

PAM2421/ PAM2422/ PAM2423

3A, 4.5A, 5.5A PWM STEP-UP DC-DC CONVERTER

Description

The PAM242x devices are high-performance, fixed frequency, current-mode PWM step-up DC/DC converters that incorporate internal power MOSFETs. The PAM242x includes an integrated power MOSFET that supports peak currents of up to 3A/4.5A/5.5A.

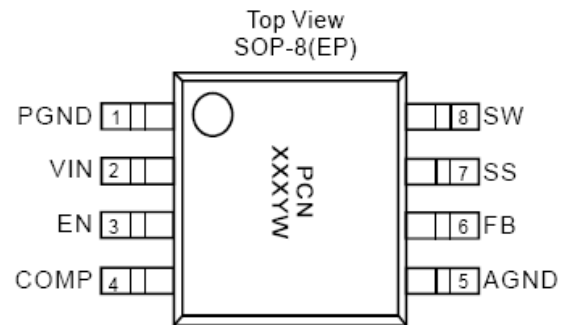
The PAM242x utilizes simple external loop compensation allowing optimization between component size, cost and AC performance across a wide range of applications. Additional functions include an externally programmable soft-start function for easy inrush current control, internal over-voltage protection (OVP), cycle-by-cycle current limit protection, under voltage lock-out and thermal shutdown.

The PAM242x is available in the small SOP-8(EP) package.

Features

- Greater than 90% Efficiency
- Adjustable Output Voltage Up to 24V
- Internal 24V Power MOSFET
- Peak Current 3A,4.5A,5.5A
- 520kHz Frequency
- Built-in Over-Voltage Protection (OVP)
- Open Protection
- Programmable Soft-Start Function
- Thermal Shutdowns
- Under-Voltage-Lockout
- Over-Current Protection
- SOP-8(EP) Package

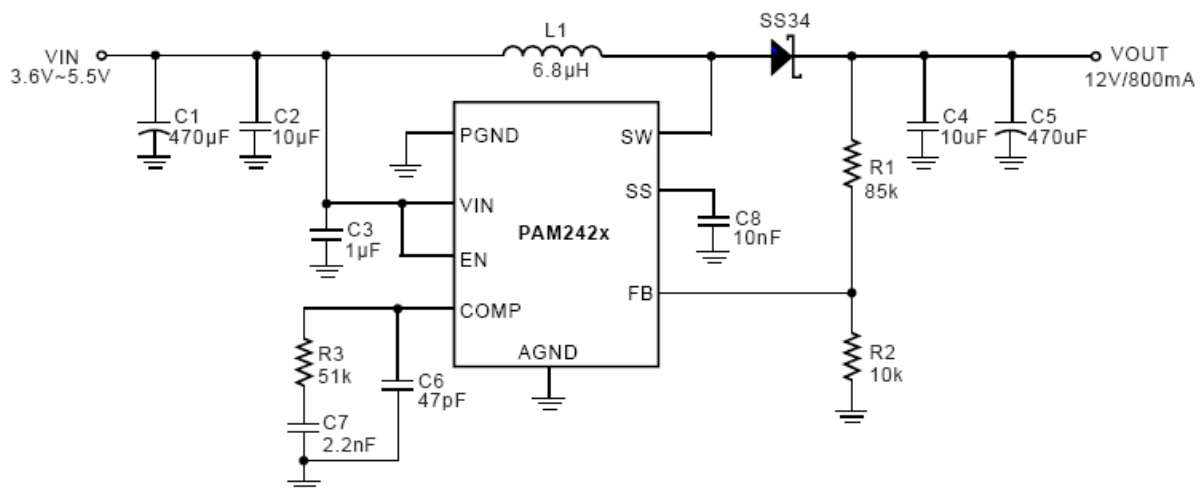
Pin Assignments



Applications

- TFT LCD Monitors
- Battery-Powered Equipment
- Set-Top Boxes
- DSL and Cable Modems and Routers

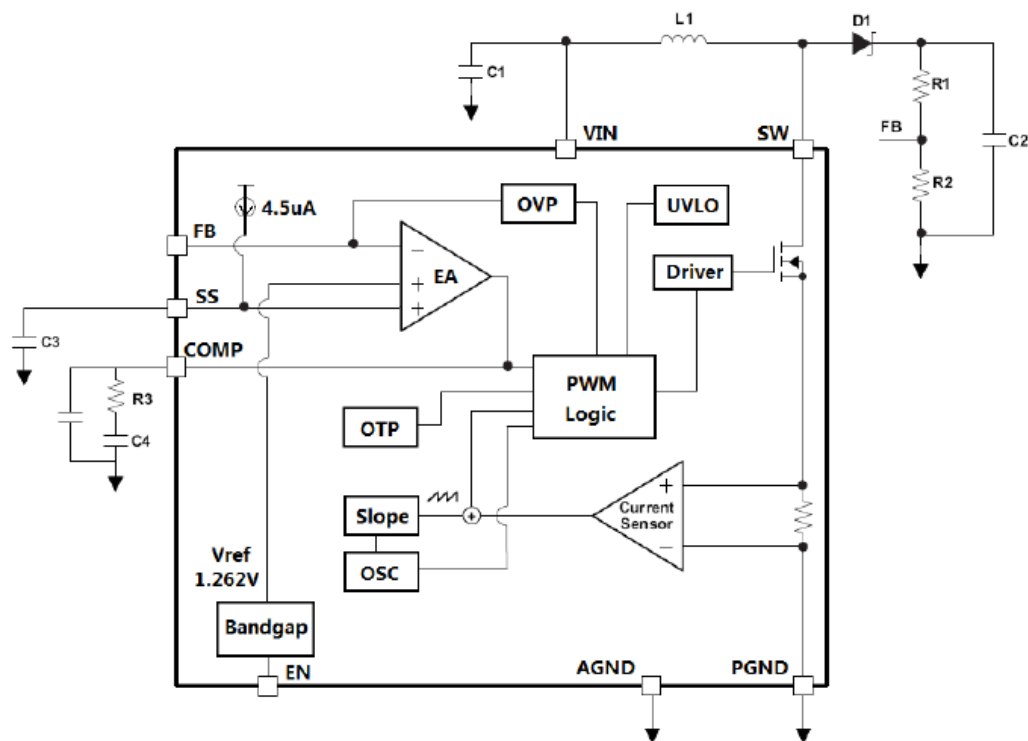
Typical Applications Circuit



Pin Descriptions

Pin Number	SOP-8(EP) Pin Name	Function
1	PGND	Power Ground
2	IN	Supply Input
3	EN	Enable Control. Connect to a logic high level to enable the IC. Connect to a logic low level to disable the IC. When unused, connect EN pin to IN (do not leave pin floating).
4	COMP	Error Amplifier Compensation Node
5	AGND	Analog Ground
6	FB	Feedback Input. Connect this pin a resistor divider from the output to set the output voltage. FB is regulated to 1.262V.
7	SS	Soft Start Control Input. Connect a capacitor from this pin to Ground to set soft-start timing duration. SS is discharged to ground in shutdown. SS may be left unconnected if soft start is not desired.
8	SW	Switch Output. Connect this pin to the inductor and the schottky diode. To minimize EMI, minimize the PCB trace path between this pin and the input bypass capacitor.
—	Exposed PAD	Connected to Ground

Functional Block Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

Parameter	Rating	Unit
SW to Ground	-0.3 to +28	V
VIN, EN, FB, SS, COMP to Ground	-0.3 to +6.5	V
Continuous SW Current	Internally Limited	V
Operating Temperature Range	-40 to +150	°C
Storage Temperature Range	-55 to +150	°C
Lead Temperature (Soldering, 10 sec)	300	°C

Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Parameter	Rating	Unit
Junction Temperature Range	-40 to +125	°C
Ambient Temperature Range	-40 to +85	

Thermal Information

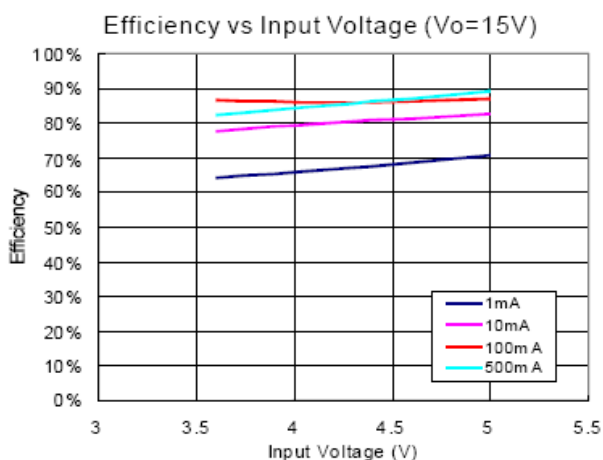
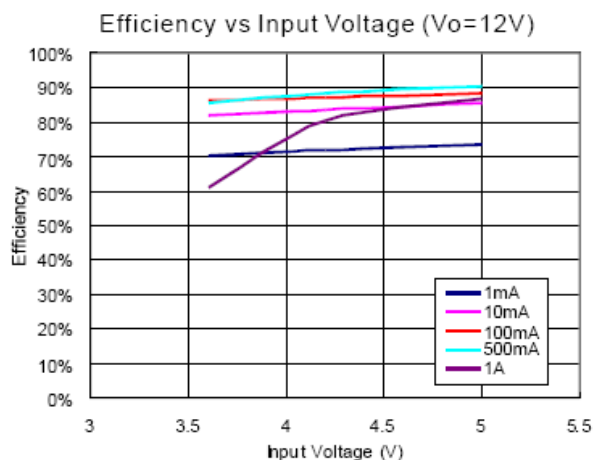
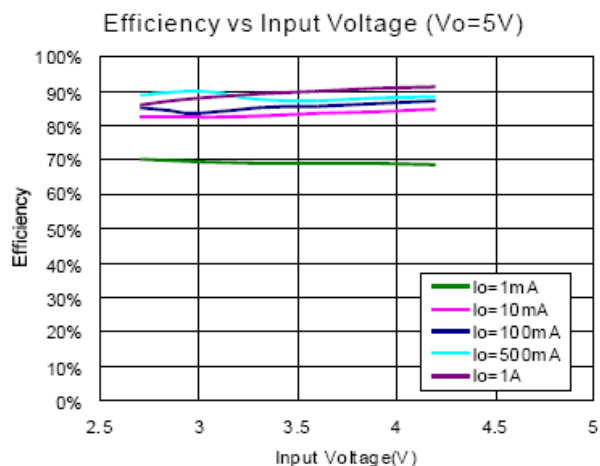
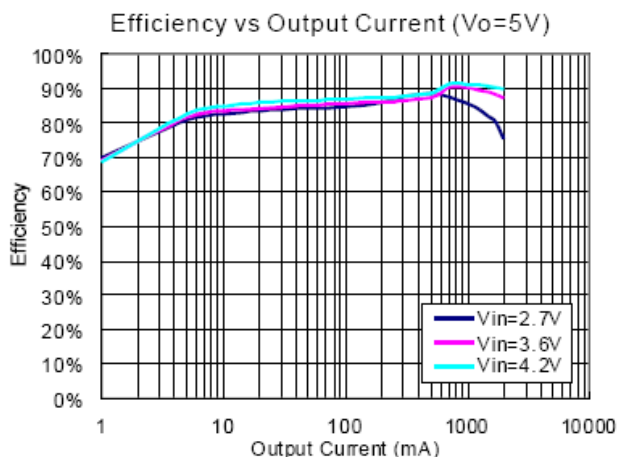
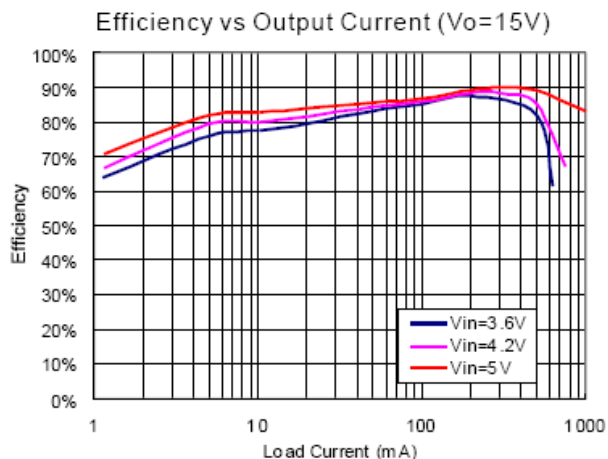
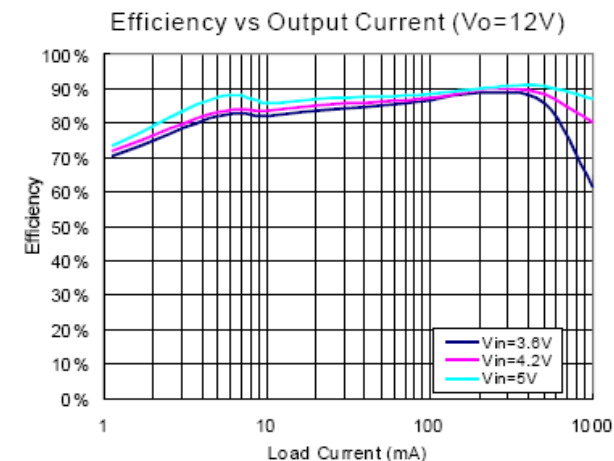
Parameter	Symbol	Package	Max	Unit
Thermal Resistance (Junction to Case)	θ_{JC}	SOP-8(EP)	75	°C/W
Thermal Resistance (Junction to Ambient)	θ_{JA}	SOP-8(EP)	180	

PAM2421/ PAM2422/ PAM2423

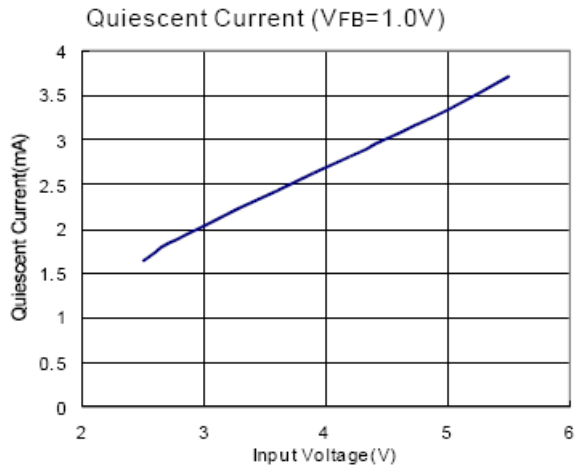
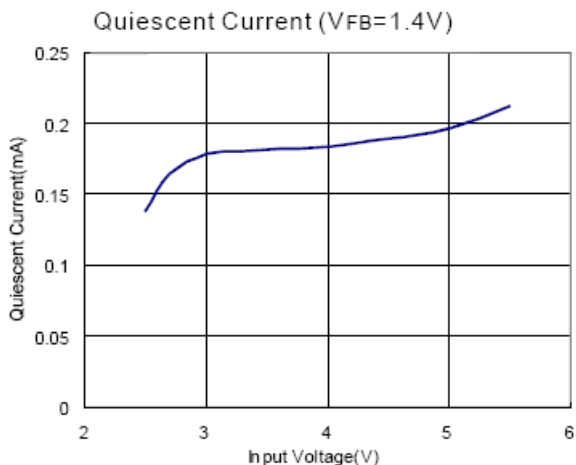
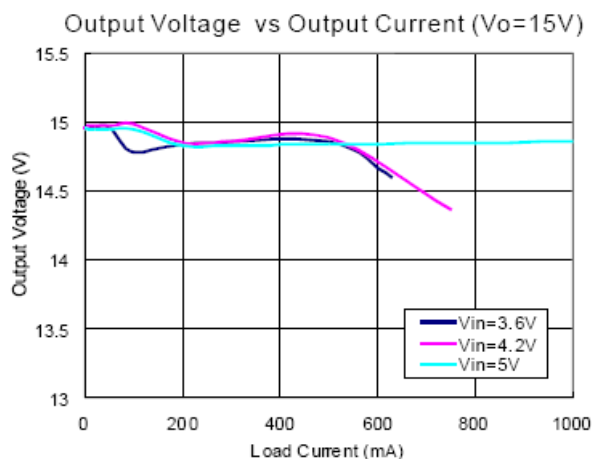
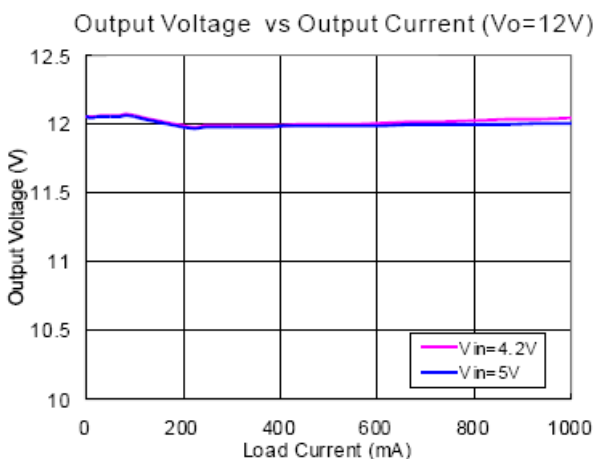
Electrical Characteristics (@T_A = +25°C, V_{IN} = V_{EN} = 5V, unless otherwise specified.)

Parameter	Test Conditions	Min	Typ	Max	Units
Input Voltage		2.7		5.5	V
Under Voltage Lockout Threshold	V _{IN} Rising		2.5		V
Under Voltage Lockout Hysteresis			200		mV
Quiescent Supply	V _{FB} = 1.4V, Not Switching		0.25	0.35	mA
	V _{FB} = 1.0V, Switching		3	5	
Supply Current in Shutdown	EN = Ground		0.1	1.0	μA
Switching Frequency			520		kHz
Maximum Duty Cycle		85			%
FB Feedback Voltage		1.237	1.262	1.287	V
FB Input Current			0	80	nA
FB Voltage Line Regulation	V _{FB} from 2.7V to 5.5V		0.05	0.15	%/V
Switch Current Limit	PAM2421	V _{IN} = 3.2V Duty Cycle = 70%	3		A
	PAM2422		4.5		
	PAM2423		5.5		
Switching On Resisistance	PAM2421		130		mΩ
	PAM2422		100		
	PAM2423		70		
Switch Leakage Current	V _{SW} = 10V, EN = Ground			15	μA
Soft Start Pin Bias Current	V _{SS} = 1.2V	2.0	4.5	7.0	μA
Logic High Threshold	EN Pin	1.4			V
Logic Low Threshold	EN Pin			0.4	V
EN Pull Down Resistor			1		mΩ
Thermal Shutdown Temperature			160		°C
Thermal Shutdown Hystersis			40		°C

Typical Operating Characteristics (@T_A = +25°C, V_{IN} = V_{EN} = 5V, V_{FREQ} = 0V, unless otherwise specified.)



Typical Performance Characteristics (cont.) (@T_A = +25°C, V_{IN} = V_{EN} = 5V, V_{FREQ} = 0V, unless otherwise specified.)



Application Information

The PAM242x are highly efficient step-up DC/DC converters that employ a current mode, fixed frequency pulse-width modulation (PWM) architecture with excellent line and load regulation. The PAM242x operate at constant switching frequency under medium to high load current conditions. At light loads, these devices operate in a pulse-skipping mode in order to improve light-load efficiency.

Soft-Start

The PAM242x both offer a programmable soft-start function which minimizes inrush current during startup. The soft-start period is programmed by connecting a 10nF capacitor between SS and Ground. Operation of the soft-start function is as follows: when the IC is disabled, SS is actively discharged to Ground. Upon enabling the IC, CSS is charged with a 4.5μA current so that the voltage at SS increases in a controlled manner. The peak inductor current is limited by the voltage at SS, so that the input current is limited until the soft-start period expires, and the regulator can achieve its full output current rating.

Setting the Output Voltage

The both feature external adjustable output voltages of up to 24V. To program the output voltage, simply connect a resistive voltage divider between the output, FB, and GND, with resistors set according to the following equation:

$$R1 = R2 \times \left[\left(\frac{V_{OUT}}{V_{FB}} \right) - 1 \right]$$

Where V_{FB} is 1.262V.

Rectifier Selection

For optimal performance, the rectifier should be a Schottky rectifier that is rated to handle both the output voltage as well as the peak switch current.

Open Voltage Protection

The features internal automatic over-voltage protection, when feedback voltage is higher than 115%.

Open Protection

Once the outputs achieve regulation, if the voltage at FB falls below 0.2V the controller will automatically disable, preventing the controller from running open-loop and potentially damaging the IC and load.

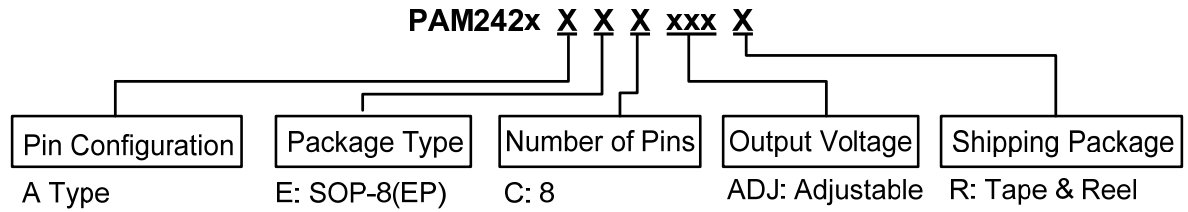
Shutdown

Drive EN low to disable the IC and reduce the supply current to just 0.1μA. As with all nonsynchronous step-up DC/DC converters, the external Schottky diode provides a DC path from the input to the output in shutdown. As a result, the output drops to one diode voltage drop below the input in shutdown.

The PAM242x both feature integrated thermal overload protection. Both devices are automatically disabled when their junction temperatures exceed +160°C, and automatically re-enable when the die temperature decreases by 40°C.

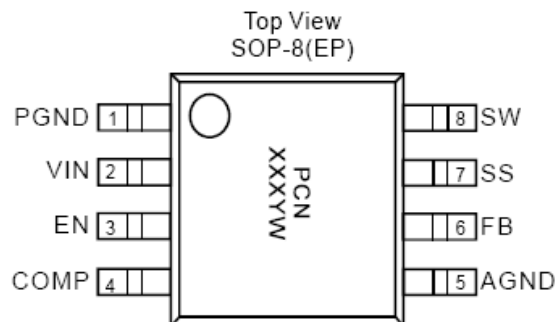
PAM2421/ PAM2422/ PAM2423

Ordering Information



Part Number	Peak Current	Package Type	Standard Package
PAM2421AECADJR	3A	SOP-8(EP)	2500 Units/Tape & Reel
PAM2422AECADJR	4.5A	SOP-8(EP)	2500 Units/Tape & Reel
PAM2423AECADJR	5.5A	SOP-8(EP)	2500 Units/Tape & Reel

Marking Information

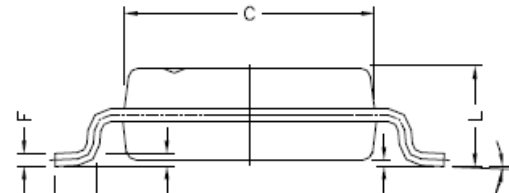
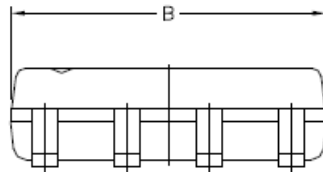
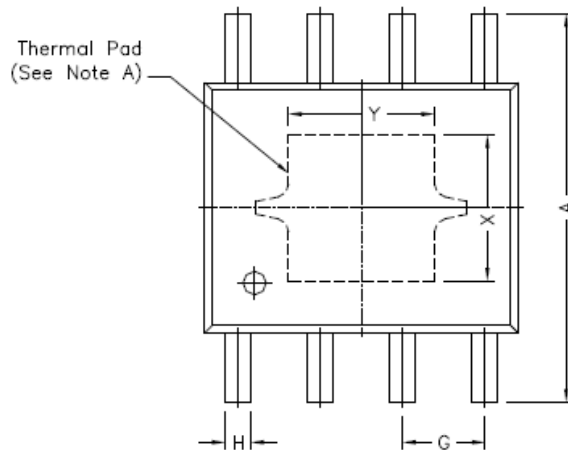


PCN: Product Code of PAM242x
XXX: Internal Code
V: Voltage Code
Y: Year
W: Week

PAM2421/ PAM2422/ PAM2423

Package Outline Dimensions (cont.) (All dimensions in mm.)

SOP-8(EP)



REF.	DIMENSIONS	
	Millimeters	
	Min.	Max.
A	5.80	6.20
B	4.80	5.00
C	3.80	4.00
D	0*	8*
E	0.40	0.90
F	0.19	0.25
M	0	0.15
H	0.35	0.49
L	1.35	1.75
G	1.27 TYP.	
Option1	X	2.28
	Y	2.28
Option2	X	2.41
	Y	3.30

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2012, Diodes Incorporated

www.diodes.com