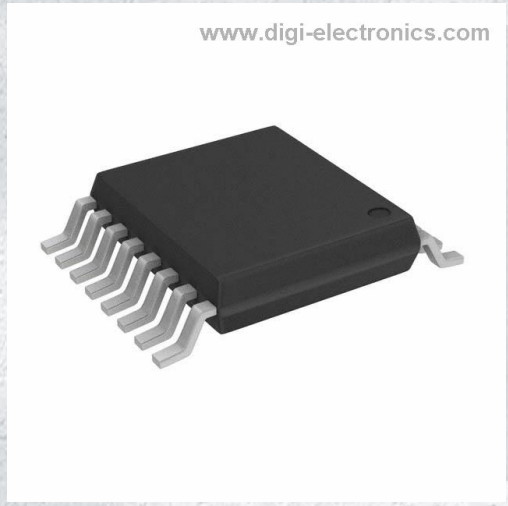
74HCT138T16-13 Datasheet



DiGi Electronics Part Number	74HCT138T16-13-DG
Manufacturer	Diodes Incorporated
Manufacturer Product Number	74HCT138T16-13
Description	IC DECODER/DEMUX 1X3:8 16TSSOP
Detailed Description	Decoder/Demultiplexer 1 x 3:8 16-TSSOP

https://www.DiGi-Electronics.com

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
74HCT138T16-13	Diodes Incorporated
Series:	Product Status:
74HCT	Active
Type:	Circuit:
Decoder/Demultiplexer	1 x 3:8
Independent Circuits:	Current - Output High, Low:
1	4mA, 4mA
Voltage Supply Source:	Voltage - Supply:
Single Supply	4.5V ~ 5.5V
Operating Temperature:	Mounting Type:
-40°C ~ 125°C	Surface Mount
Package / Case:	Supplier Device Package:
16-TSSOP (0.173", 4.40mm Width)	16-TSSOP
Base Product Number:	
74HCT138	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8542.39.0001	

74HCT138

3 TO 8 LINE DECODER DEMULTIPLEXER

Description

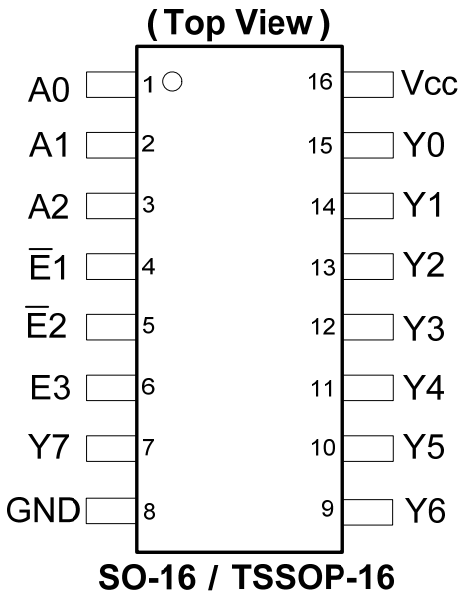
The 74HCT138 is a high speed CMOS device that is designed to be pin compatable with 74LS low power Schottky types.

The device accepts a three bit binary weighted address on input pins A0, A1 and A2 and when enabled will produce one active low output with the remaing seven being high.

There are two active LOW enable inputs $\overline{E}1$ and $\overline{E}2$, and one active HIGH enable input E3. The disabled device state results in all outputs being high. The enable state occurs with $\overline{E}1$ and $\overline{E}2$ asserted low and E3 asserted high.

The multiple enable lines allow for the parallel expansion of decoders to create 4-to-16 line versions with no additional parts and 5-to-32 versions with the addition of a single inverter.

Pin Assignments



SO-16 / TSSOP-16

Features

- Wide Supply Voltage Range from 4.5V to 5.5V
- Sinks or sources 8mA at V_{CC} = 4.5V
- CMOS low power consumption
- Schmitt Trigger Action at All Inputs
- Inputs accept up to 6.0V
- ESD Protection Tested per JESD 22
- Exceeds 200-V Machine Model (A115-A)
- Exceeds 2000-V Human Body Model (A114-A)
- Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 250mA per JESD 78, Class II
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Applications

- Memory chip select decoding
- Demultiplexing
- Single line peripheral control
- Allow simple serial bit streams from a microcontroller to control as many peripheral lines as needed.

Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com 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.

Click here for ordering information, located at the end of datasheet

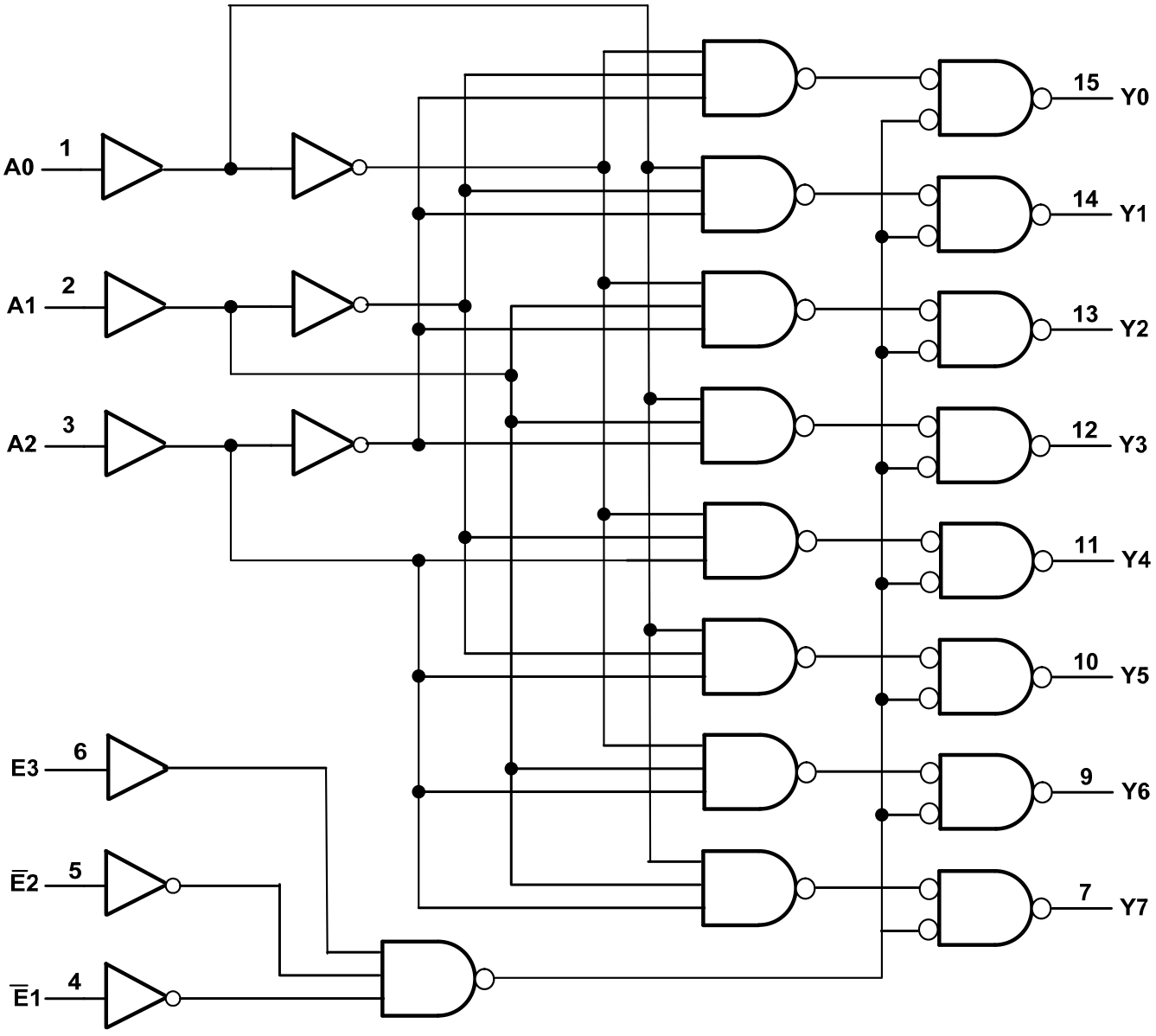
Pin Descriptions

Pin Number	Pin Name	Description
1	A0	Address Input 0
2	A1	Address Input 1
3	A2	Address Input 2
4	$\overline{E}1$	Enable Input 1 (active LOW)
5	$\overline{E}2$	Enable Input 2 (active LOW)
6	E3	Enable Input 3 (active HIGH)
7	Y7	Output 7 (active LOW)
8	GND	Ground
9	Y6	Output 6 (active LOW)
10	Y5	Output 5 (active LOW)
11	Y4	Output 4 (active LOW)
12	Y3	Output 3 (active LOW)
13	Y2	Output 2 (active LOW)
14	Y1	Output 1 (active LOW)
15	Y0	Output o (active LOW)
16	V_{cc}	Supply Voltage

Function Table Diagram

Control			Input			Output							
$\overline{E}1$	$\overline{E}2$	E3	A2	A1	A0	$\overline{Y}7$	$\overline{Y}6$	$\overline{Y}5$	$\overline{Y}4$	$\overline{Y}3$	$\overline{Y}2$	$\overline{Y}1$	$\overline{Y}0$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	–	–	–	–	–	–	–	–	–	–	–
X	X	L	–	–	–	–	–	–	–	–	–	–	–
L	L	H	–	–	–	–	–	–	–	–	–	–	–
–	–	–	L	L	L	H	H	H	H	H	H	H	L
–	–	–	L	L	H	H	H	H	H	H	H	L	H
–	–	–	L	H	L	H	H	H	H	H	L	H	H
–	–	–	L	H	H	H	H	H	H	L	H	H	H
–	–	–	H	L	L	H	H	H	L	H	H	H	H
–	–	–	H	L	H	H	H	L	H	H	H	H	H
–	–	–	H	H	L	H	L	H	H	H	H	H	H
–	–	–	H	H	H	L	H	H	H	H	H	H	H

Logic Diagram



Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	KV
ESD CDM	Charged Device Model ESD Protection	1	KV
ESD MM	Machine Model ESD Protection	200	V
V_{CC}	Supply Voltage Range	-0.5 to 7.0	V
V_I	Input Voltage Range	-0.5 to 7.0	V
V_o	Voltage Applied to Output in High or Low State	-0.3 to V_{CC}	V
I_{IK}	Input Clamp Current V_I < -0.5V	-20	mA
I_{IK}	Input Clamp Current V_I > V_{CC} + 0.5V	20	mA
I_{OK}	Output Clamp Current V_O < -0.5V	-20	mA
I_{OK}	Output Clamp Current V_O > V_{CC} + 0.5V	20	mA
I_O	Continuous Output Current	+/- 25	mA
I_{CC}	Continuous Current Through V_{CC}	50	mA
I_{GND}	Continuous Current Through GND	-50	mA
T_J	Operating Junction Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-65 to 150	°C
P_{TOT}	Total Power Dissipation	500	mW

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply Voltage	–	4.5	5.5	V
V_I	Input Voltage	–	0	Vcc	V
V_O	Output Voltage	Active Mode	0	V_{CC}	V
$\Delta t/\Delta V$	Input transition rise or fall rate	V_{CC} = 4.5V	–	100	ns/V
T_A	Operating free-air temperature	–	-40	125	°C

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions		Vcc	T_A = 25°C			-40°C to 85°C		-40°C to 125°C		Unit
					Min	Typ	Max	Min	Max	Min	Max	
V_{IH}	High-level Input Voltage	–		4.5V to 5.5V	2.0	1.6	–	2.0	–	2.0	–	V
V_{IL}	Low-level input voltage	–		4.5V to 5.5V	–	1.2	0.8	–	0.8	–	0.8	V
V_{OH}	High Level Output Voltage	I_{OH} = -20 µA		4.5V	4.4	4.5	–	4.4	–	4.4	–	V
		I_{OH} = -4 mA		4.5V	3.98	4.32	–	3.85	–	3.7	–	
V_{OL}	Low-level Output Voltage	I_{OL} = 20 µA		4.5V	–	0	0.1	–	0.1	–	0.1	V
		I_{OL} = 4 mA		4.5V	–	0.15	0.26	–	0.33	–	0.4	
I_I	Input Current	V_I =GND to 5.5 V		5.5V	–	–	±0.1	–	± 1	–	± 1	µA
I_{CC}	Supply Current	V_I = GND or V_{CC} I_O=0		5.5V	–	–	8.0	–	80	–	160	µA
ΔI_{CC}	Additional Supply Current	Test Per Pin V_I = Vcc -2.1 V Other V_I = Vcc or GND I_O=0	PINS An	4.5V to 5.5V	–	150	540	–	675	–	735	µA
			PIN $\overline{En}$		–	125	450	–	563	–	613	
			PIN E3		–	100	360	–	450	–	490	µA
C_i	Input Capacitance	V_i = V_{CC} or GND		5.5V	–	4	10	–	10	–	10	pF

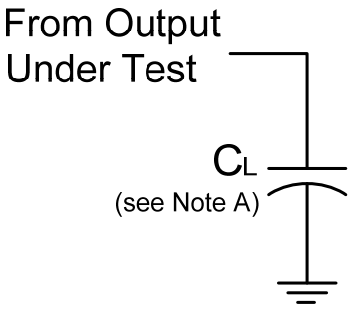
Switching Characteristics

Symbol / Parameter	Pins	Test Conditions	Vcc	T_A=25°C			-40°C to 85°C		-40°C to 125°C		Unit
				Min	Typ.	Max	Min	Max	Min	Max	
t_{PLH}, t_{PLH} Propagation Delay	An to $\overline{Yn}$	Figure 2	4.5V	–	20	35	–	35	–	45	ns
			5.0V	–	17	–	–	–	–	–	
	E3 to $\overline{Yn}$	Figure 2	4.5V	–	18	40	–	40	–	45	
			5.0V	–	19	–	–	–	–	–	
	$\overline{En}$ to $\overline{Yn}$	Figure 2	4.5V	–	19	40	–	40	–	45	
			5.0V	–	19	–	–	–	–	–	
t_{TLH}, t_{THL} Transition Time	$\overline{Yn}$	Figure 2	4.5 V	–	7	15	–	15	–	110	ns

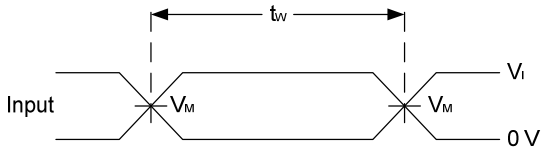
Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

Parameter		Test Conditions	V_{CC} = 5V	Unit
			TYP	
C_{pd}	Power Dissipation Capacitance	f = 1 MHz all outputs switching-no load	21	pF

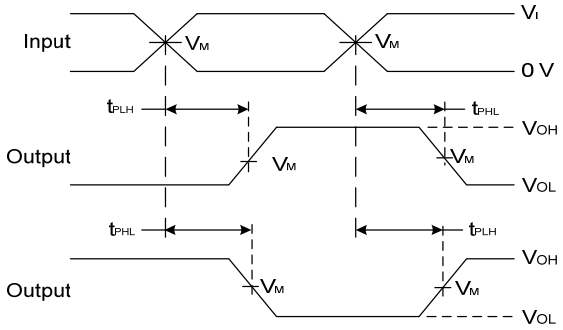
Parameter Measurement Information



V_{CC}	Inputs		V_M	C_L
	V_I	t_r/t_f		
4.5V	3 V	6ns	$V_{CC}/2$	50pF
5.0V	3 V	6ns	$V_{CC}/2$	15pF used for 5V typical test



Voltage Waveform
Pulse Duration

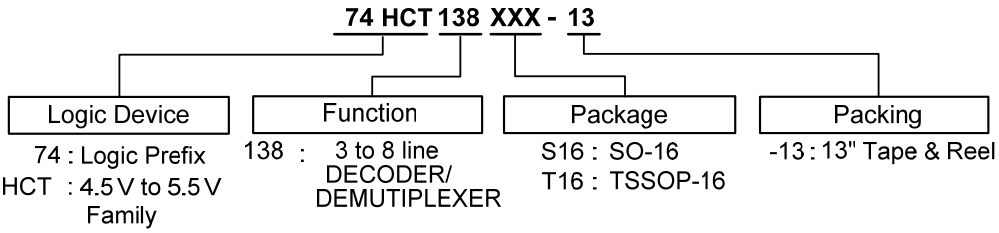


Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs

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}

Figure 1. Load Circuit and Voltage Waveforms

Ordering Information

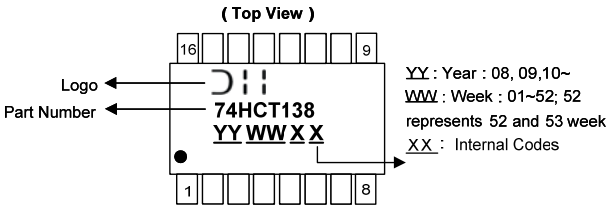


Device	Package Code	Packaging (Note 6)	7" Tape and Reel(Note 7)	
			Quantity	Part Number Suffix
74HCT138S16-13	S16	SO-16	2500/Tape & Reel	-13
74HCT138T16-13	T16	TSSOP-16	2500/Tape & Reel	-13

Notes: 6. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
http://www.diodes.com/datasheets/ap02001.pdf.
7. The taping orientation is located on our website at http://www.diodes.com/datasheets/ap02007.pdf

Marking Information

(1) SO-16, TSSOP-16

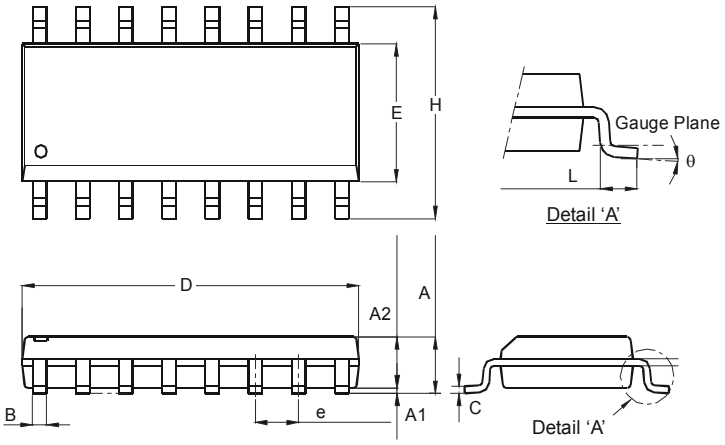


Part Number	Package
74HCT138S16	SO-16
74HCT138T16	TSSOP-16

Package Outline Dimensions (All dimensions in mm.)

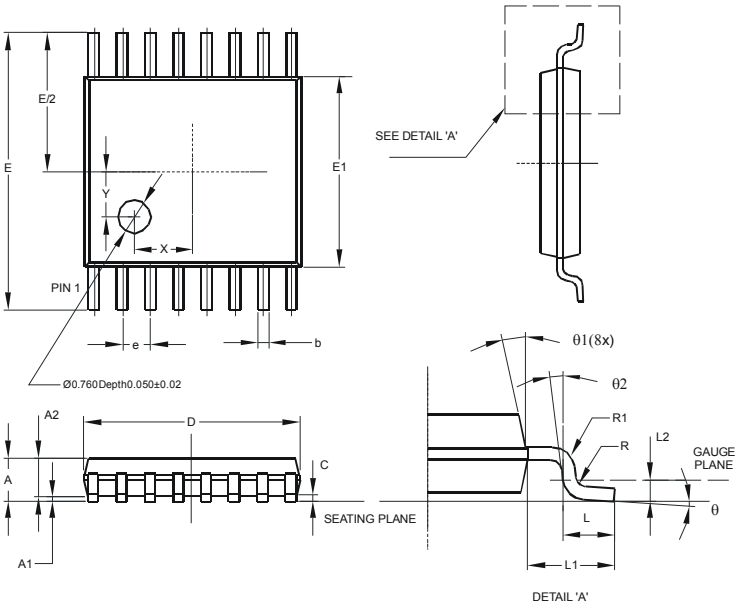
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

Package Type: SO-16



SO-16		
Dim	**Min**	**Max**
A	1.40	1.75
A1	0.10	0.25
A2	1.30	1.50
B	0.33	0.51
C	0.19	0.25
D	9.80	10.00
E	3.80	4.00
e	1.27 Typ	
H	5.80	6.20
L	0.38	1.27
θ	0°	8°
All Dimensions in mm		

Package Type: TSSOP-16

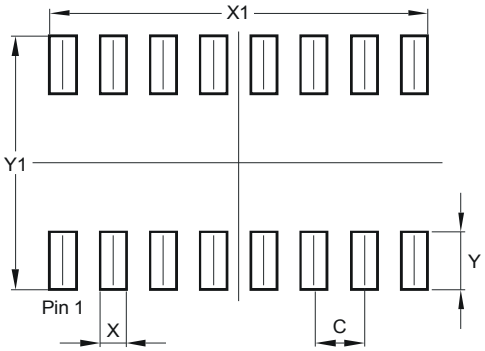


TSSOP-16			
Dim	**Min**	**Max**	**Typ**
A	-	1.08	-
A1	0.05	0.15	-
A2	0.80	0.93	-
b	0.19	0.30	-
c	0.09	0.20	-
D	4.90	5.10	-
E	6.40 BSC		
E1	4.30	4.50	-
e	0.65 BSC		
L	0.45	0.75	-
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
X	-	-	1.350
Y	-	-	1.050
θ	0°	8°	-
θ1	5°	15°	-
θ2	0°	-	-
All Dimensions in mm			

Suggested Pad Layout

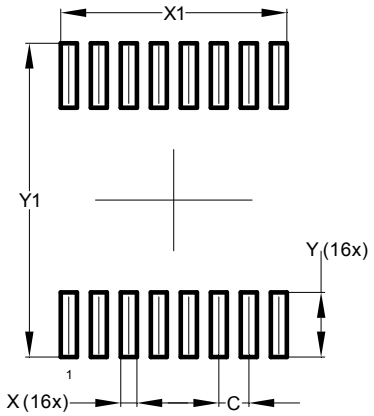
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

Package Type: SO-16



Dimensions	Value (in mm)
C	1.270
X	0.670
X1	9.560
Y	1.450
Y1	6.400

Package Type: TSSOP-16



Dimensions	Value (in mm)
C	0.650
X	0.350
X1	4.900
Y	1.400
Y1	6.800

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.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

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.

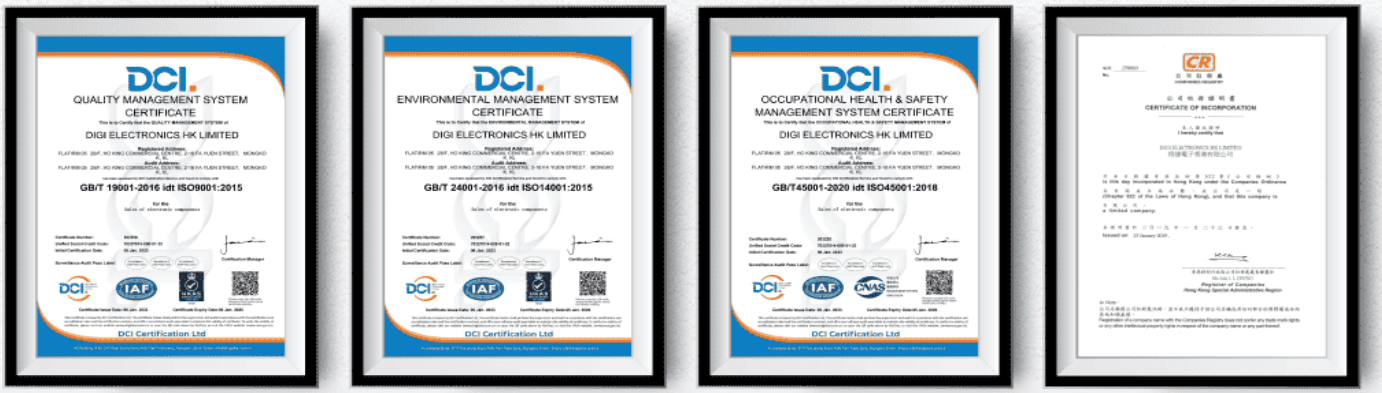
B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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.

www.diodes.com

OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement. DiGi through third-party certification, we striciy control the quality of products and services. Welcome your RFQ to Email: Info@DiGi-Electronics.com



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.