Microsemi

• *Ideal Solar Bypass Device with Bidirectional Lightning Survivability*

PRODUCTION DATASHEET

DESCRIPTION

The LX2400 provides a bypass path for a string of up to 24 solar cells. In the event of cell shading, when the string voltage becomes inverted, current is redirected through the LX2400.

Unlike a diode, the LX2400 is an active device that has an extremely low voltage drop. The voltage drop across the conducting diode is typically <50mV at 10A and 90°C.

When in reverse mode, the LX2400 will block at least 22V continuously, with less than 100µA leakage to accommodate the maximum expected cell voltage without breakdown.

Lightning survivability provides a bidirectional low impedance path which lowers power dissipation in the LX2400 during a lightning strike.

The package is a thin LGA package. Heat is dissipated through the leads and through the package, resulting in minimal LX2400 temperature rise.

IMPORTANT: For the most current data, consult *MICROSEMI*'s website: **http://www.microsemi.com**

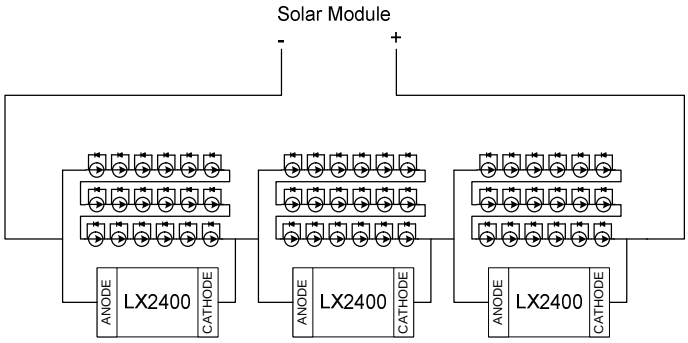
KEY FEATURES

- 30 year operation
- 0.5W dissipation at 10A and 90°C ambient temperature
- 20A is supported for IEC testing
- Ideal Bypass Diode
- Low Power Dissipation
- Low Reverse Leakage
- Bidirectional Lightning Survivability per IEC 61000-4-5, part 6.1
- Up to 24 Cells Per String
- No Heat Sink Required*

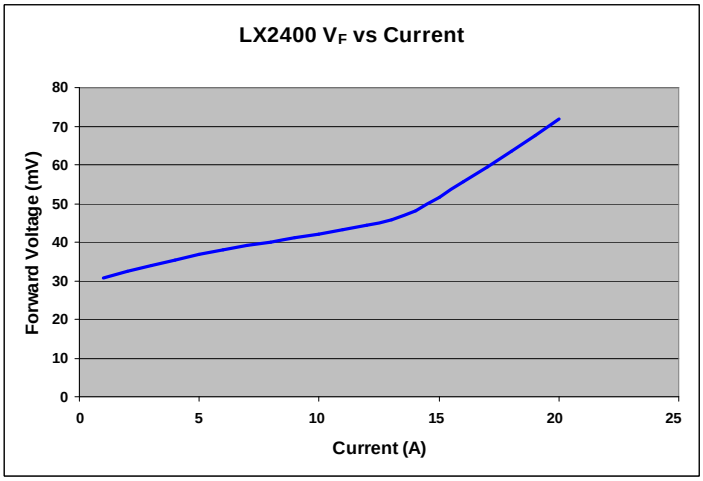
APPLICATIONS

- Solar Module Junction Boxes

PRODUCT HIGHLIGHT



TYPICAL V_{FWD} VS CURRENT



T_{amb} = 25 degC.

PACKAGE ORDER INFO

T_A (°C)		
	LG	**Plastic 7.5 x 11.5 mm LG 2-pin**
	RoHS Compliant / Pb-free	
-55 to 90	**LX2400ILG**	

Note: Available in Tape & Reel. Append the letters "TR" to the part number. (i.e. LX2400ILG-TR)

THERMAL DATA

JUNCTION TO PAD; θ_{JP} = **27 °C/W** (Note 1)

JUNCTION TO CASE; θ_{JC} = **20 °C/W** (Note 1)

JUNCTION TO AMBIENT; θ_{JA} = **33 °C/W** (Note 1a)

The θ_{JC}, θ_{JP}, and θ_{JA} numbers are guidelines for the thermal performance of the device.

*When layout guidelines are followed.

Microsemi
Analog Mixed Signal Group
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

LX2400

Microsemi

• *Ideal Solar Bypass Device with Bidirectional Lightning Survivability*

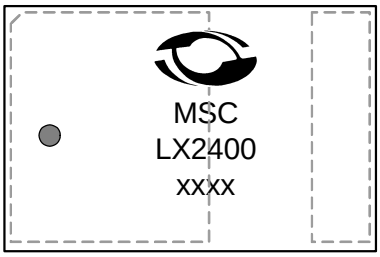
PRODUCTION DATASHEET

ABSOLUTE MAXIMUM RATINGS

Surge Current (Cathode to Anode) (Note2) 150A
Surge Current (Anode to Cathode) (Note2) 250A
Forward Current..... 25A
Reverse Voltage (-55°C to +165°C Ambient)..... 24V
Operating Junction Temperature Range..... -55^0C to 225^0C
Storage Junction Temperature Range ..... -65^0C to 150^0C
RoHS/Pb Free peak package solder reflow temperature..... 260°C

Exceeding these ratings could cause damage to the device.

PACKAGE PIN OUT



LG PACKAGE

(TopView)
RoHS / Pb-free Gold Pin Finish
MSL 3

FUNCTIONAL PIN DESCRIPTION

Name	Pin #	Description
AN	1	Anode. Power Pin. Connect to negative terminal of string.
CAT	2	Cathode. Power Pin. Connect to positive terminal of string.

ELECTRICAL CHARACTERISTICS

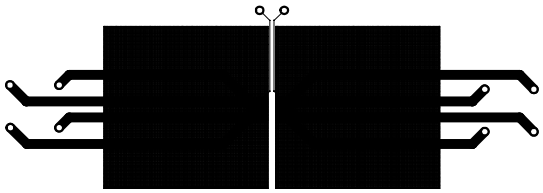
Unless otherwise specified, the following specifications apply over the operating ambient temperature of -55°C < Temp < 90°C. $V_{FORWARD}$ voltage refers to anode-to-cathode. Reverse voltage refers to cathode-to-anode.

Parameter	Symbol	Test Conditions / Comment	LX2400			Units
			Min	Typ	Max	
Diode Forward Voltage	V_{FWD}	I_{FWD} = 10A		45	65	mV
Start Up Current	$I_{FWD-SUI}$	Minimum FWD current needed to initiate bypass.	100			mA
Off-to-On Transition Time	T_{ON}	V_{FWD-BD} = 400mV		5		ms
On-to-Off Transition Time	T_{OFF}			0.5		ms
Reverse Breakdown Voltage	V_{REV}	Cathode-to-Anode; I_{REV} = 10mA	22			V
Reverse Leakage Current	I_{REV}	Cathode-to-Anode; V_{REV} = 20V			250	µA
Lightning Survivability (Note 2)	I_{PEAK}	Anode-to-Cathode 8/20us Short Circuit		250		A
		Cathode-to-Anode 8/20us Short Circuit		150		

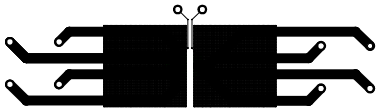
Notes:

1. θ_{JP} and θ_{JC} guaranteed by design. θ_{JA} is determined by the user's board design:

Microsemi
Analog Mixed Signal Group
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570



a) Theta J_A = 33°C/W
when mounted on 2 in^2
2Oz copper pads

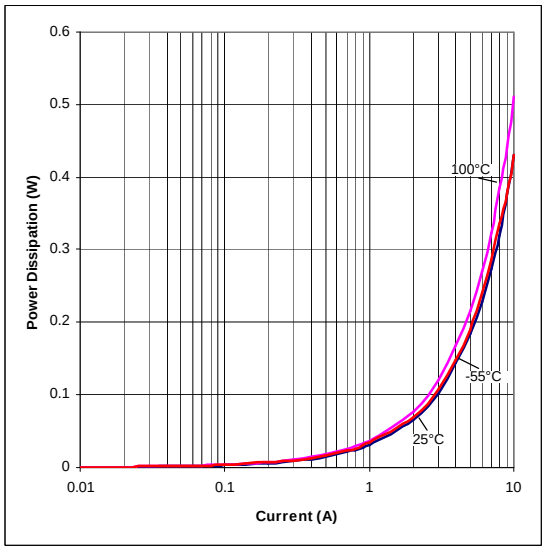


b) Theta J_A = 52°C/W
when mounted on 1 in^2
2Oz copper pads

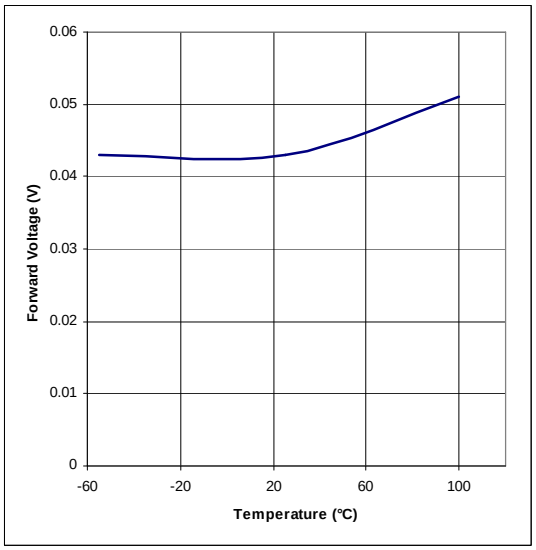
Scale = 0.4:1

2. Surge current testing per IEC 61000-4-5, part 6.1 Short Circuit Test Specifications 8us/20us Current Rise/Fall. Surge is applied over the specified operating ambient temperature range. This test is a qualification test and is not performed in production.

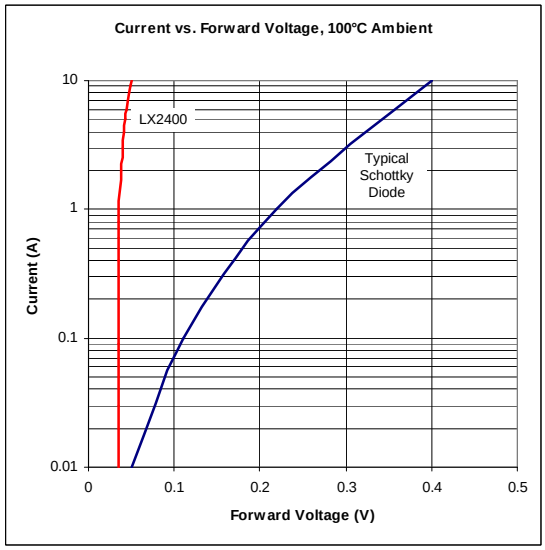
TYPICAL POWER DISSIPATION IN BYPASS MODE

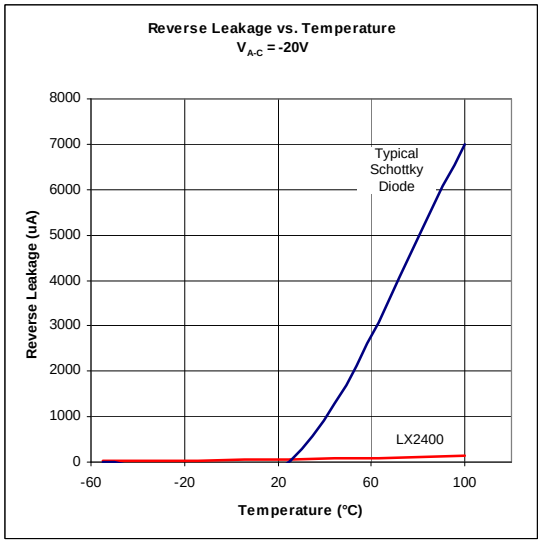


TYPICAL V_{FWD}@10A VS TEMPERATURE



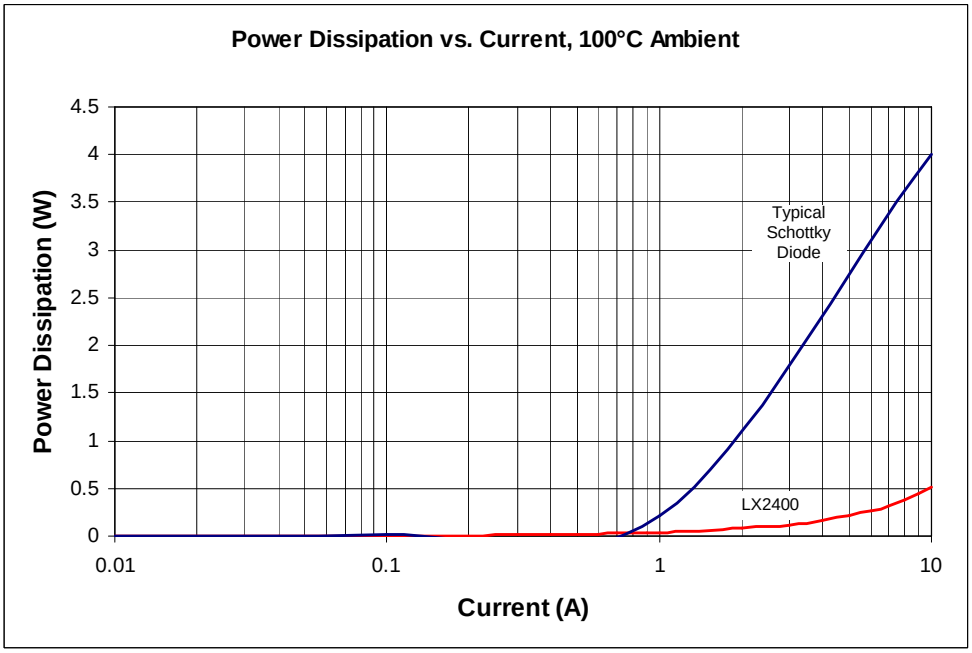
LX2400 COMPARISON TO TYPICAL SCHOTTKY DIODE



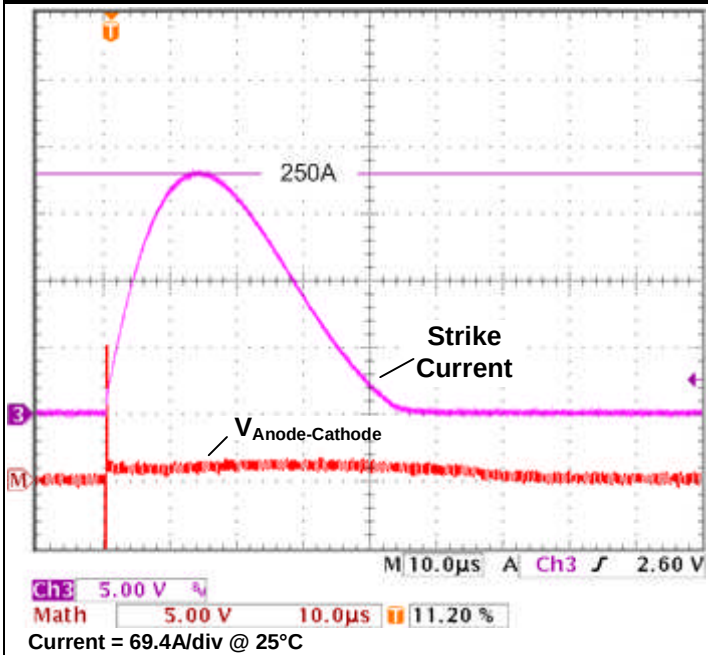


Microsemi
Analog Mixed Signal Group
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

LX2400 COMPARISON TO TYPICAL SCHOTTKY DIODE

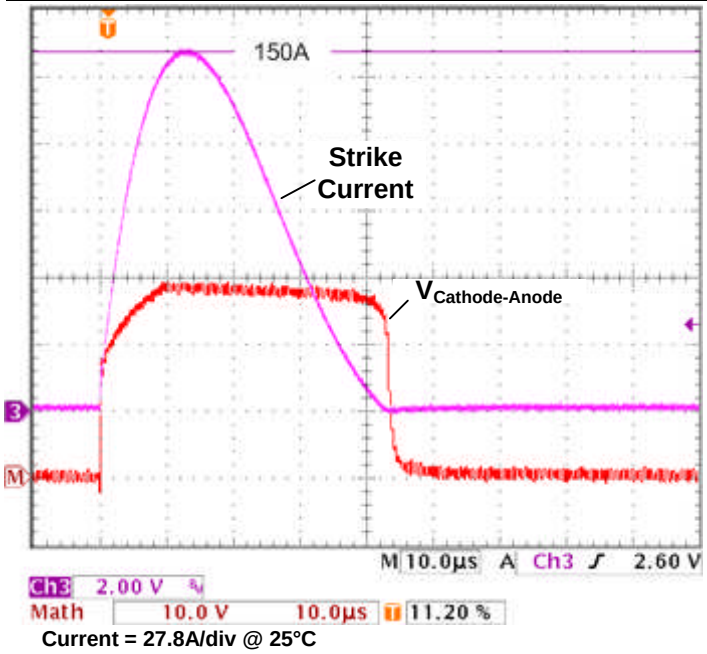


ANODE-TO-CATHODE LIGHTNING SURVIVABILITY



Current = 69.4A/div @ 25°C

CATHODE-TO-ANODE LIGHTNING SURVIVABILITY



Current = 27.8A/div @ 25°C

Microsemi
Analog Mixed Signal Group
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

LX2400 REFLOW SOLDERING & PCB LAYOUT GUIDELINES

GENERAL

The LX2400 bypass diode is an LGA package designed for soldering to a printed circuit board using reflow soldering.

PCB DESIGN GUIDELINES

One of the key efforts in implementing the LGA package on a printed circuit board is the design of the land pattern. The LGA has rectangular metalized terminals exposed on the bottom surface of the package body. Electrical and mechanical connection between the component and the pc board is made by screen printing solder paste on the pc board and then reflowing the paste after placement. To guarantee reliable solder joints it is essential to design the land pattern to the LGA terminal pattern. There are two basic designs for PCB land pads for an LGA: Copper Defined style (also known as Non Solder Mask Defined (NSMD)) and the Solder Mask Defined style (SMD). The industry has had some debate on the merits of both styles and although Microsemi recommends the Copper Defined style land pad (NSMD), both styles are acceptable for use with the LGA package. A comparison of both styles is outlined in Figure 1.

NSMD pads are recommended over SMD pads due to the tighter tolerance on copper etching than on solder masking. NSMD by definition also provides a larger copper pad area and allows the solder to anchor to the edges of the copper pads thus providing improved solder joint reliability.

When laying out a PCB for the LX2400, it is suggested using heavy, wide traces when connecting to the LX2400. Although power dissipation in the LX2400 is low due to the low forward voltage drop (on the order of 450mW at 10A forward current), using wide, heavy traces will improve overall system efficiency by reducing trace resistances (and their associated voltage drops), as well as provide improved thermal management for the LX2400. A suggested PCB layout footprint is shown in Figure 2.

SOLDER PASTE PRINTING

Due to the size of the terminals on the LX2400 the stencil should be designed to minimize the presence of voids within the connection and to eliminate floating of the device on the solder. Therefore, a matrix of squares or slotted squares is recommended. This enables out-gassing of the solder paste during reflow and regulates the finished solder thickness.

LX2400 REFLOW TEMPERATURE LIMITATION

The LGA package should be reflow soldered with a profile that meets J-STD-020. The peak temperature of the package body should not exceed 260°C.

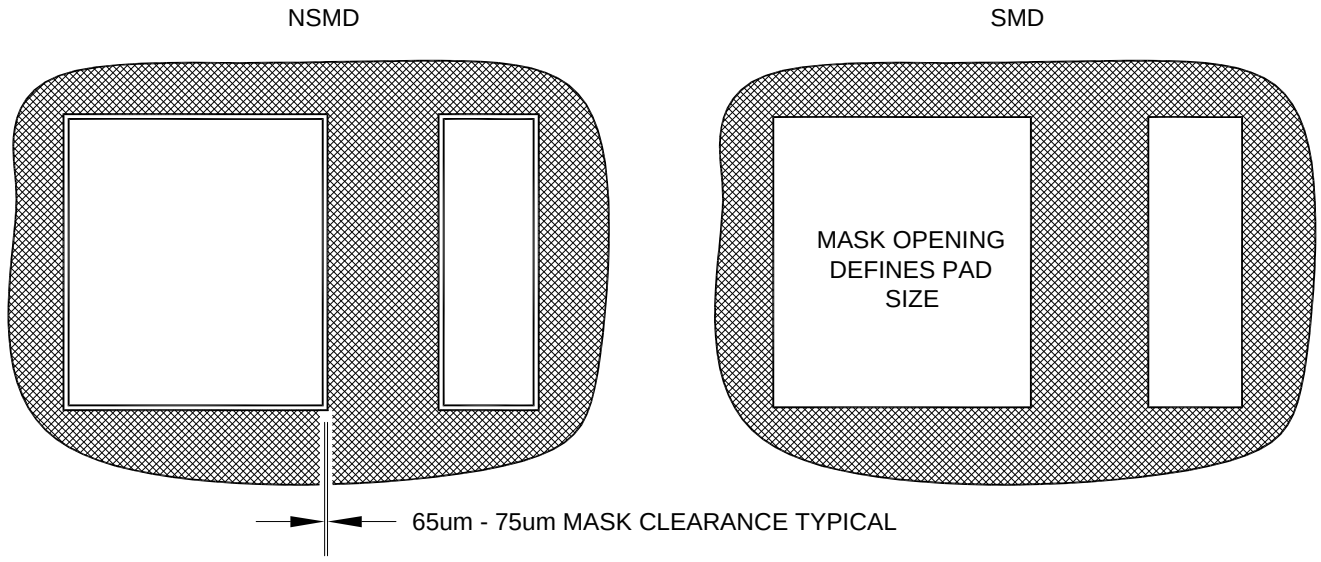


Figure 1 - NSMD and SMD Defined Pads

Microsemi
Analog Mixed Signal Group
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

LX2400 REFLOW SOLDERING & PCB LAYOUT GUIDELINES

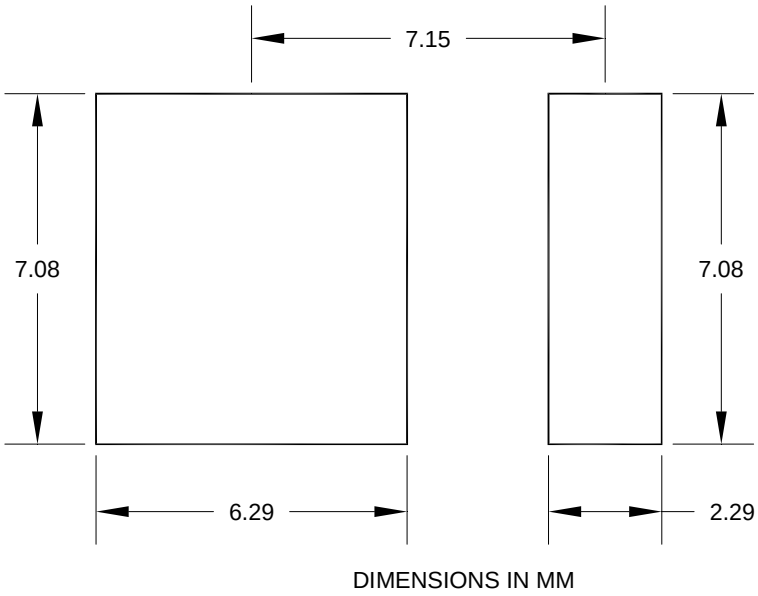


Figure 2 – Suggested PCB Footprint

Microsemi
Analog Mixed Signal Group
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

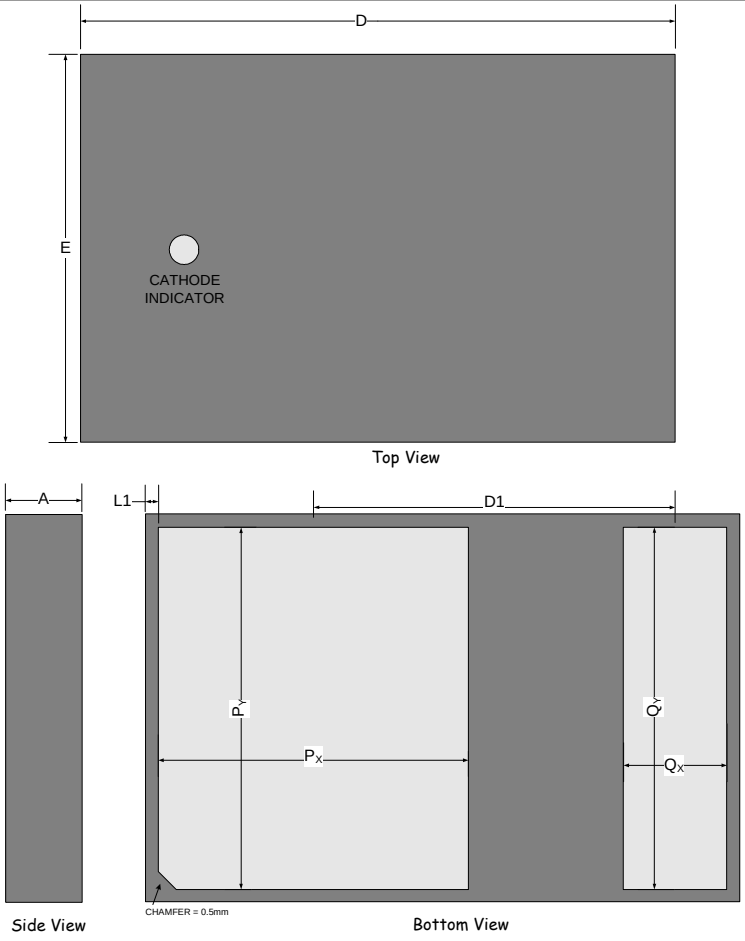
Microsemi

- *Ideal Solar Bypass Device with Bidirectional Lightning Survivability*

PRODUCTION DATASHEET

PACKAGE DIMENSIONS

LG Plastic 7.5 x 11.5 mm LGA 2-Pin Package



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.38	1.58	0.054	.062
D	11.40	11.60	0.449	0.457
D1	7.00 BSC		0.276 BSC	
E	7.40	7.60	0.291	0.299
P_X	5.97	6.03	0.235	0.237
P_Y	6.97	7.03	0.274	0.277
Q_X	1.97	2.03	0.078	0.080
Q_Y	6.97	7.03	0.274	0.277
L1	0.17	0.33	0.007	0.013
*LC	–	0.10	–	0.004

*Lead Coplanarity

Note:

1. Controlled dimensions are in mm, inches are for referenceonly.

Microsemi
Analog Mixed Signal Group
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

NOTES