



## Description

The DIODES<sup>™</sup> 74LVC1G97 is a single three-input positive configurable multiple function gate with a standard push-pull output. The output state is determined by eight patterns of three-bit input. The user can chose the logic functions MUX, AND, OR, NAND, NOR, inverter or non-inverting buffer. All inputs can be connected to ground or Vcc as required. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using IOFF. The IOFF circuitry disables the output preventing damaging current backflow when the device is powered down. The user is reminded that the device can simulate several types of logic gates but may respond differently due to the Schmitt action at the inputs.

### Features

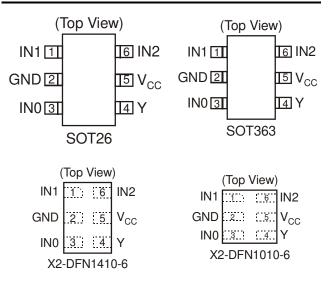
- Wide Supply Voltage Range from 1.65V to 5.5V
- ± 24mA Output Drive at 3.3V
- CMOS Low Power Consumption
- IOFF Supports Partial-Power-Down Mode Operation
- Inputs Accept up to 5.5V
- ESD Protection Exceeds JESD 22
  - 200-V Machine Model (A115-A)
  - 2000-V Human Body Model (A114-A)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- Range of Package Options
- SOT26, SOT363, X2-DFN1410-6, and X2-DFN1010-6: Available
  - in "Green" Molding Compound (no Br, Sb)
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.

- 2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  - 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

#### CONFIGURABLE MULTIPLE-FUNCTION GATE

### **Pin Assignments**



## Applications

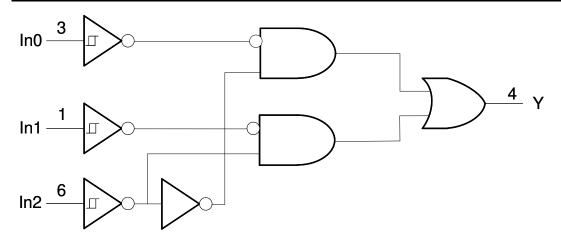
- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide Array of Products such as:
  - PCs, networking, notebooks, netbooks, PDAs
  - Computer peripherals, hard drives, CD/DVD ROM
  - TV, DVD, DVR, set top box
  - Cell Phones, Personal Navigation / GPS
  - MP3 players, Cameras, Video Recorders



# **Pin Descriptions**

Pin Name	Description
IN1	Data Input
GND	Ground
IN0	Data Input
Y	Data Output
Vcc	Supply Voltage
IN2	Data Input

# Logic Diagram



# **Function Table**

	Inputs	Output	
IN2	IN1 IN0		Y
L	L	L	L
L	L	Н	L
L	н	L	Н
L	Н	Н	Н
Н	L	L	L
Н	L	Н	Н
Н	Н	L	L
Н	Н	Н	Н

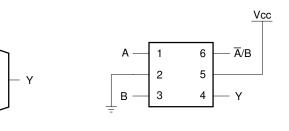


Ā/B

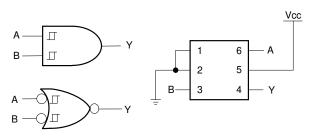
А

В

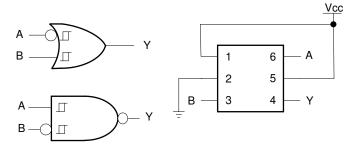
# **Logic Configurations**



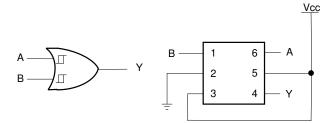
Configuration 1 2 to 1 Data Selector



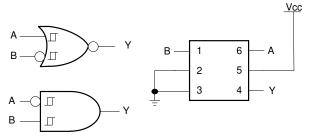
Configuration 2 2-Input AND Gate 2-Input NOR Gate with Both Inputs Inverted



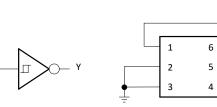
Configuration 3 2-Input NAND Gate with B Input Inverted 2-Input OR Gate with A Input Inverted



Configuration 5 2-Input OR Gate



Configuration 4 2-Input NOR Gate with One Input Inverted 2-Input AND Gate with One Input Inverted



Configuration 6 Inverter

Function Selection Table							
Logic Function	Configuration						
2-to-1 Data Selector	1						
2-input AND gate	2						
2-input AND with inverted input	3, 4						
2-input NOR with inverted input	3, 4						
2-input OR	5						
2-input NOR with both inputs inverted	2						
1-input Inverter	6						

74LVC1G97 Document number: DS35127 Rev. 6 - 2 Vcc

А

Y



# Absolute Maximum Ratings (Note 4)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD MM	Machine Model ESD Protection	200	V
V <sub>CC</sub>	Supply Voltage Range	-0.5 to 6.5	V
VI	Input Voltage Range	-0.5 to 6.5	V
Vo	Voltage applied to output in high impedance or IOFF state	-0.5 to 6.5	V
Vo	Voltage applied to output in high or low state	-0.3 to V <sub>CC</sub> +0.5	V
lıк	Input Clamp Current VI < 0	-50	mA
I <sub>OK</sub>	Output Clamp Current	-50	mA
Ι <sub>Ο</sub>	Continuous output current	±50	mA
	Continuous current through Vdd or GND	±100	mA
TJ	Operating Junction Temperature	-40 to +150	°C
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C

Note: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

# Recommended Operating Conditions (Note 5)

Symbol		Parameter	Min	Мах	Unit
M	On another Mallana	Operating	1.65	5.5	V
V <sub>CC</sub>	Operating Voltage	Data retention only	1.5	—	V
VI	Input Voltage		0	5.5	V
Vo	Output Voltage		0	V <sub>CC</sub>	V
		V <sub>CC</sub> = 1.65V	_	-4	
		V <sub>CC</sub> = 2.3V		-8	mA
I <sub>OH</sub>	High-Level Output Current	$V_{CC} = 3V$	_	-16	
			_	-24	
		V <sub>CC</sub> = 4.5V	_	-32	
		V <sub>CC</sub> = 1.65V	_	4	
		V <sub>CC</sub> = 2.3V	_	8	mA
I <sub>OL</sub>	Low-Level Output Current		_	16	
		$V_{CC} = 3V$	_	24	
		V <sub>CC</sub> = 4.5V	_	32	
T <sub>A</sub>	Operating Free-Air Temperature	_	-40	+125	°C

Note: 5. Unused inputs should be held at V<sub>CC</sub> or Ground.



Symbol	Parameter	Test Conditions	V <sub>cc</sub>	Min	Тур	Max	Unit
		_	1.65V	0.70	_	1.20	_
		_	2.3V	1.11	_	1.60	_
$V_{T+}$	Positive-going input	_	3V	1.50	_	2.00	_
	threshold voltage	_	4.5V	2.16	_	2.74	_
		_	5.5V	2.61	_	3.33	_
		_	1.65V	0.30	_	0.72	_
		_	2.3V	0.58	_	1.00	
V <sub>T-</sub>	Negative-going input	_	3V	0.80	_	1.30	_
	threshold voltage	_	4.5V	1.21	_	1.95	_
		_	5.5V	1.45		2.35	_
		_	1.65V	0.30	_	0.62	
		_	2.3V	0.40		0.80	
$\Delta V_T$	V <sub>T</sub> Hysteresis (V <sub>T+</sub> - V <sub>T-)</sub>	_	3V	0.35	_	1.00	_
		_	4.5V	0.55	_	1.10	
		_	5.5V	0.60	_	1.20	_
		I <sub>OH</sub> = -100µА	1.65V to 5.5V	V <sub>CC</sub> - 0.1			
		$I_{OH} = -4mA$	1.65V	1.2	_		
		I <sub>OH</sub> = -8mA	2.3V	1.9	_		
V <sub>OH</sub>	High Level Output Voltage	I <sub>OH</sub> = -16mA		2.4	_		V
		I <sub>OH</sub> = -24mA	3V	2.3	_		
		I <sub>OH</sub> = -32mA	4.5V	3.8	_		
		I <sub>OL</sub> = 100μA	1.65V to 5.5V	_	_	0.1	
		$I_{OL} = 4mA$	1.65V	_	_	0.45	
		I <sub>OL</sub> = 8mA	2.3V	_	_	0.3	
V <sub>OL</sub>	High-level Input Voltage	I <sub>OL</sub> = 16mA		_	_	0.4	V
		I <sub>OL</sub> = 24mA	3V	_	_	0.55	
		I <sub>OL</sub> = 32mA	4.5V	_	_	0.55	
lı –	Input Current	V <sub>I</sub> = 5.5V or GND	0 to 5.5V	_	_	± 1	μA
I <sub>OFF</sub>	Power Down Leakage Current	$V_{\rm I}$ or $V_{\rm O} = 5.5 V$	0	_	_	± 2	μA
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = 5.5V of GND I <sub>O</sub> =0	1.65V to 5.5V	_	_	4	μA
ΔI <sub>CC</sub>	Additional Supply Current	One input at $V_{CC}$ –0.6V Other inputs at $V_{CC}$ or GND	3V to 5.5V	_	_	500	μA

# Electrical Characteristics (@T<sub>A</sub> = -40°C to +85°C. All typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = +25°C)



Symbol	Parameter	Test Conditions	V <sub>cc</sub>	Min	Тур	Max	Unit
		—	1.65V	0.70	_	1.20	_
		—	2.3V	1.11	_	1.60	_
$V_{T+}$	Positive-going input threshold voltage	_	3V	1.50		2.00	
	theshold voltage	—	4.5V	2.16	_	2.74	_
		_	5.5V	2.61		3.33	
		_	1.65V	0.30		0.75	
		_	2.3V	0.58		1.03	
V <sub>T-</sub>	Negative-going input threshold voltage	_	3V	0.80		1.33	
	theshold voltage	_	4.5V	1.21		1.95	
		_	5.5V	1.45		2.35	
		—	1.65V	0.30	-	0.62	_
		—	2.3V	0.37		0.80	
$\Delta V_T$	$\Delta V_{T} \qquad \begin{array}{c} \text{Hysteresis} \\ (V_{T+} - V_{T-}) \end{array}$	_	3V	0.32	_	1.00	-
		_	4.5V	0.50	_	1.20	_
		_	5.5V	0.55		1.40	
		I <sub>OH</sub> = -100μA	1.65V to 5.5V	V <sub>CC</sub> -0.1			
		I <sub>OH</sub> = -4mA	1.65V	0.95	_		
N/		I <sub>OH</sub> = -8mA	2.3V	1.7	_		.,
V <sub>OH</sub>	High Level Output Voltage	I <sub>OH</sub> = -16mA	0.4	1.9	_		V
		I <sub>OH</sub> = -24mA	3V	2.0	-		
		I <sub>OH</sub> = -32mA	4.5V	3.4			
		I <sub>OL</sub> = 100μA	1.65V to 5.5V	_	_	0.1	
		I <sub>OL</sub> = 4mA	1.65V	_	-	0.7	
N/		I <sub>OL</sub> = 8mA	2.3V	_	_	0.45	
V <sub>OL</sub>	High-level Input Voltage	$I_{OL} = 16mA$	0.4	_		0.6	V
		$I_{OL} = 24mA$	3V	_	-	0.8	
		I <sub>OL</sub> = 32mA	4.5V	_	-	0.8	
li li	Input Current	VI = 5.5V or GND	0 to 5.5V	_		± 1	μA
I <sub>OFF</sub>	Power Down Leakage Current	$V_1$ or $V_0 = 5.5V$	0	_	_	± 2	μA
Icc	Supply Current	$V_I = 5.5V$ of GND $I_O=0$	1.65V to 5.5V	_	_	4	μA
ΔI <sub>CC</sub>	Additional Supply Current	One input at $V_{CC}$ -0.6V Other inputs at $V_{CC}$ or GND	3V to 5.5V	_		500	μA

# **Electrical Characteristics** (Continued) (@T<sub>A</sub> = -40°C to +85°C. All typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = +25°C)



# **Package Characteristics** (All typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = +25°C)

Symbol	Parameter	Test Conditions	V <sub>cc</sub>	Min	Тур	Max	Unit
Cı	Input Capacitance	$V_I = V_{CC} - or GND$	3.3	_	3.5	_	pF
		SOT26		—	204	—	
	Thermal Resistance Junction- to-Ambient	SOT363	(Note 6)	_	371	—	
θ <sub>JA</sub>		X2-DFN1410-6		_	430	_	°C/W
		X2-DFN1010-6		_	510	_	
		SOT26		_	52	_	
	Thermal Resistance Junction-	SOT363		_	143	_	
θ <sub>JC</sub>	to-Case	X2-DFN1410-6	(Note 6)	_	190	_	°C/W
		X2-DFN1010-6		_	250	_	

Note: 6. Test condition for SOT26, SOT363, X2-DFN1410-6 and X2-DFN1010-6 : Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

# **Switching Characteristics**

<b>T<sub>A</sub> = -40°C to +85°C</b> , C <sub>L</sub> = 30 or 50pF as noted (See Figure 1)											
Parameter	From	TO	V <sub>CC</sub> = ± 0.	: 1.8V .15V	•••	: 2.5V .2V		: 3.3V ).3V		= 5V ).5V	Unit
	(Input)	(OUTPUT)	Min	Max	Min	Max	Min	Мах	Min	Max	
t <sub>pd</sub>	Any	Y	1.0	14.4	0.7	8.3	0.7	6.3	0.7	5.1	ns

#### $T_A = -40^{\circ}C$ to $+125^{\circ}C$ , $C_L = 30$ or 50pF as noted (See Figure 1)

Parameter	From	то	•••	= 1.8V .15V		: 2.5V ).2V	•••	: 3.3V ).3V		= 5V ).5V	Unit
	(Input)	(OUTPUT)	Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>pd</sub>	Any	Y	1.0	18.0	0.7	10.4	0.7	7.9	0.7	6.4	ns

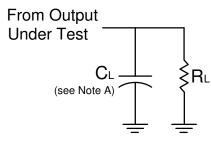
# **Operating Characteristics**

T<sub>A</sub> = +25°C

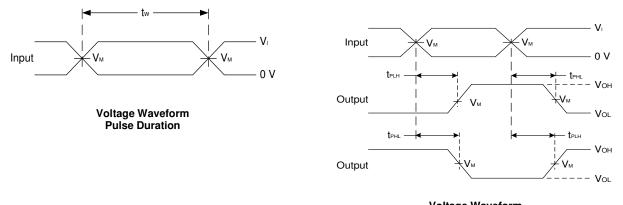
	Parameter	Test Conditions	V <sub>CC</sub> = 1.8V Typ.	V <sub>CC</sub> = 2.5V Typ.	V <sub>CC</sub> = 3.3V Typ.	V <sub>CC</sub> = 5V Typ.	Unit
C <sub>pd</sub>	Power dissipation capacitance	f = 10 MHz	22	22	23	24	pF



# **Parameter Measurement Information**



Vcc	V <sub>CC</sub> Inputs V <sub>M</sub>		CL	RL	
100	VI	tr/tf	- 101		
1.8V±0.15V	Vcc	≤2ns	V <sub>CC</sub> /2	30pF	1ΚΩ
2.5V±0.2V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	30pF	500Ω
3.3V±0.3V	3V	≤2.5ns	1.5V	50pF	500Ω
5V±0.5V	Vcc	≤2.5ns	V <sub>CC</sub> /2	50pF	500Ω



#### Voltage Waveform **Propagation Delay Times** Inverting and Non Inverting Outputs

#### Figure 1 Load Circuit and Voltage Waveforms

Notes:

A. Includes test lead and test apparatus capacitance.

B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
C. Inputs are measured separately one transition per measurement.

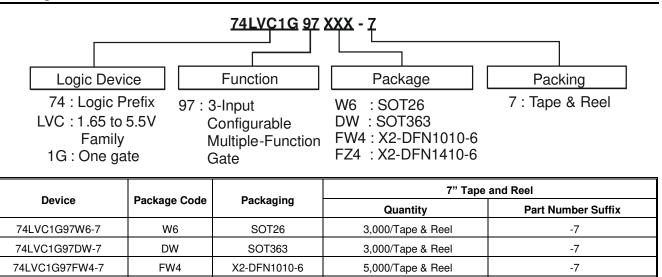
D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .



74LVC1G97FZ4-7

-7

# Ordering Information (Note 7)



5,000/Tape & Reel

Note: 7. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

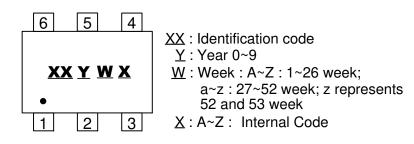
X2-DFN1410-6

FZ4



# **Marking Information**

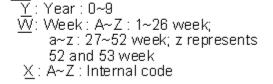
#### (1) SOT26, SOT363



Part Number	Package	Identification Code
74LVC1G97W6	SOT26	TY
74LVC1G97DW	SOT363	TY

#### (2) X2-DFN1010-6, X2-DFN1410-6

(Top View)

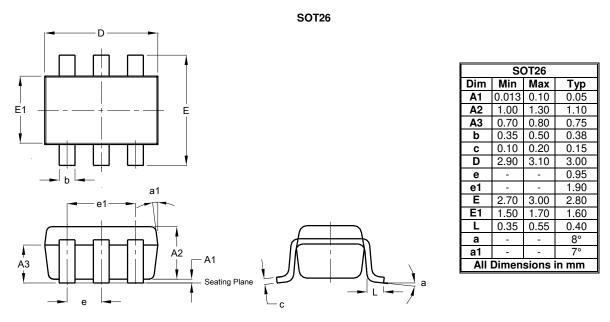


🔀 : Identification Code

Part Number	Package	Identification Code
74LVC1G97FW4	X2-DFN1010-6	TY
74LVC1G97FZ4	X2-DFN1410-6	TY



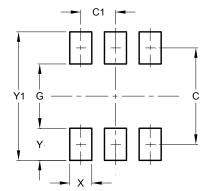
Please see http://www.diodes.com/package-outlines.html for the latest version.



## **Suggested Pad Layout**

Please see http://www.diodes.com/package-outlines.html for the latest version.



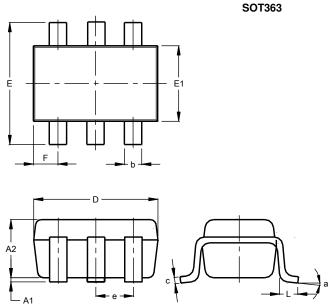


Dimensions	Value (in mm)
С	2.40
C1	0.95
G	1.60
Х	0.55
Y	0.80
Y1	3.20

Note: The suggested land pattern dimensions have been provided for reference only, as actual pad layouts may vary depending on application. These dimensions may be modified based on user equipment capability or fabrication criteria. A more robust pattern may be desired for wave soldering and is calculated by adding 0.2 mm to the 'Z' dimension. For further information, please reference document IPC-7351A, Naming Convention for Standard SMT Land Patterns, and for International grid details, please see document IEC, Publication 97.



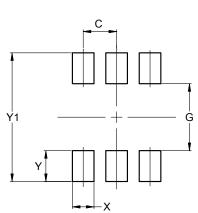
Please see http://www.diodes.com/package-outlines.html for the latest version.



SOT363				
Dim	Min	Max	Тур	
A1	0.00	0.10	0.05	
A2	0.90	1.00	0.95	
b	0.10	0.30	0.25	
С	0.10	0.22	0.11	
D	1.80	2.20	2.15	
Ε	2.00	2.20	2.10	
E1	1.15	1.35	1.30	
е	0.650 BSC			
F	0.40	0.45	0.425	
L	0.25	0.40	0.30	
а	0°	8°		
All Dimensions in mm				

### **Suggested Pad Layout**

Please see http://www.diodes.com/package-outlines.html for the latest version.



SOT363

Dimensions	Value (in mm)	
С	0.650	
G	1.300	
Х	0.420	
Y	0.600	
Y1	2.500	

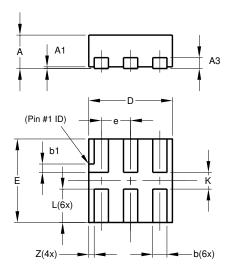
Note: The suggested land pattern dimensions have been provided for reference only, as actual pad layouts may vary depending on application. These dimensions may be modified based on user equipment capability or fabrication criteria. A more robust pattern may be desired for wave soldering and is calculated by adding 0.2 mm to the 'Z' dimension. For further information, please reference document IPC-7351A, Naming Convention for Standard SMT Land Patterns, and for International grid details, please see document IEC, Publication 97.

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Please see http://www.diodes.com/package-outlines.html for the latest version.

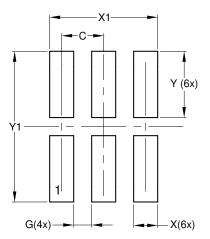
#### X2-DFN1010-6



X2-DFN1010-6				
Dim	Min	Max	Тур	
Α		0.40	0.39	
A1	0.00	0.05	0.02	
A3			0.13	
b	0.14	0.20	0.17	
b1	0.05	0.15	0.10	
D	0.95	1.05	1.00	
E	0.95	1.05	1.00	
е			0.35	
L	0.35	0.45	0.40	
K	0.15	_		
Z	_		0.065	
All Dimensions in mm				

# **Suggested Pad Layout**

Please see http://www.diodes.com/package-outlines.html for the latest version.



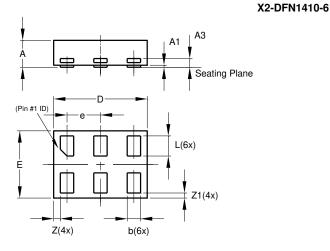
#### X2-DFN1010-6

Dimensions	Value (in mm)
С	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

Note: The suggested land pattern dimensions have been provided for reference only, as actual pad layouts may vary depending on application. These dimensions may be modified based on user equipment capability or fabrication criteria. A more robust pattern may be desired for wave soldering and is calculated by adding 0.2 mm to the 'Z' dimension. For further information, please reference document IPC-7351A, Naming Convention for Standard SMT Land Patterns, and for International grid details, please see document IEC, Publication 97.



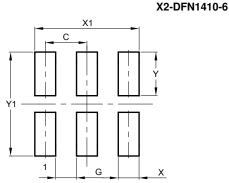
Please see http://www.diodes.com/package-outlines.html for the latest version.



X2-DFN1410-6				
Dim	Min	Max	Тур	
Α		0.40	0.39	
A1	0.00	0.05	0.02	
A3			0.13	
b	0.15	0.25	0.20	
D	1.35	1.45	1.40	
Е	0.95	1.05	1.00	
е			0.50	
L	0.25	0.35	0.30	
Z			0.10	
Z1	0.045	0.105	0.075	
All Dimensions in mm				

### **Suggested Pad Layout**

Please see http://www.diodes.com/package-outlines.html for the latest version.



Dimensions	Value (in mm)		
С	0.500		
G	0.250		
Х	0.250		
X1	1.250		
Y	0.525		

1.250

Y1

Note: The suggested land pattern dimensions have been provided for reference only, as actual pad layouts may vary depending on application. These dimensions may be modified based on user equipment capability or fabrication criteria. A more robust pattern may be desired for wave soldering and is calculated by adding 0.2 mm to the 'Z' dimension. For further information, please reference document IPC-7351A, Naming Convention for Standard SMT Land Patterns, and for International grid details, please see document IEC, Publication 97.



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