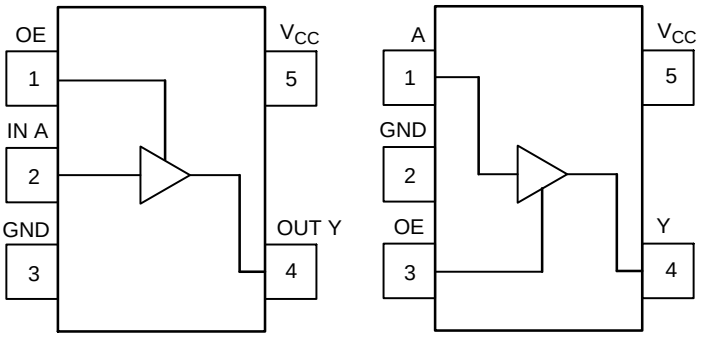
NL17SZ126

Non-Inverting 3-State Buffer

The NL17SZ126 is a high performance single noninverting buffer operating from a 1.65 V to 5.5 V supply.

Features

- Extremely High Speed: t_{PD} 2.6 ns (typical) at V_{CC} = 5.0 V
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Over Voltage Tolerant Inputs and Outputs
- LVTTL Compatible − Interface Capability With 5.0 V TTL Logic with V_{CC} = 3.0 V
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- 3−State OE Input is Active HIGH
- Replacement for NC7SZ126
- Chip Complexity = 36 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



SOT−353/SC−88A/ SOT−553 **SOT−953**

Figure 1. Pinout (Top View)

Figure 2. Logic Symbol

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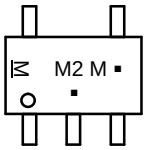
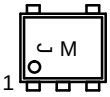
MARKING DIAGRAM

SC−88A (SOT−353)
DF SUFFIX
CASE 419A



SOT−553
XV5 SUFFIX
CASE 463B

SOT−953
CASE 527AE



M2 or J = Specific Device Code
(J with 90 degree clockwise rotation)
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 and shipping information in the package dimensions section on page 6 of this data sheet.

PIN ASSIGNMENT
(SOT−353/SC−88A/SOT−553/UDFN)

Pin	Function
1	OE
2	IN A
3	GND
4	OUT Y
5	V_{CC}

PIN ASSIGNMENT (SOT−953)

Pin	Function
1	IN A
2	GND
3	OE
4	OUT Y
5	V_{CC}

FUNCTION TABLE

Input		Output
OE	**A**	**Y**
H	L	L
H	H	H
L	X	Z

X = Don't Care

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 (SOT−353/SC−88A/SOT−553 Packages)		−0.5 to V_{CC} +0.5	V
V_{OUT}	DC Output Voltage (SOT−953 Package)	Output at High or Low State Power−Down Mode (V_{CC} = 0 V)	−0.5 to V_{CC} +0.5 −0.5 to +0.5	V
I_{IK}	DC Input Diode Current		−50	mA
I_{OK}	DC Output Diode Current (SOT−353/SC−88A/SOT−553 Packages)	V_{OUT} < GND, V_{OUT} > V_{CC}	±50	mA
I_{OK}	DC Output Diode Current (SOT−953 Package)	V_{OUT} < GND	−50	mA
I_{OUT}	DC Output Sink Current		±50	mA
I_{CC}	DC Supply Current per Supply Pin		±100	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
θ_{JA}	Thermal Resistance (Note 1)	SC−70/SC−88A	350	°C/W
P_D	Power Dissipation in Still Air at 85°C	SC−70/SC−88A	150	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	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 200 N/A	V
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 125°C (Note 5)		±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. 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 JESD22−C101−A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage		1.65	5.5	V
V_{IN}	DC Input Voltage		0	5.5	V
V_{OUT}	DC Output Voltage (SOT−353/SC−88A/SOT−553 Packages)		0	5.5	V
V_{OUT}	DC Output Voltage (SOT−953 Package)		0	V_{CC}	V
T_A	Operating Temperature Range		−40	+125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 1.8 V ±0.15 V V_{CC} = 2.5 V ±0.2 V V_{CC} = 3.0 V ±0.3 V V_{CC} = 5.0 V ±0.5 V	0 0 0 0	20 20 10 5.0	ns/V

DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES

Junction Temperature °C	Time, Hours	Time, Years
80	1,032,200	117.8
90	419,300	47.9
100	178,700	20.4
110	79,600	9.4
120	37,000	4.2
130	17,800	2.0
140	8,900	1.0

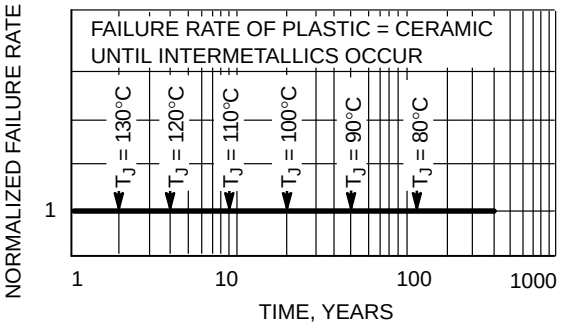


Figure 3. Failure Rate versus Time Junction Temperature

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			−40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	High−Level Input Voltage		1.65 to 1.95 2.3 to 5.5	0.75 V_{CC} 0.7 V_{CC}			0.75 V_{CC} 0.7 V_{CC}		V
V_{IL}	Low−Level Input Voltage		1.65 to 1.95 2.3 to 5.5			0.25 V_{CC} 0.3 V_{CC}		0.25 V_{CC} 0.3 V_{CC}	V
V_{OH}	High−Level Output Voltage V_{IN} = V_{IH}	I_{OH} = −100 μA	1.65 1.8 2.3 3.0 4.5	1.55 1.7 2.2 2.9 4.4	1.65 1.8 2.3 3.0 4.5		1.55 1.7 2.2 2.9 4.4		V
		I_{OH} = −4 mA I_{OH} = −8 mA I_{OH} = −16 mA I_{OH} = −24 mA I_{OH} = −32 mA	1.65 2.3 3.0 3.0 4.5	1.29 1.9 2.4 2.3 3.8	1.52 2.15 2.80 2.68 4.20		1.29 1.9 2.4 2.3 3.8		V
V_{OL}	Low−Level Output Voltage V_{IN} = V_{IL}	I_{OL} = 100 μA	1.65 1.8 2.3 3.0 4.5		0.0 0.0 0.0 0.0 0.0	0.1 0.1 0.1 0.1 0.1		0.1 0.1 0.1 0.1 0.1	V
		I_{OL} = 4 mA I_{OL} = 8 mA I_{OL} = 16 mA I_{OL} = 24 mA I_{OL} = 32 mA	1.65 2.3 3.0 3.0 4.5		0.08 0.10 0.15 0.22 0.22	0.24 0.30 0.40 0.55 0.55		0.24 0.30 0.40 0.55 0.55	V
I_{IN}	Input Leakage Current	V_{IN} = 5.5 V or GND	0 to 5.5			±0.1		±1.0	μA
I_{OZ}	3−State Output Leakage	V_{IN} = V_{IH} or V_{IL} 0 V ≤ V_{OUT} ≤ 5.5 V	1.65 to 5.5			±0.5		±5.0	μA
I_{OFF}	Power Off Leakage Current (SOT−353/ SC−88A/SOT−553 Packages)	V_{IN} = 5.5 V or V_{OUT} = 5.5 V	0			1.0		10	μA
I_{CC}	Quiescent Supply Current	V_{IN} = 5.5 V or GND	5.5			1.0		10	μA

AC ELECTRICAL CHARACTERISTICS (t_R = t_F = 3.0 ns)

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			−40°C ≤ T_A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay AN to YN (Figures 4, and 5, Table 1)	R_L = 1 MΩ C_L = 15 pF	1.8 ± 0.15	2.0	9.5	12	2.0	12.5	ns
		R_L = 1 MΩ C_L = 15 pF	2.5 ± 0.2	1.0	3.4	7.5	1.0	8.0	
		R_L = 1 MΩ C_L = 15 pF R_L = 500 Ω C_L = 50 pF	3.3 ± 0.3	0.8 1.2		5.2 5.7	0.8 1.2	5.5 6.0	
		R_L = 1 MΩ C_L = 15 pF R_L = 500 Ω C_L = 50 pF	5.0 ± 0.5	0.5 0.8		4.5 5.0	0.5 0.8	4.8 5.3	
t_{PZH} t_{PZL}	Output Enable Time (Figures 6, 7 and 8, Table 1)	R_L = 250 Ω C_L = 50 pF	1.8 ± 0.15	2.0	9.0	10.5	2.0	12.5	ns
			2.5 ± 0.2	1.8		8.5	1.8	9.0	
			3.3 ± 0.3	1.2		6.2	1.2	6.5	
			5.0 ± 0.5	0.8		5.5	0.8	5.8	
t_{PHZ} t_{PLZ}	Output Disable Time (Figures 6, 7 and 8, Table 1)	R_L and R1= 500 Ω C_L = 50 pF	2.5 ± 0.2	1.5		8.0	1.5	8.5	ns
			2.5 ± 0.2	1.5		8.0	1.5	8.5	
			3.3 ± 0.3	0.8		5.7	0.8	6.0	
			5.0 ± 0.5	0.3		4.7	0.3	5.0	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	2.5	pF
C_{OUT}	Output Capacitance	V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	2.5	pF
C_{PD}	Power Dissipation Capacitance (Note 6)	10 MHz, V_{CC} = 3.3 V, V_I = 0 V or V_{CC} 10 MHz, V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	9 11	pF

6. 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; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

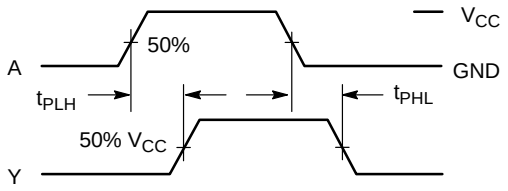
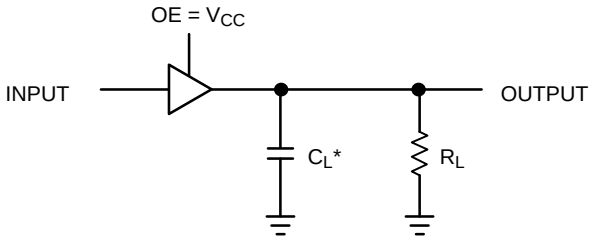
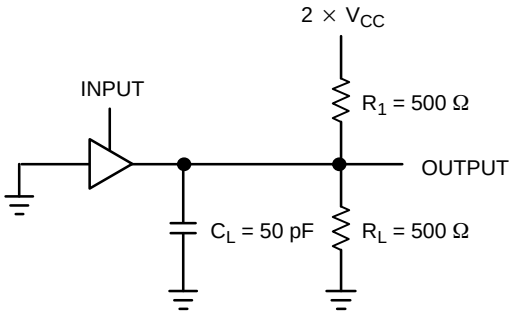


Figure 4. Switching Waveform



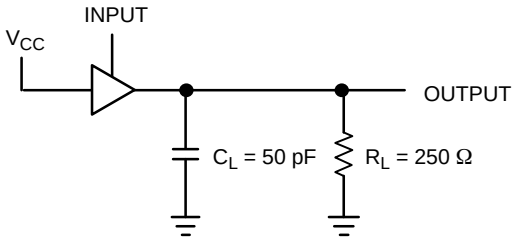
*Includes all probe and jig capacitance.
A 1−MHz square input wave is recommended for propagation delay tests.

Figure 5. t_{PLH} or t_{PHL}



A 1−MHz square input wave is recommended for propagation delay tests.

Figure 6. t_{PZL} or t_{PLZ}



A 1−MHz square input wave is recommended for propagation delay tests.

Figure 7. t_{PZH} or t_{PHZ}

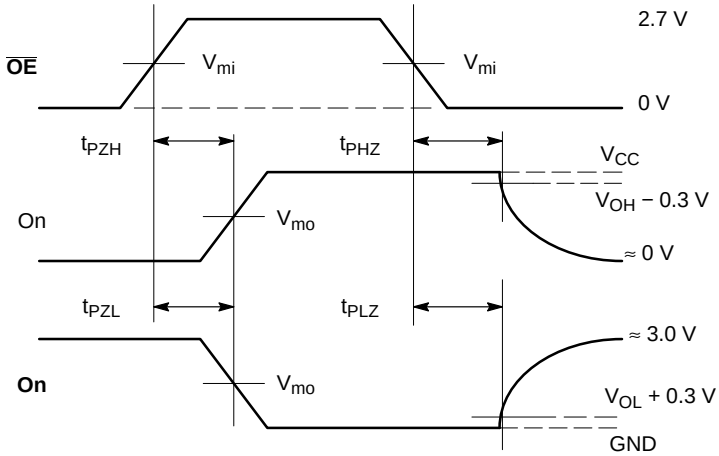


Figure 8. AC Output Enable and Disable Waveform

Table 1. Output Enable and Disable Times
$t_R = t_F$ = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

Symbol	V_{CC}		
	3.3 V ± 0.3 V	**2.7 V**	**2.5 V ± 0.2 V**
V_{mi}	1.5 V	1.5 V	$V_{CC}/2$
V_{mo}	1.5 V	1.5 V	$V_{CC}/2$

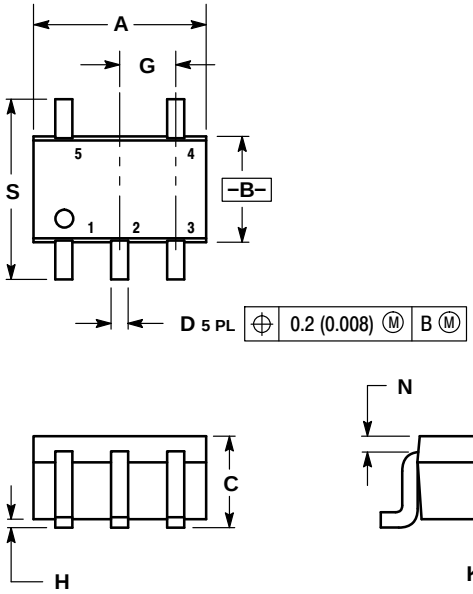
DEVICE ORDERING INFORMATION

Device	Package Type	Shipping†
NL17SZ126DFT2G	SC70−5/SC−88A/SOT−353 (Pb−Free)	3000 / Tape & Reel
NLV17SZ126DFT2G*	SC70−5/SC−88A/SOT−353 (Pb−Free)	3000 / Tape & Reel
NL17SZ126XV5T2G	SOT−553 (Pb−Free)	4000 / Tape & Reel
NL17SZ126P5T5G	SOT−953 (Pb−Free)	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.

PACKAGE DIMENSIONS

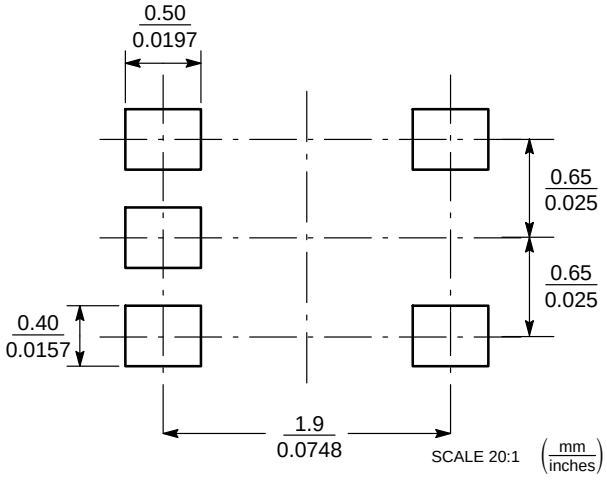
SC−88A (SC−70−5/SOT−353)
CASE 419A−02
ISSUE L



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

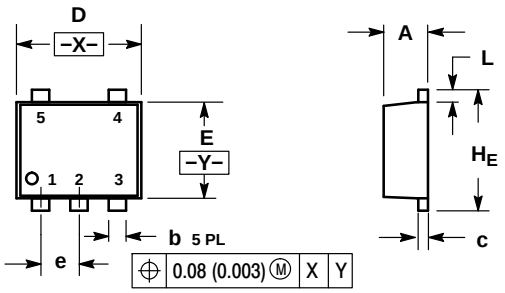
SOLDER FOOTPRINT*



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

PACKAGE DIMENSIONS

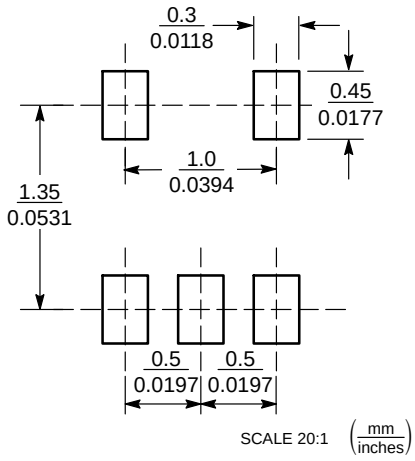
SOT−553, 5 LEAD
CASE 463B
ISSUE B



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.022	0.024
b	0.17	0.22	0.27	0.007	0.009	0.011
c	0.08	0.13	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.063	0.067
E	1.10	1.20	1.30	0.043	0.047	0.051
e	0.50 BSC			0.020 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H_E	1.50	1.60	1.70	0.059	0.063	0.067

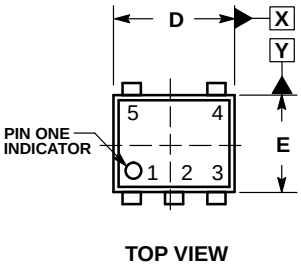
SOLDERING FOOTPRINT*



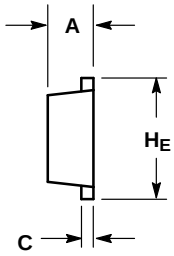
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

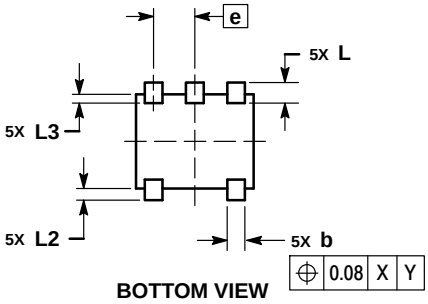
SOT−953
CASE 527AE
ISSUE E



TOP VIEW



SIDE VIEW

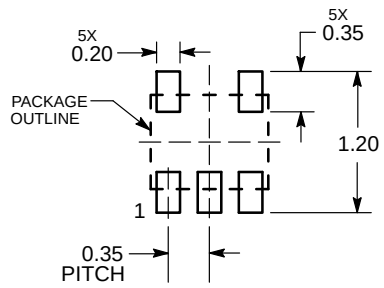


BOTTOM VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
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_E	0.95	1.00	1.05
L	0.175 REF		
L2	0.05	0.10	0.15
L3	−−−	−−−	0.15

SOLDERING 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
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Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

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