

NTP2955

MOSFET – Power, Single, P-Channel, TO-220

-60 V, -12 A

Features

- Low $R_{DS(on)}$
- Rugged Performance
- Fast Switching
- These are Pb-Free Devices*

Applications

- Industrial
- Automotive
- Power Supplies

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	-60	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	I_D -12	A
		$T_C = 85^\circ\text{C}$	-9.0	
Power Dissipation (Note 1)		$T_C = 25^\circ\text{C}$	P_D 62.5	W
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	I_D -2.4	A
		$T_A = 85^\circ\text{C}$	-1.8	
Power Dissipation (Note 1)		$T_A = 25^\circ\text{C}$	P_D 2.4	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	-42	A
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to 175		$^\circ\text{C}$
Source Current (Body Diode)		I_S	-12	A
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = -30\text{ V}, V_G = -10\text{ V}, I_{PK} = -12\text{ A}, L = 3.0\text{ mH}, R_G = 3.0\ \Omega$)	EAS	216		mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260		$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Case	$R_{\theta JC}$	2.4	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	62.5	

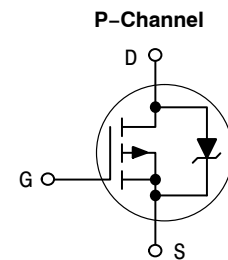
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



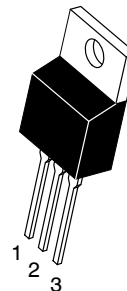
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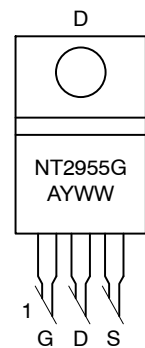
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D MAX
-60 V	156 m Ω @ -10 V	-12 A



MARKING DIAGRAM & PIN ASSIGNMENT



TO-220
CASE 221A
STYLE 5



- A = Assembly Location
- Y = Year
- WW = Work Week
- G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
NTP2955G	TO-220 (Pb-Free)	50 Units / Rail

NTP2955

1. When surface mounted to an FR4 board using 1 in pad size
(Cu. area = 1.127 in sq [1 oz] including traces).

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

NTP2955

ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			67		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -48\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 125^\circ\text{C}$		-10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-2.0		-4.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			56		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -12\text{ A}$		156	196	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = -60\text{ V}, I_D = -12\text{ A}$		6.0		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -25\text{ V}$		507	700	pF
Output Capacitance	C_{OSS}			150	250	
Reverse Transfer Capacitance	C_{RSS}			48	98	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10\text{ V}, V_{DS} = -48\text{ V}, I_D = -12\text{ A}$		14		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.6	2.5	
Gate-to-Source Charge	Q_{GS}			3.4		
Gate-to-Drain Charge	Q_{GD}			6.2		

SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -10\text{ V}, V_{DD} = -30\text{ V}, I_D = -12\text{ A}, R_G = 9.1\ \Omega$		10	20	ns
Rise Time	t_r			41	80	
Turn-Off Delay Time	$t_{d(off)}$			27	47	
Fall Time	t_f			45	85	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = -12\text{ A}$	$T_J = 25^\circ\text{C}$		-1.6	-2.0	V
			$T_J = 125^\circ\text{C}$		-1.36		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = -12\text{ A}$		53		ns	
Charge Time	t_a			42			
Discharge Time	t_b			12			
Reverse Recovery Charge	Q_{RR}			126			nC

2. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

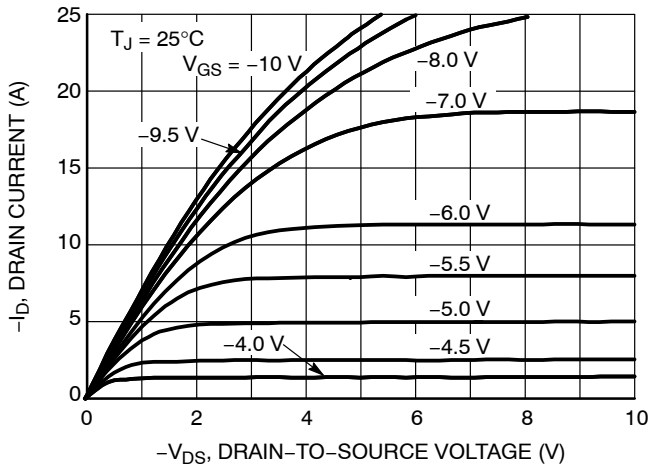


Figure 1. On-Region Characteristics

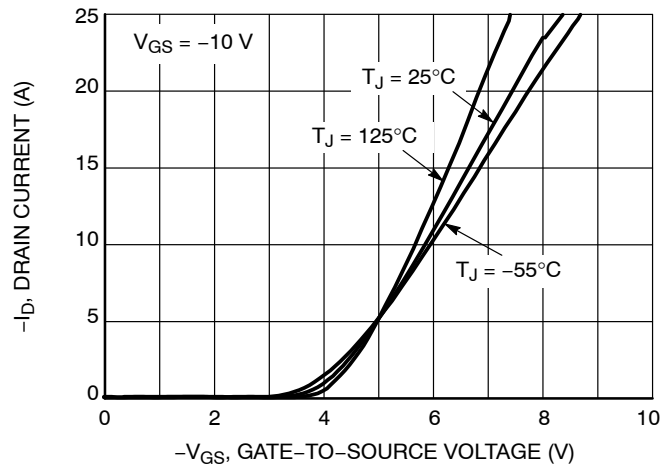


Figure 2. Transfer Characteristics

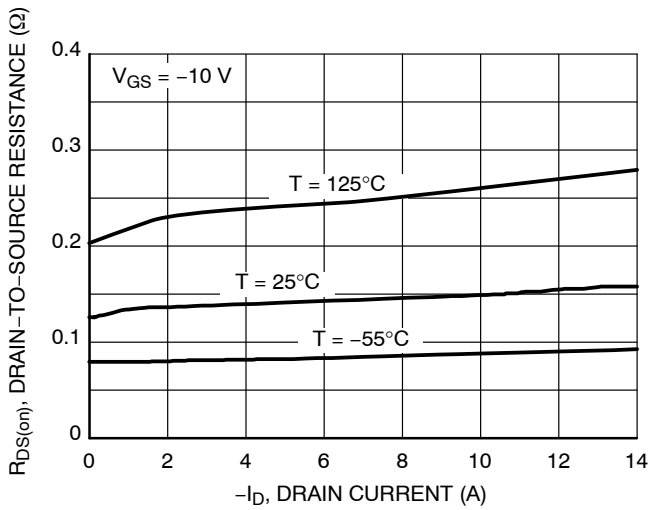


Figure 3. On-Resistance versus Drain Current and Temperature

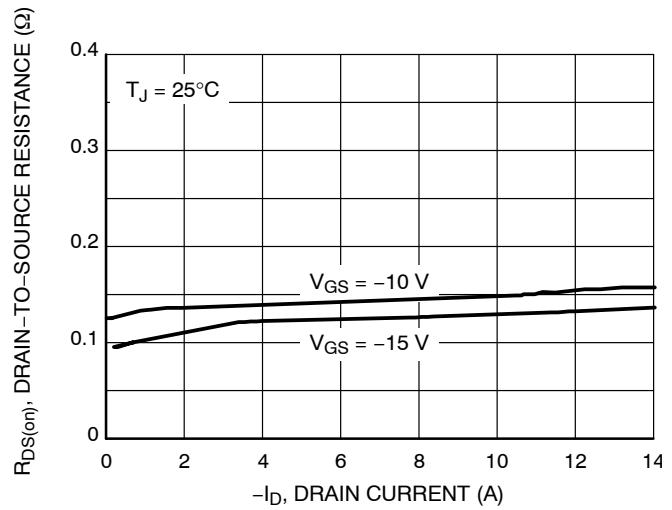


Figure 4. On-Resistance versus Drain Current and Gate Voltage

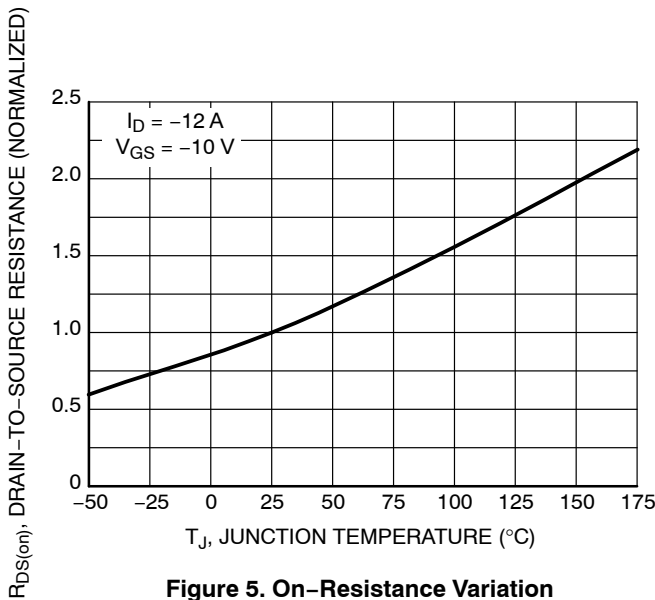


Figure 5. On-Resistance Variation with Temperature

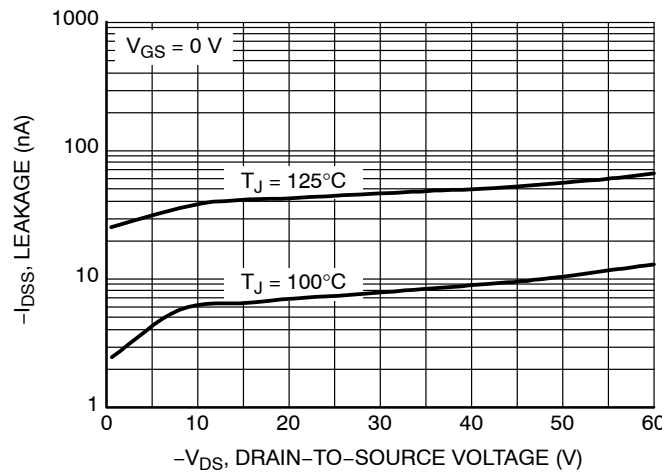


Figure 6. Drain-to-Source Leakage versus Voltage

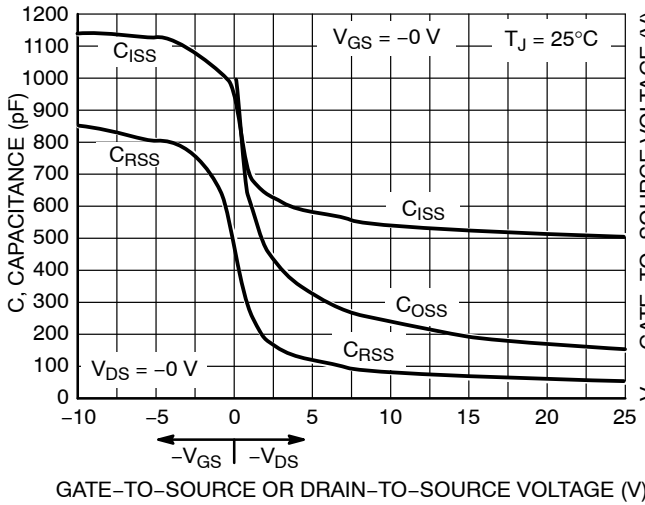


Figure 7. Capacitance Variation

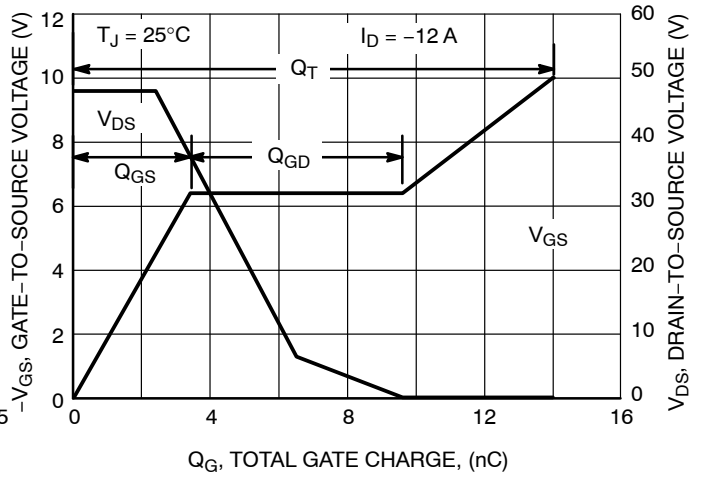


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

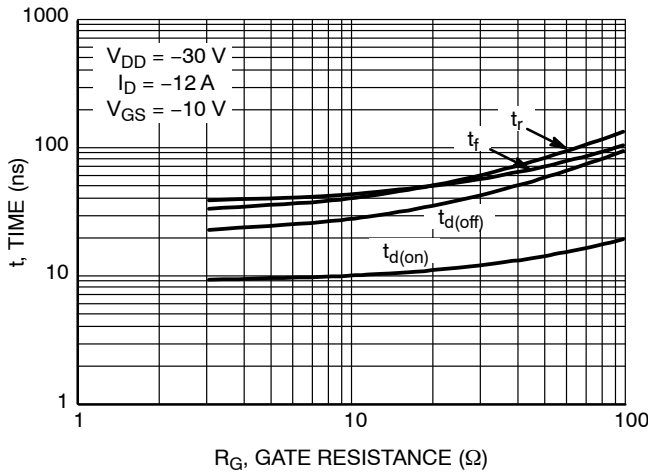


Figure 9. Resistive Switching Time Variation versus Gate Resistance

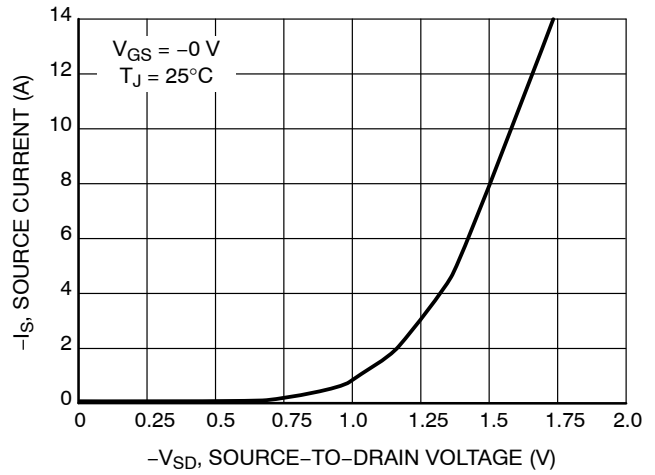


Figure 10. Diode Forward Voltage versus Current

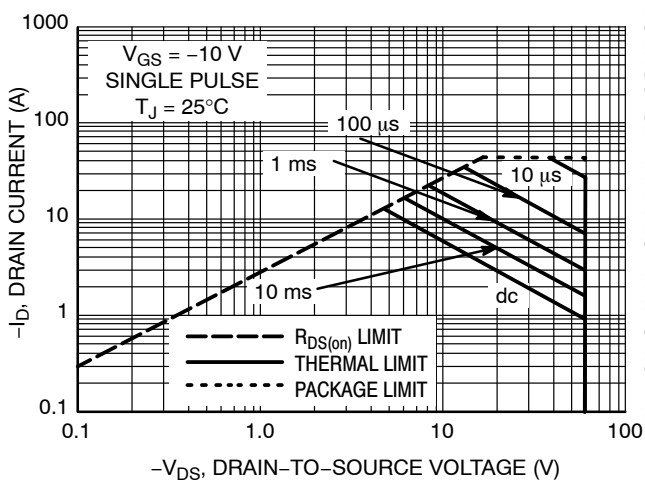


Figure 11. Maximum Rated Forward Biased Safe Operating Area

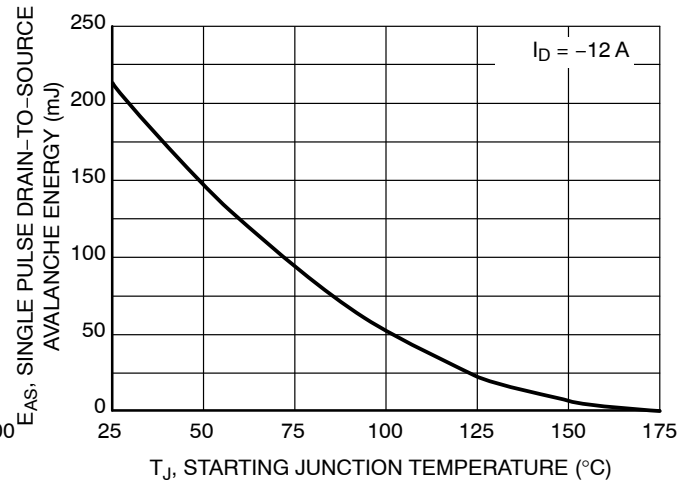
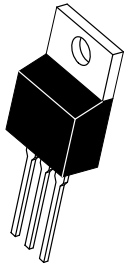


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

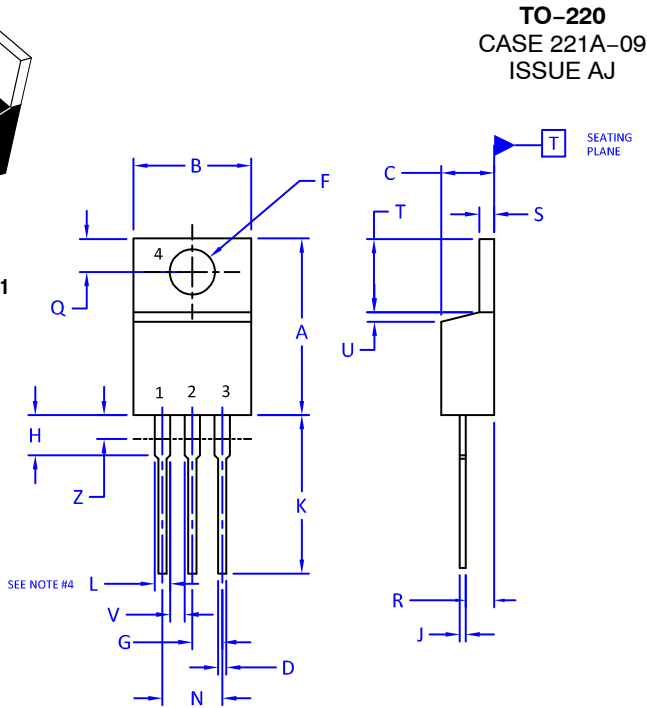
MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

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SCALE 1:1



TO-220
CASE 221A-09
ISSUE AJ

DATE 05 NOV 2019

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.41
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 1:

- PIN 1. BASE
- 2. COLLECTOR
- 3. EMITTER
- 4. COLLECTOR

STYLE 2:

- PIN 1. BASE
- 2. EMITTER
- 3. COLLECTOR
- 4. EMITTER

STYLE 3:

- PIN 1. CATHODE
- 2. ANODE
- 3. GATE
- 4. ANODE

STYLE 4:

- PIN 1. MAIN TERMINAL 1
- 2. MAIN TERMINAL 2
- 3. GATE
- 4. MAIN TERMINAL 2

STYLE 5:

- PIN 1. GATE
- 2. DRAIN
- 3. SOURCE
- 4. DRAIN

STYLE 6:

- PIN 1. ANODE
- 2. CATHODE
- 3. ANODE
- 4. CATHODE

STYLE 7:

- PIN 1. CATHODE
- 2. ANODE
- 3. CATHODE
- 4. ANODE

STYLE 8:

- PIN 1. CATHODE
- 2. ANODE
- 3. EXTERNAL TRIP/DELAY
- 4. ANODE

STYLE 9:

- PIN 1. GATE
- 2. COLLECTOR
- 3. EMITTER
- 4. COLLECTOR

STYLE 10:

- PIN 1. GATE
- 2. SOURCE
- 3. DRAIN
- 4. SOURCE

STYLE 11:

- PIN 1. DRAIN
- 2. SOURCE
- 3. GATE
- 4. SOURCE

STYLE 12:

- PIN 1. MAIN TERMINAL 1
- 2. MAIN TERMINAL 2
- 3. GATE
- 4. NOT CONNECTED

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