

MOSFET – Power, Single, N-Channel, SOT-23, 2.4 x 2.9 x 1.0 mm

20 V, 3.6 A

NTR3C21NZ

Features

- Advanced Trench Technology
- Ultra-Low $R_{DS(on)}$ in SOT-23 Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Power Load Switch
- Power Management

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-to-Source Voltage	20	V
V_{GS}	Gate-to-Source Voltage	± 8	V
I_D	Continuous Drain Current (Note 1)	Steady State $T_A = 25^\circ\text{C}$	3.6
		$T_A = 85^\circ\text{C}$	2.6
		$t \leq 5 \text{ s}$ $T_A = 25^\circ\text{C}$	6.5
P_D	Power Dissipation (Note 1)	Steady State $T_A = 25^\circ\text{C}$	0.47
		$t \leq 5 \text{ s}$	1.56
I_{DM}	Pulsed Drain Current	$t_p = 10 \mu\text{s}$	13.2
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to 150	$^\circ\text{C}$
I_S	Source Current (Body Diode) (Note 2)	2.2	A
T_L	Lead Temperature for Soldering Purposes (1/8 in from case for 10 s)	260	$^\circ\text{C}$

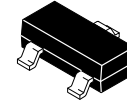
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 1)	264	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient – $t \leq 5 \text{ s}$ (Note 1)	80	

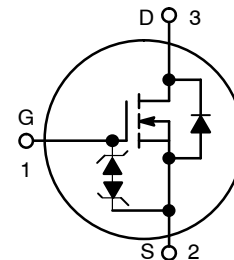
- Surface-mounted on FR4 board using 1 in sq. pad size (Cu area = 1.127 in sq. [1 oz] including traces).
- Pulse Test: pulse width $\leq 300 \text{ ms}$, duty cycle $\leq 2\%$.

$V_{(BR)DSS}$	$R_{DS(on)}$ Max	I_D MAX
20 V	24 m Ω @ 4.5 V	3.6 A
	26 m Ω @ 3.7 V	
	29 m Ω @ 3.3 V	
	33 m Ω @ 2.5 V	
	55 m Ω @ 1.8 V	

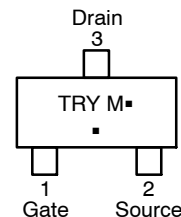


SOT-23
CASE 318
STYLE 21

N-Channel MOSFET



MARKING DIAGRAM & PIN ASSIGNMENT



TRY = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*For additional marking information, refer to

Application Note [AND8002/D](#).

ORDERING INFORMATION

Device	Package	Shipping†
NTR3C21NZT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
NTR3C21NZT3G	SOT-23 (Pb-Free)	10,000 / 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](#).

NTR3C21NZ

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
$V_{(BR)DSS}/T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, ref to 25°C		21.6		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 85^\circ\text{C}$		5.0	μA
I_{GSS}	Gate-to-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 10	μA

ON CHARACTERISTICS (Note 3)

V _{GS(TH)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 250 μA		0.45		1.0	V
V _{GS(TH)} /T _J	Negative Threshold Temperature Coefficient				2.7		mV/°C
R _{DS(on)}	Drain-to-Source On Resistance	V _{GS} = 4.5 V	I _D = 5 A		18	24	mΩ
		V _{GS} = 3.7 V	I _D = 4 A		18.5	26	
		V _{GS} = 3.3 V	I _D = 3 A		19	29	
		V _{GS} = 2.5 V	I _D = 2 A		20	33	
		V _{GS} = 1.8 V	I _D = 1 A		25	55	
g _{FS}	Forward Transconductance	V _{DS} = 5 V, I _D = 3 A			20		S

CHARGES AND CAPACITANCES

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 16\text{ V}$		1540		pF
C_{oss}	Output Capacitance			105		
C_{rss}	Reverse Transfer Capacitance			86		
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 4.5\text{ V}, V_{DS} = 16\text{ V}, I_D = 5\text{ A}$		17.8		nC
$Q_{G(TH)}$	Threshold Gate Charge			2.1		
Q_{GS}	Gate-to-Source Charge			3.0		
Q_{GD}	Gate-to-Drain Charge			0.8		

SWITCHING CHARACTERISTICS (Note 4)

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 4.5\text{ V}, V_{DS} = 16\text{ V}, I_D = 5\text{ A}, R_G = 6.0\text{ }\Omega$		7.0		ns
t_r	Rise Time			14		
$t_{d(off)}$	Turn-Off Delay Time			420		
t_f	Fall Time			4670		

DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Forward Diode Voltage	$V_{GS} = 0\text{ V}, I_S = 2.0\text{ A}$	$T_J = 25^\circ\text{C}$		0.7	1.0	V
			$T_J = 125^\circ\text{C}$		0.56		

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.

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

4. Switching characteristics are independent of operating junction temperatures.



TYPICAL CHARACTERISTICS

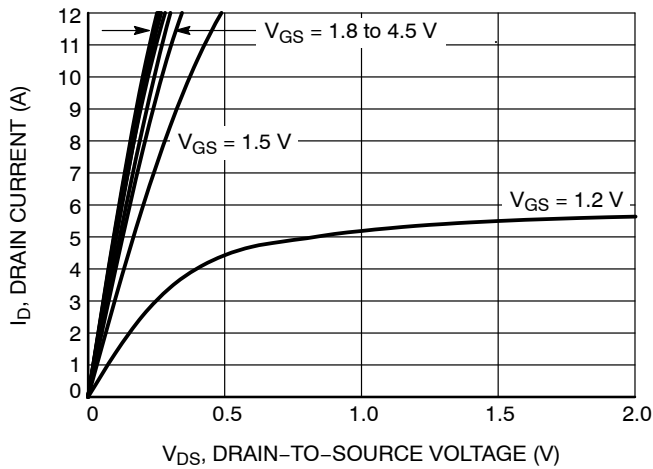


Figure 1. On-Region Characteristics

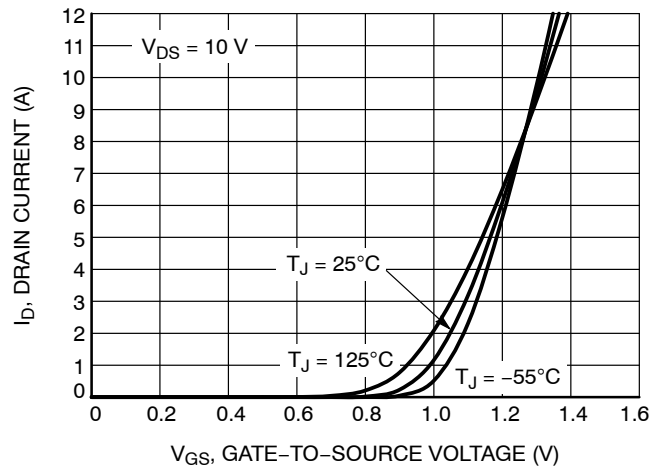


Figure 2. Transfer Characteristics

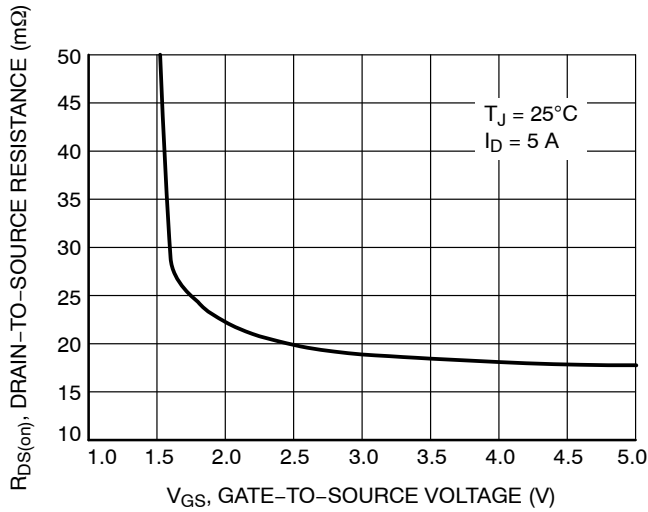


Figure 3. On-Resistance vs. Gate-to-Source Voltage

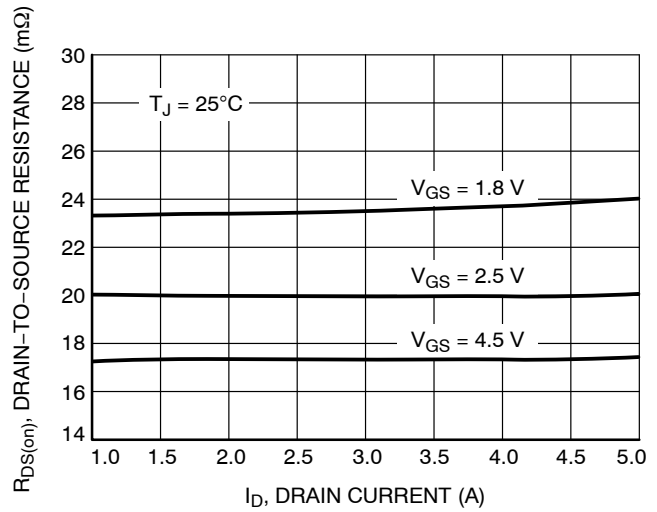


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

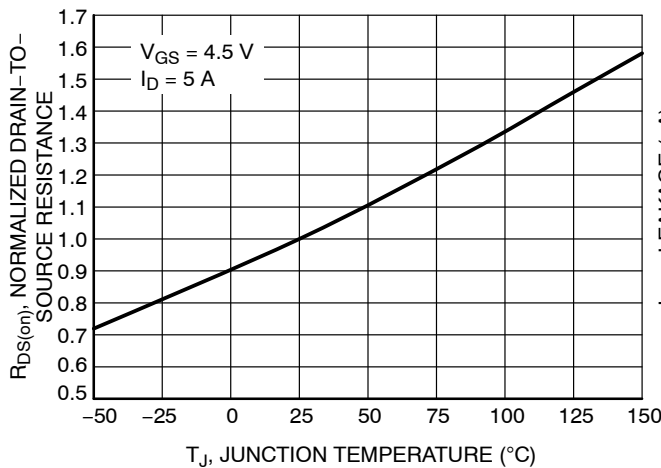


Figure 5. On-Resistance Variation with Temperature

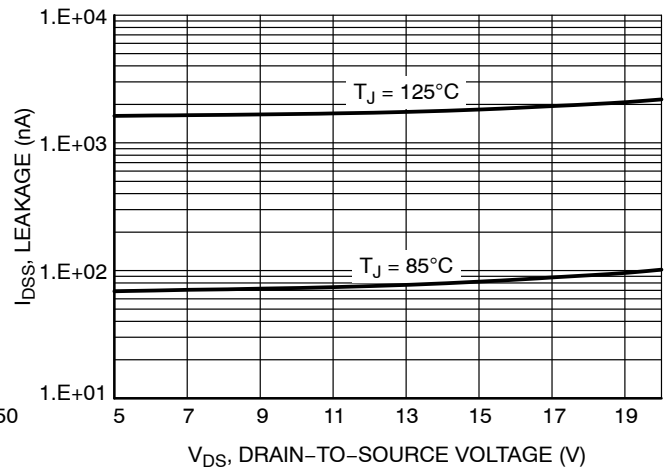


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTR3C21NZ

TYPICAL CHARACTERISTICS (continued)

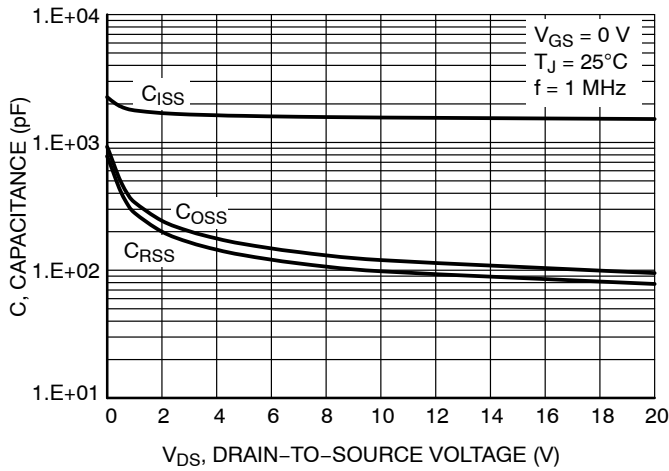


Figure 7. Capacitance Variation

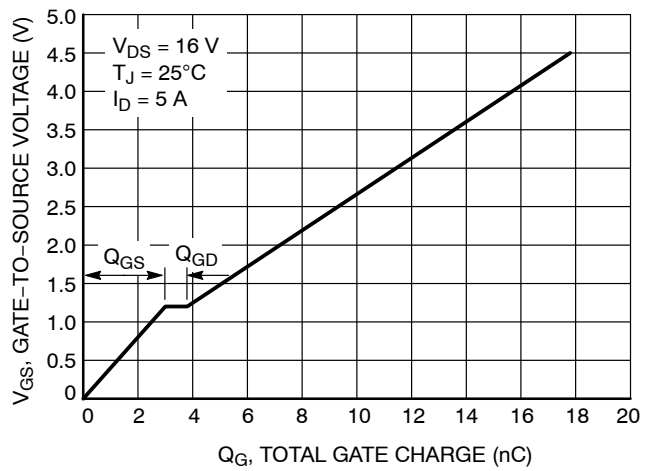


Figure 8. Gate-to-Source vs. Total Charge

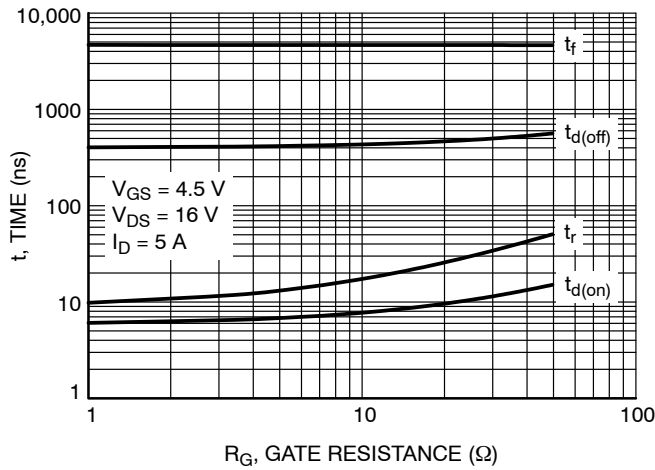


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

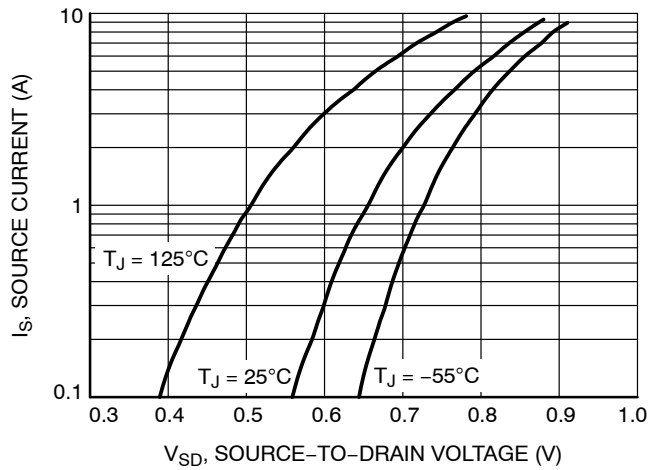


Figure 10. Diode Forward Voltage vs. Current

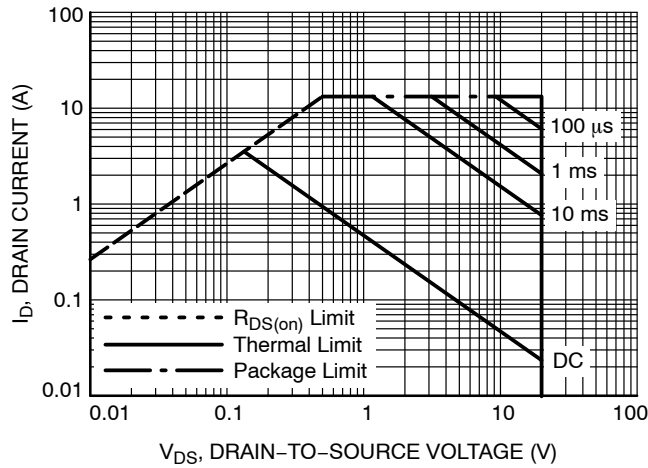


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS (continued)

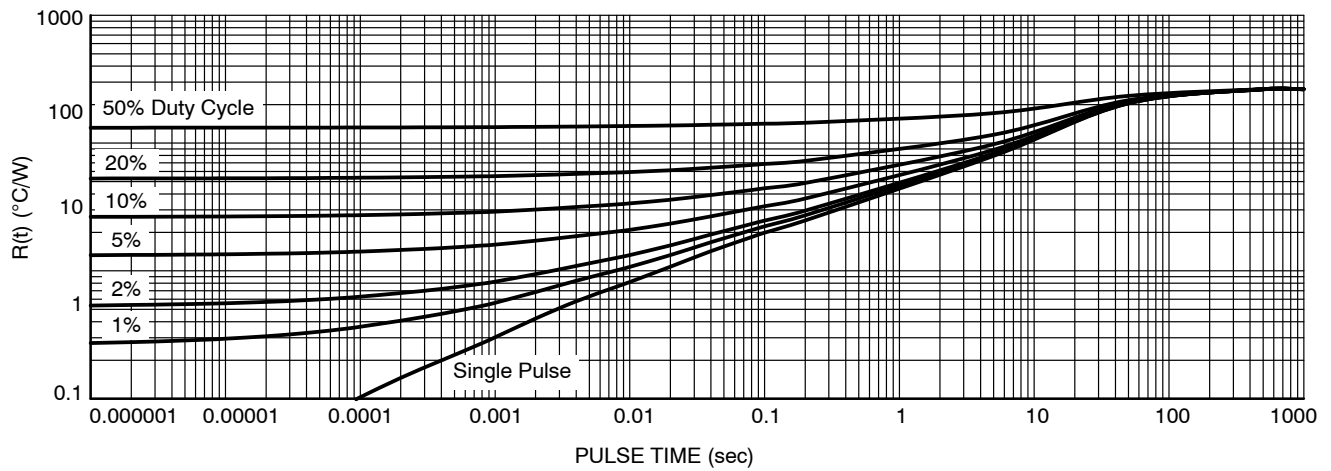
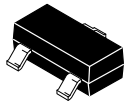


Figure 12. FET Thermal Response

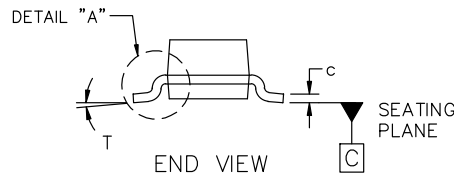
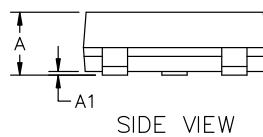
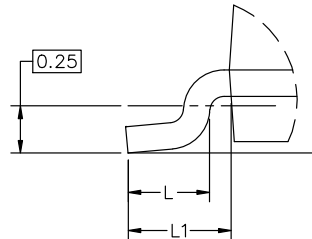
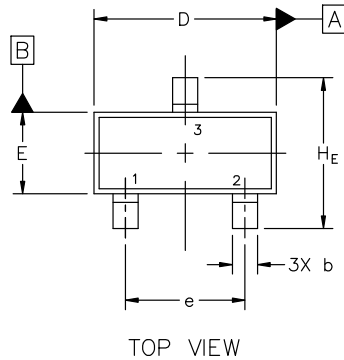




SCALE 4:1

SOT-23 (TO-236) 2.90x1.30x1.00 1.90P
CASE 318
ISSUE AU

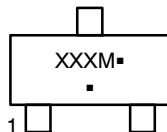
DATE 14 AUG 2024



MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

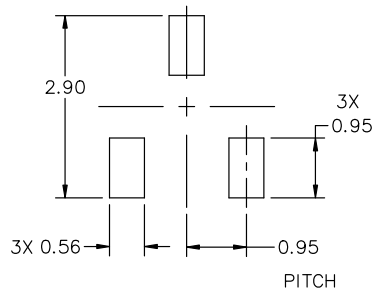
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

GENERIC MARKING DIAGRAM*


XXX = Specific Device Code
M = Date Code
▪ = Pb-Free Package

*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.



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

STYLES ON PAGE 2

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DATE 14 AUG 2024

STYLE 1 THRU 5: CANCELLED	STYLE 6: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 7: PIN 1. EMITTER 2. BASE 3. COLLECTOR	STYLE 8: PIN 1. ANODE 2. NO CONNECTION 3. CATHODE		
STYLE 9: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 10: PIN 1. DRAIN 2. SOURCE 3. GATE	STYLE 11: PIN 1. ANODE 2. CATHODE 3. CATHODE-ANODE	STYLE 12: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 13: PIN 1. SOURCE 2. DRAIN 3. GATE	STYLE 14: PIN 1. CATHODE 2. GATE 3. ANODE
STYLE 15: PIN 1. GATE 2. CATHODE 3. ANODE	STYLE 16: PIN 1. ANODE 2. CATHODE 3. CATHODE	STYLE 17: PIN 1. NO CONNECTION 2. ANODE 3. CATHODE	STYLE 18: PIN 1. NO CONNECTION 2. CATHODE 3. ANODE	STYLE 19: PIN 1. CATHODE 2. ANODE 3. CATHODE-ANODE	STYLE 20: PIN 1. CATHODE 2. ANODE 3. GATE
STYLE 21: PIN 1. GATE 2. SOURCE 3. DRAIN	STYLE 22: PIN 1. RETURN 2. OUTPUT 3. INPUT	STYLE 23: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 24: PIN 1. GATE 2. DRAIN 3. SOURCE	STYLE 25: PIN 1. ANODE 2. CATHODE 3. GATE	STYLE 26: PIN 1. CATHODE 2. ANODE 3. NO CONNECTION
STYLE 27: PIN 1. CATHODE 2. CATHODE 3. CATHODE	STYLE 28: PIN 1. ANODE 2. ANODE 3. ANODE				

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