SHARP

Electronic Components
August 2010

For Your Creative Products

ELECTRONIC COMPONENTS

http://sharp-world.com/products/device/

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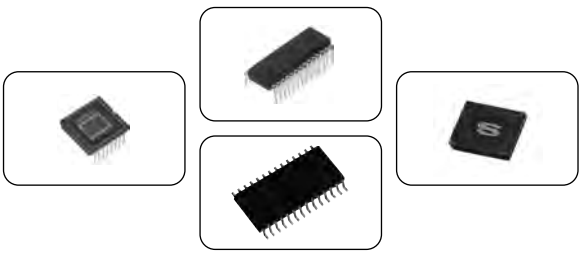

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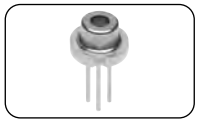

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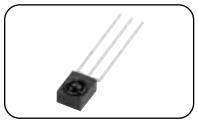

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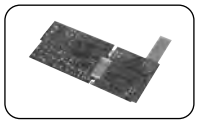


UNIT

PICKUPS

Sharp Efforts Towards a Green Society

Based on its fiscal 2010 corporate vision of becoming an “Eco-Positive Company,” the entire Sharp Group is working as one towards realizing a green society.

● **Basic Environmental Philosophy** ●

Creating an Environmentally Conscious Company with Sincerity and Creativity

● **The Sharp Group Charter of Corporate Behavior** ●

Contribution to Conservation of the Global Environment

The Sharp Group will fulfill our responsibility for environmental conservation by promoting the creation of proprietary technologies that contribute to protection of the global environment, and by carrying out our product development and business activities in an environmentally conscious manner.

● **The Sharp Code of Conduct** ●

Contribution to Conservation of the Global Environment

1. To Conserve the Environment:

① We will comply with all applicable environmental laws, regulations and territorial agreements, and work to practice efficient use and conservation of resources and energy voluntarily, in the recognition that environmental conservation is an essential facet of corporate and individual pursuits.

② We will ensure proper use and control of chemical substances in our business activities, including research, development and manufacturing, meeting or exceeding levels determined by laws and regulations.

③ We will engage in the active acquisition, reporting and promotion of environmental information at an international level, as the Sharp Group companies promote communication with shareholders and local residents.

④ We understand the importance of internal company systems and related details in acquiring third-party certification and recertification of our ISO environmental management systems, and we will conduct our business operations in accordance with relevant internal guidelines.

2. To Develop Environmentally Conscious Products and Services, and Conduct Our Business Operations in an Environmentally Conscious Manner:

① We will engage positively in the minimization of resource use, reduction in the size and weight of products, use of recycled materials, and the development of long-lasting, energy-saving, energy-creating products.

② We will work to compile information related to harmful substances that might damage the environment or human health, and will not, as a matter of principle, make use of these harmful substances in our products, services and business activities.

③ We will use recyclable materials wherever possible, with product development focused as a matter of policy on structures that are detachable or capable of dismantling, and suited to recycling.

④ We will work aggressively to reduce greenhouse gas emissions in the full range of our business activities, in order to contribute to the prevention of global warming.

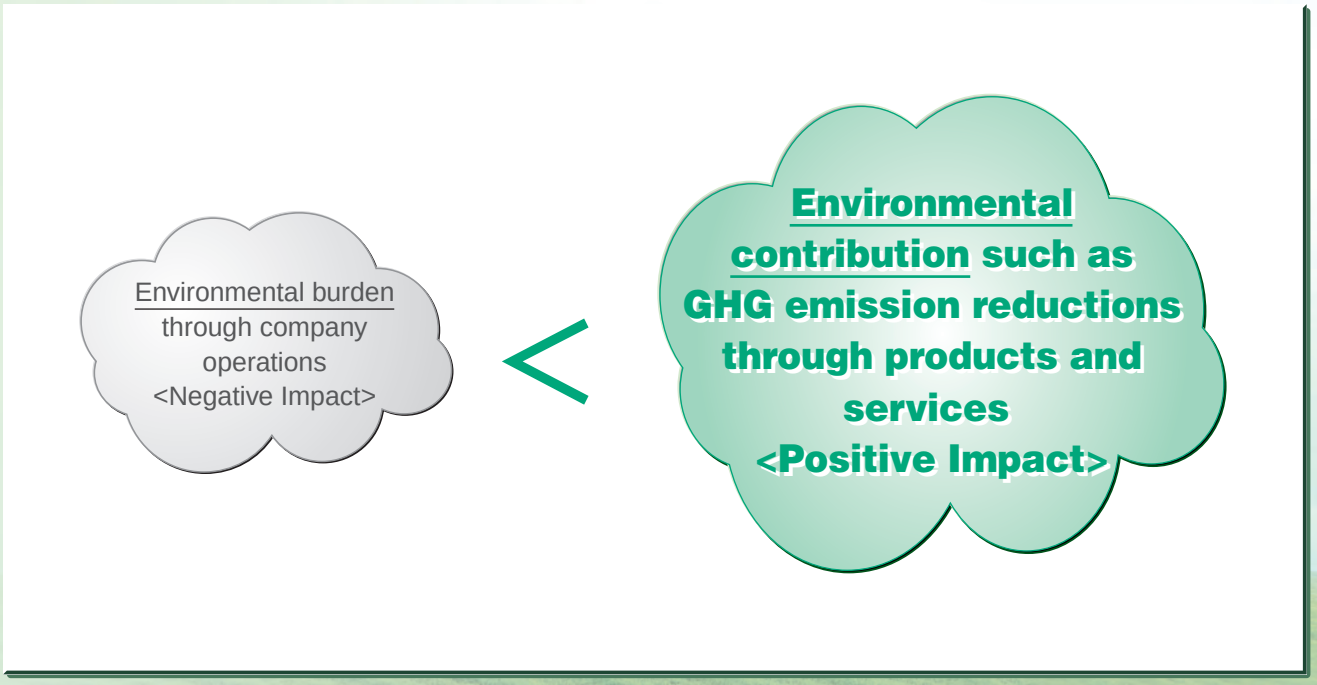
⑤ We will work to conduct our business in such a way as to select and purchase materials that are harmless to the global environment, and to local residents and employees, for the resources needed for business activities (equipment, raw materials, subsidiary materials, tools, etc.).

⑥ We realize that waste material is a valuable resource, and we will actively conduct our business operations in such a way as to maximize the 3Rs (reduce, recycle and reuse) and will contribute to minimizing the amount of waste sent for permanent landfill disposal.

* The Sharp Group Charter of Corporate Behavior and the Sharp Code of Conduct were instituted in May 2005 as a revised edition of the preceding Sharp Charter of Conduct (instituted in 2003). The contents of the Sharp Code of Conduct are current as of June 2010, and are currently under review. The section above is an excerpt from descriptions of Sharp’s environmental conservation efforts.
For more information: http://sharp-world.com/corporate/eco/report/index.html

Corporate Vision: Eco-Positive Company

Sharp aims to be an “Eco-Positive Company,” a company that works with all stakeholders in creating solutions that have significantly more positive impact on the environment than negative impact caused by company operations.
To this end, Sharp will use the four aspects of its Eco-Positive Strategy to carry out advanced environmental efforts including spreading the use of solar power, improving the environmental performance of its products and devices, making plants more environmentally conscious, and developing one-of-a-kind environmental technologies.



Developing Devices with High Environmental Performance

Developing Green Devices and Super Green Devices

Sharp calls its environmentally conscious devices Green Devices (GD). To define guidelines for development and design based on seven concepts, Sharp established the GD Guidelines, which it began applying at all device design departments in fiscal 2004. The device development process starts with the planning stage, in which Sharp uses the GD Standard Sheet, which was formulated based on the GD Guidelines, to set specific objectives. In the trial manufacture and mass production stages, Sharp determines how well the actual device has met these objectives, with those achieving the standards being certified as GD.
In fiscal 2005, Sharp began certifying devices from among GD with the highest possible levels of environmental performance as Super Green Devices (SGD). GD and SGD have been accounting for an increasing share of Sharp's net sales with each year.

◆ Green Device Concepts

Energy Efficiency	**Devices with superior energy efficiency and that consume less energy** Reduce power consumption during operation and in standby mode.
Resource Conservation	**Devices designed to conserve resources** Reduce device weight or volume.
Recyclability	**Devices designed for recycling** Use standard plastic and/or design devices that are easy to disassemble.
Safe Use and Disposal	**Devices that can be used and disposed of safely** Control usage of chemical substances contained in parts and materials.
Long Life	**Devices that make products last longer** Extend the life of the product with exchangeable parts and consumables (target: LCD devices).
Packaging	**Devices that use packaging with enhanced environmental consciousness** Reduce packaging.
Information Disclosure	**Devices that give environmental information** Provide information on chemical substances in devices.

Next-Generation LCD Module Incorporates Newly Developed LCD Panel and LED Backlight

◆ Energy Efficiency

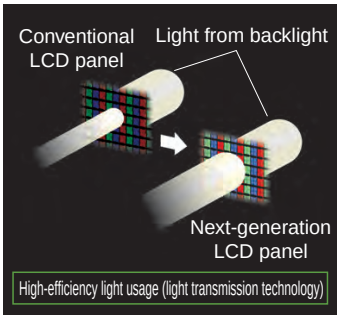
- LCD panel: Newly developed LCD panel employs UV^{2}A*1, a world-first*2 photo-alignment technology that gives a higher aperture ratio for brighter images with minimal light.
- Backlight: The LED backlight offers precise, efficient control of light.
- The newly developed LCD panel and LED backlight combine to give outstanding energy efficiency.

◆ High Contrast

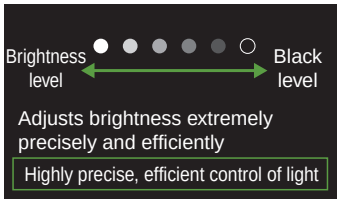
- TV contrast*3 of 2,000,000:1.

*1 Abbreviation for Ultraviolet-induced Multi-domain Vertical Alignment
*2 On a production volume basis using large glass substrates of at least 6th generation or later. Based on Sharp research.
*3 When viewed from directly in front of the screen. The maximum contrast level a TV set is capable of achieving (the ratio of maximum screen brightness for an all-white signal to the minimum screen brightness with an all-black signal; in this case, 2,000,000:1 with AV position set to "Dynamic").

Newly developed LCD panel



LED backlight



Raising the Level of Environmental Performance in Factories

Making More Factories Super Green Factories

Sharp defines factories with a high level of environmental consciousness as Green Factories (GF). The basic policies and operational know-how for achieving GF status have been formulated in line with 10 concepts in the GF Guidelines, which Sharp has been applying at all production bases in Japan since fiscal 1999 and overseas since fiscal 2001.
With construction of the Kameyama Plant, in fiscal 2003 Sharp established assessment criteria for Super Green Factories (SGF)—factories with exceptionally high levels of environmental performance—and launched efforts to award in-house certification. The Kameyama Plant was the first plant to achieve this certification. Sharp started GF certification in fiscal 2004 and overseas as well, and Sharp has achieved its mid-term objective of having all Sharp plants in Japan and overseas certified for GF status and all 10 Sharp Corporation plants in Japan certified for SGF status by fiscal 2007.
In fiscal 2008, Sharp stepped up its SGF efforts with the start of the SGF II initiative at plants certified for SGF status.

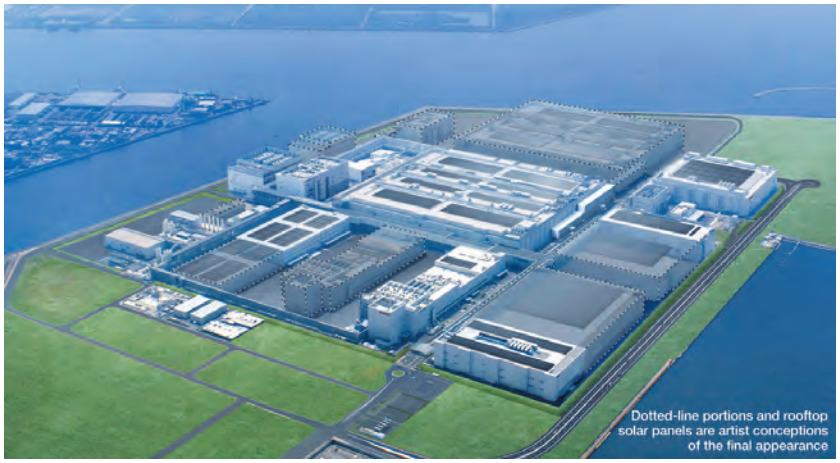
◆ Green Factory Concepts

Greenhouse gases	**Minimize emission of greenhouse gases**
Energy	**Minimize energy consumption**
Waste	**Minimize discharge of waste**
Resources	**Minimize resource consumption**
Chemical substances	**Minimize risk of environmental pollution and accidents caused by chemical substances**
Atmosphere, water, soil	**Minimize environmental burden on the atmosphere, water, and soil**
Harmony with nature	**Endeavor to preserve nature both on and off site**
Harmony with the community	**Encourage harmony with the local community**
Environmental consciousness	**Foster high environmental awareness among employees**
Information disclosure	**Disclose information on the environment**

Development of GREEN FRONT SAKAI

In order to become a company that contributes to the environment, Sharp has been developing its business on the two pillars of energy-saving LCDs and energy-creating solar cells. In order to further these efforts, Sharp commenced operations at a new LCD panel plant in October 2009 in Sakai, Osaka prefecture. We hope to propel our business forward by having companies in other fields with advanced technology join us, to help us achieve the goal of creating a “green society” suitable to today’s environmentally conscious mindset.

GREEN FRONT



Overview of GREEN FRONT SAKAI
Location: 1-banchi, Takumi-cho, Sakai-ku, Sakai-shi, Osaka
Site area: 1.27 million m^2
(approx. 28 times the size of Tokyo Dome)

LCD Panel Plant
Start of operations: October 2009
Mother glass size: 2,880 mm x 3,130 mm (10th generation)
Mother glass input capacity: 72,000 substrates per month (initial capacity at start of operations: 36,000 substrates per month)

Thin-Film Solar Cell Plant
Start of operations: March 2010
Glass substrate size: 1,000 mm x 1,400 mm
Plant capacity: up to 1 GW expansion in production is possible

Achieving Super Green Factories

Sharp is systematically acting to enhance the environmental consciousness of its production sites worldwide. Sharp has established proprietary assessment standards to rank factories with high environmental consciousness as Green Factories, and those with extremely high environmental consciousness as Super Green Factories.

Sharp's First Super Green Factory Kameyama Plant

Liquid Crystal Display Production Group (Kameyama, Mie Prefecture)

The Kameyama Plant is Sharp's first "Super Green Factory," a compilation of the company's environmental protection technologies.
In preparing for construction, we gave a great deal of careful consideration to protecting the environment, beginning at the initial design stage. Working in consultation with local governments and with nearby residents, we carefully selected the parameters that would be subject to environmental protection measures. We chose the standards that would apply, and confirmed them through evaluation by independent experts.
Also, when building Kameyama Plant No. 2, we took the opportunity to introduce the latest environmental technology to make it one of the world's most advanced "Super Green" factories.

The Kameyama Plant Receives Japan Sustainable Management Award
The Kameyama Plant in Japan was recognized for its outstanding environmental sustainability management by being chosen from among 125 applicants for the highest honor, the Sustainable Management Pearl Award, in the 2004 Japan Sustainable Management Awards* (sponsored by the Japan Sustainable Management Awards Committee and Mie Prefecture). This award shows the high esteem for the environmental measures—including 100% recycling of manufacturing process wastewater, the introduction of a cogeneration system and the installation of a photovoltaic power system—taken by the Kameyama Plant, Sharp's first Super Green Factory.
The Kameyama Plant received the first Minister of Economy, Trade and Industry Award in the 8th Japan Water Prize (2006), the Energy Saving Encouraging Prize in the 4th Excellent Cogeneration System Commendation (FY 2005) sponsored by the Japan Cogeneration Center, and the Minister of the Environment's Award for Activities to Fight Global Warming (FY2007).

* The Japan Sustainable Management Awards honor all organizations across the nation, no matter what their size or type of business—including private companies, NPOs and schools—that demonstrate outstanding results of their environmental sustainability management efforts.

An Efficient and Environment-Friendly Integrated Production System
The entire process is carried out in a single plant—from fabricating the LCD panels to final assembly. This system makes it possible to consolidate technical departments and strengthen our development capabilities, as well as shorten the lead-time from order to shipping. Eliminating the need to ship sub-assemblies between distant plants has also enabled us to slash the amount of packaging materials required for shipping and reduce emissions such as carbon dioxide (CO_2).

Countering Global Warming by Unifying Diverse Power Sources Distributed over a Wide Area
The Kameyama plant generates one-third of its annual electricity consumption and has reduced CO_2 emissions to about 40% lower than previous levels by means of a cogeneration system* using liquefied natural gas (LNG) (approx. 40,000 kW) as well as one of the world's largest-class photovoltaic (PV) power generation systems (5,210 kW).

* Cogeneration system: A system designed to save energy by using city gas to generate electricity. The waste heat generated is then used in applications such as air conditioning, hot water supply and steam electricity generation.

Creating Energy at the Factory for Energy-Saving Products, Using One of the World's Largest-Class* PV Power Generation Systems
In addition to the existing 60-kW photovoltaic (PV) power generation system, new PV power generation systems, in a total area of approx. 47,000 m^2 and with a total output of 5,150 kW, have been installed. Located at the large-screen LCD TV factory, the distribution building, and on the roof and curtain wall of the Kameyama Plant No. 2, these systems generate an annual electricity output that would power 1,300 average Japanese households.

* As a building-installed system. Survey by Sharp.

Water Purifying System—100% Water Recycling in the Production Process
The plant collects all the wastewater from the production process of liquid crystal panels, etc. and recycles it 100% with water purification techniques using microorganism treatment. Malodorous wastewater containing chemicals is deodorized using peat moss* from Ishikari River, Hokkaido.

* Bog moss decomposed and piled up for several thousands of years.

Mie Plant Becomes First Existing Factory to Achieve Super Green Status

Liquid Crystal Display Production Group (Taki, Mie Prefecture)

The results described below are major efforts in upgrading to a Super Green Factory.

Mie Plant Environmental Site Report Receives Awards for Two Consecutive Years
In 2008, the Sharp Mie Plant environmental site report was presented with the Site Report Award at the 12th annual Environmental Reporting Awards hosted by Toyo Keizai Inc. and Green Reporting Forum. In 2009, the report was awarded the Incentive Award at the 13th annual Environmental Communication Awards hosted by the Japanese Ministry of the Environment and the Global Environmental Forum. Both of these awards are intended to honor excellence in environmental site reporting by factories, and the Mie Plant's earning of awards two years in a row is an indicator of the high acclaim the plant enjoys.

CO_2 Emissions Reduction Efforts
Sharp has assembled a CO_2 Emissions Reduction Commission to curb emissions from heavy CO_2-emitting equipment and achieve major cuts in overall CO_2 emissions. Included among the members of this committee are the managers in charge of running all types of production equipment. The Commission has outlined plans for annual emissions reductions of 3% or more, and the entire Mie Plant is making an all-out effort to minimize the volume of CO_2 emitted.

Biodiversity Efforts
In response to the rapid decline in once-abundant fish populations in the rivers and ponds surrounding the Mie Plant, employees have taken steps to release stocks of fish in the reservoir on the plant premises and protect them. Also, starting in FY 2009, plant employees are engaged in conservation efforts in the coastal Matsunase Tidal Flats area. These are among Japan's most important tidal flats, home to large numbers of endangered plants and animals, and are therefore a key site for efforts to maintain biodiversity.

Participation in Local Activities
As a regional corporate citizen, members of the Mie Plant are making active contributions to local activities. Members have been taking part in educational programs at local schools; have dispatched visiting lecturers to about 20 elementary, junior high and high schools in the vicinity of the plant; are conducting joint environmental activities; and are seeking to raise young people's level of environmental awareness.

Participation in Local Environmental Conservation Activities
In addition to efforts to mitigate the impact of the plant on the surrounding environment, the Mie plant is playing a role in local environmental conservation activities. Activities include a wide range of mountain, river, road and park-related programs, such as the upkeep of the forest surrounding the water source in the Osugi Valley, maintenance of the forests and mountains in the town of Taki, cleaning of the plant's effluent stream (the Sanagawa River), cleanup and planting of flowers on National Route 42, and work on the plaza at Taki Crystal Town Shopping Center.

From Super Green Factory to Super Green Factory II

Advanced Development & Planning Center/ Corporate Research & Development Group/ Production Technology Development Group (Tenri, Nara Prefecture)

ISO 14001 certification: December 3, 1996

Adoption of a Cogeneration System*

About 26% of facility power is provided through private power generation. Waste heat is used for heating or cooling and also supplied to a steam generator for power generation. This cuts facility CO_2 emissions by about 13%.

* An energy-saving system that generates power using municipal gas and uses the produced waste heat for heating or cooling, hot water supply and steam electricity generation, etc.

Installation of a Solar Generation System

Installation of solar panels with a generating capacity of 40 kW.

Waste Fluid Processing System based on Natural Purification*

Waste and the pollution load of released water are reduced by using a waste fluid treatment system for waste water containing alcohol or other organic components.
After treatment, water is given further high-level treatment and used as intermediate factory water, to ensure more effective use of water resources.

* A natural purification system based on micro-organisms, developed independently by Sharp. (Patented)

Promotion of Zero Emissions*

Zero emissions were achieved in fiscal 2002 through reclamation of waste into useful resources for other business fields. Efforts will continue to further reduce waste emissions.

Environmental and Social Contributions

The center has a historic ancient burial mound on its grounds, and the center's employees are actively involved in biodiversity efforts in the surrounding area. These include upkeep of the bamboo grove near the mound and efforts to protect the rare *sasayuri* lilies *(Lilium japonicum)* growing nearby.
In terms of community exchange, in August of each year the center invites employees and their families and local people to a "Sharp Festa," which includes exhibits showcasing the environmental activities of the center. Also, the company hosts parent-child tours during the spring, summer and winter breaks at its Sharp Memorial Technology Hall.

Solar Systems Group
Solar Systems Development Group
Global Solar Systems Sales & Marketing Group
Electronic Components & Devices Group (Katsuragi, Nara Prefecture)

ISO 14001 certification: June 25, 1996

Prevention of Water Pollution

All wastewater from production and other processes is released into public sewers only after being purified at a wastewater treatment facility within the factory grounds.
The treated wastewater released into public sewers is held to voluntary standards that are stricter than water emission standards set forth in the Sewerage Law.
A portion of the wastewater from production processes is collected, purified, and recycled as water reused in production, mitigating environmental impact and making efficient use of water resources.

Prevention of Air Pollution

Waste gases containing acids, alkalis and organic solvents produced during production and other processes, are purified and rendered harmless by onsite waste gas treatment equipment (acid/alkali scrubbers or solvent scrubbers, depending on the waste gas properties).

Continuation (Maintenance) of Zero Waste Emissions*

In fiscal 2001, the factory achieved zero emissions through the recycling of waste into useful materials. It is now working to promote further reduction of waste volumes, as well as further recycling efforts.

Solar Generation System

A solar generation system (194.5 kW total capacity) has been installed on the rooftops of factory buildings and elsewhere on the grounds, and the electricity generated is used for tasks such as factory air conditioning.

Relations with the Local Community

The factory takes an active role as a member of the community, participating in the twice-yearly local event known as "tsuyu-barai," or "banishing the dew." Held in April and September, this event includes cleanup of the waterways (ditches) and roads in the vicinity of the factory.
In October of each year, the factory holds the Katsuragi Festa (festival) to maintain positive relations with the surrounding community and showcase the site's environmental activities.

Electronic Components & Devices Group (Fukuyama, Hiroshima Prefecture)

ISO 14001 certification: September 24, 1996

Development of Unique Environmental Technologies

The Group developed a fusion of micro-nano bubble (MNB) technology and a unique microorganism treatment technology, and put it into practice in July 2006 in the world's first semiconductor plant using non-dilution treatment technology on the nitrogen contained in wastewater. The plant also incorporated waste treatment technology to address emissions of 2-aminoethanol, covered under the Pollutant Release and Transfer Register (PRTR) system, and has succeeded in cutting such emissions to approximately one-third of previous amounts.

Promotion of Zero Emissions*

Zero emissions was achieved in 2001 through ongoing efforts such as reductions in volume of waste produced, recycling of waste into useful materials, and reuse.

Prevention of Global Warming

An energy conservation committee has been formed to promote energy conservation efforts involving the entire Group. Efforts such as building a unique energy-saving outer air treatment system have been highly regarded, and the Group received a "2005 Excellent Energy Conservation Factory & Building (electricity category)" award from the Director-general of the Agency for Natural Resources and Energy.

Relations with the Local Community

In August of each year, employees and their families and local people are invited to the "Family Day in Sharp (Summer Festival)." At this festival, an environmental exhibition space is prepared to provide an opportunity for people to experience nature and to introduce the environmental protection efforts of the facility.
The plant also implemented the semiconductor industry's first full-scale risk communication system (July 2005), and holds ongoing meetings and other events with local residents in order to provide a better understanding of them. Furthermore, the plant jointly produced a large communication panel (4 m x 6 m) called "Daimoncho—Yesterday and Today" in cooperation with the local residents who approved and supported our efforts. The panel is on display at our premises and is being used to introduce our business and Daimoncho to visitors.
Communication activities such as these have been highly evaluated, and the Group received the "2005 PRTR Prize" sponsored by the Center for Environmental Information Science.

Electronic Components & Devices Group (Mihara, Hiroshima Prefecture)

ISO 14001 certification: November 17, 2003

Prevention of Global Warming

The precise air-conditioning necessary for production activities is maintained by operating coolers and boilers on municipal gas, which produces little CO_2.
The turbo coolers provided in air-conditioning equipment use a waste heat recovery system. A remover optimized for greenhouse gases is provided to suppress emission of such gases and prevent global warming.

Installation of a Solar Generation System

In February 2007, solar panels with a generating capacity of 20 kW were installed on the roof of the No. 2 Plant.

Promotion of Zero Emissions*

Zero waste emission has been achieved through active efforts to reduce and reclaim waste, instituted from the beginning of the facility. In recognition of these efforts, Sharp was awarded the Clean Japan Center's 2008 chairperson's award in recognition of distinguished persons promoting the principle of "Reduce, Reuse, and Recycle" (sponsored by the Ministry of Economy, Trade and Industry).

Efforts to Prevent Pollution

After treatment at an in-house facility, all process waste water is discharged into the public sewer only after clearing voluntary standards stricter than waste water standards. Sludge produced in waste water treatment is sorted by type and reclaimed.
Measures are taken such as installing equipment indoors to prevent noise escaping to the surrounding area from noisy equipment, such as large fans and large compressors. Noise levels at the site boundary are within regulation values.
The plant is working to improve management of chemical substances, prevent accidents and environmental disasters, and reduce environmental impact.

Efforts to Contribute to the Local Community

Through efforts such as inviting local people to festivals and activities to protect forests, the plant aims to deepen relations with people in the local area and protect the environment.
Efforts are being made to beautify the area by participating in greenification activities in the Mihara Western Industrial District where this facility is located.

* Sharp defines this as bringing the amount of buried waste (final disposal amount) as close to zero as to be negligible.
In figures, a final disposal rate of less than 0.5% (final disposal rate = buried amount / total discharged amount x 100) is taken to be zero emissions.

☆New product/Under development

■ LCD Modules

<For industrial appliances> (1)

	Display size	Model No.	Number of pixels (dot) H × V	Pixel pitch (mm) H × V	Display colors	Lumi-nance (cd/m²)	Input video signal	Power con-sumption (W)	Outline dimensions (mm) W × H × D	Weight (g)	Backlight	Remarks
TFT	28.1″ (71cm)	LQ281L1LW14	2 048 × RGB × 2 048	0.246 × 0.246	16.77 M	225	4ch LVDS	96.0	594.0 × 594.0 × 83.0	15 000	18CCFT	Built-in inverter Advanced Super V
	23.1″ (59cm)	LQ231U1LW31/32	1 600 × RGB × 1 200	0.294 × 0.294	16.77 M	500	LDI 8 bit RGB	T.B.D.	530.0 × 431.5 × 32.5	(Max. 4 500)	LED	Advanced Super V LED backlight
	20.1″ (51cm)	LQ201U1LW11Z	1 600 × XYZ × 1 200	0.255 × 0.255	256 (gray scales)	700	2ch LVDS 8 bit XYZ	32.9	436.0 × 335.0 × 27.5	Max. 3 800	6CCFT	Advanced Super V
	19.0″ (48cm)	LQ190E1LW02	1 280 × RGB × 1 024	0.294 × 0.294	16.77 M	300	2ch LVDS 8 bit RGB	(25.5)	404.2 × 330.0 × 20.0	Max. 2 800	4CCFT	Advanced Super V
		LQ190E1LW43				400		37	404.2 × 330.0 × 22.0	Max. 3 200	6CCFT	
		LQ190E1LX51				1 000		75	404.2 × 330.0 × 34.0	Max. 2 600	LED	Advanced Super V LED backlight
	15.0″ (38cm)	LQ150X1LGB1	1 024 × RGB × 768	0.297 × 0.297	16.19 M	600	1ch LVDS 8 bit RGB (6 bit + 2FRC)	16.0	331.6 × 254.76 × 12.5	1 200±50	4CCFT	
		LQ150X1LG55				350		9.6	326.5 × 253.5 × 11.2	Max. 1 000	2CCFT	Compliant with the PSWG standard
		LQ150X1LG81						9.8	326.0 × 252.0 × 11.2			
		☆LQ150X1LW73						T.B.D.	331.6 × 254.76 × 12.5	Max. 1 350	4CCFT	Advanced Super V
	12.1″ (31cm)	LQ121S1DG42/LG42	800 × RGB × 600	0.3075 × 0.3075	260 k	370	CMOS 6 bit RGB/ 1ch LVDS 6 bit RGB	8.3	276.0 × 209.0 × 11.0	Max. 660	2CCFT	
		LQ121S1DG61/LG61				450				Max. 800		Strong LCD2
		☆LQ121S1LG71			12 M	(450)	1ch LVDS 8 bit RGB	(6.36)	265.0 × 205.0 × 9.5	Max. 550	LED	LED backlight
	10.4″ (26cm)	LQ104S1DG2A/LG2A	800 × RGB × 600	0.264 × 0.264	260 k	350	CMOS 6 bit RGB/ 1ch LVDS 6 bit RGB	6.5/6.6	246.5 × 179.4 × 15.5	Max. 620	2CCFT	
		LQ104S1DG61/LG61				420		8.0	246.5 × 179.4 × 13.7	Max. 620		Strong LCD2
		LQ104V1DG21	640 × RGB × 480	0.330 × 0.330		350	CMOS 6 bit RGB	6.4	265.0 × 195.0 × 11.5	Max. 700	2CCFT	
		LQ104V1DG5A							246.5 × 179.4 × 15.5	Max. 620		
		LQ104V1DG61/LG61				450	CMOS 6 bit RGB/ 1ch LVDS 6 bit RGB	6.3	246.5 × 179.4 × 13.7			Strong LCD2
		LQ104V1DG62				550	CMOS 6 bit RGB	5.2	246.5 × 179.4 × 12.5	Max. 580	LED	Strong LCD2 Long-life LED backlight
	8.4″ (21cm)	LQ084S3LG01	800 × RGB × 600	0.213 × 0.213	16.19 M	400	1ch LVDS 8 bit RGB	5.9	199.5 × 149.5 × 11.6	Max. 405	2CCFT	Strong LCD2
		LQ084V3DG02	640 × RGB × 480	0.270 × 0.270	260 k		CMOS 6 bit RGB	4.6		Max. 400	LED	Long-life LED backlight
		LQ084V1DG41				300		4.9	221.0 × 152.4 × 12.0	Max. 430	1CCFT	

Notice
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. The models listed on this page are lead-free solder compatible. For details, please inquire with SHARP. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

☆New product/Under development

<For industrial appliances> (2)

	Display size	Model No.	Number of pixels (dot) H × V	Pixel pitch (mm) H × V	Display colors	Lumi-nance (cd/m^2)	Input video signal	Power con-sumption (W)	Outline dimensions (mm) W × H × D	Weight (g)	Backlight	Remarks
TFT	5.7″ (14cm)	LQ057V3DG02	640 × RGB × 480	0.180 × 0.180	260 k	400	CMOS 6 bit RGB	4.5	144.0 × 104.6 × 13.0	Max. 250	LED	Long-life LED backlight
		☆LQ057V3LG11			260 k	350	1ch LVDS 6 bit RGB	2.3	144.0 × 104.6 × 12.3	Max. 190		LED backlight
		LQ057Q3DG01	320 × RGB × 240	0.360 × 0.360	260 k	320	CMOS 6 bit RGB	1.4	144.0 × 104.6 × 13.8	230	LED	LED backlight with resistive-film touch panel
		LQ057Q3DG02				400			144.0 × 104.6 × 12.3	190		LED backlight
		LQ057Q3DG21				(500)		(1.5)	(131.6 × 103.8 × 9.0)	(Max. 170)		
	4.3″ (12cm)	LQ043T3DG01	480 × RGB × 272	0.198 × 0.198	260 k	400	CMOS 6 bit RGB	0.6	105.5 × 67.2 × 5.05	65	LED	LED backlight
		LQ043T3DG02				480			105.5 × 67.2 × 3.95	55		
	3.5″ (9cm)	LQ035Q3DG03	320 × RGB × 240	0.2205 × 0.2205	16 M	(450)	CMOS 8 bit RGB	T.B.D.	76.9 × 63.9 × 4.7	T.B.D.		Long-life LED backlight
		LQ035Q3DW02			260 k	450	CMOS 6 bit RGB	0.5	76.9 × 63.9 × Max. 3.5	33		Advanced Super V LED backlight
	2.5″ (6cm)	LQ025Q3DW02		0.156 × 0.156	260 k	350 TYP.	CMOS 6 bit RGB	0.28	56.8 × 48.8 × Max. 3.5	Max. 25		

* Protrusions such as backlight harnesses and positioning bosses are not included.

☆New product
★Under development

<For automotive applications> (1)

- LQ065T9DZ03A: operating temperature (panel surface temperature) –40 to +85°C / storage temperature –40 to +95°C
- Other models: operating temperature (panel surface temperature) –30 to +85°C / storage temperature –40 to +85°C

	Display size (cm) [″]	Model No.	Dot format H × V (dot)	Pixel pitch H × V (mm)	Active area H × V (mm)	Input signal system	Input video signal	Back-light	Lumi-nance (cd/m²) (TYP.)	Power consump-tion (mW) (TYP.)	Outline dimensions*1 W × H × D (mm) (TYP.)	Weight (g) (TYP.)	Remarks
TFT	7.6 [3]	☆LQ030T5DG01	480 × 240 × RGB	0.139 × 0.153	66.84 × 36.72	6-bit digital RGB	6-bit digital	Built-in LED	400	490	77 × 48 × 6.0	40	Wide QVGA (16:9), Thin, LED backlight, 260K-color display, Wide viewing angle
	8.9 [3.5]	LQ035Q5DG02	320 × RGB × 240	0.222 × 0.222	71.0 × 53.3	6-bit digital RGB	6-bit digital	Built-in LED	500	1 280	86.4 × 84 × 6.7	65	"Compact LCD" suitable for display in meter, LED backlight, High luminance, Thin, High-speed response (low temperature), 260K-color display, Wide viewing angle, RoHS compliant
		★LQ035Q5DG06	240 × 320 × RGB	0.222 × 0.222	53.28 × 71.04	6-bit digital RGB	6-bit digital	Built-in LED	400	930	67 × 84 × 6.7	T.B.D.	LED backlight, Thin, High-speed response (low temperature), 260K-color display, Wide viewing angle, RoHS compliant
	11 [4.3]	LQ043T5DG02	400 × RGB × 234	0.2385 × 0.2275	95.4 × 53.24	6-bit digital RGB	6-bit digital	Built-in LED	500	1 200	107.7 × 65.5 × 8.15	65	Wide QVGA (16:9), LED backlight, Digital I/F, 260K-color display, High luminance, Wide viewing angle, RoHS compliant
	12.7 [5]	☆LQ050T5DG01	400 × RGB × 240	0.27 × 0.27	108 × 64.8	6-bit digital RGB	6-bit digital	Built-in LED	600	840	120.6 × 75.2 × 9.0	110	Wide QVGA (15:9), Thin, High contrast, LED backlight, 260K-color display, Wide viewing angle, RoHS compliant
	15 [5.8]	☆LQ058T5DG02	480 × 240 × RGB	0.268 × 0.297	128.4 × 70.92	6-bit digital RGB	6-bit digital	Built-in LED	450	994	139 × 82.7 × 6.0	120 (Max.)	Wide QVGA (16:9), LED backlight, Thin, 260K-color display
		★LQ058T5DR02	480 × 272 × RGB	0.2685 × 0.2625	128.88 × 71.4	6-bit digital RGB	6-bit digital	Built-in LED	450	1 286	141.1 × 83.7 × 10.5	120 (Max.)	Wide QVGA (16:9), LED backlight, Digital I/F, 260K-color display, Wide viewing angle, RoHS compliant
	16 [6.5]	LQ065T5GG64	400 × RGB × 234	0.3585 × 0.339	143.4 × 79.326	NTSC/ PAL	TFT specific analog RGB*2	Built-in LED	900	1 220	155 × 89.2 × 6.5	140 (Max.)	Wide QVGA (16:9), Thin, High luminance, LED backlight, 260K-color display, Wide viewing angle, RoHS compliant

*1 Excluding FPC for connection and other protruding parts.
*2 Video interface: External (Device specific external video interface IC is available.)
(Note) Please refer to the latest relevant specification sheets before using these devices.

LQ030T5DG01

LQ058T5DG02

LQ070T5DG04

☆New product

<For automotive applications> (2)

- LQ070Y5DG06/LQ080Y5DG03/LQ080Y5DR04: operating temperature (panel surface temperature) –30 to +85°C / storage temperature –40 to +95°C
- Other models: operating temperature (panel surface temperature) –30 to +85°C / storage temperature –40 to +85°C

	Display size (cm) [″]	Model No.	Dot format H × V (dot)	Pixel pitch H × V (mm)	Active area H × V (mm)	Input signal system	Input video signal	Back-light	Lumi-nance (cd/m²) (TYP.)	Power consump-tion (mW) (TYP.)	Outline dimensions*1 W × H × D (mm) (TYP.)	Weight (g) (TYP.)	Remarks
TFT	18 [7]	☆LQ070T5DG04	480 × 240 × RGB	0.326 × 0.339	156.48 × 81.72	6-bit digital RGB	6-bit digital	Built-in LED	450	1 184	167 × 93 × 6.0	150 (Max)	Wide QVGA (17:9), LED backlight, 260K-color display, RoHS compliant
		☆LQ070T5DG05	480 × 240 × RGB	0.321 × 0.363	154.08 × 86.94	6-bit digital RGB	6-bit digital	Built-in LED	450	1 314	164.4 × 99.5 × 6.0	160 (Max)	Wide QVGA (16:9), LED backlight, 260K-color display, RoHS compliant
		LQ070Y5DG06	800 × RGB × 480	0.191 × 0.191	152.4 × 91.44	6-bit digital RGB	6-bit digital*2	Built-in LED	540*3	5 100	170 × 104 × 8.0	230	High resolution (wide VGA/15:9), High color purity (65% of NTSC), High-speed response (low temperature), LED backlight, 260K-color display, Wide viewing angle, RoHS compliant
		LQ070Y5DE03	800 × RGB × 480	0.195 × 0.1725	156.0 × 82.8	6-bit digital RGB	6-bit digital*2	Built-in LED	370*3	6 400	170.8 × 107.95 × 12.5	315 (Max.)	Dual directional viewing LCD, Wide screen (17:9), LED backlight, 260K-color display, Wide viewing angle, RoHS compliant
	20 [8]	LQ080Y5DG03	800 × RGB × 480	0.2175 × 0.2175	174.0 × 104.4	6-bit digital RGB	6-bit digital*2	Built-in LED	540*3	6 200	190 × 120 × 8.0	270	High resolution (wide VGA/15:9), High color purity (65% of NTSC), High-speed response (low temperature), LED backlight, Thin, 260K-color display, Wide viewing angle, RoHS compliant
		LQ080Y5DR04	800 × RGB × 480	0.2175 × 0.2175	174.0 × 104.4	6-bit digital RGB	6-bit digital*2	Built-in LED	480	4 300	190 × 120 × 8.0	290 (Max.)	High resolution (wide VGA/15:9), Thin, LED backlight, 260K-color display, Wide viewing angle, RoHS compliant
		☆LQ080Y5DW01	800 × RGB × 480	0.2175 × 0.2175	174.0 × 104.4	6-bit digital RGB	6-bit digital	Built-in LED	625	9 925	190 × 120 × 13.0	385	Wide VGA (15:9), LED backlight, 260K-color display, RoHS compliant
		☆LQ080Y5DW30	480 × RGB × 480	0.2175 × 0.2175	174.0 × 104.4	6-bit digital RGB	6-bit digital	Built-in LED	543	8 632	190 × 120 × 15.0	435	Wide VGA (15:9), LED backlight, 260K-color display, Touch panel, RoHS compliant
		☆LQ080Y5DE30	800 × RGB × 480	0.2175 × 0.2175	174.0 × 104.4	6-bit digital RGB	6-bit digital	Built-in LED	320*3	8 617	190 × 120 × 12.75	439	Dual directional viewing LCD, Wide VGA (16:9), LED backlight, 260K-color display, Touch panel, RoHS compliant

*1 Excluding FPC for connection and other protruding parts.
*2 Video interface: External (Device specific external video interface IC is available.)
*3 Luminosity at eye point
(Note) Please refer to the latest relevant specification sheets before using these devices.
The plants No. 1 and No. 2 (JQA-AU0121) at the Mie site of the Mobile Liquid Crystal Display Group have been certified under the ISO/TS 16949:2002 Quality Management System. [Certifying organization: Japan Quality Assurance Organization (JQA)]

★Under development

<Large-size LCD Module>

	Display size (cm) [″]	Model No.	Number of pixels*1	Dot format H × V (dot)	Active area H × V (mm)	Number of colors (color)	Outline dimensions*2 W × H × D (TYP.) (mm)	Backlight	Interface (Input signal)	Remarks
TFT	207.2 [81.6]	★LK816D3LA19	2 073 600	1 080 × 1 920 × RGB	1 015.7 × 1 805.8	16.77M	1 094.0 × 1 879.0 × (81.9)	CCFL Built-in	2ch-LVDS*3 (8-bit digital)	Portrait/Landscape free-setting Advanced Super V High luminance: (1 500 Max.)*4 cd/m^2 Wide viewing angle: L/R 176°/ U/D 176° High contrast: (1 500:1) High-speed response [G to G]: (6) ms (Ave.)
	152.5 [60]	★LK600D3LA19	2 073 600	1 920 × RGB × 1 080	1 329.1 × 747.6	1.06B (8-bit + 2FRC)	(1 401.1 × 820.4 × 43.0)		2ch-LVDS*3 (10-bit digital)	Advanced Super V High luminance: 500 cd/m^2 Wide viewing angle: L/R 176°/ U/D 176° High contrast: (2 000:1) High-speed response [G to G]: (6) ms (Ave.)
	132.2 [52]	LK520D3LZ8X	2 073 600	1 920 × RGB × 1 080	1 152.0 × 648.0	1.06B (8-bit + 2FRC)	(1 219.0 × 706.7 × 64.6)		2ch-LVDS*3 (10-bit digital)	Advanced Super V High luminance: 450 cd/m^2 Wide viewing angle: L/R 176°/ U/D 176° High contrast: (1 500:1) High-speed response [G to G]: (6) ms (Ave.)
	116.8 [46]	★LK460D3LA2X	2 073 600	1 920 × RGB × 1 080	1 018.1 × 572.7	1.06B (8-bit + 2FRC)	(1 083.0 × 624.7 × 53.4)		2ch-LVDS*3 (10-bit digital)	Advanced Super V High luminance: 500 cd/m^2 Wide viewing angle: L/R 176°/ U/D 176° High contrast: (3 000:1) High-speed response [G to G]: (6) ms (Ave.)
	101.6 [40]	★LK400D3LA1X	2 073 600	1 920 × RGB × 1 080	885.6 × 498.2	1.06B (8-bit + 2FRC)	(952.0 × 551.0 × 50.8)		2ch-LVDS*3 (10-bit digital)	Advanced Super V High luminance: 500 cd/m^2 Wide viewing angle: L/R 176°/ U/D 176° High contrast: (3 000:1) High-speed response [G to G]: (6) ms (Ave.)
	80.0 [31.5]	LK315T3LA5X	1 049 088	1 366 × RGB × 768	697.7 × 392.3	16.77M	(760.0 × 450.0 × 50.0)		1ch-LVDS*3 (8-bit digital)	Advanced Super V High luminance: 450 cd/m^2 Wide viewing angle: L/R 176°/ U/D 176° High contrast: (2 000:1) High-speed response [G to G]: (7) ms (Ave.)
	80.0 [31.5]	★LK315T3LA7X	1 049 088	1 366 × RGB × 768	697.7 × 392.3	16.77M	(760.0 × 450.0 × 32.5)		1ch-LVDS*3 (8-bit digital)	Ultraviolet-induced Multi-domain Vertical Alignment LCD High luminance: 450 cd/m^2 Wide viewing angle: L/R 176°/ U/D 176° High contrast: (5 000:1) High-speed response [G to G]: (7) ms (Ave.)

*1 Pixel means a set of each RGB dot.
*2 Excluding FPC for connection and other protruding parts.
*3 LVDS: Low Voltage Differential Signaling
*4 With cooling module prepared by user.
(Note) Please note that the specifications are subject to change without prior notice for product improvement.

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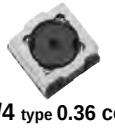
■ CMOS Camera Modules Road Map

Image format	2008 or before	2009	2010
5 M (QSXGA)		RJ64SC100  1/4 type 0.36 cc Built-in auto focus function 8.5 x 8.5 x 5.0	
3 M (QXGA)	RJ64PC200  1/4 type 0.38 cc Built-in auto focus function 8.5 x 8.5 x 5.3		RJ64PC800  1/4 type 0.37 cc Built-in auto focus function 8.5 x 8.5 x 5.1
2 M (UXGA)	RJ65NC100  1/5 type 0.20 cc Built-in auto focus function 7.0 x 7.0 x 4.0		
VGA	RJ6ABA103  1/10 type 0.05 cc 5.0 x 5.0 x 1.95	RJ68BA100  1/8 type 0.07 cc 6.0 x 5.5 x 2.2	RJ6ABA600  1/10 type 0.05 cc 5.0 x 5.0 x 1.95

Model No.

Optical format & volume

Outline dimensions (D x W x H) TYP. (mm)

Notice
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

■ CMOS Camera Modules

Module configuration : CMOS image sensor, CDS/AGC/10-bit ADC, timing generator, DSP, lens
Color filter : R, G, B primary color mosaic filters
Operating temperature : –20 to 60°C

Optical format	Image format	Optical function	Model No.	Features	Output pixels (H x V) MAX.	Lens			Output signal	Supply voltage (V)	Power consumption (mW) TYP.	Package*1
						F No.	Config-uration	Horizontal viewing angle (°)				
1/4 type	QSXGA	Auto focus function	RJ64SC100	• QSXGA to SubQCIF • 5 fps at QSXGA/30 fps at VGA • 8x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	2 592 x 1 944	F2.8	4 pcs.	54	UYVY (Parallel)	2.8/1.8 (I/O: 1.8 or 2.8)	270 (at 4.5 fps)	35FPC type
	QXGA		RJ64PC200	• QXGA to SubQCIF • 7.5 fps at QXGA/30 fps at XGA • 6.4x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	2 048 x 1 536		3 pcs.	53			230 (at 7.5 fps)	30FPC type
			RJ64PC800	• QXGA to SubQCIF • 7.5 fps at QXGA/30 fps at XGA • 6.4x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)			4 pcs.	54			190 (at 7.5 fps)	27FPC type
1/5 type	UXGA		RJ65NC100	• UXGA to SubQCIF • 10 fps at UXGA/30 fps at SXGA • 5x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	1 600 x 1 200		3 pcs.				220 (at 10 fps)	30FPC type
1/8 type	FWVGA	—	RJ68BA100	• FWVGA to SubQCIF • 30 fps at FWVGA • 2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	854 x 480		2 pcs.	62	UYVY (Mipi)		125 (at 30 fps)	17FPC type
1/10 type	VGA		RJ6ABA103	• VGA to SubQCIF • 30 fps at VGA • 2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	640 x 480			54	UYVY (Parallel)		70 (at 30 fps)	20LCC type (Socket mounted only)
			RJ6ABA600						UYVY (Mipi)		90 (at 30 fps)	21FPC type

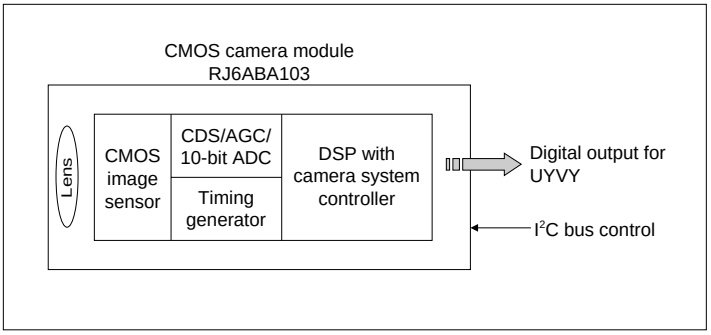
*1 Contact a SHARP sales office regarding FPC type package.

●Outline Dimensions

Model No.	Outline dimensions (D x W x H) TYP. (mm)	Package*1
RJ64SC100	8.5 x 8.5 x 5.0	35FPC type
RJ64PC200	8.5 x 8.5 x 5.3	30FPC type
RJ64PC800	8.5 x 8.5 x 5.1	27FPC type
RJ65NC100	7.0 x 7.0 x 4.0	30FPC type
RJ68BA100	6.0 x 5.5 x 2.2	17FPC type
RJ6ABA103	5.0 x 5.0 x 1.95	20LCC type (Socket mounted only)
RJ6ABA600	5.0 x 5.0 x 1.95	21FPC type

*1 Contact a SHARP sales office regarding FPC type package.

●System Configuration Example



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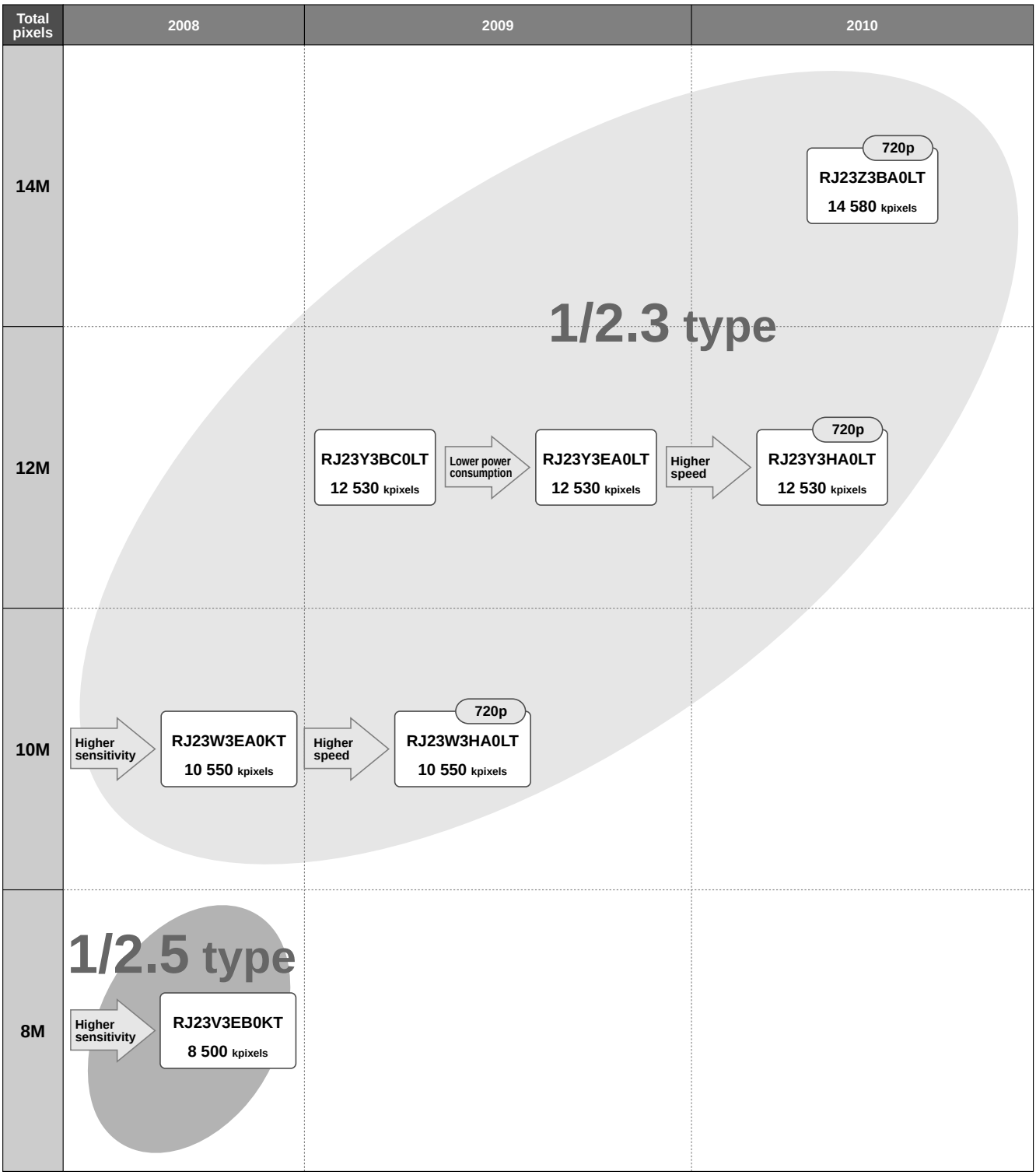
■ Road Map for High-resolution CCDs for Digital Cameras



★Under development

■ High-resolution CCDs

Optical format	Total pixels	Color filter	Model No.	Movie function	Resolution Image pixels (H x V)	Pixel size H x V (μm²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
1/2.3 type	10 550 k	R,G,B primary color mosaic filters	RJ23W3EA0KT	VGA 30 fps	3 704 x 2 784	1.68 x 1.68	105	–87	N-LCC040-S433A
			RJ23W3HA0LT	720p 30 fps					N-LCC040-R350
	12 530 k		RJ23Y3BC0LT	VGA 30 fps	4 040 x 3 032	1.55 x 1.55	105	–86	
			RJ23Y3EA0LT						
			RJ23Y3HA0LT	720p 30 fps				–84	
	14 580 k		RJ23Z3BA0LT	720p 30 fps	4 352 x 3 264	1.43 x 1.43	105	–86	
1/2.5 type	8 500 k		RJ23V3EB0KT	VGA 30 fps	3 320 x 2 496	1.75 x 1.75	100	–85	N-LCC040-S433A

■ 1/3-type CCDs

Total pixels	Standard		Model No.	Resolution Horizontal TV lines	Resolution Image pixels (H x V)	Pixel size H x V (μm²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
270 k	Color	NTSC	RJ2311DB0PB*	330	512 x 492	9.6 x 7.5	3 200	–135	P-DIP016-0450
			RJ2312DB0PB*						
320 k		PAL	RJ2321DB0PB*		512 x 582	9.6 x 6.34	3 200	–135	
			RJ2322DB0PB*						
410 k		NTSC	RJ2351CA0PB*	480	768 x 494	6.4 x 7.5	2 000	–120	
			RJ2352CA0PB*					–130	
470 k		PAL	RJ2361CA0PB*		752 x 582	6.5 x 6.3	2 000	–120	
			RJ2362CA0PB*					–130	

* Suitable for intense light exposure.

■ 1/3.8-type CCD

Total pixels	Standard		Model No.	Resolution Horizontal TV lines	Resolution Image pixels (H x V)	Pixel size H x V (μm²)	Sensitivity TYP. (mV)	Smear ratio TYP. (dB)	Package
290 k	Color	NTSC	RJ2411CA0PB*	330	532 x 512	7.2 x 5.6	1 200	–120	P-DIP014-0400A

* Suitable for intense light exposure.

■ 1/4-type CCDs

Total pixels	Standard		Model No.	Resolution Horizontal TV lines	Resolution Image pixels (H x V)	Pixel size H x V (μm²)	Sensitivity TYP. (mV)	Smear ratio TYP. (dB)	Package
270 k	Color	NTSC	RJ2411EA0PB*	330	512 x 492	7.2 x 5.6	1 200	–130	P-DIP014-0400A
			RJ2411EB0PB						
			RJ2411FA0PB*				1 800		
320 k		PAL	RJ2421EB0PB		512 x 582	7.2 x 4.73	1 100	–130	
			RJ2421FA0PB*				1 650		
410 k		NTSC	RJ2451CA0PB*	480	768 x 494	4.9 x 5.6	900	–114	
			★RJ2452CA0PB						
470 k		PAL	RJ2461CA0PB*		752 x 582	5.0 x 4.77	900	–114	
			★RJ2462CA0PB						

* Suitable for intense light exposure.

★Under development

■ CCD Peripheral ICs/LSIs

Description	Model No.	Features		Package
V driver	LR366851	Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4, 2-level output circuit for electronic shutter		P-SSOP024-0275
CDS/PGA/ADC	IR3Y48B1	Low power consumption [80 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC (18 MHz), 10-bit digital output		P-QFP048-0707
	LR36B03	Low power consumption [81 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC (25 MHz), mechanical iris control function, 12-bit digital output		P-VQFN036-0606
V driver + CDS/PGA/ADC + DSP	LR38653	For 270-k/320-k/410-k/ 470-kpixel CCDs	<V driver> Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 2, 2-level output circuit for electronic shutter <CDS/PGA/ADC> 25 MHz, high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC <DSP> 10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, YUV digital output, NTSC/PAL analog output	P-LFBGA171-0811
	LR38654	For 270-k/290-k/320-k/410-k/ 470-kpixel CCDs	<V driver> Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 2, 2-level output circuit for electronic shutter <CDS/PGA/ADC> 25 MHz, high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC <DSP> 10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, electronic optical axis adjustment function*1, YUV digital output, NTSC/PAL analog output	P-LFBGA171-0811
CDS/PGA/ADC + DSP	★LR38692	For 1 310-kpixel CCDs	<CDS/PGA/ADC> 36 MHz, high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC <DSP> 10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, mechanical iris control function, privacy masking function, Day/Night control function, color rolling suppression function, high resolution function, motion detection function, auto focus control function, NTSC/PAL analog output, Y/C analog output, UYVY digital output (ITU-R BT656 compatible)	P-LFBGA256-1111
	★LR38693	For 410-k/470-kpixel CCDs	<CDS/PGA/ADC> 36 MHz, high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC <DSP> 10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, mechanical iris control function, privacy masking function, Day/Night control function, color rolling suppression function, high resolution function, line lock function, motion detection function, auto focus control function, wide dynamic range function, slow shutter function, NTSC/PAL analog output, Y/C analog output, UYVY digital output (ITU-R BT656 compatible)	

★Under development

■ CCD Peripheral ICs/LSIs (cont'd)

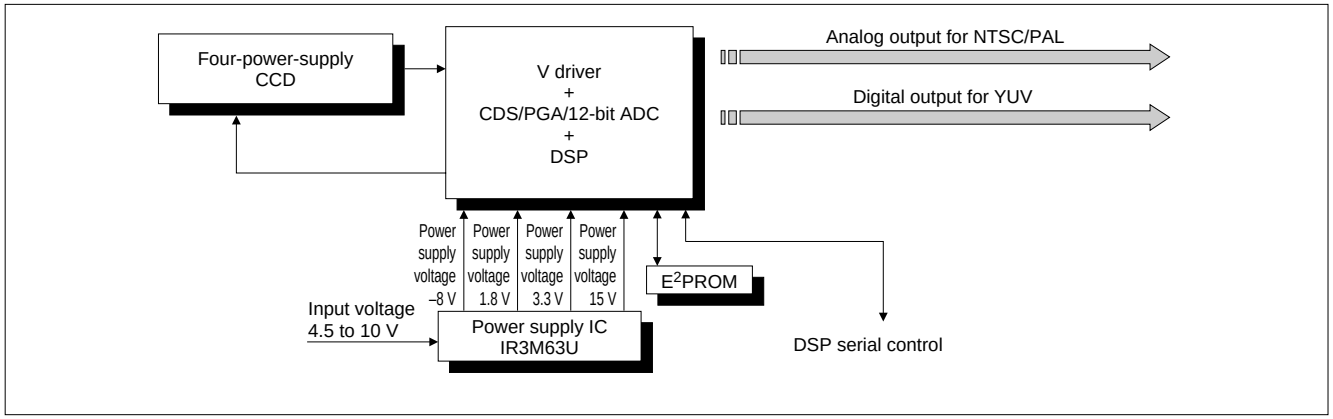
Description	Model No.	Features		Package
CDS/PGA/ADC + DSP	★LR38694	For 410-k/470-kpixel CCDs	<CDS/PGA/ADC> 36 MHz, high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC <DSP> 10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, mechanical iris control function, privacy masking function, Day/Night control function, color rolling suppression function, high resolution function, line lock function, motion detection function, auto focus control function, NTSC/PAL analog output, Y/C analog output, UYVY digital output (ITU-R BT656 compatible)	P-LFBGA256-1111
DSP	LR386032	For 270-k/320-k/410-k/ 470-kpixel CCDs	9-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, mirror image function, YUV digital output, NTSC/PAL analog output	P-LQFP080-1212
	LR38627		10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, YUV digital output, NTSC/PAL analog output	P-TQFP128-1414
	LR38690		10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, mechanical iris control function, privacy masking function, Day/Night control function, color rolling suppression function, high resolution function, NTSC/PAL analog output, Y/C analog output, UYVY digital output (ITU-R BT656 compatible)*2	P-LQFP100-1414
Power supply IC for CCDs and peripheral ICs/LSIs	IR3M59U	For 270-k/320-kpixel CCDs	Input voltage range: 4.5 to 16 V, PWM control + charge pump system, output voltage: three outputs (15 V/12 V, –8 V/–5 V, 3.3 V), power sequencing circuit, overcurrent protection circuit	P-VQFN032-0505
	IR3M63U	For 270-k/290-k/320-k/410-k/ 470-kpixel CCDs	Input voltage range: 4.5 to 10 V, PWM control + charge pump system, output voltage: four outputs (15 V, –8 V, 3.3 V, 1.8 V), power sequencing circuit, overcurrent protection circuit	

*1 Support for only 290-kpixel CCD.
*2 Support for only 410-k/470-kpixel CCDs.

★Under development

●System Configuration Examples

<Color Security Camera System with Two-chip Configuration [Low Power Consumption Type]>

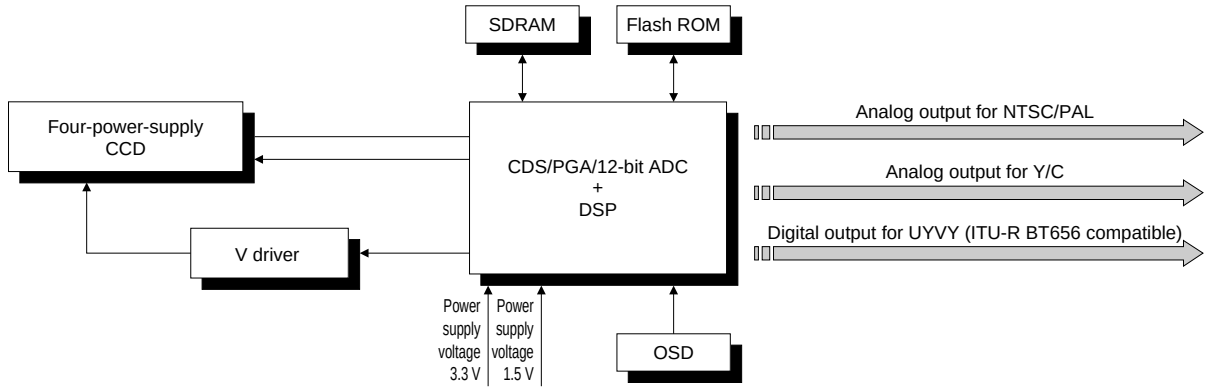


Four-power-supply CCDs and peripheral IC/LSIs

CCD			V driver + CDS/PGA/ADC + DSP	Power supply IC
1/3 type	270 kpixels	RJ2311DB0PB	LR38653/LR38654	—
		RJ2312DB0PB		
	320 kpixels	RJ2321DB0PB		
		RJ2322DB0PB		
	410 kpixels	RJ2351CA0PB		IR3M63U
		RJ2352CA0PB		
	470 kpixels	RJ2361CA0PB		
		RJ2362CA0PB		
1/3.8 type	290 kpixels	RJ2411CA0PB	LR38654	
1/4 type	270 kpixels	RJ2411EA0PB	LR38653/LR38654	
		RJ2411EB0PB		
		RJ2411FA0PB		
	320 kpixels	RJ2421EB0PB		
		RJ2421FA0PB		
	410 kpixels	RJ2451CA0PB		
		★RJ2452CA0PB		
	470 kpixels	RJ2461CA0PB		
		★RJ2462CA0PB		

★Under development

<Color Security Camera System with Three-chip Configuration>



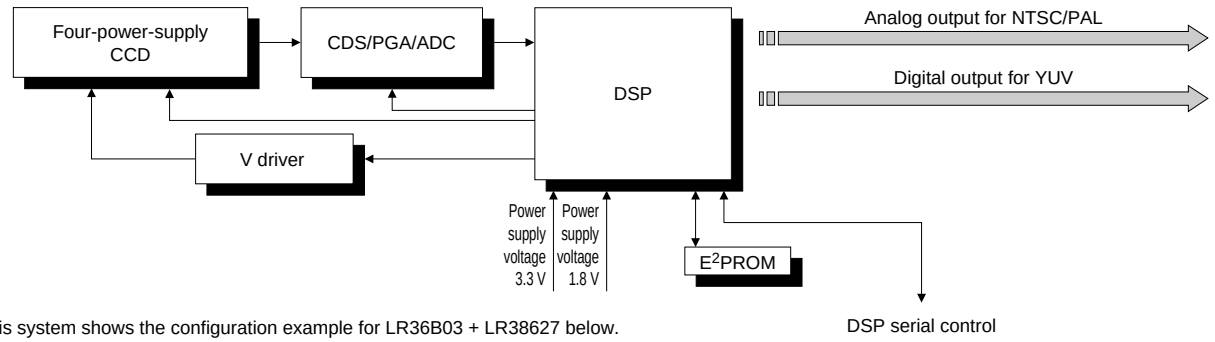
* This system shows the configuration example for ★LR38693 below.

Four-power-supply CCDs and peripheral ICs/LSIs

CCD			CDS/PGA/ADC + DSP
1/3 type	410 kpixels	RJ2351CA0PB	★LR38693/★LR38694
		RJ2352CA0PB	
	470 kpixels	RJ2361CA0PB	
		RJ2362CA0PB	
1/4 type	410 kpixels	RJ2451CA0PB	
		★RJ2452CA0PB	
	470 kpixels	RJ2461CA0PB	
		★RJ2462CA0PB	

★Under development

<Color Security Camera System with Four-chip Configuration (I)>



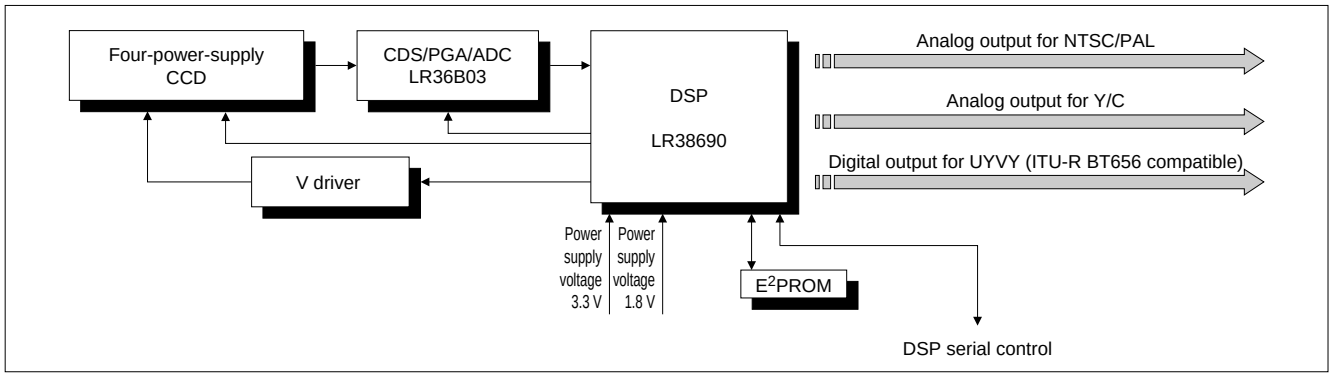
* This system shows the configuration example for LR36B03 + LR38627 below.

Four-power-supply CCDs and peripheral ICs/LSIs

CCD			CDS/PGA/ADC	DSP
1/3 type	270 kpixels	RJ2311DB0PB	IR3Y48B1 + LR386032/ LR36B03 + LR38627	
		RJ2312DB0PB		
	320 kpixels	RJ2321DB0PB		
		RJ2322DB0PB		
	410 kpixels	RJ2351CA0PB		
		RJ2352CA0PB		
	470 kpixels	RJ2361CA0PB		
		RJ2362CA0PB		
1/4 type	270 kpixels	RJ2411EB0PB		
		RJ2411FA0PB		
	320 kpixels	RJ2421EB0PB		
		RJ2421FA0PB		
	410 kpixels	RJ2451CA0PB		
		★RJ2452CA0PB		
	470 kpixels	RJ2461CA0PB		
		★RJ2462CA0PB		

★Under development

<Color Security Camera System with Four-chip Configuration (II)>



Four-power-supply CCDs and peripheral ICs/LSIs

CCD			CDS/PGA/ADC	DSP
1/3 type	270 kpixels	RJ2311DB0PB	LR36B03	LR38690
		RJ2312DB0PB		
	320 kpixels	RJ2321DB0PB		
		RJ2322DB0PB		
	410 kpixels	RJ2351CA0PB		
		RJ2352CA0PB		
	470 kpixels	RJ2361CA0PB		
		RJ2362CA0PB		
1/4 type	270 kpixels	RJ2411EB0PB		
		RJ2411FA0PB		
	320 kpixels	RJ2421EB0PB		
		RJ2421FA0PB		
	410 kpixels	RJ2451CA0PB		
		★RJ2452CA0PB		
	470 kpixels	RJ2461CA0PB		
		★RJ2462CA0PB		

☆New product

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■ For Notebook PCs, PC Monitors and LCD TVs

●TFT-LCD Drivers

Drive function		Model No.	Gray scale	No. of LCD drive outputs	Display voltage (V) MAX.	Clock frequency (MHz) MAX.	Supply voltage (V)	Description	Package
Source driver	Dot inversion drive	☆LH16DF	256 levels	414	16.5	250	2.7 to 3.6	Low EMI*1 driver using mini-LVDS interface, R-DAC system	SOF
		LH16DD		630/642/ 684/720					
		☆LH16DH		804/840/ 912/960		330			
		☆LH16DE	1 024 levels	630/642/ 684/720		250			

*1 EMI: Electro-Magnetic Interference

●TFT-LCD Controller

Model No.	Image size	Input interface	Output interface	Function	Clock frequency (MHz) MAX.	Supply voltage (V)			Package
						Core	Digital	Analog	
LR388F5A	1 366 x 768	LVDS 1ch 10/8 bits	RSDS 8/6 bits 2/1ch mini-LVDS 8 bits 2/1ch	• Improves response speed of LCD image by original Quick Shoot technology (with a built-in frame memory) • Register control by external EEPROM (SPI) and I²C I/F • Control by gamma correction IC (SPI)	85	1.1 to 1.3	3.0 to 3.6	2.3 to 2.7	TFBGA204-1212

RSDS and PPDS are trademarks of National Semiconductor Corporation.

■ For Mobile Phones

●TFT-LCD Controllers

Model No.	LCD interface (pixel) MAX.	Display colors MAX.	Display RAM capacity (bit)	Function	CPU interface	Supply voltage (V)		Package
						Core	Host I/F	
☆LR388G9	600 x 1 024	16 770 k colors	32 M (Flexibly meets the requirement depending on the panel size)	• MDDI*1 1.1/1.2 type2-compliant • MIPI*2-compliant • Built-in IrSimple™ and IrDA communications functions • Main/sub LCD controller • Graphic processing • Built-in SDHC interface • Built-in HDMI 1 080p/24 Hz, 1 080i/60 Hz output interface	MDDI*1 for MSM series/ 80-family (8/16/18-bit parallel) MIPI*2 DSI type4	1.08 to 1.32	1.65 to 3.6	P-WFBGA261-0808
LR388D8	480 x 864		16 M (Flexibly meets the requirement depending on the panel size)	• MDDI*1-compliant • Built-in IrSimple™ and IrDA communications functions • Main/sub LCD controller • Graphic processing • Built-in SDHC interface	MDDI*1 for MSM series/ 80-family (8/9/16/ 18-bit parallel)			P-WFBGA205-0808
LR388D1	240 x 400	262 144 colors	240 x 400 x 18	• MDDI*1-compliant • Built-in IrSimple™ and IrDA communications functions • Main/sub LCD controller • Graphic processing		1.65 to 1.95		P-VFBGA144-0808
LR38869A				• MDDI*1-compliant • Main/sub LCD controller • Graphic processing • Parallel bus host interface				P-TFBGA176-0909

*1 MDDI (Mobile Display Digital Interface): The serial interface standard developed by QUALCOMM
*2 MIPI: Mobile Industry Processor Interface

IrSimple™ is a trademark of Infrared Data Association.
QUALCOMM and MSM are trademarks of QUALCOMM Incorporated.

■ Power Supply ICs for TFT-LCDs

Model No.	No. of output circuits	Input voltage range (V)	Output voltage (V)	System	Switching frequency (Hz)	Switching transistor	Switching current (mA) [Built-in SW Tr]	Drive capacity (pF) [External SW Tr]	Package
IR3M58M/U	3	4.5 to 28	External setting	Step-up (MAX. 20 V)/ step-down type PWM	70 k to 500 k	Built-in (for step-up type PWM)	400	1 000	P-QFP048-0707/ P-VQFN036-0505
				Step-down type PWM		External	–		
				Step-down, inverting type PWM		External	–		

■ System LSIs

Model No.	Function	Features	Supply voltage (V)	Package
LR35501	One-chip graphic controller	• Built-in video encoder (NTSC/PAL) • Composite signal output • Analog RGB signal output • Capable of moving picture transmission/play, thanks to real-time image compression and extension technology • Real images, backgrounds and sprites can be superimposed • Built-in sprite graphic processor • Built-in color object detector • Built-in Bluetooth® HCI controller • Built-in sound generator (ADPCM/PSG) • Built-in CMOS camera interface (9 MHz) • CPU: Z80 compatible, 27 MHz • Peripherals (NAND flash I/F, PIO, SIO, UART, ADC, PWM, etc.)	Core: 1.8 ± 0.18 I/O: 3.3 ± 0.3	P-QFP128-1420
LR35503	One-chip graphic controller	• Digital LCD interface (6-bit RGB), QVGA (320 x 240) compliant • 27 MHz digital YUV video input • Capable of moving picture transmission/play, thanks to real-time image compression and extension technology • Real images, backgrounds and sprites can be superimposed • Built-in sprite graphic processor • Built-in color object detector (Only for CMOS camera input) • Built-in Bluetooth® HCI controller • Built-in sound generator (ADPCM/PSG) • Built-in CMOS camera interface (9 MHz) • CPU: Z80 compatible, 27 MHz • Peripherals (NAND flash I/F, PIO, SIO, UART, ADC, PWM, etc.)	Core: 1.8 ± 0.18 I/O: 3.3 ± 0.3	P-LQFP144-2020
LR35504	One-chip graphic controller	• Digital LCD interface (Capable of being set from 320 x 240 to 1 366 x 768 by increments of 8 dots) 24-bit color • ITU-R BT656 compatible, digital video input • Built-in CMOS camera interface (3 Mpixels, 54 MHz) • Built-in JPEG-CODEC • Real images, backgrounds and sprites can be superimposed • Built-in sprite graphic processor (Built-in enlargement, size reduction, rotation, transformation, and α blending effect functions) • Built-in color object detector • Built-in sound generator (16 ch PCM/ADPCM decoder) • CPU: ARM926EJ-S, 108/54 MHz • Peripherals (NAND flash interface, SD card interface, GPIO, EBI, SIO, UART, I^2C, I^2S, PWM, etc.)	Core: 1.2 I/O: 3.3	P-LFBGA280-1616

Bluetooth is a trademark of Bluetooth SIG, Inc.
Z80 is a trademark of ZiLOG, Inc.
ARM926EJ-S is a trademark of ARM Ltd.

■ Smart Modules

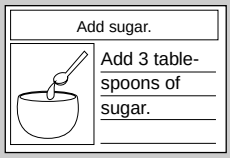
Model No.	Function	Features	Supply voltage (V)	Outline dimensions (W × D) (mm)
LR0G934	3.5-inch smart module with built-in one-chip graphic controller	• LED backlight, QVGA (320 x 240), built-in 3.5-inch color TFT LCD • Built-in one-chip graphic controller (LR35503) • Built-in 64 Mbit NOR flash • Video input (composite NTSC) • Built-in real-time clock (RTC) • External interface Video input, digital input/output (shared 2 ch UART), analog input (4 ch ADC), sound output, battery backup terminal (RTC use)	5±0.5	87.4 × 69.2
LR0G938	3.5-inch smart module with touch panel and built-in one-chip graphic controller	• LED backlight, QVGA (320 x 240), built-in 3.5-inch color TFT LCD • Touch panel function • Built-in one-chip graphic controller (LR35503) • Built-in 64 Mbit NOR flash • Video input (composite NTSC) • Built-in real-time clock (RTC) • External interface Video input, digital input/output (shared 2 ch UART), analog input (4 ch ADC), sound output, battery backup terminal (RTC use)	5±0.5	87.4 × 69.2

■ One-chip Graphic Controller <LR35501/LR35503>

LR35501/LR35503 are the system LSIs which enable smooth graphic display by graphic controller with built-in microcomputers and device control and graphic display with one chip due to the microcomputers and various I/Os.

Common features

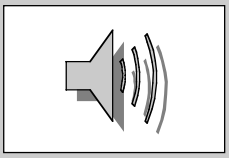
Built-in versatile graphic functions



- Smooth imaging using sprite processor
- Capable of moving picture transmission/play, thanks to real-time image compression technology
- Real images, backgrounds and sprites can be superimposed

Graphic expression with smooth movement is possible

Sound output



Built-in stereo sound circuit
- ADPCM decoder
- Programmable sound generator

Warning using realistic alarm tone / audio is possible

CMOS camera interface

- CIF/QVGA UYVY input

CIF/QVGA CMOS imager can be connected

Bluetooth®

- Built-in HCI controller
- SPP, HID compliant

Smooth images transmission achieved by using Bluetooth®

General purpose I/O built-in PIO/UART/SIO/NAND flash interface/ADC/PWM/SPI, etc.

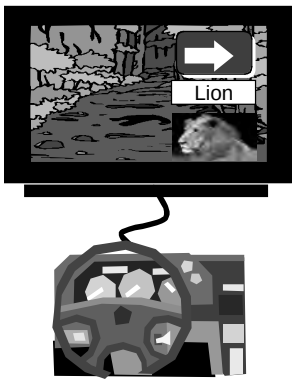
LR35501 features and functions

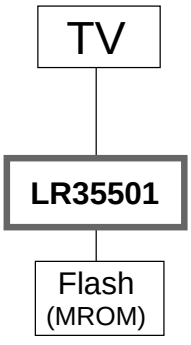
- Built-in video encoder (NTSC/PAL)
- Built-in analog RGB output
- Built-in composite video output

LR35503 features and functions

- Built-in digital LCD interface (6-bit RGB QVGA [320 x 240])
- Built-in 27 MHz YUV digital video input

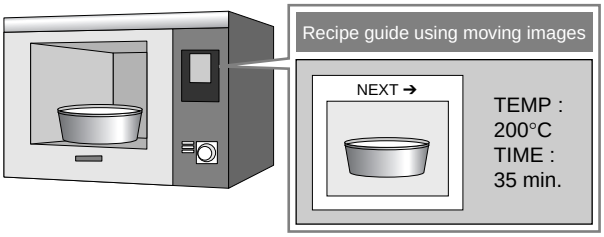
Intellectual training toy
(Driving game)



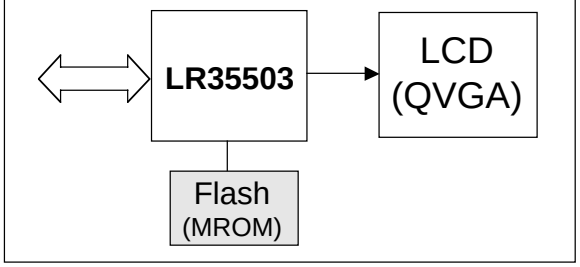


Directly connected to TV (composite) output

Household electrical appliance



Smooth graphics achieved by simple circuits



Bluetooth is a trademark of Bluetooth SIG, Inc.

☆New product

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■ IrSimple™ Communications Series <☆LR388G9/LR388D8/LR388D1>

IrSimple™ communications is a communications protocol which makes the Ir communication standard employed in mobile terminals such as mobile phones, IrDA protocol, more efficient. Compared with IrDA, since the data transfer time can be significantly reduced to approximately 1/4th to 1/10th, higher volumes of data can be sent and received. In addition, by incorporating a controller for IrSimple™ communications into mobile equipment or digital home appliances, high-quality image data taken with a digital camera or a mobile phone camera can be readily transferred to a TV or a printer at high speed with a simple operation such as with a remote controller. The image data captured from the camera can be enjoyed on full HD-TV, or by printing the data out.

●Features

●☆LR388G9
(MDDI*1/MIPI*2-compliant HXGA LCD controller for IrSimple™)

The LR388G9 can display on up to HXGA-sized LCD displays. For incorporating 32-Mbit embedded memory, FHD-sized (1 920 x 1 080) external output is available with HDMI. Also, by adding on MIPI*2 interface, the LR388G9 can be used in wide range of application systems.

● LR388D8
(MDDI*1-compliant WVGA LCD controller for IrSimple™)

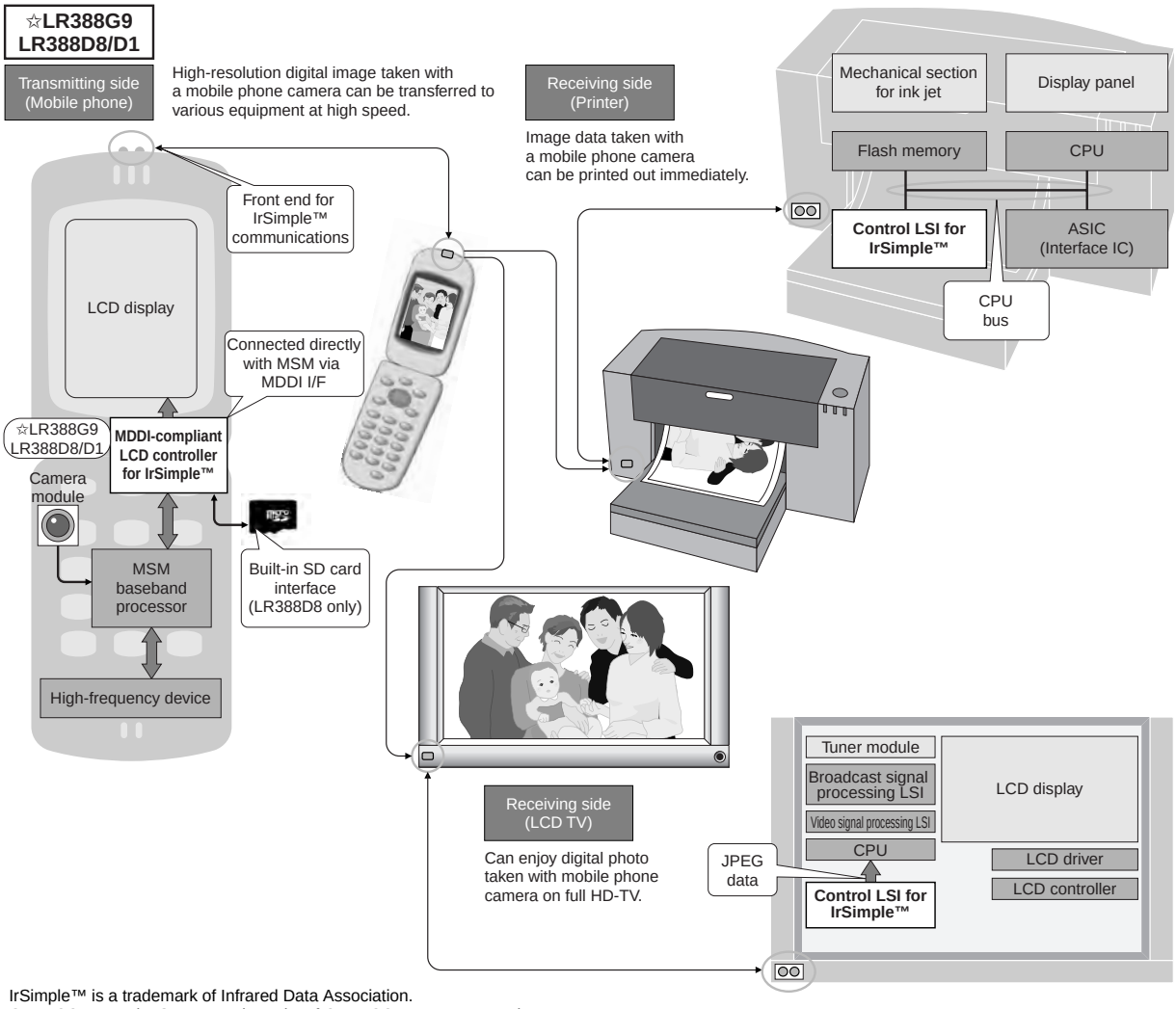
The LR388D1 has been made compatible with full-WVGA LCD displays, with internal memory (16 Mbits) that can hold two screens of data (main and sub). High-resolution display and low power consumption have been realized. Furthermore, a built-in SD card interface supports a reduction in the number of chips.

● LR388D1
(MDDI*1-compliant WQVGA LCD controller for IrSimple™)

Thanks to a built-in IrSimple™ function in the LCD controller, the mounting area of a mobile phone can be decreased; thus it contributes to size reduction in mobile phones. Also, a higher volume of data can be transferred at high speed with 4 fewer signal lines due to the incorporation of an MDDI*1 interface.

*1 MDDI (Mobile Display Digital Interface) :
The serial interface standard developed by QUALCOMM
*2 MIPI : Mobile Industry Processor Interface

●Application & System Configuration Example



IrSimple™ is a trademark of Infrared Data Association.
QUALCOMM and MSM are trademarks of QUALCOMM Incorporated.

■ Low Power-Loss Voltage Regulators

●TO-220 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings				Electrical characteristics			Built-in functions						Package	
		Output current Io (A)	Input voltage Vin (V)	Power dissipation (W) Pd*1	Power dissipation (W) Pd*2	Output voltage Vo*3 (V) TYP.	Output voltage precision (%)	Dropout voltage VI-O*5 (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	Lead forming available		Package shape type*7
PQxxRD08J00H series	ASO protection function	0.8	20	1.25	10	5, 9, 12	±3	0.5	○	○	○				TO-220	A
PQ3RD083J00H						3.3			○	○	○					A
PQ6RD083J00H						6.3			○	○	○					A
PQxxRA11J00H series	Low dissipation current at OFF state (Iqs: 1 µA (MAX.))	1	35	1.5	15	5, 9, 12	±2.5		○	○	○	○				B
PQ3RD13J000H	ASO protection function		20	1.4		3.3	±3		○	○	○					A
PQxxRD11J00H series	ASO protection function					5, 9, 12			○	○	○			○		A
PQxxxRDA1SZH series	ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.))		24			3.3, 5, 8, 9, 12	±3		○	○	○	○				A
PQxxxRDA2SZH series		2	20	1.4	15	3.3, 5, 9, 12	±2.5	1.0	○	○	○	○				A
PQxxxEF01SZH series	Minimum operating input voltage: 2.35 V (4 terminals)	1	10	1.4	15	1.5, 1.8, 2.5, 3.3	±2.5	0.5	○	○	○	○				A
PQxxxEF02SZH series		2							○	○	○	○				A
PQxxRF11J00H series	General purpose	1	35	1.5		5, 9, 12			○	○	○			○		B
PQxxRH11J00H series		1.5			18				○	○	○					B
PQ3RD23J000H	ASO protection function	2	20	1.4	15	3.3	±3		○	○	○					A
PQxxRD21J00H series						5, 9, 12			○	○	○					A
PQxxRF21J00H series	General purpose		35	1.5	18		±2.5		○	○	○			○		B
PQ3RF23J000H	General purpose					3.3			○	○	○					B
PQ3RF33J000H	High output current	3.5		1.8					○	○	○					B
PQ070XF01SZH	Minimum operating input voltage: 2.35 V (4 terminals)	1	10	1.4	15	1.5 to 7	±2*4		○	○			○			A
PQ070XF02SZH		2							○	○			○			A
PQ070VK01FZH	Minimum operating input voltage: 2.35 V (5 terminals)	1							○	○	○	○	○	○		E
PQ070VK02FZH		2							○	○	○	○	○	○		E
PQ15RW08J00H	ASO protection function, minimum operating input voltage: 3.5 V	0.8	20	1.25	10	3.0 to 15	±2.5*4	0.5	○	○			○			A
PQ15RW11J00H		1		1.4	15				○	○			○			A
PQ15RW21J00H		2							○	○			○			A
PQ150RWA2SZH	ASO protection function			1.4	15			1.0	○	○			○			A
PQ20RX05J00H	Variable output voltage, output ON/OFF control	0.5	24	1.25	10	3.0 to 20		0.5	○	○	○	○	○	○		C
PQ20RX11J00H		1		1.5	15				○	○	○	○	○	○		C
PQ150VB01FZH	Overheat shutdown circuit, minimum operating input voltage: 2.35 V (5 terminals)		17	1.25	12.5	1.5 to 15				○	○	○	○	○		E
PQ150VB02FZH		2								○	○	○	○	○		E
PQ30RV11J00H	Variable output voltage	1	35	1.5	15	1.5 to 30	±2*4		○	○	△*6		○	○		B
PQ30RV21J00H		2			18				○	○	△*6		○	○		B
PQ30RV31J00H		3		2	20				○	○	△*6		○	○		B
PQ7RV4J0000H		4.6	10	1.8	18	1.5 to 7			○	○	△*6		○			B

*1 At self-cooling
*2 With infinite heat sink attached
*3 The xx/xxx in the model No. refer to the output voltage values of the model (e.g. 05/050 for 5 V, 12/120 for 12 V, 015 for 1.5 V).
*4 Reference voltage precision
*5 Current ratings are defined individually.
*6 △ : Available by adding circuit
*7 Refer to page 50

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■ Surface Mount Type Low Power-Loss Voltage Regulators

●SOT-23-5 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electrical characteristics				Built-in functions				Package
		Input voltage Vin (V)	Power dissipation Pd*1 (W)	Output current Io (A)	Output voltage Vo*2 (V) TYP.	Output voltage precision (%)	Dropout voltage V_{I-O} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	
PQ1Uxx1M2ZPH series	Compact, low output current	16	0.35	0.18	1.8, 2.5, 2.8, 3.0, 3.3, 3.5, 5.0	±2.0 (3.0 V output)	0.26 (Io = 60 mA)	○	○	○	○	SOT-23-5
PQ1Xxx1M2ZPH series	Compact, ceramic capacitor compatible	9			*3			○	○	○	○	

*1 When mounted on a board
*2 The xx in the model No. refer to the output voltage values of the model (e.g. 50 for 5.0 V, 18 for 1.8 V).
*3 1.5, 1.8, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.3, 3.5, 3.7, 4.0, 4.5, 5.0

●SOT-23L type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics				Built-in functions				Package
		Output current Io (A)	Input voltage Vin (V)	Power dissipation Pd*1 (W)	Output current Io (A)	Output voltage Vo*2 (V) TYP.	Output voltage precision (%)	Dropout voltage V_{I-O} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	
PQ1RxxJ0000H series	Compact, surface mount type, low dissipation current at OFF state (Iqs: 0.1 µA (MAX.))	–	16	0.4	0.18	*3	±2.7 (3.0 V output)	0.26 (Io = 60 mA)	○	○	○	○	SOT-23L
PQ1Kxx3M2ZPH series	Compact, surface mount type, high ripple rejection, output current of up to 300 mA	0.3	9		–	1.8, 2.5, 3.0, 3.3, 3.6, 5.0	±2.0 (3.0 V output)	0.7 (Io = 300 mA)	○	○	○	○	

*1 When mounted on a board
*2 The xx in the model No. refer to the output voltage values of the model (e.g. 25 for 2.5 V, 47 for 4.7 V, 50 for 5.0 V).
*3 1.8, 2.0, 2.3, 2.5, 2.7, 2.8, 2.9, 3.0, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8, 4.0, 4.2, 4.4, 4.7, 4.9, 5.0, 5.2

●SOT-89 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics			Built-in functions					Package
		Output current Io (A)	Input voltage Vin (V)	Power dissipation Pd*1 (W)	Output voltage Vo*2 (V) TYP.	Output voltage precision (%)	Dropout voltage V_{I-O}*3 (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	
PQ1Lxx3M2SPQ	Compact, high radiation package, low dissipation current at OFF state (Iqs: 1 µA (MAX.))	0.3	16	0.9	1.5, 1.8, 2.5, 3.0, 3.2, 3.3, 5.0	±2.0 (3.0 V output)	0.7	○	○	○	○		SOT-89
PQ1LAxx5MSPQ	Compact, high radiation package, ceramic capacitor compatible	0.5	15		1.2, 1.5, 1.8, 2.5, 3.3, 5.0	±2.0		○	○	○	○		
PQ1LAX95MSPQ	Ceramic capacitor compatible, variable output voltage				1.5 to 9.0	±2.0*6		○	○	○	○	○	
PQ1Mxx5M2SPQ	Compact, high output current, ceramic capacitor compatible		9		1.5, 1.8, 2.5, 3.3, 5.0	±2.0 (5.0 V output)		○	○	○	○		
PQ1MX55M2SPQ	Ceramic capacitor compatible, variable output voltage				1.3 to 5.0	±2.0*6	0.7	○	○	○	○	○	
PQ1Nxx3MxSPQ	Reset signal output function*4, ceramic capacitor compatible	0.35			2.5, 3.3	±2.0		○	○				
PQ2Lxxx2MSPQ	Compact, high radiation package, 2 outputs	0.25/ch	9		*5	–	0.4	○	○				

*1 When mounted on a board
*2 The xx in the model No. refer to the output voltage values of the model (e.g. 25 for 2.5 V, 50 for 5.0 V). [Except PQ2Lxxx2MSPQ]
*3 Current ratings are defined individually.
*4 Reset detection voltage: 4.2 V, 3.8 V
*5 Output voltage combination: 3.3/3.3 V, 3.3/2.5 V, 3.3/1.8 V, 3.3/1.5 V, 2.5/1.8 V, 2.5/1.5 V
*6 Reference voltage precision

●SC-63 type (1) Output voltage fixed type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings: Output current Io (A) 0.5	1	1.5	Input voltage Vin (V)	Power dissipation Pd*1 (W)	Electrical characteristics: Output voltage Vo*2 (V) TYP.	Output voltage precision (%)	Dropout voltage VI-O*5 (V)	Built-in functions: Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	Taped package	Package	Package shape type*6
PQ07VR5MAZPH series	Reset signal generation function (input voltage drop detection)	○			10	8	1.5 to 7	±2.0*3	0.5	○	○			○	○	SC-63	F
PQ3DZ53J000H	ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.))	○			24	8	3.3	±3.0	0.5	○	○	○	○		○	SC-63	F
PQ3DZ13J000H			○							○	○	○	○		○	SC-63	F
PQxxDZ51J00H series		○					5, 9, 12			○	○	○	○		○	SC-63	F
PQxxDZ11J00H series			○							○	○	○	○		○	SC-63	F
PQxxxDNA1ZPH series	Ceramic capacitor compatible, ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.)), solder dip compatible lead shape		○				3.3, 5, 8, 9, 12	±2.5		○	○	○	○		○	SC-63	G
PQxxxDZ01ZPH series	Low dissipation current at OFF state (Iqs: 5 µA (MAX.))		○		9, 10	5	3.3, 5	±3.0		○	○	○	○		○	SC-63	F
PQxxxEZ5MZPH series	Minimum operating input voltage: 2.35 V	○			10	8	1.5, 1.8, 2.5, 3.0, 3.3	±2.5*4		○	○	○	○		○	SC-63	F
PQxxxEZ01ZPH series			○							○	○	○	○		○	SC-63	F
PQxxxEN01ZPH series	Minimum operating input voltage: 2.35 V, solder dip compatible lead shape		○							○	○	○	○		○	SC-63	G
PQxxxENA1ZPH series	Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape		○				1.5, 1.8, 2.5, 3.3	±2.0		○	○	○	○		○	SC-63	G
PQxxxENB1ZPH series			○			5	1.2, 1.5, 1.8, 2.5, 3.3		0.3	○	○	○	○		○	SC-63	G
PQxxxENAHZPH series				○		8	1.5, 1.8, 2.5, 3.3		0.9	○	○	○	○		○	SC-63	G
PQxxxEZ1HZPH series	Minimum operating input voltage: 2.35 V			○			1.5, 1.8, 2.5, 3.0, 3.3	±2.5*4	1.0	○	○	○	○		○	SC-63	F
PQxxxEZ02ZPH series				○ (2 A)			1.5, 1.8, 2.5		0.5	○	○	○	○		○	SC-63	F
PQxxxFZ5MZPH series	Minimum operating input voltage: 1.7 V (Dual power supply type)	○			3.7		1.0, 1.2	±30 mV	–	○	○	○	○		○	SC-63	F
PQxxxGN01ZPH series	Minimum operating input voltage: 1.7 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape		○		5.5		0.8, 1.0, 1.2			○	○				○	SC-63	G
PQxxxGN1HZPH series				○						○	○				○	SC-63	G

*1 With infinite heat sink attached
*2 The xx/xxx in the model No. refer to the output voltage values of the model (e.g. 033 for 3.3 V, 05/050 for 5 V, 12/120 for 12 V).
*3 Reference voltage precision
*4 The value is defined as ±50 mV in some models.
*5 Current ratings are defined individually.
*6 Refer to page 50

●SC-63 type (2) Output voltage variable type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings: Output current Io (A) 0.5	1	1.5	Input voltage Vin (V)	Power dissipation Pd*1 (W)	Electrical characteristics: Output voltage Vo (V) TYP.	Output voltage precision (%)	Dropout voltage VI-O*3 (V)	Built-in functions: Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	Taped package	Package	Package shape type*4
PQ070XZ5MZPH	Minimum operating input voltage: 2.35 V	○			10	8	1.5 to 7	±2.0*2	0.5	○	○	○	○	○	○	SC-63	F
PQ070XZ01ZPH			○							○	○	○	○	○	○		F
PQ070XN01ZPH	Minimum operating input voltage: 2.35 V, solder dip compatible lead shape		○							○	○	○	○	○	○		G
PQ070XNA1ZPH	Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape		○							○	○	○	○	○	○		G
PQ070XNAHZPH				○					0.9	○	○	○	○	○	○		G
PQ070XNA2ZPH				○ (2 A)					0.5	○	○	○	○	○	○		G
PQ070XNB1ZPH			○			5	1.2 to 7		0.3	○	○	○	○	○	○		G
PQ070XZ1HZPH	Minimum operating input voltage: 2.35 V			○		8	1.5 to 7		1.0	○	○	○	○	○	○		F
PQ070XZ02ZPH				○ (2 A)					0.5	○	○	○	○	○	○		F
PQ015YZ5MZPH	Reference voltage (Vref): 1.0 V, minimum operating input voltage: 1.7 V (Dual power supply type)	○			3.7		1.0 to 1.5	±3.0*2	–	○	○			○	○		F
PQ035ZN01ZPH	Reference voltage (Vref): 0.6 V, minimum operating input voltage: 1.7 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape		○		5.5		0.8 to 3.5	±30 mV		○	○			○	○		G
PQ035ZN1HZPH				○						○	○			○	○		G
PQ20VZ51J00H	Minimum operating input voltage: 4.5 V	○			24		1.5 to 20	±2.0*2	0.5	○	○	○	○	○	○		F
PQ20VZ11J00H			○							○	○	○	○	○	○		F
PQ20WZ51J00H	Minimum operating input voltage: 3.5 V, ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.))	○					3.0 to 20	±2.5*2		○	○	○	○	○	○		F
PQ20WZ11J00H			○							○	○	○	○	○	○		F
PQ200WNA1ZPH	Minimum operating input voltage: 3.5 V, ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.)), ceramic capacitor compatible, solder dip compatible lead shape		○							○	○	○	○	○	○		G
PQ200WN3MZPH	Minimum operating input voltage: 5.5 V, low dissipation current at OFF state (Iqs: 5 µA (MAX.)), ceramic capacitor compatible, current limit: 800 mA	○ (0.3)				6.8	5.0 to 20			○	○	○	○	○	○		

*1 With infinite heat sink attached
*2 Reference voltage precision
*3 Current ratings are defined individually.
*4 Refer to page 50

●TO-263 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics			Built-in functions					Taped package	Package
		Output current Io (A)	Input voltage Vin (V)	Power dissipation Pd*1 (W)	Output voltage Vo*2 (V) TYP.	Output voltage precision (%)	Dropout voltage V_{I-O}*4 (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage		
PQxxxY053ZPH	High output current (minimum operating input voltage: 2.35 V)	5.0	7	35	1.5, 2.5, 3.3	±1.0	0.5	○	○	○			○	TO-263
PQ05VY053ZPH					1.5 to 5	±1.0*3		○	○	○		○	○	
PQxxxY3H3ZPH		3.5			1.5, 2.5, 3.3	±1.0		○	○	○			○	
PQ05VY3H3ZPH					1.5 to 5	±1.0*3		○	○	○		○	○	
PQxxxEH02ZPH	2 A output (minimum operating input voltage: 2.35 V)	2.0	10		1.5, 1.8, 2.5	±2.5*5		○	○	○	○		○	
PQ070XH02ZPH					1.5 to 7	±2.0*3		○	○	○	○	○	○	
PQ070XHA2ZPH	2 A output (minimum operating input voltage: 2.35 V), ceramic capacitor compatible				1.5 to 7	±2.0*3		○	○	○	○	○	○	
PQxxxEH01ZPH	1 A output (minimum operating input voltage: 2.35 V)	1.0			1.5, 1.8, 2.5	±2.5*5		○	○	○	○		○	
PQ070XH01ZPH					1.5 to 7	±2.0*3		○	○	○	○	○	○	

*1 With infinite heat sink attached
*2 The xxx in the model No. refer to the output voltage values of the model (e.g. 015 for 1.5 V, 025 for 2.5 V, 033 for 3.3 V).
*3 Reference voltage precision
*4 Current ratings are defined individually.
*5 The value is defined as ±50 mV in some models.

●SOP-8 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics		Built-in functions		Taped package	Package
		Output current Io (A)	Input voltage Vin (V)	Power dissipation Pd*1 (W)	Output voltage Vo (V) TYP.	Output voltage precision*2 (mV)	Overheat protection	Overcurrent protection		
PQ1DX095MZPQ	Built-in sink source function (For DDR II memory)	±0.8	6	0.6	V_{DD} x 1/2 (V_{DDQ}: 1.5 V (MIN.))	±25	○	○	○	SOP-8
PQ1DX125MZPQ	Built-in sink source function (For DDR memory)				V_{DD} x 1/2 (V_{DDQ}: 2.3 V (MIN.))	±35	○	○	○	

*1 When mounted on a board
*2 Reference voltage precision

☆New product

■ Surface Mount Type Chopper Regulators (DC-DC Converters) (1)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electrical characteristics					Package	
		Switching current Isw (A)	Power dissipation Pd*1 (W)	Input voltage range Vin (V)	Output voltage*2 Vo (V)	Output type	Oscillation frequency fo (Hz) TYP.	Output saturation voltage Vsat (V) TYP.		Outline shape type*6
PQ6CU12X2APQ	• High switching voltage: 40 V (MAX.) • For tuner power supply • Variable oscillation frequency • Ceramic capacitor compatible	0.25	0.35	3.0 to 5.5	up to 36	Step-up	300 k to 800 k	Ron TYP. 1.7Ω	SOT-23-6W	
PQ1CN38M2ZPH	• PWM chopper regulator (high oscillation frequency) • Output ON/OFF control function • Overcurrent/overheat protection circuits • For light load	0.8	8	4.5 to 40	*3 VREF to 35 (step-down type)/ –VREF to –30 (inverting type)	Step-down	300 k	0.9	SC-63	G
PQ1CN41H2ZPH	• PWM chopper regulator (high oscillation frequency) • Overcurrent/overheat protection circuits	1.5	8			Step-down	300 k	0.9		G
PQ1CZ21H2ZPH	• PWM chopper regulator • Output ON/OFF control function • Overcurrent/overheat protection circuits • Low dissipation current at OFF state (Standby current <ISD>: 1 µA (MAX.))		8			Step-down	100 k	0.9		F
PQ1CX12H2ZPQ	• Bootstrap system for high efficiency (Efficiency 88% (TYP.)) • Low dissipation current	2.5	0.9 When mounted on board	4.5 to 30	*3 VREF to 24	Step-down	150 k	0.25	SOP-8	
PQ1CX22H2ZPQ	• Bootstrap system for high efficiency (Efficiency 88% (TYP.)) • Low dissipation current • Low voltage output: 1.2 V (MIN.)				*4 VREF to 24 (step-down type)			0.25		
PQ1CX41H2ZPQ	• Bootstrap system for high efficiency (Efficiency 90% (TYP.)) • Low voltage output: 0.8 V (MIN.) • Ceramic capacitor compatible	1.5	0.8 When mounted on board	4.75 to 27	0.8 to 20	Step-down	400 k	RDSon TYP. 0.45Ω		
☆PQ1CX53H2MPQ	• Bootstrap system for high efficiency (Efficiency 89% (TYP.)) • Low voltage output: 0.8 V (MIN.) • Ceramic capacitor compatible	3.5	2 When mounted on board	4.75 to 27	0.8 to 16	Step-down	400 k	RDSon TYP. 0.15Ω	USB-8	
☆PQ1CX61H1ZPQ	• Bootstrap system for high efficiency (Efficiency 88% (TYP.)) • Low voltage output: 1.0 V (MIN.) • Ceramic capacitor compatible	1.5	0.8 When mounted on board	4.75 to 28	1.0 to 18.9	Step-down	900 k	RDSon TYP. 0.55Ω	SOP-8	
PQ1CY1032ZPH	• PWM chopper regulator • Output ON/OFF control function • Overheat protection/overcurrent shutdown circuits • High output current type	3.5	35	4.5 to 40	*3 VREF to 35 (step-down type)/ –VREF to –30 (inverting type)	Step-down	150 k	1.4	TO-263	
PQ1CYxx3HZPH series PQ1CYxx3LZPH series*5	• PWM chopper regulator • Fixed output voltage: 3.3 V or 5 V • Overheat protection circuit • Output ON/OFF control function		35		5/3.3	Step-down		1.4		

*1 With infinite heat sink attached or when mounted on a board listed in the specification sheets.
*2 Output variable range (step-down/inversion). *3 VREF nearly equal to 1.26 V *4 VREF nearly equal to 1 V
*5 PQ1CYxx3HZPH series is "H" active, and PQ1CYxx3LZPH series is "L" active.
*6 Refer to page 50

■Surface Mount Type Chopper Regulators (DC-DC Converters) (2)

Model No.	No. of output circuits	Input voltage range (V)	Output voltage (V)	System	Switching frequency (Hz)	Switching transistor	Switching current (mA) [Built-in SW Tr]	Drive capacity (pF) [External SW Tr]	Package
IR3M58M/U	3	4.5 to 28	External setting	Step-up (MAX. 20 V)/ step-down type PWM	70 k to 500 k	Built-in	400	1 000	P-QFP048-0707/ P-VQFN036-0505
				Step-down type PWM		External	–		
				Step-down, inverting type PWM		External	–		

★Under development

■ Chopper Regulators (DC-DC Converters)

●TO-220 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electrical characteristics					Package	
		Switching current Isw (A)	Power dissipation Pd*1 (W)	Input voltage range Vin (V)	Output voltage Vo*2 (V)	Output type	Oscillation frequency fo (kHz) TYP.	Output saturation voltage Vsat (V) TYP.		Outline shape type*5
PQ1CG38M2FZH	• PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • For light load • Output ON/OFF control function	0.8*3	14	40	V_{REF}*4 to 35 (step-down type)/ $-V_{REF}$*4 to –30 (inverting type)	Step-down	300	0.95	TO-220	E
PQ1CG38M2RZH										D
PQ1CG21H2FZH	• PWM chopper regulator • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function	1.5*3					100	1.0		E
PQ1CG21H2RZH										D
PQ1CG41H2FZH	• PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function						300	1.0		E
PQ1CG41H2RZH										D
PQ1CG2032FZH	• PWM chopper regulator • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function	3.5*3					70	1.4		E
PQ1CG2032RZH										D
PQ1CG3032FZH	• PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function						150			E
PQ1CG3032RZH										D
PQ2CF1J0000H	• PWM chopper regulator • Built-in overcurrent/overheat protection circuits	2.5*3	15	35	4.5 to 35 (step-up type)	Step-up	50	0.6		E

*1 With infinite heat sink attached
*2 Output voltage variable range
*3 Peak current
*4 V_{REF} nearly equal to 1.26 V (TYP.)
*5 Refer to page 50

■ DC-DC Converter Module with Built-in Coil

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electrical characteristics					Outline dimensions (W x D x H) mm
		Output current Io (A)	Operating temperature Topr (°C)	Control system	Input voltage range Vin (V)	Oscillation frequency fo TYP. (MHz)	Output voltage Vo*1 (V)	Standby current Isd (µA) TYP.	
★PQ5CM03 series	• DC-DC converter module with built-in coil for simplified power-supply design • High efficiency thanks to synchronous rectification method (efficiency: 82%)	3.0	–10 to +80	PWM system	8.5 to 14	1.0	1.1 to 3.3	20	9.0 x 6.0 x 2.6

*1 Output voltage variable range

☆New product

■ Power Supply ICs for CCDs/CCD Camera Modules

Model No.	No. of output circuits	Input voltage range (V)	Output voltage (V)	System	Switching frequency (Hz)	Switching transistor	Switching current (mA) [Built-in SW Tr]	Drive capacity (pF) [External SW Tr]	Package
IR3M63U	4	4.5 to 10	15	Charge pump	200 k	–	12 (DC)	–	P-VQFN032-0505
			–8	Negative charge pump			2.5 (DC)	–	
			3.3	Step-down type PWM + REG	1 M	Built-in	120 (DC)	–	
			1.8	Step-down type PWM + REG			50 (DC)	–	
IR3M59U	3	4.5 to 16	15/12	Charge pump	200 k	–	12/20 (DC)	–	P-VQFN032-0505
			–8/–5	Negative charge pump			2.5/5 (DC)	–	
			3.3	Step-down type PWM + REG	1 M	Built-in	150 (DC)	–	

■ Power Supply ICs for TFT-LCDs

Model No.	No. of output circuits	Input voltage range (V)	Output voltage (V)	System	Switching frequency (Hz)	Switching transistor	Switching current (mA) [Built-in SW Tr]	Drive capacity (pF) [External SW Tr]	Package
IR3M58M/U	3	4.5 to 28	External setting	Step-up (MAX. 20 V)/ step-down type PWM	70 k to 500 k	Built-in	400 (for step-up type PWM)	1 000	P-QFP048-0707/ P-VQFN032-0505
				Step-down type PWM		External	–		
				Step-down, inverting type PWM		External	–		

■ LED Drivers

●Built-in step-up circuit (1)

Model No.	Function	Features	No. of output circuits	Number of LEDs	Booster method	Constant current circuit	Switching transistor	Input voltage range (V)	Output*3 current (mA) MAX.	Oscillation frequency (Hz) TYP.	Package
PQ6CB11X1CP	White LED driver for backlight (for small panels)	• High voltage CMOS output: 30 V (MAX.) • Output ON/OFF control function • Overvoltage/overcurrent protection circuits • Soft start function	1	6 (Series connection)	PWM	*1	○	2.7 to 5.5	250*2	1.2 M	USB-6
PQ7L2020BP		• High voltage CMOS output: 37 V (MAX.) • Output ON/OFF control function • Overvoltage/overcurrent protection circuits • Soft start function • Possible to use a low-capacity (0.1 µF) output capacitor	1	9 (Series connection)		*1	○	2.9 to 5.5	500	1.0 M	USB-6
☆PQ7L3010QPF	White LED driver for flashlight	• Automatic-switching (between 1x/2x) charge pump system • Non-external coil • Built-in fail-safe function • Short-circuit LED protection function/overheat protection function/soft start function	1	1	Charge pump	*1	–	2.6 to 4.4	800	0.9 M	16QFN

*1 LED constant current value can be set by external resistors.
*2 Peak switching current
*3 Constant current (MAX.)
*4 Use this IC within the range of power dissipation.
*5 Selectable oscillation frequency range
*6 3.57 mm x 3.57 mm x 0.82 mm (TYP.)
*7 3.57 mm x 3.57 mm x 0.65 mm (TYP.)

☆New product
★Under development

RoHS Pb FREE

■ LED Drivers

●Built-in step-up circuit (2)

Model No.	Function	Features	No. of output circuits	Number of LEDs	Booster method	Constant current circuit	Switching transistor	Input voltage range (V)	Output*3 current (mA) MAX.	Oscillation frequency (Hz) TYP.	Package
IR2E49U/ IR2E49M	White LED driver for backlight	• Capable of driving a maximum of 40 LEDs with 8 LEDs (in series) per channel • Built-in step-up DC-DC controller • Capable of controlling brightness using PWM control • Step-up output control according to LED-Vf	5	40	PWM	○	External	6 to 28	150/ ch*4	100 k to 1 M*5	P-VQFN036-0606/ P-QFP048-0707
IR2E51Y6	LED driver for backlight and call alert display (auto brightness adjustment)	• Capable of direct connection of ambient light sensor • Brightness adjustment by ambient illuminance feedback (16-step ambient illuminance/ 128-level illuminance) (for main LCDs) • Non-external coil thanks to charge pump drive • Capable of driving 4 main-LEDs, 2 sub-LEDs, and 3 call alert LEDs with a single device. • I^2C interface-compatible • Standby function/power on reset function/ soft start function	9	4 + 2 + 3	Charge pump	○	–	3.0 to 4.5 (for drive)/ 2.3 to 3.2 (for control)	27.4/ch	660 k	35WL-CSP*6
IR2E55Yx	LED driver for backlight and call alert display (auto brightness adjustment)	• Capable of driving 7 main-LEDs (series) and 6 call alert LEDs • Auto brightness adjustment and PWM brightness adjustment • Power supply for EL panel and LCD controller • LDO 2ch • Built-in GPIO interface • I^2C/SPI interface-compatible	7	13	PWM + charge pump	○	○	3 to 4.2 (for drive)/ 2.7 to 3.2 (for control)	Main 25.6/ch Call alert 12.8/ch	1 M	48WL-CSP*7
☆IR2E56U6	White LED driver for backlight	• Capable of driving a maximum of 72 LEDs with 12 LEDs (in series) per channel • Built-in step-up DC-DC controller • High oscillation frequency (1.5 MHz) makes use of a small coil possible • Capable of controlling brightness using PWM control • Step-up output control according to LED-Vf • Built-in sequential drive mode for output current	6	72	PWM	○	External	5 to 28	25/ch	200 k to 1.5 M	32VQFN
★IR2E58U		• Capable of driving a maximum of 96 LEDs with 12 LEDs (in series) per channel • Built-in step-up DC-DC converter • High oscillation frequency (1.5 MHz) makes use of a small coil possible • Capable of controlling brightness using PWM control • Step-up output control according to LED-Vf	8	96		○	○	4.5 to 28	40/ch	500 k to 1.5 M	24HQFN
★IR2E62U		• Capable of driving a maximum of 96 LEDs with 12 LEDs (in series) per channel • Built-in step-up DC-DC converter • High oscillation frequency (1.5 MHz) makes use of a small coil possible • Capable of controlling brightness using PWM control • Step-up output control according to LED-Vf • Built-in sequential drive mode for output current • Brightness control and operation mode settings carried out using an I^2C-bus, making use of an internal monitor possible	8	96		○	○	4.5 to 28	35/ch	500 k to 1.5 M	24HQFN

*1 LED constant current value can be set by external resistors.
*2 Peak switching current
*3 Constant current (MAX.)
*4 Use this IC within the range of power dissipation.
*5 Selectable oscillation frequency range
*6 3.57 mm x 3.57 mm x 0.82 mm (TYP.)
*7 3.57 mm x 3.57 mm x 0.65 mm (TYP.)

☆New product
★Under development

●Built-in step-up circuit (3)

Model No.	Function	Features	No. of output circuits	Number of LEDs	Booster method	Constant current circuit	Switching transistor	Input voltage range (V)	Output*3 current (mA) MAX.	Oscillation frequency (Hz) TYP.	Package
☆IR2E65U	White LED driver for backlight	• Capable of driving a maximum of 120 LEDs with 12 LEDs (in series) per channel • Built-in step-up DC-DC controller • High oscillation frequency (1.5 MHz) makes use of a small coil possible • Wider range of PWM brightness control possible, from simultaneous total output control to local dimming • Step-up output control according to LED-Vf	10	120	PWM	○	External	10 to 28	100/ch	500 k to 1.5 M	52HQFN
★IR2E66M		• Capable of driving a maximum of 48 LEDs with 12 LEDs (in series) per channel • Relationship between input voltage and LED anode voltage sizes not relevant, thanks to built-in step-up/step-down DC-DC converter • High oscillation frequency (2 MHz) makes use of a small coil possible • Capable of controlling brightness using PWM control • Step-up output control according to LED-Vf	4	48		○	○	6 to 28	100/ch	100 k to 2 M	48QFP

*1 LED constant current value can be set by external resistors.
*2 Peak switching current
*3 Constant current (MAX.)
*4 Use this IC within the range of power dissipation.
*5 Selectable oscillation frequency range
*6 3.57 mm x 3.57 mm x 0.82 mm (TYP.)
*7 3.57 mm x 3.57 mm x 0.65 mm (TYP.)

●External power supply for LEDs

Model No.	Function	Features	Supply voltage (V)	Package
IR2D20U	24-dot LED panel driver with constant-current sink outputs	• Output current (constant current sink output): 30 mA (MAX.) (setup by external resistor) • Gradation function (clock cycle setting or external synchronization) • Independent current control for three systems (for RGB LED) • LED drive voltage: 15 V • Rated output voltage: 20 V (MAX.) • f_{CLK}: 20 MHz (MAX.)/16.6 MHz (MAX.) (at cascade connection)	4.5 to 5.5	P-HQFN052-0707
IR2D071	16-dot LED panel driver with constant current sink outputs	• Output current (constant-current sink output): 60 mA (MAX.) (setup by external resistor) • Rated output voltage: 7 V (MAX.) • f_{CLK}: 20 MHz (MAX.)/16.6 MHz (MAX.) (at cascade connection)	3.0 to 5.5	P-SDIP028-0400

★Under development

■ AC-DC Conversion Type ICs for LED Lighting

Model No.	Features	Absolute maximum ratings		Electrical characteristics					Package
		Vcc (V)	Topr (°C)	Drive voltage Vcc (V) MIN.	Dissipation current Icc (mA) TYP.	Low level output current I_{OL} (mA) MIN.	High level output current I_{OH} (mA) MAX.	Switching frequency F_{SW} (kHz) TYP.	
★PQ1DC15C0P	• Use of forward type allows high (90%) efficiency rate • No electrolytic capacitor	23	–30 to +100	20	3	15	–15	68	SOT-23
★PQ1DC15F1P									SOP-8

■ Power Amplifiers for Wireless LAN

Model No.	Application	Supply voltage Vcc (V) TYP.	Control voltage Vbb (V) TYP.	Linear output power*1 (dBm)	Dissipation current (mA) TYP.	Gain (dB) TYP.	Detection circuit	Matching circuit	Package (mm)
IRM068U7	For 2.4 GHz single-band wireless LAN (IEEE802.11b/g/n)	3.3	2.8	18	115	27	○*2	Built-in (IN)	HQFN6 pin (1.5 × 1.5 × 0.4 mm)
QM2A1UA003				20	150	28	○	Built-in (IN)	
IRM053U7	For 5 GHz single-band wireless LAN (IEEE802.11a/n)			18	170	30	○	Built-in (IN/OUT)	HQFN10 pin (2 × 2 × 0.4 mm)
QM2A1UA004				20	225	31	○	Built-in (IN/OUT)	
IRM065U7	For 2.4/5 GHz dual-band wireless LAN (IEEE802.11a/b/g/n)			18	130	30	○	Built-in (IN/OUT)	HQFN16 pin (3 × 3 × 0.4 mm)
				18	160	30			
IRM067U6			2.9	17	100	28	○*2	Built-in (IN/OUT)	
				17	140	30			

*1 At time of OFDM 64QAM modulating wave input.
*2 Load fluctuation stabilization and detection output type

■ Power Amplifier for WiMAX

Model No.	Operating frequency (GHz)	Output (dBm)	Dissipation current (mA) at 25 dBm	EVM (%) at 25 dBm	Gain (dB)	Detection circuit	Step gain function	On-chip matching circuit	Supply voltage/ control voltage Vcc/Vbb (V)	Package (mm)
QM2B1UA001	2.5 to 2.7	25	430	3	31	○	○	○	3.3/2.8	HQFN16 pin (3 × 3 × 0.4)

■ Fail Safe ICs

Model No.	Features	Operating voltage			Dissipation current (μA) TYP.	Operating temp. (°C)	Package
		VBAT (V)	VBAC (V)	VIO (V)			
IR3T46U6	• Malfunction detection • Built-in 8-bit ADC • Built-in timer circuit • Built-in key detection output OR gate	3.2 to 4.5	3.0 to 3.3	2.6 to 3.0	10	–20 to +85	P-HQFN024-0404
IR3T48Y6	• Small package • Built-in 3-STATE buffer • Malfunction detection • Built-in 8-bit ADC • Built-in timer circuit • Built-in key detection output OR gate			1.6 to 3.0			35WL-CSP*

* 3.0 (W) x 3.0 (D) x 0.975 (H) mm (TYP.)

SOLAR MODULES FOR MOBILE DEVICES

☆New product

■ Solar Modules for Mobile Devices

Model No.	Features	Maximum output power* Pmax (mW) TYP.	Maximum output voltage* Vpm (V) TYP.	Maximum output current* Ipm (mA) TYP.	Outline dimensions (mm)
☆LR0GC02	Module thickness: 0.8 mm	300	4.5	67	67.5 × 41.0 × 0.8
☆LR0GC03	Module thickness: 0.8 mm	145	4.5	32	41.0 × 33.0 × 0.8

* Measuring conditions: AM 1.5; irradiance: 1000 W/m^2 ± 50 mW; module temperature: at 25°C

LR0GC02

LR0GC03

★Under development

■ CSP

●CSP (Chip Size Package)

The FBGA (commonly known as CSP) has an area array terminal structure with solder balls on the bottom, to give it a near chip-size footprint. This high-density, compact and low-profile package technology will greatly help in the design of compact mobile equipment, such as mobile phones and digital cameras.

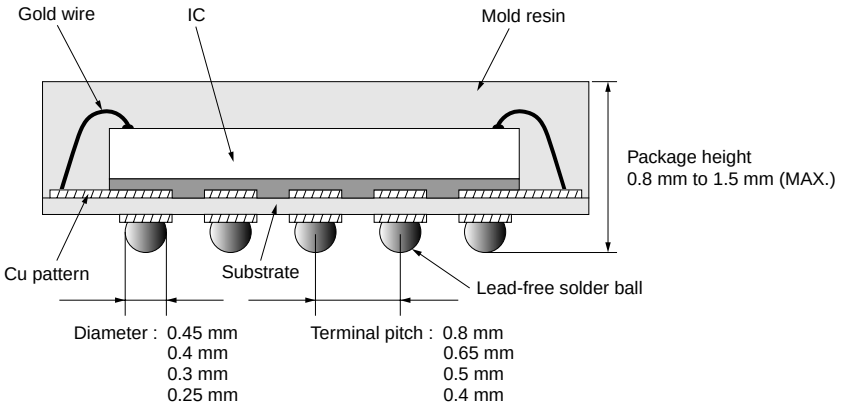
FBGA (CSP)

Features

- **Compact and lightweight**
  Ability to create a near-chip size and lighter-weight package in comparison with conventional plastic packages.
- **High reliability**
  Comparable high reliability with that of conventional plastic packages.
- **Mountability**
  Conventional mounting system is available for CSP. SOP and QFP can be mounted together with CSP.

Terminal pitch	0.8 mm	0.65 mm	0.5 mm	0.4 mm
Maximum terminal counts	352 (16 mm x 16 mm)	352 (16 mm x 16 mm)	372 (16 mm x 16 mm)	264 (10 mm x 10 mm)
Nominal dimensions	6 mm x 6 mm to 16 mm x 16 mm			5 mm x 5 mm to 10 mm x 10 mm

Cross section example



●Wafer-level CSP

The wafer-level CSP (WL-CSP) is a kind of chip-size package which is manufactured by assembling directly onto the finished wafer.

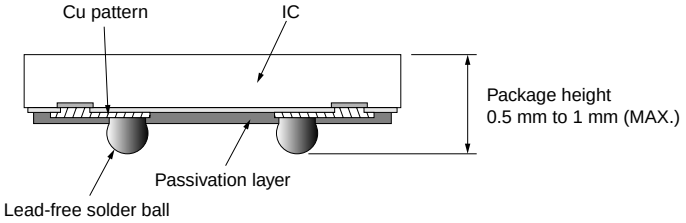
Features

- **Compact and thinner size**
  It makes it possible to create an almost IC-size and lighter-weight package.
- **Mountability**
  The conventional CSP mounting system can be also used in that of wafer-level CSP, which facilitates chip mounting more than bare-chip mounting does. It can be mounted together with other existing packages and passive components. (The use of underfill is recommended to improve the reliability of assembly.)

Chip size*	4 mm x 4 mm		3.5 mm x 3.5 mm		3 mm x 3 mm		★ 2.5 mm x 2.5 mm	
Pad pitch	0.5 mm	0.4 mm	0.5 mm	0.4 mm	0.5 mm	0.4 mm	0.5 mm	0.4 mm
Maximum terminal counts	49 (7 x 7)	81 (9 x 9)	36 (6 x 6)	49 (7 x 7)	25 (5 x 5)	36 (6 x 6)	16 (4 x 4)	25 (5 x 5)

* Rectangular chip form is also available.

Cross section example



■ SiP (System in Package)

System in Package is SHARP's original high-density mounting technology that achieves high-density memory capacity and multiple functions by stacking multiple ICs or multiple packages. The System in Package technology means chip-stacked package technology that can achieve up to 5-chip mounting by stacking ICs in a single package. The System in Package technology contributes to higher functionality of applications, such as mobile phones and digital cameras, as well as to reduction in size and weight.

●Chip Stacked CSP

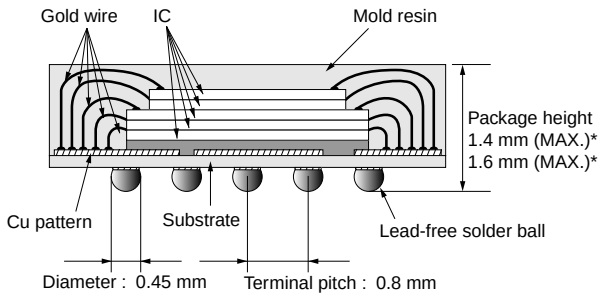
Features

- **Wide variety of lineup**
  It is possible to provide a wide lineup of stacked CSPs, including 2-chip, 3-chip, 4-chip and 5-chip stacked CSPs, to respond to customer needs.
- **Compact and thinner size**
  Encapsulating multiple ICs into an existing plastic package contributes to decreasing the mounting area. In addition, SHARP's wafer thinning technology makes it possible to achieve 1.4 mm (MAX.) package height.
- **Multiple functions**
  Multiple ICs of different sizes and functions, such as logic LSIs and memories, can be incorporated in a single package, making possible multiple functions.
- **Same-size IC stacking technology**
  SHARP's stacking technology enables stacking of multiple same-size ICs, contributing to higher memory density.

(4-chip stacked CSP)
When using a SHARP four-chip stacked CSP, the mounting area and weight of a package can be decreased by half in comparison with using two 2-chip stacked CSPs, or a 3-chip stacked CSP and a conventional CSP.

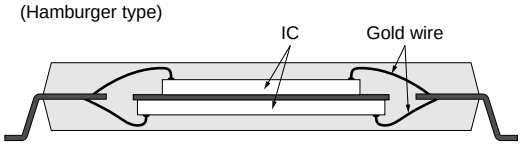
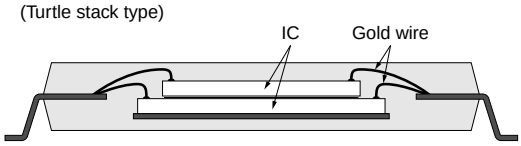
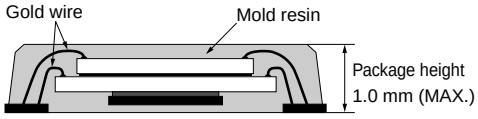
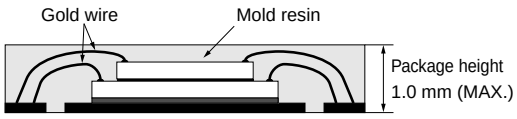
Cross section example

(5-chip stacked CSP)



* At 0.8 mm terminal pitch

●Chip Stacked TSOP/QFP*/VQFN/HQFN

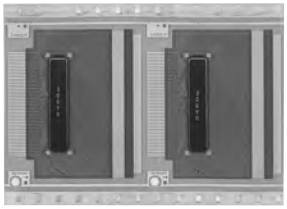
Features	● **Decreased mounting area** By encapsulating two identical or different types of ICs into a single conventional plastic package, the mounting area of the package can be decreased. ● **Multiple functions** Thanks to the incorporation of different sizes and functions of multiple ICs, such as logic LSIs and memories, the functionality increases. ● **Higher memory density** When incorporating two identical memory ICs into a single package, memory density doubles on the same mounting area.
Cross section example	(TSOP, QFP*) (Hamburger type)  (Turtle stack type)  (VQFN)  (HQFN) 

* Including TQFP and LQFP.

■ SOF

●SOF (System On Film)

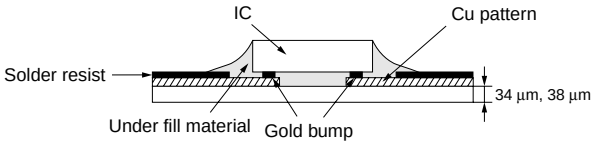
SOF is a highly flexible thin film package, created from SHARP's TCP technologies.
It can be easily bent, and contributes to thin and compact design of products.
Peripheral circuit components can also be mounted.



Features

- **Highly flexible and thin film package**
  By using highly flexible and thin film, SOF contributes to creating thin and compact products.
  It can also achieve finer terminal pitches and multiple outputs easily, and pattern layout on a film under the chip makes it possible to improve the flexibility of the pattern layout.
- **Multiple chip mounting**
  Multiple chip mounting with peripheral chip components contribute to the higher functionality of products.

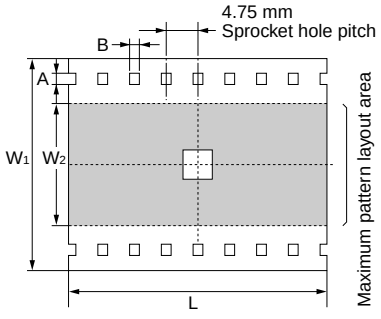
Cross section example



Thickness 0.6 mm (MIN.)
1.0 mm (TYP.)

Film specifications

Film width : W_1	35 mm super wide	48 mm super wide	70 mm wide
Maximum pattern layout area : W_2	28.6 mm	41.6 mm	59.0 mm
Maximum device pitch : L	15 sprockets		
Pattern thickness	8 µm		
Pattern layer	Electro-deposited Cu		
Pattern layer finish	Tin (Sn)		
Minimum pattern pitch	0.025 mm		
Sprocket hole : A	1.981 mm (wide) /1.42 mm (super wide)		
Sprocket hole : B	1.981 mm (wide) /1.42 mm (super wide)		



Other components

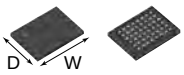
Bare chips and peripheral chip components can be mounted on the film.

In addition to the SOF described above, a conventional TCP (Tape Carrier Package) is also available.

RoHS Pb FREE

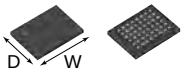
■ Package Lineup

●Surface-mount Type

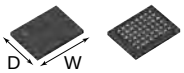
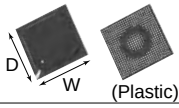
Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package depth & width (D x W) x (seated height [MAX.]) mm
FBGA (CSP)	 (Plastic)	P-LFBGA048-0606	48	0.8	6 x 6	6.0 x 6.0 x (1.4)
		P-TFBGA048-0608			6 x 8	6.0 x 8.0 x (1.2)
		P-TFBGA048-0808			8 x 8	8.0 x 8.0 x (1.2)
		P-TFBGA056-0808	56			
		P-TFBGA060-0811	60 (48)*		8 x 11	8.0 x 11.0 x (1.2)
		P-TFBGA064-0811	64			
		P-TFBGA072-0811	72 (64)*			
		P-LFBGA072-0811				8.0 x 11.0 x (1.4) / (1.6)
		P-TFBGA081-0808	81		8 x 8	8.0 x 8.0 x (1.2)
		P-LFBGA085-0811	85		8 x 11	8.0 x 11.0 x (1.4) / (1.6)
		P-LFBGA087-0811	87			
		P-LFBGA088-0811	88			
		P-LFBGA088-0912			9 x 12	9.0 x 12.0 x (1.4) / (1.6)
		P-LFBGA090-0811	90		8 x 11	8.0 x 11.0 x (1.4) / (1.6)
		P-TFBGA096-1010	96		10 x 10	10.0 x 10.0 x (1.2)
		P-LFBGA107-0912	107		9 x 12	9.0 x 12.0 x (1.4) / (1.6)
		P-TFBGA111-1010	111		10 x 10	10.0 x 10.0 x (1.2)
		P-TFBGA112-1010	112			
		P-LFBGA115-0914	115		9 x 14	9.0 x 14.0 x (1.4) / (1.6)
		P-LFBGA116-1010	116		10 x 10	10.0 x 10.0 x (1.4) / (1.6)
		P-LFBGA130-1013	130		10 x 13	10.0 x 13.0 x (1.4) / (1.6)
		P-TFBGA144-1111	144		11 x 11	11.0 x 11.0 x (1.2)
		P-TFBGA160-1212	160		12 x 12	12.0 x 12.0 x (1.2)
		P-LFBGA168-1212	168			12.0 x 12.0 x (1.4) / (1.6)
		P-TFBGA180-1212	180			12.0 x 12.0 x (1.2)
		P-TFBGA184-1212	184			
		P-TFBGA240-1414	240		14 x 14	14.0 x 14.0 x (1.2)
		P-LFBGA280-1616	280		16 x 16	16.0 x 16.0 x (1.5)
		P-LFBGA352-1616	352			
		P-TFBGA064-0606	64	0.65	6 x 6	6.0 x 6.0 x (1.2)
		P-LFBGA140-0909	140		9 x 9	9.0 x 9.0 x (1.4)
		P-LFBGA160-1010	160		10 x 10	10.0 x 10.0 x (1.4) / (1.6)
		P-TFBGA180-1313	180		13 x 13	13.0 x 13.0 x (1.2)
		P-LFBGA192-1010	192		10 x 10	10.0 x 10.0 x (1.4) / (1.6)
		P-LFBGA208-1212	208		12 x 12	12.0 x 12.0 x (1.4) / (1.6)
		P-LFBGA224-1313	224		13 x 13	13.0 x 13.0 x (1.4) / (1.6)
		P-TFBGA260-1313	260			13.0 x 13.0 x (1.2)

* Figures in brackets indicate available terminal counts.

●Surface-mount Type (cont'd)

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package depth & width (D x W) x (seated height [MAX.]) mm
FBGA (CSP)	 (Plastic)	P-VFBGA057-0505	57	0.5	5 x 5	5.0 x 5.0 x (0.9)
		P-VFBGA075-0505	75			
		P-TFBGA064-0606	64		6 x 6	6.0 x 6.0 x (1.1)
		P-TFBGA068-0606	68			
		P-VFBGA081-0606	81			6.0 x 6.0 x (0.9)
		P-TFBGA084-0606	84			6.0 x 6.0 x (1.1)
		P-VFBGA100-0606	100			6.0 x 6.0 x (0.9)
		P-VFBGA100-0707			7 x 7	7.0 x 7.0 x (0.9)
		P-TFBGA100-0707				7.0 x 7.0 x (1.1)
		P-VFBGA108-0707	108			7.0 x 7.0 x (0.9)
		P-TFBGA108-0707				7.0 x 7.0 x (1.1)
		P-VFBGA120-0707	120			7.0 x 7.0 x (0.9)
		P-TFBGA120-0707				7.0 x 7.0 x (1.1)
		P-TFBGA132-0707	132			
		P-TFBGA133-0808	133		8 x 8	8.0 x 8.0 x (1.1)
		P-VFBGA144-0808	144			8.0 x 8.0 x (0.9)
		P-LFBGA144-0808				8.0 x 8.0 x (1.3) / (1.5)
		P-LFBGA144-0811			8 x 11	8.0 x 11.0 x (1.3)
		P-TFBGA152-0808	152		8 x 8	8.0 x 8.0 x (1.1)
		P-VFBGA171-0811	171		8 x 11	8.0 x 11.0 x (0.9)
		P-LFBGA171-0811				8.0 x 11.0 x (1.3) / (1.5)
		P-VFBGA176-0909	176		9 x 9	9.0 x 9.0 x (0.9)
		P-TFBGA176-0909				9.0 x 9.0 x (1.1)
		P-TFBGA180-0909	180			
		P-TFBGA188-0909	188			
		P-VFBGA188-1111			11 x 11	11.0 x 11.0 x (0.9)
		P-VFBGA208-1010	208		10 x 10	10.0 x 10.0 x (0.9)
		P-TFBGA208-1010				10.0 x 10.0 x (1.1)
		P-TFBGA245-1010	245			
		P-LFBGA245-1010				10.0 x 10.0 x (1.3)
		P-FBGA424-1414	424		14 x 14	14.0 x 14.0 x (1.8)
		P-WFBGA144-0606	144	0.4	6 x 6	6.0 x 6.0 x (0.75)
		P-WFBGA121-0606	121			6.0 x 6.0 x (0.8)
		P-WFBGA145-0606	145			
		P-TFBGA168-0707	168		7 x 7	7.0 x 7.0 x (1.0)
		P-TFBGA204-0808	204		8 x 8	8.0 x 8.0 x (1.0)
		P-WFBGA205-0808	205			8.0 x 8.0 x (0.8)
		P-WFBGA261-0808	261			

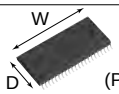
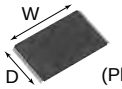
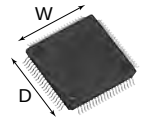
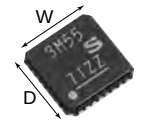
●Surface-mount Type (cont'd)

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package depth & width (D x W) x (seated height [MAX.]) mm
FBGA (CSP)	 D W	P-TFBGAXXX-0606	to 36	0.8	6 x 6	6.0 x 6.0 x (1.2)
		P-TFBGAXXX-0707	to 49		7 x 7	7.0 x 7.0 x (1.2)
		P-TFBGAXXX-0808	to 81		8 x 8	8.0 x 8.0 x (1.2)
		P-TFBGAXXX-0909	to 100		9 x 9	9.0 x 9.0 x (1.2)
		P-TFBGAXXX-1010	to 121		10 x 10	10.0 x 10.0 x (1.2)
		P-TFBGAXXX-1111	to 144		11 x 11	11.0 x 11.0 x (1.2)
		P-TFBGAXXX-1212	to 196		12 x 12	12.0 x 12.0 x (1.2)
		P-TFBGAXXX-1313	to 216		13 x 13	13.0 x 13.0 x (1.2)
		P-TFBGAXXX-1414	to 240		14 x 14	14.0 x 14.0 x (1.2)
		P-TFBGAXXX-1515			15 x 15	15.0 x 15.0 x (1.2)
		P-TFBGAXXX-1616	to 352		16 x 16	16.0 x 16.0 x (1.2)
		P-TFBGAXXX-0606	to 49	0.65	6 x 6	6.0 x 6.0 x (1.2)
		P-TFBGAXXX-0707	to 81		7 x 7	7.0 x 7.0 x (1.2)
		P-TFBGAXXX-0808	to 121		8 x 8	8.0 x 8.0 x (1.2)
		P-TFBGAXXX-0909	to 144		9 x 9	9.0 x 9.0 x (1.2)
		P-TFBGAXXX-1010	to 196		10 x 10	10.0 x 10.0 x (1.2)
		P-TFBGAXXX-1111	to 224		11 x 11	11.0 x 11.0 x (1.2)
		P-TFBGAXXX-1212	to 256		12 x 12	12.0 x 12.0 x (1.2)
		P-TFBGAXXX-1313	to 272		13 x 13	13.0 x 13.0 x (1.2)
		P-TFBGAXXX-1414	to 304		14 x 14	14.0 x 14.0 x (1.2)
		P-TFBGAXXX-1515	to 320		15 x 15	15.0 x 15.0 x (1.2)
		P-TFBGAXXX-1616	to 352		16 x 16	16.0 x 16.0 x (1.2)
		P-TFBGAXXX-0606	to 100	0.5	6 x 6	6.0 x 6.0 x (1.1)
		P-TFBGAXXX-0707	to 132		7 x 7	7.0 x 7.0 x (1.1)
		P-TFBGAXXX-0808	to 164		8 x 8	8.0 x 8.0 x (1.1)
		P-TFBGAXXX-0909	to 192		9 x 9	9.0 x 9.0 x (1.1)
		P-TFBGAXXX-1010	to 216		10 x 10	10.0 x 10.0 x (1.1)
		P-TFBGAXXX-1111	to 244		11 x 11	11.0 x 11.0 x (1.1)
		P-TFBGAXXX-1212	to 268		12 x 12	12.0 x 12.0 x (1.1)
		P-TFBGAXXX-1313	to 296		13 x 13	13.0 x 13.0 x (1.1)
		P-TFBGAXXX-1414	to 320		14 x 14	14.0 x 14.0 x (1.1)
		P-TFBGAXXX-1515	to 348		15 x 15	15.0 x 15.0 x (1.1)
		P-TFBGAXXX-1616	to 372		16 x 16	16.0 x 16.0 x (1.1)
		P-TFBGAXXX-0505	to 100	0.4	5 x 5	5.0 x 5.0 x (1.0)
		P-TFBGAXXX-0606	to 144		6 x 6	6.0 x 6.0 x (1.0)
		P-TFBGAXXX-0707	to 168		7 x 7	7.0 x 7.0 x (1.0)
		P-TFBGAXXX-0808	to 204		8 x 8	8.0 x 8.0 x (1.0)
		P-TFBGAXXX-0909	to 228		9 x 9	9.0 x 9.0 x (1.0)
	(Plastic)	P-TFBGAXXX-1010	to 264		10 x 10	10.0 x 10.0 x (1.0)
PBGA (BGA)	 D W (Plastic)	P-BGA0356-2121	356	1.0	21 x 21	21.0 x 21.0 x (2.2)
		P-BGA0476-3535	476	1.27	35 x 35	35.0 x 35.0 x (2.63)
		P-BGA0528-3535	528			

XXX: Terminal counts

BGA is a trademark of Motorola Nippon Ltd.

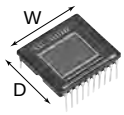
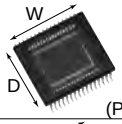
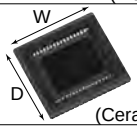
●Surface-mount Type (cont'd)

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm (mil)	Nominal dimensions mm (mil)	Package depth & width (D x W) x (seated height [MAX.]) mm	Lead frame material: Alloy42	Lead frame material: Copper alloy
SSOP	 (Plastic)	P-SSOP008-0150	8	0.65	4.5 (150)	3.0 x 3.0 x (1.1)	–	○
		P-SSOP024-0275	24		7.0 (275)	6.0 x 7.8 x (1.27)	–	○
TSOP	 (Plastic)	P-TSOP040-1020	40	0.5	10 x 20	10.0 x 18.4 x (1.2)	○	○
		P-TSOP048-1220	48		12 x 20	12.0 x 18.4 x (1.2)	○	○
		P-TSOP056-1420	56		14 x 20	14.0 x 18.4 x (1.2)	○	○
QFP	 (Plastic)	P-QFP048-0707	48	0.5	7 x 7	7.0 x 7.0 x (1.65)	○	○
		P-QFP072-1010	72		10 x 10	10.0 x 10.0 x (1.8)	○	–
LQFP		P-LQFP080-1212	80	0.5	12 x 12	12.0 x 12.0 x (1.7)	○	–
		P-LQFP100-1414	100		14 x 14	14.0 x 14.0 x (1.7)	○	–
TQFP		P-TQFP048-0707	48	0.5	7 x 7	7.0 x 7.0 x (1.2)	○	–
		P-TQFP100-1414	100		14 x 14	14.0 x 14.0 x (1.2)	○	–
		P-TQFP128-1414	128	0.4			○	–
VQFN	 (Plastic)	P-VQFN020-0404	20	0.5	4 x 4	4.2 x 4.2 x (1.0)	–	○
		P-VQFN024-0404	24				–	○
		P-VQFN028-0505	28		5 x 5	5.2 x 5.2 x (1.0)	–	○
		P-VQFN032-0505	32				–	○
		P-VQFN036-0606	36		6 x 6	6.2 x 6.2 x (1.0)	–	○
		P-VQFN048-0707	48		7 x 7	7.2 x 7.2 x (1.0)	–	○
		P-VQFN036-0505	36	0.4	5 x 5	5.2 x 5.2 x (1.0)	–	○
		P-VQFN052-0707	52		7 x 7	7.2 x 7.2 x (1.0)	–	○
HQFN*		P-HQFN020-0404	20	0.5	4 x 4	4.0 x 4.0 x (1.0)	–	○
		P-HQFN024-0404	24			4.0 x 4.0 x (0.85)	–	○
						4.2 x 4.2 x (1.0)	–	○
		P-HQFN028-0505	28		5 x 5	5.0 x 5.0 x (1.0)	–	○
		P-HQFN052-0707	52	0.4	7 x 7	7.2 x 7.2 x (1.0)	–	○

* HQFN is a higher heat dissipation package of VQFN.

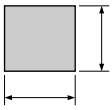
100 mil = 2.54 mm

●For CCDs

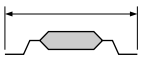
Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm (mil)	Package depth & width (D x W) x (seated height [TYP.]) mm
DIP	 (Plastic)	P-DIP014-0400A	14	1.27	10.16 (400)	10.0 x 10.0
		P-DIP016-0450	16	1.27	11.43 (450)	11.4 x 12.2
		P-DIP016-0500C		1.78	12.7 (500)	12.4 x 14.0
SOP	 (Plastic)	P-SOP028-0400	28	0.69	10.16 (400)	10.0 x 10.0 x (3.5)
		P-SOP032-0525	32	0.78	13.3 (525)	12.0 x 13.8 x (3.92)
LCC	 (Ceramic)	N-LCC040-R350	40	0.65	8.9	8.3 x 8.9 x (1.52)
		N-LCC040-S433A		0.80	11.0	11.0 x 11.0 x (1.62)

100 mil = 2.54 mm

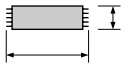
Nominal dimensions



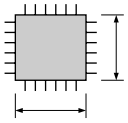
FBGA (CSP)
PBGA (BGA)



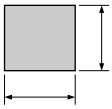
SOP
SSOP
MFP



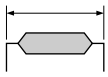
TSOP



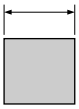
QFP
LQFP
TQFP



VQFN
HQFN



DIP

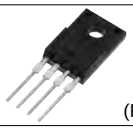
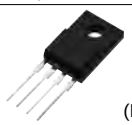
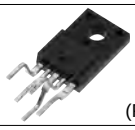


LCC

FBGA : fine-pitch ball grid array package
PBGA : plastic ball grid array package
SOP : small outline package
SSOP : shrink small outline package
MFP : mini flat package
TSOP : thin small outline package
QFP : quad flat package
LQFP : low profile quad flat package
TQFP : thin quad flat package
VQFN : very thin quad flat non-leaded package
HQFN : heat sink quad flat non-leaded package
DIP : dual inline package
LCC : leadless chip carrier

Ball Grid Array and BGA are trademarks of Motorola Nippon Ltd.

●Lead-inserting Type Packages [For regulators: PQ series]

Package type	Appearance (Package material)	No.of terminals	Terminal pitch mm	Outline dimensions (Width x Thickness x Height) mm	Lead frame material
A TO-220	 (Plastic)	4	2.54	10.2 (MAX.) x 4.5 x 29.1*2	Cu
B TO-220 (Full mold)	 (Plastic)	4	2.54	10.2 (MAX.) x 4.5 x 29.1*2	Cu
C TO-220 (Full mold) [Lead forming type]	 (Plastic)	5	(1.7)*1	10.2 (MAX.) x 4.5 x 24.6*2	Cu
D TO-220 [Lead forming type]	 (Plastic)	5	(1.7)*1	10.2 (MAX.) x 4.5 x 24.6*2	Cu
E TO-220 [Lead forming type]	 (Plastic)	5	(1.7)*1	10.2 (MAX.) x 4.5 x 24.6*2	Cu

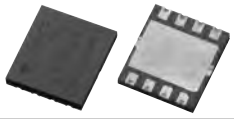
*1 The figure in parentheses indicates reference value.
*2 Including lead length

●Surface-mount Type Packages [For regulators/LED drivers: PQ series]

Package type	Appearance (Package material)	No.of terminals	Terminal pitch mm	Outline dimensions (Width x Height x Thickness) mm	Lead frame material
TO-263	 (Plastic)	5 (Heat sink not included)	(1.7)*1	10.6 (MAX). x 13.7 (MAX.)*2 x 3.5	Cu
F SC-63	 (Plastic)	5 (Heat sink not included)	(1.27)*1	6.6 (MAX.) x 9.7 (MAX.)*2 x 2.3	Cu
G SC-63	 (Plastic)	5 (Heat sink included)	(1.27)*1	6.6(MAX.) x 9.7 (MAX.)*2 x 2.1	Cu
SOP-8	 (Plastic)	8	1.27	5 x 6.2*2 x 1.55*2	Cu
SOT-89	 (Plastic)	6	1.5	4.5 x 4.3*2 x 1.5	Cu

*1 The figure in parentheses indicates reference value.
*2 Including lead length

●Surface-mount Type Packages [For regulators/LED drivers: PQ series] (cont'd)

Package type	Appearance (Package material)	No.of terminals	Terminal pitch mm	Outline dimensions (Width x Height x Thickness) mm	Lead frame material
SOT-23-6	 (Plastic)	6	0.95	2.9 x 2.8*2 x 1.3	Cu
SOT-23-6W	 (Plastic)	6	0.95	2.9 x 2.8*2 x 1.3	Cu
SOT-23-L	 (Plastic)	6	(0.95)*1	(3.4)*1 x 3.3*2 x 1.4 (MAX.)	Cu
SOT-23-5	 (Plastic)	5	(0.95)*1	(2.9)*1 x 2.8*2 x 1.3 (MAX.)	Cu
USB-6		6	0.5	2.0 x 1.8 x 0.8	Cu (Terminal material)/ Au plating (Terminal finish)
USB-8		9 (Including radiating fin)	1.0	5.0 x 4.5 x 0.75 (MAX.)	Cu

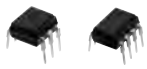
*1 The figure in parentheses indicates reference value.
*2 Including lead length

■ Photocoupler Lineup

<Phototransistor output type>

Package type	Output type	Features		Model No. (series)	Page
4-pin SOP Compact, SMT type	Single phototransistor	General purpose, High collector-emitter voltage, etc.		PC35x series/PC451J00000F	53
			Low input current	PC367NJ0000F	53
		AC input response		PC354NJ0000F	53
			Low input current	PC364NJ0000F	53
	Darlington phototransistor	High sensitivity, High collector-emitter voltage		PC355NJ0000F/PC452J00000F	53
			Low input current	PC365NJ0000F	53
Compact, Half pitch (lead space), SMT type	Single phototransistor	General purpose, High resistance to noise, etc.		PC3Hx series	54
			Reinforced insulation	PC3HU7xYIP0B	54
			Low input current	PC3H71xNIP0F	54
		High collector-emitter voltage		PC4H510NIP0F	54
		AC input response		PC3H3J00000F/PC3H4J00000F	54
			Low input current	PC3H41xNIP0F	54
	Darlington phototransistor	High sensitivity		PC3H5J00000F	54
			Low input current	PC3H510NIP0F	54
DIP type (4-pin)	Single phototransistor	Reinforced insulation		PC123XNNSZ0F	55
(4-pin, DIP type)		General purpose, High collector-emitter voltage, etc.	Low input current	PC1231xNSZ0X	55
				PC817XNNSZ0F/PC851XNNSZ0F	55
			Low input current	PC8171xNSZ0X	55
		Built-in SBD/High response speed		PC81100NSZ0X	55
	Darlington phototransistor	High sensitivity, High collector-emitter voltage		PC815XNNSZ0F/PC852XNNSZ0F/ PC853XNNSZ0F	55
			Low input current	PC81510NSZ0X	55
DIP type (6-pin)	Single phototransistor	General purpose, High collector-emitter voltage, etc.		PC7xxV0NSZXF	56
	Darlington phototransistor	High sensitivity, High collector-emitter voltage, etc.		PC7x5V0NSZXF	56

<OPIC output type>

Package type	Output type	Features	Model No. (series)	Page
Compact, SMT type	Digital output	General purpose, High response speed, 2ch, etc.	PC40xJ00000F/PC456L0NIP0F/ PC410S0NIP0F/PC410L0NIP0F/ PC4D10SNIP0F	57
	Analog/Digital output	High CMR	PC457S0NIP0F/PC457L0NIP0F	57
DIP type, SMT type	Digital output	General purpose	PC90xV0NSZXF	58
	Built-in base amplifier	For inverter control, Built-in short-circuit protection circuit	PC925LxNSZ0F/PC942J00000F/ PC928J00000F/PC929J00000F	58

■ Photocouplers

◆Phototransistor Output Type <Compact, SMT type>

○: Approved, △: Under application

(Ta = 25°C)

Output type	Model No.	Internal connection diagram	Features	Approved by safety standards*2 UL	Package	Absolute maximum ratings: Forward current IF (mA)	Absolute maximum ratings: Isolation voltage (AC) Viso (rms) (kV)	Absolute maximum ratings: Collector-emitter voltage VCEO (V)	Electro-optical characteristics: Current transfer ratio CTR (%) MIN.	Current transfer ratio: IF (mA)	Current transfer ratio: VCE (V)	Response time: tr (µs) TYP.	Response time: IC (mA)	Response time: RL (Ω)	Response time: VCE (V)
Single phototransistor output	PC357NJ0000F		General purpose	○*	Mini-flat 4-pin	50	3.75	80	50	5	5	4	2	100	2
	PC352NJ0000F		General purpose, high resistance to noise*1	○		50	3.75	80	90	5	5	4	2	100	2
	PC451J00000F		High collector-emitter voltage	○*		50	3.75	350	40	5	5	4	2	100	2
	PC367NJ0000F		Low input current, high resistance to noise*1	○		10	3.75	80	100	0.5	5	4	2	100	2
	PC354NJ0000F		AC input response	○*		±50	3.75	80	20	±1	5	4	2	100	2
	PC364NJ0000F		Low input current, AC input response, high resistance to noise*1	○		±10	3.75	70	50	±0.5	5	4	2	100	2
Darlington photo-transistor output	PC355NJ0000F		High sensitivity	○*		50	3.75	35	600	1	2	60	2	100	2
	PC365NJ0000F		High sensitivity, low input current	○		10	3.75	35	600	0.5	2	60	2	100	2
	PC452J00000F		High collector-emitter voltage	○*		50	3.75	350	1 000	1	2	100	20	100	2

*1 CMR: MIN.10 kV/µs
*2 Please refer to Specification Sheets for model numbers approved by safety standards.
* A VDE approved type is optionally available.

PC357NJ0000F
(Mini-flat 4-pin)

◆Phototransistor Output Type
<Compact, half pitch (lead space) SMT type>

○: Approved, △: Under application

(Ta = 25°C)

Output type	Model No.	Internal connection diagram	Features	Approved by safety standards*3 UL	Package	Absolute maximum ratings: Forward current IF (mA)	Isolation voltage (AC) Viso (rms) (kV)	Collector-emitter voltage VCEO (V)	Electro-optical characteristics: Current transfer ratio CTR (%) MIN.	IF (mA)	VCE (V)	Response time tr (µs) TYP.	IC (mA)	RL (Ω)	VCE (V)
Single phototransistor output	PC3HU7xYIP0B		Reinforced insulation (internal insulation distance: MIN. 0.4 mm), low-profile package	○*4, 5	Low-profile mini-flat 4-pin	50	3.75	80	50	5	5	4	2	100	2
	PC3H2J00000F		High resistance to noise*1	○	Mini-flat 4-pin	50	2.5	80	20	1	5	4	2	100	2
	PC3H7J00000F		Standard	○		50	2.5	80	20	1	5	4	2	100	2
	PC3H71xNIP0F		High resistance to noise*1, low input current	○		10	2.5	80	100	0.5	5	4	2	100	2
	PC3H3J00000F		AC input response, high resistance to noise*1	○		±50	2.5	80	20	±1	5	4	2	100	2
	PC3H4J00000F		AC input response	○*2		±50	2.5	80	20	±1	5	4	2	100	2
	PC3H41xNIP0F		AC input response, high resistance to noise*1, low input current	○		±10	2.5	80	50	±0.5	5	4	2	100	2
	PC4H510NIP0F		High collector-emitter voltage	○		50	2.5	350	40	5	5	4	2	100	2
Darlington photo-transistor output	PC3H5J00000F		High sensitivity	○	Mini-flat 4-pin	50	2.5	35	600	1	2	60	2	100	2
	PC3H510NIP0F		High sensitivity, low input current	○		10	2.5	35	600	0.5	2	60	2	100	2

*1 CMR: MIN.10 kV/µs
*2 A VDE approved type is optionally available.
*3 Please refer to Specification Sheets for model numbers approved by safety standards.
*4 VDE, CSA approved
*5 In conformance with BSI, SEMKO, DEMKO, NEMKO, and FIMKO

PC3HU7xYIP0B

PC3H2J00000F
(Mini-flat 4-pin)

◆Phototransistor Output Type
<DIP type (4-pin)>

○: Approved, △: Under application

(Ta = 25°C)

Output type	Model No.	Internal connection diagram	Features	Approved by safety standards*8			Package	Absolute maximum ratings			Electro-optical characteristics			
				UL	VDE *2	Others *3		Forward current I_F (mA)	Isolation voltage (AC) Viso (rms) (kV)	Collector-emitter voltage V_{CEO} (V)	Current transfer ratio CTR (%) MIN.	Current transfer ratio I_F (mA)	Response time tr (μs) TYP.	Response time R_L (Ω)
Single phototransistor output	PC123XNNSZ0F*1, *5, *6, *7		High isolation voltage, reinforced insulation	○	○	○	4-pin DIP	50	5.0	70	50	5	4	100
	PC1231xNSZ0X*1		High isolation voltage, reinforced insulation, low input current, high resistance to noise*4	○	○	○		10	5.0	70	50	0.5	4	100
	PC817XNNSZ0F*5, *6, *7		High isolation voltage	○	○	–		50	5.0	80	50	5	4	100
	PC8171xNSZ0X*5, *6		High isolation voltage, low input current, high resistance to noise*4	○	–	–		10	5.0	80	100	0.5	4	100
	PC851XNNSZ0F*5, *6		High isolation voltage, high collector-emitter voltage	○	–	–		50	5.0	350	40	5	4	100
	PC81100NSZ0X	Schottky barrier diode	Built-in schottky barrier diode, toff: 35μs TYP. (In saturation, R_L = 100kΩ)	○	–	–		50	5.0	70	50	5	ton: TYP. 9	100
Darlington phototransistor output	PC815XNNSZ0F*5, *6		High isolation voltage, high sensitivity	○	–	–		50	5.0	35	600	1	60	100
	PC81510NSZ0X		High isolation voltage, high sensitivity, low input current	○	–	–		10	5.0	35	600	0.5	60	100
	PC852XNNSZ0F*5, *6		High isolation voltage, high collector-emitter voltage	○	○	–		50	5.0	350	1 000	1	100	100
	PC853XNNSZ0F*5, *6		High isolation voltage, high collector-emitter voltage	○	○	–		50	5.0	350	1 000	1	100	100

*1 Wide lead spacing type is also available. Creepage distance: 6.4 mm or more, wide lead spacing type: 8 mm or more.
*2 Optionally available.
*3 BSI, SEMKO, DEMKO, NEMKO, FIMKO, CSA
*4 CMR: 10 kV/μs MIN.
*5 Lead forming type is also available for surface mounting.
*6 Taped package of lead forming type for surface mounting is also available.
*7 Wide lead spacing type is also available. Compatible with wide lead spacing type lead-forming models for surface-mount use. Also compatible with taped packages for wide lead spacing type lead-forming models for surface-mount use.
*8 Please refer to Specification Sheets for model numbers approved by safety standards.

PC817XNNSZ0F
(4-pin DIP)

◆Phototransistor Output Type
<DIP type (6-pin)>

○: Approved, △: Under application

(Ta = 25°C)

Output type	Model No.	Internal connection diagram	Features	Approved by safety standards*2		Package	Absolute maximum ratings			Electro-optical characteristics			
										Current transfer ratio		Response time	
				UL	VDE*1		Forward current I_F (mA)	Isolation voltage (AC) Viso (rms) (kV)	Collector-emitter voltage V_{CEO} (V)	CTR (%) MIN.	I_F (mA)	tr (μs) TYP.	R_L (Ω)
Single phototransistor output	PC714V0NSZXF		High isolation voltage	○	○	6-pin DIP	50	5.0	80	50	5	4	100
	PC724V0NSZXF		High isolation voltage, large input current	○	–		150	5.0	35	20	100	4	100
	PC713V0NSZXF		High isolation voltage, with base terminal	○	○		50	5.0	80	50	5	4	100
Darlington phototransistor output	PC715V0NSZXF		High isolation voltage, high sensitivity	○	○		50	5.0	35	600	1	60	100
	PC725V0NSZXF		High isolation voltage, high sensitivity, high collector-emitter voltage, high power	○	○		50	5.0	300	1 000	1	100	100

*1 Optionally available.
*2 Please refer to Specification Sheets for model numbers approved by safety standards.

PC713V0NSZXF
(6-pin DIP)

◆OPIC Output

("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

<Compact, SMT type> (1-1)

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*2		Package	Absolute maximum ratings		Electro-optical characteristics*1						
								Low level output voltage				Threshold input current		
			UL	VDE*3		Forward current I_F (mA)	Isolation voltage (AC) Viso (rms) (kV)	V_{OL} (V) MAX.	Ta (°C)	I_{OL} (mA)	I_F (mA)	I_{FHL} (mA) MAX.	I_{FLH} (mA) MAX.	R_L (Ω)
PC400J00000F		Digital output, normal-off operation	○	–	Mini-flat 5-pin	50	3.75	0.4	0 to +70	16	4	2.0	–	280
PC401J00000F		Digital output, normal-on operation	○	–		50	3.75	0.4	0 to +70	16	0	–	2.0	280
PC456L0NIP0F		Built-in preamplifier, high speed transmission (2 Mb/s), for flow soldering	○	○		25	3.75	0.6	–40 to +85	4.4	10	5.0	–	20 k
PC410L0NIP0F		High speed (10 Mb/s), High CMR (10 kV/μs), For flow soldering	○	○		20	3.75	0.6	–40 to +85	13	5	5.0	–	350
PC410S0NIP0F		High speed (10 Mb/s), high CMR (10 kV/μs), for flow soldering, Solder heat resistance: 270°C	○	○	SOP 8-pin	20	3.75	0.6	–40 to +85	13	5	5.0	–	350
PC4D10SNIP0F		High speed (10 Mb/s), for flow soldering, Solder heat resistance: 270°C 2ch output	○	–	SOP 8-pin	20	3.75	0.6	–40 to +85	13	5	5.0	–	–

A: Rated voltage circuit
*1 Each item is measured at Vcc=5V. (PC400, PC401)
*2 Please refer to Specification Sheets for model numbers approved by safety standards.
*3 Optionally available.

<Compact, SMT type> (1-2)

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*1		Package	Absolute maximum ratings		Electro-optical characteristics							
								Current transfer ratio				Propagation delay time			
			UL	VDE*2		Forward current I_F (mA)	Isolation voltage (AC) Viso (rms) (kV)	CTR (%) MIN.	I_F (mA)	V_O (V)	V_{CC} (V)	t_{PHL} (μs) TYP.	t_{PLH} (μs) TYP.	R_L (Ω)	I_F (mA)
PC457L0NIP0F		High speed (1 Mb/s), high CMR (15 kV/μs), for flow soldering	○	○	Mini-flat 5-pin	25	3.75	19	16	0.4	4.5	0.2	0.6	1 900	16
PC457S0NIP0F		High speed (1 Mb/s), high CMR (15 kV/μs), for flow soldering, Solder heat resistance: 270°C	○	○	SOP 8-pin	25	3.75	19	16	0.4	4.5	0.2	0.6	1 900	16

*1 Please refer to Specification Sheets for model numbers approved by safety standards.
*2 Optionally available.


PC400J00000F
(Mini-flat 5-pin)


PC410S0NIP0F
(SOP 8-pin)

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◆OPIC Output ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

<DIP type, digital output>

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*5		Package	Absolute maximum ratings		Electro-optical characteristics*1						
			UL	VDE *4		Forward current I_F (mA)	Isolation voltage (AC) Viso (rms) (kV)	Low level output voltage				Threshold input current		
								V_{OL} (V) MAX.	Ta (°C)	I_{OL} (mA)	I_F (mA)	I_{FHL} (mA) MAX.	I_{FLH} (mA) MAX.	R_L (Ω)
PC900V0NSZXF*2, *3		Digital output, normal-off operation	○	○	6-pin DIP	50	5.0	0.4	0 to +70	16	4	2.0	–	280
PC901V0NSZXF*2, *3		Digital output, normal-on operation	○	○		50	5.0	0.4	0 to +70	16	0	–	2.0	280

A: Rated voltage circuit
*1 Each item is measured at Vcc=5V.
*2 Lead forming type is also available for surface mounting.
*3 Taped package of lead forming type for surface mounting is also available.
*4 Optionally available.
*5 Please refer to Specification Sheets for model numbers approved by safety standards.

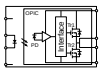
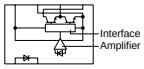
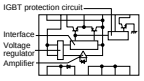
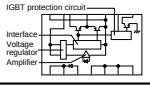
PC90xV0NSZXF series
(6-pin DIP)

◆OPIC Output ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

<DIP type, Gate drive type>

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*3		Package	Absolute maximum ratings			Electro-optical characteristics					
									Propagation delay time					
			UL	VDE *2		Forward current I_F (mA)	Isolation voltage (AC) Viso (rms) (kV)	Output current I_{O1} (A)	t_{PHL} (μs) TYP.	t_{PLH} (μs) TYP.	V_{CC} (V)	I_F (mA)	R_{L1} (Ω)	R_{L2} (Ω)
PC925LxNSZ0F*1		• Built-in drive circuit directly connectable to MOS-FET and IGBT • Peak output current: 2.5 A • Low dissipation current (Icc = TYP. 2.5 mA) • High resistance to noise (CMR: MIN. 15 kV/μs)	○	○	8-pin DIP	25	5.0	2.5	MAX. 0.5	MAX. 0.5	15 to 30	7 to 16	R_G = 10	–
PC942J00000F		For controlling inverter-controlled air-conditioner	○	○		25	5.0	0.5	2.0	2.0	6	5	5	10
PC928J00000F		For driving inverter IGBT, built-in short protection circuit	○	○	14-pin SMT (Half pitch lead)	25	4.0	0.1	1.0	1.0	24	10	R_G = 47	–
PC929J00000F		For driving inverter IGBT, high speed, built-in short protection circuit	○	○		20	4.0	0.1	0.3	0.3	24	5	R_G = 47	–

*1 Lead forming type is also available for surface mounting. Taped package of lead forming type for surface mounting is also available.
*2 A VDE approved type is optionally available.
*3 Please refer to Specification Sheets for model numbers approved by safety standards.

PC925LENSZ0F, PC942J00000F
(8-pin DIP)

PC928J00000F
(PC929J00000F)

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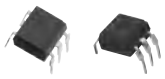
■ Phototriac Coupler Lineup

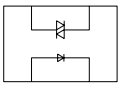
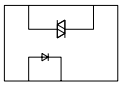
Package	Applied voltage	ON-state current (rms)	Features		Model No.	Page
Mini-flat (SMD)	AC 200 V lines (V_{DRM} = 600V)	0.05 A	General purpose		S2S3000F*4 / S2S5A00F*4	60
				Built-in zero-cross circuit	S2S4000F*4	61
DIP type	AC 200 V lines (V_{DRM} = 600V)	0.1 A	General purpose		PC3ST11NSZAX*4	60
(4-pin)				Built-in zero-cross circuit	PC3ST21NSZBX*3	61
			Reinforced isolation		PC3SH11YFZAX*4 / PC3SH13YFZAX*4	60
				Built-in zero-cross circuit	PC3SH21YFZBX*3	61
DIP type	AC 100 V lines (V_{DRM} = 400V)	0.1 A	General purpose		PC2SD11NTZAF*4	60
(6-pin package, 5th-pin cut)	AC 200 V lines (V_{DRM} = 600V)	0.1 A	General purpose		PC3SD12NTZAF*4 / PC3SD11NTZBF*3 / PC3SD11NTZCF*2 / PC3SD11YTZDF*1 / PC3SD21YTZEF*5	60/61
				Built-in zero-cross circuit	PC3SD21NTZAF*4 / PC3SD21NTZBF*3 / PC3SD21NTZCF*2 / PC3SD21NTZDF*1 / PC3SD23YTZCF*2	61
			Reinforced isolation		PC3SF11YVZAF*4 / PC3SF11YVZBF*3 / PC3SF13YVZBF*3	60
				Built-in zero-cross circuit	PC3SF21YVZAF*4 / PC3SF21YVZBF*3 / PC3SF23YVZSF*3	61
	AC 200 V lines (V_{DRM} = 800V)	0.1 A	General purpose		PC4SD11NTZBF*3 / PC4SD11NTZCF*2	60
				Built-in zero-cross circuit	PC4SD21NTZCF*2 / PC4SD21NTZDF*1	61
			Reinforced isolation		PC4SF11YVZAF*4 / PC4SF11YVZBF*3	60
				Built-in zero-cross circuit	PC4SF21YVZBF*3 / PC4SF21YVZCF*2	61

Minimum trigger current: *1 I_{FT} ≦ 3 mA, *2 I_{FT} ≦ 5 mA, *3 I_{FT} ≦ 7 mA, *4 I_{FT} ≦ 10 mA, *5 I_{FT} ≦ 2 mA

■ Phototriac Couplers

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*4			Package	Absolute maximum ratings			Electro-optical characteristics
			UL, CSA	VDE	Others		ON-state current I_T (rms) (A)	Repetitive peak OFF-state voltage V_{DRM} (V)	Isolation voltage (AC) Viso (rms) (kV)	Min. trigger current I_{FT} (mA) MAX. V_D = 6 V, R_L = 100Ω
S2S3000F		200 V lines, compact	○	○*6	–	Mini-flat 4-pin	0.05	600	3.75	10
S2S5A00F		200 V lines, compact	○	○*6	–					10
PC3ST11NSZAX		200 V lines, compact	○	○*6	–	4-pin DIP	0.1	600	5.0	10
PC3SH11YFZAX		200 V lines, compact, reinforced isolation	○	○	○*2					10
PC3SH13YFZAX		200 V lines, compact, reinforced isolation, high noise resistance	○	○	○*2					10
PC2SD11NTZAF*7		100 V lines	○	–	–	6-pin DIP*1, 3	0.1	400	5.0	10
PC3SD12NTZAF*8		200 V lines	○	○*6	–			600		10
PC3SD11NTZBF		200 V lines	○	○*6	–					7
PC4SD11NTZBF		200 V lines, repetitive peak-OFF-state voltage	○	○*6	–			800		7
PC3SD11NTZCF		200 V lines	○	○*6	–			600		5
PC3SD11YTZDF		200 V lines, low input drive	○	○	–					3
PC4SD11NTZCF		200 V lines, repetitive peak-OFF-state voltage	○	○*6	–			800		5
PC3SF11YVZAF		200 V lines, reinforced isolation	○	○	○*2			600		10
PC3SF11YVZBF		200 V lines, reinforced isolation	○	○	○*2					7
PC3SF13YVZBF		200 V lines, reinforced isolation, high noise resistance	○	○	○*2					7
PC4SF11YVZAF		200 V lines, reinforced isolation, repetitive peak-OFF-state voltage	○	○	○*2			800		10
PC4SF11YVZBF		200 V lines, reinforced isolation, repetitive peak-OFF-state voltage	○	○	○*2					7

For the notes *1 to *9, see next page.

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■ Phototriac Couplers
(Built-in zero-cross circuit type)

○: Approved, △: Under application (Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*4			Package	Absolute maximum ratings			Electro-optical characteristics
			UL, CSA	VDE	Others		ON-state current IT (rms) (A)	Repetitive peak OFF-state VDRM (V)	Isolation voltage (AC) Viso (rms) (kV)	Min. trigger current IFT (mA) MAX. VD = 4 V, RL = 100Ω
S2S4000F	Zero-cross circuit	200 V lines, compact	○	○*6	–	Mini-flat 4-pin	0.05	600	3.75	10*5
PC3ST21NSZBX		200 V lines, compact	○	○*6	–	4-pin DIP	0.1	600	5.0	7
PC3SH21YFZBX		200 V lines, compact, reinforced isolation	○	○	○*2					7
PC3SD21NTZAF		200 V lines, low zero-cross voltage: MAX. 20 V	○	○*6	–	6-pin DIP*1, 3	0.1	600	5.0	10
PC3SD21NTZBF		200 V lines, low zero-cross voltage: MAX. 20 V	○	○*6	–					7
PC3SD21NTZCF*9		200 V lines, low zero-cross voltage: MAX. 20 V	○	○*6	–					5
PC3SD23YTZCF		200 V lines, high pulse/noise resistance (TYP. 2 kV)	○	○	–					5
PC3SD21NTZDF		200 V lines, low zero-cross voltage: MAX. 20 V	○	○*6	–					3
PC3SD21YTZEF	Zero-cross circuit	200 V lines, Low input drive	○	○	–					2
PC4SD21NTZCF		200 V lines, repetitive peak-OFF-state voltage	○	○*6	–			800		5
PC4SD21NTZDF		200 V lines, repetitive peak-OFF-state voltage	○	○*6	–					3
PC3SF21YVZAF		200 V lines, reinforced isolation	○	○	○*2			600		10
PC3SF21YVZBF		200 V lines, reinforced isolation	○	○	○*2					7
PC3SF23YVZSF		200 V lines, reinforced isolation, high pulse/noise resistance (TYP. 2 kV)	○	○	○*2					7
PC4SF21YVZBF		200 V lines, reinforced isolation, repetitive peak-OFF-state voltage	○	○	○*2			800		7
PC4SF21YVZCF		200 V lines, reinforced isolation, repetitive peak-OFF-state voltage	○	○	○*2					5

*1 Lead forming type for surface mounting is also available.
*2 In conformance with BSI, SEMKO, DEMKO, and FIMKO
*3 These are molded pin No. 5.
*4 Please refer to Specification Sheets for model numbers approved by safety standards.
*5 VD = 6 V, RL = 100Ω
*6 Optionally available
*7 An equivalent model (IFT MAX.: 15 mA) with overseas brand compatibility is also available. (PC1S3021NTZF)
*8 An equivalent model with overseas brand compatibility is also available. (PC1S3052NTZF)
*9 An equivalent model with overseas brand compatibility is also available. (PC1S3063NTZF)


S2S3000F
(Mini-flat 4-pin)


PC2SD series
(PC3SD series, PC4SD series)
(6-pin DIP)


PC3SF series
(PC4SF series)
(6-pin DIP)


PC3ST11NSZAX
(PC3ST21NSZBX)
(4-pin DIP)


PC3SH11YFZAX
PC3SH21YFZBX,
PC3SH13YFZAX
(4-pin DIP)

Notice
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

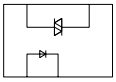
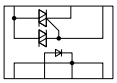
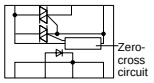
■ Solid State Relay Lineup

Package	Applied voltage	ON-state current (rms)	Features	Model No.	Page
DIP 6-pin	AC 100 V lines	0.06 A	General purpose	PR22MA11NTZF	63
	AC 200 V lines	0.15 A	General purpose	PR31MA11NTZF / PR32MA11NTZF	63
DIP 8-pin	AC 100 V lines	0.3/0.6/0.9 A	General purpose	PR23MF11NSZF / PR26MF series / PR29MF series	63
		0.6/0.9 A	Built-in zero-cross circuit	PR26MF21NSZF / PR29MF21NSZF	63
	AC 200 V lines	0.3/0.6/0.9/1.2 A	General purpose	PR33MF51NSZF / PR36MF series / PR39MF series / PR3BMF51NSKF	63
		0.6/0.9/1.2 A	Built-in zero-cross circuit	PR36MF2 series / PR39MF2 series / PR3BMF21NSZF	63
SIP 4-pin	AC 100 V lines	2/8 A 3 to 16 A	General purpose	S102T01F / S108T01F / S101S05F / S102S01F / S112S01F / S116S01F	64
 Low profile		2/8 A 3 to 16 A	Built-in zero-cross circuit	S102T02F / S108T02F / S101S06F / S102S02F / S116S02F	64
		8 A	Built-in snubber circuit	S102S11F	64
		3/8 A	Built-in snubber circuit/ zero-cross circuit	S101S16F / S102S12F	64
	AC 200 V lines		General purpose	S202T01F / S208T01F / S202S01F / S212S01F / S216S01F	64
		2/8 A 3 to 16 A	Built-in zero-cross circuit	S202T02F / S208T02F / S201S06F / S202S02F / S216S02F	64/65
		8/8 A	Built-in snubber circuit	S202S15F / S202S11F	65
		8 A	Built-in snubber circuit/ zero-cross circuit	S202S12F	65

■ Solid State Relays

<DIP type>

○: Approved, △: Under application (Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*1			Package	Absolute maximum ratings			Electrical characteristics
			UL	CSA	VDE*2		ON-state current IT (rms) (A)	Repetitive peak OFF-state voltage VDRM (V)	Isolation voltage (AC) Viso (rms) (kV)	Min. trigger current IFT (mA) MAX. VD = 6 V, RL = 100Ω
PR31MA11NTZF		200 V lines, compact	○	○	○	6-pin DIP	0.06	600	5.0	10
PR22MA11NTZF		100 V lines, 150 mA model in a small package	○	○	○		0.15	400		10
PR32MA11NTZF		200 V lines, 150 mA model in a small package	○	○	○			600		10
PR23MF11NSZF		100 V lines, compact	○	○	–	8-pin DIP	0.3	400	4.0	10
PR33MF51NSZF		200 V lines, compact	○	○	○			600		10
PR26MF11NSZF		100 V lines, compact	○	○	–		0.6	400		10
PR26MF12NSZF		100 V lines, compact, low input current	○	○	–					5
PR29MF11NSZF		100 V lines, compact	○	○	–		0.9			10
PR29MF12NSZF		100 V lines, compact, low input current	○	○	–					5
PR36MF51NSZF		200 V lines, compact	○	○	○		0.6	600		10
PR36MF12NSZF		200 V lines, compact, low input current	○	○	○					5
PR39MF12NSZF		200 V lines, compact, low input current	○	○	○		0.9			5
PR39MF51NSZF		200 V lines, compact	○	○	○					10
PR3BMF51NSKF		200 V lines, compact	○	○	○		1.2			10
PR26MF21NSZF		100 V lines, compact (built-in zero-cross circuit)	○	○	–		0.6	400		10
PR29MF21NSZF		100 V lines, compact (built-in zero-cross circuit)	○	○	–		0.9			10
PR36MF22NSZF		200 V lines, compact (built-in zero-cross circuit), low input current	○	○	○		0.6	600		5
PR39MF22NSZF		200 V lines, compact (built-in zero-cross circuit), low input current	○	○	○		0.9			5
PR36MF21NSZF		200 V lines, compact (built-in zero-cross circuit)	○	○	○		0.6			10
PR39MF21NSZF		200 V lines, compact (built-in zero-cross circuit)	○	○	○		0.9			10
PR3BMF21NSZF		200 V lines, compact (built-in zero-cross circuit)	○	○	○		1.2			10

*1 Please refer to Specification Sheets for model numbers approved by safety standards.
*2 Optionally available.

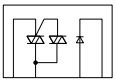
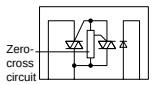
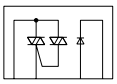
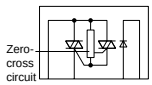
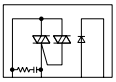
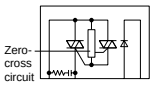
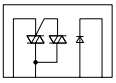
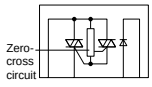
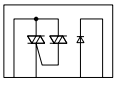

PR22MA11NTZF
(6-pin DIP)


PR26MF21NSZF
(8-pin DIP)

<SIP type> (1)

○: Approved, △: Under application

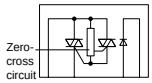
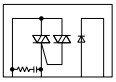
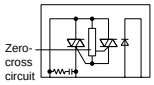
(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*6		Package	Absolute maximum ratings			Electrical characteristics		
			UL	CSA		ON-state current I_T (rms) (A)	Repetitive peak OFF-state voltage V_{DRM}(V)	Isolation voltage (AC) Viso (rms) (kV)	Min. trigger current I_{FT} (mA) MAX.	V_D (V)	R_L (Ω)
S102T01F		100 V lines, low profile	○	○	Low profile 4-pin SIP	2	400	3.0	8	12	30
S108T01F		100 V lines, low profile	–	–		8*2			8	12	30
S102T02F		100 V lines, low profile (built-in zero-cross circuit)	○	○		2			8	12	30
S108T02F		100 V lines, low profile (built-in zero-cross circuit)	–	–		8*2			8	12	30
S101S05F		100 V lines	○	○	4-pin SIP	3*3			15	12	30
S102S01F		100 V lines	○	○		8*2		4.0	8	12	30
S112S01F		100 V lines	○	○		12*4			8	12	30
S116S01F		100 V lines	○	○		16*5			8	12	30
S101S06F		100 V lines (built-in zero-cross circuit)	○	○		3*3		3.0	15	6	30
S102S02F		100 V lines (built-in zero-cross circuit)	○	○		8*2		4.0	8	6	30
S116S02F		100 V lines (built-in zero-cross circuit)	○	○		16*5			8	6	30
S102S11F		100 V lines (built-in snubber circuit)	○	○		8*1			8	12	30
S101S16F		100 V lines (built-in snubber circuit, built-in zero-cross circuit)	○	○		3*3		3.0	15	6	30
S102S12F		100 V lines (built-in snubber circuit, built-in zero-cross circuit)	○	○		8*1		4.0	8	6	30
S202T01F		200 V lines, low profile	○	○	Low profile 4-pin SIP	2	600	3.0	8	12	30
S208T01F		200 V lines, low profile	–	–		8*2			8	12	30
S202T02F		200 V lines, low profile (built-in zero-cross circuit)	○	○		2			8	12	30
S208T02F		200 V lines, low profile (built-in zero-cross circuit)	–	–		8*2			8	12	30
S202S01F		200 V lines	○	○	4-pin SIP	8*2		4.0	8	12	30
S212S01F		200 V lines	–	–		12*4			8	12	30
S216S01F		200 V lines	–	–		16*5			8	12	30

For the notes *1 to *6, see next page.

<SIP type> (2)

○: Approved, △: Under application (Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*6		Package	Absolute maximum ratings			Electrical characteristics		
			UL	CSA		ON-state current I_T (rms) (A)	Repetitive peak OFF-state voltage V_{DRM}(V)	Isolation voltage (AC) Viso (rms) (kV)	Min. trigger current I_{FT} (mA) MAX.	V_D (V)	R_L (Ω)
S201S06F		200 V lines (built-in zero-cross circuit)	○	○	4-pin SIP	3*3	600	3.0	15	6	30
S202S02F		200 V lines (built-in zero-cross circuit)	○	○		8*2		4.0	8	6	30
S216S02F		200 V lines (built-in zero-cross circuit)	–	–		16*5			8	6	30
S202S15F		200 V lines (built-in snubber circuit)	–	–		8*2		3.0	15	12	30
S202S11F		200 V lines (built-in snubber circuit)	○	○		8*1		4.0	8	12	30
S202S12F		200 V lines (built-in snubber circuit, built-in zero-cross circuit)	○	○		8*1			8	6	30

*1 Tc ≦ 88°C *2 Tc ≦ 80°C *3 Tc ≦ 100°C *4 Tc ≦ 70°C *5 Tc ≦ 60°C
*6 Please refer to Specification Sheets for model numbers approved by safety standards.

S102T01F series
(Low profile 4-pin SIP)

S102S02F series
(4-pin SIP)

RoHS Pb FREE

■ Photointerrupter Lineup

<Transmissive type>

Output type	Package type	Outline	Mounting method	Model No. (series)	Page
Single phototransistor	Compact	High resolution	PWB mounting type/ Soldering reflow	GP1S296HCPSF/GP1S092HCPIF/ GP1S09xHCZ0F/GP1S19xHCZ0F/ GP1S19xHCxSF	67
High response speed	Case type	High resolution	PWB mounting type, etc.	GP1S5x series	68
		Horizontal slit, High resolution	PWB mounting type	GP1S59J0000F	68
	With connector	General purpose	Snap-in	GP1S173LCS2F/GP1S74PJ000F/ GP1S273LCS1F	68
Darlington phototransistor	Case type	General purpose	PWB mounting type, etc.	GP1L5x series	69
High sensitivity		Wide gap	PWB mounting type	GP1L57J0000F	69
Digital output	Compact	High voltage	PWB mounting type	GP1A98HCZ0F	69
(OPIC output)	Case type	High resolution	With screw hole/ PWB mounting type	GP1A5x series	70
		Wide gap	PWB mounting type	GP1A57HRJ00F	70
	With connector	General purpose	Screw mounting type/Snap-in	GP1A173LCS2F/GP1A273LCS1F/ GP1A7x series/GP1A07x series	71

<Reflective type>

Output type	Package type	Outline	Mounting method	Model No. (series)	Page
Single phototransistor	Leadless	Long focal distance	Surface-mount type	GP2S700HCP	71
High response speed	Compact, thin (leadless)	General purpose	Surface-mount type	GP2S60	71
OPIC output	With connector	Light modulation type, Sensitivity adjusted	Screw mounting type/ Compact snap-in/ Inverter light countermeasures	GP2A25 series/GP2A28 series/ GP2A200LCS0F/GP2A231LRSAF/ GP2A240LCS0F/GP2A250LCS0F	72

<Application-specific photointerrupter lineup>

Detection type	Outline (Output type etc.)		Mounting method	Model No. (series)	Page
Transmissive type	Case type With encoder function Digital 2 output (phase A/B)	Resolution: 45 LPI Linear scale slit pitch: 0.56 mm	PWB mounting type	GP1A057SGKLF	73
		Resolution: 150 LPI Linear scale slit pitch: 0.17 mm	PWB mounting type/	GP1A057RBKLF	73
		Resolution: 180 LPI Linear scale slit pitch: 0.14 mm	Screw mounting type	GP1A058SCK0F	73
		Resolution: 300 LPI Linear scale slit pitch: 0.0847 mm	PWB mounting type	GP1A054RDKLF	73
	Case type With encoder function Digital 2 output (Multiplying output)	Resolution for reading: 180 LPI Pitch: 0.14 mm Output resolution: 360 LPI	PWB mounting type	GP1A101C2KSF	73
	For amusement use		Screw mounting	GP1A204HCS0	73
Reflective type	Injection For prism system (Single phototransistor)		Screw mounting	GP2S29SVJ00F	73
	For amusement use (Pachinko ball sensor)		–	GP2A224P0KA	74

RoHS Pb FREE

■ Photointerrupters

<Transmissive type>

◆Single phototransistor output

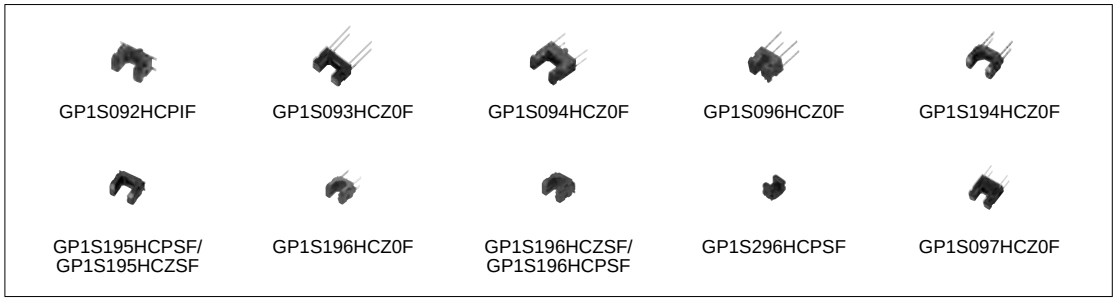
<Compact type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	I_F (mA)	V_{CE} (V)	tr (μs) TYP.	I_C (mA)	R_L (kΩ)	V_{CE} (V)
GP1S092HCPIF		Wide gap, for soldering reflow, surface mount compatible, with positioning boss (4.5 × 2.6 × 2.9 [height] mm)	2.0	0.3	2.0	5	5	50	0.1	1	5
GP1S093HCZ0F		Wide gap (4.5 × 2.6 × 2.9 [height] mm)	2.0	0.3	2.0	5	5	50	0.1	1	5
GP1S094HCZ0F		Wide gap, with positioning pin, (5.5 × 2.6 × 4.8 [height] mm)	3.0	0.3	0.8	5	5	50	0.1	1	5
GP1S096HCZ0F		Narrow gap (3.5 × 2.6 × 2.9 [height] mm)	1.0	0.3	2.0	5	5	50	0.1	1	5
GP1S194HCZ0F		Compact, wide gap, size: 3.6 × 2.0 × 2.7 (height) mm	1.7	0.3	3.0	5	5	50	0.1	1	5
GP1S195HCZSF GP1S195HCPSF		Compact, wide gap, surface mount compatible, size: 3.4 × 2.0 × 2.7 (height) mm	1.5	0.3	3.0	5	5	50	0.1	1	5
GP1S196HCZ0F		Compact, Low profile (3.1 × 2.0 × 2.7 [height] mm)	1.1	0.3	2.0	5	5	50	0.1	1	5
GP1S196HCZSF GP1S196HCPSF		Surface mount, for soldering reflow, compact, low profile (3.1 × 2.0 × 2.7 [height] mm)	1.1	0.3	2.0	5	5	50	0.1	1	5
GP1S296HCPSF		Surface mount, for soldering reflow, compact, Low profile (2.5 × 1.8 × 1.9 [height] mm)	1.0	0.2	3.0	5	5	50	0.1	1	5
GP1S097HCZ0F		High resolution, wide gap, with mounting hole (4.5 × 2.6 × 4.5 [height] mm)	2.0	0.3	2.0	5	5	50	0.1	1	5

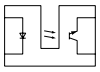
✳ Topr: –25 to +85 °C

✳✳ GP1SxxxHCZxF: Sleeve package, GP1SxxxHCPxF: Taped package



<Case type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	I_F (mA)	V_{CE} (V)	tr (µs) TYP.	I_C (mA)	R_L (Ω)	V_{CE} (V)
GP1S50J0000F		High resolution, both-side mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S51VJ000F*1		High resolution, side mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S52VJ000F*1		High resolution, PWB mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S53VJ000F		High resolution, PWB mounting type	5.0	0.5	2.5	20	5	3	2	100	2
GP1S54J0000F		High resolution, with positioning pin, PWB mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S56TJ000F		High resolution, with positioning pin, PWB mounting type	2.0	0.15	2.0	20	5	38	0.5	1 000	2
GP1S58VJ000F		High resolution, with positioning pin, PWB mounting type	5.0	0.5	2.5	20	5	3	2	100	2
GP1S59J0000F		High resolution, horizontal slit, with positioning pin, PWB mounting type	4.2	0.5	2.5	20	5	3	2	100	2

※ Topr: –25 to +85 °C
*1 Highly reliable types: GP1SQ51VJ00F, GP1SQ52J000F, and GP1SQ53VJ00F are also available.


GP1S50J0000F


GP1S51VJ000F


GP1S52VJ000F


GP1S53VJ000F


GP1S54J0000F


GP1S56TJ000F


GP1S58VJ000F


GP1S59J0000F

<With connector>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	I_F (mA)	V_{CE} (V)	tr (µs) TYP.	I_C (mA)	R_L (Ω)	V_{CE} (V)
GP1S74PJ000F		Snap-in mounting type with connector Applicable to 3 kinds of thickness of mounting boards	5.0	0.5	2.5	20	5	3	2	100	2
GP1S173LCS2F		Snap-in mounting integrated connector type Applicable to 3 kinds of thickness of mounting boards	5.0	0.5	2.5	20	5	3	2	100	2
GP1S273LCS1F		Snap-in mounting integrated connector type Applicable to 3 kinds of thickness of mounting boards Compact (Compatible with 1.5 mm pitch connector)	5.0	0.7	2.5	20	5	3	2	100	2

※ Topr: –25 to +85 °C, –30 to +95 °C (GP1S173LCS2F, GP1S273LCS1F)


GP1S74PJ000F


GP1S173LCS2F


GP1S273LCS1F

◆Darlington phototransistor output

<Case type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	I_F (mA)	V_{CE} (V)	tr (µs) TYP.	I_C (mA)	R_L (Ω)	V_{CE} (V)
GP1L50J0000F		High sensitivity, both-side mounting type	3.0	0.5	50	1	2	80	2	100	2
GP1L51J0000F		High sensitivity, side mounting type	3.0	0.5	50	1	2	80	2	100	2
GP1L52VJ000F		High sensitivity, PWB mounting type	3.0	0.5	50	1	2	80	2	100	2
GP1L53VJ000F		High sensitivity, PWB mounting type	5.0	0.5	30	1	2	80	2	100	2
GP1L57J0000F		High sensitivity, wide gap, PWB mounting type	10.0	1.8	70	1	2	130	2	100	2

✻ Topr: –25 to +85 °C


GP1L50J0000F


GP1L51J0000F


GP1L52VJ000F


GP1L53VJ000F


GP1L57J0000F

◆OPIC type

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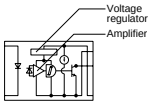
<Compact type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics							
					Threshold input current			Propagation delay time				
					I_{FLH} (mA) MAX.	I_{FHL} (mA) MAX.	V_{CC} (V)	t_{PLH} (µs) TYP.	t_{PHL} (µs) TYP.	I_F (mA)	R_L (kΩ)	V_{CC} (V)
GP1A98HCZ0F		Compact, PWB mounting	3.2	0.5	8	–	3.3 to 24	2.0	10.0	10	3.9 to 20	3.3 to 24

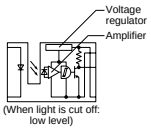
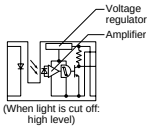
✻ Topr = –25 to +85°C


GP1A98HCZ0F

RoHS Pb FREE

<Case type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics							
					Threshold input current			Propagation delay time				
					I_{FLH} (mA) MAX.	I_{FHL} (mA) MAX.	V_{CC} (V)	t_{PLH} (µs) TYP.	t_{PHL} (µs) TYP.	I_F (mA)	R_L (Ω)	V_{CC} (V)
GP1A50HRJ00F		Both-side mounting, with screw hole	3.0	0.5	5	–	5	3	5	5	280	5
GP1A51HRJ00F		Side mounting, with screw hole	3.0	0.5	5	–	5	3	5	5	280	5
GP1A52HRJ00F		PWB mounting type	3.0	0.5	5	–	5	3	5	5	280	5
GP1A53HRJ00F		PWB mounting type	5.0	0.5	8	–	5	3	5	8	280	5
GP1A57HRJ00F		PWB mounting type, with positioning pin	10.0	1.8	7	–	5	3	5	7	280	5
GP1A58HRJ00F		PWB mounting type, with positioning pin	5.0	0.5	8	–	5	3	5	8	280	5
GP1A52LRJ00F		PWB mounting type	3.0	0.5	–	5	5	5	3	5	280	5

✻ Topr = –25 to +85°C

GP1A50HRJ00F

GP1A51HRJ00F

GP1A52LRJ00F
(GP1A52HRJ00F)

GP1A53HRJ00F
{ GP1A58HRJ00F with positioning pin }

GP1A57HRJ00F

☆New product

RoHS Pb FREE

◆OPIC type

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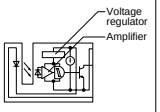
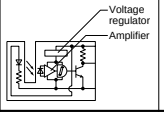
<With 3-pin connector terminal>

(Ta = 25°C)

Model No.	Internal connection diagram	Features		Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics					
						Supply voltage V_{CC} (V)		Low level output voltage			
						MIN.	MAX.	V_{OL} (V) MAX.	Light cut-off	I_{OL} (mA)	V_{CC} (V)
GP1A173LCS2F		with 3-pin connector	Snap-in mounting integrated connector type*1	5.0	0.5	4.5	5.5	0.35	No	4	5
☆GP1A273LCS1F			Integrated connector, compatible with 1.5 mm pitch connector, snap-in mounting type*1	5.0	0.7	4.5	5.5	0.35	No	4	5
GP1A73AJ000F			Compact, snap-in mounting type*1	5.0	0.5	4.5	5.5	0.35	No	4	5
GP1A073LCS			Compact, snap-in mounting type*1, low voltage operation	5.0	0.5	2.7	5.5	0.35	No	4	3
GP1A75EJ000F			Either-side mounting type Screw mounting type	5.0	0.5	4.5	5.5	0.35	Yes	16	5

※ Topr: –20 to +75°C, –30 to +95 °C (GP1A173LCS2F)
*1 Applicable to 3 kinds of thickness of mounting boards.

GP1A73AJ000F, GP1A073LCS

GP1A173LCS2F

GP1A273LCS1F

GP1A75EJ000F

■ Photointerrupters

<Reflective type>

◆Single phototransistor output

<Compact>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Standard detecting distance (mm)	Electro-optical characteristics						
				Current transfer ratio			Response time			
				CTR (%) MIN.	I_F (mA)	V_{CE} (V)	tr (μs) TYP.	I_C (mA)	R_L (kΩ)	V_{CE} (V)
GP2S700HCP		Compact (4 × 3 × 2 [height] mm), long focal distance, surface mounting leadless type	3	1.5	4	2	20	0.1	1	2
GP2S60		Thin (3.2 × 1.7 × 1.1 [height] mm), surface mounting leadless type	0.5	1.0	4	2	20	0.1	1	2

※ Topr: –25 to +85°C

GP2S700HCP

GP2S60

◆OPIC output

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<With 3-pin connector terminal>

(Ta = 25°C)

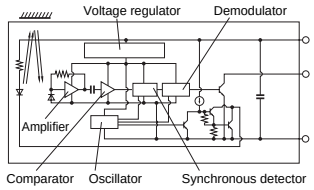
Model No.	Internal connection diagram	Features	Optimum detecting distance (mm)	Electro-optical characteristics					
				Supply voltage V_{CC} (V)		Dissipation current		Low level output voltage	
				MIN.	MAX.	I_{CC} (mA) MAX.	V_{CC} (V)	V_{OL} (V) MAX.	V_{CC} (V)
GP2A200LCS0F	(Following diagram [A])	Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted	5 to 15	4.75	5.25	30*1	5	0.4	5
GP2A240LCS0F		Improved light-resistance characteristic for inverter lighting, light modulation type, with connector, sensitivity adjusted	5 to 15	4.75	5.25	30*1	5	0.4	5
GP2A250LCS0F		Static electricity resistant, improved light-resistance characteristic for inverter lighting, light modulation type, with connector, sensitivity adjusted	2.5 to 12.5	4.75	5.25	30*1	5	0.4	5
GP2A25J0000F		Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted	3 to 7	4.75	5.25	30*1	5	0.4	5
GP2A231LRSAF	(Following diagram [B])	Compact, hook type, multi types of paper detectable, light modulation type, with connector	3 to 7	4.75	5.25	20*1	5	0.4	5
GP2A25NJJ00F	(Following diagram [A])	Multi types of paper detectable, light modulation type, sensitivity adjusted, applicable to inverter fluorescent lamp, built-in visible light cut filter	3 to 7	4.75	5.25	30*1	5	0.4	5
GP2A25DJ000F		Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted	3 to 7	4.75	5.25	30*1	5	0.4	5
GP2A28AJ000F		Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted, hook type	3 to 7	4.75	5.25	30*1	5	0.4	5

※ Topr: –10 to +60°C (GP2A25J0000F, etc.)
–10 to +70°C (GP2A200LCS0F, GP2A240LCS0F, GP2A250LCS0F, GP2A231LRSAF)

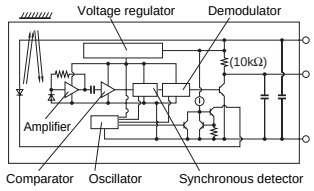
*1 Smoothing value $R_L = \infty$

[Internal connection diagram]

[A]



[B]



GP2A25J0000F
(GP2A25NJJ00F, GP2A200LCS0F, GP2A240LCS0F)

GP2A250LCS0F

GP2A25DJ000F

GP2A231LRSAF

GP2A28AJ000F

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■ Photointerrupters for Specific Applications

◆Transmissive type

<Case type, with encoder function>

(Ta = 25°C)

Model No.	Absolute maximum ratings		Electro-optical characteristics					
	Vcc (V)	Topr (°C)	Operating voltage Vcc (V) TYP.	Output signal	Resolution	Response frequency (kHz) MAX.	Response frequency IF (mA)	Dissipation current (output side) Icc (mA) MAX.
GP1A057RBKLF	6	–10 to +70	3.3	Digital 2 output (Phase A/B)	Linear scale slit pitch 0.17 (mm) (150LPI)	60	20	7
GP1A054RDKLF	6	–10 to +70	3.3		Linear scale slit pitch 0.0847 (mm) (300LPI)	40	20	5.5
GP1A057SGKLF	6	–10 to +70	3.3		Linear scale slit pitch 0.56 (mm) (45LPI)	25	20	5.5
GP1A058SCK0F	6	–10 to +70	3.3		Linear scale slit pitch 0.14 (mm) (180LPI)	40	20	5.5
GP1A101C2KSF	6.5	–10 to +70	3.3	Digital 2 output (Multiplying output)	Resolution for reading: 180 LPI (Pitch: 0.14 mm) Output resolution: 360 LPI	120	20	20

* High precision read and low affection of angle error from vibration thanks to the multi-segment PD system.
Duty ratio: 50±15%, phase difference: 90±45°


GP1A054RDKLF

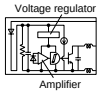

GP1A057RBKLF
(GP1A057SGKLF)


GP1A058SCK0F


GP1A101C2KSF

<For amusement use>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics					
					Operating voltage Vcc (V)		Low level output voltage			
					MIN.	MAX.	VOL (V) MAX.	Light cut-off	IOL (mA)	VCC (V)
GP1A204HCS0		Connector with lock, screw mounting type, high resistant to noise	4.0	0.5	10.8	24	0.4	Yes	5	10.8 to 24


GP1A204HCS0

◆Reflective type

<Case type, phototransistor output>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Electro-optical characteristics						
			Peak photocurrent			Response time			
			ICP (mA)	IF (mA)	VCE (V)	tr (µs) TYP.	IC (mA)	RL (kΩ)	VCE (V)
GP2S29SVJ00F		Long focal distance (with prism system*1), compact, screw mounting type	0.4 to 3.0*1	20	5	38	0.5	1	2

❊ Topr: –25 to +85°C *1 Space between prism and sensor is 8 mm.


GP2S29SVJ00F

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☆New product

<For amusement use>

(Ta = 25°C)

Model No.	Features	Electro-optical characteristics		
		Supply voltage Vcc (V)	Dissipation current Icc (mA)	Response frequency f (Hz)
☆GP2A224P0KA	Reflection-type ball detection sensor, connector (2-wire output) with lock, Disconnection/short-circuit detection when combined with ICs*1	7.5 to 24	MAX. 12	MAX. 500

*1 Shared with interface IC for control (IR3N340)

GP2A224P0KA

■ Proximity Sensor

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics				
		V_{CC} (V)	Topr (°C)	Dissipation current Icc (μA) TYP.	Detecting distance Lon (mm) MIN.	Non-detecting distance Loff (mm) MAX.	Maximum acceptable illuminance Ev (lx) MIN.	Peak emission wavelength λp (nm)
☆GP2AP002S00F	Compact size (4.0 × 2.0 × 1.2 t mm) Disparities in detecting distance results are greatly reduced using a built-in circuit for reduction of light-detecting sensitivity disparities Built-in LEDs for simple optical design and I^2C output	3.8	–25 to +85	240	25	150	3 000	940

☆New product

■ Proximity Sensor with Integrated Ambient Light Sensor

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics								
					Proximity sensor portion				Ambient light sensor portion			
											Output current	
		V_{CC} (V)	Topr (°C)	Dissipation current Icc (μA) TYP.	Detecting distance Lon (mm) MIN.	Non-detecting distance Loff (mm) MAX.	Maximum acceptable illuminance Ev (lx) MIN.	Peak emission wavelength λp (nm)	Recommended illuminance range Ev (lx) MIN.	Peak sensitivity wavelength λp (nm)	I_{O1} (μA) TYP.	I_{O2} (μA) MAX.
☆GP2AP002A00F	LED and ambient light sensor combined in a single package (5.6 × 2.1 × 1.2 t mm) Disparities in detecting distance results are greatly reduced using a built-in circuit for reduction of light-detecting sensitivity disparities Built-in LEDs for simple optical design Proximity sensor: I²C output Ambient light sensor: logarithmic current output	3.8	–25 to +85	270	25	150	3 000	940	3 to 55 000	555	30 (at Ev = 1 000 lx)	1 (at Ev = 0 lx)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics							
					Proximity sensor portion			Ambient light sensor portion			
		V_{CC} (V)	Topr (°C)	Dissipation current Icc (μA) TYP.	Detecting distance Lon (mm) MIN.	Non-detecting distance Loff (mm) MAX.	Peak emission wavelength λp (nm)	Recommended illuminance range Ev (lx)	Output resolution (bit)	Peak sensitivity wavelength λp (nm)	ADC conversion time Tint (ms) TYP.
☆GP2AP012A00F	LED and ambient light sensor combined in a single package (4.4 × 2.6 × 1.0 t mm) Built-in LEDs for simple optical design Illuminance output: digital 16-bit output (Minimum detectable illuminance: 0.1 lx) I²C output compatible (proximity sensor, ambient light sensor)	3.8	–40 to +85	45	25	125	940	0.1 to 130 000	16	540	100


GP2AP002S00F


GP2AP002A00F


GP2AP012A00F

Optoelectronics

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☆New product

■ Ambient Light Sensors

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings			Electro-optical characteristics					
			V_{CC} (V)	I_O (mA)	Topr (°C)	Recommended supply voltage V_{CC} (V)	Recommended illuminance range Ev (lx)	Dissipation current Icc (μA) TYP.	Peak sensitivity wavelength λp (nm)	Output current I_{O1} (μA) TYP.	Output current I_{O2} (μA) TYP.
GA1A2S100SS	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Linear current output for illuminance Lead frame (straight) type	Transparent epoxy resin (3 × 4 mm)	7.0	5	–40 to +85	2.7 to 3.6	10 to 10 000	500	555	480 (at Ev = 1 000 lx)	48 (at Ev = 100 lx)
GA1A2S100LY	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Linear current output for illuminance Lead frame (L bend) type		7.0	5	–40 to +85	2.7 to 3.6	10 to 10 000	500	555	480 (at Ev = 1 000 lx)	48 (at Ev = 100 lx)
GA1A1S202WP	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Logarithmic current output for illuminance	Compact SMD (2.0 × 1.6 × 0.6 mm) Leadless	7.0	1	–40 to +85	2.3 to 3.2	3 to 55 000	70	555	20 (at Ev = 100 lx)	30 (at Ev = 1 000 lx)
☆GA1A1S203WP	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Logarithmic current output for illuminance Thin type	Compact SMD (2.0 × 1.6 × 0.42 mm) Leadless	7.0	1	–40 to +85	2.3 to 3.2	3 to 55 000	70	555	20 (at Ev = 100 lx)	30 (at Ev = 1 000 lx)
☆GA1A1S204WP	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Logarithmic current output for illuminance Back-mount-available type	Compact SMD (3.3 × 2.0 × 0.6 mm) Back-mount available, leadless	7.0	1	–40 to +85	2.3 to 3.2	3 to 55 000	70	555	20 (at Ev = 100 lx)	30 (at Ev = 1 000 lx)
GA1A1S100WP	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Linear current output for illuminance	Compact SMD (2.0 × 1.6 × 0.6 mm) Leadless	7.0	10	–40 to +85	2.7 to 3.6	10 to 5 000	1 460	555	1 420 (at Ev = 1 000 lx)	142 (at Ev = 100 lx)

GA1A2S100SS

GA1A2S100LY

GA1A1S202WP
(GA1A1S100WP)

GA1A1S203WP

GA1A1S204WP

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■ OPIC Light Detectors

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(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings				Electro-optical characteristics							
			V_{CC} (V)	P (mW)	I_O (mA)	Topr (°C)	E_{VLH} (lx) MAX.	E_{VHL} (lx) MAX.	V_{CC} (V)	t_{PLH} (µs) TYP.	t_{PHL} (µs) TYP.	V_{CC} (V)	E_V (lx)	R_L (Ω)
IS485E	Built-in schmidt trigger circuit, amplifier and voltage regulator	Transparent epoxy resin with condenser (lens)	–0.5 to +17	175	50	–25 to +85	–	35	5	5	3	5	50	280
IS486E			–0.5 to +17	175	50	–25 to +85	35	–	5	3	5	5	50	280

IS485E
(IS486E)

<Low-voltage operation>

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings			Electro-optical characteristics								
			P (mW)	I_O (mA)	Topr (°C)	Operating supply voltage (V)	E_{VLH} (lx) MAX.	E_{VHL} (lx) MAX.	V_{CC} (V)	t_{PHL} (µs) TYP.	t_{PLH} (µs) TYP.	V_{CC} (V)	E_V (lx)	R_L (Ω)
IS489E	Built-in Schmidt trigger circuit and amplifier	Transparent epoxy resin with condenser (lens)	80	2	–25 to +85	1.4 to 7.0	–	15	3	1.3	8.5	3	125	3 000

IS489E

<Model employing a light modulation system>

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings				Electro-optical characteristics*2						External disturbing light illuminance E_{VDX}(lx) TYP.
			V_{CC} (V)	P (mW)	I_O (mA)	Topr (°C)	V_{OL} (V) MAX.	V_{OH} (V) MIN.	t_{PLH} (µs) TYP.	t_{PHL} (µs) TYP.	V_{CC} (V)	R_L (Ω)	
IS471FE*1, *3	Built-in pulse driver circuit at the emitter side, synchronous detector circuit, amplifier circuit and demodulator circuit	Visible light cut-off epoxy resin	–0.5 to +16	250	50	–25 to +60	0.35	4.97	400	400	5	280	7 000

*1 IS471FE is less susceptible to disturbing effects thanks to the light modulation system
*2 Vcc = 5 V
*3 Straight lead type (IS471FSE) is also available.

IS471FE

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<For laser beam printers (laser beam origin detection)>

(Ta = 25°C)

Model No.	Type	Package	Electro-optical characteristics			
			Recommended supply voltage V_{CC} (V)	V_{OH} (V) MIN.	V_{OL} (V) MAX.	H → L delay time variation Δt_{PHL} (ns) MAX.
GA220T2L1IZ	2-PD, differential type	Transparent epoxy resin 18-pin	4.5 to 5.5	4.9	0.6	±8.5

GA220T2L1IZ

■ Phototransistor Lineup

Package	Output type	Features	Half sensitivity angle	Model No.	
				Standard	Visible light cut-off
Epoxy resin with lens (ø3 mm)	Single phototransistor	General purpose	±20°	PT380	PT380F
	Darlington phototransistor	High sensitivity	±20°	PT381	PT381F
Epoxy resin with lens	Single phototransistor	General purpose/Narrow acceptance	±13°	PT480E00000F	PT480FE0000F
		Compact, thin	±35°	PT4800E0000F	PT4800FE000F / PT4850FE000F
	Darlington phototransistor	High sensitivity/Narrow acceptance	±13°	PT481E00000F	PT481FE0000F
		High sensitivity/Narrow acceptance/Long lead	±13°	—	PT483F1E000F
		High sensitivity/Compact, thin	±35°	PT4810E0000F	PT4810FJE00F
		High sensitivity/Intermediate acceptance	±40°	—	PT491FE0000F
		High sensitivity/Intermediate acceptance/Long lead	±40°	—	PT493FE0000F
Surface mounting leadless type	Single phototransistor	Compact (side view/top view mounting possible)	±15°	PT100MC0MP	PT100MF0MP
	Darlington phototransistor	Compact (side view/top view mounting possible)	±15°	—	PT100MF1MP

■ Phototransistors

Type	Model No.	Package	Absolute maximum ratings			Ic (mA)				I_{CEO}(A)		Δθ (°)	λp (nm)
			V_{CEO} (V)	P_C (mW)	Topr (°C)	MIN.	MAX.	V_{CE} (V)	Ee (mW/cm²)	MAX.	V_{CE} (V)	TYP.	TYP.
Single	PT380*2	ø3 epoxy resin	35	50	–25 to +85	0.16	1.17	5	Ev, 100 lx	1×10^{-7}	20	±20	800
	PT380F*1, 2		35	50	–25 to +85	0.095	0.9	5	Ev, 100 lx	1×10^{-7}	20	±20	860
	PT100MC0MP	Surface mounting leadless type with lens	35	75	–30 to +85	1.7	5.1	5	1	1×10^{-7}	20	±15	900
	PT100MF0MP*1		35	75	–30 to +85	1.15	3.45	5	1	1×10^{-7}	20	±15	910
	PT480E00000F	Epoxy resin with lens	35	75	–25 to +85	0.4	TYP. 1.7	5	1	1×10^{-7}	20	±13	800
	PT480FE0000F*1		35	75	–25 to +85	0.25	TYP. 0.8	5	1	1×10^{-7}	20	±13	860
	PT4800E0000F		35	75	–25 to +85	0.12	TYP. 0.4	5	1	1×10^{-7}	20	±35	800
	PT4800FE000F*1		35	75	–25 to +85	0.08	TYP. 0.25	5	1	1×10^{-7}	20	±35	860
	PT4850FE000F*1		35	75	–25 to +85	0.12	0.56	5	1	1×10^{-7}	20	±35	860
Darlington	PT381*2	ø3 epoxy resin	35	50	–25 to +85	0.12	1.5	10	Ev, 2 lx	1×10^{-6}	10	±20	800
	PT381F*1, 2		35	50	–25 to +85	0.07	1.08	10	Ev, 2 lx	1×10^{-6}	10	±20	860
	PT481E00000F	Epoxy resin with lens	35	75	–25 to +85	1.5	25	2	0.1	1×10^{-6}	10	±13	800
	PT481FE0000F*1		35	75	–25 to +85	0.9	27	2	0.1	1×10^{-6}	10	±13	860
	PT4810E0000F		35	75	–25 to +85	0.45	7.0	2	0.1	1×10^{-6}	10	±35	800
	PT4810FJE00F*1		35	75	–25 to +85	0.27	6.0	2	0.1	1×10^{-6}	10	±35	860
	PT483F1E000F*1		35	75	–25 to +85	1.5	4.0	2	0.1	1×10^{-6}	10	±13	860
	PT491FE0000F*1		35	75	–25 to +85	0.2	0.8	2	Ev, 2 lx	1×10^{-6}	10	±40	860
	PT493FE0000F*1		35	75	–25 to +85	0.2	0.8	2	Ev, 2 lx	1×10^{-6}	10	±40	860
	PT100MF1MP*1	Surface mounting leadless type with lens	35	75	–30 to +85	0.2	1.2	5	0.01	1×10^{-6}	10	±15	860

*1 Visible light cut-off type
*2 Handled by the System Device Division III.

PT100MF0MP
(PT100MF1MP, PT100MC0MP: Transparent resin)

PT380
(PT380F, PT381 PT381F)

PT480E00000F
(PT480FE0000F, PT481E00000F, PT481FE0000F)

PT4800E0000F
(PT4800FE000F, PT4810E0000F, PT4810FJ00F, PT4810FJE00F, PT4850FE000F)

PT483F1E000F

PT491FE0000F

PT493FE0000F

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■ PIN Photodiodes

(Ta = 25°C)

Model No.	Features	Package (Material)	Active area (mm^2)	Topr (°C)	Isc (μA) MIN.	Ev (lx)	Id (A) MAX.	V_R (V)	tr, tf (μs) TYP.	V_R (V)	R_L (kΩ)	λp (nm) TYP.
PD410PI2E00F	PIN type	Visible light cut-off epoxy resin with condenser (lens)	3.31	–25 to +85	2.5	100	1×10^{-8}	10	0.2	10	1	1 000
PD411PI2E00F		Transparent epoxy resin with condenser (lens)	3.31	–25 to +85	5.0	100	1×10^{-8}	10	0.2	10	1	960
PD412PI2E00F		Transparent epoxy resin with condenser (lens)	3.31	–25 to +85	3.5	100	1×10^{-8}	10	0.25	10	1	800
PD413PI2E00F	PIN type IrDA1.0	Visible light cut-off epoxy resin with condenser (lens)	3.31	–25 to +85	MIN. 4.5 (TYP. 5.4)	100	1×10^{-8}	10	0.2	10	1	960
PD100MC0MP	Surface mounting leadless type	Transparent epoxy resin board with lens	–	–30 to +85	0.6	100	1×10^{-8}	10	0.01	15	0.18	820
PD100MF0MP	Surface mounting leadless type	Visible light cut-off epoxy resin board with lens	–	–30 to +85	0.4	100	1×10^{-8}	10	0.01	15	0.18	850

PD410PI2E00F
{PD411PI2E00F: transparent; PD412PI2E00F: transparent, PD413PI2E00F}

PD100MC0MP
(PD100MF0MP: black)

■ Laser Power Monitoring Photodiodes for Optical Disc System

(Ta = 25°C)

Model No.	Features	Package (Material)	Active area (mm)	Topr (°C)	Isc (mA) TYP.	Ev (lx)	Id (A) MAX.	V_R (V)	λp (nm) TYP.
PD101SC0SS1F	High response speed (cut-off frequency: 400 MHz)	Transparent epoxy resin	ø0.8	–25 to +85	450	100	1×10^{-9}	5	820

PD101SC0SS1F

■ Infrared Emitting Diode Lineup

Type	Package	Features	Half intensity angle	Model No.
Single-end lead (Top view type)	Epoxy resin with lens (ø3 mm type)	General purpose	±13°	GL380
		High output type	±13°	GL381
		High speed signal transmission (12 MHz)	±17°	GL382
Single-end lead (Side view type)	Epoxy resin with lens	General purpose/Narrow beam angle	±13°	GL480E00000F
		Compact and thin	±30°	GL4800E0000F
	Flat epoxy resin	Wide beam angle	±90°	GL4100E0000F
Single-end lead (Top view type)	Epoxy resin with lens (ø5 mm type)	Low forward voltage type	±21°	GL560
		Low forward voltage type/Narrow beam angle	±13°	GL561
		High output type	±25°	GL537
		High output type/Narrow beam angle	±13°	GL538
Surface mount type	Epoxy resin with lens/ leadless	Compact/Narrow beam angle	±10°	GL100MN0MP
	(Mountable for Top view/ Side view type)	High output type (Output: radiant flux/ radiant intensity indicated)	±10°/ ±9°	GL100MN1MP / GL100MN3MP
		Compact/Wide beam angle	±80°	GL100MD1MP1

■ Infrared Emitting Diodes

(Ta = 25°C)

Model No.	Package, features	Absolute maximum ratings				Radiant flux Φe (mW)			V_F (V)			Δθ (°)	λp (nm)
		I_F (mA)	V_R (V)	P (mW)	Topr (°C)	MIN.	TYP.	I_F (mA)	TYP.	MAX.	I_F (mA)	TYP.	TYP.
GL380*2	ø3 epoxy resin	60	6	150	–25 to +85	4.5*1	11*1	50	1.3	1.5	50	±13	950
GL381*2		60	6	150	–25 to +85	8.5*1	20*1	50	1.3	1.5	50	±13	950
GL382*2	ø3 epoxy resin, for high speed signal transmission:12 MHz	60	4	–	–25 to +85	6	18	50	1.5	1.7	50	±17	880
GL480E00000F	Epoxy resin with lens	50	6	75	–25 to +85	0.7	–	20	1.2	1.4	20	±13	950
GL4800E0000F		50	6	75	–25 to +85	0.7	1.6	20	1.2	1.4	20	±30	950
GL4100E0000F	Side-view flat type, epoxy resin	50	6	75	–25 to +85	1.0	–	20	1.2	1.4	20	±90	950
GL560*2	ø5 epoxy resin	100	6	150	–25 to +85	5*1	14*1	50	1.25	1.37	50	±21	940
GL561*2		100	6	150	–25 to +85	12*1	25*1	50	1.25	1.37	50	±13	940
GL537*2		100	6	150	–25 to +85	6*1	13*1	50	1.3	1.5	50	±25	950
GL538*2		100	6	150	–25 to +85	15*1	30*1	50	1.3	1.5	50	±13	950
GL100MN0MP	Surface mounting leadless type, epoxy resin board with lens	50	6	75	–30 to +85	1.0	3.0 (MAX.)	20	1.2	1.4	20	±10	940
GL100MN1MP	Surface mounting leadless type, epoxy resin board with lens, high output type	50	6	75	–30 to +85	2.0	6.0 (MAX.)	20	1.2	1.5	20	±10	940
GL100MN3MP	Surface mounting leadless type, epoxy resin board with lens, high output type	50	6	75	–30 to +85	3.0*1	6.0*1	20	1.25	1.5	20	±9	940
GL100MD1MP1	Surface mounting leadless type, epoxy resin board with lens, wide beam angle	50	6	75	–30 to +85	–	6.0 (MAX.)	20	–	1.5	20	±80	940

*1 Radiant intensity mW/sr
*2 Handled by the System Device Division III.

GL380
(GL381, GL382)

GL480E00000F

GL4800E0000F

GL4100E0000F

GL560
(GL561)

GL537
(GL538)

GL100MN0MP
(GL100MN1MP, GL100MN3MP, GL100MD1MP1)

■ Distance Measuring Sensor Lineup

Output	Range of distance measuring	Features	Model No.
1-bit digital output according to distance measuring	4 to 30 cm	1-bit digital output (detected distance: 15/13 cm)	GP2D150AJ00F/GP2Y0D413K0F
	10 to 80 cm	1-bit digital output (detected distance: 24 cm)	GP2Y0D21YK0F
	20 to 150 cm	1-bit digital output (detected distance: 80 cm)	GP2Y0D02YK0F
		Battery drive compatible, compact, 1-bit digital output (detected distance: 5/10 cm)	GP2Y0D805Z0F/GP2Y0D810Z0F
		Wide operating temperature type (–40 to +85°C) (detected distance: 10 cm)	GP2Y0D810Z1F
		Compact, thin 1-bit digital output (detected distance: 10/40 cm)	GP2Y0D310K/GP2Y0D340K
		Battery drive compatible, compact, 1-bit digital output (detected distance: 1.5 cm) Capable of operation at high temperature (–30 to +105°C)	GP2Y5D91S00F
Analog voltage output according to distance measuring	2 to 15 cm	Analog output	GP2Y0A51SK0F
	4 to 30 cm	Analog output	GP2D120XJ00F/GP2Y0A41SK0F
	10 to 80 cm	Analog output	GP2Y0A21YK0F
	10 to 150 cm	Compact (22 × 8 × 7.2 [T] mm), Analog output	GP2Y0A60SZ0F/GP2Y0A60SZLF
	20 to 150 cm	Analog output	GP2Y0A02YK0F
	100 to 550 cm	Analog output	GP2Y0A710K0F

■ Wide Angle Sensor Lineup

Output	Range of distance measuring	Detection angle of view	Model No.
Voltage output according to distance measuring	4 to 30 cm	25° (When using 5 beams)	GP2Y3A001K0F
	20 to 150 cm	25° (When using 5 beams)	GP2Y3A002K0F
	40 to 300 cm	25° (When using 5 beams)	GP2Y3A003K0F

■ Paper Size Sensor (Using Optical Distance Measuring Method) Lineup

Output	Features		Model No.
1-bit output	1-beam (detection height: 60 mm)	Thin type (T: 11.5 mm)	GP2Y2D160K0F
Analog output relative to measuring distance	1-beam (detection height: 80 mm)	Thin type (T: 11.5 mm)	GP2Y2A180K0F
	2-beam (detection height: 80 mm)	Thin type (T: 11.5 mm)	GP2Y2A280K0F

■ High-Precision Displacement Sensor

Output	Range of distance measuring	Features	Model No.
Voltage output according to distance measuring	4.5 to 6.0 mm	Resolution: 50 µm	GP2Y0AH01K0F

■ Dust Sensor Unit Lineup

Output	Features	Model No.
Analog output	Pulse analog output, single-shot detection of house dust, general purpose	GP2Y1010AU0F

■ Smoke Sensor Module (For Fire Alarms) Lineup

Features	Model No.
Built-in microcomputer	GP2Y6001AK0F

■ Color Toner Concentration (Deposition Amount) Sensor Lineup

Output	Features	Model No.
Analog output	Employs diffuse reflection system + mirror reflection system	GP2TC2J0000F
	Employs diffuse reflection system + mirror reflection system	GP2Y40010K0F

■ Distance Measuring Sensors (1)

◆Digital output

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics*1					
		Vcc (V)	Topr (°C)	Detected distance (cm)	Distance measuring range (cm)	V_{OH} (V) MIN.	V_{OL} (V) MAX.	Dissipation current	
								Operating (mA)	Standby (μA)
GP2Y0D805Z0F	Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V)	–0.3 to +7	–10 to +60	5	–	Vcc –0.6	0.6	MAX. 6.5	MAX. 8
GP2Y0D810Z0F	Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V)	–0.3 to +7	–10 to +60	10	–	Vcc –0.6	0.6	MAX. 6.5	MAX. 8
GP2Y0D810Z1F	Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V)	–0.3 to +7	–40 to +85	10	–	Vcc –0.6	0.6	TYP. 5	MAX. 8
GP2Y5D91S00F	Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V), capable of operation at high temperature	–0.3 to +7	–30 to +105	1.5	–	Vcc –0.6	0.6	TYP. 7	–
GP2Y0D310K	Digital voltage output according to the measured distance of GP2Y0D340K	–0.3 to +7	–10 to +60	10	–	Vcc –0.3	0.6	MAX. 35	–
GP2Y0D340K	Compact, thin type (15 x 9.6 x 8.7 mm: sensor part), Light detector, infrared LED and signal processing circuit, digital voltage output according to the measured distance	–0.3 to +7	–10 to +60	40	–	Vcc –0.3	0.6	MAX. 35	–
GP2Y0D21YK0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, digital voltage output	–0.3 to +7	–10 to +60	24	10 to 80	Vcc –0.3	0.6	MAX. 40	–
GP2D150AJ00F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, digital voltage output	–0.3 to +7	–10 to +60	15	4 to 30	Vcc –0.3	0.6	MAX. 50	–
GP2Y0D413K0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, digital voltage output	–0.3 to +7	–10 to +60	13	4 to 30	Vcc –0.3	0.6	–	–
GP2Y0D02YK0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, long distance measuring type (No external control signal required), digital voltage output according to the measured distance	–0.3 to +7	–10 to +60	80	20 to 150	Vcc –0.3	0.6	MAX. 50	–

*1 Vcc = 5 V

※ PSD: Position Sensitive Detector

■ Distance Measuring Sensors (2)

◆Analog output

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics*1			
		Vcc (V)	Topr (°C)	Distance measuring range (cm)	VOH (V) MIN.	VOL (V) MAX.	Dissipation current Operating (mA)
GP2Y0A21YK0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, linear voltage output	–0.3 to +7	–10 to +60	10 to 80	VO (TYP.) = 0.4 V (at L = 80 cm), ΔVO (TYP.) = 1.9 V (at L: 80 cm → 10 cm)		MAX. 40
GP2D120XJ00F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, linear voltage output	–0.3 to +7	–10 to +60	4 to 30	VO (TYP.) = 0.4 V (at L = 30 cm), ΔVO (TYP.) = 2.25 V (at L = 30 cm → 4 cm)		MAX. 50
GP2Y0A41SK0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, short measuring cycle (16.5 ms)	–0.3 to +7	–10 to +60	4 to 30	VO (TYP.) = 0.4 V (at L = 30 cm), ΔVO (TYP.) = 2.25 V (at L = 30 cm → 4 cm)		MAX. 22
GP2Y0A51SK0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, short measuring cycle (16.5 ms)	–0.3 to +7	–10 to +60	2 to 15	VO (TYP.) = 0.4 V (at L = 15 cm), ΔVO (TYP.) = 2.25 V (at L = 15 cm → 2 cm)		TYP. 12
GP2Y0A60SZ0F/ GP2Y0A60SZLF *2	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, compact type (22 x 8 x 7.2 mm), long distance measuring type (No external control signal required)	–0.3 to +5.5	–10 to +60	10 to 150	VO (TYP.) = 0.65 V *3 (at L = 150 cm), ΔVO (TYP.) = 3.0 V (at L = 150 cm → 20 cm)		MAX. 50
GP2Y0A02YK0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, long distance measuring type (No external control signal required)	–0.3 to +7	–10 to +60	20 to 150	VO (TYP.) = 0.4 V (at L = 150 cm), ΔVO (TYP.) = 2.05 V (at L = 150 cm → 20 cm)		MAX. 50
GP2Y0A710K0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, long distance measuring type (No external control signal required)	–0.3 to +7	–10 to +60	100 to 550	VO (TYP.) = 2.5 V (at L = 100 cm), ΔVO (TYP.) = 0.7 V (at L = 100 cm → 200 cm)		TYP. 30

*1 Vcc = 5 V
*2 GP2Y0A60SZ0F: Surface mount type
GP2Y0A60SZLF: Board insertion type
*3 When Vcc = 3 V: Vo (TYP.) = 0.35 V (at L = 150 cm); ΔVo (TYP.) = 1.6 V (at L = 150 cm → 20 cm)

※ PSD: Position Sensitive Detector


GP2Y5D91S00F


GP2Y0D805Z0F
(GP2Y0D810Z0F, GP2Y0D810Z1F)


GP2Y0D340K
(GP2Y0D310K)


GP2Y0A60SZ0F


GP2Y0A60SZLF


GP2Y0A21YK0F
(GP2D120XJ00F, GP2D150AJ00F, GP2Y0D21YK0F, GP2Y0A41SK0F
GP2Y0D413K: without mounting hole)


GP2Y0A51SK0F


GP2Y0D02YK0F
(GP2Y0A02YK0F)


GP2Y0A710K0F

Optoelectronics

■ Wide Angle Sensors

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics				
		Vcc (V)	Topr (°C)	Distance measuring range (cm)	Output terminal voltage (V)	Output voltage difference (V)	Input voltage (V)	
							V_{INH}	LEDL
GP2Y3A001K0F	Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, distance measuring sensor application product, wide range (field of view) detection using 5 infrared beams	–0.3 to +7	–10 to +60	4 to 30	TYP. 2.85*1	TYP. 1.6*4	MIN. 4.5	MAX. 0.5
GP2Y3A002K0F		–0.3 to +7	–10 to +60	20 to 150	TYP. 2.3*2	TYP. 1.6*5	MIN. 4.5	MAX. 0.5
GP2Y3A003K0F		–0.3 to +7	–10 to +60	40 to 300	TYP. 2.3*3	TYP. 1.2*6	MIN. 4.5	MAX. 0.5

※ PSD: Position Sensitive Detector
Reflector used: White paper (Gray chart R-27/white surface, made by Kodak Corp., reflectance 90%)
L = Reflector - Sensor distance

*1 L = 4 cm
*2 L = 20 cm
*3 L = 40 cm
*4 Change in output voltage from L = 4 cm to 10 cm
*5 Change in output voltage from L = 20 cm to 80 cm
*6 Change in output voltage from L = 40 cm to 100 cm

GP2Y3A001K0F GP2Y3A002K0F GP2Y3A003K0F

■ Paper Size Sensors

(Ta = 25°C)

Model No.	Features	Operating temperature Topr (°C)	Supply voltage Vcc (V)	Paper detection height H (mm)	LED beam pitch Lp (mm)	Approved value of paper position sliding Δx (mm)	Paper detection density OD	Dissipation current Icc (mA)
GP2Y2D160K0F	Thin type (T: 11.5 mm), using optical distance measuring method (1-beam), digital output (1-bit)	–10 to +65	5 ±0.5	TYP. 60	–	MIN. ±7.5	0.7 or less*1	MAX. 40
GP2Y2A180K0F	Thin type (T: 11.5 mm), analog output using optical distance measuring method (1-beam)	–10 to +65	5 ±0.5	TYP. 80	–	–	–	MAX. 25
GP2Y2A280K0F	Thin type (T: 11.5 mm), analog output using optical distance measuring method (2-beam)	–10 to +65	5 ±0.5	TYP. 80	TYP. 21	–	–	MAX. 50

※ This table shows the characteristics when configured in the paper size sensor system.
*1 Reflectivity: 18% or more, OD = log (1/T), T: Reflectivity

GP2Y2D160K0F GP2Y2A180K0F GP2Y2A280K0F

■ High-Precision Displacement Sensor

(Ta = 25°C)

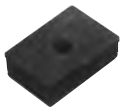
Model No.	Features	Topr (°C)	Operating supply voltage (V)	Dissipation current (mA)	Distance measuring range (mm)	Distance characteristic of output
GP2Y0AH01K0F	Resolution: 50 µm	–10 to +60	4.5 to 5.5	TYP. 20	4.5 to 6.0	TYP. 1.70 V Variation in output over range (4.5 to 6.0 mm)

GP2Y0AH01K0F

■ Dust Sensor Unit

(Ta = 25°C)

Model No.	Features	Topr (°C)	Electro-optical characteristics				
			Operating supply voltage (V)	Dissipation current (mA)	Detection sensitivity V/(0.1 mg/m^3)	Output voltage at no dust Voc (V)	Output voltage range V_{OH} (V)
GP2Y1010AU0F	Built-in infrared emitting diode, photodiode and signal processing circuit, compact, single-shot detection of house dust	–10 to +65	4.5 to 5.5	TYP. 11	TYP. 0.5	TYP. 0.9	MIN. 3.4



GP2Y1010AU0F

■ Smoke Sensor Module (For Fire Alarms)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics	
		Topr (°C)	Supply voltage (V)	Average dissipation current (µA)	Output voltage when no smoke (V)
GP2Y6001AK0F	• Thin, compact module integrating sensors and microcomputer • Low dissipation current • Can be made to order with custom functions.	–10 to +50	–0.3 to +3.8	TYP. 16	TYP. 1.25

* Please consult with Sharp if you select this product.

■ Color Toner Concentration (Deposition Amount) Sensors

(Ta = 25°C)

Model No.	Features	Topr (°C)	Electro-optical characteristics		
			Dissipation current*1 (mA)	Output voltage*2 V_{O1} (V)	Output voltage*2 V_{O2} (V)
GP2TC2J0000F	Employs diffuse reflection system + mirror reflection system, high-precision detection of toner concentration on photo-sensitive drum, 2-line analog output (2-PD)	0 to +60	TYP. 4	TYP. 1.17	TYP. 2.81
GP2Y40010K0F	Employs diffuse reflection system + mirror reflection system, high-precision detection of toner concentration on transfer belt, 2-line analog output (2-PD)	0 to +60	TYP. 4	TYP. 1.27	MAX. 3.5 TYP. 2.87

*1 Dissipation current with LED current of I_{FM} = 0 mA
*2 With reflection object A (Reflectance: 15.6%)

GP2TC2J0000F

GP2Y40010K0F

■ Fiber Optics Lineup for Audio Equipment

Connector type	Type	Outline	Features		High speed signal transmission	Model No.	
						Supply voltage 3 to 5 V	Supply voltage 5 V
Square connector	Fiber optic transmitter	Without mounting hole	With shutter	Horizontal mounting type	MAX. 13.2 Mb/s		GP1FMV51TK0F
(EIAJ RC-5720B)					MAX. 15.5 Mb/s	GP1FMV31TK0F	
		With mounting hole	With shutter	Horizontal mounting type	MAX. 13.2 Mb/s		GP1FAV51TK0F*1
					MAX. 15.5 Mb/s	GP1FAV31TK0F	
					MAX. 50 Mb/s		GP1FAV55TK0F
				Vertical mounting type	MAX. 13.2 Mb/s		GP1FSV51TK0F
					MAX. 15.5 Mb/s	GP1FSV31TK0F (mounting height: 15 mm) GP1FSB31TK0F (mounting height: 8.5 mm)	
			With protection cap	Horizontal mounting type	MAX. 13.2 Mb/s		GP1FAV50TK0F*1
					MAX. 15.5 Mb/s	GP1FAV30TK0F	
	Fiber optic receiver	Without mounting hole	With shutter	Horizontal mounting type	MAX. 13.2 Mb/s		GP1FMV51RK0F
					MAX. 15.5 Mb/s	GP1FMV31RK0F	
		With mounting hole	With shutter	Horizontal mounting type	MAX. 13.2 Mb/s		GP1FAV51RK0F
					MAX. 15.5 Mb/s	GP1FAV31RK0F	
			With protection cap	Horizontal mounting type	MAX. 13.2 Mb/s		GP1FAV50RK0F
					MAX. 15.5 Mb/s	GP1FAV30RK0F	

*1 TTL drive compatible

Connector type	Type	Outline	Features	High speed signal transmission	Model No.
					Supply voltage 3 V
Optical mini-jack ø3.5 mm	Fiber optic transmitter	Thin type (t: 4.2 mm)	Capable of detection/transmission of optical/electrical signals	MAX. 8 Mb/s	GP1FD310TP0F
(JIS C 6650)				MAX. 25 Mb/s	GP1FD320TP0F

GP1FMV31 series
(GP1FMV51 series)

GP1FAV50TK0F
(GP1FAV50RK0F,
GP1FAV30TK0F,
GP1FAV30RK0F)

GP1FAV51TK0F
(GP1FAV31TK0F,
GP1FAV55TK0F,
GP1FAV51RK0F,
GP1FAV31RK0F)

GP1FSB31TK0F

GP1FSV31TK0F
(GP1FSV51TK0F)

GP1FD310TP0F
(GP1FD320TP0F)

■ Fiber Optic Transmitters (Square Connector)

(Ta = 25°C)

Model No.	Appearance		Features	Absolute maximum ratings		Electro-optical characteristics					
	Mounting hole	Shutter		Vcc (V)	Topr (°C)	Supply voltage (V)	Propagation delay time t_{PLH} (ns) MAX.	Propagation delay time t_{PHL} (ns) MAX.	Dissipation current Icc (mA) MAX.	Pulse width distortion Δtw (ns)	Transmission speed T (Mb/s) MAX.
GP1FMV31TK0F	No	Yes	Compact	–0.5 to +7	–20 to +70	2.7 to 5.25	180	180	12	±15	15.5
GP1FMV51TK0F	No	Yes	Compact	–0.5 to +7	–20 to +70	4.75 to 5.25	180	180	13	±15	13.2
GP1FAV30TK0F	Yes	No	Low voltage drive, with protection cap	–0.5 to +7	–20 to +70	2.7 to 5.25	180	180	12	±15	15.5
GP1FAV50TK0F	Yes	No	TTL drive compatible, with protection cap	–0.5 to +7	–20 to +70	4.75 to 5.25 Input voltage: MIN. 2.0 V	180	180	13	±15	13.2
GP1FAV51TK0F	Yes	Yes	TTL drive compatible	–0.5 to +7	–20 to +70	4.75 to 5.25	180	180	13	±15	13.2
GP1FSV51TK0F	No	Yes	Vertical mounting (mounting height: 15 mm)	–0.5 to +7	–20 to +70	4.75 to 5.25	180	180	13	±15	13.2
GP1FAV31TK0F	Yes	Yes	Low voltage drive	–0.5 to +7	–20 to +70	2.7 to 5.25	180	180	12	±15	15.5
GP1FSV31TK0F	No	Yes	Vertical mounting (mounting height: 15 mm)	–0.5 to +7	–20 to +70	2.7 to 5.25	180	180	13	±15	15.5
GP1FAV55TK0F	Yes	Yes	High response speed	–0.5 to +7	–20 to +70	4.75 to 5.25	180	180	13	±15	50
GP1FSB31TK0F	No	Yes	Vertical mounting (mounting height: 8.5 mm)	–0.5 to +7	–20 to +70	2.7 to 5.25	180	180	13	±15	15.5

■ Fiber Optic Transmitters (ø3.5 mm Optical Mini-jack)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electro-optical characteristics					
		Vcc (V)	Vin (V)	Topr (°C)	Supply voltage (V)	Propagation delay time t_{PLH} (ns) MAX.	Propagation delay time t_{PHL} (ns) MAX.	Dissipation current Icc (mA) MAX.	Pulse width distortion Δtw (ns)	Transmission speed T (Mb/s) MAX.
GP1FD310TP0F	Compact, thin type (t: 4.2 mm), optical mini-jack (low voltage type)	–0.5 to +7	–0.5 to Vcc + 0.5	–20 to +70	2.7 to 3.6	180	180	12	±30	8
GP1FD320TP0F	Compact, thin type (t: 4.2 mm), high speed, optical mini-jack (low voltage type)	–0.5 to +7	–0.5 to Vcc + 0.5	–20 to +70	2.3 to 5.5	180	180	12	±11	25

■ Fiber Optic Receivers (Square Connector)

(Ta = 25°C)

Model No.	Appearance		Features	Absolute maximum ratings			Electro-optical characteristics					
	Mounting hole	Shutter		Vcc (V)	I_{OL} (mA)	Topr (°C)	Supply voltage (V)	Propagation delay time t_{PLH} (ns) MAX.	Propagation delay time t_{PHL} (ns) MAX.	Dissipation current Icc (mA) MAX.	Pulse width distortion Δtw (ns)	Transmission speed T (Mb/s) MAX.
GP1FMV31RK0F	No	Yes	Compact, low voltage drive	–0.5 to +7	10	–20 to +70	2.7 to 3.6	180	180	15	±20	15.5
GP1FMV51RK0F	No	Yes	Compact	–0.5 to +7	10	–20 to +70	4.75 to 5.25	180	180	25	±20	13.2
GP1FAV30RK0F	Yes	No	Low voltage drive, with protection cap	–0.5 to +7	10	–20 to +70	2.7 to 3.6	180	180	15	±20	15.5
GP1FAV50RK0F	Yes	No	With protection cap	–0.5 to +7	10	–20 to +70	4.75 to 5.25	180	180	25	±20	13.2
GP1FAV51RK0F	Yes	Yes		–0.5 to +7	10	–20 to +70	4.75 to 5.25	180	180	25	±20	13.2
GP1FAV31RK0F	Yes	Yes	Low voltage drive	–0.5 to +7	10	–20 to +70	2.7 to 3.6	180	180	15	±20	15.5

HIGH-LUMINOSITY (AlGaInP) SURFACE MOUNT LEDs / HIGH-LUMINOSITY (InGaN) SURFACE MOUNT LEDs

■ High-Luminosity (AlGaInP) Surface Mount LEDs (Taped Models Only)

(I_F = 20 mA, Tc = 25°C)

Outline dimensions (mm)	Resin type: Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	J E Yellow-green	Luminous intensity (mcd) TYP.	Z V J V Amber	Luminous intensity (mcd) TYP.	Z S J S Sunset orange	Luminous intensity (mcd) TYP.	Z J J J Orange	Luminous intensity (mcd) TYP.	Z R J R Red	Luminous intensity (mcd) TYP.
1.6 × 0.8 (t = 0.35)			●		GM1JE35200AE*1	13	GM1JV35200AE*1	18.8	GM1JS35200AE*1	19	GM1JJ35200AE*1	19	GM1JR35200AE*1	13
1.6 × 0.8 (t = 0.55)			●		GM1JE55200AE	13	GM1JV55200AE*1	16.8	GM1JS55200AE	20.9	GM1JJ55200AE	19	GM1JR55200AE	15
3.2 × 2.8 (t = 1.9)			●		–	–	GM5ZV96270A	600	–	–	–	–	GM5ZR96270A	600
6.0 × 5.0 (t = 2.5)			●		–	–	GM5ZV01200A*2	500	GM5ZS01200A*2	700	GM5ZJ01200A*2	500	GM5ZR01200A*2	400
6.0 × 5.0 (t = 2.3) (board insertion type)			●		–	–	GM5ZV03200Z*2	500	GM5ZS03200Z*2	700	GM5ZJ03200Z*2	500	GM5ZR03200Z*2	400

*1 GM1JV35200AE series, GM1JV55200AE series: I_F = 5 mA
*2 GM5ZR01200A series, GM5ZR03200Z series: I_F = 60 mA

■ High-Luminosity (InGaN) Surface Mount LEDs (Taped Models Only)

(I_F = 10 mA, Ta = 25°C*4)

Outline dimensions (mm)	Resin type: Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	B C Blue	Luminous intensity (mcd) TYP.	G C Green	Luminous intensity (mcd) TYP.
1.6 × 0.8 (t = 0.35)				●	GM1BC35372AC*1	35	GM1GC35370AC*1	80
3.2 × 2.8 (t = 1.9)			●		GM5BC96270A*2	500	GM5GC96270A*2	1 300
6.0 × 5.0 (t = 2.5)			●		GM5BC01250AC*3	400	GM5GC01250AC*3	1 200
6.0 × 5.0 (t = 2.3) board insertion type			●		GM5BC03210Z*3	400	GM5GC03210Z*3	1 200

*1 GM1BC35372AC series: I_F = 5 mA
*2 GM5BC96270A series: I_F = 20 mA
*3 GM5BC01250AC series, GM5BC03210Z series: I_F = 50 mA
*4 GM5BC96270A series, GM5BC01250AC series, GM5BC03210Z series: Tc= 25°C

■ Surface Mount LEDs (Taped Models Only)

(I_F = 20 mA, Ta = 25°C)

Outline dimensions (mm)	Resin type: Colored diffusion	Resin type: Colored transparency	Resin type: Colorless transparency	Resin type: Milky diffusion	E G: Yellow-green	E G: Luminous intensity (mcd) TYP.	H Y: Yellow	H Y: Luminous intensity (mcd) TYP.	H S: Sunset orange	H S: Luminous intensity (mcd) TYP.	H D: Red	H D: Luminous intensity (mcd) TYP.
1.6 × 0.8 (t = 0.55)			●		GM1EG55200A	19	GM1HY55200A	11.5	GM1HS55200A	11.4	GM1HD55200A	12.5

GM1EG55200A series
GM1JV55200AE series

GM1JV35200AE series
GM1BC35372AC
GM1GC35370AC

GM5ZV96270A series
GM5BC96270A series

GM5ZR01200A series
GM5BC01250AC series

GM5ZV03200Z series
GM5BC03210Z series

Taped model

HIGH-LUMINOSITY WHITE SURFACE MOUNT LEDs

☆New product

■ High-Luminosity White Surface Mount LEDs (Taped Models Only)

(Ta = 25°C*5)

Outline dimensions (mm)	Color coordinates (x, y) TYP.	BW White			BN High rendering color		
			Luminous intensity (mcd) TYP.	Color temperature (K) TYP.		Luminous intensity (mcd) TYP.	Color temperature (K) TYP.
2.8 × 1.2 (t = 0.8) Side view type	(0.30, 0.29)	GM4BW853A0A*1	1 900	–	–	–	–
		GM4BW853B0A*1	2 200	–	–	–	–
3.85 × 1.0 (t = 0.6) Side view type	(0.30, 0.29)	GM4BW653A0A*1	1 900	–	–	–	–
		GM4BW653B0A*1	2 200	–	–	–	–
	(0.29, 0.28)	–	–	–	GM4BN653C0A*1, 4	1 700	–
3.85 × 1.0 (t = 0.5) Side view type	(0.30, 0.29)	GM4BW53340A*1	1 800	–	–	–	–
3.2 × 2.8 (t = 1.9)	(0.31, 0.31)	☆GM5BW96382A*1	2 300	–	–	–	–
	(0.34, 0.36)	☆GM5BW96385A	2 600	–	–	–	–
	(0.29, 0.28)	☆GM5BW96387A	2 000	–	–	–	–
	(0.338, 0.365)	☆GM5BW97330A*2	6 400	5 300	–	–	–
	(0.312, 0.311)	☆GM5BW97332A*2	5 800	6 700	–	–	–
	(0.283, 0.262)	☆GM5BW97333A*2	5 100	11 500	–	–	–
	(0.3398, 0.3472)	–	–	–	☆GM5BN97330A*2, 4	6 000	5 200
3.2 × 2.8 (t = 1.4)	(0.32, 0.33)	☆GM5BW94370A*3	5 200	–	–	–	–

*1 GM4BW853A0A series, GM4BW653A0A series, GM4BN653C0A, GM4BW53340A, GM5BW96382A: I_F = 20 mA
*2 GM5BW97330A series, GM5BN97330A: I_F = 20 mA/chip
*3 GM5BW94370A: I_F = 25 mA/chip
*4 GM4BN653C0A and GM5BN97330A are high-NTSC-ratio products.
*5 GM5BW96382A, GM5BW96385A, GM5BW96387A, GM5BW97330A series, GM5BW94370A, GM5BN97330A: Tc = 25°C

GM5BW96382A
GM5BW96385A
GM5BW96387A

GM5BW97330A series
GM5BN97330A

GM4BW853A0A series

GM4BW53340A

GM4BW653A0A series
GM4BN653C0A

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★Under development

■ High-Luminosity Surface Mount LEDs (RGB 3-color) (Taped Models Only)

(Tc = 25°C)

Outline dimensions (mm)	Resin type				WA Red + Green + Blue	
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion		Luminous intensity (mcd) TYP.
1.6 × 1.6 (t = 0.55)				●	GM1WA55311A*2	20/70/23
3.2 × 2.8 (t = 1.4)				●	GM5WA94310A*3	1 800 [Mixed color]
				●	★GM5WA94320A*3	(2 300) [Mixed color]
5.0 × 2.5 (t = 2.5)				●	GM4WA25300A*4	2 200 [Mixed color]
6.0 × 5.0 (t = 2.5) 6-terminal leadless				●	GM5WA06310A*1	3 500 [Mixed color]

*1 GM5WA06310A: I_F = 35 mA (Red), I_F = 40 mA (Green), I_F = 10 mA (Blue)
*2 GM1WA55311A: I_F = 5 mA (Red, Green, Blue)
*3 GM5WA94310A, GM5WA94320A: I_F = 20 mA (Red), I_F = 20 mA (Green), I_F = 7 mA (Blue)
*4 GM4WA25300A: I_F = 21 mA (Red), I_F = 25 mA (Green), I_F = 7 mA (Blue)

GM1WA55311A

GM5WA06310A

GM5WA94310A
GM5WA94320A

GM4WA25300A

☆New product

■ ZENIGATA LEDs for Lighting

(ZENIGATA is a registered trademark or a trademark of Sharp Corporation in Japan, the United States and/or other countries.)

<3W class>

(I_F = 360 mA, Tc = 25°C)

Outline dimensions (mm)	Model No.	Color coordinates (x, y) TYP.	Color temperature (K) TYP.	Total luminous flux (lm) TYP.	Average color rendering index Ra TYP.
15.0 × 12.0 (t = 1.6)	☆GW5BTC27K00	(0.4640, 0.4180)	2 700	200	85
	☆GW5BTC30K00	(0.4350, 0.4030)	3 025	210	87
	☆GW5BTC35K00	(0.4090, 0.3930)	3 450	220	87
	☆GW5BTC50K00	(0.3460, 0.3600)	5 000	230	87
	☆GW5BTC65K00	(0.3130, 0.3320)	6 500	230	85
18.0 × 18.0 (t = 2.0)	GW5BQC15L02	(0.458, 0.410)	2 725	160	85
	GW5BDC15L02	(0.45, 0.41)	2 800	200	70
	GW5BTC15L02	(0.434, 0.403)	3 045	190	85
	GW5BRC15L02	(0.382, 0.380)	3 985	180	94
	GW5BWC15L02	(0.35, 0.36)	5 000	280	60
	GW5BNC15L02	(0.35, 0.35)	5 000	190	90
	GW5BNC15L12	(0.31, 0.32)	6 500	190	90

<6W class>

(I_F = 640 mA, Tc = 25°C)

Outline dimensions (mm)	Model No.	Color coordinates (x, y) TYP.	Color temperature (K) TYP.	Total luminous flux (lm) TYP.	Average color rendering index Ra TYP.
15.0 × 12.0 (t = 1.6)	☆GW5BTF27K00	(0.4640, 0.4180)	2 700	355	85
	☆GW5BTF30K00	(0.4350, 0.4030)	3 025	375	87
	☆GW5BTF35K00	(0.4090, 0.3930)	3 450	390	87
	☆GW5BTF50K00	(0.3460, 0.3600)	5 000	410	87
	☆GW5BTF65K00	(0.3130, 0.3320)	6 500	410	85
18.0 × 18.0 (t = 2.0)	GW5BQF15L0B	(0.458, 0.410)	2 725	300	85
	GW5BDF15L00	(0.45, 0.41)	2 800	400	70
	GW5BTF15L0B	(0.434, 0.403)	3 045	360	85
	GW5BRF15L0B	(0.382, 0.380)	3 985	340	94
	GW5BWF15L00	(0.35, 0.36)	5 000	540	60
	GW5BNF15L00	(0.35, 0.35)	5 000	350	90
	GW5BNF15L10	(0.31, 0.32)	6 500	350	90

GW5BTC27K00 series

GW5BTF27K00 series

GW5BWC15L02 series
GW5BWF15L00 series

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SURFACE MOUNT LEDs FOR LIGHTING / SURFACE MOUNT LEDs FOR LIGHTING (RGB 3-COLOR)

☆New product
★Under development

■ Surface Mount LEDs for Lighting (Taped Models Only)

(I_F = 100 mA, Tc = 25°C)

Outline dimensions (mm)	Model No.	Color coordinates (x, y) TYP.	Color temperature (K) TYP.	Total luminous flux (lm) TYP.	Average color rendering index Ra TYP.
2.8 × 2.8 (t = 1.9)	★GM2BB27BMAC	(0.4578, 0.4101)	(2 725)	(21)	(85)
	★GM2BB30BMAC	(0.4338, 0.4030)	(3 045)	(22)	(85)
	★GM2BB35BMAC	(0.4073, 0.3917)	(3 465)	(23)	(85)
	★GM2BB40BMAC	(0.3818, 0.3797)	(3 985)	(23)	(85)
	★GM2BB45BMAC	(0.3611, 0.3658)	(4 503)	(24)	(85)
	★GM2BB50BMAC	(0.3447, 0.3553)	(5 028)	(25)	(85)
	★GM2BB57BMAC	(0.3287, 0.3417)	(5 665)	(24)	(85)
	★GM2BB65BMAC	(0.3123, 0.3282)	(6 530)	(23)	(85)

(I_F = 150 mA, Tc = 25°C)

Outline dimensions (mm)	Model No.	Color coordinates (x, y) TYP.	Color temperature (K) TYP.	Total luminous flux (lm) TYP.	Average color rendering index Ra TYP.
2.8 × 2.8 (t = 1.9)	☆GM2BB27BM0C	(0.4578, 0.4101)	2 725	33	85
	☆GM2BB30BM0C	(0.4338, 0.4030)	3 045	34	85
	★GM2BB35BM0C	(0.4073, 0.3917)	(3 465)	(35)	(85)
	☆GM2BB40BM0C	(0.3818, 0.3797)	3 985	36	85
	★GM2BB45BM0C	(0.3611, 0.3658)	(4 503)	(37)	(85)
	☆GM2BB50BM0C	(0.3447, 0.3553)	5 028	38	85
	★GM2BB57BM0C	(0.3287, 0.3417)	(5 665)	(37)	(85)
	★GM2BB65BM0C	(0.3123, 0.3282)	(6 530)	(36)	(85)

(I_F = 20 mA, Tc = 25°C)

Outline dimensions (mm)	Model No.	Color coordinates (x, y) TYP.	Color temperature (K) TYP.	Luminous intensity (mcd) TYP.	Average color rendering index Ra TYP.
3.2 × 2.8 (t = 1.9)	GM5SAE27P0A	(0.4578, 0.4101)	(2 700)	2 100	85
	GM5SAE30P0A	(0.4338, 0.4030)	(3 000)	1 900	85
	GM5SAE35P0A	(0.4073, 0.3917)	(3 500)	2 100	83
	GM5SAE40P0A	(0.3818, 0.3797)	(4 000)	2 100	83
	GM5SAE45P0A	(0.3611, 0.3658)	(4 500)	2 200	83
	GM5SAE50P0A	(0.3447, 0.3553)	(5 000)	2 200	83
	GM5SAE57P0A	(0.3287, 0.3417)	(5 700)	2 200	80
	GM5SAE65P0A	(0.3123, 0.3282)	(6 500)	2 200	80

■ Surface Mount LEDs for Lighting (RGB 3-color) (Taped Models Only)

(I_F = 20 mA/chip, Tc = 25°C)

Outline dimensions (mm)	Model No.	Radiation color	Luminous intensity (mcd) TYP.
3.2 × 2.8 (t = 1.4)	★GM5WA94315A	Red	(680)
		Green	(1 500)
		Blue	(450)

GM2BB27BM0C series
GM2BB27BMAC series

GM5SAE27P0A series

GM5WA94315A

Notice
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

☆New product
★Under development

■ Laser Diodes

◆Model Configurations

• For applications other than optical discs

Wavelength (nm)	Absolute maximum ratings (mW)*1	Package	
		 ø5.6 mm Metal type	 ø3.3 mm Metal type
660 band	10	–	GH06510F4A
785 band	10	GH07810C2K	–
	25	GH07825C2K	–

*1 The absolute maximum ratings are the limits that are not to be exceeded under any condition whatsoever, whether in testing or in actual use.

• For optical disc use*3

Wavelength (nm)	Absolute maximum ratings (mW)*1	Package		
		 ø5.6 mm Metal type	 ø3.3 mm Metal type	 1.8 mm t Resin type
405 band	20	GH04020A2G	GH04020A4G	–
	210*2	GH04P21A2G	–	–
	250*2	☆GH04P25A2G	☆GH04P25A4G	–
660 band	240*2	GH06P24A2C	–	GH16P24A8C
	350*2	–	–	GH16P35A8C
	400*2	–	–	☆GH16P40A8C
785 band	240*2	GH07P24C1C	GH07P24C4C	–
	280*2	★GH07P28F1C	★GH07P28F4C	–

*1 The absolute maximum ratings are the limits that are not to be exceeded under any condition whatsoever, whether in testing or in actual use.
*2 Optical power output MAX. (mW)
*3 New models for optical disc use are introduced frequently, and it is possible the model you wish to order may no longer be in production. Sample sales may not be available, either. We ask for your understanding in this matter.

☆New product
★Under development

RoHS Pb FREE

◆Specifications

• Laser diodes lineup for applications other than optical discs

(Tc = 25°C)

Model No.	Wave-length (nm)	Absolute maximum ratings*1	Features	Applications	Terminal connec-tions
		CW (Continuous wave)			
GH06510F4A	660 band	10	ø3.3 mm CAN package, operating temperature: 70°C MAX., with built-in monitor PD	Bar code reader, laser displacement gauge, etc.	A
GH07810C2K	785 band	10	ø5.6 mm CAN package, operating temperature: 60°C MAX., with built-in monitor PD	Printer, copier, complex machine	D
GH07825C2K		25	ø5.6 mm CAN package, operating temperature: 60°C MAX., with built-in monitor PD	Printer, copier, complex machine	

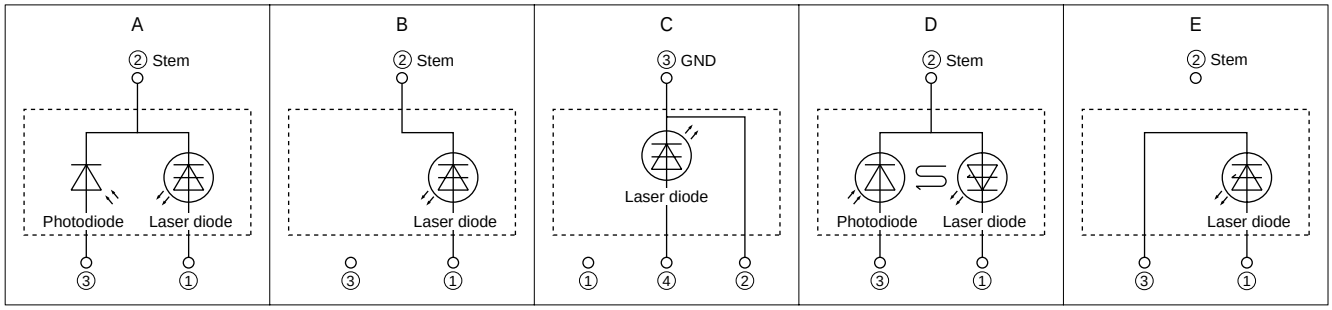
• Laser diodes lineup for optical disc use*2

(Tc = 25°C)

Model No.	Wave-length (nm)	Absolute maximum ratings*1		Features	Applications	Terminal connec-tions
		CW (Continu-ous wave)	Pulse			
GH04020A2G	405 band	20	—	ø5.6 mm CAN package, operating temperature: 70°C MAX.	Blu-ray disc playback	E
GH04020A4G		20	—	ø3.3 mm CAN package, operating temperature: 70°C MAX.	Blu-ray disc playback	E
GH04P21A2G		105	210	ø5.6 mm CAN package, operating temperature: 70°C MAX. (pulse drive)	Blu-ray disc recording	E
☆GH04P25A2G		125	250	ø5.6 mm CAN package, operating temperature: 80°C MAX. (pulse drive)	Blu-ray disc recording	E
☆GH04P25A4G		125	250	ø3.3 mm CAN package, operating temperature: 80°C MAX. (pulse drive)	Blu-ray disc recording	E
GH06P24A2C	660 band	100	240	ø5.6 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	Double-layer DVD 4× writing	B
GH16P24A8C		100	240	1.8 mm frame package, operating temperature: 80°C MAX. (pulse drive)	Double-layer DVD 4× writing	C
GH16P35A8C		125	350	1.8 mm frame package, operating temperature: 80°C MAX. (pulse drive)	Double-layer DVD 8× to 16× recording	
☆GH16P40A8C		135	400	1.8 mm frame package, operating temperature: 80°C MAX. (pulse drive)	Double-layer DVD 8× to 16× recording	
GH07P24C1C	785 band	120	240	ø5.6 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (MAX. 48× to 52× writing)	B
★GH07P28F1C		150	280	ø5.6 mm CAN package, operating temperature: 80°C MAX. (pulse drive)	CD-R/RW (MAX. 48× to 52× writing)	
GH07P24C4C		120	240	ø3.3 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (H/H, slim dual-purpose) (MAX. 48× to 52× writing)	
★GH07P28F4C		150	280	ø3.3 mm CAN package, operating temperature: 80°C MAX. (pulse drive)	CD-R/RW (H/H, slim dual-purpose) (MAX. 48× to 52× writing)	

*1 The absolute maximum ratings are the limits that are not to be exceeded under any condition whatsoever, whether in testing or in actual use. For recommended optical power output, consult the specification sheet or data sheet for each model.
*2 New models for optical disc use are introduced frequently, and it is possible the model you wish to order may no longer be in production. Sample sales may not be available, either. We ask for your understanding in this matter.

• Terminal Connections



■ Europe: LNBs for Satellite Broadcast

◆ Features

(1) Wide band type receiving all broadcasting channels (analog & digital) in Europe. [Universal LNB]

(2) Originally developed feed-horn waveguide makes the wide-band, low-noise characteristics possible.

(3) One of the industry's most compact and lightweight package

(4) Low dissipation current design for energy saving [80 mA (TYP.): BS1K0EL150A]

◆ Specifications

Destination		Europe, Astra/Eutelsat Satellite etc.			
Receiving polarization		Horizontal/Vertical polarization			
Model No. <Type>		BS1R8EL500A <4 output>	BS1R8EL400A <4 output>	BS1K0EL250A <2 output>	BS1K0EL150A <1 output>
Input frequency (GHz)		10.7 to 11.7 [Low band], 11.7 to 12.75 [High band]			
Output frequency (MHz)		950 to 1 950 [Low band], 1 100 to 2 150 [High band]			
Local oscillation frequency (GHz)		9.75 [Low band], 10.6 [High band]			
NF (dB)		0.7 (TYP.)		0.4 (TYP.)	
Conversion gain (dB)		56 (TYP.)			58 (TYP.)
Phase noise		–55 dBc/Hz at 1 kHz (TYP.)			
Cross-polar discrimination (dB)		25 (TYP.)			
Supply voltage (V DC) (Polarization switching)	Vertical polarization	11.5 to 14.0 (0/22 kHz)			
	Horizontal polarization	16.0 to 19.0 (0/22 kHz)			
Dissipation current (mA)		210 (TYP.)/250 (MAX.)	310 (TYP.)/350 (MAX.)	190 (TYP.)/250 (MAX.)	80 (TYP.)/120 (MAX.)
Waveguide		Feed-horn (F/D = 0.6)			
Output impedance (Ω)		75			
Output connector (F-type)		4-output (H/H, H/L, V/H, V/L)	4-output (H/V, High and low switching)	2-output (H/V, High and low switching)	1-output (H/V, High and low switching)
Outline dimensions (W) × (D) × (H) (mm)		133.0 × 103.6 × 60.0	133.0 × 103.6 × 60.0	135.0 × 90.0 × 58.0	103.0 × 60.0 × 60.0
Weight (g)		Approx. 255	Approx. 256	Approx. 245	Approx. 90

BS1R8EL500A

BS1R8EL400A

BS1K0EL250A

BS1K0EL150A

■ Japan/Asia/Australia: LNBs for CS Digital Satellite Broadcast

◆ Specifications

Destination		Japan, Asia, Australia, CS Satellite
Receiving polarization		Horizontal/Vertical polarization
Model No. <Type>		BS1R8AR100A
Input frequency (GHz)		11.70 to 12.75
Output frequency (MHz)		1 000 to 2 050
Local oscillation frequency (GHz)		10.7
NF (dB)		0.7 (TYP.) / 0.9 (MAX.)
Conversion gain (dB)		55 to 64
Phase noise		–75 dBc/Hz at 1 kHz (TYP.)
Cross-polar discrimination (dB)		25 (TYP.)
Supply voltage (V DC) (Polarization switching)	Vertical polarization	11.5 to 14.0
	Horizontal polarization	16.0 to 19.0
Dissipation current (mA)		80 (TYP.)/120 (MAX.)
Waveguide		Feed-horn (F/D = 0.6)
Output impedance (Ω)		75
Output connector (F-type)		1-output (H/V switching)
Outline dimensions (mm)		107.3 (W) × 60 (D) × 60 (H)
Weight (g)		Approx. 110

BS1R8AR100A

■ Japan: LNBs for BS/CS 110° Satellite Broadcast

◆ Features

(1) Can receive 2 satellite broadcasts of 110° BS/CS digital
[Employs wide-band (1 GHz) circular' linear polarization conversion technology (septum waveguide structure)]

(2) Outstanding noise figure (NF) characteristics enabling compact design of antenna diameter. [NF: 0.45 dB (TYP.)/BS1F6JU300A]

(3) Low dissipation current design for improved energy saving. [80 mA (TYP.)]

◆ Standard Specifications

Destination		Japan BS/CS 110° Satellite		
Receiving polarization		Right circular polarization		Right/Left circular polarization
Model No.		BS1F6JU300A	BS1F6JP300A	BS1F6JP100A
Input frequency (GHz)		11.71023 to 12.751		
Output frequency (MHz)		1 032.23 to 2 073		
Local oscillation frequency (GHz)		10.678		
NF (dB)		0.45 (TYP.) / 0.6 (MAX.)	0.7 (TYP.) / 1.1 (MAX.)	
Conversion gain (dB)		48 to 60		
Phase noise		–65 dBc/Hz at 1 kHz (TYP.)		
Cross-polar discrimination (dB)		25 (TYP.)/20 (MIN.)		
Supply voltage (V DC) (Polarization switching)	Right circular polarization	9.5 to 18.0		13.5 to 16.5
	Left circular polarization	—		9.5 to 12.0
Dissipation current (mA)		80 (TYP.)/110 (MAX.)		
Waveguide		Feed-horn (F/D = 0.5)		
Output impedance (Ω)		75		
Output connector (F-type)		1-output		1-output (R/L switching)
Outline dimensions (mm)		96 (W) × 53.07 (D) × 71 (H)		
Weight (g)		Approx. 130 (not including outer cabinet)		

BS1F6JP300A

* Outer cabinet is made upon request.

RF Components

■ Digital DBS Front-End Units

◆ Features

(1) Equipped with a direct conversion IC developed by Sharp. Reliability is improved by reducing power consumption and component counts.

(2) Wide-band reception design also covering CS broadcast band. [Reception frequency: 950 to 2 150 MHz]

(3) Wide product line-up of LINK integrated types for contributing to set development time reduction. [Compatible with DVB-S/DVB-S2/ISDB-S/ABS-S demodulation]

(4) User support tools can be provided. [Sample/evaluation boards and software are available.]

◆ Standard Specifications <IQ output type>

Destination	Global (DVB-S)	Global (ISDB-S/DVB-S2/ABS-S)	
Input type	1-input/1-loop through output		1-input
Model No.	BS2S7HZ0502	BS2S7HZ7306A	BS2S7HZ6701
Input frequency (MHz)	950 to 2 150		
Input signal level (dBm)	–65 to –25		
The 1st intermediate frequency (MHz)	Zero-IF (Direct conversion)		
Base band frequency bandwidth (MHz)	10 to 30, 2.0 MHz step (BB LPF)		
RF input local leak (dBm)	–70 and below		
Output type	I/Q		
Channel selection system	PLL (I²C-bus)*1		
Noise figure (dB)	7 (TYP.)		
Tuning voltage (V DC)	Shared with a 3.3 V power source		
Supply voltage (V DC)	3.3		
LNB power supply	DC 25 V, 400 mA (MAX.)		
Input impedance (Ω)	75		
Outline dimensions (mm)	29.6 (W) × 29.4 (D) × 13.0 (H)		30.6 (W) × 25.0 (D) × 13.0 (H)

BS2S7HZ0502/
BS2S7HZ7306A

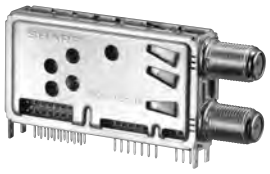
BS2S7HZ6701

※ Contact SHARP for custom design product.
*1 I²C-bus is a trademark of Philips Corporation.

■ Digital DBS Front-End Unit

◆ Standard Specifications <NIM type>

Destination	Global (DVB-S)
Input type	1-input, 1-loop through output
Model No.	BS2F7VZ7395
Input frequency (MHz)	950 to 2 150
Input signal level (dB m)	–65 to –25
The 1st intermediate frequency (MHz)	Zero-IF (Direct conversion)
Base band frequency bandwidth (MHz)	10 to 30, 2.0 MHz step (BB LPF)
RF input local leak (dB m)	–70 and below
Output type	Transport stream (parallel/serial)
Symbol rate (M baud)	45 (MAX.)
Channel selection system	PLL (I²C-bus)*1
Noise figure (dB)	7 (TYP.)
Tuning voltage (V DC)	Shared with a 3.3 V power source
Supply voltage (V DC)	3.3, 2.5
LNB power supply	25 V DC, 400 mA (MAX.)
Input impedance (Ω)	75
Outline dimensions (mm)	57.5 (W) × 29.6 (D) × 13.2 (H)

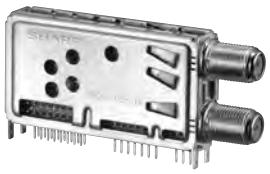


BS2F7VZ7395

※ Contact SHARP for custom design product.
*1 I²C-bus is a trademark of Philips Corporation.

◆ Standard Specifications <NIM type>

Destination	Europe (DVB-S2)	
Input type	1-input, 1-loop through output	1-input
Model No.	BS2F7VZ7702	BS2F7HZ1263
Input frequency (MHz)	950 to 2 150	
Input signal level (dB m)	–65 to –25	
The 1st intermediate frequency (MHz)	Zero-IF (Direct conversion)	
Base band frequency bandwidth (MHz)	10 to 30, 2.0 MHz step (BB LPF)	10 to 30
RF input local leak (dB m)	–70 and below	
Output type	Transport stream (parallel/serial)	
Symbol rate (M baud)	45 (MAX.)	10 to 30
Channel selection system	PLL (I²C-bus)*1	
Noise figure (dB)	7 (TYP.)	
Tuning voltage (V DC)	Shared with a 3.3 V power source	
Supply voltage (V DC)	3.3, 1.2	3.3, 1.0
LNB power supply	25 V DC, 400 mA (MAX.)	
Input impedance (Ω)	75	
Outline dimensions (mm)	57.5 (W) × 29.6 (D) × 13.2 (H)	56.0 (W) × 34.9 (D) × 10.0 (H)



BS2F7VZ7702

BS2F7HZ1263

※ Contact SHARP for custom design product.
*1 I²C-bus is a trademark of Philips Corporation.

■ Combination Front-End Units for Digital Terrestrial, Analog Terrestrial and Digital Satellite Broadcasting

◆ Features

(1) Enables simultaneous reception of digital terrestrial and digital satellite broadcasting.

(2) Contributes to making LCD TVs and other devices thinner.

◆ Standard Specifications

Destination	Japan (ISDB-T/S/NTSC)		
Model No.	VA1R5JF8012		
	Digital terrestrial	Analog terrestrial	Digital DBS
Input frequency (MHz)	VHF, UHF, CATV (pass-through) VHF Low: 93 to 167 VHF High: 173 to 399 UHF: 405 to 767		950 to 2 150
Input signal level*1 (dBm)	–75 to –20	–	–65 to –25
Output type	Transport stream (Serial)	CVBS/SIF	Transport stream (Serial)
IF bandwidth (MHz)	6		–
Base band frequency bandwidth (MHz)	–		10 to 30, 2.0 MHz step (BB LPF)
Noise figure (dB)	6 (TYP.)		6 (TYP.)
Phase noise (dBc/Hz)	–90 (TYP.) at 10 kHz offset		–80 (TYP.) at 10 kHz offset
Image rejection (dB)	–65 (TYP.)		–
Channel selection system	PLL (I^2C-bus)*2		
Supply voltage (V DC)	1.2, 2.5, 3.3, 5.0		
Outline dimensions (mm)	85.5 (W) × 45.2 (D) × 12.7 (H)		

VA1R5JF8012

*1 It conforms to the ARIB standard.
*2 I^2C-bus is a trademark of Philips Corporation.

■ Front-End Units for ISDB-T/DVB-T/CTTB/CATV

◆ Features

(1) Low phase noise characteristics, high elimination of adjacent channel interference.

(2) Transport stream output front-end units with built-in OFDM demodulation IC.

(3) Compact, low power consumption.

(4) Other types are available with various forms of chassis (vertical or horizontal type) and input connectors (F or DIN type), etc.

◆ Standard Specifications

Destination	Japan (ISDB-T/S)		Europe (DVB-T)/Asia (DVB-T)	
Model No.	VA1J5JF7011*1		VA1T1ED5065	VA1K5ED5459
	Digital terrestrial	Digital satellite		
Input frequency (MHz)	VHF, UHF, CATV (pass-through) VHF Low: 93 to 167 VHF High: 173 to 399 UHF: 405 to 767	950 to 2 150	VHF: 143.5 to 430 UHF: 430 to 862	VHF: 146 to 430 UHF: 430 to 862
Output type	Transport stream (Serial)		Direct IF	Transport stream (Parallel/serial)
IF bandwidth (MHz)	6	—	7, 8, selectable	8
Noise figure (dB)	6 (TYP.)	8 (TYP.)	6 (TYP.)	
Phase noise (dBc/Hz)	–90 (TYP.) at 10 kHz offset	–80 (TYP.) at 10 kHz offset	–90 (TYP.) at 10 kHz offset	
Image rejection (dB)	–65 (TYP.)	—	–55 (TYP.)	—
Channel selection system	PLL (I^2C-bus)*2			
Power consumption (W)	2.0*3		0.75	1.3
Supply voltage (V DC)	1.2, 2.5, 3.3, 5		5 (DC-DC converter)	5, 3.3, 1.2 (DC-DC converter)
Outline dimensions (mm)	70.0 (W) x 40.0 (D) x 12.7 (H)		52.0 (W) x 35.9 (D) x 13.4 (H)	70.0 (W) x 29.6 (D) x 13.2 (H)

*1 Enables simultaneous reception of digital terrestrial and digital satellite broadcasting.
*2 I^2C-bus is a trademark of Philips Corporation.
*3 During simultaneous OFDM/8PSK demodulation operation.

VA1J5JF7011

VA1K5ED5459

FRONT-END UNITS FOR ISDB-T/DVB-T/CTTB/CATV

◆ Standard Specifications

Destination	Brazil (ISDB-TB)	China (CTTB)	Europe/China/India (DVB-C)
Model No.	VA1J5BF6009	VA1T1EF2096	VA1K5CD5405
	Digital terrestrial	Digital terrestrial	CATV
Input frequency (MHz)	54 to 864	47 to 862	
Output type	Transport stream (Serial)	Direct IF	Transport stream (Parallel/serial)
IF frequency/IF bandwidth (MHz)	44/6	36/8	
Noise figure (dB)	6 (TYP.)		
Phase noise (dBc/Hz)	–90 (TYP.) at 10 kHz offset	–87 (TYP.) at 10 kHz offset	
Image rejection (dB)	–65 (TYP.)	–55 (TYP.)	
Channel selection system	PLL (I^2C-bus)*1		
Power consumption (W)	2.0	0.75	1.3
Supply voltage (V DC)	1.2, 2.5, 3.3, 5	5	2.5, 3.3, 5
Outline dimensions (mm)	70.0 (W) x 37.0 (D) x 12.5 (H)	68.2 (W) x 35.9 (D) x 14.1 (H)	70.0 (W) x 29.4 (D) x 13.0 (H)

*1 I^2C-bus is a trademark of Philips Corporation.

VA1J5BF6009

VA1T1EF2096

■ Front-End Units for Digital Terrestrial and Analog Terrestrial Broadcasting

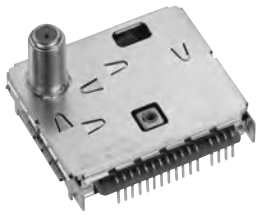
◆ Features

Contributing to the development of thinner LCD TVs and similar products by combining compatibility with digital and analog terrestrial broadcasts into a single unit.

◆ Standard Specifications

Destination		North America	Europe	Brazil*2	China
Model No.		VA1Y2UF2446	VA1E2ED2001	VA1G5BF8015	VA1G2CD8001
Input frequency (MHz)		Low: 54 to 160.9 Mid: 161 to 425.9 High: 426 to 864	VHF: 47 to 430 UHF: 430 to 862	VHF Low: 54 to 160.9 VHF High: 161 to 425.9 UHF: 426 to 864	47 to 870
Analog intermediate frequency (MHz)	Video	45.75	B/G, I, D/K, L: 38.9 L': 33.9	45.75	38.0
	Audio	41.25	D/K, L: 32.4 I: 32.9 B/G: 33.4 L': 40.4	41.25	D/K: 31.5, I: 32.0, B/G: 32.5, M/N: 33.5
Digital intermediate frequency (MHz)		44	36.167	44	36
Digital IF bandwidth (MHz)		6	7/8 (switchable)	6	8
Phase noise (dBc/Hz)		–85 (TYP.) at 20 kHz offset	–85 (TYP.) at 10 kHz offset	–90 (TYP.) at 10 kHz offset	–85 (TYP.) at 10 kHz offset
Supply voltage (V DC)		5.0	5.0	1.2, 2.5, 3.3, 5	5.0
Noise figure (dB)		TYP. 6 (54 to 806 MHz), TYP. 7 (806 to 861 MHz)	TYP. 6		
Channel selection system		PLL (I^2C-bus)*1			
Image rejection (dB)		Low: –65.0, Mid: –65.0, High: –60.0	TYP. –65		
Outline dimensions (W) × (D) × (H) (mm)		52.6 × 38.1 × 10.0	53.9 × 28.9 × 9.5	70.0 × 37.0 × 10.0	70.0 × 37.0 × 10.0

*1 I^2C-bus is a trademark of Philips Corporation.
*2 Transport stream output front-end units with built-in OFDM demodulation IC


VA1Y2UF2446


VA1E2ED2001


VA1G5BF8015

■ MPEG Module

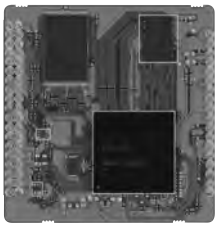
◆ Features

(1) An OFDM demodulator, MPEG decoder and video encoder circuit are combined into a single package for reception of ISDB-T.

(2) Comes with built-in standard reception software, with a simple EPG included, based on the ARIB standard.
Compatible with Ministry of Internal Affairs and Communications specifications for a "simple tuner."
Compatible also with full HD output.

(3) The tuner (RF) section is separate, making it possible to select between digital/analog and digital tuners.

Recommended tuner { Digital terrestrial: VA1T1JF2031
Analog terrestrial/Digital terrestrial: VA1W2JF2008



DU6N4JZ00xx

◆ Standard Specifications

Model No.	DU6N4JZ00xx
Circuit configuration	[RF (separate body) +] OFDM + MPEG
Receiving channel (ch)	[VHF] 1 to 13, [UHF] 14 to 62, [CATV] C13 to C63*1
Video output	Component (Full HD)*2
Audio output	Analog stereo (L/R)
B-CAS	Built-in control software
EPG	Built-in simple EPG
ES (Engineering service)	○
Firm ware upgrades	○
Supply voltage (V)	3.3/1.8/1.0
Power consumption (W)	Approx. 1.1
Outline dimensions (mm)	58 (W) × 60 (D) × 7 (H)

*1 CATV (pass-through)
*2 Composite video/YC (SD) output is also supported.

■ One-Seg Tuner Module

◆ Features

(1) High sensitivity: -98 dBm (13 seg, QPSK CR: 2/3)
(2) Compact and thin design: 5.9 × 5.9 × 1.0 mm
(3) Low power consumption: 70 mW (with software power control)
(4) Output interface: TS serial output

VA3A5JZ947

◆ Standard Specifications

Destination	Japan
Model No.	VA3A5JZ947
Input frequency (MHz)	470 to 770 (UHF: 13 to 62)
Input signal level (dBm)	–98 (13 seg, QPSK CR: 2/3)
Outline dimensions (mm)	5.9 (W) × 5.9 (D) × 1.0 (H)
Supply voltage (V DC)	1.8 (RF) 2.8 (RF OSC) 1.2 (OFDM Core) 1.7 to 2.8 (I/O)
Power consumption (mW)	70 (with software power control)
Operating temperature (degree C)	–20 to 85
Control I/F	I²C-bus*1

*1 I²C-bus is a trademark of Philips Corporation.

ONE-SEG TUNER MODULE FOR SIMULTANEOUS 2-PROGRAM RECEPTION / EMBEDDED WIRELESS LAN-BLUETOOTH COMBO MODULE

■ One-Seg Tuner Module for Simultaneous 2-program Reception

◆ Features

(1) Capable of receiving two one-seg programs simultaneously

(2) Compatible with diversity reception for stable, high-sensitivity reception (with single-program reception)

(3) Compact package size (9.0 × 9.0 × 1.25 mm)

VA3A5JZ923

◆ Standard Specifications

Destination	Japan
Model No.	VA3A5JZ923
Output type	Transport stream
Reception frequency range (MHz)	470 to 770 (UHF: 13 to 62 ch)
OFDM demodulation	Built in
Input sensitivity (dBm)	–112 (using diversity reception)
Control interface	I²C-bus*1
Supply voltage (V)	1.2 (OFDM), 1.8 (RF), 1.8 to 3.1 (I/O)
Power consumption (mW)	82 (with single-tuner reception) 160 (with 2-tuner reception) 155 (with 2-tuner diversity reception)
Outline dimensions (mm)	9.0 (W) × 9.0 (D) × 1.25 (H)

*1 I²C-bus is a trademark of Philips Corporation.

■ Embedded Wireless LAN-Bluetooth Combo Module

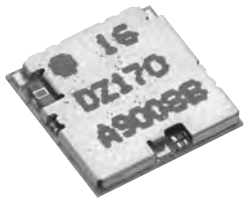
◆ Features

(1) A two-in-one module compliant with the latest Bluetooth standard (v2.1)
Wireless LAN: 11b/g, Bluetooth: v2.1+EDR* (3 Mbps)

(2) Compatible with IEEE802.15.2 standard compliant wireless LAN and Bluetooth coexistence functions.

(3) Thin, compact configuration—the smallest class in the industry.
9.0 x 9.0 x 1.22 mm

*EDR: Enhanced Data Rate



DC2K1DZ170

◆ Standard Specifications

Model No.	DC2K1DZ170	
Wireless communication standard	WLAN (IEEE802.11b/g)	Bluetooth v2.1+EDR
Outline dimensions (mm)	9.0 (W) × 9.0 (D) × 1.22 (H) (LTCC)	
Frequency (MHz)	2 400 to 2 483.5	2 402 to 2 480
Data rate (Mbps)	1/2/5.5/11 & 6/9/12/18/24/36/48/54	1/2/3
Number of channels	13	79
Transmission output (dBm)	11g: +14/11b: +18	Class 2
Receiving sensitivity (dBm)	TYP.: –84 (11 Mbps, PER 8%) TYP.: –71 (54 Mbps, PER 10%)	TYP.: –70 (1 Mbps, BER 0.1%) TYP.: –70 (2 Mbps, BER 0.01%) TYP.: –70 (3 Mbps, BER 0.01%)
Security	WEP TKIP AES	by driver software
Interface	SPI/SDIO	PCM (64 kbps), SPI/UART

Consult separately regarding driver software.

■ Infrared Data Communication Device Lineup

Communication system	Transmission speed	Transmission distance	Features	Operating supply voltage	Model No.
IrDA data	FIR 4 Mb/s (Receiver only)	250 cm		3.0 to 3.6 V	GP2W4020XPMF
(IrDA 1.x)		150 cm		3.0 to 3.6 V	GP2W4010YP0F
	FIR 4 Mb/s (Integrated receiver and transmitter type)	100/20 cm	LP/MP/HP mode switching function	2.7 to 5.5 V	GP2W1001YP0F
		35/21 cm	LP/HP mode switching function, remote control transmission function, thin (height: 1.5 mm)	2.6 to 3.6 V	GP2W3152YP0F
			LP/HP mode switching function, remote control transmission function, top view type (height: 1.75 mm)	2.6 to 3.6 V	GP2W3172XP0F
			LP/HP mode switching and remote control transmission functions	2.6 to 3.6 V	GP2W3120YP0F
		20 cm	LP/HP mode switching function	2.6 to 3.6 V	GP2W1320YP0F
		70/21 cm	LP/MP/HP mode switching and remote control transmission functions	2.6 to 3.3 V	GP2W3104YP0F
	SIR 115.2 kb/s (Integrated receiver and transmitter type)	100 cm	Compact, low dissipation current	2.4 to 5.5 V	GP2W0004YP0F/ GP2W0004XP0F
	SIR LP 115.2 kb/s (Integrated receiver and transmitter type)	21 cm	Built-in LED constant current circuit, 3-state output	2.0 to 3.6 V	GP2W0110VX/ GP2W0110VY

RoHS Pb FREE

■ Infrared Data Communication Devices

◆FIR Compliant Devices (Receiver Only)

Model No.	Communication system	Transmission speed	Description	Maximum reception distance*1 (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W4020XPMF	Uni-directional communication (receiving only)	4 Mb/s	IrSS™-compliant, receiving-only type	250	3 to 3.6	20.96 × 6.68 × 7.1
GP2W4010YP0F	Uni-directional communication (receiving only)	9.6 k to 4 Mb/s	IrSS™-compliant, receiving-only type	150	3 to 3.6	10 × 3.93 × 4.53

*1 Radiant intensity at transmitting side: 100 mW/sr

GP2W4020XPMF

GP2W4010YP0F

◆FIR Compliant Devices (Integrated Receiver and Transmitter Type)

Model No.	Communication system	Transmission speed	Description	Transmission distance (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W3152YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	With remote control transmission function, LP/HP mode switching function	21/35	2.6 to 3.6	7.88 × 2.76 × 1.5
GP2W3172XP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	With remote control transmission function, top-view, LP/HP mode switching function	21/35	2.6 to 3.6	8.76 × 2.53 × 1.75
GP2W3120YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	With remote control transmission function, LP/HP mode switching function	21/35	2.6 to 3.6	7.16 × 2.73 × 1.82
GP2W1001YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	LP/MP/HP mode switching function	20/100	2.7 to 5.5	10.01 × 4.38 × 3.53
GP2W1320YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	Compact, thin, low dissipation current (Icc: TYP. 0.45 mA)	21	2.6 to 3.6	7.16 × 2.73 × 1.82
GP2W3104YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	With remote control transmission function, LP/MP/HP mode switching function	21/70	2.6 to 3.3	7.9 × 2.85 × 2.5

GP2W3152YP0F

GP2W3172XP0F

GP2W3120YP0F

GP2W3104YP0F

GP2W1001YP0F

GP2W1320YP0F

IR Devices

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◆SIR Compliant Devices (Integrated Receiver and Transmitter Type)

Model No.	Communication system	Transmission speed	Description	Transmission distance (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W0004YP0F	Bi-directional (half-duplex) communication	9.6 k to 115.2 kb/s	Low dissipation current (Icc: 130 µA MAX.)	100	2.4 to 5.5	9.21 × 3.76 × 2.71
GP2W0004XP0F	Bi-directional (half-duplex) communication	9.6 k to 115.2 kb/s	Low dissipation current (Icc: 130 µA MAX.), top-view	100	2.4 to 5.5	9.21 × 3.35 × 3.8


GP2W0004YP0F


GP2W0004XP0F

◆SIR LP Compliant Devices (Integrated Receiver and Transmitter Type)

Model No.	Communication system	Transmission speed	Description	Transmission distance (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W0110VX/VY	Bi-directional (half-duplex) communication	2.4 k to 115.2 kb/s	Top-view and side view compatible (Model name is prescribed based on the packaging status.)	21	2.0 to 3.6	6.8 × 2.35 × 2.1


GP2W0110VX
(GP2W0110VY)

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IR DETECTING UNIT FOR REMOTE CONTROL LINEUP (CLASSIFIED BY FORM)

■ IR Detecting Unit for Remote Control Lineup (Classified by Form)

Type	Package		Features	Model No.
	Form	Detection position*5 (from PCB)		Operating voltage: 3 to 5 V
IR detecting unit for remote control	Compact, thin type SMD (4.5 × 5.0 × 1.35 t mm)			GP1USC3xXP series
	Compact type SMD (6.8 × 2.1 × 2.35 t mm)			GP1UF31 series
	Lead L bend with shield case (holder)	16.0 mm*1	Compact size	GP1UE28xXKC4 series
			Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE28xRKC4 series
		12.0 mm*2	Compact size	GP1UE27xXKC4 series
			Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE27xRKC4 series
		6.8 mm*3	Compact size	GP1UE26xXKC4 series
			Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE26xRKC4 series
	Lead straight with shield case (holder)	19.0 mm	Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE29xQKC4 series
	Holderless	9.6 mm	Compact size	GP1UE28xYKC4 series
			Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE28xQKC4 series
		Lead straight 6.0 mm		GP1UXC4xQS series
		Lead L bend*4 5.3 mm		GP1UXC4xRK series

*1 Mesh type (strengthened resistance to electromagnetic induction noise): 16.4 mm
*2 Mesh type: 12.4 mm *3 Mesh type: 7.2 mm *4 Mesh type: 5.3 mm
*5 Lead straight: Distance from lens center to mounting board upper surface
No mesh lead L bend: Distance from tip of lens to mounting board upper surface
Mesh-type lead L bend: Distance from tip of mesh to mounting board upper surface


GP1UE26xXKC4


GP1UE27xXKC4


GP1UE28xXKC4


GP1UE28xYKC4


GP1UE26xRKC4


GP1UE27xRKC4


GP1UE28xRKC4


GP1UE28xQKC4


GP1UE29xQKC4


GP1UE4xQS


GP1UF31xXP0F
(GP1UF31xYP0F)


GP1USC3xXP

☆New product

■ IR Detecting Units for Remote Control

(Ta = 25°C)

Type	Series No.	Absolute maximum ratings		Operating voltage (V)	Electrical characteristics				Size (mm)	Terminal layout
		Vcc (V)	Topr (°C)		Icc (mA) *1 MAX.	V_{OH} (V) MIN.	V_{OL} (V) MAX.	fo (kHz) TYP.		
Surface-mount type, Reflow soldering compatible	GP1UF31xXP0F/ *5 GP1UF31xYP0F	0 to 6.0	–30 to +85	2.7 to 5.5	0.4	Vcc–0.5	0.45	*4	6.8 × 2.1 × 2.35	–
	☆GP1USC3xXP	0 to 6.0	–30 to +85	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5 × 4.5 × 1.3	–
With shield case (holder), 3 to 5 V drive	GP1UE26xXKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 9.6 × 6.8	Center Vcc
	GP1UE27xXKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 9.6 × 12.0	
	GP1UE28xXKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 9.6 × 16.0	
	GP1UE28xYKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 8.6 × 12.5(9.6)*2	
With shield case (holder), 3 to 5 V drive, Strengthened resistance to electromagnetic induction noise	GP1UE26xRKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 9.6 × 7.2	
	GP1UE27xRKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 9.6 × 12.4	
	GP1UE28xRKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 9.6 × 16.4	
	GP1UE28xQKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 9.0 × 12.5(9.6)*2	
	GP1UE29xQKC4	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.6 × 16.2 × 21.9(19)*2	
Holderless, 3 to 5 V drive, Strengthened resistance to electromagnetic induction noise	GP1UXC4xQS	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.5 × 5.3 × 7.5	Center GND
	GP1UXC4xRK	0 to 6.0	–10 to +70	2.7 to 5.5	0.6	Vcc–0.5	0.45	*3	5.5 × 5.3 × 7.5	

* A voltage regulator circuit is built-in but may be affected by the usage environment. Install with an externally mounted C and R as a power supply filter.
*1 When no signal is input (during input light).
*2 Figures in parentheses indicate the distance to the light detection center.
*3 fo = 32.75/36/36.7/38/40 kHz
*4 fo = 36/36.7/38/40 kHz
*5 GP1UF31xXP0F: Top view taped package,
GP1UF31xYP0F: Side view taped package

■ Advanced Flex Printed Circuit Boards

The advanced flex printed circuit board is a multilayered composite wiring board comprised of flexible printed circuits (FPC) laminated into a multilayer configuration. The PWBs and FPCs are connected to each other via copper-plated through holes. It is ideal for compact, lightweight equipment design.

◆ Features

(1) For selecting optimal specifications to suit specific applications, special specifications such as for mobile phones are also available.
- Minimum thickness in multi-layer part: 0.26 mm (4-layer), 0.33 mm (6-layer)
- Minimum pattern width/pitch: 0.06/0.07 mm
- Flexibility of single/double sided FPC part (dedicated for hinge): More than 200 000 times 180-degree bending of radius 3 mm

(2) Capable of board-to-board connection without connectors, which enables space-saving and 3-dimensional equipment assembly.

(3) Through hole plating connection of multi-layer (3 to 8) part to flexible part significantly improves reliability.

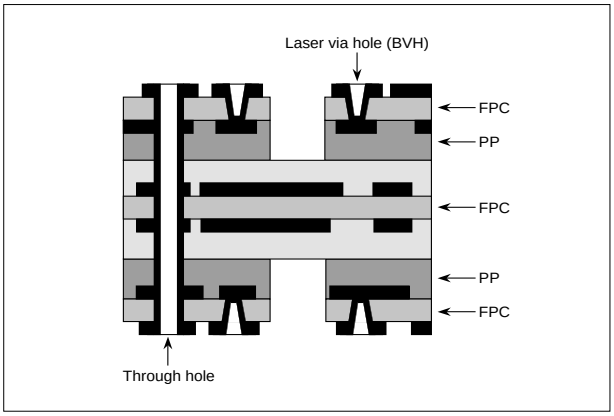
(4) Blind Via Hole (BVH) forming with laser via drilling of small diameter.

(5) Sheet design provides excellent mountability, equivalent to that of PWB.

◆ Outline Specifications

Type		Folding type/Flying tail type
Min. base thickness (mm)		0.26 (4-layer), 0.33 (6-layer), 0.40 (8-layer)
Min. line width/spacing (mm)		0.06/0.07
Min. through hole diameter (mm)		ø0.25
Min. via hole land diameter	Through hole (mm)	Outer layer: ø0.5, Inner layer: ø0.5
	Blind via hole (mm)	ø0.09
	Inner via hole (mm)	ø0.30
Solder resist		Multi layer: Liquid photo solder resist, FPC: Film cover ray
Surface finish		Heat-resistant preflux, Ni-Au plating (Ni-Au plating for flying tail)
Safety standard		UL (94V-0)

■ Construction of Advanced Flex Board (example of 6-layer BVH)



■ Flexible Build-Up Multilayer PCBs

<Flex-rigid specifications>

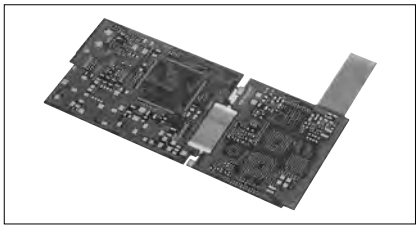
Advanced flex specifications are used for the inner layer core material of this build-up multilayer PCB, so the board can handle finer mounting patterns and achieve connectorless between-board connections using an inner layer flexible printed circuit (FPC). This facilitates greater equipment design flexibility and ultra-compact designs.

◆Features

(1) Multiple build-up layers are connected internally with an FPC, thereby improving connection reliability between multilayer boards and reducing both connection space and connector weight.

(2) Enables narrow pitch (0.4 mm) CSP and bare chip mounting, and thus greater equipment compactness through ultra-high density mounting.

(3) Enables via-on-IVH (inner-via-hole) configurations, and makes it possible to achieve ultra-high density wiring designs.
(Facilitates a diverse range of designs for greater compactness and thinness.)

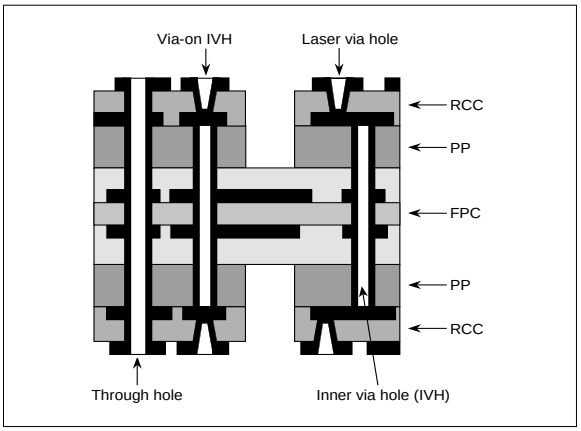


◆Outline Specifications

Type		F1 (6- to 8-layer)
No. of build-up layers		1 for each side of core layer
Core layer configuration		3 to 6 layers (Polyimide, FR-4)
Min. board thickness*1 (mm)		0.57 (6-layer), 0.77 (8-layer)
Via hole diameter Land hole diameter	Conformal via hole (mm)	ø0.09/ø0.30
	Stacked via hole	–
Via-on IVH		Available
Inner via hole diameter (mm)		ø0.2
Min. line width/spacing*2 (mm)		0.09/0.09
CSP mountable pitch (mm)		0.4
Safety standard		UL (94V-0)

*1 Consult with SHARP if a thinner type is required for special designs.
*2 Values are measured at build-up portion.

■ Construction of Flexible Build-Up Multilayer PCBs (example of 6-layer IVH)



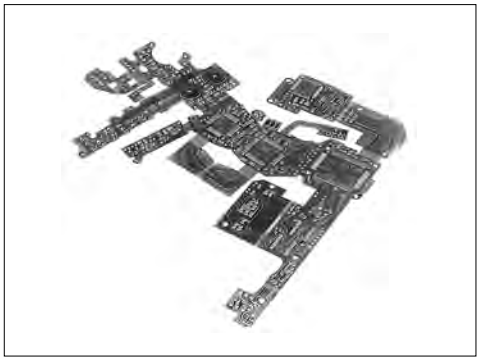
■ Flexible Printed Circuit Boards

The flexible printed circuit board is designed for high space efficiency and product design flexibility, which are now aiming at more compact and higher density mounting. It also contributes to the reduction of assembly process and to the enhancement of the reliability.

◆ Features

(1) High density mounting circuit, SMT and other most suitable flexible PCB are available.

(2) High precision type for COF with flip chip mounting and wire bonding capabilities and other connector mounting type are also available.



◆ Standard specifications

Layers	Single side	Both-side through-hole
Substrate materials	Polyimido film, non-adhesive polyimido	
Design pattern width (mm)	0.02 (MIN.)	0.05 (MIN.)
Design pattern spacing (mm)	0.04 (MIN.)	0.05 (MIN.)
Through-hole / land diameter (mm)	–	ø0.1/ø0.3 (MIN.)
Cover lay	Polyimido film, heat resistant ink, liquid soldering resist	
Safety standard	UL (94V-0)	

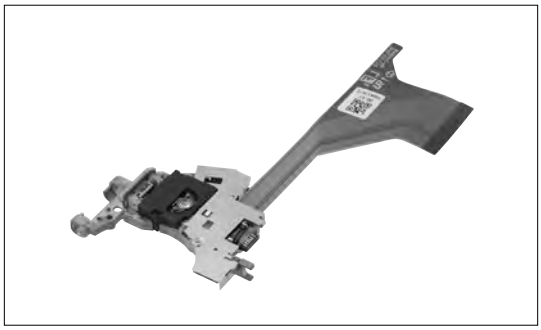
◆ Line-up

Multi-layer flexible PCB	Both-side flexible PCB	
Single-layer flexible PCB	Flex-rigid PCB	
Single-side high precision flexible PCB	Both-side high precision flexible PCB	

Other line-up

Bonding Ni-Au plating
Highly flexible (bending capacity)
High density SMT

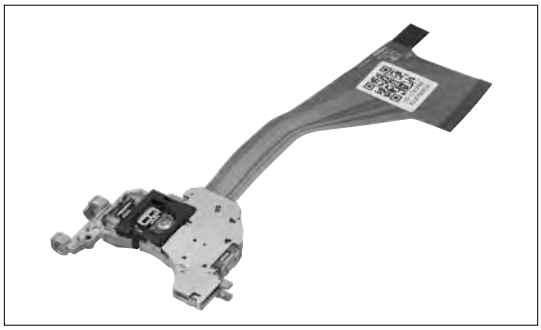
■ Slim Combo Drive Pickup <DD-57>



◆ **Features**

- Thin type pickup compatible with half-inch-height drive (12.7 mm thickness)
- Playback speed: 8× (DVD-ROM), 24× (CD-ROM)
- Recording speed: 24× (CD-R), 24× (CD-RW)
- DVD-RAM readable
- Outline dimensions: W 38.6 × H 7.3 × D 48.7 (mm)
- Weight: Approx. 11 g

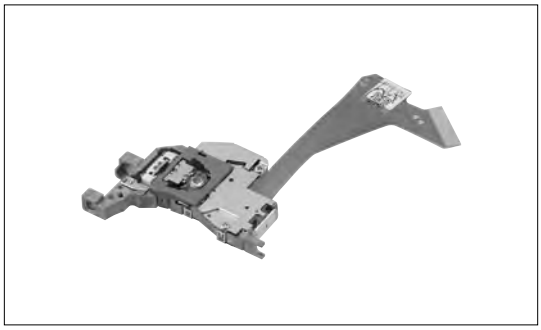
■ Slim DVD Super-Multi Drive Pickup <DD-115>



◆ **Features**

- Thin type pickup compatible with half-inch-height drive (12.7 mm thickness)
- Playback speed: 8× (DVD-ROM), 24× (CD-ROM)
- Recording speed: 8× (DVD±R, +RW, ±R/+RW(DL))
  6× (DVD-RW, -RW(DL))
  5× (DVD-RAM)
  24× (CD-R/RW)
- Outline dimensions: W 35.6 × H 7.3 × D 48.7 (mm)
- Weight: Approx. 13.5 g

■ DVD Pickup for Automotive Use <HPD-61>



◆ **Features**

- Compact, thin (7.3 mm) pickup
- Playable disk: DVD-ROM, CD-ROM
- Operating temperature: –20 to +80°C
- Outline dimensions: W 30.2 × H 7.3 × D 48.7 (mm)
- Weight: Approx. 13.5 g

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UKAS ENVIRONMENTAL MANAGEMENT 051

CERTIFIED JQA MANAGEMENT SYSTEM ENVIRONMENTAL SYSTEM

UL REGISTERED FIRM
SHARP CORPORATION
20002660 UM ISO14001:2004

ANAB ACCREDITED

The following facilities of Sharp Corporation have been certified under the ISO 14001 international standard for environmental management systems. In our products and manufacturing processes, we are actively engaged in environmental preservation efforts.

Facility	Certificate No.	Date of Registration/Renewal	Scope of Registered Activities
Headquarters and Associated Companies Group	EC97J1037	June 24, 1997	Research and development of electronic and electric products and general electronic components, sales and service activities, and general administration within the registered organization
Katsuragi Works	EC99J2006	June 25, 1996	Development, design and production of photovoltaic cells and electronic devices
Electronic Components and Devices Group (Fukuyama)	EC99J2016	September 24, 1996	The manufacture of IC (Memory, Logic, etc.)
Advanced Development and Planning Center	EC99J2038	December 3, 1996	Research and development, production engineering development and promotion, design and manufacture of electronic devices
Mobile Liquid Crystal Display Group	EC99J2051	January 28, 1997	Development, design and manufacture of LCDs and inorganic electroluminescence
Kameyama Plant	EC04J0284	October 12, 2004	Production and development of Large LCD TV including affiliate companies
Electronic Components and Devices Group (Mihara)	200026660 UM	November 17, 2003	Design, development and manufacture of laser diodes, hologram laser and LED devices and printed wiring board, design of optical pick-up units

CERTIFIED JQA MANAGEMENT SYSTEM QUALITY SYSTEM
MS JAB CM009

The following groups of Sharp Corporation have been certified under the ISO 9001:2008 international standard for quality management systems.

Certifying organization: Japan Quality Assurance Organization (JQA) [JAB certified]

Group	Certificate No.	Scope of Registered Activities
Electronic Components and Devices Group System Device Division I*1 System Device Division II	JQA-QM8688	Design, development, and manufacture of semiconductor integrated circuits / Design, development, and manufacture of RF components / Design, development, and manufacture of optoelectronic devices / Design, development, and manufacture of component mounting modules / Design, development, and manufacture of printed circuit boards
Electronic Components and Devices Group System Device Division III	JQA-QMA14116	Design, development, and manufacture of LED devices / Design, development, and manufacture of stand-alone laser diodes and hologram lasers / Design, development, and manufacture of optical pickups
General Manager Liquid Crystal Display Business / Liquid Crystal Display Administration Group / Liquid Crystal Display Group / Liquid Crystal Display Production Group*2	JQA-QMA11778	1) Design, development and manufacture of LCD panels 2) Design and development of LCD modules
Liquid Crystal Display Administration Group / Liquid Crystal Display Group / Liquid Crystal Display Production Group*3	JQA-QM3776	Design, development, and manufacture of LCD panels and modules

*1 This Group designates Sharp Takaya Electronics Industry Co., Ltd. (JQA-AU0212) as an ISO/TS16949: 2002 management system registered facility with regard to design, development and manufacture of camera units for vehicle use, with registration as a management system support division.
*2 These four Group names have been changed from AVC Liquid Crystal Display Group as of April 1, 2010.
*3 These three Group names have been changed from Mobile Liquid Crystal Display Group as of April 1, 2010.

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