MOSFET – Single, N-Channel, Small Signal, SC-88

25 V, 1.2 A

NTJS4405N, NVJS4405N

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D Max
25 V	249 mΩ @ 4.5 V	1.2 A
	299 mΩ @ 2.7 V	

1
SC−88/SOT−363
CASE 419B

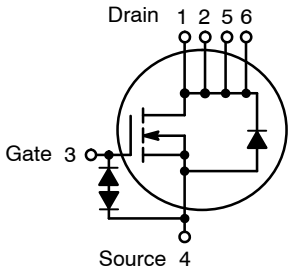
Features

- Advance Planar Technology for Fast Switching, Low $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- AEC−Q101 Qualified and PPAP Capable – NVJS4405N
- These Devices are Pb−Free and are RoHS Compliant

Applications

- Boost and Buck Converter
- Load Switch
- Battery Protection

N−Channel



MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Symbol	Rating			Value	Unit
V_{DSS}	Drain−to−Source Voltage			25	V
V_{GS}	Gate−to−Source Voltage			±8.0	V
I_D	Drain Current	t < 5 s	T_A = 25°C	1.2	A
I_D	Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	1.0	A
			T_A = 75°C	0.80	
P_D	Power Dissipation (Note 1)	Steady State		0.63	W
P_D	Power Dissipation (Note 1)	t ≤ 5 s		0.89	W
I_{DM}	Pulsed Drain Current	t_p = 10 μs		3.7	A
T_J, T_{STG}	Operating Junction and Storage Temperature			−55 to +150	°C
I_S	Source Current (Body Diode) (Note 1)			0.8	A
T_L	Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			260	°C
	ESD Rating – Machine Model			25	V

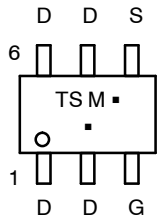
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

Symbol	Rating	Max	Unit
$R_{\theta JL}$	Junction−to−Lead – Steady State (Note 1)	102	°C/W
$R_{\theta JA}$	Junction−to−Ambient – Steady State (Note 1)	200	
$R_{\theta JA}$	Junction−to−Ambient – t ≤ 5 s (Note 1)	140	

1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

MARKING DIAGRAM & PIN ASSIGNMENT



TS = Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTJS4405NT1G	SC−88 (Pb−Free)	3,000 / Tape & Reel
NVJS4405NT1G	SC−88 (Pb−Free)	3,000 / Tape & Reel

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

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Characteristic	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
$V_{(BR)DSS}$	Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA		25			V
$V_{(BR)DSS}/T_J$	Drain−to−Source Breakdown Voltage Temperature Coefficient				30		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0 V, V_{DS} = 20 V	T_J = 25°C			1.0	μA
			T_J = 125°C			10	
I_{GSS}	Gate−to−Source Leakage Current	V_{DS} = 0 V, V_{GS} = 8.0 V				100	nA
ON CHARACTERISTICS (Note 2)							
$V_{GS(TH)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA		0.65		1.5	V
$V_{GS(TH)}/T_J$	Negative Threshold Temperature Coefficient				−2.0		mV/°C
$R_{DS(on)}$	Drain−to−Source On Resistance	V_{GS} = 4.5 V, I_D = 0.6 A			249	350	mΩ
		V_{GS} = 2.7 V, I_D = 0.2 A			299	400	
		V_{GS} = 4.5 V, I_D = 1.2 A			260		
g_{FS}	Forward Transconductance	V_{DS} = 5.0 V, I_D = 0.5 A			0.5		S
CHARGES AND CAPACITANCES							
C_{ISS}	Input Capacitance	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 10 V			49	60	pF
C_{OSS}	Output Capacitance				22.4	30	
C_{RSS}	Reverse Transfer Capacitance				8.0	12	
$Q_{G(TOT)}$	Total Gate Charge	V_{GS} = 4.5 V, V_{DS} = 5.0 V, I_D = 0.95 A			0.75	1.5	nC
$Q_{G(TH)}$	Threshold Gate Charge				0.10		
Q_{GS}	Gate−to−Source Charge				0.30	0.50	
Q_{GD}	Gate−to−Drain Charge				0.20	0.40	
SWITCHING CHARACTERISTICS (Note 3)							
$t_{d(ON)}$	Turn−On Delay Time	V_{GS} = 4.5 V, V_{DS} = 6.0 V, I_D = 0.5 A, R_G = 50 Ω			6.0	12	ns
t_r	Rise Time				4.7	8.0	
$t_{d(OFF)}$	Turn−Off Delay Time				25	35	
t_f	Fall Time				41	60	
DRAIN−SOURCE DIODE CHARACTERISTICS							
V_{SD}	Forward Diode Voltage	V_{GS} = 0 V, I_S = 0.6 A	T_J = 25°C		0.82	1.20	V

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.

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

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TYPICAL PERFORMANCE CURVES (T_J = 25°C UNLESS OTHERWISE NOTED) (continued)

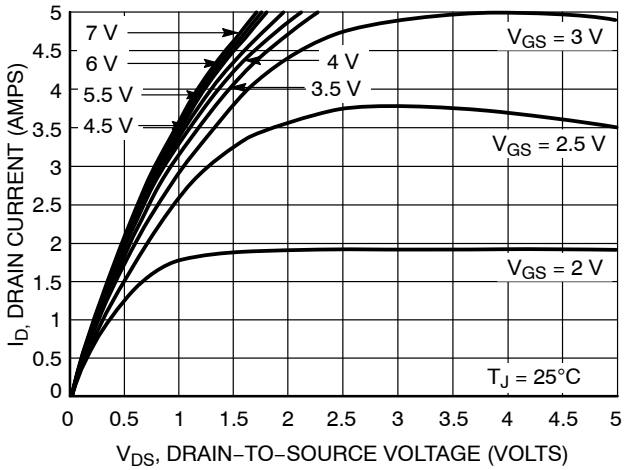

Figure 1. On−Region Characteristics

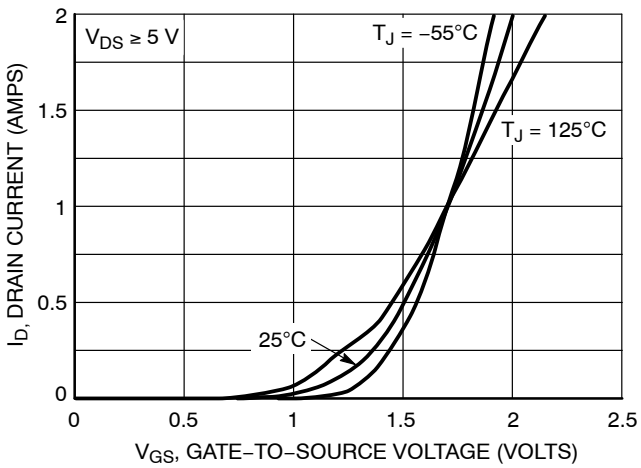

Figure 2. Transfer Characteristics

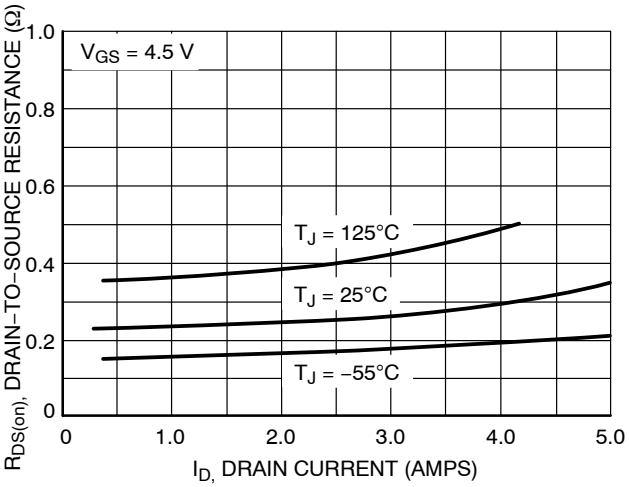

Figure 3. On−Resistance vs. Drain Current and Temperature

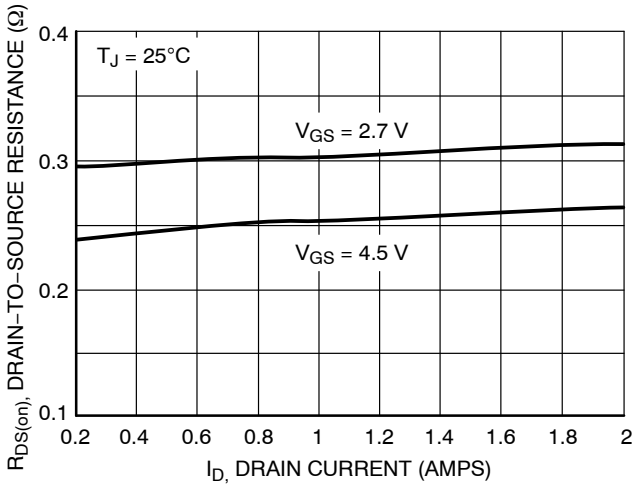

Figure 4. On−Resistance vs. Drain Current and Gate Voltage

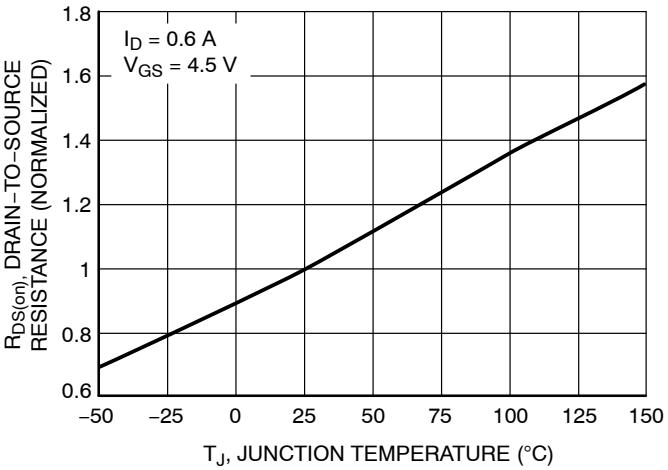

Figure 5. On−Resistance Variation with Temperature

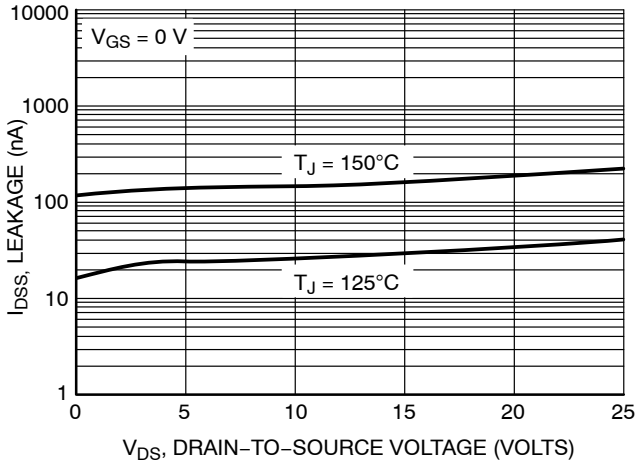

Figure 6. Drain−to−Source Leakage Current vs. Voltage

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TYPICAL PERFORMANCE CURVES (T_J = 25°C UNLESS OTHERWISE NOTED) (continued)

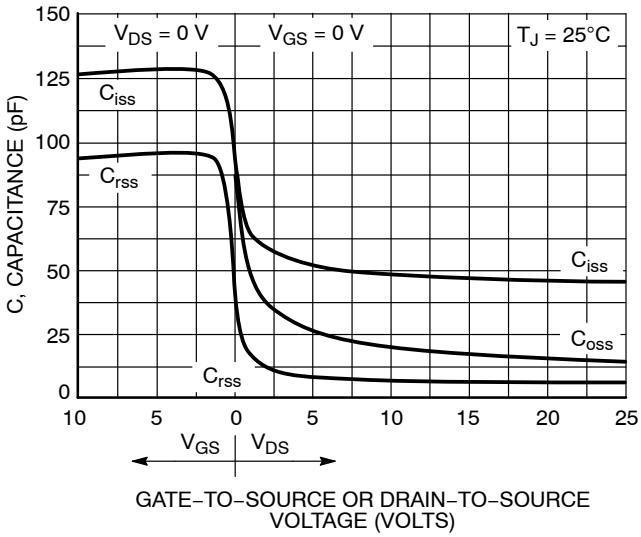

Figure 7. Capacitance Variation

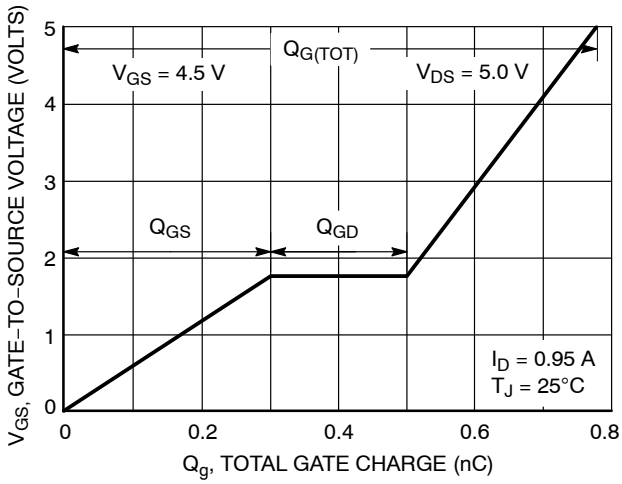

Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

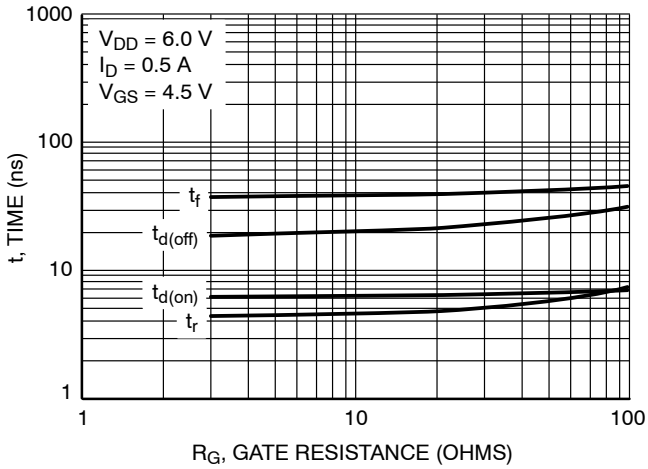

Figure 9. Resistive Switching Time Variation vs. Gate Resistance

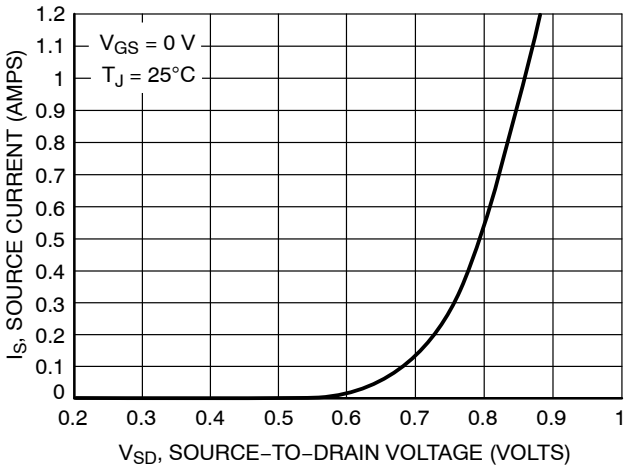

Figure 10. Diode Forward Voltage vs. Current

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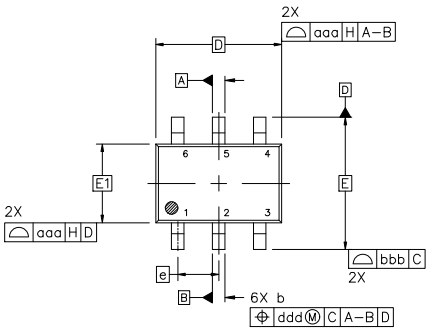
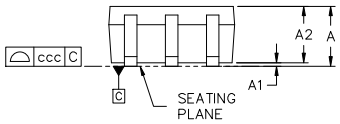
DATE 18 APR 2024



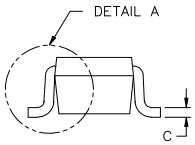
TOP VIEW

NOTES:

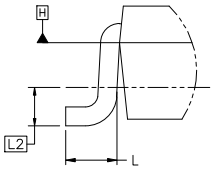
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5−2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE 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.



SIDE VIEW

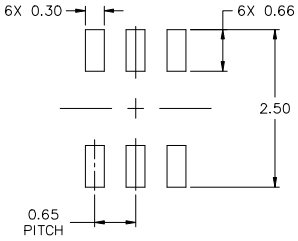


END VIEW



DETAIL A
SCALE 2:1

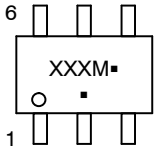
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	−−−	−−−	1.10
A1	0.00	−−−	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		



RECOMMENDED MOUNTING FOPTPRINT*

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

GENERIC MARKING DIAGRAM*



XXX = 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.

*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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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:
PIN 1. ANODE
2. N/C
3. COLLECTOR
4. EMITTER
5. BASE
6. CATHODE

STYLE 14:
PIN 1. VREF
2. GND
3. GND
4. IOUT
5. VEN
6. VCC

STYLE 15:
PIN 1. ANODE 1
2. ANODE 2
3. ANODE 3
4. CATHODE 3
5. CATHODE 2
6. CATHODE 1

STYLE 16:
PIN 1. BASE 1
2. EMITTER 2
3. COLLECTOR 2
4. BASE 2
5. EMITTER 1
6. COLLECTOR 1

STYLE 17:
PIN 1. BASE 1
2. EMITTER 1
3. COLLECTOR 2
4. BASE 2
5. EMITTER 2
6. COLLECTOR 1

STYLE 18:
PIN 1. VIN1
2. VCC
3. VOUT2
4. VIN2
5. GND
6. VOUT1

STYLE 19:
PIN 1. I OUT
2. GND
3. GND
4. V CC
5. V EN
6. V REF

STYLE 20:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 21:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. N/C
6. CATHODE 1

STYLE 22:
PIN 1. D1 (i)
2. GND
3. D2 (i)
4. D2 (c)
5. VBUS
6. D1 (c)

STYLE 23:
PIN 1. Vn
2. CH1
3. Vp
4. N/C
5. CH2
6. N/C

STYLE 24:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 25:
PIN 1. BASE 1
2. CATHODE
3. COLLECTOR 2
4. BASE 2
5. EMITTER
6. COLLECTOR 1

STYLE 26:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 27:
PIN 1. BASE 2
2. BASE 1
3. COLLECTOR 1
4. EMITTER 1
5. EMITTER 2
6. COLLECTOR 2

STYLE 28:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 29:
PIN 1. ANODE
2. ANODE
3. COLLECTOR
4. EMITTER
5. BASE/ANODE
6. CATHODE

STYLE 30:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
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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