Configurable Multifunction Gate

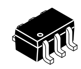
NLV7SZ58

The NLV7SZ58 is an advanced high−speed CMOS multifunction gate. The device allows the user to choose logic functions AND, OR, NAND, NOR, XOR, INVERT and BUFFER.

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 3.3 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
- Sink 24 mA at 3.0 V
- Available in SC−88 Package
- 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

MARKING DIAGRAMS



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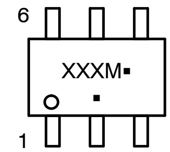
SC−88
CASE 419B−02



XXX = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location or may not be present)

*Date Code orientation and/or position may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

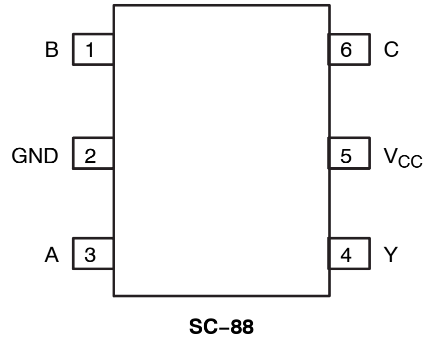


Figure 1. Pinout (Top View)

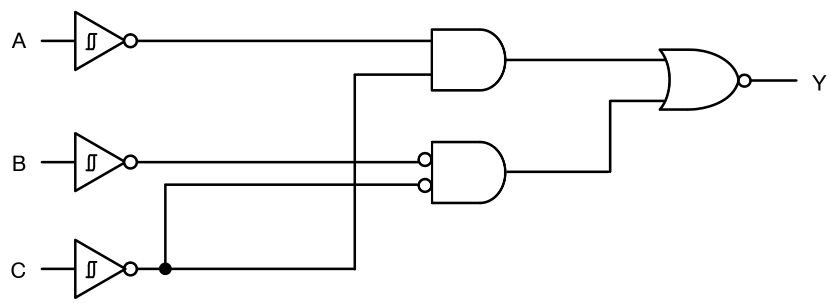


Figure 2. Function Diagram

PIN ASSIGNMENT

Pin	Function
1	B
2	GND
3	A
4	Y
5	V_{CC}
6	C

FUNCTION TABLE*

Input			Output
A	**B**	**C**	**Y**
L	L	L	L
L	L	H	H
L	H	L	L
L	H	H	L
H	L	L	H
H	L	H	H
H	H	L	H
H	H	H	L

*To select a logic function, please refer to “Logic Configurations section”.

LOGIC CONFIGURATIONS

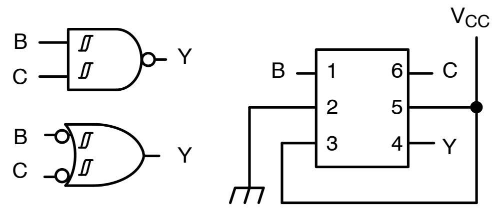


Figure 3. 2−Input NAND (When A = “H”)

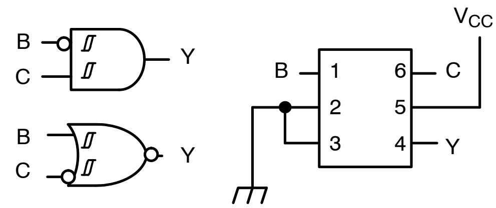


Figure 4. 2−Input AND with Input B Inverted (When A = “L”)

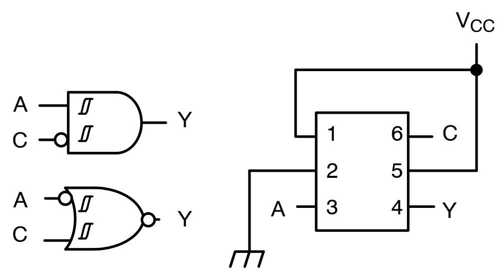


Figure 5. 2−Input AND with Input C Inverted (When B = “H”)

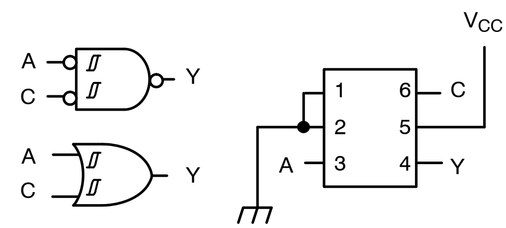


Figure 6. 2−Input OR (When B = “L”)

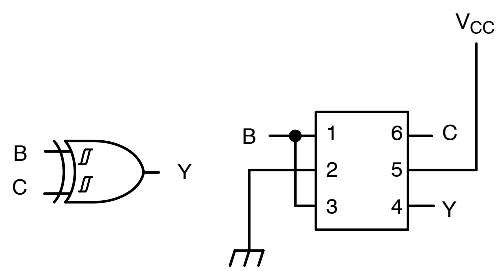


Figure 7. 2−Input XOR (When A = B)

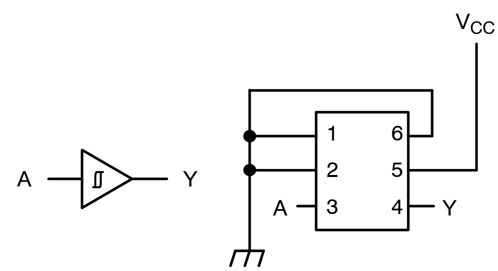


Figure 8. Buffer (When B = C = “L”)

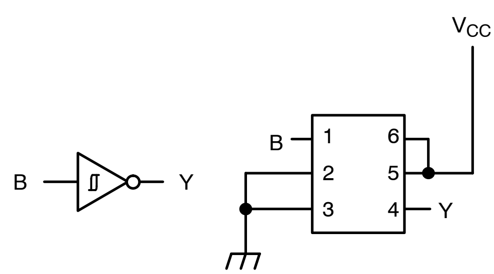


Figure 9. Inverter (When A = “L” and C = “H”)

MAXIMUM RATINGS

Symbol	Parameter		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
I_{IK}	DC Input Diode Current	V_{IN} < GND	−50	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	−50	mA
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−88	377	°C/W
P_D	Power Dissipation in Still Air	SC−88	332	mW
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating Oxygen	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage (Note 3)	Human Body Mode Charged Device Model Charged Device Model	>2000 >200 N/A	V
$I_{LATCHUP}$	Latchup Performance (Note 4)		±500	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. 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	Parameter		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	5.5	V
T_A	Operating Free−Air Temperature		−55	+125	°C
t_r, t_f	Input Rise or Fall Rate	V_{CC} = 1.65 V to 1.95 V V_{CC} = 2.3 V to 2.7 V V_{CC} = 3.0 V to 3.6 V V_{CC} = 4.5 V to 5.5 V	0 0 0 0	No Limit No Limit No Limit 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			−40°C ≤ T_A ≤ 85°C		−55°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V_{T+}	Positive Input Threshold Voltage		1.65	0.79	–	1.16	–	1.16	–	1.16	V
			2.3	1.11	–	1.56	–	1.56	–	1.56	
			3.0	1.5	–	1.87	–	1.87	–	1.87	
			4.5	2.16	–	2.74	–	2.74	–	2.74	
			5.5	2.61	–	3.33	–	3.33	–	3.33	
V_{T-}	Negative Input Threshold Voltage		1.65	0.35	–	0.62	0.35	–	0.35	–	V
			2.3	0.58	–	0.87	0.58	–	0.58	–	
			3.0	0.84	–	1.19	0.84	–	0.84	–	
			4.5	1.41	–	1.9	1.41	–	1.41	–	
			5.5	1.78	–	2.2	1.78	–	1.78	–	
V_H	Negative Input Threshold Voltage		1.65	0.3	–	0.62	0.3	0.62	0.3	0.62	V
			2.3	0.4	–	0.8	0.4	0.8	0.4	0.8	
			3.0	0.53	–	0.87	0.53	0.87	0.53	0.87	
			4.5	0.71	–	1.04	0.71	1.04	0.71	1.04	
			5.5	0.8	–	1.2	0.8	1.2	0.8	1.2	
V_{OH}	High−Level Output Voltage	I_{OH} = −50 µA	1.65 to 5.5	V_{CC} – 0.1	V_{CC}	–	V_{CC} – 0.1	–	V_{CC} – 0.1	–	V
	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −4 mA	1.65	1.20	1.52	–	1.20	–	1.20	–	
		I_{OH} = −8 mA	2.3	1.9	2.1	–	1.9	–	1.9	–	
		I_{OH} = −16 mA	3	2.4	2.7	–	2.4	–	2.4	–	
		I_{OH} = −24 mA	3	2.3	2.5	–	2.3	–	2.3	–	
		I_{OH} = −32 mA	4.5	3.8	4	–	3.8	–	3.8	–	
V_{OL}	Low−Level Output Voltage	I_{OL} = 100 µA	1.65 to 5.5	–	–	0.1	–	0.1	–	0.1	V
	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 4 mA	1.65	–	0.08	0.45	–	0.45	–	0.45	
		I_{OL} = 8 mA	2.3	–	0.2	0.3	–	0.3	–	0.4	
		I_{OL} = 16 mA	3	–	0.28	0.4	–	0.4	–	0.5	
		I_{OL} = 24 mA	3	–	0.38	0.55	–	0.55	–	0.55	
		I_{OL} = 32 mA	4.5	–	0.42	0.55	–	0.55	–	0.65	
I_{IN}	Input Leakage Current	V_{IN} = 5.5 V or GND	1.65 to 5.5	–	–	+0.1	–	+1.0	–	+1.0	µA
I_{OFF}	Power Off Leakage Current	V_{IN} = 5.5 V or V_{OUT} = 5.5 V	0	–	–	1.0	–	10	–	10	µA
I_{CC}	Quiescent Supply Current	V_{IN} = 5.5 V or GND	5.5	–	–	1.0	–	10	–	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.

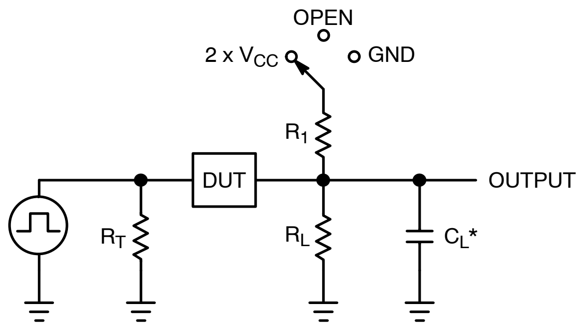
AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			−40°C ≤ T_A ≤ 85°C		−55°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay, (A or B or C) to Y (Figures 10 and 11)	R_L = 1 kΩ, C_L = 30 pF	1.65 to 1.95	–	8.6	14.4	–	14.4	–	14.4	ns
		R_L = 500 Ω, CL = 30 pF	2.3 to 2.7	–	5.1	8.3	–	8.3	–	8.3	
		R_L = 500 Ω, C_L = 50 pF	3.0 to 3.6	–	3.9	6.3	–	6.3	–	6.3	
			4.5 to 5.5	–	3.3	5.1	–	5.1	–	5.1	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
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}	4.0	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} = 5.0 V, V_{IN} = 0 V or V_{CC}	16 19.5	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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.



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

Figure 10. 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 x V_{CC}	50	500	500
t_{PHZ} / t_{PZH}	GND	50	500	500

X = Don't Care

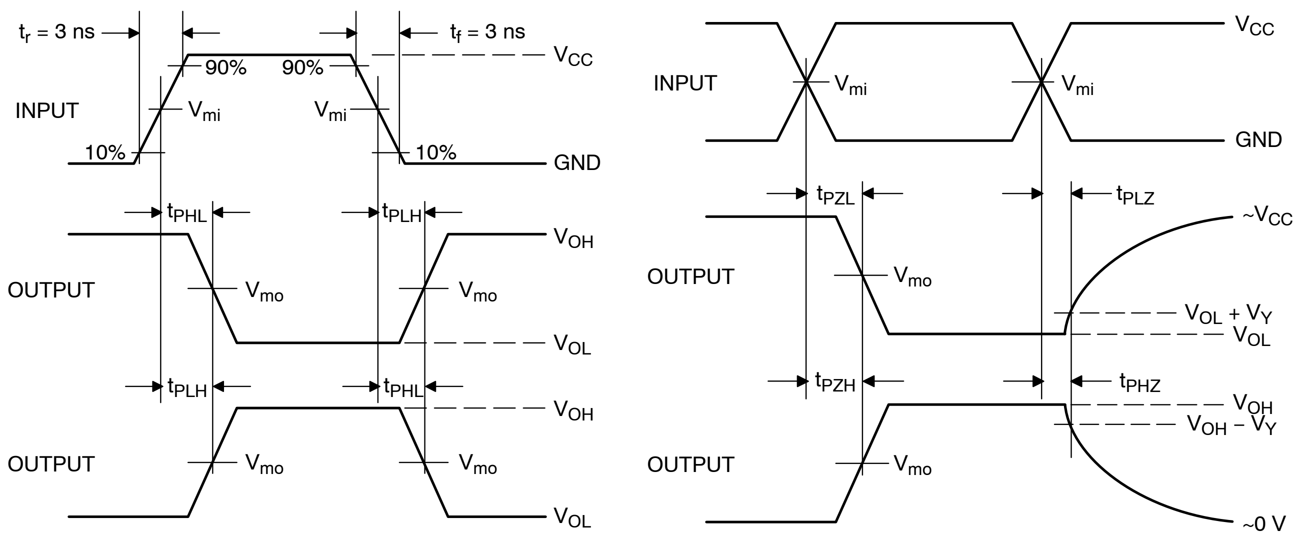


Figure 11. Switching Waveforms

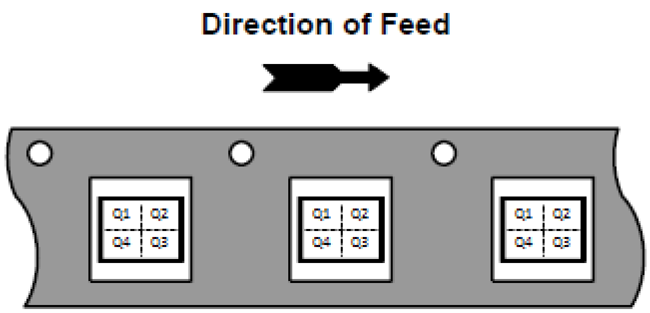
V_{CC}, V	V_{mi}, V	V_{mo}, V		V_Y, V
		t_{PLH}, t_{PHL}	t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}	
1.65 to 1.95	V_{CC} / 2	V_{CC} / 2	V_{CC} / 2	0.15
2.3 to 2.7	V_{CC} / 2	V_{CC} / 2	V_{CC} / 2	0.15
3.0 to 3.6	V_{CC} / 2	V_{CC} / 2	V_{CC} / 2	0.3
4.5 to 5.5	V_{CC} / 2	V_{CC} / 2	V_{CC} / 2	0.3

ORDERING INFORMATION

Device	Package	Specific Device Code	Pin 1 Orientation (See below)	Shipping†
NLV7SZ58DFT2G*	SC−88 (Pb−Free)	MM	Q4	3000 / Tape & Reel

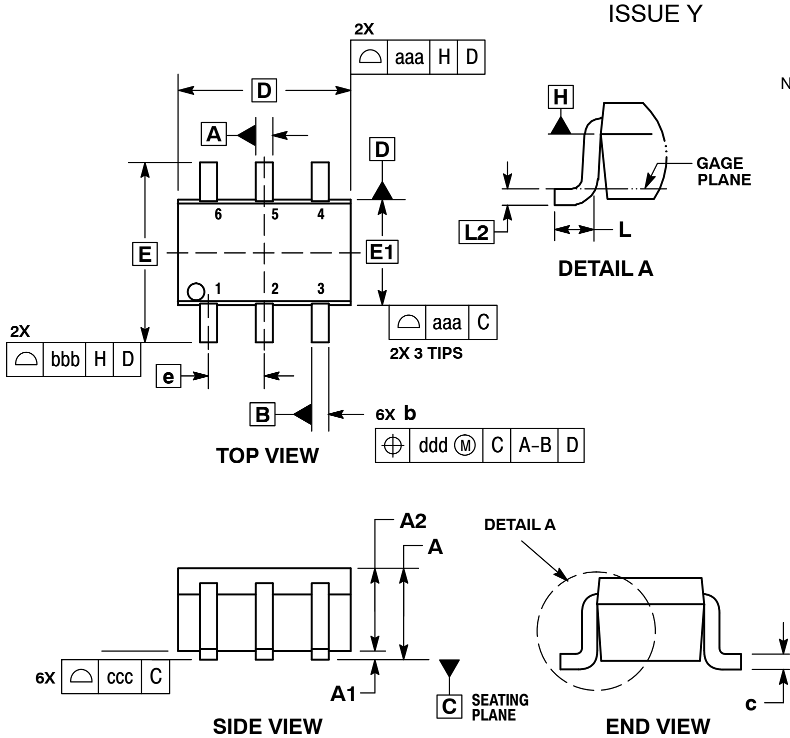
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

PIN 1 ORIENTATION IN TAPE AND REEL



PACKAGE DIMENSIONS

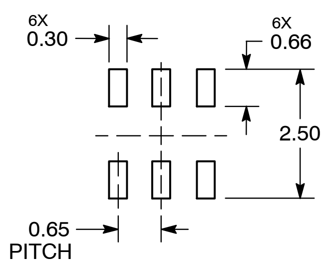
SC−88/SC70−6/SOT−363
CASE 419B−02
ISSUE Y



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.043
A1	0.00	---	0.10	0.000	---	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

RECOMMENDED SOLDERING 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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For additional information, please contact your local Sales Representative

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