NL17SG17

Schmitt Buffer

The NL17SG17 MiniGate™ is an advanced high−speed CMOS Schmitt Buffer in ultra−small footprint.

The NL17SG17 input structures provides protection when voltages up to 4.6 V are applied.

Features

- Wide Operating V_{CC} Range: 0.9 V to 3.6 V
- High Speed: t_{PD} = 3.7 ns (Typ) at V_{CC} = 3.0 V, C_L = 15 pF
- Low Power Dissipation: I_{CC} = 0.5 μA (Max) at T_A = 25°C
- 4.6 V Overvoltage Tolerant (OVT) Input Pins
- Ultra−Small Packages
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

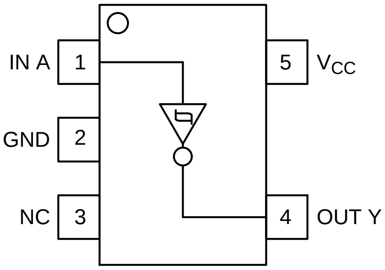

Figure 1. SOT−953
(Top Thru View)

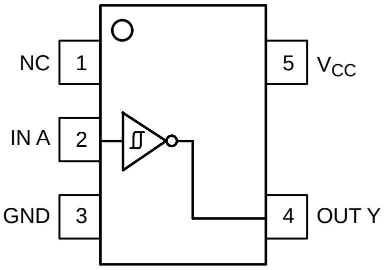

Figure 2. SC−88A
(Top View)

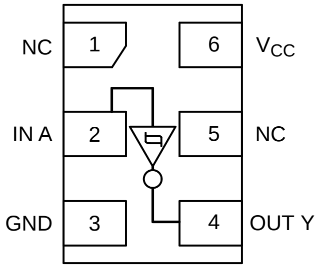

Figure 3. UDFN6
(Top View)

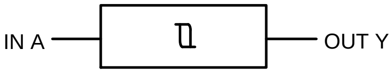

Figure 4. Logic Symbol

ON Semiconductor®

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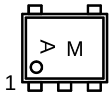
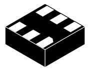
MARKING DIAGRAMS

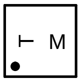
SOT−953
CASE 527AE

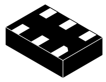


A = Specific Device Code
(A with 90 degree clockwise rotation)

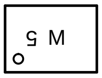


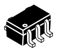
UDFN6
1.0 x 1.0
CASE 517BX



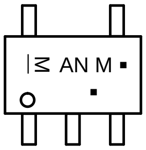


UDFN6
1.45 x 1.0
CASE 517AQ





SC−88A
DF SUFFIX
CASE 419A



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	IN A	NC	NC
2	GND	IN A	IN A
3	NC	GND	GND
4	OUT Y	OUT Y	OUT Y
5	V_{CC}	V_{CC}	NC
6			V_{CC}

FUNCTION TABLE

A Input	Y Output
L	L
H	H

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +5.5	V
V_{IN}	DC Input Voltage		−0.5 to +4.6	V
V_{OUT}	DC Output Voltage	Output at High or Low State Power−Down Mode (V_{CC} = 0 V)	−0.5 to V_{CC} + 0.5 −0.5 to +4.6	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		±20	mA
I_{CC}	DC Supply Current per Supply Pin		±20	mA
I_{GND}	DC Ground Current per Ground Pin		±20	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		+150	°C
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	Human Body Model (Note 2) Machine Model (Note 3)	>2000 >100	V

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. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 2−ounce copper trace with no air flow.
2. Tested to EIA/JESD22−A114−A.
3. Tested to EIA/JESD22−A115−A.
4. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		0.9	3.6	V
V_{IN}	Digital Input Voltage		0.0	3.6	V
V_{OUT}	Output Voltage	Output at High or Low State Power−Down Mode (V_{CC} = 0 V)	0.0 0.0	V_{CC} 3.6	V
T_A	Operating Temperature Range		−55	+125	°C
$\Delta t / \Delta V$	Input Transition Rise or Fail 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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition		V_{CC} (V)	$T_A = 25°C$			$-55°C \le T_A \le 125°C$		Unit
					Min	Typ	Max	Min	Max	
V_{T+}	Positive−Going Input Threshold Voltage			0.9	0.64	0.7	0.86	0.62	0.87	V
				1.1	0.73	0.81	0.95	0.71	1	
				1.4	0.86	0.94	1.16	0.84	1.2	
				1.65	0.95	1.06	1.25	0.94	1.3	
				2.3	1.22	1.36	1.6	1.18	1.65	
				3.0	1.51	1.8	2.05	1.38	2.1	
V_{T-}	Negative−Going Input Threshold Voltage			0.9	0.09	0.23	0.30	0.08	0.33	V
				1.1	0.15	0.33	0.39	0.12	0.43	
				1.4	0.3	0.47	0.54	0.25	0.55	
				1.65	0.35	0.6	0.65	0.3	0.65	
				2.3	0.55	0.85	0.88	0.5	0.88	
				3.0	0.95	1.13	1.16	0.9	1.16	
V_H	Hysteresis Voltage			0.9	0.15	0.5	0.75	0.2	0.8	V
				1.1	0.15	0.5	0.75	0.2	0.8	
				1.4	0.15	0.5	0.75	0.2	0.8	
				1.65	0.15	0.5	0.75	0.2	0.8	
				2.3	0.15	0.5	0.75	0.2	0.8	
				3.0	0.25	0.65	0.85	0.3	0.9	
V_{OH}	High−Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -20\ \mu A$	0.9	0.75			0.75		V
			$I_{OH} = -0.3$ mA	1.1 to 1.3	$0.75 \times V_{CC}$			$0.75 \times V_{CC}$		
			$I_{OH} = -1.7$ mA	1.4 to 1.6	$0.75 \times V_{CC}$			$0.75 \times V_{CC}$		
			$I_{OH} = -3.0$ mA	1.65 to 1.95	$V_{CC} - 0.45$			$V_{CC} - 0.45$		
			$I_{OH} = -4.0$ mA	2.3 to 2.7	2.0			2.0		
			$I_{OH} = -8.0$ mA	3.0 to 3.6	2.48			2.48		
V_{OL}	Low−Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 20\ \mu A$	0.9			0.1		0.1	V
			$I_{OL} = 0.3$ mA	1.1 to 1.3			$0.25 \times V_{CC}$		$0.25 \times V_{CC}$	
			$I_{OL} = 1.7$ mA	1.4 to 1.6			$0.25xV_{CC}$		$0.25 \times V_{CC}$	
			$I_{OL} = 3.0$ mA	1.65 to 1.95			0.45		0.45	
			$I_{OL} = 4.0$ mA	2.3 to 2.7			0.4		0.4	
			$I_{OL} = 8.0$ mA	3.0 to 3.6			0.4		0.4	
I_{IN}	Input Leakage Current	$0 \le V_{IN} \le 3.6$ V		0 to 3.6			±0.1		±1.0	μA
I_{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND		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.

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3.0 ns)

Symbol	Parameter	Test Condition	V_{CC} (V)	T_A = 25 °C			T_A = −55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay, A to Y	C_L = 10 pF, R_L = 1 MΩ	0.9	−	27.3	−	−	−	ns
			1.1 to 1.3	−	13.0	22.6	1.0	35.9	
			1.4 to 1.6	−	7.5	10.5	1.0	11.3	
			1.65 to 1.95	−	6.0	7.8	1.0	8.2	
			2.3 to 2.7	−	4.3	5.4	1.0	5.8	
			3.0 to 3.6	−	3.5	4.4	1.0	4.6	
		C_L = 15 pF, R_L = 1 MΩ	0.9	−	29.5	−	−	−	ns
			1.1 to 1.3	−	14.3	25.1	1.0	41.8	
			1.4 to 1.6	−	8.0	11.5	1.0	12.6	
			1.65 to 1.95	−	6.3	8.4	1.0	8.7	
			2.3 to 2.7	−	4.6	5.7	1.0	6.1	
			3.0 to 3.6	−	3.7	4.6	1.0	5.0	
		C_L = 30 pF, R_L = 1 MΩ	0.9	−	40.5	−	−	−	ns
			1.1 to 1.3	−	19.6	35.7	1.0	58.1	
			1.4 to 1.6	−	10.7	15.8	1.0	17.6	
			1.65 to 1.95	−	7.8	10.7	1.0	11.7	
			2.3 to 2.7	−	5.4	6.9	1.0	8.1	
			3.0 to 3.6	−	4.3	5.2	1.0	6.1	
C_{IN}	Input Capacitance		0 to 3.6		3	−	−	−	pF
C_O	Output Capacitance	V_O = GND	0		3	−	−	−	pF
C_{PD}	Power Dissipation Capacitance (Note 5)	f = 10 MHz	0.9 to 3.6	−	4	−	−	−	pF

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.

5. C_{PD} 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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

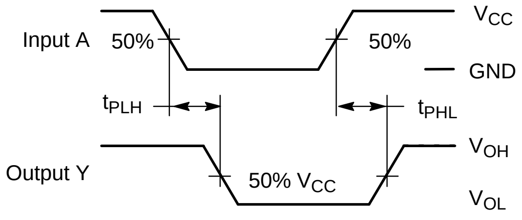
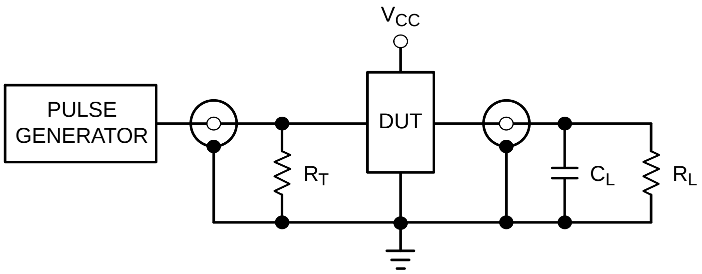


Figure 5. Switching Waveform



$R_T = Z_{OUT}$ of pulse generator (typically 50 Ω)

Figure 6. Test Circuit

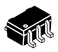
ORDERING INFORMATION

Device	Package	Shipping†
NL17SG17P5T5G	SOT−953 (Pb−Free)	8000 / Tape & Reel
NL17SG17DFT2G	SC−88A (Pb−Free)	3000 / Tape & Reel
NL17SG17AMUTCG	UDFN6 1.45x1 mm (Pb−Free)	3000 / Tape & Reel
NL17SG17CMUTCG*	UDFN6 1x1 mm (Pb−Free)	3000 / 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.

*In Development

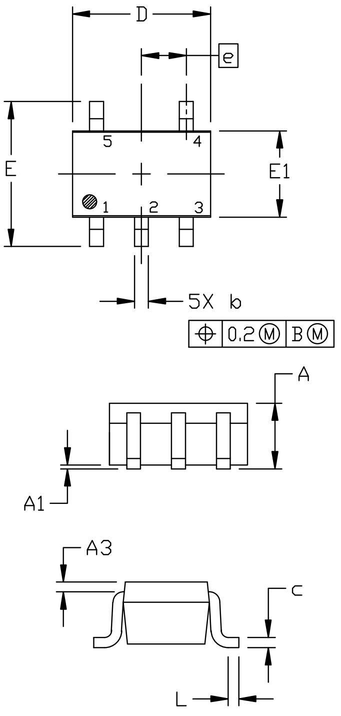
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



SCALE 2:1

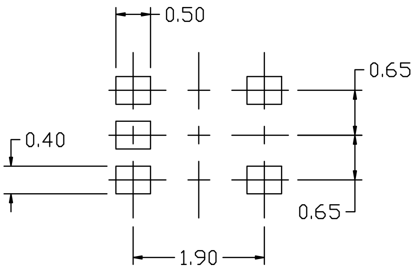
SC−88A (SC−70−5/SOT−353)
CASE 419A−02
ISSUE M

DATE 11 APR 2023



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
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.

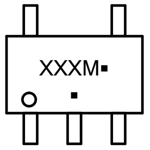
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.95	1.10
A1	---	---	0.10
A3	0.20 REF		
b	0.10	0.20	0.30
c	0.10	---	0.25
D	1.80	2.00	2.20
E	2.00	2.10	2.20
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.10	0.15	0.30



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*



*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

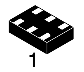
STYLE 7:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

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.

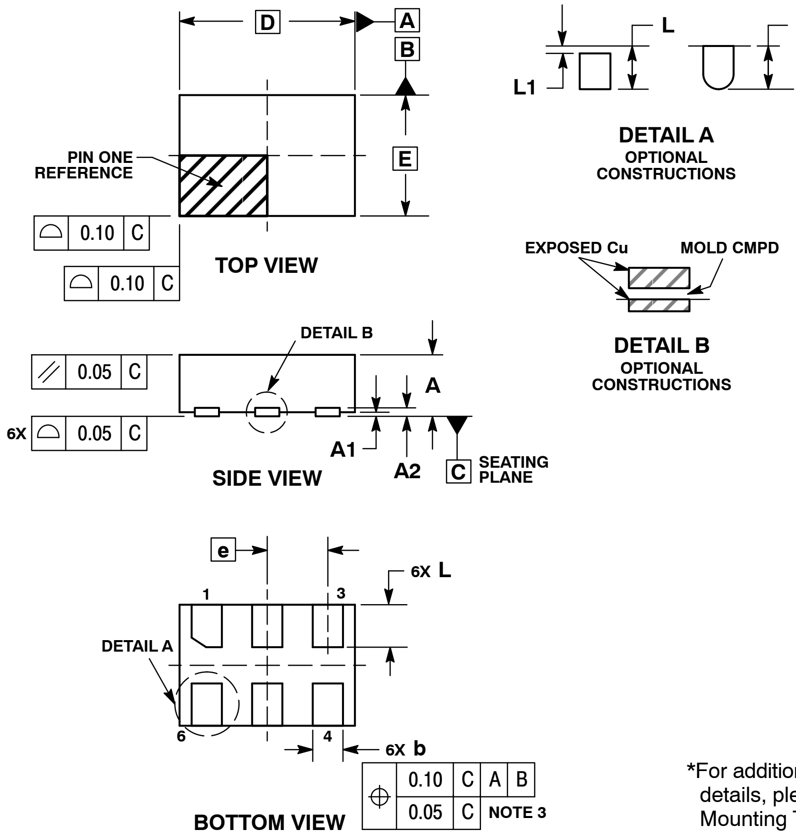
DOCUMENT NUMBER:	**98ASB42984B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**SC−88A (SC−70−5/SOT−353)**	**PAGE 1 OF 1**



SCALE 4:1

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

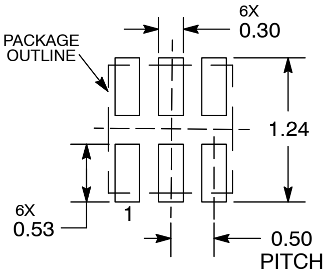
DATE 15 MAY 2008



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

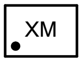
MOUNTING FOOTPRINT



DIMENSIONS: MILLIMETERS

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

GENERIC MARKING DIAGRAM*

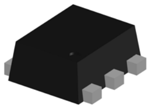


X = Specific Device Code
M = Date Code

*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.

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

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

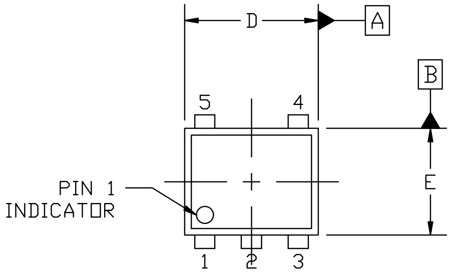


SOT-953 1.00x0.80x0.37, 0.35P
CASE 527AE
ISSUE F

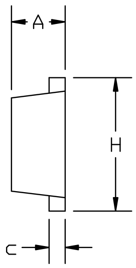
DATE 17 JAN 2024

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.

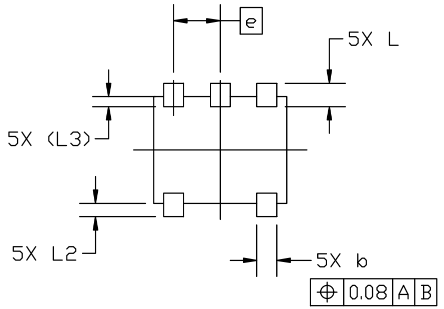
MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H	0.95	1.00	1.05
L	0.125	0.175	0.225
L2	0.05	0.10	0.15
L3	0.075 (REF)		



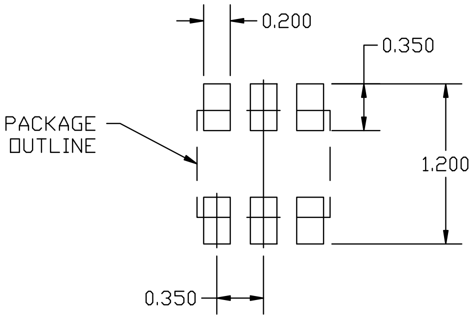
TOP VIEW



SIDE VIEW



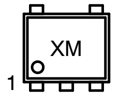
BOTTOM VIEW



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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