

# Inverter with Schmitt-Trigger

## NL17SG14

The NL17SG14 is a single inverter with Schmitt-trigger input in tiny footprint packages. The device is designed to operate for  $V_{CC} = 0.9\text{ V}$  to  $3.6\text{ V}$ .

### Features

- Designed for  $0.9\text{ V}$  to  $3.6\text{ V}$   $V_{CC}$  Operation
- $2.4\text{ ns}$  (Typ) at  $V_{CC} = 3.0\text{ V}$ ,  $C_L = 15\text{ pF}$
- Inputs/Outputs Over-Voltage Tolerant up to  $3.6\text{ V}$
- $I_{OFF}$  Supports Partial Power Down Protection
- Available in UDFN Package
- -Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen-Free/BFR-Free and RoHS-Compliant

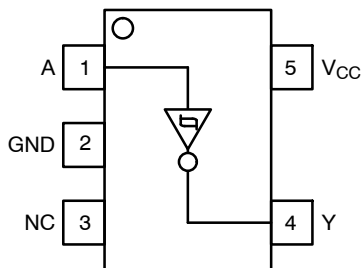


Figure 1. SOT-953 (Top Thru View)

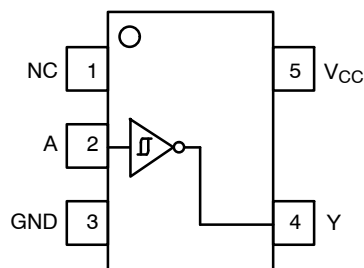


Figure 2. SC-88A (Top View)

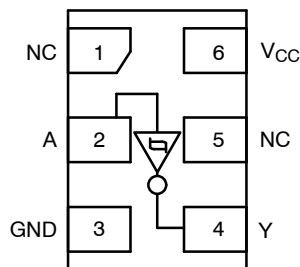


Figure 3. UDFN (Top View)

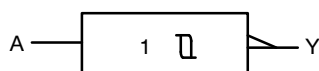
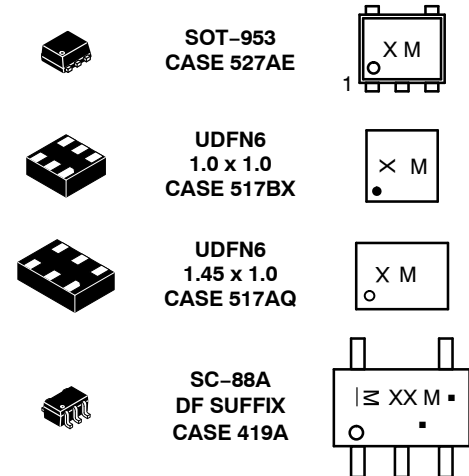


Figure 4. Logic Symbol

### MARKING DIAGRAMS



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.

PIN ASSIGNMENT			
	SOT-953	SC-88A	UDFN6
1	A	NC	NC
2	GND	A	A
3	NC	GND	GND
4	Y	Y	Y
5	$V_{CC}$	$V_{CC}$	NC
6			$V_{CC}$

FUNCTION TABLE	
A Input	Y Output
L	H
H	L

### ORDERING INFORMATION

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

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 6.

# NL17SG14

**Table 1. MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply Voltage	-0.5 to +4.3	V
$V_{IN}$	DC Input Voltage	-0.5 to +4.3	V
$V_{OUT}$	DC Output Voltage Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode ( $V_{CC} = 0$ V)	-0.5 to $V_{CC} + 0.5$ -0.5 to +4.3 -0.5 to +4.3	V
$I_{IK}$	DC Input Diode Current $V_{IN} < GND$	-20	mA
$I_{OK}$	DC Output Diode Current $V_{OUT} < GND$	-20	mA
$I_{OUT}$	DC Output Source/Sink Current	$\pm 20$	mA
$I_{CC}$ or $I_{GND}$	DC Supply Current Per Supply Pin or Ground Pin	$\pm 20$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	$^{\circ}C$
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	$^{\circ}C$
$T_J$	Junction Temperature Under Bias	+150	$^{\circ}C$
$\theta_{JA}$	Thermal Resistance (Note 2)	154	$^{\circ}C/W$
$P_D$	Power Dissipation in Still Air	812	mW
$\theta_{JA}$	Thermal Resistance (Note 2) SC-88A SOT-953 UDFN6	377 254 154	$^{\circ}C/W$
$P_D$	Power Dissipation in Still Air SC-88A SOT-953 UDFN6	332 491 812	mW
MSL	Moisture Sensitivity	Level 1	
FR	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
$V_{ESD}$	ESD Withstand Voltage (Note 3) Human Body Model Charged Device Model	2000 1000	V
$I_{LATCHUP}$	Latchup Performance (Note 4)	$\pm 100$	mA

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.

1. Applicable to devices with outputs that may be tri-stated.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm – by – 1inch, 2 ounce copper trace no air flow per JESD51-7.
3. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.
4. Tested to EIA/JESD78 Class II.

**Table 2. RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	Positive DC Supply Voltage	0.9	3.6	V
$V_{IN}$	Digital Input Voltage	0	3.6	V
$V_{OUT}$	Output Voltage Active Mode (High or Low State) Tri-State Mode (Note 1) Power Down Mode ( $V_{CC} = 0$ V)	0 0 0	$V_{CC}$ 3.6 3.6	V
$T_A$	Operating Free-Air Temperature	-55	+125	$^{\circ}C$
$t_r, t_f$	Input Transition Rise or Fall Rate	0	No Limit	nS/V

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.

# NL17SG14

**Table 3. DC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
V <sub>T+</sub>	Positive Going Input Threshold Voltage		0.9	-	0.7	-	-	-	V
			1.1	-	0.81	0.95	-	0.95	
			1.4	-	0.94	1.16	-	1.16	
			1.65	-	1.06	1.3	-	1.3	
			2.3	-	1.36	1.73	-	1.73	
			3.0	-	1.8	2.24	-	2.24	
V <sub>T-</sub>	Negative Going Input Threshold Voltage		0.9	-	0.23	-	-	-	V
			1.1	0.15	0.33	-	0.15	-	
			1.4	0.3	0.47	-	0.3	-	
			1.65	0.35	0.6	-	0.35	-	
			2.3	0.55	0.85	-	0.55	-	
			3.0	0.95	1.13	-	0.95	-	
V <sub>H</sub>	Hysteresis Voltage		0.9	-	0.27	-	-	-	V
			1.1	0.2	0.35	0.8	0.2	0.8	
			1.4	0.25	0.41	0.86	0.25	0.86	
			1.65	0.30	0.46	0.9	0.30	0.9	
			2.3	0.40	0.56	1.05	0.40	1.05	
			3.0	0.49	0.59	1.1	0.49	1.1	
V <sub>OH</sub>	High-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>							V
		I <sub>OH</sub> = -20 μA	0.9	-	0.75	-	-	-	
		I <sub>OH</sub> = -0.3 mA	1.1 to 1.3	0.75 x V <sub>CC</sub>	-	-	0.75 x V <sub>CC</sub>	-	
		I <sub>OH</sub> = -1.7 mA	1.4 to 1.6	0.75 x V <sub>CC</sub>	-	-	0.75 x V <sub>CC</sub>	-	
		I <sub>OH</sub> = -3.0 mA	1.65 to 1.95	V <sub>CC</sub> - 0.45	-	-	V <sub>CC</sub> - 0.45	-	
		I <sub>OH</sub> = -4.0 mA	2.3 to 2.7	2.0	-	-	2.0	-	
V <sub>OL</sub>	Low-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>							V
		I <sub>OL</sub> = 20 μA	0.9	-	0.1	-	-	-	
		I <sub>OL</sub> = 0.3 mA	1.1 to 1.3	-	-	0.25 x V <sub>CC</sub>	-	0.25 x V <sub>CC</sub>	
		I <sub>OL</sub> = 1.7 mA	1.4 to 1.6	-	-	0.25 x V <sub>CC</sub>	-	0.25 x V <sub>CC</sub>	
		I <sub>OL</sub> = 3.0 mA	1.65 to 1.95	-	-	0.45	-	0.45	
		I <sub>OL</sub> = 4.0 mA	2.3 to 2.7	-	-	0.4	-	0.4	
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 0 V to 3.6 V	0.9 to 3.6	-	-	±0.1	-	±1.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> = 0 V to 3.6 V; V <sub>OUT</sub> = 0 V to 3.6 V	0	-	-	1.0	-	10.0	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	0.9 to 3.6	-	-	0.5	-	10.0	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# NL17SG14

**Table 4. AC ELECTRICAL CHARACTERISTICS**

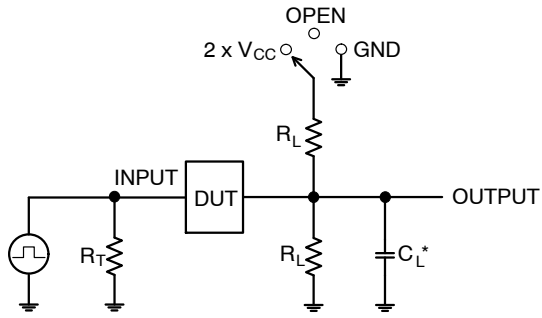
Symbol	Parameter	Test Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, A to Y (Figures 5 and 6)	C <sub>L</sub> = 10 pF, R <sub>L</sub> = 1 MΩ	0.9	-	38.0	-	-	-	ns
			1.1 to 1.3	-	9.7	24.1	-	35.9	
			1.4 to 1.6	-	5.4	10.5	-	11.3	
			1.65 to 1.95	-	3.9	7.8	-	8.2	
			2.3 to 2.7	-	2.8	5.4	-	5.8	
			3.0 to 3.6	-	2.3	4.4	-	4.6	
		C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	0.9	-	38.4	-	-	-	
			1.1 to 1.3	-	9.9	25.1	-	41.6	
			1.4 to 1.6	-	5.6	11.5	-	12.6	
			1.65 to 1.95	-	4.1	8.4	-	8.7	
			2.3 to 2.7	-	2.9	5.7	-	6.1	
			3.0 to 3.6	-	2.4	4.6	-	5.0	
		C <sub>L</sub> = 30 pF, R <sub>L</sub> = 1 MΩ	0.9	-	39.6	-	-	-	
			1.1 to 1.3	-	10.5	35.7	-	58.1	
			1.4 to 1.6	-	6.0	15.8	-	17.6	
			1.65 to 1.95	-	4.7	10.7	-	11.7	
			2.3 to 2.7	-	3.2	6.9	-	8.1	
			3.0 to 3.6	-	2.6	5.2	-	6.1	

**Table 5. CAPACITIVE CHARACTERISTICS**

Symbol	Parameter	Test Condition	Typical (T <sub>A</sub> = 25°C)	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 0 V	3.0	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 0 V	3.0	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)	f = 10 MHz, V <sub>CC</sub> = 0.9 V to 3.6 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	4.0	pF

5. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption: P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

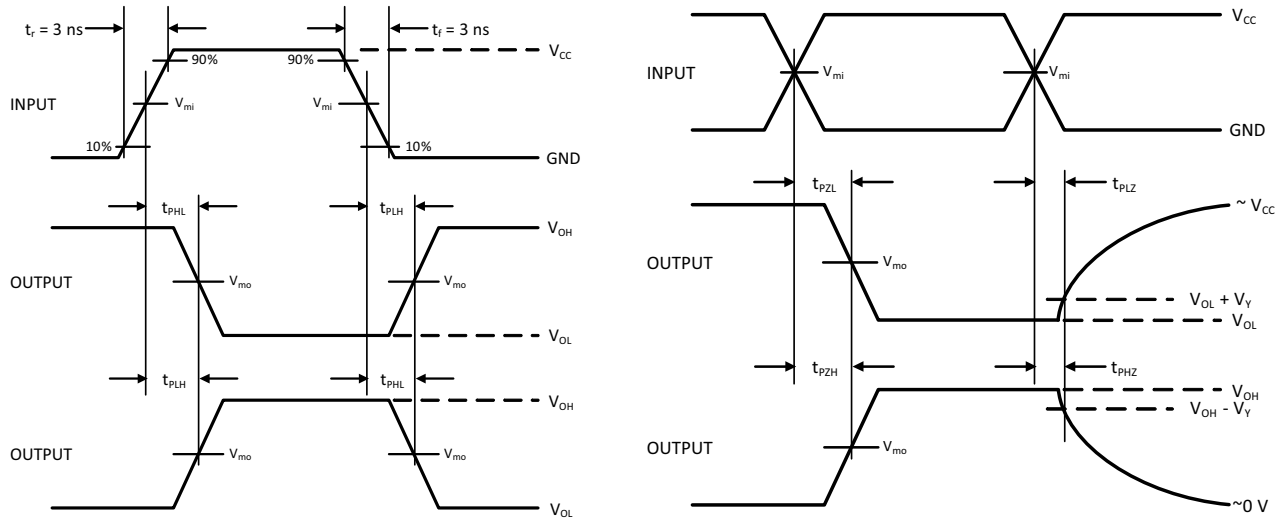
# NL17SG14



$C_L$  includes probe and jig capacitance  
 $R_T$  is  $Z_{OUT}$  of pulse generator (typically 50  $\Omega$ )  
 $f = 1$  MHz

**Figure 5. Test Circuit**

Test	Switch Position
$t_{PLH} / t_{PHL}$	Open
$t_{PLZ} / t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ} / t_{PZH}$	GND



**Figure 6. Switching Waveforms**

$V_{CC}, V$	$V_{mi}, V$	$V_{mo}, V$	$V_Y, V$
0.9	$V_{CC}/2$	$V_{CC}/2$	0.1
1.1 to 1.3	$V_{CC}/2$	$V_{CC}/2$	0.1
1.4 to 1.6	$V_{CC}/2$	$V_{CC}/2$	0.1
1.65 to 1.95	$V_{CC}/2$	$V_{CC}/2$	0.15
2.3 to 2.7	$V_{CC}/2$	$V_{CC}/2$	0.15
3.0 to 3.6	1.5	1.5	0.3

# NL17SG14

## ORDERING INFORMATION

Device	Package	Marking	Pin 1 Orientation (See below)	Shipping <sup>†</sup>
NL17SG14MU1TCG	UDFN6, 1.45 x 1.0	4 (Rotated 180°CW)	Q4	3000 / Tape & Reel
NL17SG14DFT2G-Q*	SC-88A	AR	Q4	3000 / Tape & Reel
NL17SG14P5T5G	SOT-953	2	Q2	8000 / Tape & Reel

### DISCONTINUED (Note 6)

NL17SG14DFT2G	SC-88A	AR	Q4	3000 / Tape & Reel
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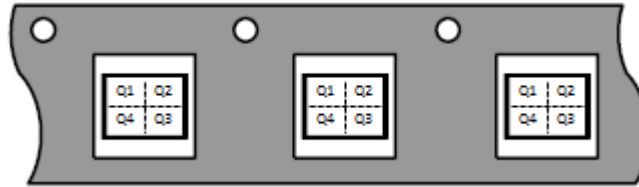
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC – Q100 Qualified and PPAP Capable.

6. **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 [www.onsemi.com](http://www.onsemi.com).

### PIN 1 ORIENTATION IN TAPE AND REEL

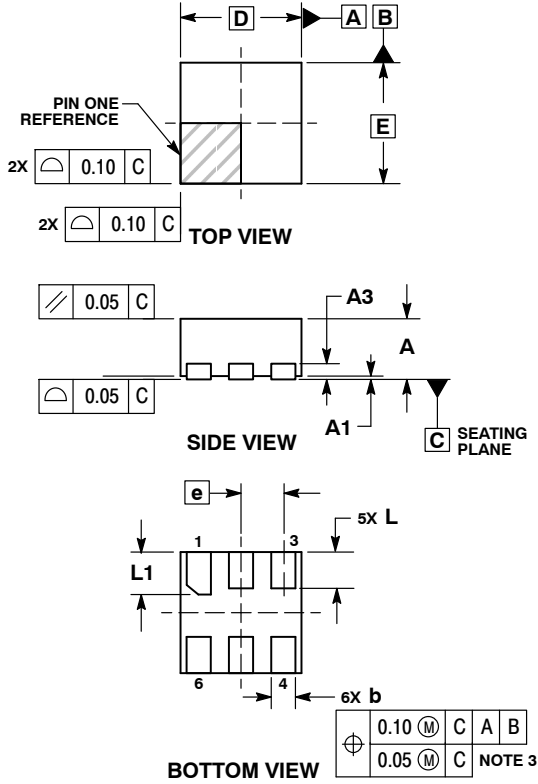
Direction of Feed



# NL17SG14

## PACKAGE DIMENSIONS

UDFN6, 1x1, 0.35P  
CASE 517BX  
ISSUE O

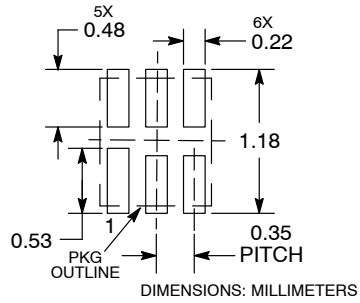


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

DIM	MILLIMETERS	
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.12	0.22
D	1.00 BSC	
E	1.00 BSC	
e	0.35 BSC	
L	0.25	0.35
L1	0.30	0.40

**RECOMMENDED SOLDERING FOOTPRINT\***



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



SCALE 2:1

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

DATE 11 APR 2023



RECOMMENDED MOUNTING FOOTPRINT

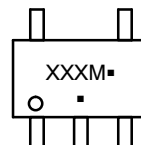
\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02
4. 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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.95	1.10
A1	---	---	0.10
A3	0.20 REF		
b	0.10	0.20	0.30
c	0.10	---	0.25
D	1.80	2.00	2.20
E	2.00	2.10	2.20
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.10	0.15	0.30

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  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

STYLE 1:

- PIN 1. BASE
- EMITTER
- BASE
- COLLECTOR
- COLLECTOR

STYLE 2:

- PIN 1. ANODE
- EMITTER
- BASE
- COLLECTOR
- CATHODE

STYLE 3:

- PIN 1. ANODE 1
- N/C
- ANODE 2
- CATHODE 2
- CATHODE 1

STYLE 4:

- PIN 1. SOURCE 1
- DRAIN 1/2
- SOURCE 1
- GATE 1
- GATE 2

STYLE 5:

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

STYLE 6:

- PIN 1. EMITTER 2
- BASE 2
- EMITTER 1
- COLLECTOR
- COLLECTOR 2/BASE 1

STYLE 7:

- PIN 1. BASE
- EMITTER
- BASE
- COLLECTOR
- COLLECTOR

STYLE 8:

- PIN 1. CATHODE
- COLLECTOR
- N/C
- BASE
- EMITTER

STYLE 9:

- PIN 1. ANODE
- CATHODE
- ANODE
- ANODE
- ANODE

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.

DOCUMENT NUMBER:	98ASB42984B	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-88A (SC-70-5/SOT-353)	PAGE 1 OF 1

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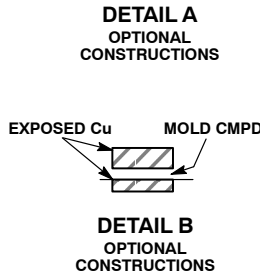
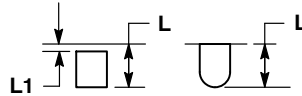
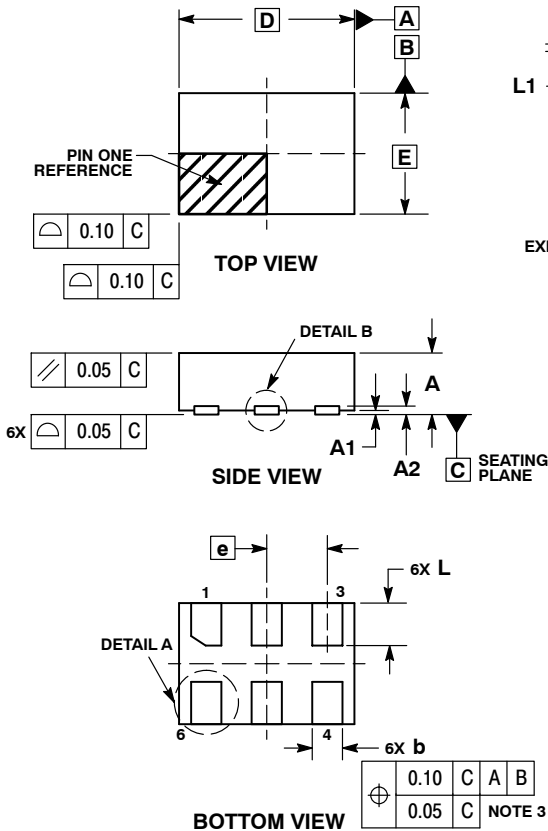




SCALE 4:1

UDFN6, 1.45x1.0, 0.5P  
CASE 517AQ  
ISSUE O

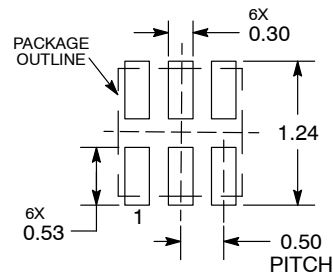
DATE 15 MAY 2008



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A2	0.07	REF
b	0.20	0.30
D	1.45	BSC
E	1.00	BSC
e	0.50	BSC
L	0.30	0.40
L1	---	0.15

**MOUNTING FOOTPRINT**



DIMENSIONS: MILLIMETERS

\*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\***



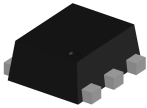
X = Specific Device Code

M = 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.

<b>DOCUMENT NUMBER:</b>	<b>98AON30313E</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>UDFN6, 1.45x1.0, 0.5P</b>	<b>PAGE 1 OF 1</b>

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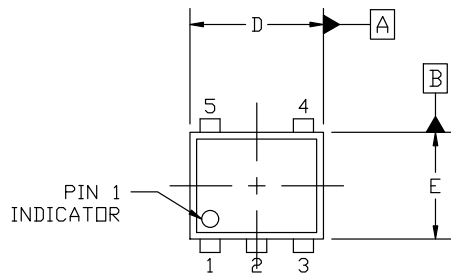
**SOT-953 1.00x0.80x0.37, 0.35P**  
**CASE 527AE**  
**ISSUE F**

DATE 17 JAN 2024

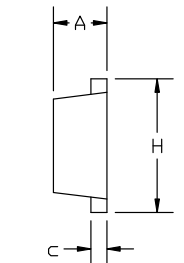
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

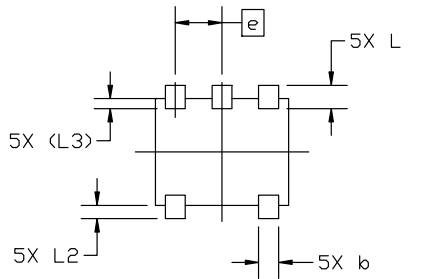
MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H	0.95	1.00	1.05
L	0.125	0.175	0.225
L2	0.05	0.10	0.15
L3	0.075 (REF)		



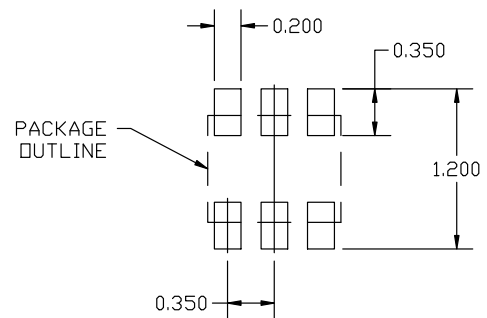
TOP VIEW



SIDE VIEW



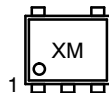
BOTTOM VIEW



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.

**GENERIC MARKING DIAGRAM\***



X = Specific Device Code  
M = Month 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.

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