

NL17SZ125

Non-Inverting 3-State Buffer

The NL17SZ125 is a high performance non-inverting 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
- Overvoltage 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-Low
- Replacement for NC7SZ125
- Chip Complexity = 36 FETs
- These Devices are Pb-Free and are RoHS Compliant
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

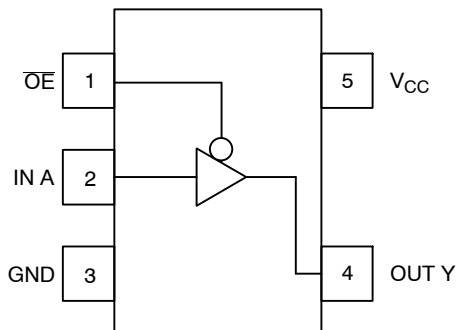


Figure 1. Pinout (Top View)

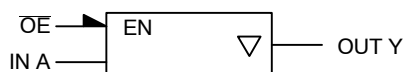


Figure 2. Logic Symbol

PIN ASSIGNMENT	
1	\overline{OE}
2	IN A
3	GND
4	OUT Y
5	V_{CC}

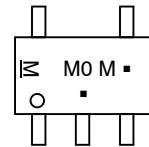


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MARKING DIAGRAMS

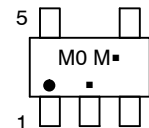

SC-88A (SOT-353)
DF SUFFIX
CASE 419A



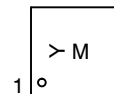

SOT-553
XV5 SUFFIX
CASE 463B




TSOP-5
DT SUFFIX
CASE 483




UDFN6
1.0 x 1.0
CASE 517BX



M0 = 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.

FUNCTION TABLE

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

X = Don't Care

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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MAXIMUM RATINGS

Symbol	Parameter	Value	Units
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	-0.5 to +7.0	V
I _{IK}	DC Input Diode Current	-50	mA
I _{OK}	DC Output Diode Current	-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-88A/SOT-553 TSOP-5	350 230	°C/W
P _D	Power Dissipation in Still Air at 85°C	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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Units
V _{CC}	DC Supply Voltage	1.65	5.5	V
V _{IN}	DC Input Voltage	0	5.5	V
V _{OUT}	DC Output Voltage	0	5.5	V
T _A	Operating Temperature Range	-55	+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

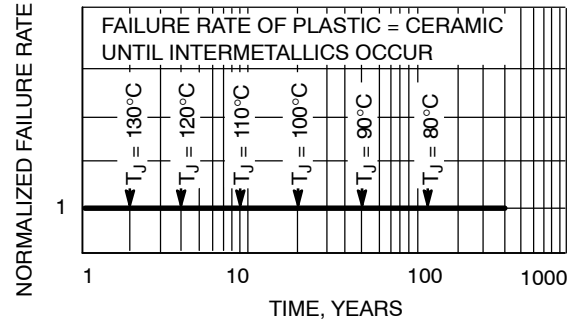


Figure 3. Failure Rate vs. Time Junction Temperature

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	T _A = 25°C			-55°C ≤ T _A ≤ 125°C		Units	Condition
			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}	1.65	1.55	1.65		1.55		V	I _{OH} = -100 μA
		1.8	1.7	1.8		1.7			
V _{OH}	High-Level Output Voltage V _{IN} = V _{IH}	2.3	2.2	2.3		2.2		V	I _{OH} = -4 mA
		3.0	2.9	3.0		2.9			I _{OH} = -8 mA
V _{OH}	High-Level Output Voltage V _{IN} = V _{IH}	3.0	2.9	3.0		2.9		V	I _{OH} = -16 mA
		4.5	4.4	4.5		4.4			I _{OH} = -24 mA
V _{OH}	High-Level Output Voltage V _{IN} = V _{IH}	4.5	4.4	4.5		4.4		V	I _{OH} = -32 mA
		1.65	1.29	1.52		1.29			
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IL}	2.3	1.9	2.15		1.9		V	I _{OL} = 100 μA
		3.0	2.4	2.80		2.4			
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IL}	3.0	2.3	2.68		2.3		V	I _{OL} = 4 mA
		4.5	3.8	4.20		3.8			I _{OL} = 8 mA
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IL}	1.65		0.08	0.24		0.24	V	I _{OL} = 16 mA
		2.3		0.10	0.30		0.30		I _{OL} = 24 mA
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IL}	3.0		0.15	0.40		0.40	V	I _{OL} = 32 mA
		3.0		0.22	0.55		0.55		
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IL}	4.5		0.22	0.55		0.55	V	
		4.5		0.22	0.55		0.55		
I _{IN}	Input Leakage Current	0 to 5.5			±0.1		±1.0	μA	V _{IN} = 5.5 V or GND
I _{OZ}	3-State Output Leakage	1.65 to 5.5			±0.5		±5.0	μA	V _{IN} = V _{IH} or V _{IL} 0 V ≤ V _{OUT} ≤ 5.5 V
I _{OFF}	Power Off Leakage Current	0			1.0		10	μA	V _{IN} = 5.5 V or V _{OUT} = 5.5 V
I _{CC}	Quiescent Supply Current	5.5			1.0		10	μA	V _{IN} = 5.5 V or GND

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AC ELECTRICAL CHARACTERISTICS ($t_R = t_F = 3.0$ ns)

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 AN to YN (Figures 4 and 5, Table 1)	R _L = 1 MΩ C _L = 15 pF	1.8 ± 0.15	2.0	9.0	10	2.0	10.5	ns
		R _L = 1 MΩ C _L = 15 pF	2.5 ± 0.2	1.0		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	7.6	9.5	2.0	10	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 R ₁ = 500 Ω C _L = 50 pF	1.8 ± 0.15	2.0	8.0	10	2.0	10.5	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	Units
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 5)	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

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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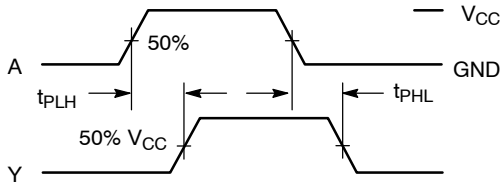
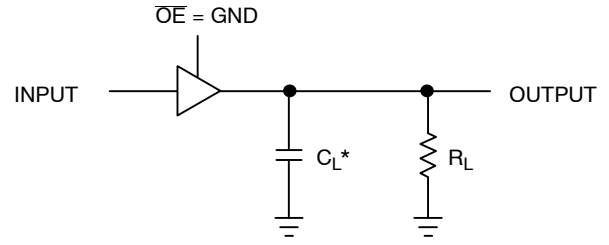
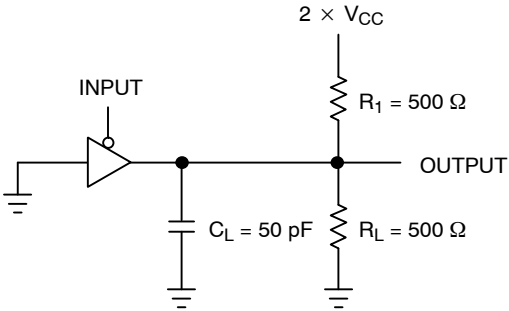


Figure 4. Switching Waveform



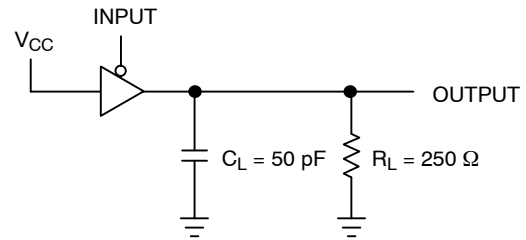
*Includes all probe and jig capacitance.
A 1 MHz square input wave is recommended for propagation delay tests.

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}

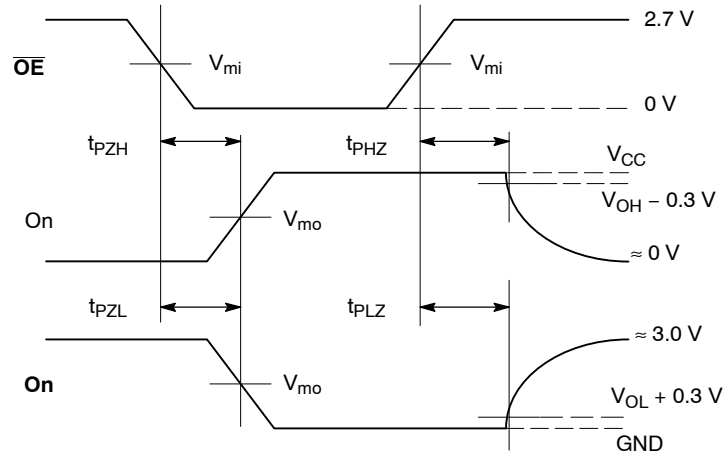


Figure 8. AC Output Enable and Disable Waveform

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}		
	$3.3 \text{ V} \pm 0.3 \text{ V}$	2.7 V	$2.5 \text{ V} \pm 0.2 \text{ V}$
V_{mi}	1.5 V	1.5 V	$V_{CC}/2$
V_{mo}	1.5 V	1.5 V	$V_{CC}/2$

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DEVICE ORDERING INFORMATION

Device	Package	Shipping†
NL17SZ125DFT2G	SC-88A (SOT-353) (Pb-Free)	3000 / Tape & Reel
NLV17SZ125DFT2G*	SC-88A (SOT-353) (Pb-Free)	3000 / Tape & Reel
NL17SZ125XV5T2G	SOT-553 (Pb-Free)	4000 / Tape & Reel
NL17SZ125DTT1G	TSOP-5 (Pb-Free)	3000 / Tape & Reel
NL17SZ125CMUTCG	UDFN6, 1.0 x 1.0 x 0.35P (Pb-Free)	3000 / Tape & Reel

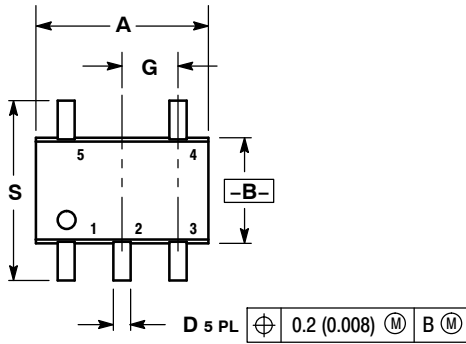
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

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PACKAGE DIMENSIONS

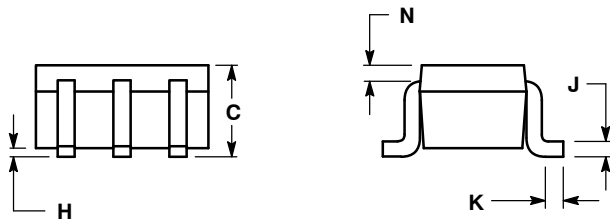
SC-88A (SC-70-5/SOT-353)
CASE 419A-02
ISSUE K



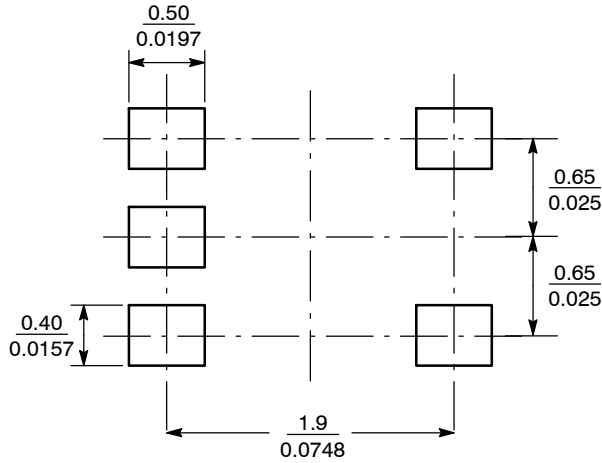
NOTES:

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.

DIM	INCHES		MILLIMETERS	
	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



SOLDERING FOOTPRINT*

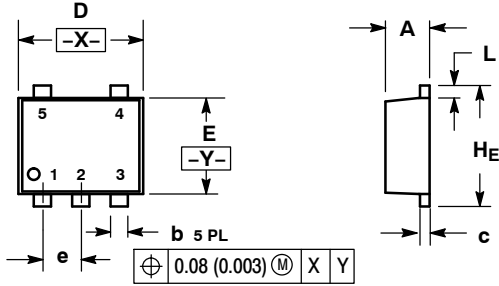


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NL17SZ125

PACKAGE DIMENSIONS

SOT-553, 5 LEAD
CASE 463B
ISSUE B

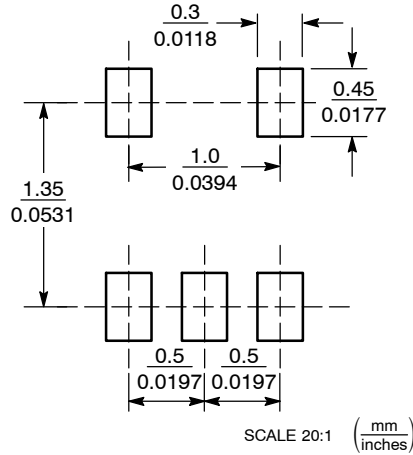


NOTES:

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.

DIM	MILLIMETERS			INCHES		
	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
HE	1.50	1.60	1.70	0.059	0.063	0.067

SOLDERING FOOTPRINT*

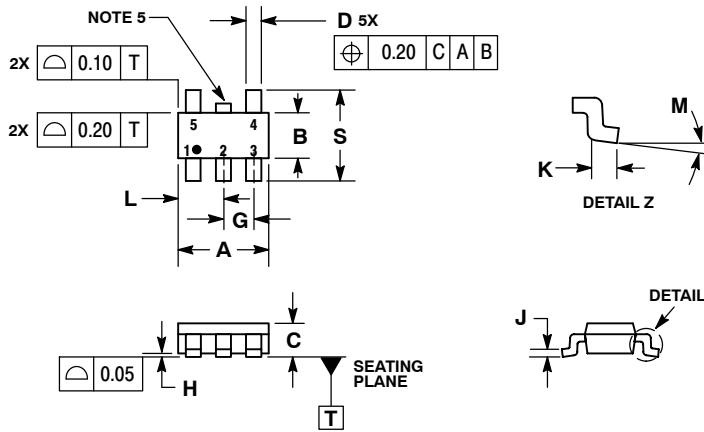


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NL17SZ125

PACKAGE DIMENSIONS

TSOP-5 CASE 483-02 ISSUE H

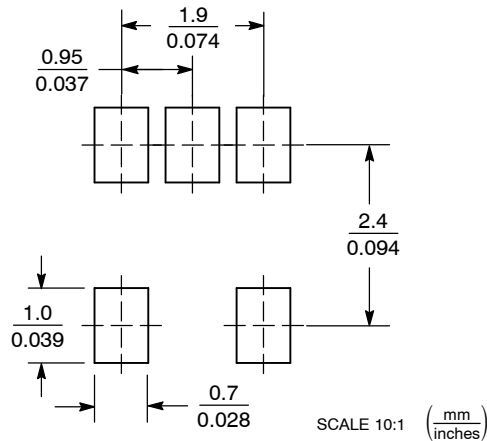


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

DIM	MILLIMETERS	
	MIN	MAX
A	3.00 BSC	
B	1.50 BSC	
C	0.90	1.10
D	0.25	0.50
G	0.95 BSC	
H	0.01	0.10
J	0.10	0.26
K	0.20	0.60
L	1.25	1.55
M	0°	10°
S	2.50	3.00

SOLDERING FOOTPRINT*

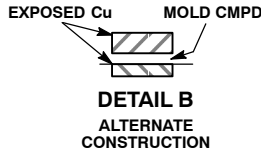
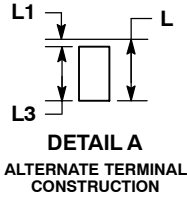
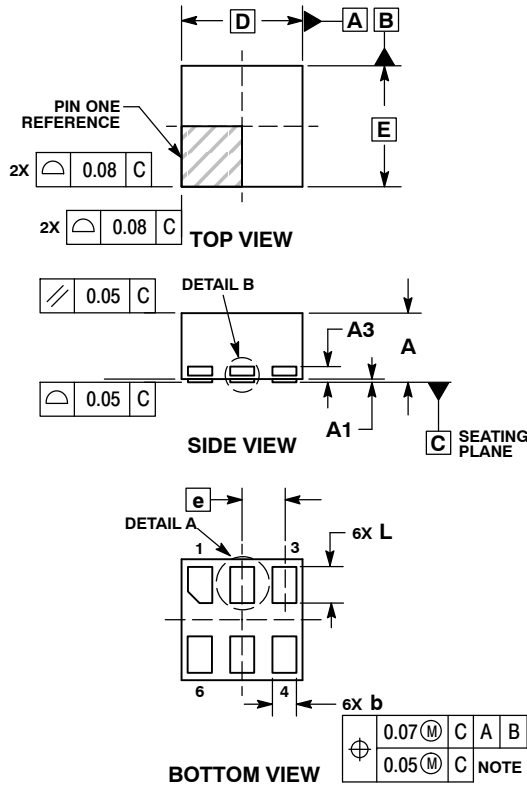


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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PACKAGE DIMENSIONS

UDFN6, 1x1, 0.35P
CASE 517BX
ISSUE O

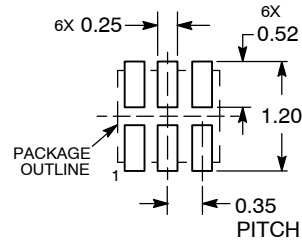


NOTES:

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 0.20 MM FROM TERMINAL TIP.
4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

MILLIMETERS		
DIM	MIN	MAX
A	0.50	0.65
A1	0.00	0.05
A3	0.13	REF
b	0.17	0.23
D	1.00	BSC
E	1.00	BSC
e	0.35	
L	0.20	0.40
L1	---	0.15
L3	0.26	0.33

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSION: MILLIMETERS

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