

NL27WZU04

Dual Unbuffered Inverter

The NL27WZU04 is a high performance dual unbuffered inverter operating from a 1.65 to 5.5 V supply.

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- I_{OFF} Supports Partial Power Down Protection
- Sink 16 mA at 3.0 V
- Available in SC-88, SC-74 and UDFN6 Packages
- 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

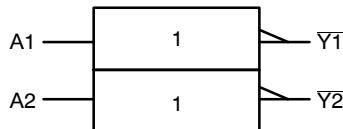


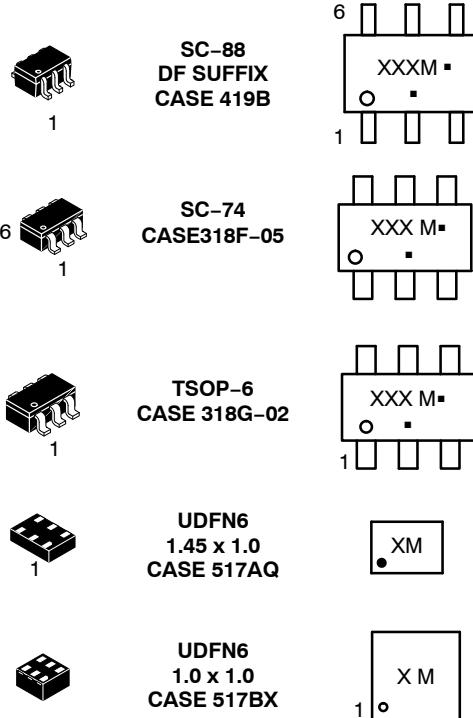
Figure 1. Logic Symbol

ON

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MARKING DIAGRAMS



X, XXX = Specific Device Code

M = Date Code*

A = Assembly Location

Y = Year

W = Work Week

▪ = Pb-Free Package

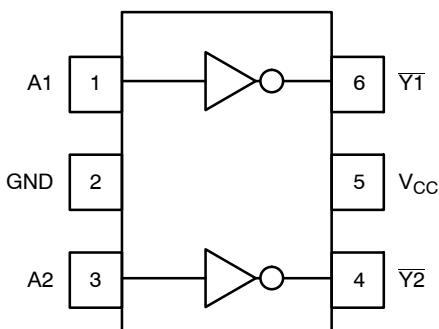
(Note: Microdot may be in either location)

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

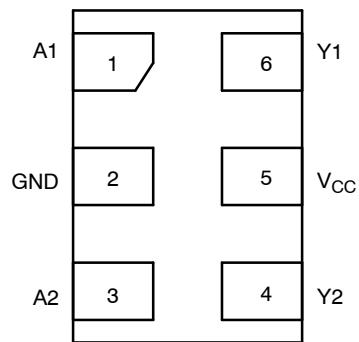
ORDERING INFORMATION

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

NL27WZU04



(SC-88 / SC-74 / TSOP-6)



UDFN6

Figure 2. Pinout (Top View)

PIN ASSIGNMENT

Pin	Function
1	A1
2	GND
3	A2
4	Y2
5	V _{CC}
6	Y1

FUNCTION TABLE

A Input	Y Output
L	H
H	L

MAXIMUM RATINGS

Symbol	Characteristics	Value	Unit
V _{CC}	DC Supply Voltage SC-88 (NLV) SC-88, SC-74, UDFN6	-0.5 to +7.0 -0.5 to +6.5	V
V _{IN}	DC Input Voltage SC-88 (NLV) SC-88, SC-74, UDFN6	-0.5 to +7.0 -0.5 to +6.5	V
V _{OUT}	DC Output Voltage	-0.5 to V _{CC} + 0.5	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 SC-74 UDFN6 659 555 382	°C/W
P _D	Power Dissipation in Still Air	SC-88 SC-74 UDFN6 190 225 327	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 (Note 3)	Human Body Model Charged Device Model (NLV) Charged Device Model 2000 1000 N/A	V
I _{Latchup}	Latchup Performance (Note 4)	(NLV) ±500 ±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.

- Applicable to devices with outputs that may be tri-stated.
- Measured with minimum pad spacing on an FR4 board, using 10mm-by-1inch, 2 ounce copper trace no air flow.
- HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
- Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics	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	0	V _{CC}	
T _A	Operating Temperature Range	-55	+125	°C
t _r , t _f	Input Rise and Fall Time 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	20 20 10 5	ns

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 ≤ T _A ≤ 125°C		Units
				Min	Typ	Max	Min	Max	
V _{IH}	High-Level Input Voltage		1.65 to 1.95	0.85 V _{CC}	—	—	0.85 V _{CC}	—	V
			2.3 to 5.5	0.80 V _{CC}	—	—	0.80 V _{CC}	—	
V _{IL}	Low-Level Input Voltage		1.65 to 1.95	—	—	0.15 V _{CC}	—	0.15 V _{CC}	V
			2.3 to 5.5	—	—	0.20 V _{CC}	—	0.20 V _{CC}	
V _{OH}	High-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OH} = -100 µA I _{OH} = -3 mA I _{OH} = -4 mA I _{OH} = -6 mA I _{OH} = -8 mA I _{OH} = -12 mA I _{OH} = -16 mA	1.65 to 5.5 1.65 2.3 2.7 3 3 3 4.5	V _{CC} - 0.1 1.29 1.52 2.1 2.2 2.4 2.6 2.5 3.8	— — — — — — — —	V _{CC} - 0.1 1.29 1.9 2.2 2.4 2.6 2.3 3.8	— — — — — — — —	— — — — — — — —	V
V _{OL}	Low-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OH} = 100 µA I _{OH} = 3 mA I _{OH} = 4 mA I _{OH} = 6 mA I _{OH} = 8 mA I _{OH} = 12 mA I _{OH} = 16 mA	1.65 to 5.5 1.65 2.3 2.7 3 3 3 4.5	— — — — — — — —	— 0.08 0.12 0.2 0.24 0.26 0.26 0.31	0.1 0.24 0.3 0.4 0.4 0.55 0.55 0.55	— — — — — — — —	0.1 0.24 0.3 0.4 0.4 0.55 0.55 0.55	V
I _{IN}	Input Leakage Current	V _{IN} = 5.5 V or GND	1.65 to 5.5	—	—	±0.1	—	±1.0	µA
I _{OFF}	Power Off Leakage Current	V _{IN} = 5.5 V or V _{OUT} = 5.5 V	0	—	—	1.0	—	10	µA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5	—	—	1.0	—	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.

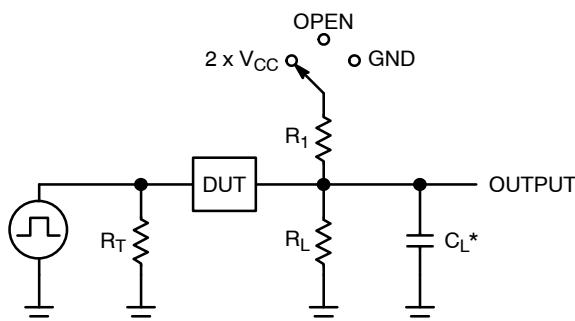
AC ELECTRICAL CHARACTERISTICS t_R = t_F = 2.5 ns; C_L = 50 pF; R_L = 500 Ω

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 Input A to Y (Figure 3 and 4)	R _L = 1 MΩ, C _L = 50 pF	1.8 ± 0.15	—	5.5	1.8	—	11.0	ns
		R _L = 1 MΩ, C _L = 15 pF	2.5 ± 0.2	—	3.3	5.7	—	6.3	
		R _L = 1 MΩ, C _L = 15 pF	3.3 ± 0.3	—	2.7	4.1	—	4.5	
		R _L = 500 Ω, C _L = 50 pF		—	4.0	6.4	—	7.0	
		R _L = 1 MΩ, C _L = 15 pF	5.0 ± 0.5	—	2.2	3.3	—	3.6	
		R _L = 500 Ω, C _L = 50 pF		—	3.4	5.6	—	6.2	

CAPACITIVE CHARACTERISTICS (t_R = t_F = 3.0 ns)

Symbol	Parameter	Condition	Typical	Units
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} = 5.5 V, V _{IN} = 0 V or V _{CC}	4.0	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}.



C_L includes probe and jig capacitance

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

f = 1 MHz

Figure 3. 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}	-	-	-
		See AC Characteristics Table	-	-
t_{PHZ} / t_{PZH}	GND	-	-	-
		See AC Characteristics Table	-	-

X = Don't Care

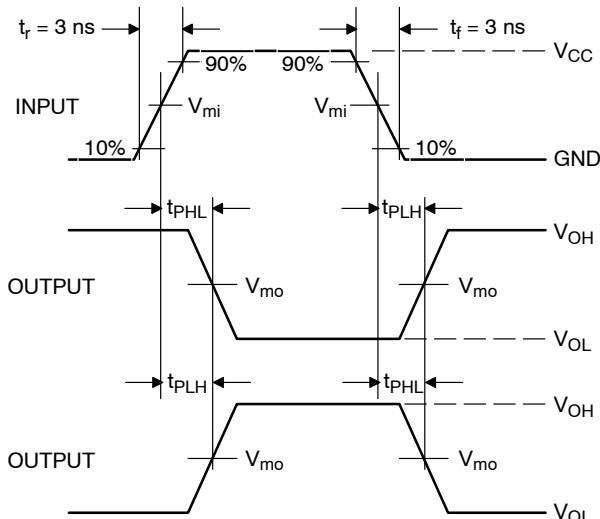


Figure 4. Switching Waveforms

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	$V_{CC}/2$	$(V_{OH} - V_{OL})/2$	$V_{CC}/2$	0.15
2.3 to 2.7	$V_{CC}/2$	$(V_{OH} - V_{OL})/2$	$V_{CC}/2$	0.15
3.0 to 3.6	$V_{CC}/2$	$(V_{OH} - V_{OL})/2$	$V_{CC}/2$	0.3
4.5 to 5.5	$V_{CC}/2$	$(V_{OH} - V_{OL})/2$	$V_{CC}/2$	0.3

NL27WZU04

DEVICE ORDERING INFORMATION

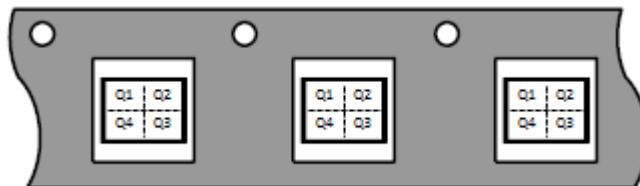
Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping [†]
NL27WZU04DFT2G	SC-88	M6	Q4	3000 / Tape & Reel
NLV27WZU04DFT2G*	SC-88	M6	Q4	3000 / Tape & Reel
NL27WZU04DBVT1G (In Development)	SC-74	M6	Q4	3000 / Tape & Reel
NL27WZU04DTT1G	TSOP-6	M6	Q4	3000 / Tape & Reel
NL27WZU04MU1TCG (In Development)	UDFN6, 1.45 x 1.0 x 0.35P	TBD	Q4	3000 / Tape & Reel
NL27WZU04MU3TCG (In Development)	UDFN6, 1.0 x 1.0 x 0.35P	TBD	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-Q100 Qualified and PPAP Capable.

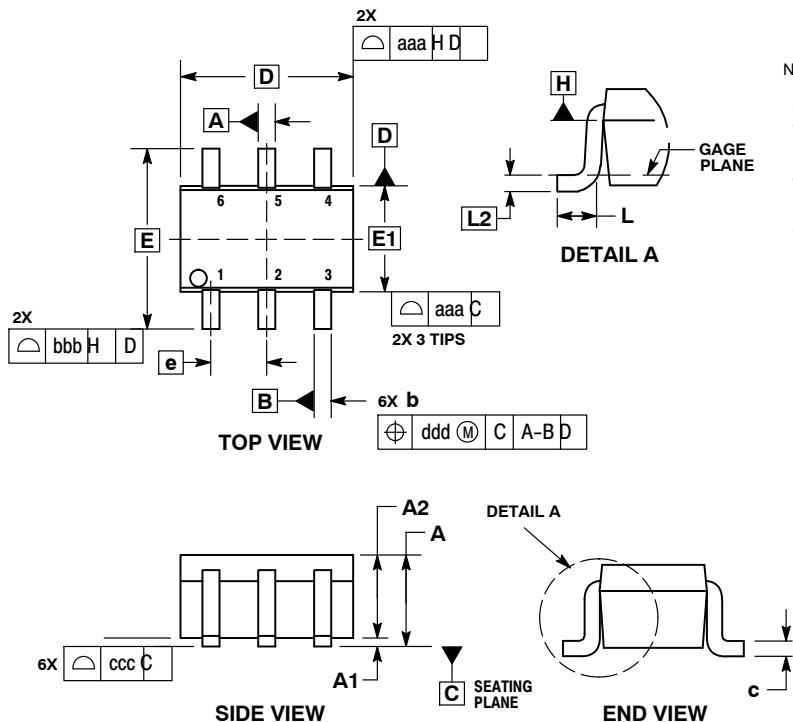
Pin 1 Orientation in Tape and Reel

Direction of Feed



PACKAGE DIMENSIONS

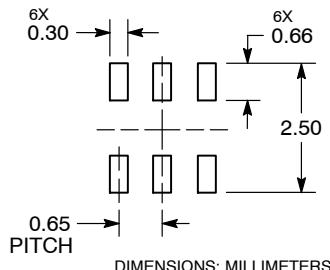
SC - 88/SC70 - 6/SOT - 363
CASE 419B - 02
ISSUE Y



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.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	—	—	—	—	—
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		

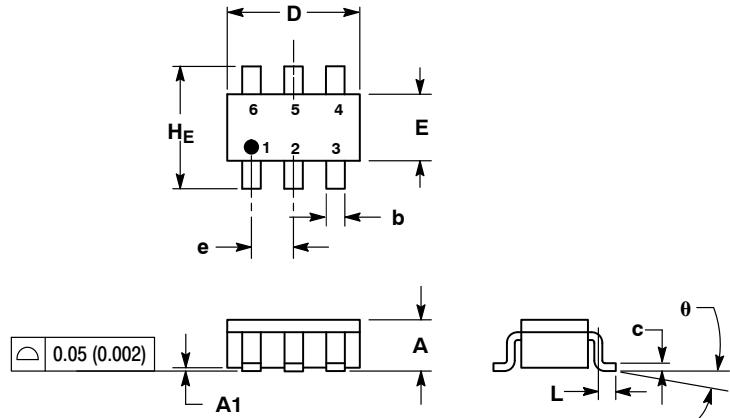
RECOMMENDED
SOLDERING FOOTPRINT*

DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

SC-74
CASE 318F-05
ISSUE N

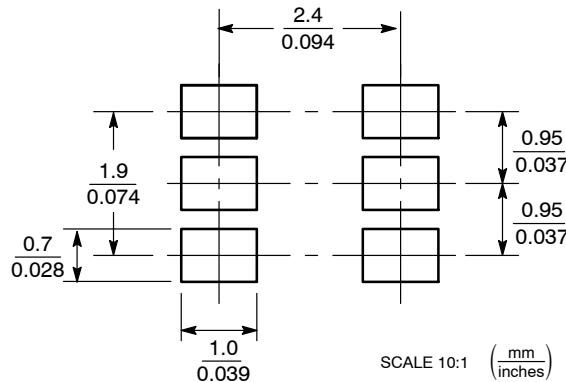


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318F-01, -02, -03, -04 OBSOLETE. NEW STANDARD 318F-05.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.37	0.50	0.010	0.015	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.05	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
H_E	2.50	2.75	3.00	0.099	0.108	0.118
θ	—	—	—	—	—	—

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.

STYLE 1:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

STYLE 2:
PIN 1. NO CONNECTION
2. COLLECTOR
3. Emitter
4. NO CONNECTION
5. COLLECTOR
6. BASE

STYLE 3:
PIN 1. Emitter 1
2. BASE 1
3. COLLECTOR 2
4. Emitter 2
5. BASE 2
6. COLLECTOR 1

STYLE 4:
PIN 1. COLLECTOR 2
2. Emitter 1/EMITTER 2
3. COLLECTOR 1
4. Emitter 3
5. BASE 1/BASE 2/COLLECTOR 3
6. BASE 3

STYLE 5:
PIN 1. CHANNEL 1
2. ANODE
3. CHANNEL 2
4. CHANNEL 3
5. CATHODE
6. CHANNEL 4

STYLE 6:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 7:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 8:
PIN 1. Emitter 1
2. BASE 2
3. COLLECTOR 2
4. Emitter 2
5. BASE 1
6. COLLECTOR 1

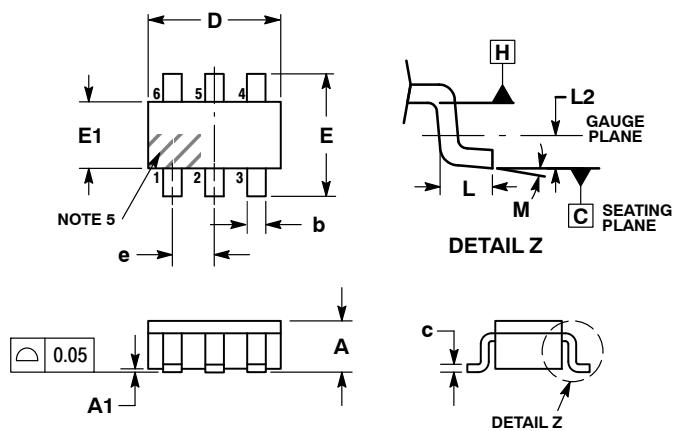
STYLE 9:
PIN 1. Emitter 2
2. BASE 2
3. COLLECTOR 1
4. Emitter 1
5. BASE 1
6. COLLECTOR 2

STYLE 10:
PIN 1. ANODE/CATHODE
2. BASE
3. Emitter
4. COLLECTOR
5. ANODE
6. CATHODE

STYLE 11:
PIN 1. Emitter
2. BASE
3. ANODE/CATHODE
4. ANODE
5. CATHODE
6. COLLECTOR

PACKAGE DIMENSIONS

TSOP-6
CASE 318G-02
ISSUE V

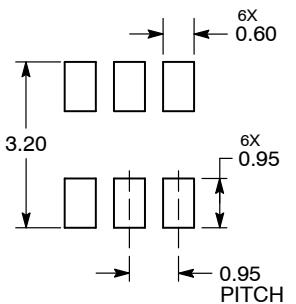


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
 4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
 5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	—	10°

STYLE 1: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN	STYLE 2: PIN 1. Emitter 2 2. Base 1 3. Collector 1 4. Emitter 1 5. Base 2 6. Collector 2	STYLE 3: PIN 1. ENABLE 2. N/C 3. R BOOST 4. Vz 5. Vin 6. Vout	STYLE 4: PIN 1. N/C 2. Vin 3. Not Used 4. Ground 5. Enable 6. Load	STYLE 5: PIN 1. Emitter 2 2. Base 2 3. Collector 1 4. Emitter 1 5. Base 1 6. Collector 2	STYLE 6: PIN 1. Collector 2. Collector 3. Base 4. Emitter 5. Collector 6. Collector
STYLE 7: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. N/C 5. COLLECTOR 6. Emitter	STYLE 8: PIN 1. Vbus 2. Di(in) 3. Di(in)+ 4. Di(out) 5. Di(out) 6. GND	STYLE 9: PIN 1. LOW VOLTAGE GATE 2. DRAIN 3. SOURCE 4. DRAIN 5. DRAIN 6. HIGH VOLTAGE GATE	STYLE 10: PIN 1. D(OUT)+ 2. GND 3. D(OUT)- 4. D(IN)- 5. VBUS 6. D(IN)+	STYLE 11: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1/GATE 2	STYLE 12: PIN 1. I/O 2. GROUND 3. I/O 4. I/O 5. VCC 6. I/O
STYLE 13: PIN 1. GATE 1 2. SOURCE 2 3. GATE 2 4. DRAIN 2 5. SOURCE 1 6. DRAIN 1	STYLE 14: PIN 1. ANODE 2. SOURCE 3. GATE 4. CATHODE/DRAIN 5. CATHODE/DRAIN 6. CATHODE/DRAIN	STYLE 15: PIN 1. ANODE 2. SOURCE 3. GATE 4. DRAIN 5. N/C 6. CATHODE	STYLE 16: PIN 1. ANODE/CATHODE 2. BASE 3. Emitter 4. COLLECTOR 5. ANODE 6. CATHODE	STYLE 17: PIN 1. Emitter 2. BASE 3. ANODE/CATHODE 4. ANODE 5. CATHODE 6. COLLECTOR	

**RECOMMENDED
SOLDERING FOOTPRINT***

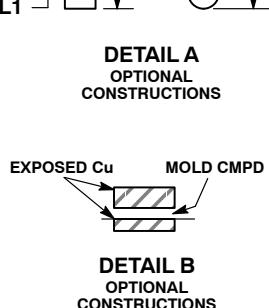
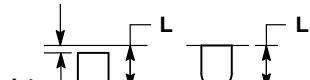
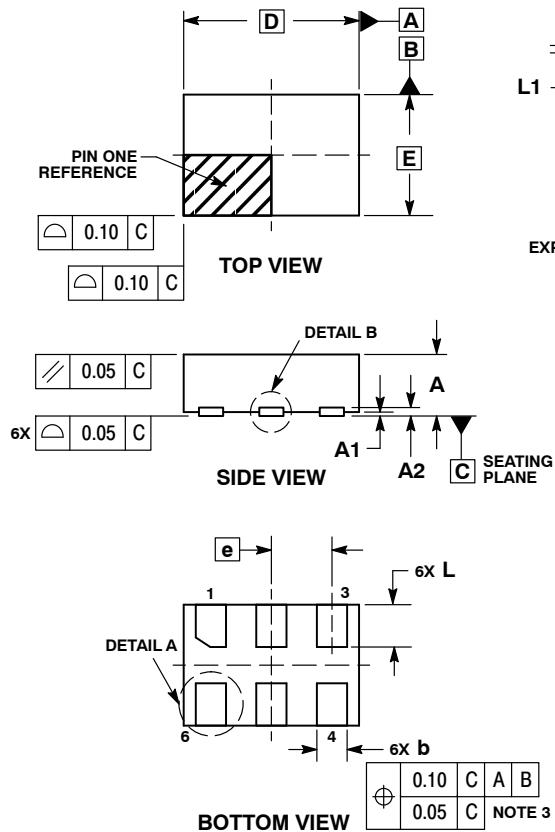


DIMENSIONS: MILLIMETERS

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PACKAGE DIMENSIONS

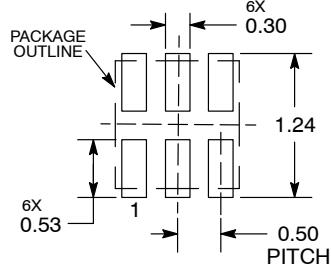
UDFN6, 1.45x1.0, 0.5P
CASE 517AQ
ISSUE O



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.

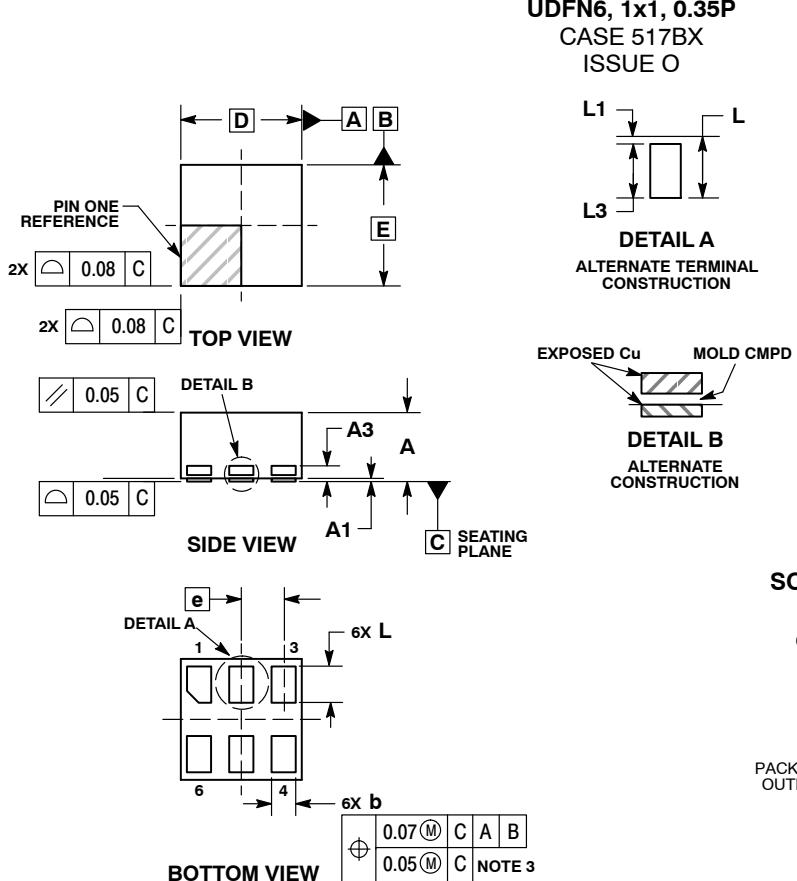
MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A2	0.07 REF	
b	0.20	0.30
D	1.45 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.30	0.40
L1	---	0.15

MOUNTING FOOTPRINT

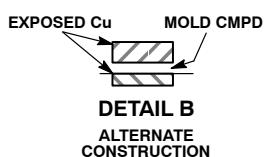
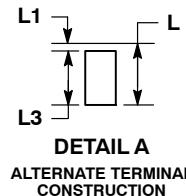
DIMENSIONS: MILLIMETERS

*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



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

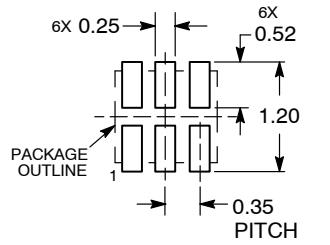


NOTES:

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.

DIM	MILLIMETERS	
	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***



*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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