

Single 2-Input NAND Gate

NLV17SZ00

The NLV17SZ00 is a single 2-input NAND Gate in tiny footprint packages.

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 2.4 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, SOT-553 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

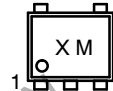
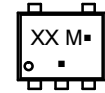
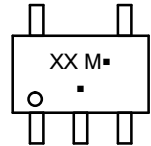


SOT-553
XV5 SUFFIX
CASE 463B



SOT-953
P5 SUFFIX
CASE 527AE

MARKING DIAGRAMS



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.

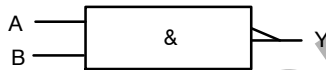


Figure 1. Logic Symbol

ORDERING INFORMATION

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

NLV17SZ00

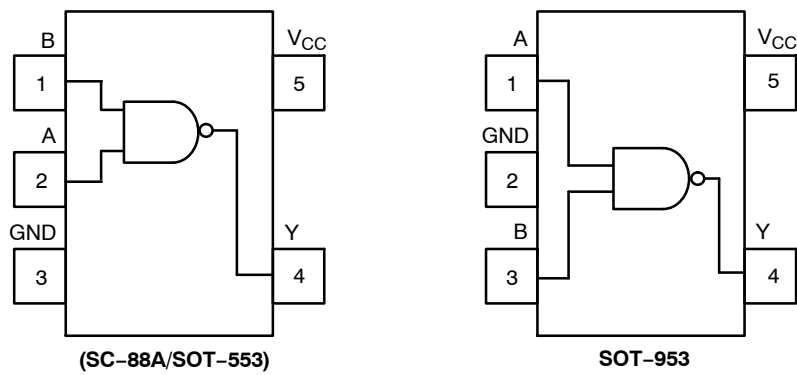


Figure 2. Pinout (Top View)

PIN ASSIGNMENT
(SC-88A/SOT-553)

Pin	Function
1	B
2	A
3	GND
4	Y
5	V _{CC}

PIN ASSIGNMENT (SOT-953)

Pin	Function
1	A
2	GND
3	B
4	Y
5	V _{CC}

FUNCTION TABLE

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

NLV17SZ00

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	(NL17SZ00P5T5G–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	(NL17SZ00P5T5G–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
θ _{JA}	Thermal Resistance (Note 2)	SC-88A SOT-553 SOT-953	377 324 254	°C/W
P _D	Power Dissipation in Still Air	SC-88A SOT-553 SOT-953	332 386 491	mW
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 Charged Device Model	2000 1000	V
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 10mm-by-1inch, 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.

NLV17SZ00

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 (NL17SZ00P5T5G-L22088 Only)	0	V_{CC}	
T_A	Operating Temperature Range	-55	+125	°C
t_r, t_f	Input Rise and Fall Time (NLV) $V_{CC} = 3.0$ 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)	$T_A = 25^\circ\text{C}$			$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Units
				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}							V
		$I_{OH} = -100 \mu\text{A}$	1.65 to 5.5	$V_{CC} - 0.1$	V_{CC}	-	$V_{CC} - 0.1$	-	
		$I_{OH} = -4 \text{ mA}$	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}							V
		$I_{OL} = 100 \mu\text{A}$	1.65 to 5.5	-	-	0.1	-	0.1	
		$I_{OL} = 4 \text{ mA}$	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	$V_{IN} = 5.5$ V or GND	1.65 to 5.5	-	-	± 0.1	-	± 1.0	μA
I_{OFF}	Power Off Leakage Current	$V_{IN} = 5.5$ V or $V_{OUT} = 5.5$ V	0	-	-	1.0	-	10	μA
	Power Off Leakage Current (NL17SZ00P5T5G-L22088 Only)	$V_{IN} = 5.5$ V	0	-	-	1.0	-	10	μA
I_{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	5.5	-	-	1.0	-	10	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.

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	T _A = 25°C			-55°C ≤ T _A ≤ 125°C		Units
				Min	Typ	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay, (A or B) to Y (Figures 3 and 4)	R _L = 1 MΩ, C _L = 15 pF	1.65 to 1.95	–	5.4	11.4	–	12	ns
		R _L = 1 MΩ, C _L = 15 pF	2.3 to 2.7	–	3.0	6.5	–	7.0	
		R _L = 1 MΩ, C _L = 15 pF	3.0 to 3.6	–	2.4	4.5	–	4.7	
		R _L = 500 Ω, C _L = 50 pF		–	2.4	5.0	–	5.2	
		R _L = 1 MΩ, C _L = 15 pF	4.5 to 5.5	–	2.0	3.9	–	4.1	
		R _L = 500 Ω, C _L = 50 pF		–	2.4	4.3	–	4.5	

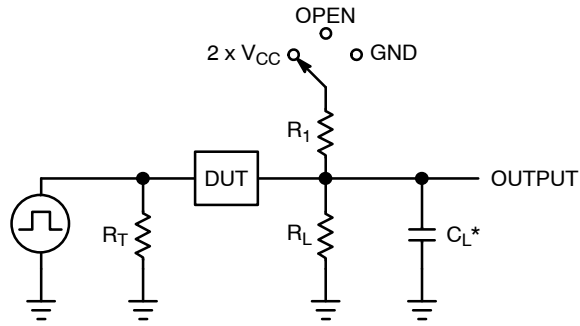
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Units
C _{IN}	Input Capacitance	V _{CC} = 5.5 V, V _{IN} = 0 V or V _{CC}	2.5	pF
C _{OUT}	Output Capacitance	V _{CC} = 5.5 V, V _{IN} = 0 V or V _{CC}	2.5	pF
C _{PD}	Power Dissipation Capacitance (Note 5)	10 MHz, V _{CC} = 3.3 V, V _{IN} = 0 V or V _{CC} 10 MHz, V _{CC} = 5.5 V, V _{IN} = 0 V or V _{CC}	9 11	pF

5. C_{PD} 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_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

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THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN
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REPRESENTATIVE FOR INFORMATION

NLV17SZ00



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

Figure 3. Test Circuit

Test	Switch Position	C_L , pF	R_L , Ω	R_1 , Ω
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

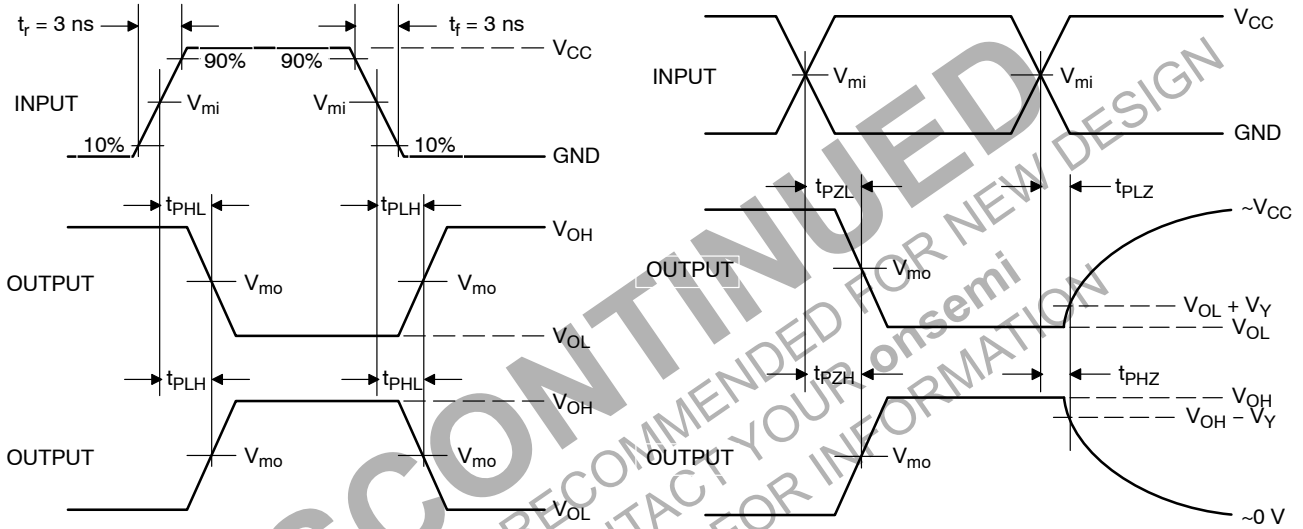


Figure 4. Switching Waveforms

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

NLV17SZ00

DEVICE ORDERING INFORMATION

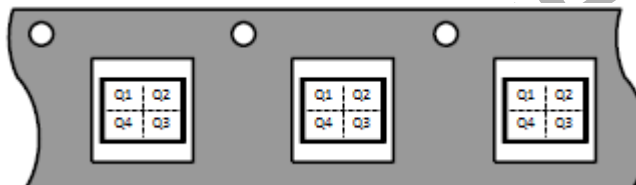
Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping [†]
NLV17SZ00DFT2G*	SC-88A	L1	Q4	3000 / Tape & Reel
NL17SZ00DFT2G-L22038	SC-88A	L1	Q4	3000 / Tape & Reel
NL17SZ00XV5T2G-L22087	SOT-553	L1	Q4	4000 / Tape & Reel
NL17SZ00P5T5G-L22088	SOT-953	3 (Rotated 90° CW)	Q2	8000 / Tape & Reel

[†]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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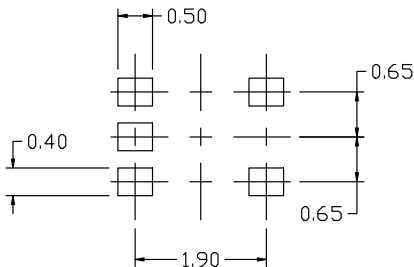
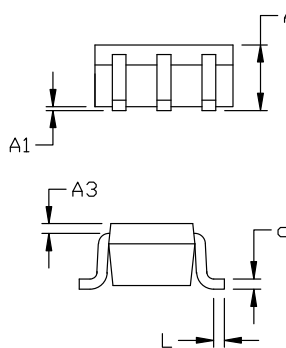
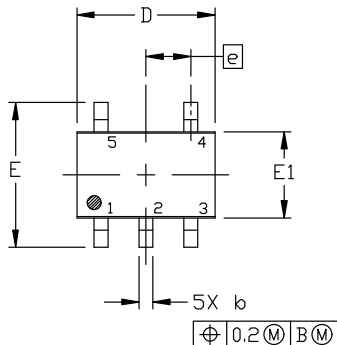
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 2:1

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

DATE 11 APR 2023



RECOMMENDED MOUNTING FOOTPRINT

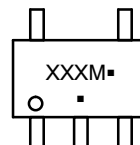
* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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:

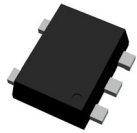
- PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

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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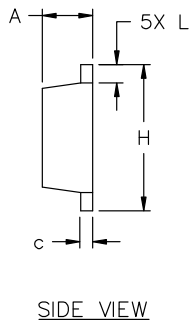
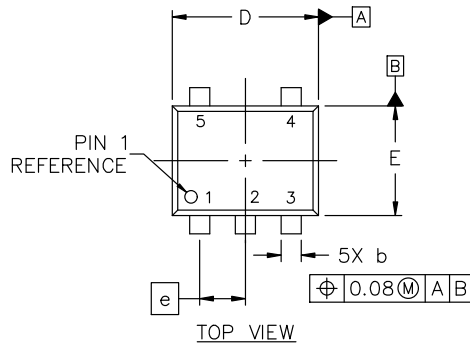
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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-553-5 1.60x1.20x0.55, 0.50P CASE 463B ISSUE D

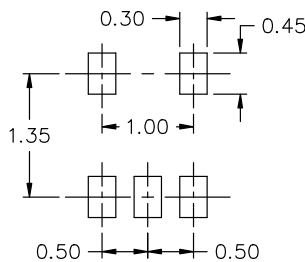
DATE 21 FEB 2024



NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
b	0.17	0.22	0.27
c	0.08	0.13	0.18
D	1.55	1.60	1.65
E	1.15	1.20	1.25
e	0.50 BSC		
H	1.55	1.60	1.65
L	0.10	0.20	0.30



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.

GENERIC MARKING DIAGRAM*



- XX = 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.

STYLE 1:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

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

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

STYLE 6:
PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR 1
5. COLLECTOR 2/BASE 1

STYLE 7:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

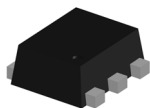
STYLE 8:
PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

STYLE 9:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

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DESCRIPTION:	SOT-553-5 1.60x1.20x0.55, 0.50P	PAGE 1 OF 1

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

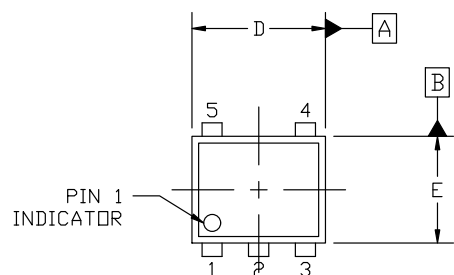


SOT-953 1.00x0.80x0.37, 0.35P
CASE 527AE
ISSUE F

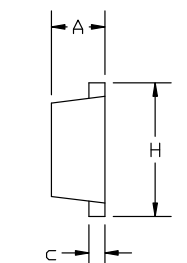
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NOTES:

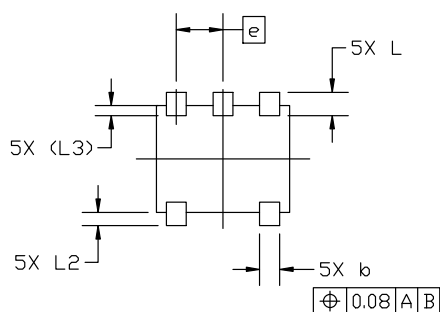
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.



TOP VIEW

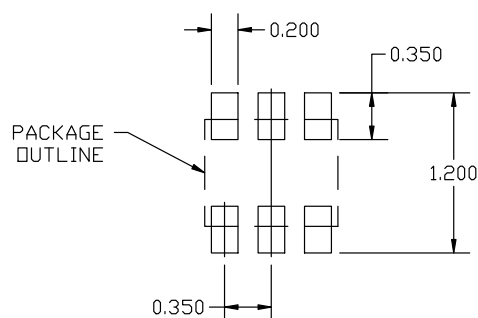


SIDE VIEW



BOTTOM VIEW

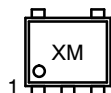
MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H	0.95	1.00	1.05
L	0.125	0.175	0.225
L2	0.05	0.10	0.15
L3	0.075 (REF)		



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.

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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