

## NC7SZ14L6X Datasheet



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DiGi Electronics Part Number NC7SZ14L6X-DG

Manufacturer onsemi

Manufacturer Product Number NC7SZ14L6X

Description IC INVERTER 1CH 1-INP 6MICROPAK

Detailed Description Inverter IC 1 Channel Schmitt Trigger 6-MicroPak



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RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.



### **Purchase and inquiry**

Manufacturer Product Number:	Manufacturer:
NC7SZ14L6X	onsemi
Series:	Product Status:
7SZ	Active
Logic Type:	Number of Circuits:
Inverter	1
Number of Inputs:	Features:
1	Schmitt Trigger
Voltage - Supply:	Current - Quiescent (Max):
1.65V ~ 5.5V	1 μΑ
Current - Output High, Low:	Input Logic Level - Low:
32mA, 32mA	0.2V ~ 1.2V
Input Logic Level - High:	Max Propagation Delay @ V, Max CL:
1.4V ~ 3.6V	5.9ns @ 5V, 50pF
Operating Temperature:	Mounting Type:
-40°C ~ 85°C	Surface Mount
Supplier Device Package:	Package / Case:
6-MicroPak	6-UFDFN
Base Product Number:	
7SZ14	

### **Environmental & Export classification**

8542.39.0001

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



# TinyLogic UHS Inverter with Schmitt Trigger Input

### NC7SZ14

#### Description

The NC7SZ14 is a single inverter with Schmitt trigger input from **onsemi**'s Ultra–High Speed (UHS) series of TinyLogic. The device is fabricated w ith advanced CMOS technology to achieve ultra–high speed with high output drive while maintaining low static power dissipation over a very broad  $V_{\rm CC}$  operating range. The device is specified to operate over the 1.65 V to 5.5 V  $V_{\rm CC}$  range. The inputs and outputs are high–impedance when  $V_{\rm CC}$  is 0 V. Inputs tolerate voltages up to 5.5 V independent of  $V_{\rm CC}$  operating voltage.

#### **Features**

- Ultra-High Speed:  $t_{PD} = 3.7 \text{ ns}$  (Typical) into 50 pF at 5 V  $V_{CC}$
- High Output Drive: ±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<sup>TM</sup> Packages
- Space–Saving SOT23–5, SC–74A and SC–88A Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

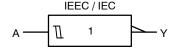
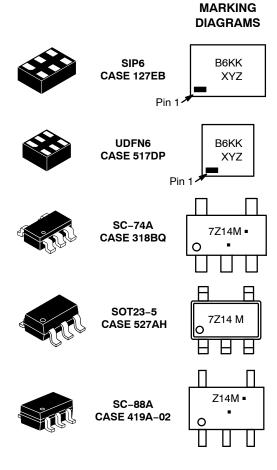


Figure 1. Logic Symbol



B6, 7Z14, Z14 = 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

(Note: Microdot may be in either location)

#### **ORDERING INFORMATION**

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5.

#### **Pin Configurations**

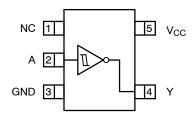


Figure 2. SOT23-5, SC-88A and SC-74A (Top View)

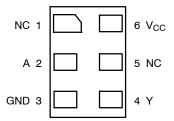


Figure 3. MicroPak (Top Through View)

#### **PIN DEFINITIONS**

Pin # SC-88A / SC74A/ SOT23-5	Pin # MicroPak	Name	Description
1	1, 5	NC	No Connect
2	2	Α	Input
3	3	GND	Ground
4	4	Υ	Output
5	6	V <sub>CC</sub>	Supply Voltage

#### **FUNCTION TABLE**

Inputs	Output
Α	Υ
L	Н
Н	L

H = HIGH Logic Level L = LOW Logic Level

#### **ABSOLUTE MAXIMUM RATINGS**

Symbol	Paramet	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	-	±50	mA	
T <sub>STG</sub>	Storage Temperature Range	-65	+150	°C	
TJ	Junction Temperature Under Bias		-	+150	°C
T <sub>L</sub>	Junction Lead Temperature (Solder	ing, 10 Seconds)	-	+260	°C
P <sub>D</sub>	Power Dissipation in Still Air	SC-74A / SOT23-5	-	390	mW
		SC-88A	-	332	
		MicroPak-6	-	812	
		MicroPak2™-6	-	812	
ESD	Human Body Model, JEDEC: JESD	22-A114	-	2000	V
	Charge Device Model, JEDEC: JES	SD22-C101	-	1000	1

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	5.5	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		-40	+85	°C
$\theta_{\sf JA}$	Thermal Resistance	SC-74A / SOT23-5	-	320	°C/W
		SC-88A	-	377	
		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.

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

#### DC ELECTRICAL CHARACTERISTICS

				,	T <sub>A</sub> = +25°C	;	T <sub>A</sub> = -40	to +85°C	
Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	Min	Тур	Max	Min	Max	Unit
V <sub>P</sub>	Positive Threshold Voltage	1.65		-	1.00	1.40	-	1.40	V
		1.80		-	1.10	1.50	-	1.50	
		2.30		-	1.40	1.80	-	1.80	
		3.00		-	1.75	2.20	-	2.20	
		4.50		-	2.45	3.10	-	3.10	
		5.50		-	2.90	3.60	-	3.60	
V <sub>N</sub>	Negative Threshold Voltage	1.65		0.20	0.50	-	0.20	-	V
		1.80		0.25	0.55	-	0.25	-	<b>1</b>
		2.30		0.40	0.75	_	0.40	-	
		3.00		0.60	1.00	_	0.60	-	
		4.50		1.00	1.43	_	1.00	-	
		5.50		1.20	1.70	_	1.20	-	
V <sub>H</sub>	Hysteresis Voltage	1.65		0.10	0.48	0.90	0.10	0.90	V
		1.80		0.15	0.54	1.00	0.15	1.00	
		2.30		0.25	0.65	1.10	0.25	1.10	
		3.00		0.40	0.77	1.20	0.40	1.20	
		4.50		0.60	1.01	1.50	0.60	1.50	
		5.50		0.70	1.18	1.70	0.70	1.70	1

#### DC ELECTRICAL CHARACTERISTICS (continued)

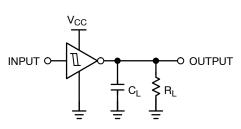
				$T_A = +25^{\circ}C$		T <sub>A</sub> = -40	to +85°C		
Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	Min	Тур	Max	Min	Max	Unit
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	$V_{IN} = V_P \text{ or } V_N$	1.55	1.65	-	1.55	-	V
		1.80	I <sub>OH</sub> = -100 μA	1.70	1.80	-	1.70	-	
		2.30		2.20	2.30	-	2.20	-	
		3.00		2.90	3.00	-	2.90	-	
		4.50		4.40	4.50	=	4.40	_	
		1.65	I <sub>OH</sub> = -4 mA	1.29	1.52	=	1.29	_	
		2.30	I <sub>OH</sub> = -8 mA	1.90	2.15	-	1.90	-	
		3.00	I <sub>OH</sub> = -16 mA	2.40	2.80	-	2.40	-	
		3.00	I <sub>OH</sub> = -24 mA	2.30	2.68	-	2.30	-	
		4.50	I <sub>OH</sub> = -32 mA	3.80	4.20	-	3.80	-	
V <sub>OL</sub>	LOW Level Output Voltage	1.65	$V_{IN} = V_P \text{ or } V_N,$	-	0.00	0.10	-	0.10	V
		1.80	I <sub>OL</sub> = 100 μA	-	0.00	0.10	-	0.10	
		2.30		-	0.00	0.10	-	0.10	
		3.00		-	0.00	0.10	-	0.10	
		4.50		-	0.00	0.10	-	0.10	
		1.65	I <sub>OL</sub> = 4 mA	-	0.08	0.24	-	0.24	
		2.30	I <sub>OL</sub> = 8 mA	-	0.10	0.30	-	0.30	
		3.00	I <sub>OL</sub> = 16 mA	-	0.15	0.40	-	0.40	
		3.00	I <sub>OL</sub> = 24 mA	-	0.22	0.55	-	0.55	
		4.50	I <sub>OL</sub> = 32 mA	-	0.22	0.55	-	0.55	
I <sub>IN</sub>	Input Leakage Current	1.65 to 5.5	V <sub>IN</sub> = 5.5 V, GND	-	_	±0.1	-	±1.0	μΑ
l <sub>OFF</sub>	Power Off Leakage Current	0	$V_{IN}$ or $V_{OUT} = 5.5 \text{ V}$	-	_	1	-	10	μΑ
I <sub>CC</sub>	Quiescent Supply Current	1.65 to 5.5	V <sub>IN</sub> = 5.5 V, GND	1	-	1.0	-	10	μΑ

#### **AC ELECTRICAL CHARACTERISTICS**

				T <sub>A</sub> = +25°C		T <sub>A</sub> = -40	to +85°C		
Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	Min	Тур	Max	Min	Max	Unit
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay	1.65	C <sub>L</sub> = 15 pF,	_	9.1	15.0	-	15.6	ns
	(Figure 4, 5)	1.80	$R_L = 1 M\Omega$	-	7.6	12.5	-	13.0	
		2.50 ±0.20	±0.20	_	5.0	9.0	-	9.5	
		3.30 ±0.30		_	3.7	6.3	-	6.5	
		5.00 ±0.50		_	3.1	5.2	-	5.5	
		3.30 ±0.30	C <sub>L</sub> = 50 pF,	_	4.4	7.2	-	7.5	
		5.00 ±0.50	$R_L = 500 \Omega$	_	3.7	5.9	-	6.2	
C <sub>IN</sub>	Input Capacitance	0.00		_	4	_	-	-	pF
C <sub>PD</sub>	Power Dissipation Capacitance	3.30		_	24	-	-	_	pF
	(Note 2) (Figure 6)	5.00		-	30	_	-	_	

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<sub>CCD</sub> = (C<sub>PD</sub>) (V<sub>CC</sub>) (f<sub>IN</sub>) + (I<sub>CC</sub>static).





NOTE:

4.  $C_L$  includes load and stray capacitance; Input PRR = 1.0 MHz;  $t_W$  = 500 ns

Figure 4. AC Test Circuit

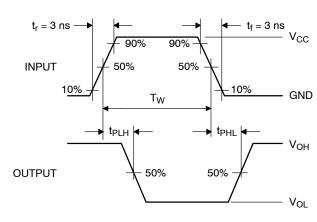
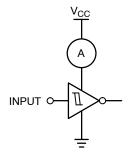


Figure 5. AC Waveforms



NOTE:

3. Input = AC Waveform;  $t_r = t_f = 1.8$  ns; PRR = 10 MHz; Duty Cycle = 50%.

Figure 6. I<sub>CCD</sub> Test Circuit

#### **ORDERING INFORMATION**

Part Number	Top Mark	Operating Temperature	Packages	Shipping <sup>†</sup>
NC7SZ14M5X	7Z14	−40 to +85°C	SC-74A	3000 / Tape & Reel
NC7SZ14P5X	Z14	−40 to +85°C	SC-88A	3000 / Tape & Reel
NC7SZ14L6X	B6	−40 to +85°C	SIP6, MicroPak	5000 / Tape & Reel
NC7SZ14FHX	B6	-40 to +85°C	UDFN6, MicroPak2	5000 / Tape & Reel

#### **DISCONTINUED** (Note 5)

NC7SZ14M5X-L22090	7Z14	−40 to +85°C	SOT23-5	3000 / Tape & Reel
NC7SZ14P5X-L22057	Z14	−40 to +85°C	SC-88A	3000 / Tape & Reel
NC7SZ14L6X-L22175	B6	−40 to +85°C	SIP6, MicroPak	5000 / Tape & Reel
NC7SZ14FHX-L22175	B6	−40 to +85°C	UDFN6, MicroPak2	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.

MicroPak and MicroPak2 are trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries.

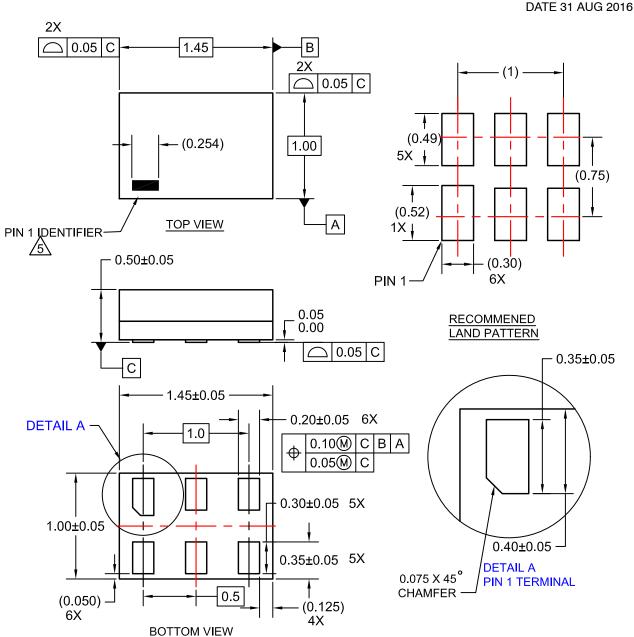


DISCONTINUED: These devices are not recommended for new design. Please contact your onsemi representative for information. The
most current information on these devices may be available on <a href="https://www.onsemi.com">www.onsemi.com</a>.



#### **MECHANICAL CASE OUTLINE** PACKAGE DIMENSIONS

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



NOTES:

- 1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
- 2. DIMENSIONS ARE IN MILLIMETERS
- 3. DRAWING CONFORMS TO ASME Y14.5M-2009
  4. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY

  - OTHER LINE IN THE MARK CODE LAYOUT.

DOCUMENT NUMBER:	98AON13590G	Electronic versions are uncontrolled except when accessed directly from the Document Repos Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.					
DESCRIPTION:	SIP6 1.45X1.0		PAGE 1 OF 1				

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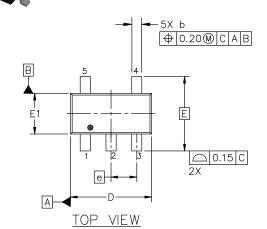


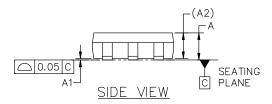
PACKAGE DIMENSIONS

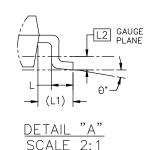


#### SC-74A-5 3.00x1.50x0.95, 0.95P CASE 318BQ ISSUE C

**DATE 26 FEB 2024** 







### GENERIC MARKING DIAGRAM\*



XXX = Specific Device Code

M = Date Code

= Pb-Free Package

(Note: Microdot may be in either 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.

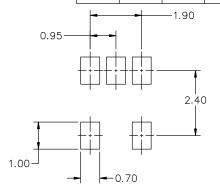
#### NOTES:

- DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
- 2. ALL DIMENSION ARE IN MILLIMETERS (ANGLES IN DEGREES).
- 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
- 4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OF GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

DETAIL	A —
_c	
<b>↓</b>	
† END	VIEW

DIM			
DIIVI	MIN.	NOM.	MAX.
Α	0.90	1.00	1.10
A1	0.01	0.18	0.10
A2	0.95 REF.		
b	0.25	0.37	0.50
С	0.10	0.18	0.26
D	2.85	3.00	3.15
Е	2.75 BSC		
E1	1.35	1.50	1.65
е	0.95 BSC		
L	0.20	0.40	0.60
L1	0.62 REF.		
L2	0.25 BSC		
Θ	0,	5*	10°

**MILLIMETERS** 



RECOMMENDED MOUNTING FOOTPRINT\*

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

DOCUMENT NUMBER:	98AON66279G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	SC-74A-5 3.00x1.50x0.95, 0.95P		PAGE 1 OF 1

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PACKAGE DIMENSIONS



#### SC-88A (SC-70-5/SOT-353) CASE 419A-02 ISSUE M

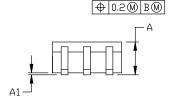
**DATE 11 APR 2023** 

#### NOTES:

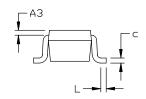
- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- 419A-01 DBSDLETE. NEW STANDARD 419A-02
- DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

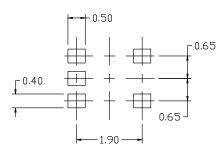
	MILLIMETERS		
DIM	MILLIMETERS		
	MIN.	N□M.	MAX.
А	0.80	0.95	1.10
A1			0.10
A3	0.20 REF		
b	0.10	0.20	0.30
С	0.10		0.25
D	1.80	2.00	2,20
Е	2.00	2.10	2,20
E1	1.15	1.25	1.35
е	0.65 BSC		
L	0.10	0.15	0.30

### е Ε1 0



5X b





#### RECOMMENDED MOUNTING FOOTPRINT

For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

#### **GENERIC MARKING DIAGRAM\***



\*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.

XXX = Specific Device Code

= Date Code

= Pb-Free Package

(Note: Microdot may be in either location)

STYLE 9:

STYLE 1:
PIN 1. BASE
<ol><li>EMITTER</li></ol>
3. BASE
<ol><li>COLLECTOR</li></ol>
<ol><li>COLLECTOR</li></ol>

PIN 1. EMITTER 2

2. BASE 2

3. EMITTER 1

COLLECTOR

5. COLLECTOR 2/BASE 1

STYLE 6:

STYLE 2: PIN 1. ANODE 2. EMITTER 3. BASE 4. COLLECTOR CATHODE

2. EMITTER

4. COLLECTOR

5. COLLECTOR

3. BASE

STYLE 3: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. CATHODE 1 STYLE 8:

PIN 1. CATHODE 2. COLLECTOR 3. N/C

5. EMITTER

4. BASE

STYLE 4: PIN 1. SOURCE 1 2. DRAIN 1/2 3 SOURCE 1 4. GATE 1 5. GATE 2

3. ANODE 4. ANODE

5 ANODE

PIN 1. CATHODE 2. COMMON ANODE 3. CATHODE 2 4. CATHODE 3 5. CATHODE 4

Note: Please refer to datasheet for PIN 1. ANODE 2. CATHODE style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

#### **DOCUMENT NUMBER:**

98ASB42984B

STYLE 7:

PIN 1. BASE

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STYLE 5:

**DESCRIPTION:** 

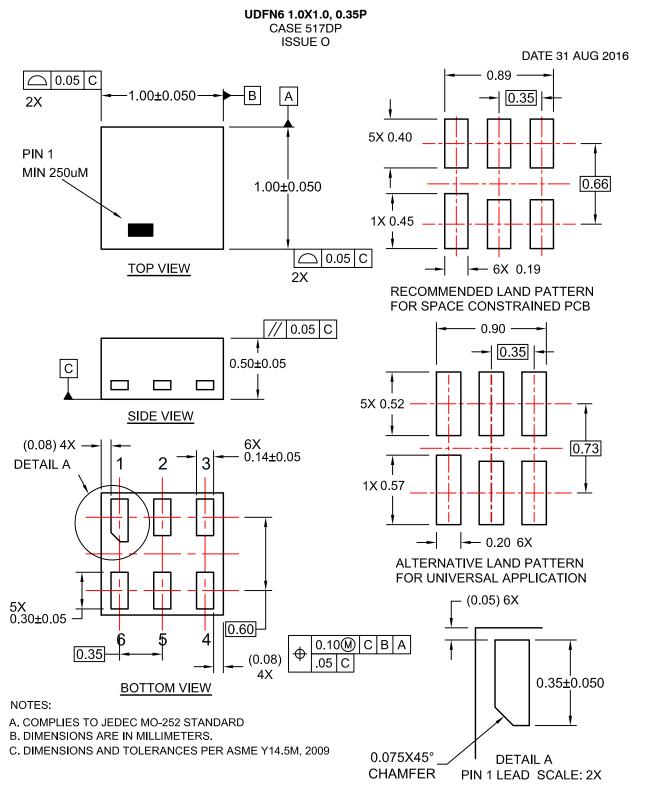
SC-88A (SC-70-5/SOT-353)

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PACKAGE DIMENSIONS



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PACKAGE DIMENSIONS



REFERENCE

SOT-23, 5 Lead CASE 527AH **ISSUE A** 

**DATE 09 JUN 2021** 



A

F1 F

В

DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 19894

DIM

Α

A1

Α2

b

n

Ε

E1

е

L1

L2

θ

θ1

- CONTROLLING DIMENSION: MILLIMETERS
- MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE
- DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS, MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.25 PER SIDE. D AND E1 DIMENSIONS ARE DETERMINED AT DATUM D.

MTN.

0.90

0.00

0.90

0.30

0.08

0.30

0°

DIMENSION 'b' DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE O. 08mm TOTAL IN EXCESS OF THE 'b' DIMENSION AT MAXIMUM MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD SHALL NOT BE LESS THAN 0.07mm.

MILLIMETERS

NΠM.

1.15

2.90 BSC

2.80 BSC

1.60 BSC

0.95 BSC

0.45

0.60 REF 0.25 REF

4°

10°

MAX.

1.45

0.15

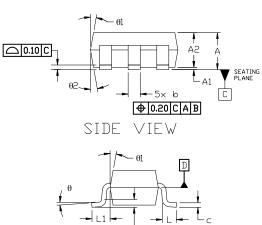
1.30

0.50

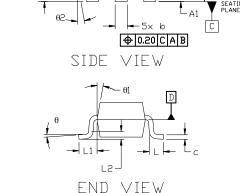
0.22

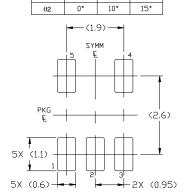
0.60

15°



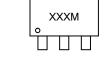
TOP VIEW





**GENERIC** 

**MARKING DIAGRAM\*** 



XXX = Specific Device Code = Date Code

\*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.

#### RECOMMENDED MOUNTING FOOTPRINT

For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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