

# TinyLogic UHS Dual Inverter with Schmitt Trigger Inputs

## NC7WZ14

### Description

The NC7WZ14 is a dual inverter with Schmitt trigger input from onsemi's Ultra-High Speed (UHS) Series of TinyLogic. The device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive while maintaining low static power dissipation over a very broad V<sub>CC</sub> operating range. The device is specified to operate over the 1.65 V to 5.5 V V<sub>CC</sub> range. The inputs and outputs are high-impedance when V<sub>CC</sub> is 0 V. Inputs tolerate voltages up to 5.5 V independent of V<sub>CC</sub> operating voltage. Schmitt trigger inputs achieve typically 1 V hysteresis between the positive-and negative-going input threshold voltage at 5 V.

### Features

- Ultra High-Speed: t<sub>PD</sub> = 3.2 ns (Typical) into 50 pF at 5 V
- High Output Drive:  $\pm 24$  mA at 3 V V<sub>CC</sub>
- Broad V<sub>CC</sub> Operating Range: 1.65 V to 5.5 V
- Matches Performance of LCX when Operated at 3.3 V V<sub>CC</sub>
- Power Down High Impedance Inputs / Outputs
- Over-Voltage Tolerance Inputs Facilitate 5 V to 3 V Translation
- Proprietary Noise / EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SC-88 Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

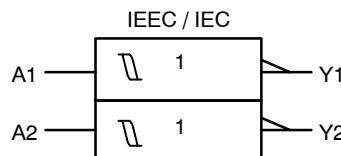


Figure 1. Logic Symbol

### MARKING DIAGRAMS



SIP6 1.45x1.0  
CASE 127EB



UDFN6  
1.0X1.0, 0.35P  
CASE 517DP



SC-88  
CASE 419B-02

A9	= Specific Device Code
KK	= 2-Digit Lot Run Traceability Code
XY	= 2-Digit Date Code Format
Z	= Assembly Plant Code
M	= Date Code
•	= Pb-Free Package (Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

## Pin Configurations

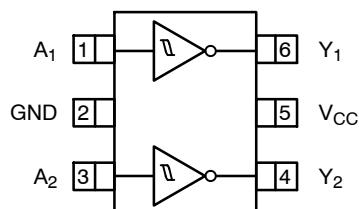


Figure 2. SC-88 (Top View)

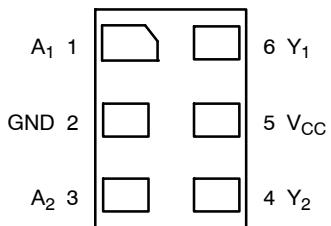
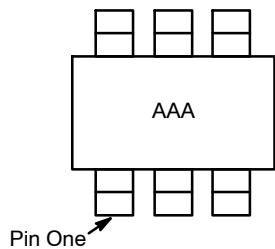


Figure 3. MicroPak (Top Through View)



## NOTES:

1. AAA represents Product Code Top Mark (see *Ordering Information*).
2. Orientation of Top Mark determines Pin One location. Read the top mark left to right, pin one is the lower left pin.

Figure 4. SC-88 Pin 1 Orientation

## PIN DEFINITIONS

Pin # SC-88	Pin # MicroPak	Name	Description
1	1	A <sub>1</sub>	Input
2	2	GND	Ground
3	3	A <sub>2</sub>	Input
4	4	Y <sub>2</sub>	Output
5	5	V <sub>CC</sub>	Supply Voltage
6	6	Y <sub>1</sub>	Output

FUNCTION TABLE (Y =  $\bar{A}$ )

Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level  
 L = LOW Logic Level

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	Unit
V <sub>CC</sub>	Supply Voltage		-0.5	6.5	V
V <sub>IN</sub>	DC Input Voltage		-0.5	6.5	V
V <sub>OUT</sub>	DC Output Voltage		-0.5	6.5	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> < 0 V	-	-50	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> < 0 V	-	-50	mA
I <sub>OUT</sub>	DC Output Current		-	±50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current		-	±100	mA
T <sub>STG</sub>	Storage Temperature Range		-65	+150	°C
T <sub>J</sub>	Junction Temperature Under Bias		-	+150	°C
T <sub>L</sub>	Junction Lead Temperature (Soldering, 10 Seconds)		-	+260	°C
P <sub>D</sub>	Power Dissipation	SC-88	-	332	mW
		MicroPak-6	-	812	
		MicroPak2™-6	-	812	
ESD	Human Body Model, JEDEC: JESD22-A114		-	4000	V
	Charge Device Model, JEDEC: JESD22-C101		-	2000	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage Operating		1.65	5.50	V
	Supply Voltage Data Retention		1.5	5.5	
V <sub>IN</sub>	Input Voltage		0	5.5	V
V <sub>OUT</sub>	Output Voltage		0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature	SC-88	-40	+125	°C
		MicroPak-6	-40	+85	
		MicroPak2-6	-40	+85	
θ <sub>JA</sub>	Thermal Resistance	SC-88	-	377	°C/W
		MicroPak-6	-	154	
		MicroPak2-6	-	154	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

3. Unused inputs must be held HIGH or LOW. They may not float.

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		T <sub>A</sub> = -40 to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V <sub>P</sub>	Positive Threshold Voltage	1.65		-	-	1.40	-	1.40	-	1.40	V
		1.80		-	-	1.50	-	1.50	-	1.50	
		2.30		-	-	1.80	-	1.80	-	1.80	
		3.00		-	-	2.20	-	2.20	-	2.20	
		4.50		-	-	3.10	-	3.10	-	3.20	
		5.50		-	-	3.60	-	3.60	-	3.70	

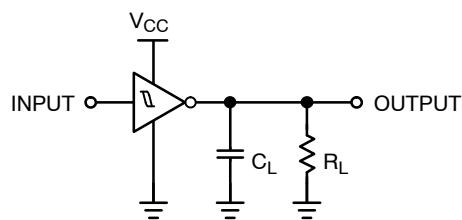
## DC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		T <sub>A</sub> = -40 to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V <sub>N</sub>	Negative Threshold Voltage	1.65		0.20	0.50	–	0.20	–	0.30	–	V
		1.80		0.25	0.56	–	0.25	–	0.35	–	
		2.30		0.40	0.75	–	0.40	–	0.50	–	
		3.00		0.60	0.98	–	0.60	–	0.70	–	
		4.50		1.00	1.42	–	1.00	–	1.10	–	
		5.50		1.20	1.68	–	1.20	–	1.40	–	
V <sub>H</sub>	Hysteresis Voltage	1.65		0.10	0.48	0.90	0.10	0.90	0.10	0.90	V
		1.80		0.15	0.51	1.00	0.15	1.00	0.15	1.00	
		2.30		0.25	0.62	1.10	0.25	1.10	0.25	1.10	
		3.00		0.40	0.76	1.20	0.40	1.20	0.40	1.20	
		4.50		0.60	1.01	1.50	0.60	1.50	0.60	1.50	
		5.50		0.70	1.20	1.70	0.70	1.70	0.70	1.70	
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>P</sub> or V <sub>N</sub> , I <sub>OH</sub> = -100 μA	1.55	1.65	–	1.55	–	1.55	–	V
		1.80		1.70	1.80	–	1.70	–	1.70	–	
		2.30		2.20	2.30	–	2.20	–	2.20	–	
		3.00		2.90	3.00	–	2.90	–	2.90	–	
		4.50		4.40	4.50	–	4.40	–	4.40	–	
		1.65		1.29	1.52	–	1.29	–	1.26	–	
		2.30	I <sub>OH</sub> = -8 mA	1.90	2.14	–	1.90	–	1.80	–	
		3.00	I <sub>OH</sub> = -16 mA	2.40	2.75	–	2.40	–	2.30	–	
		3.00	I <sub>OH</sub> = -24 mA	2.30	2.62	–	2.30	–	2.20	–	
		4.50	I <sub>OH</sub> = -32 mA	3.80	4.13	–	3.80	–	3.70	–	
V <sub>OL</sub>	LOW Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>P</sub> or V <sub>N</sub> , I <sub>OL</sub> = 100 μA	–	0.00	0.10	–	0.10	–	0.10	V
		1.80		–	0.00	0.10	–	0.10	–	0.10	
		2.30		–	0.00	0.10	–	0.10	–	0.10	
		3.00		–	0.00	0.10	–	0.10	–	0.10	
		4.50		–	0.00	0.10	–	0.10	–	0.10	
		1.65	I <sub>OL</sub> = 4 mA	–	0.08	0.24	–	0.24	–	0.26	
		2.30	I <sub>OL</sub> = 8 mA	–	0.10	0.30	–	0.30	–	0.32	
		3.00	I <sub>OL</sub> = 16 mA	–	0.16	0.40	–	0.40	–	0.43	
		3.00	I <sub>OL</sub> = 24 mA	–	0.24	0.55	–	0.55	–	0.60	
		4.50	I <sub>OL</sub> = 32 mA	–	0.25	0.55	–	0.55	–	0.60	
I <sub>IN</sub>	Input Leakage Current	1.65 to 5.5	V <sub>IN</sub> = 5.5 V, GND	–	–	±0.1	–	±1.0	–	±2.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	0	V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V	–	–	1	–	10	–	20	μA
I <sub>CC</sub>	Quiescent Supply Current	1.65 to 5.5	V <sub>IN</sub> = 5.5 V, GND	–	–	1.0	–	10	–	20	μA

## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		T <sub>A</sub> = -40 to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay (Figure 5, 6)	1.65	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ,	—	7.6	13.1	—	14.5	—	14.7	ns
		1.80		—	6.3	10.9	—	12.0	—	12.3	
		2.50 ±0.20		—	4.3	7.4	—	8.1	—	8.4	
		3.30 ±0.30		—	3.3	5.0	—	5.5	—	5.8	
		5.00 ±0.50		—	2.7	4.1	—	4.5	—	4.8	
		3.30 ±0.30	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω,	—	4.0	6.0	—	6.6	—	6.9	
		5.00 ±0.50		—	3.2	4.9	—	5.4	—	5.7	
C <sub>IN</sub>	Input Capacitance	0.00		—	2.5	—	—	—	—	—	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 4) (Figure 7)	3.30		—	11.0	—	—	—	—	—	pF
		5.00		—	12.5	—	—	—	—	—	

4. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression:  
 $I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CCstatic})$ .



NOTE:

5. C<sub>L</sub> includes load and stray capacitance;  
 Inputs PRR = 1.0 MHz, t<sub>W</sub> = 500 ns.

Figure 5. AC Test Circuit

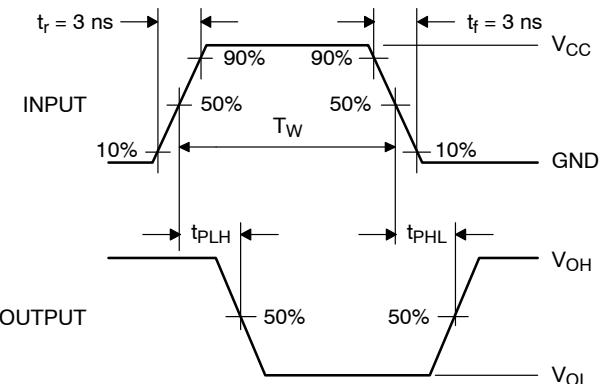
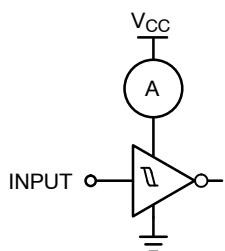


Figure 6. AC Waveforms



NOTE:

6. Input = AC Waveform; t<sub>r</sub> = t<sub>f</sub> = 1.8 ns; PRR = variable;  
 Duty Cycle = 50%.

Figure 7. I<sub>CCD</sub> Test Circuit

# NC7WZ14

## ORDERING INFORMATION

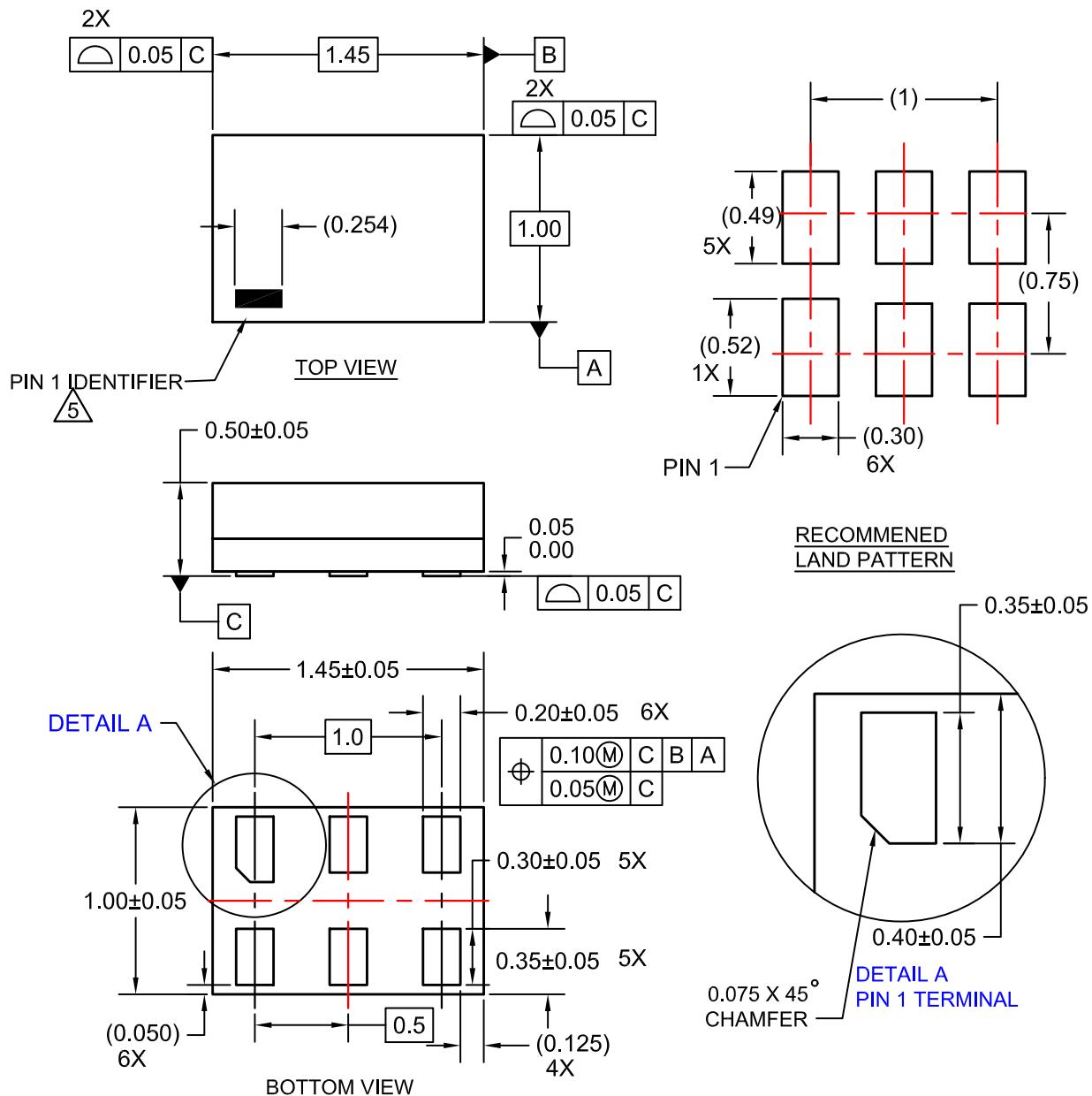
Device	Operating Temperature	Top Mark	Packages	Shipping <sup>†</sup>
NC7WZ14P6X	–40 to +125°C	Z14	6-Lead SC70, EIAJ SC-88, 1.25 mm Wide	3000 / Tape & Reel
NC7WZ14L6X	–40 to +85°C	A9	6-Lead MicroPak, 1.00 mm Wide	5000 / Tape & Reel
NC7WZ14FHX	–40 to +85°C	A9	6-Lead, MicroPak2, 1x1 mm Body, .35 mm Pitch	5000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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**SIP6 1.45X1.0**  
CASE 127EB  
ISSUE O

DATE 31 AUG 2016



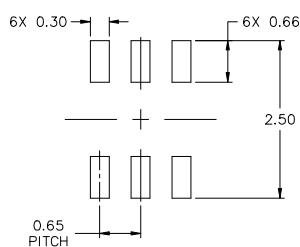
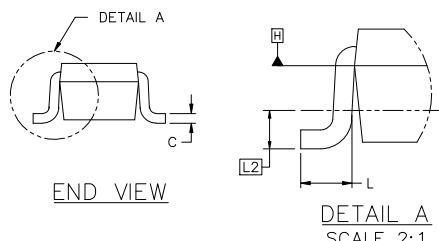
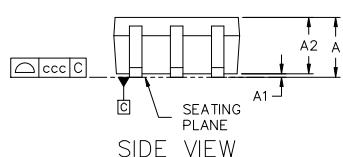
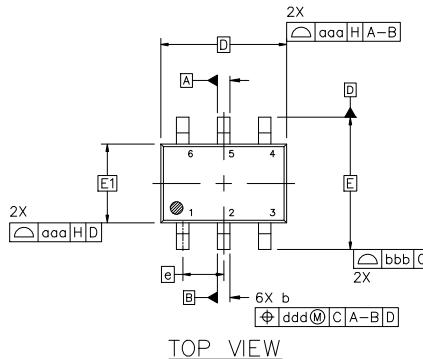
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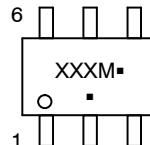
**SC-88 2.00x1.25x0.90, 0.65P**  
CASE 419B-02  
ISSUE Z

DATE 18 APR 2024



\* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

**GENERIC  
MARKING DIAGRAM\***



XXX = Specific Device Code  
M = Date Code\*  
■ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

**STYLES ON PAGE 2**

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DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	1.10
A1	0.00	---	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00	BSC	
E	2.10	BSC	
E1	1.25	BSC	
e	0.65	BSC	
L	0.26	0.36	0.46
L2	0.15	BSC	
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		

**SC-88 2.00x1.25x0.90, 0.65P**

CASE 419B-02

ISSUE Z

DATE 18 APR 2024

STYLE 1: PIN 1. Emitter 2 2. Base 2 3. Collector 1 4. Emitter 1 5. Base 1 6. Collector 2	STYLE 2: Cancelled	STYLE 3: Cancelled	STYLE 4: PIN 1. Cathode 2. Cathode 3. Collector 4. Emitter 5. Base 6. Anode	STYLE 5: PIN 1. Anode 2. Anode 3. Collector 4. Emitter 5. Base 6. Cathode	STYLE 6: PIN 1. Anode 2 2. N/C 3. Cathode 1 4. Anode 1 5. N/C 6. Cathode 2
STYLE 7: PIN 1. Source 2 2. Drain 2 3. Gate 1 4. Source 1 5. Drain 1 6. Gate 2	STYLE 8: Cancelled	STYLE 9: PIN 1. Emitter 2 2. Emitter 1 3. Collector 1 4. Base 1 5. Base 2 6. Collector 2	STYLE 10: PIN 1. Source 2 2. Source 1 3. Collector 1 4. Drain 1 5. Drain 2 6. Gate 2	STYLE 11: PIN 1. Cathode 2 2. Cathode 2 3. Anode 1 4. Cathode 1 5. Cathode 1 6. Anode 2	STYLE 12: PIN 1. Anode 2 2. Anode 2 3. Cathode 1 4. Anode 1 5. Anode 1 6. Cathode 2
STYLE 13: PIN 1. Anode 2. N/C 3. Collector 4. Emitter 5. Base 6. Cathode	STYLE 14: PIN 1. Vref 2. GND 3. GND 4. Iout 5. Ven 6. Vcc	STYLE 15: PIN 1. Anode 1 2. Anode 2 3. Anode 3 4. Cathode 3 5. Cathode 2 6. Cathode 1	STYLE 16: PIN 1. Base 1 2. Emitter 2 3. Collector 2 4. Base 2 5. Emitter 1 6. Collector 1	STYLE 17: PIN 1. Base 1 2. Emitter 1 3. Collector 2 4. Base 2 5. Emitter 2 6. Collector 1	STYLE 18: PIN 1. Vin1 2. Vcc 3. Vout2 4. Vin2 5. Gnd 6. Vout1
STYLE 19: PIN 1. Iout 2. Gnd 3. Gnd 4. Vcc 5. Ven 6. Vref	STYLE 20: PIN 1. Collector 2. Collector 3. Base 4. Emitter 5. Collector 6. Collector	STYLE 21: PIN 1. Anode 1 2. N/C 3. Anode 2 4. Cathode 2 5. N/C 6. Cathode 1	STYLE 22: PIN 1. D1 (i) 2. Gnd 3. D2 (i) 4. D2 (c) 5. Vbus 6. D1 (c)	STYLE 23: PIN 1. Vn 2. Ch1 3. Vp 4. N/C 5. Ch2 6. N/C	STYLE 24: PIN 1. Cathode 2. Anode 3. Cathode 4. Cathode 5. Cathode 6. Cathode
STYLE 25: PIN 1. Base 1 2. Cathode 3. Collector 2 4. Base 2 5. Emitter 6. Collector 1	STYLE 26: PIN 1. Source 1 2. Gate 1 3. Drain 2 4. Source 2 5. Gate 2 6. Drain 1	STYLE 27: PIN 1. Base 2 2. Base 1 3. Collector 1 4. Emitter 1 5. Emitter 2 6. Collector 2	STYLE 28: PIN 1. Drain 2. Drain 3. Gate 4. Source 5. Drain 6. Drain	STYLE 29: PIN 1. Anode 2. Anode 3. Collector 4. Emitter 5. Base/Anode 6. Cathode	STYLE 30: PIN 1. Source 1 2. Drain 2 3. Drain 2 4. Source 2 5. Gate 1 6. Drain 1

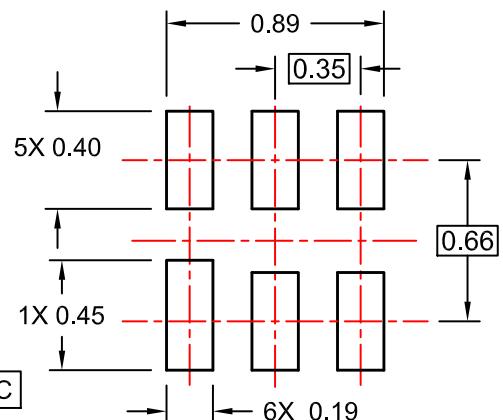
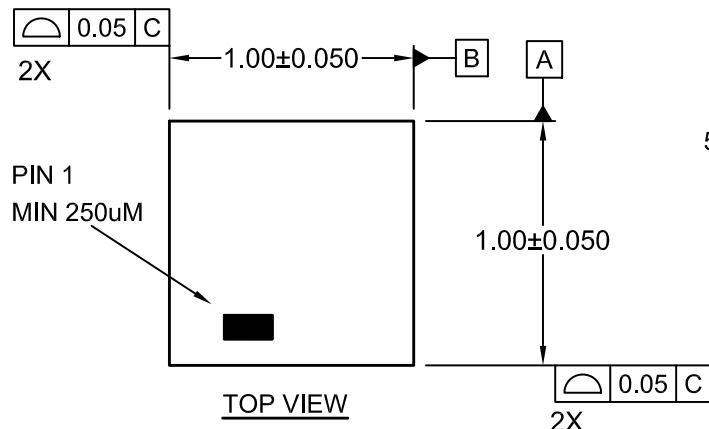
Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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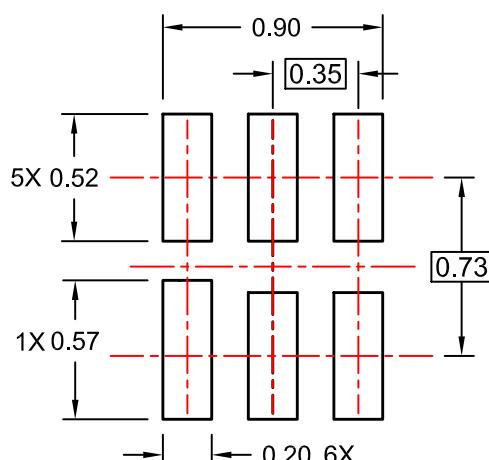
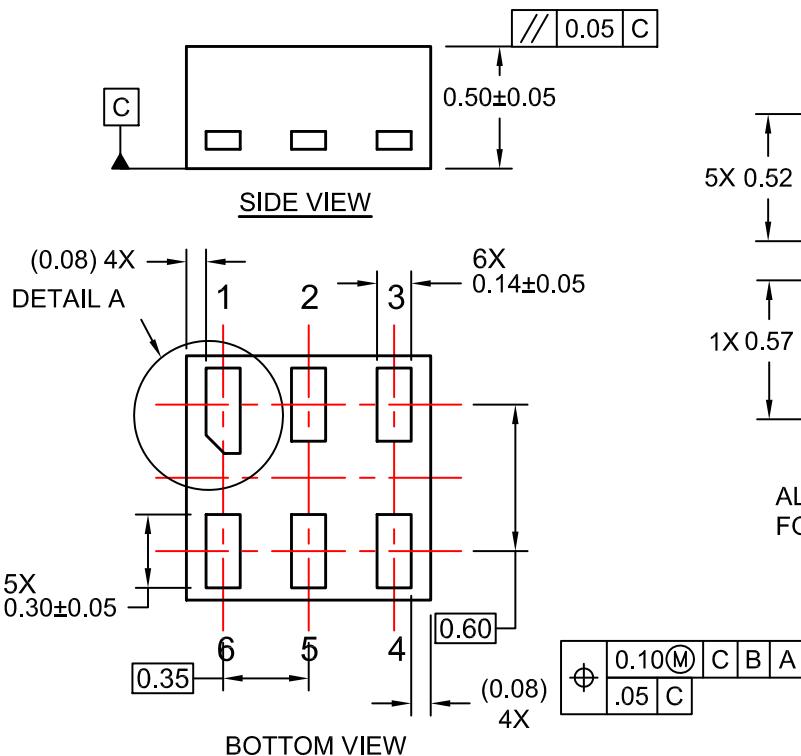
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## RECOMMENDED LAND PATTERN FOR SPACE CONSTRAINED PCB



## ALTERNATIVE LAND PATTERN FOR UNIVERSAL APPLICATION

## NOTES:

- A. COMPLIES TO JEDEC MO-252 STANDARD
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009

0.075X45° CHAMFER  DETAIL A  
PIN 1 LEAD SCALE: 2X

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