

MOSFET - Power, Single P-Channel, SOT-23

-60 V, 230 mΩ, -1.1 A

NVR5124PL

Features

- Trench Technology
- NVR Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

MAXIMUM RATINGS (T_J = 25°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 R _{θJA} (Notes 1, 2, 3) | Steady State | T _A = 25°C | I _D -1.1 A |
| | | T _A = 100°C | -0.67 |
| Power Dissipation R _{θJA} (Notes 1, 2) | | T _A = 25°C | P _D 0.47 W |
| | | T _A = 100°C | 0.19 |
| Pulsed Drain Current | T _A = 25°C, t _p = 10 μs | I _{DM} | 25 A |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | -55 to +150 | °C |
| Source Current (Body Diode) | I _S | -0.6 | A |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T _L | 260 | °C |

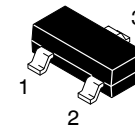
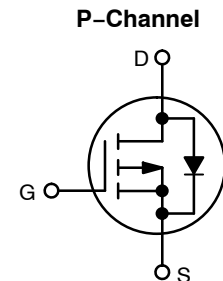
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

| Parameter | Symbol | Value | Unit |
|---------------------------------------------|------------------|-------|------|
| Junction-to-Ambient - Steady State (Note 2) | R _{θJA} | 268 | °C/W |

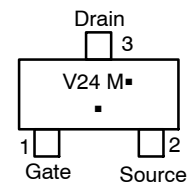
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

| V _{(BR)DSS} | R _{DS(on)} MAX | I _D MAX |
|----------------------|-------------------------|--------------------|
| -60 V | 230 mΩ @ -10 V | -1.1 A |
| | 365 mΩ @ -4.5 V | |



SOT-23
CASE 318
STYLE 21

MARKING DIAGRAM/ PIN ASSIGNMENT



V24 = Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|--------------|------------------|-----------------------|
| NVR5124PLT1G | SOT-23 (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](#).

NVR5124PL

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

| Parameter | 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 | -60 | - | - | V | |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = -60 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} = ± 20 V | - | - | ± 100 | nA | |

ON CHARACTERISTICS (Note 4)

| | | | | | | |
|-------------------------------|---------------------|--------------------------------------------------------------|------|-----|------|----|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = -250 μA | -1.5 | - | -2.5 | V |
| Drain-to-Source On Resistance | R _{DS(on)} | V _{GS} = -10 V, I _D = -3 A | - | 183 | 230 | mΩ |
| | | V _{GS} = -4.5 V, I _D = -3 A | - | 280 | 365 | |
| Forward Transconductance | g _{FS} | V _{DS} = -15 V, I _D = -5 A | 4 | - | - | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|---------------------|-----------------------------------------------------------------------------|---|------|---|----|
| Input Capacitance | C _{iss} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = -25 V | - | 240 | - | pF |
| Output Capacitance | C _{oss} | | - | 27.6 | - | |
| Reverse Transfer Capacitance | C _{rss} | | - | 18.5 | - | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = -4.5 V, V _{DS} = -48 V, I _D = -3 A | - | 2.3 | - | nC |
| Threshold Gate Charge | Q _{G(TH)} | | - | 0.5 | - | |
| Gate-to-Source Charge | Q _{GS} | | - | 0.9 | - | |
| Gate-to-Drain Charge | Q _{GD} | | - | 1.0 | - | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = -10 V, V _{DS} = -48 V, I _D = -3 A | - | 4.3 | - | |

SWITCHING CHARACTERISTICS (Note 5)

| | | | | | | |
|---------------------|---------------------|-----------------------------------------------------------------------------------------------------|---|------|---|----|
| Turn-On Delay Time | t _{d(on)} | V _{GS} = -4.5 V, V _{DS} = -48 V, I _D = -3 A, R _G = 2.5 Ω | - | 6.6 | - | ns |
| Rise Time | t _r | | - | 10.6 | - | |
| Turn-Off Delay Time | t _{d(off)} | | - | 12.2 | - | |
| Fall Time | t _f | | - | 3.5 | - | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|-----------------|------------------------------------------------------------------------------------|------------------------|-----|-------|------|---|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = -3 A | T _J = 25°C | - | -0.88 | -1.0 | V |
| | | | T _J = 125°C | - | -0.76 | - | |
| Reverse Recovery Time | t _{RR} | V _{GS} = 0 V, di _S /dt = 100 A/μs, I _S = -3 A | - | 15 | - | ns | |
| Charge Time | t _a | | - | 13 | - | | |
| Discharge Time | t _b | | - | 2.4 | - | | |
| Reverse Recovery Charge | Q _{RR} | | - | 10 | - | nC | |

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.

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

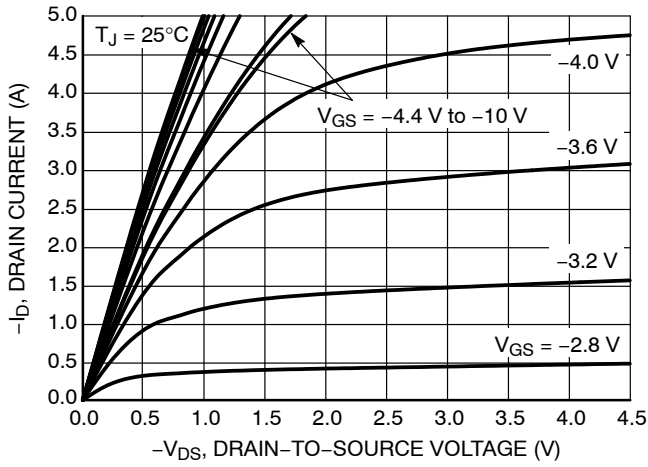


Figure 1. On-Region Characteristics

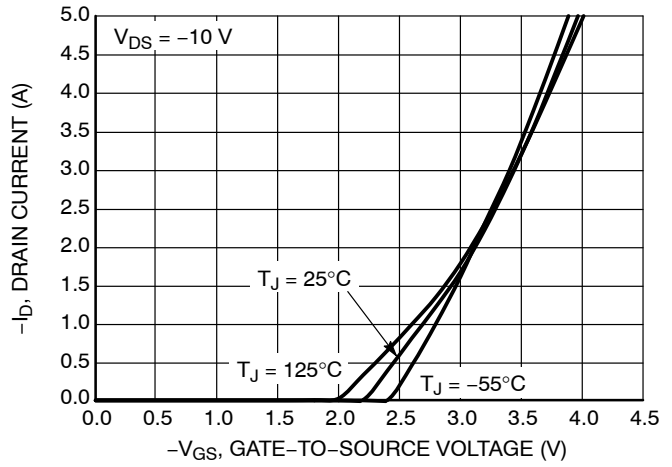


Figure 2. Transfer Characteristics

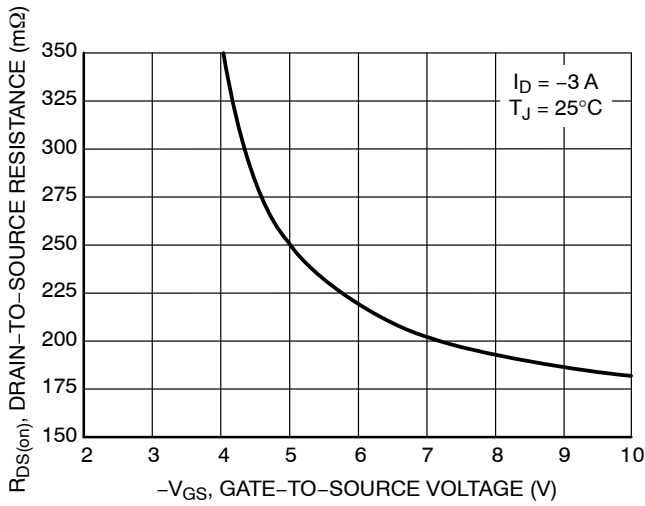


Figure 3. On-Resistance vs. Gate-to-Source Voltage

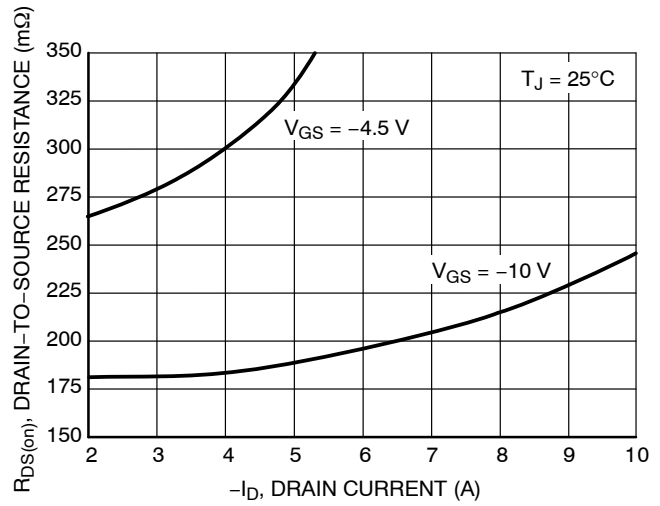


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

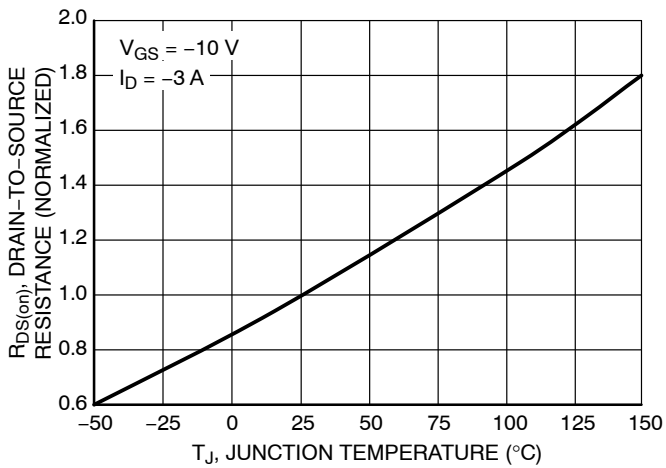


Figure 5. On-Resistance Variation with Temperature

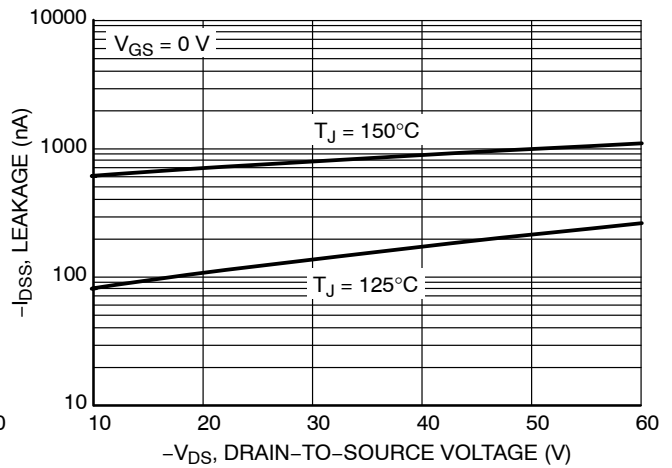


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NVR5124PL

TYPICAL CHARACTERISTICS

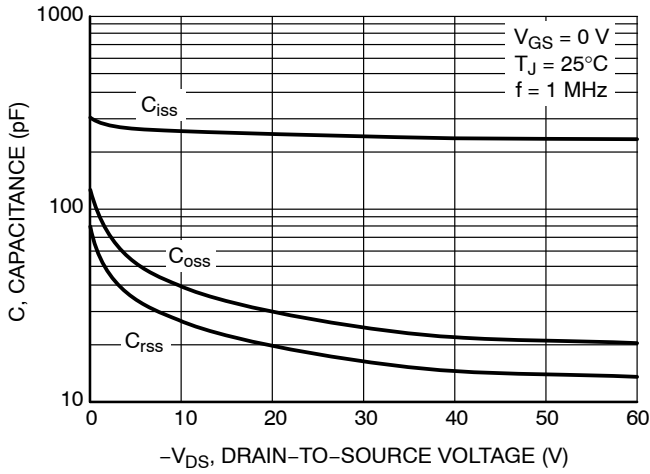


Figure 7. Capacitance Variation

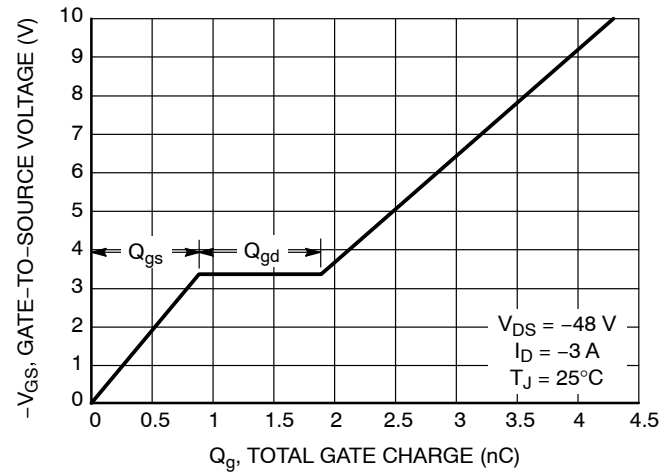


Figure 8. Gate-to-Source Voltage vs. Total Charge

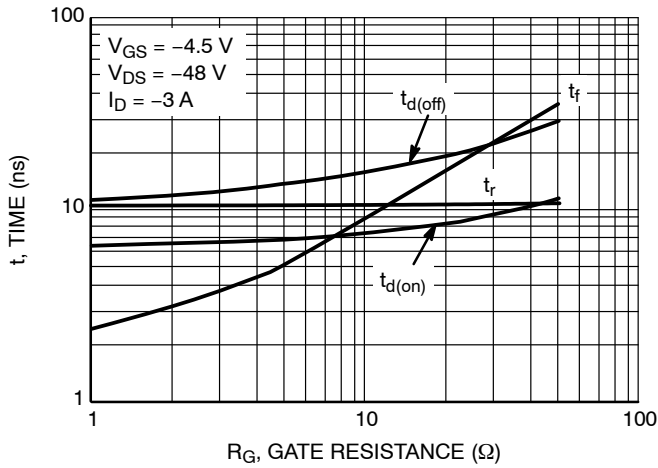


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

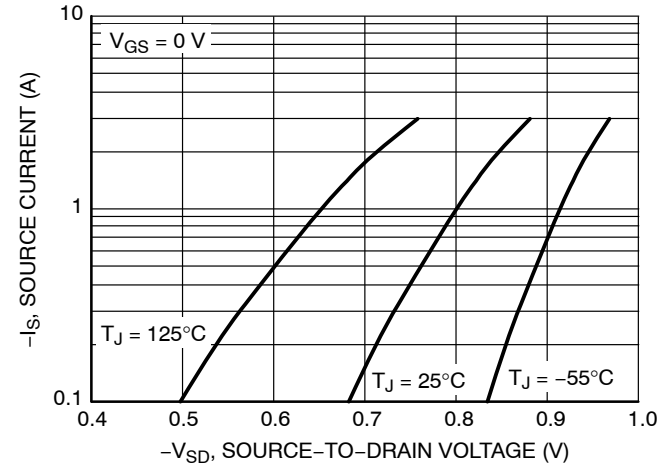


Figure 11. Diode Forward Voltage vs. Current

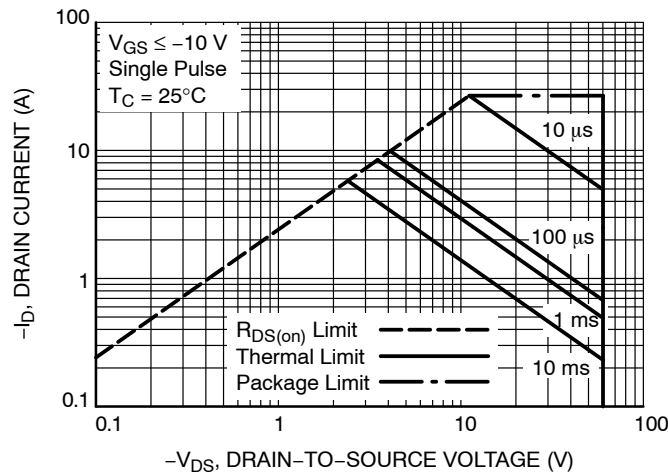


Figure 10. Maximum Rated Forward Biased Safe Operating Area

NVR5124PL

TYPICAL CHARACTERISTICS

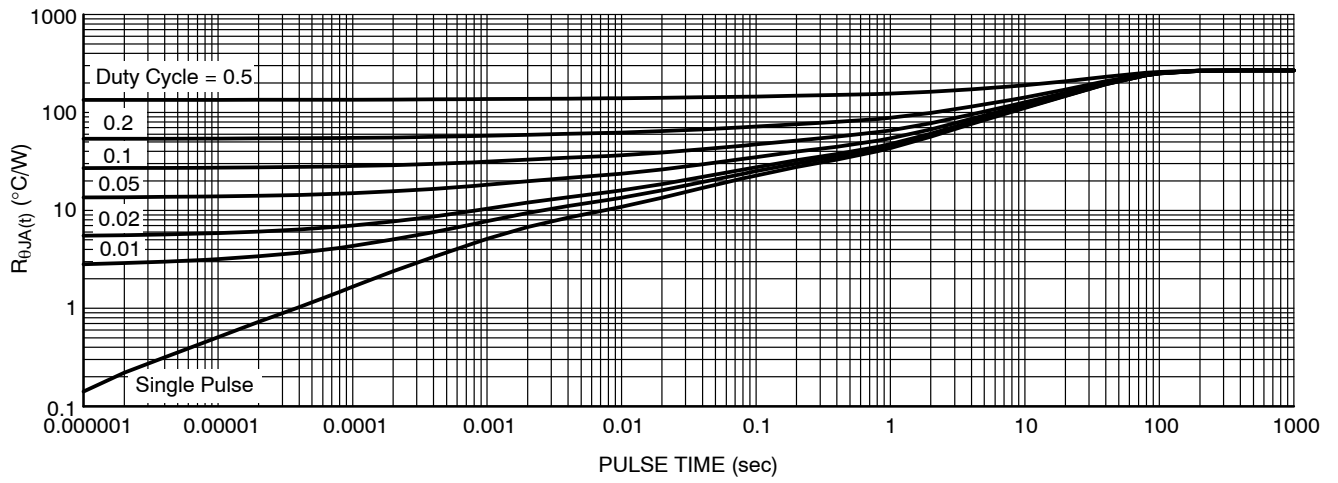


Figure 12. Thermal Response

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-23 (TO-236)
CASE 318
ISSUE AT

DATE 01 MAR 2023

SCALE 4:1



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. CONTROLLING DIMENSION: 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.

| DIM | MILLIMETERS | | | INCHES | | |
|----------------|-------------|------|------|--------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| H _E | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

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.



RECOMMENDED MOUNTING FOOTPRINT

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

STYLES ON PAGE 2

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023

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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