

# Single 2-Input Exclusive-OR Gate

## NLV17SZ86

The NLV17SZ86 is a high performance single 2-input Exclusive-OR Gate in tiny footprint packages.

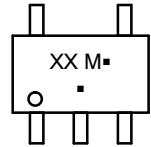
### Features

- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- 2.9 ns  $t_{PD}$  at  $V_{CC} = 5$  V (typ)
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- $I_{OFF}$  Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Available in SC-88A and SOT-953 Packages
- Chip Complexity < 100 FETs
- NLV Prefix 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 are RoHS Compliant

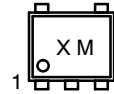


SC-88A  
DF SUFFIX  
CASE 419A

### MARKING DIAGRAMS



SOT-953  
P5 SUFFIX  
CASE 527AE



XX = 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.

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 7 of this data sheet.

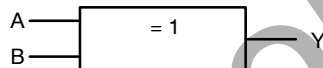


Figure 1. Logic Symbol

NLV17SZ86

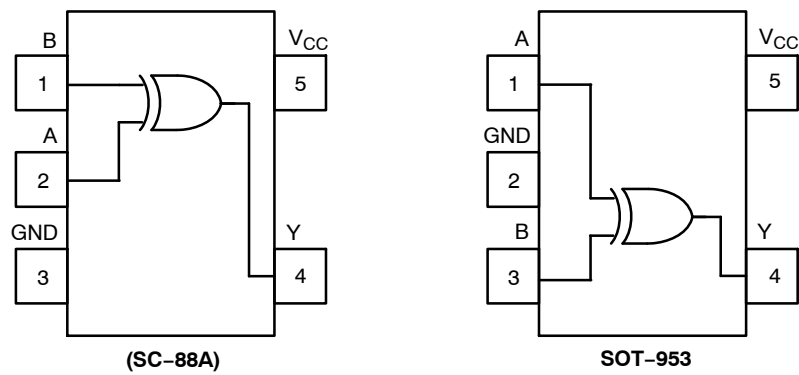


Figure 2. Pinout (Top View)

PIN ASSIGNMENT (SC-88A)		PIN ASSIGNMENT (SOT-953)	
Pin	Function	Pin	Function
1	B	1	A
2	A	2	GND
3	GND	3	B
4	Y	4	Y
5	V <sub>CC</sub>	5	V <sub>CC</sub>

FUNCTION TABLE

Input		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

MAXIMUM RATINGS

Symbol	Characteristics	Value	Unit
$V_{CC}$	DC Supply Voltage	-0.5 to +7.0	V
$V_{IN}$	DC Input Voltage	-0.5 to +7.0	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 +7.0 -0.5 to +7.0	V
	DC Output Voltage (NL17SZ86P5T5G-L22088 Only)	-0.5 to $V_{CC} + 0.5$	
$I_{IK}$	DC Input Diode Current $V_{IN} < GND$	-50	mA
$I_{OK}$	DC Output Diode Current $V_{OUT} < GND$	-50	mA
	DC Output Diode Current (NL17SZ86P5T5G-L22088 Only)	±50	
$I_{OUT}$	DC Output Source/Sink Current	±50	mA
$I_{CC}$ or $I_{GND}$	DC Supply Current per Supply Pin or Ground Pin	±100	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$T_L$	Lead Temperature, 1 mm from Case for 10 secs	260	°C
$T_J$	Junction Temperature Under Bias	+150	°C
$\theta_{JA}$	Thermal Resistance (Note 2)	SC-88A	°C/W
		SOT-953	
$P_D$	Power Dissipation in Still Air	SC-88A	mW
		SOT-953	
MSL	Moisture Sensitivity	Level 1	-
$F_R$	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	-
$V_{ESD}$	ESD Withstand Voltage (Note 3)	Human Body Model	V
		Charged Device Model	
$I_{Latchup}$	Latchup Performance (Note 4)	± 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-1 inch, 2 ounce copper trace no air flow per JESD51-7.
3. HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
4. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics	Min	Max	Unit
$V_{CC}$	Positive DC Supply Voltage	1.65	5.5	V
$V_{IN}$	DC Input Voltage	0	5.5	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 0 0	$V_{CC}$ 5.5 5.5	V
	DC Output Voltage (NL17SZ86P5T5G-L22088 Only)	0	$V_{CC}$	
$T_A$	Operating Temperature Range	-55	+125	°C
$t_r, t_f$	Input Rise and Fall Time $V_{CC} = 3.0$ V to $3.6$ V $V_{CC} = 4.5$ V to $5.5$ V	0 0	100 20	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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	$V_{CC}$ (V)	$T_A = 25^\circ\text{C}$			$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	
$V_{IH}$	High-Level Input Voltage		1.65 to 1.95	$0.75 \times V_{CC}$	—	—	$0.75 \times V_{CC}$	—	V
			2.3 to 5.5	$0.70 \times V_{CC}$	—	—	$0.70 \times V_{CC}$	—	
$V_{IL}$	Low-Level Input Voltage		1.65 to 1.95	—	—	$0.25 \times V_{CC}$	—	$0.25 \times V_{CC}$	V
			2.3 to 5.5	—	—	$0.30 \times V_{CC}$	—	$0.30 \times V_{CC}$	
$V_{OH}$	High-Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $I_{OH} = -100 \mu\text{A}$	1.65 to 5.5	$V_{CC} - 0.1$	$V_{CC}$	—	$V_{CC} - 0.1$	—	V
		$I_{OH} = -4 \text{ mA}$	1.65	1.29	1.4	—	1.29	—	
		$I_{OH} = -8 \text{ mA}$	2.3	1.9	2.1	—	1.9	—	
		$I_{OH} = -12 \text{ mA}$	2.7	2.2	2.4	—	2.2	—	
		$I_{OH} = -16 \text{ mA}$	3.0	2.4	2.7	—	2.4	—	
		$I_{OH} = -24 \text{ mA}$	3.0	2.3	2.5	—	2.3	—	
		$I_{OH} = -32 \text{ mA}$	4.5	3.8	4.0	—	3.8	—	
$V_{OL}$	Low-Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $I_{OL} = 100 \mu\text{A}$	1.65 to 5.5	—	—	0.1	—	0.1	V
		$I_{OL} = 4 \text{ mA}$	1.65	—	0.08	0.24	—	0.24	
		$I_{OL} = 8 \text{ mA}$	2.3	—	0.2	0.3	—	0.3	
		$I_{OL} = 12 \text{ mA}$	2.7	—	0.22	0.4	—	0.4	
		$I_{OL} = 16 \text{ mA}$	3.0	—	0.28	0.4	—	0.4	
		$I_{OL} = 24 \text{ mA}$	3.0	—	0.38	0.55	—	0.55	
		$I_{OL} = 32 \text{ mA}$	4.5	—	0.42	0.55	—	0.55	
$I_{IN}$	Input Leakage Current	$V_{IN} = 5.5 \text{ V}$ or GND	1.65 to 5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$
$I_{OFF}$	Power Off Leakage Current	$V_{IN} = 5.5 \text{ V}$ or $V_{OUT} = 5.5 \text{ V}$	0	—	—	1.0	—	10	$\mu\text{A}$
	Power Off Leakage Current (NL17SZ86P5T5G-L22088 Only)	$V_{IN} = 5.5 \text{ V}$	0	—	—	1.0	—	10	$\mu\text{A}$
$I_{CC}$	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	5.5	—	—	1.0	—	10	$\mu\text{A}$

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.

AC ELECTRICAL CHARACTERISTICS

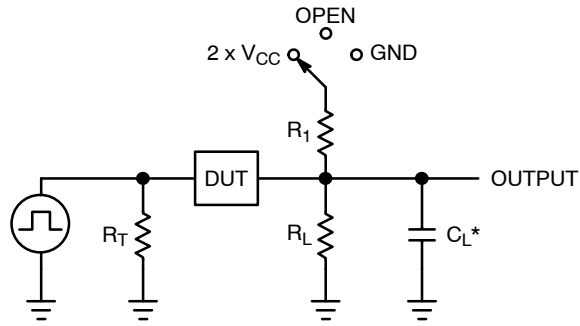
Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, (A or B) to Y (Figures 3 and 4)	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.65 to 1.95	–	6.9	13.8	–	14.5	ns
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	2.3 to 2.7	–	4.1	7.0	–	7.5	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	3.0 to 3.6	–	3.0	4.8	–	5.2	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF		–	3.8	5.4	–	5.9	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	4.5 to 5.5	–	2.2	3.5	–	3.8	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF		–	2.9	4.2	–	4.6	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)	10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub> 10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	9 11	pF

5. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the 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>.

**DISCONTINUED**  
THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
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$C_L$  includes probe and jig capacitance  
 $R_T$  is  $Z_{OUT}$  of pulse generator (typically 50  $\Omega$ )  
 $f = 1$  MHz

Figure 3. Test Circuit

Test	Switch Position	$C_L$ , pF	$R_L$ , $\Omega$	$R_1$ , $\Omega$
$t_{PLH} / t_{PHL}$	Open	See AC Characteristics Table		
$t_{PLZ} / t_{PZL}$	$2 \times V_{CC}$	50	500	500
$t_{PHZ} / t_{PZH}$	GND	50	500	500

X = Don't Care

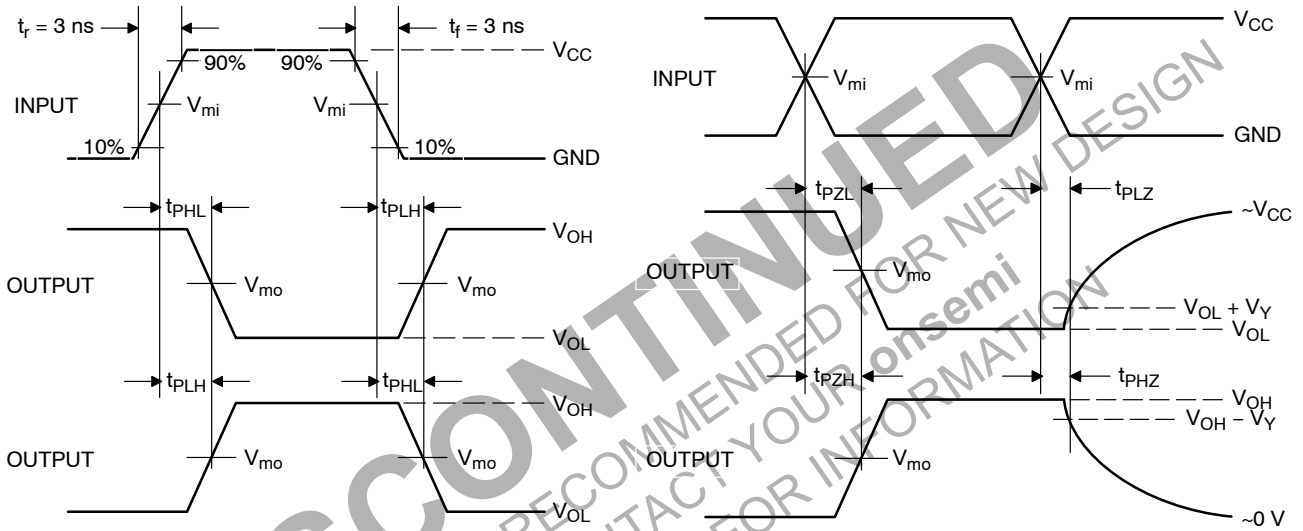


Figure 4. Switching Waveforms

$V_{CC}$ , V	$V_{mi}$ , V	$V_{mo}$ , V		$V_Y$ , V
		$t_{PLH}, t_{PHL}$	$t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}$	
1.65 to 1.95	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.15
2.3 to 2.7	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.15
3.0 to 3.6	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3
4.5 to 5.5	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3

# NLV17SZ86

## DEVICE ORDERING INFORMATION

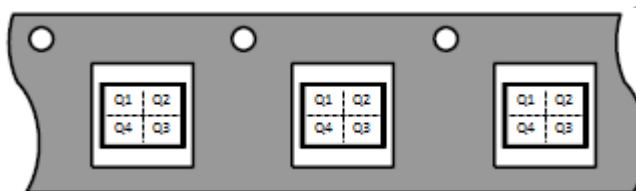
Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping <sup>†</sup>
NLV17SZ86DFT2G*	SC-88A	L8	Q4	3000 / Tape & Reel
NLV17SZ86P5T5G-L22088	SOT-953	P (Rotated 180° CW)	Q2	8000 / Tape & Reel

<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.

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

## PIN 1 ORIENTATION IN TAPE AND REEL

Direction of Feed



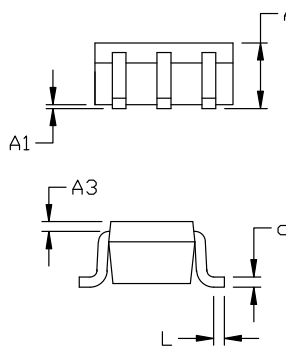
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SCALE 2:1

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

DATE 11 APR 2023



RECOMMENDED  
MOUNTING FOOTPRINT

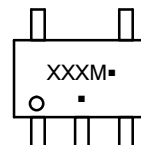
\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 2:

- PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

STYLE 3:

- PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

STYLE 4:

- PIN 1. SOURCE 1
2. DRAIN 1/2
3. SOURCE 1
4. GATE 1
5. GATE 2

STYLE 5:

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

STYLE 6:

- PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

STYLE 7:

- PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 8:

- PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

STYLE 9:

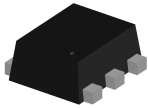
- PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

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.

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DESCRIPTION:	SC-88A (SC-70-5/SOT-353)	PAGE 1 OF 1

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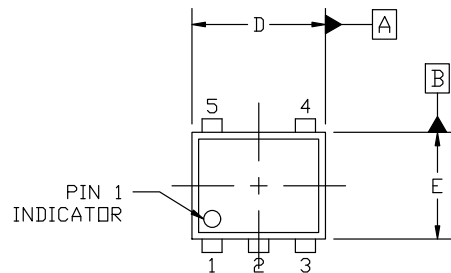



**SOT-953 1.00x0.80x0.37, 0.35P**  
**CASE 527AE**  
**ISSUE F**

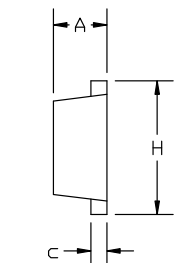
DATE 17 JAN 2024

## NOTES:

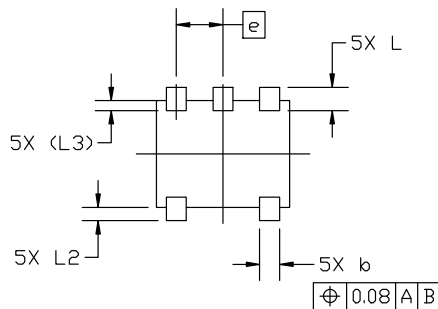
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.



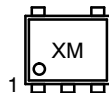
TOP VIEW



SIDE VIEW



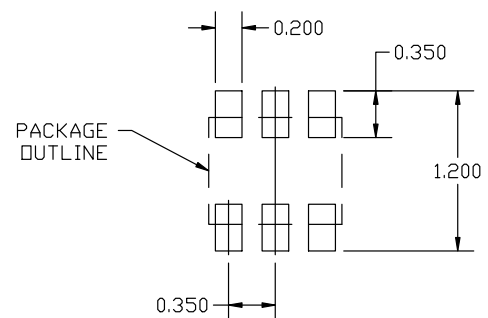
BOTTOM VIEW

**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.

## 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)		


**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.

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<b>DESCRIPTION:</b>	<b>SOT-953 1.00x0.80x0.37, 0.35P</b>	<b>PAGE 1 OF 1</b>

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