NL17SG125

Bus Buffer with 3-State Output

The NL17SG125 MiniGate™ is an advanced high−speed CMOS Bus Buffer with 3−State Output in ultra−small footprint.

The NL17SG125 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} = 2.4 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 are Pb−Free and Halide−Free Devices

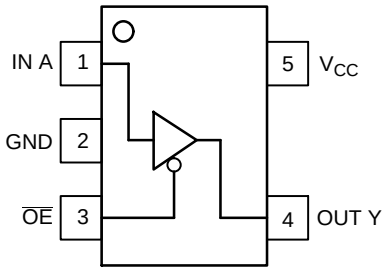


Figure 1. SOT−953
(Top Thru View)

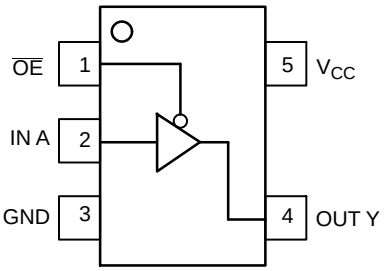


Figure 2. SC−88A
(Top View)

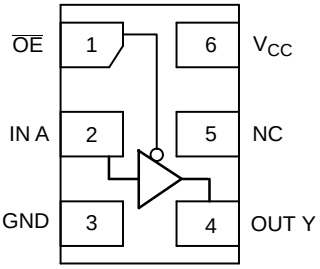


Figure 3. UDFN6
(Top View)

Figure 4. Logic Symbol

PIN ASSIGNMENT

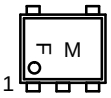
Pin Number	SOT−953	SC−88A	UDFN6
1	IN A	$\overline{OE}$	$\overline{OE}$
2	GND	IN A	IN A
3	$\overline{OE}$	GND	GND
4	OUT Y	OUT Y	OUT Y
5	V_{CC}	V_{CC}	NC
6			V_{CC}

ON Semiconductor®

http://onsemi.com

MARKING DIAGRAMS

SOT−953
CASE 527AE

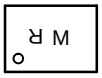


F = Specific Device Code
(F with 90 degree clockwise rotation)
M = Month Code

UDFN6
1.0 x 1.0
CASE 517BX

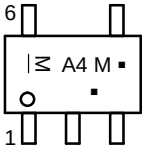
K = Specific Device Code
(K with 270 degree clockwise rotation)
M = Month Code

UDFN6
1.45 x 1.0
CASE 517AQ



R = Specific Device Code
(R with 180 degree clockwise rotation)
M = Month Code

SC−88A
DF SUFFIX
CASE 419A



A4 = 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

A Input	$\overline{OE}$ Input	Y Output
L	L	L
H	L	H
X	H	Z

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 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
$I_{LATCHUP}$	Latchup Performance	Above V_{CC} and Below GND at 125°C (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. 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	V_{CC} = 3.3 V ± 0.3 V	0	10	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	Conditions		V_{CC} (V)	T_A = 25°C		T_A = -55°C to +125°C		Unit
					Min	Max	Min	Max	
V_{IH}	High-Level Input Voltage			0.9	V_{CC}		V_{CC}		V
				1.1 to 1.3	0.7xV_{CC}		0.7xV_{CC}		
				1.4 to 1.6	0.65xV_{CC}		0.65xV_{CC}		
				1.65 to 1.95	0.65xV_{CC}		0.65xV_{CC}		
				2.3 to 2.7	1.7		1.7		
				3.0 to 3.6	2.0		2.0		
V_{IL}	Low-Level Input Voltage			0.9		GND		GND	V
				1.1 to 1.3		0.3xV_{CC}		0.3xV_{CC}	
				1.4 to 1.6		0.35xV_{CC}		0.35xV_{CC}	
				1.65 to 1.95		0.35xV_{CC}		0.35xV_{CC}	
				2.3 to 2.7		0.7		0.7	
				3.0 to 3.6		0.8		0.8	
V_{OH}	High-Level Output Voltage	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −20 μA	0.9	0.75		0.75		V
			I_{OH} = -0.3 mA	1.1 to 1.3	0.75xV_{CC}		0.75xV_{CC}		
			I_{OH} = -1.7 mA	1.4 to 1.6	0.75xV_{CC}		0.75xV_{CC}		
			I_{OH} = -3.0 mA	1.65 to 1.95	Vcc-0.45		Vcc-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 μA	0.9		0.1		0.1	V
			I_{OL} = 0.3 mA	1.1 to 1.3		0.25xV_{CC}		0.25xV_{CC}	
			I_{OL} = 1.7 mA	1.4 to 1.6		0.25xV_{CC}		0.25xV_{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 ≤ V_{IN} ≤ 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		1.0		10.0	μA
I_{OZ}	3−State Output Leakage Current	V_{IN} = V_{IH} or V_{IL} V_{OUT} = 0 to 3.6 V		0.9 to 3.6		1.0		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)

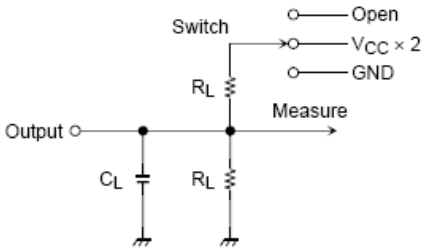
Symbol	Parameter	Test Condition	V_{CC} (V)	T_A = 25 °C			T_A = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay, A to Y	C_L = 10 pF, R_L = 1 MΩ	0.9	-	11.3	13.6	-	15.9	ns
			1.1 to 1.3	-	8.3	10.4	-	12.8	
			1.4 to 1.6	-	5.0	8.5	-	10.0	
			1.65 to 1.95	-	4.0	6.2	-	6.7	
			2.3 to 2.7	-	2.6	3.9	-	4.4	
			3.0 to 3.6	-	2.1	3.1	-	3.7	
		C_L = 15 pF, R_L = 1 MΩ	0.9	-	12.6	14.7	-	17.0	ns
			1.1 to 1.3	-	9.6	11.5	-	15.2	
			1.4 to 1.6	-	5.6	9.3	-	11.2	
			1.65 to 1.95	-	4.5	6.9	-	7.1	
			2.3 to 2.7	-	2.9	4.4	-	5.0	
			3.0 to 3.6	-	2.4	3.4	-	3.9	
		C_L = 30 pF, R_L = 1 MΩ	0.9	-	14.5	16.3	-	19.6	ns
			1.1 to 1.3	-	11.3	13.6	-	17.5	
			1.4 to 1.6	-	8.2	13.1	-	15.9	
			1.65 to 1.95	-	6	9.2	-	9.6	
			2.3 to 2.7	-	4	5.7	-	6.1	
			3.0 to 3.6	-	3.3	4.4	-	4.8	
t_{PZH}, t_{PZL}	Output Enable Time, $\overline{OE}$ to Y	C_L = 10 pF;							ns
		R_L = 100 kΩ	0.9	-	11.0	13.3	-	15.8	
		R_L = 5 kΩ	1.1 to 1.3	-	8.4	10.9	-	13.0	
		R_L = 5 kΩ	1.4 to 1.6	-	5.3	7.8	-	8.3	
		R_L = 5 kΩ	1.65 to 1.95	-	3.9	5.5	-	5.9	
		R_L = 5 kΩ	2.3 to 2.7	-	2.5	3.5	-	3.8	
		R_L = 5 kΩ	3.0 to 3.6	-	2.1	2.7	-	3	
		C_L = 15 pF;							ns
		R_L = 100 kΩ	0.9	-	12.0	14.8	-	17.0	
		R_L = 5 kΩ	1.1 to 1.3	-	9.0	11.7	-	13.8	
		R_L = 5 kΩ	1.4 to 1.6	-	5.9	8.9	-	11	
		R_L = 5 kΩ	1.65 to 1.95	-	4.4	6.3	-	6.5	
		R_L = 5 kΩ	2.3 to 2.7	-	2.9	3.9	-	4.2	
		R_L = 5 kΩ	3.0 to 3.6	-	2.3	3	-	3.3	
		C_L = 30 pF;							ns
		R_L = 100 kΩ	0.9	-	13.0	15.2	-	18.3	
		R_L = 5 kΩ	1.1 to 1.3	-	10.0	13.1	-	15.2	
		R_L = 5 kΩ	1.4 to 1.6	-	8.3	12.2	-	13.7	
		R_L = 5 kΩ	1.65 to 1.95	-	6.1	8.6	-	9.7	
		R_L = 5 kΩ	2.3 to 2.7	-	3.8	5	-	5.5	
		R_L = 5 kΩ	3.0 to 3.6	-	2.9	3.8	-	4.2	

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

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_{PHZ}, t_{PLZ}	Output Disable Time, $\overline{OE}$ to Y	C_L = 10 pF;							ns
		R_L = 100 kΩ	0.9	-	100.4	-	-	-	
		R_L = 5 kΩ	1.1 to 1.3	-	9.1	14.4	-	22.4	
		R_L = 5 kΩ	1.4 to 1.6	-	7.1	9.1	-	10.4	
		R_L = 5 kΩ	1.65 to 1.95	-	6.5	8.3	-	9	
		R_L = 5 kΩ	2.3 to 2.7	-	5.8	7.3	-	8.8	
		R_L = 5 kΩ	3.0 to 3.6	-	5.4	6.9	-	7.6	
		C_L = 15 pF;							ns
		R_L = 100 kΩ	0.9	-	122.2	-	-	-	
		R_L = 5 kΩ	1.1 to 1.3	-	9.8	15.3	-	25.1	
		R_L = 5 kΩ	1.4 to 1.6	-	7.8	9.8	-	11.3	
		R_L = 5 kΩ	1.65 to 1.95	-	7.2	9.2	-	10.6	
		R_L = 5 kΩ	2.3 to 2.7	-	7	8.2	-	10.3	
		R_L = 5 kΩ	3.0 to 3.6	-	6.6	7.7	-	9.5	
		C_L = 30 pF;							ns
		R_L = 100 kΩ	0.9	-	217.1	-	-	-	
		R_L = 5 kΩ	1.1 to 1.3	-	13.2	19.6	-	31.9	
		R_L = 5 kΩ	1.4 to 1.6	-	12.2	13.5	-	14.9	
		R_L = 5 kΩ	1.65 to 1.95	-	11.4	12.7	-	13.9	
		R_L = 5 kΩ	2.3 to 2.7	-	11.3	12.2	-	13.5	
		R_L = 5 kΩ	3.0 to 3.6	-	10.2	11.5	-	12.9	
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 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; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.



Characteristics	Switch
t_{pLH}, t_{pHL}	Open
t_{pLZ}, t_{pZL}	V_{CC} × 2
t_{pHZ}, t_{pZH}	GND

Figure 5. Test Circuit

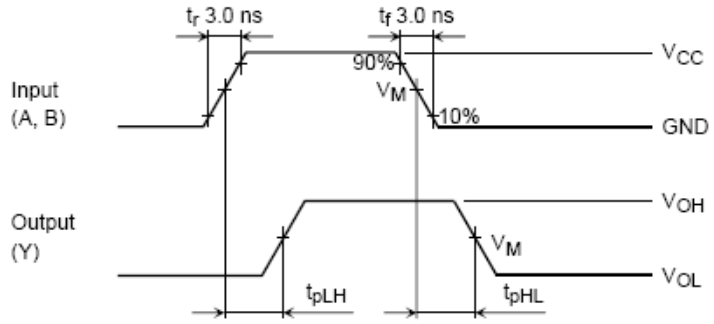


Figure 6. t_{PLH}, t_{PHL} Waveforms

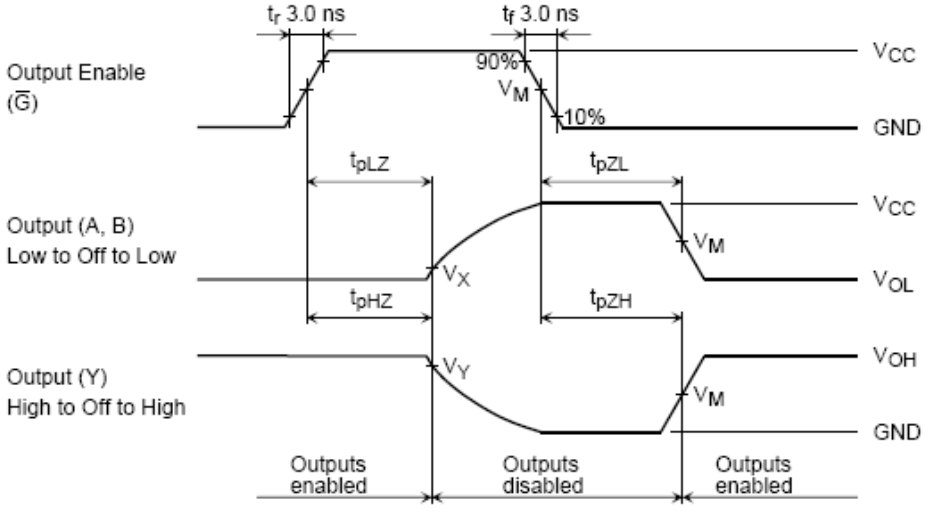


Figure 7. t_{PLZ}, t_{PHZ}, t_{PZH}, t_{PZL} Waveforms

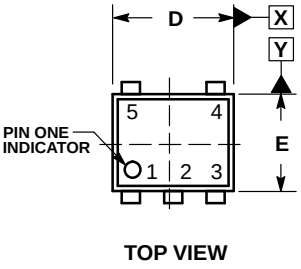
ORDERING INFORMATION

Device	Package	Shipping†
NL17SG125P5T5G	SOT−953 (Pb−Free)	8000 / Tape & Reel
NL17SG125DFT2G	SC−88A (Pb−Free)	3000 / Tape & Reel
NL17SG125AMUTCG*	UDFN6 1.45 x 1 mm (Pb−Free)	3000 / Tape & Reel
NL17SG125CMUTCG*	UDFN6 1 x 1 mm (Pb−Free)	3000 / Tape & Reel

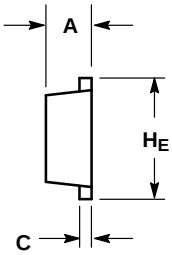
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
*In Development

PACKAGE DIMENSIONS

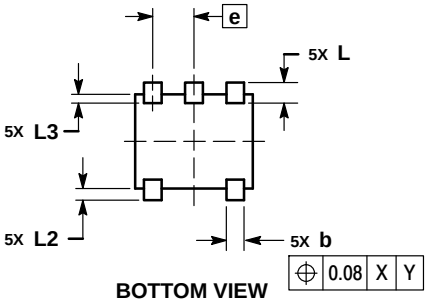
SOT−953
CASE 527AE
ISSUE E



TOP VIEW



SIDE VIEW

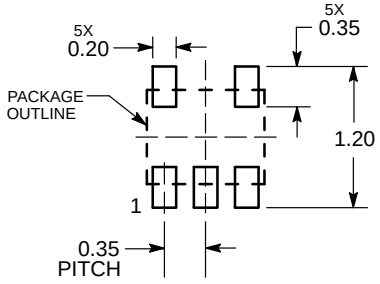


BOTTOM VIEW

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*

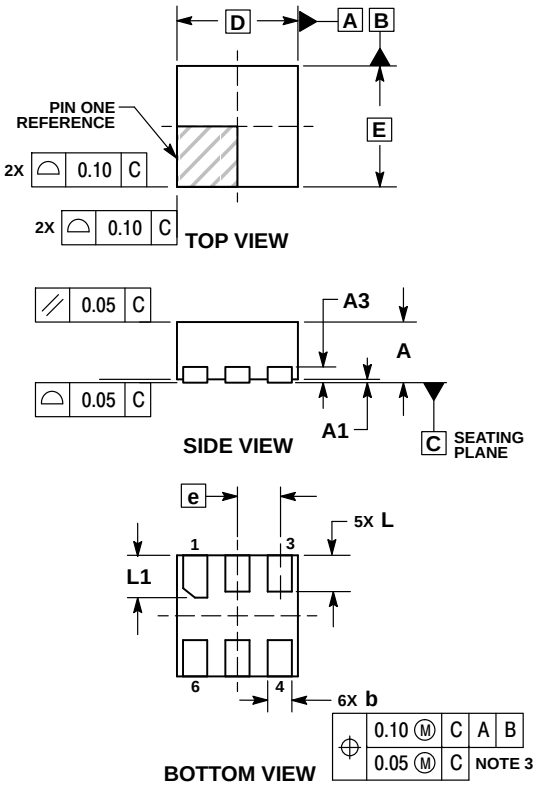


DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

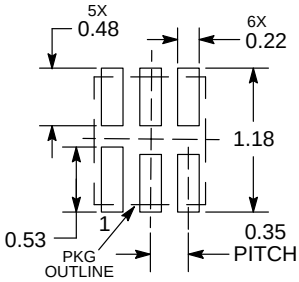
UDFN6 1.0x1.0, 0.35P
CASE 517BX
ISSUE O



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	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.12	0.22
D	1.00 BSC	
E	1.00 BSC	
e	0.35 BSC	
L	0.25	0.35
L1	0.30	0.40

RECOMMENDED SOLDERING FOOTPRINT*

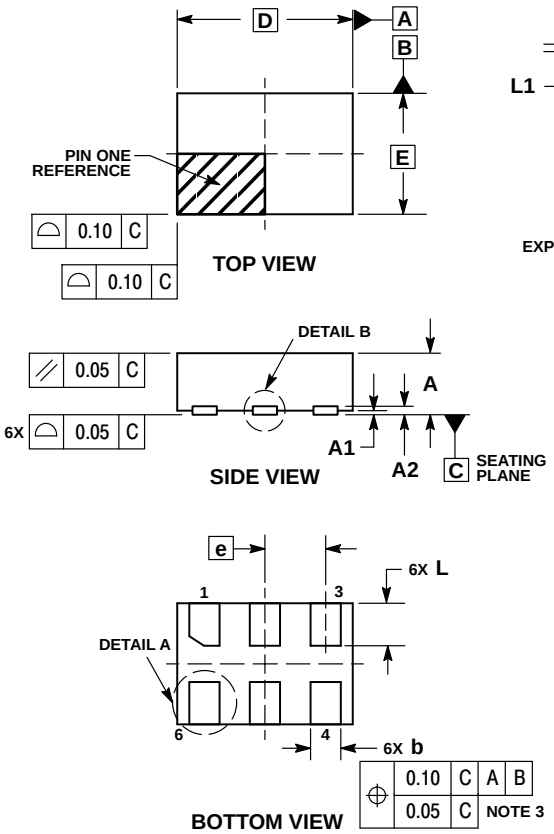


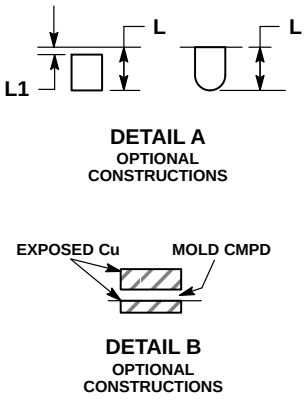
DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

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

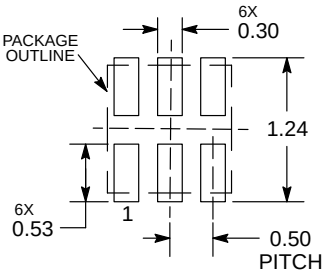




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

	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

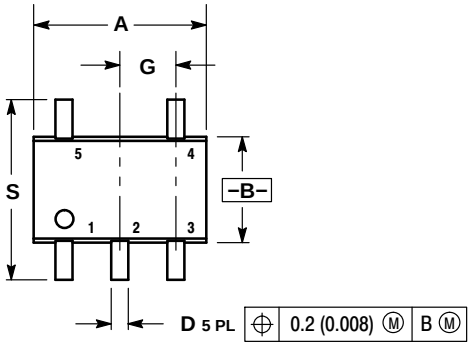


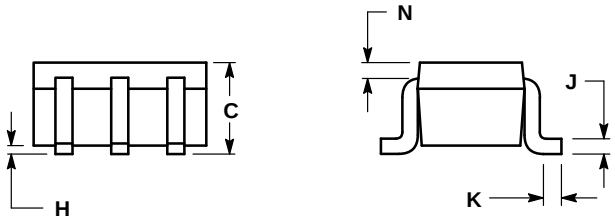
DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

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

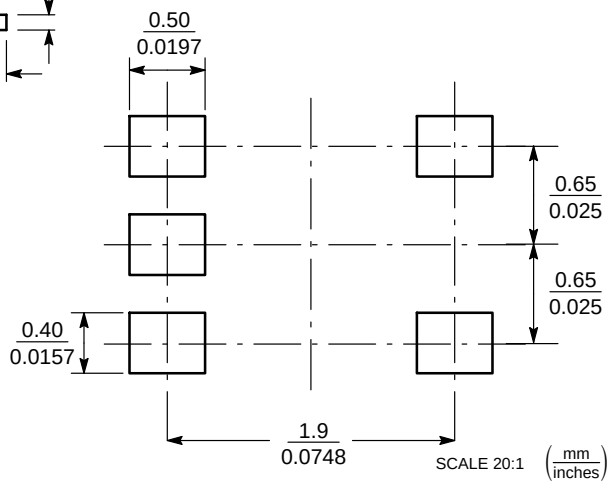




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	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.

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