## onsemi

## **Dual Unbuffered Inverter**

### **NL27WZU04**

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<sub>CC</sub> Operation
- Input Overvoltage Tolerant up to 5.5 V
- I<sub>OFF</sub> Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Available in SC-88, SC-74 and UDFN6 Packages
- Chip Complexity < 100 FETs
- -Q Suffix 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

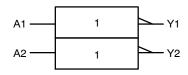
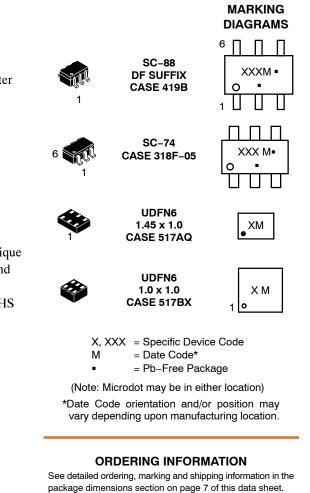
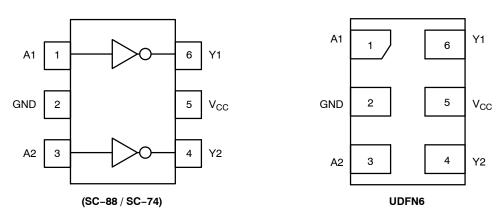


Figure 1. Logic Symbol







#### **PIN ASSIGNMENT**

Pin	Function
1	A1
2	GND
3	A2
4	Y2
5	V <sub>CC</sub>
6	Y1

#### FUNCTION TABLE

A Input	Y Output
L	Н
Н	L

#### MAXIMUM RATINGS

Symbol	Characteristics		Value	Unit
V <sub>CC</sub>	DC Supply Voltage		-0.5 to +6.5	V
V <sub>IN</sub>	DC Input Voltage		-0.5 to +6.5	V
V <sub>OUT</sub>	DC Output Voltage		–0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current V <sub>IN</sub> < GND		-50	mA
I <sub>OK</sub>	DC Output Diode Current	±50	mA	
I <sub>OUT</sub>	DC Output Source/Sink Current	±50	mA	
I <sub>CC</sub> or I <sub>GND</sub>	DC Supply Current per Supply Pin or Ground Pin	±100	mA	
T <sub>STG</sub>	Storage Temperature Range		-65 to +150	°C
ΤL	Lead Temperature, 1 mm from Case for 10 secs		260	°C
TJ	Junction Temperature Under Bias		+150	°C
$\theta_{JA}$	Thermal Resistance (Note 2)	SC-88 SC-74 UDFN6	377 320 154	°C/W
P <sub>D</sub>	Power Dissipation in Still Air	SC-88 SC-74 UDFN6	332 300 812	mW
MSL	Moisture Sensitivity		Level 1	-
F <sub>R</sub>	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	-
$V_{\text{ESD}}$	ESD Withstand Voltage (Note 3)	Human Body Model Charged Device Model	2000 1000	V
I <sub>Latchup</sub>	Latchup Performance (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. Applicable to devices with outputs that may be tri-stated.

 Applicable to devices with outputs that may be the stated.
Measured with minimum pad spacing on an FR4 board, using 10mm-by-1inch, 2 ounce copper trace no air flow per JESD51-7.
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.

4. Tested to EIA/JESD78 Class II.

#### **RECOMMENDED OPERATING CONDITIONS**

Symbol	Characteristics	Min	Max	Unit	
V <sub>CC</sub>	Positive DC Supply Voltage	1.65	5.5	V	
V <sub>IN</sub>	DC Input Voltage	0	5.5	V	
V <sub>OUT</sub>	DC Output Voltage	0	V <sub>CC</sub>		
T <sub>A</sub>	Operating Temperature Range		-55	+125	°C
t <sub>r</sub> , t <sub>f</sub>			0 0 0 0	20 20 10 5	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

			V <sub>CC</sub>	T <sub>A</sub> = 25°C			–55°C ≤ T	A ≤ 125°C	
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Max	Units
VIH	High-Level Input		1.65 to 1.95	0.85 V <sub>CC</sub>	-	-	0.85 V <sub>CC</sub>	-	V
	Voltage		2.3 to 5.5	0.80 V <sub>CC</sub>	-	-	0.80 V <sub>CC</sub>	-	
V <sub>IL</sub>	Low-Level Input		1.65 to 1.95	-	-	0.15 V <sub>CC</sub>	-	0.15 V <sub>CC</sub>	V
	Voltage		2.3 to 5.5	-	-	0.20 V <sub>CC</sub>	-	0.20 V <sub>CC</sub>	
V <sub>OH</sub>	High-Level Output Voltage	$ \begin{array}{l} V_{IN} = GND \\ I_{OH} = -100 \ \mu A \\ I_{OH} = -4 \ mA \\ I_{OH} = -8 \ mA \\ I_{OH} = -12 \ mA \\ I_{OH} = -16 \ mA \\ I_{OH} = -24 \ mA \\ I_{OH} = -32 \ mA \end{array} $	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5	V <sub>CC</sub> - 0.1 1.29 1.9 2.2 2.4 2.3 3.8	V <sub>CC</sub> 1.4 2.1 2.4 2.7 2.5 4.0		V <sub>CC</sub> - 0.1 1.29 1.9 2.2 2.4 2.3 3.8		V
V <sub>OL</sub>	Low-Level Output Voltage		1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5		- 0.08 0.2 0.22 0.28 0.38 0.42	0.1 0.24 0.3 0.4 0.4 0.55 0.55		0.1 0.24 0.3 0.4 0.4 0.55 0.55	V
I <sub>IN</sub>	Input Leakage Current	$V_{IN}$ = 5.5 V or GND	1.65 to 5.5	-	-	±0.1	-	±1.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> = 5.5 V	0	-	-	1.0	_	10	μΑ
I <sub>CC</sub>	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	5.5	-	-	1.0	-	10	μΑ

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.

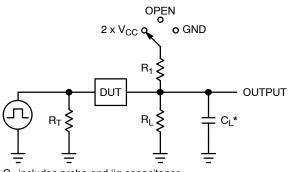
#### AC ELECTRICAL CHARACTERISTICS

				Ţ	<sub>A</sub> = 25°	С	– 55°C ≤ 1	Γ <sub>A</sub> ≤ 125°C	
Symbol	Parameter	Condition	V <sub>CC</sub> (V)	Min	Тур	Max	Min	Max	Units
t <sub>PLH</sub>		$R_L$ = 1 M $\Omega$ , $C_L$ = 15 pF	1.65 to 1.95	-	5.5	9.8	-	11.0	ns
tPHL	Input A to Y (Figure 3 and 4)	$R_L = 1 M\Omega$ , $C_L = 15 pF$	2.3 to 2.7	-	3.3	5.7	-	6.3	
		$R_L = 1 M\Omega$ , $C_L = 15 pF$	3.0 to 3.6	-	2.7	4.1	-	4.5	
		$R_L = 500 \Omega$ , $C_L = 50 pF$		-	4.0	6.4	_	7.0	
		$R_L = 1 M\Omega$ , $C_L = 15 pF$	4.5 to 5.5	-	2.2	3.3	-	3.6	
		$R_L$ = 500 $\Omega$ , $C_L$ = 50 pF		-	3.4	5.6	-	6.2	

#### **CAPACITIVE CHARACTERISTICS**

Symbol	Parameter	Condition	Typical	Units
C <sub>IN</sub>	Input Capacitance	$V_{CC}$ = 5.5 V, $V_{IN}$ = 0 V or $V_{CC}$	2.5	pF
C <sub>OUT</sub>	Output Capacitance	$V_{CC}$ = 5.5 V, $V_{IN}$ = 0 V or $V_{CC}$	4.0	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)	10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	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:  $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$ .  $C_{PD}$  is used to determine the no-load dynamic power consumption;  $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$ .

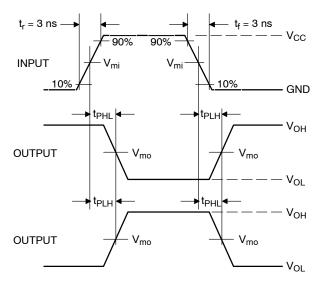


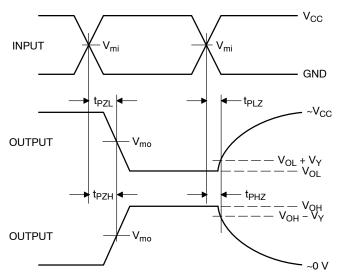
Test	Switch Position	C <sub>L</sub> , pF	$R_{L}, \Omega$	R <sub>1</sub> , Ω
t <sub>PLH</sub> / t <sub>PHL</sub>	Open	See AC Characteristics Table		
t <sub>PLZ</sub> / t <sub>PZL</sub>	$2 \times V_{CC}$	50	500	500
t <sub>PHZ</sub> / t <sub>PZH</sub>	GND	50	500	500

X = Don't Care

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

#### Figure 3. Test Circuit





#### Figure 4. Switching Waveforms

		Vm		
V <sub>CC</sub> , V	V <sub>mi</sub> , V	t <sub>PLH</sub> , t <sub>PHL</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub> , t <sub>PZH</sub> , t <sub>PHZ</sub>	V <sub>Y</sub> , V
1.65 to 1.95	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.15
2.3 to 2.7	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.15
3.0 to 3.6	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.3
4.5 to 5.5	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.3

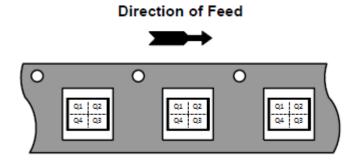
#### **DEVICE ORDERING INFORMATION**

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping <sup>†</sup>
NL27WZU04DFT2G	SC-88	M6	Q4	3000 / Tape & Reel
NL27WZU04DFT2G-Q*	SC-88	M6	Q4	3000 / Tape & Reel
NL27WZU04DBVT1G	SC-74	M6	Q4	3000 / Tape & Reel
NL27WZU04MU1TCG (In Development)	UDFN6, 1.45 x 1.0, 0.5P	TBD	Q4	3000 / Tape & Reel
NL27WZU04MU3TCG (In Development)	UDFN6, 1.0 x 1.0, 0.35P	TBD	Q4	3000 / Tape & Reel

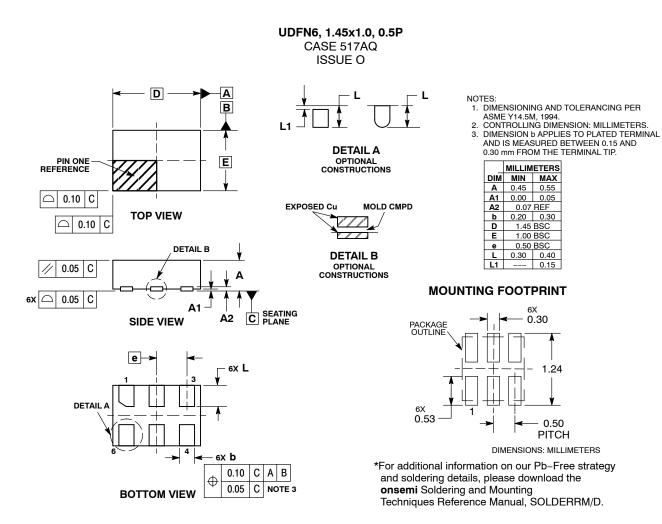
+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
\*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP

Capable.

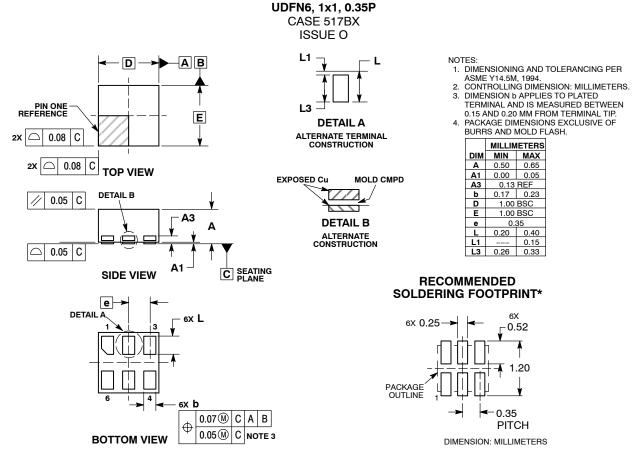
#### Pin 1 Orientation in Tape and Reel



#### PACKAGE DIMENSIONS



#### PACKAGE DIMENSIONS



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

1.00 BSC 1.00 BSC

0.35

6X

-0.52

1.20

0.35

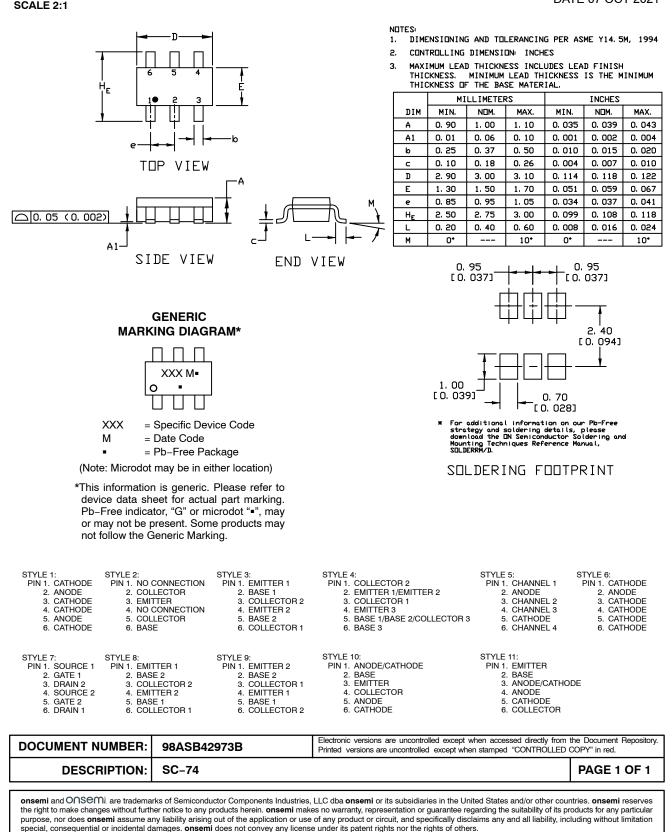
PITCH

0.15

# onsemi

SC-74 CASE 318F ISSUE P

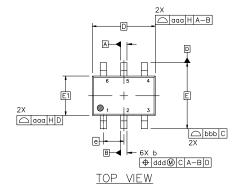
DATE 07 OCT 2021



#### SC-88 2.00x1.25x0.90, 0.65P CASE 419B-02 **ISSUE Z**

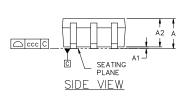
#### DATE 18 APR 2024

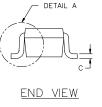
DUSEM

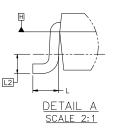


### NOTES:

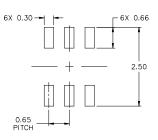
- DIMENSIONING AND TOLERANCING CONFORM TO ASME 1. Y14.5-2018.
- 2.
- ALL DIMENSION ARE IN MILLIMETERS. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 3. PER END.
- 4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF
- DATUMS A AND B ARE DETERMINED AT DATUM H. 5.
- DIMENSIONS & AND C APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP. 6.
- DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. 7 ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION & AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.







	MILLIMETERS			
DIM	MIN.	NOM.	MAX.	
A			1.10	
A1	0.00		0.10	
A2	0.70	0.90	1.00	
b	0.15	0.20	0.25	
с	0.08	0.15	0.22	
D	2.00 BSC			
E	2.10 BSC			
E1		1.25 BSC	;	
е		0.65 BSC	)	
L	0.26	0.36	0.46	
L2		0.15 BSC		
aaa	0.15			
bbb	0.30			
ccc	0.10			
ddd		0.10		



RECOMMENDED MOUNTING FOOTPRINT\*

FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

XXX = Specific Device Code

XXXM-

0

GENERIC **MARKING DIAGRAM\*** 

6

Μ

- = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)

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

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

#### **STYLES ON PAGE 2**

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#### SC-88 2.00x1.25x0.90, 0.65P CASE 419B-02 ISSUE Z

#### DATE 18 APR 2024

STYLE 1: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 6: PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
STYLE 7: PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	STYLE 8: CANCELLED	STYLE 9: PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	STYLE 10: PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	STYLE 11: PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	STYLE 12: PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
STYLE 13:	STYLE 14:	STYLE 15:	STYLE 16:	STYLE 17:	STYLE 18:
PIN 1. ANODE	PIN 1. VREF	PIN 1. ANODE 1	PIN 1. BASE 1	PIN 1. BASE 1	PIN 1. VIN1
2. N/C	2. GND	2. ANODE 2	2. EMITTER 2	2. EMITTER 1	2. VCC
3. COLLECTOR	3. GND	3. ANODE 3	3. COLLECTOR 2	3. COLLECTOR 2	3. VOUT2
4. EMITTER	4. IOUT	4. CATHODE 3	4. BASE 2	4. BASE 2	4. VIN2
5. BASE	5. VEN	5. CATHODE 2	5. EMITTER 1	5. EMITTER 2	5. GND
6. CATHODE	6. VCC	6. CATHODE 1	6. COLLECTOR 1	6. COLLECTOR 1	6. VOUT1
STYLE 19:	STYLE 20:	STYLE 21:	STYLE 22:	STYLE 23:	STYLE 24:
PIN 1. I OUT	PIN 1. COLLECTOR	PIN 1. ANODE 1	PIN 1. D1 (i)	PIN 1. Vn	PIN 1. CATHODE
2. GND	2. COLLECTOR	2. N/C	2. GND	2. CH1	2. ANODE
3. GND	3. BASE	3. ANODE 2	3. D2 (i)	3. Vp	3. CATHODE
4. V CC	4. EMITTER	4. CATHODE 2	4. D2 (c)	4. N/C	4. CATHODE
5. V EN	5. COLLECTOR	5. N/C	5. VBUS	5. CH2	5. CATHODE
6. V REF	6. COLLECTOR	6. CATHODE 1	6. D1 (c)	6. N/C	6. CATHODE
STYLE 25:	STYLE 26:	STYLE 27:	STYLE 28:	STYLE 29:	STYLE 30:
PIN 1. BASE 1	PIN 1. SOURCE 1	PIN 1. BASE 2	PIN 1. DRAIN	PIN 1. ANODE	PIN 1. SOURCE 1
2. CATHODE	2. GATE 1	2. BASE 1	2. DRAIN	2. ANODE	2. DRAIN 2
3. COLLECTOR 2	3. DRAIN 2	3. COLLECTOR 1	3. GATE	3. COLLECTOR	3. DRAIN 2
4. BASE 2	4. SOURCE 2	4. EMITTER 1	4. SOURCE	4. EMITTER	4. SOURCE 2
5. EMITTER	5. GATE 2	5. EMITTER 2	5. DRAIN	5. BASE/ANODE	5. GATE 1
6. COLLECTOR 1	6. DRAIN 1	6. COLLECTOR 2	6. DRAIN	6. CATHODE	6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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