NTJS4405N, NVJS4405N

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

25 V, 1.2 A

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

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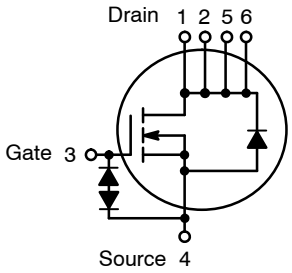
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D Max
25 V	249 mΩ @ 4.5 V	1.2 A
	299 mΩ @ 2.7 V	

N−Channel



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

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

THERMAL RESISTANCE RATINGS

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

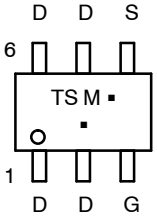
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. 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

1

SC−88/SOT−363
CASE 419B



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)	3000 / Tape & Reel
NVJS4405NT1G	SC−88 (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.

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

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

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

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

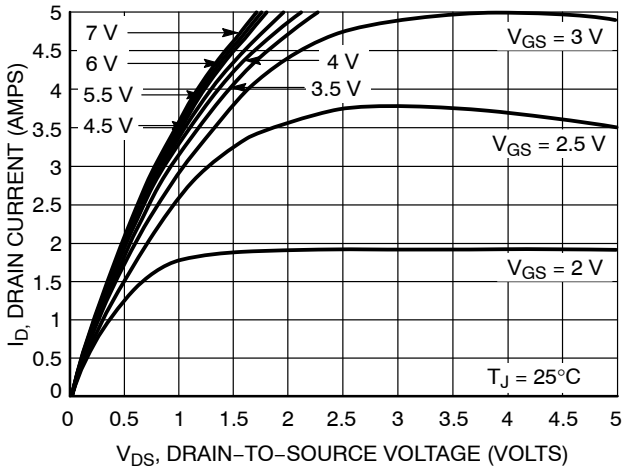


Figure 1. On−Region Characteristics

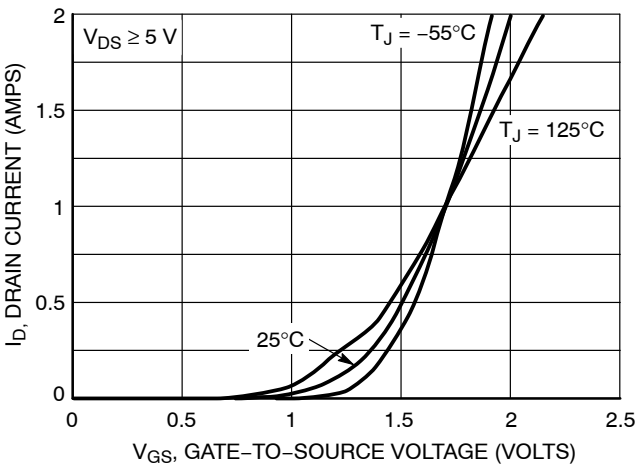


Figure 2. Transfer Characteristics

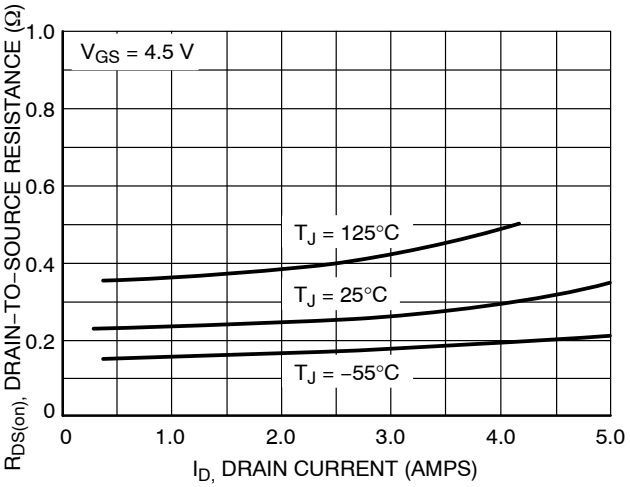


Figure 3. On−Resistance vs. Drain Current and Temperature

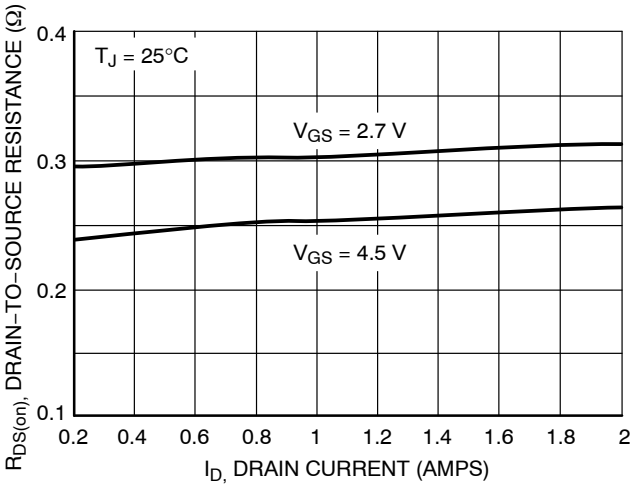


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

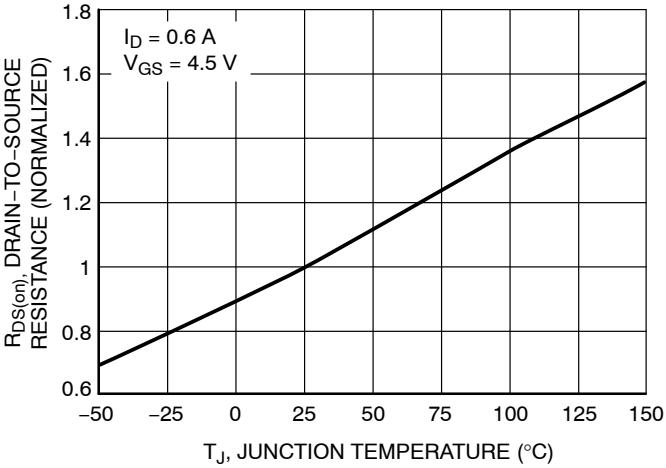


Figure 5. On−Resistance Variation with Temperature

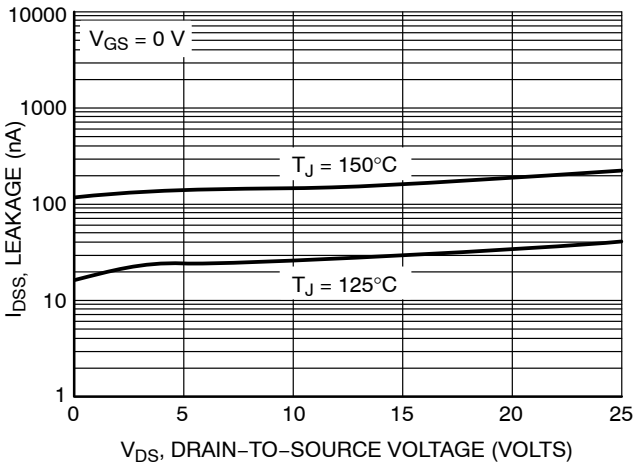


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

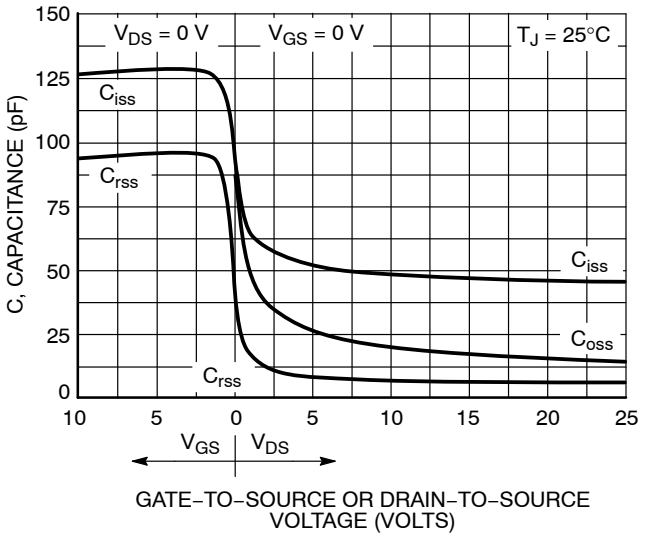


Figure 7. Capacitance Variation

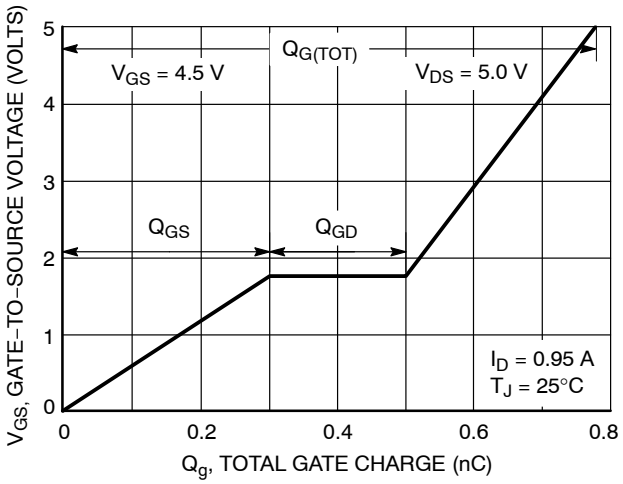


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

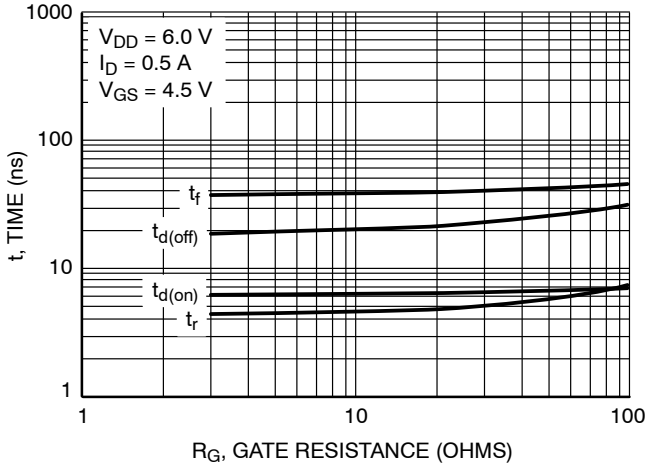


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

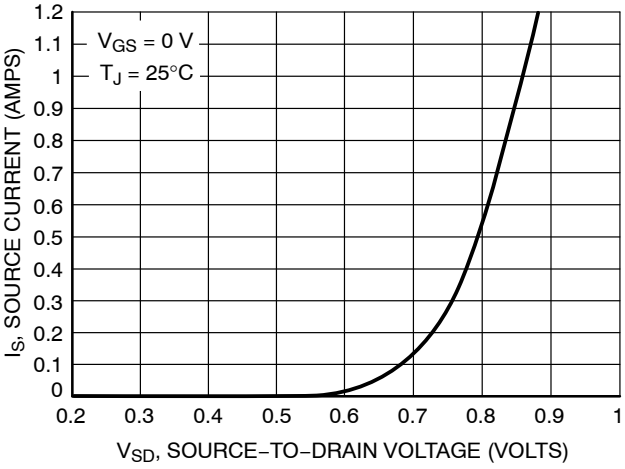


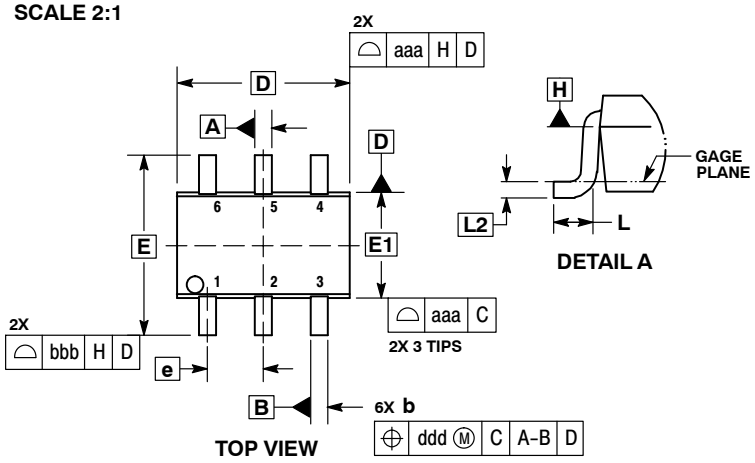
Figure 10. Diode Forward Voltage vs. Current

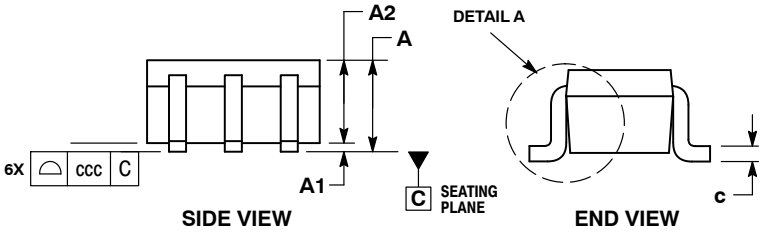
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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

DATE 11 DEC 2012

1
SCALE 2:1

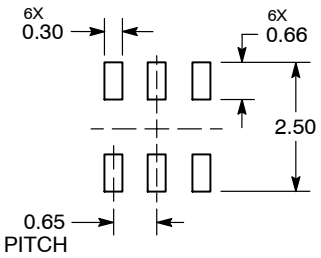




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF 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.

	MILLIMETERS			INCHES		
DIM	**MIN**	**NOM**	**MAX**	**MIN**	**NOM**	**MAX**
A	−−−	−−−	1.10	−−−	−−−	0.043
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		

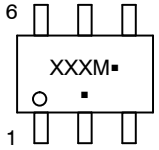
RECOMMENDED SOLDERING FOOTPRINT*



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.

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, "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

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

DATE 11 DEC 2012

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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