



Photocoupler

Product Data Sheet

LTV-M501-DE

Spec No.: DS70-2013-0019

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Revision: -

LITE-ON DCC

RELEASE

BNS-OD-FC001/A4

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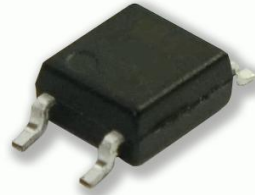
LTV-M501-DE

Small Outline, 5 Lead, High Speed Optocouplers



Description

The LTV-M501-DE consists of a high efficient AlGaAs Light Emitting Diode and a high speed optical detector. This design provides excellent AC and DC isolation between the input and output sides of the Optocoupler. Connection for the bias of the photodiode improves the speed that of a conventional phototransistor coupler by reducing the base-collector capacitances. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 15KV/ μ s (Min.)



Features

- Surface mountable
- High speed – 1MBd typical
- Compatible with infrared vapor phase reflow and wave soldering process
- Very high common mode transient immunity: 15K V/ μ s at $V_{CM} = 1500$ V guaranteed
- TTL compatible
- Open collector output
- Lead free option
- Worldwide Safety approval :

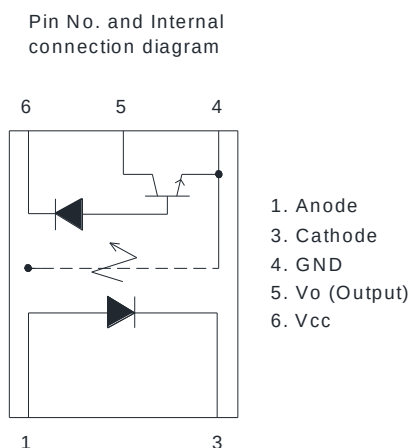
UL/ cUL 1577, Cert. No.E113898.

3750 Vrms/1 min

VDE DIN EN60747-5-5, Cert. No. 138213

$V_{IORM} = 560 V_{peak}$

Functional Diagram



Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

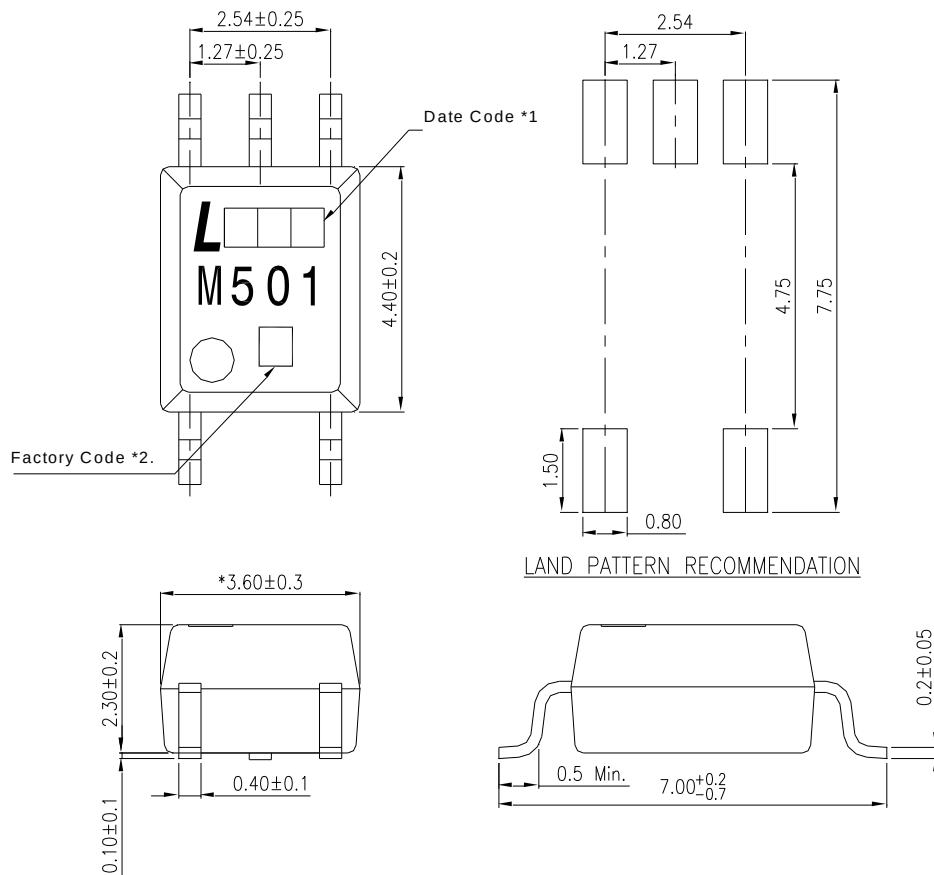
A 0.1 μ F bypass Capacitor must be connected between Pin4 and Pin6

Application

- Line receivers: High common mode transient immunity (>1000 V/ μ s) and low input-output capacitance (0.6 pF).
- High speed logic ground isolation: TTL/TTL, TTL/LTTL, TTL/CMOS, TTL/LSTTL
- Replace slow phototransistor optocouplers
- Replace pulse transformers: save board space and weight
- Analog signal ground isolation: Integrated photon detector provides improved linearity over phototransistor type

Package Dimensions

5-pin SOP Package (LTV-M501-DE)



*1. Year date code and 2-digit work week.

*2. Factory identification mark

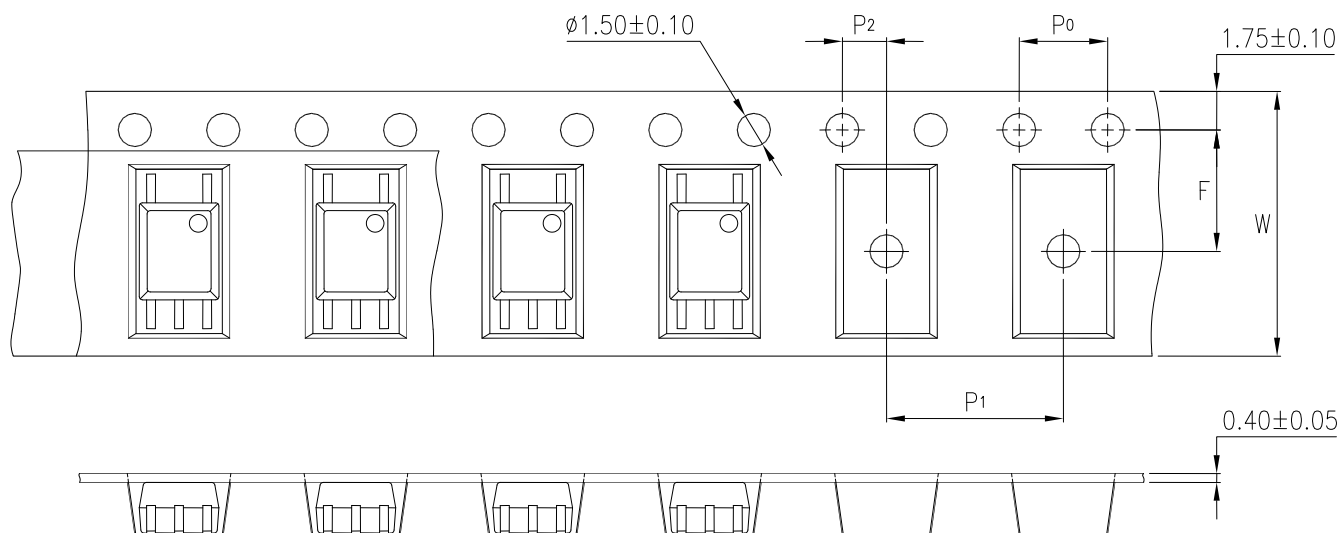
(W :China-CZ)

Dimensions are in Millimeters and (Inches).

Mold flash on each side is 0.15mm maximum

Taping Dimensions

LTV-M501-DE



Description	Symbol	Dimensions in millimeters (inches)
Tape wide	W	12±0.3 (0.47)
Pitch of sprocket holes	P0	4±0.1 (0.15)
Distance of compartment	F	5.5±0.1 (0.217)
Distance of compartment to compartment	P1	8±0.1 (0.315)

Quantitv Per Reel

Package Type	LTV-M501-DE
Quantities(pcs)	3000

Absolute Maximum Ratings*1

Parameter	Symbol	Min	Max	Units	Note
Storage Temperature	T _{ST}	-55	125	°C	
Operating Temperature	T _A	-55	100	°C	
Isolation Voltage	V _{ISO}	3750		V _{RMS}	
Supply Voltage	V _{CC}	-0.5	30	V	
Lead Solder Temperature * 2			260	°C	2
Input					
Average Forward Input Current	I _F		25	mA	
Peak Input Current (50% duty cycle, 1 ms pulse width)	I _F		50	mA	
Peak Transient Input Current (1 μs pulse width, 300 pps)	I _F		1.0	A	
Reverse Input Voltage	V _R		5	V	
Input Power Dissipation	P _I		45	mW	
Output					
Output Collector Current	I _O		8	mA	
Peak Output Current	I _O		16	mA	
Output Collector Voltage	V _O	-0.5	20	V	
Output Collector Power Dissipation	P _O		100	mW	

1. Ambient temperature = 25°C, unless otherwise specified. Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

2. 260°C for 10 seconds. Refer to Lead Free Reflow Profile.

Electrical Specifications

Parameters	Test Condition	Symbol	Min	Typ	Max	Units
Input						
Input Forward Voltage	$I_F = 16\text{mA}$, $T_A = 25^\circ\text{C}$	V_F	1.2	1.4	1.8	V
Input Reverse Voltage	$I_R = 10\mu\text{A}$	BV_R	5			V
Detector						
Current transfer ratio	$I_F = 16\text{mA}$; $V_{CC} = 4.5\text{V}$; $T_A = 25^\circ\text{C}$; $V_O = 0.4\text{V}$	CTR	20	24	50	%
	$I_F = 16\text{mA}$; $V_{CC} = 4.5\text{V}$; $T_A = 25^\circ\text{C}$; $V_O = 0.5\text{V}$		15	25		
Logic low output voltage output voltage	$I_F = 16\text{mA}$; $V_{CC} = 4.5\text{V}$; $I_O = 3.0\text{mA}$; $T_A = 25^\circ\text{C}$	V_{OL}		0.1	0.4	V
	$I_F = 16\text{mA}$; $V_{CC} = 4.5\text{V}$; $I_O = 2.4\text{mA}$; $T_A = 25^\circ\text{C}$				0.5	
Logic high output current	$I_F = 0\text{mA}$, $V_O = V_{CC} = 5.5\text{V}$, $T_A = 25^\circ\text{C}$	I_{OH}		0.003	0.5	μA
	$I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$ $T_A = 25^\circ\text{C}$			0.01	1	
	$T_A = 0 \sim 70^\circ\text{C}$				50	
Logic low supply current	$I_F = 16\text{mA}$, $V_O = \text{open}$ ($V_{CC} = 15\text{V}$)	I_{CCL}		50	200	
Logic high supply current	$I_F = 0\text{mA}$, $V_O = \text{open}$; $T_A = 25^\circ\text{C}$ ($V_{CC} = 15\text{V}$)	I_{CCH}		0.02	1	

Over recommended temperature ($T_A = 0^\circ\text{C}$ to 70°C) unless otherwise specified.

*All Typical at $T_A = 25^\circ\text{C}$

Switching Specifications

Parameter	Test Condition		Symbol	Min	Typ	Max	Units		
Propagation Delay Time to Low Output Level	$T_A = 25^{\circ}\text{C}$	$R_L=1.9\text{K}\Omega$	t_{PHL}		200	800	ns		
	$0 \sim 100^{\circ}\text{C}$					800			
Propagation Delay Time to High Output Level	$T_A = 25^{\circ}\text{C}$		t_{PLH}		250	800			
	$0 \sim 100^{\circ}\text{C}$					800			
Logic High Common Mode Transient Immunity	$I_F = 0\text{mA}; V_{\text{CM}} = 1500\text{Vp-p}; C_L = 15 \text{ pF}; T_A=25^{\circ}\text{C}, R_L=1.9\text{K}\Omega$		$ \text{CM}_H $	15				KV/ μs	
Logic Low Common Mode Transient Immunity	$I_F = 16\text{mA}; V_{\text{CM}} = 1500\text{Vp-p}; C_L = 15 \text{ pF}; T_A = 25^{\circ}\text{C}, R_L = 1.9\text{K}\Omega$		$ \text{CM}_L $	15				KV/ μs	

Over recommended temperature ($T_A = 0^\circ\text{C}$ to 70°C) $V_{\text{CC}} = 5\text{V}$, $I_F = 16\text{mA}$ unless otherwise specified.

*All Typical at $T_A = 25^\circ\text{C}$

Isolation Characteristics

Parameter	Test Condition	Symbol	Min	Typ	Max	Units
Input-Output Insulation Leakage Current	45% RH, t = 5s, $V_{I-O} = 3\text{kV DC}$, $T_A = 25^\circ\text{C}$	I_{I-O}			1.0	μA
Withstand Insulation Test Voltage	$RH \leq 50\%$, t = 1min, $T_A = 25^\circ\text{C}$	V_{ISO}	3750			V_{RMS}
Input-Output Resistance	$V_{I-O} = 500\text{V DC}$	R_{I-O}		10^{12}		Ω

*All Typical at $T_A = 25^\circ\text{C}$

Notes

1. A $0.1\mu\text{F}$ or bigger bypass capacitor for V_{CC} is needed as shown in Fig.1
2. Current Transfer Ratio is defined as the ratio of output collector current I_O , to the forward LED input current I_F , times 100.
3. The $1.9\text{K}\Omega$ load represents 1TTL unit load of 1.6mA and the $5.6\text{K}\Omega$ pull-up resistor.
4. The $4.1\text{K}\Omega$ load represents 1LSTTL unit load of 0.36mA and the $6.1\text{K}\Omega$ pull-up resistor.

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Characteristics Curves

Figure 1: DC and Pulsed Transfer Characteristics

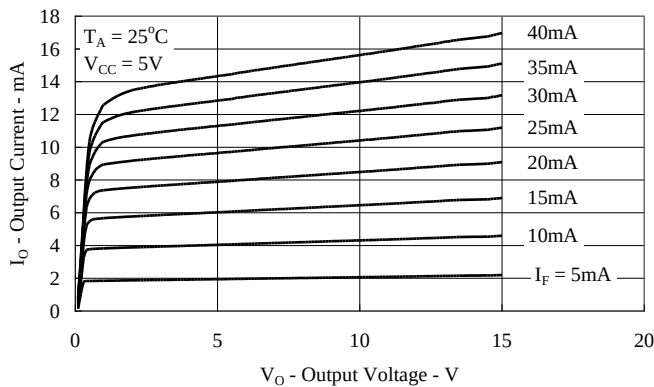


Figure 4: Current Transfer Ratio vs. Input

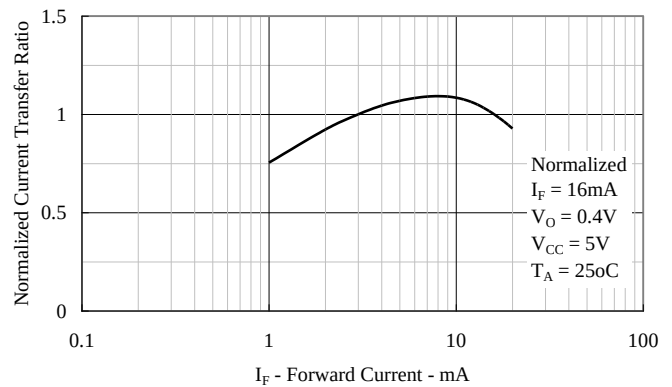


Figure 2: Input Current vs. Forward

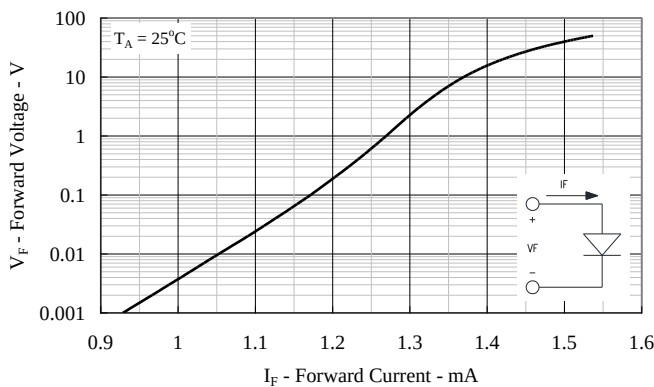


Figure 5: Current Transfer Ratio vs. Temperature.

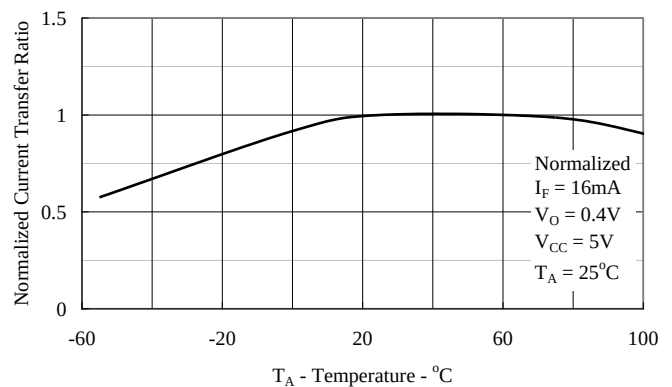


Figure 3: Propagation Delay vs. Temperature.

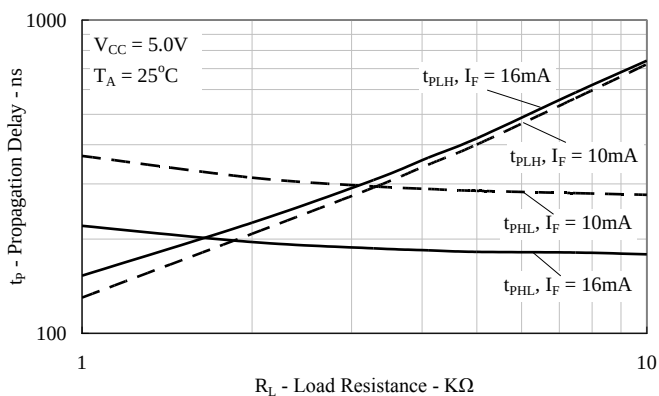
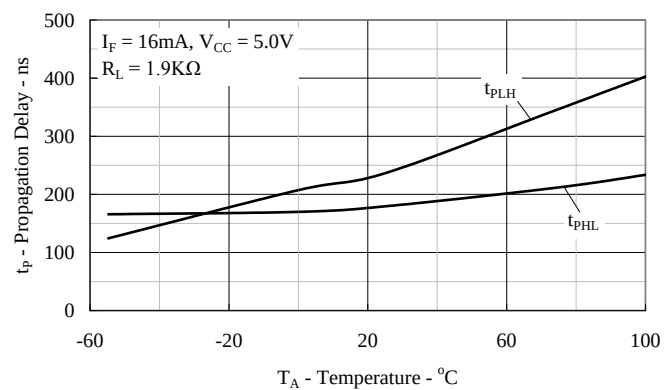


Figure 6: Propagation Delay Time vs. Load Resistance.



Characteristics Curves

Figure 7: Logic High Output Current vs. Temperature.

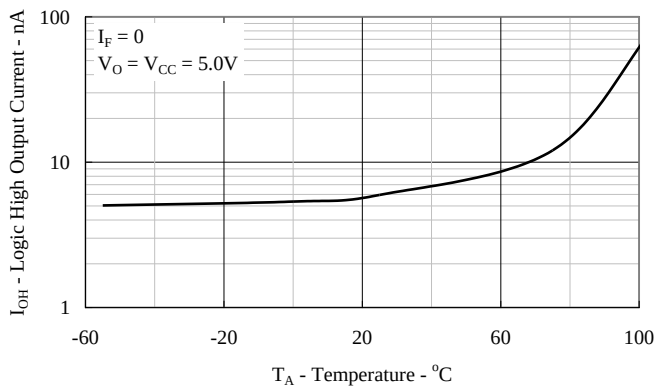


Figure 8: Frequency Response..

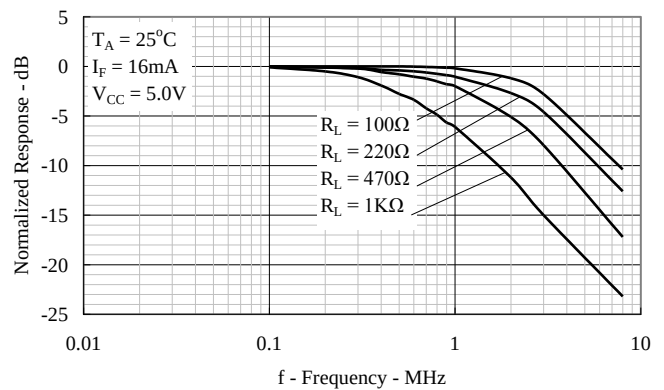


Figure 9: Switching Test Circuit

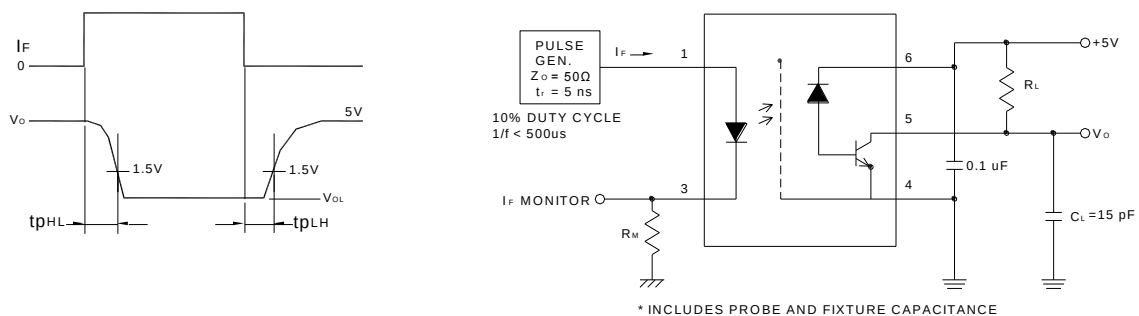
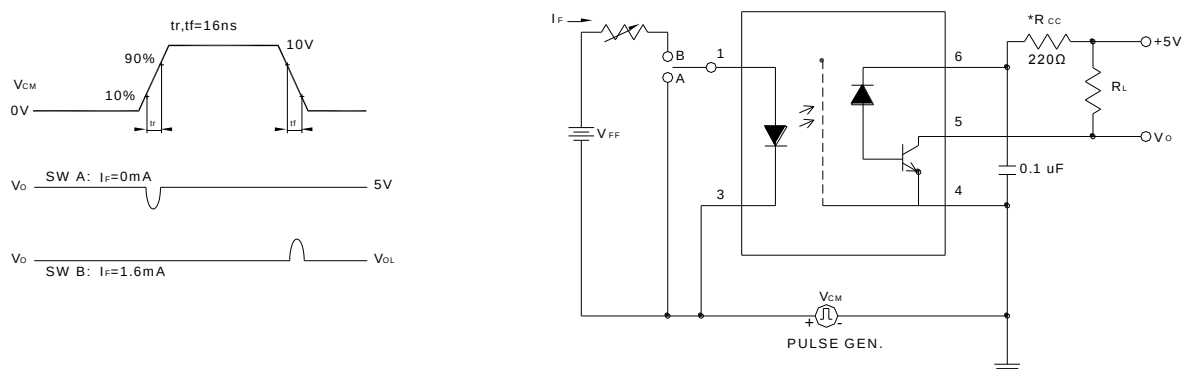


Figure 10: Test Circuit for Transient Immunity and Typical Waveforms

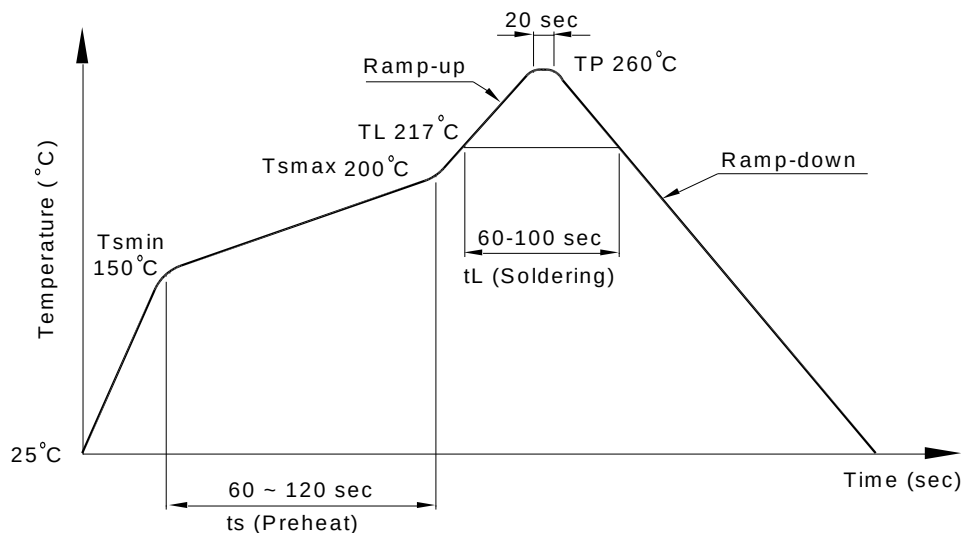


Temperature Profile Of Soldering Reflow

(1) IR Reflow soldering (JEDEC-STD-020C compliant)

One time soldering reflow is recommended within the condition of temperature and time profile shown below.

Profile item	Conditions
Preheat - Temperature Min (T_{Smin}) - Temperature Max (T_{Smax}) - Time (min to max) (t_s)	150°C 200°C 90±30 sec
Soldering zone - Temperature (T_L) - Time (t_L)	217°C 60 ~ 100sec
Peak Temperature (T_P)	260°C
Ramp-up rate	3°C / sec max.
Ramp-down rate	3~6°C / sec



Temperature Profile Of Soldering Reflow

(2) Wave soldering (JEDEC22A111 compliant)

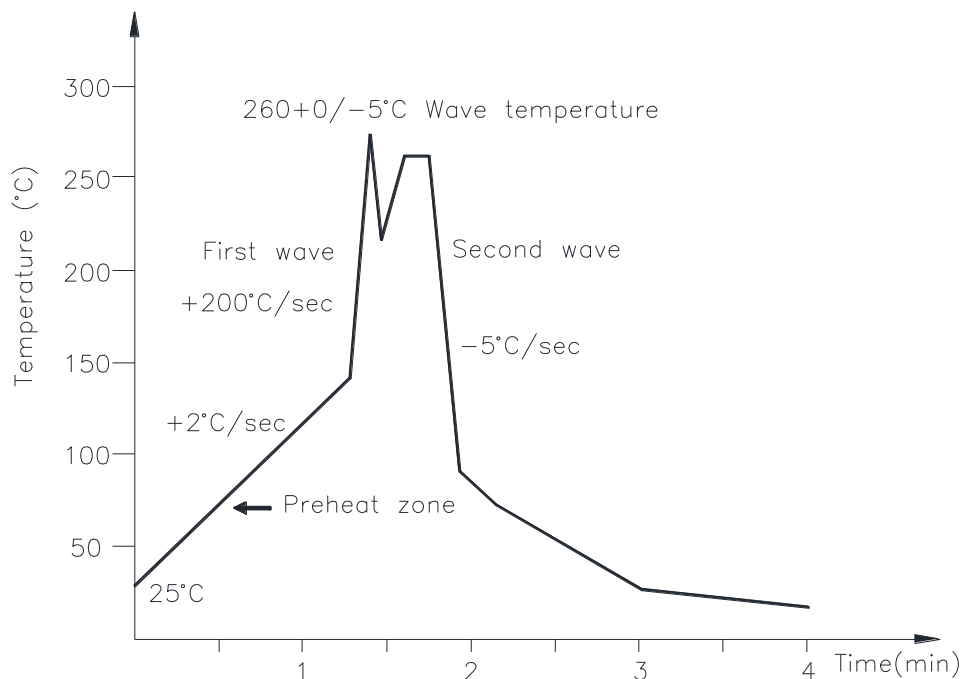
One time soldering is recommended within the condition of temperature.

Temperature: $260 \pm 0/-5^{\circ}\text{C}$

Time: 10 sec.

Preheat temperature: 25 to 140°C

Preheat time: 30 to 80 sec.



(3) Hand soldering by soldering iron

Allow single lead soldering in every single process. One time soldering is recommended.

Temperature: $380 \pm 0/-5^{\circ}\text{C}$

Time: 3 sec max.

Note:

Specifications of the products displayed herein are subject to change without notice.

The products shown in this publication are designed for the general use in electronic applications such as office automation equipment, communications devices, audio/visual equipment, electrical instrumentation and application. For equipment/devices where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.