

MGSF1N03L, MVGSF1N03L

MOSFET – Single, N-Channel, SOT-23 30 V, 2.1 A

These miniature surface mount MOSFETs low $R_{DS(on)}$ assure minimal power loss and conserve energy, making these devices ideal for use in space sensitive power management circuitry. Typical applications are dc-dc converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

Features

- Low $R_{DS(on)}$ Provides Higher Efficiency and Extends Battery Life
- Miniature SOT-23 Surface Mount Package Saves Board Space
- MV 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 ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | | Symbol | Value | Unit | |
|---|---|--------------------------|--------------------------|------------------|---|
| Drain-to-Source Voltage | | V_{DS} | 30 | V | |
| Gate-to-Source Voltage | | V_{GS} | ± 20 | V | |
| Continuous Drain Current $R_{\theta JL}$ | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 2.1 | A |
| | | | $T_A = 85^\circ\text{C}$ | 1.5 | A |
| Power Dissipation $R_{\theta JL}$ | Steady State | $T_A = 25^\circ\text{C}$ | P_D | 0.69 | W |
| Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 1.6 | A |
| | | | $T_A = 85^\circ\text{C}$ | 1.2 | A |
| Power Dissipation (Note 1) | | $T_A = 25^\circ\text{C}$ | P_D | 0.42 | W |
| Pulsed Drain Current | $t_p = 10 \mu\text{s}$ | I_{DM} | 6.0 | A | |
| ESD Capability (Note 3) | $C = 100 \text{ pF}$, $R_S = 1500 \Omega$ | ESD | 125 | V | |
| Operating Junction and Storage Temperature | | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | | I_S | 2.1 | A | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 sec) | | T_L | 260 | $^\circ\text{C}$ | |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|-----|---------------------------|
| Junction-to-Foot – Steady State | $R_{\theta JL}$ | 180 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 300 | |
| Junction-to-Ambient – $t < 10 \text{ s}$ (Note 1) | $R_{\theta JA}$ | 250 | |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 400 | |

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.

1. Surface-mounted on FR4 board using 650 mm², 1 oz. Cu pad size.
2. Surface-mounted on FR4 board using 50 mm², 1 oz. Cu pad size.
3. ESD Rating Information: HBM Class 0.

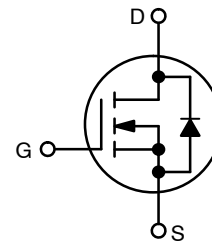


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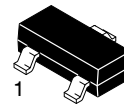
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| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D MAX |
|---------------|------------------------|-----------|
| 30 V | 80 m Ω @ 10 V | 2.1 A |
| | 125 m Ω @ 4.5 V | |

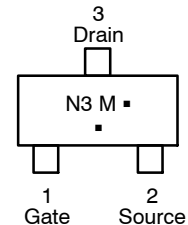
N-Channel



MARKING DIAGRAM/ PIN ASSIGNMENT



SOT-23
CASE 318
STYLE 21



N3 = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)
*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|---------------------|---------------------|
| MGSF1N03LT1G | SOT-23 Pb-Free | 3000 / Tape & Reel |
| MGSF1N03LT3G | SOT-23 (Pb-Free) | 10000 / Tape & Reel |
| MVGSF1N03LT1G | 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 Specification Brochure, BRD8011/D.

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|----|---|-----------|-----------------|
| Drain-to-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 10\ \mu\text{Adc}$) | $V_{(BR)DSS}$ | 30 | - | - | Vdc |
| Zero Gate Voltage Drain Current ($V_{DS} = 30\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 30\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$) | I_{DSS} | - | - | 1.0 10 | μAdc |
| Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$) | I_{GSS} | - | - | ± 100 | nAdc |

ON CHARACTERISTICS (Note 4)

| | | | | | |
|---|--------------|-----|---------------|---------------|----------|
| Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{Adc}$) | $V_{GS(th)}$ | 1.0 | 1.7 | 2.4 | Vdc |
| Static Drain-to-Source On-Resistance ($V_{GS} = 10\text{ Vdc}$, $I_D = 1.2\text{ Adc}$) ($V_{GS} = 4.5\text{ Vdc}$, $I_D = 1.0\text{ Adc}$) | $r_{DS(on)}$ | - | 0.08 0.125 | 0.10 0.145 | Ω |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|----------------------|-------------------------------|-----------|---|-----|---|----|
| Input Capacitance | ($V_{DS} = 5.0\text{ Vdc}$) | C_{iss} | - | 140 | - | pF |
| Output Capacitance | ($V_{DS} = 5.0\text{ Vdc}$) | C_{oss} | - | 100 | - | |
| Transfer Capacitance | ($V_{DG} = 5.0\text{ Vdc}$) | C_{rss} | - | 40 | - | |

SWITCHING CHARACTERISTICS (Note 5)

| | | | | | | |
|----------------------------|--|--------------|---|------|---|----|
| Turn-On Delay Time | (V _{DD} = 15 Vdc, I _D = 1.0 Adc, R _L = 50 Ω) | $t_{d(on)}$ | - | 2.5 | - | ns |
| Rise Time | | t_r | - | 1.0 | - | |
| Turn-Off Delay Time | | $t_{d(off)}$ | - | 16 | - | |
| Fall Time | | t_f | - | 8.0 | - | |
| Gate Charge (See Figure 6) | | Q_T | - | 6000 | - | pC |

SOURCE-DRAIN DIODE CHARACTERISTICS

| | | | | | |
|--------------------------|----------|---|-----|------|---|
| Continuous Current | I_S | - | - | 0.6 | A |
| Pulsed Current | I_{SM} | - | - | 0.75 | |
| Forward Voltage (Note 5) | V_{SD} | - | 0.8 | - | 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.

4. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperature.

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TYPICAL ELECTRICAL CHARACTERISTICS

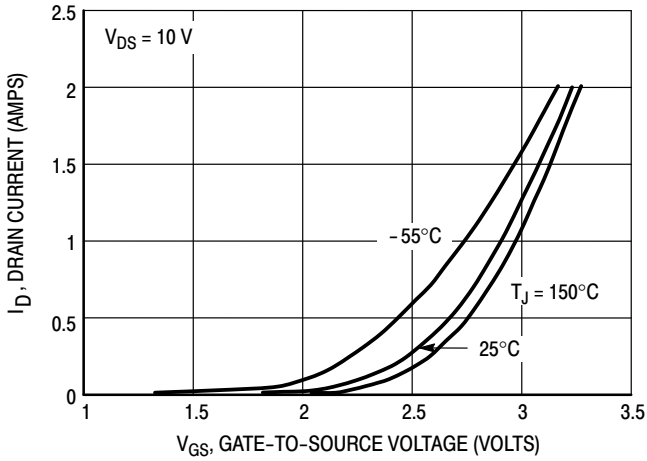


Figure 1. Transfer Characteristics

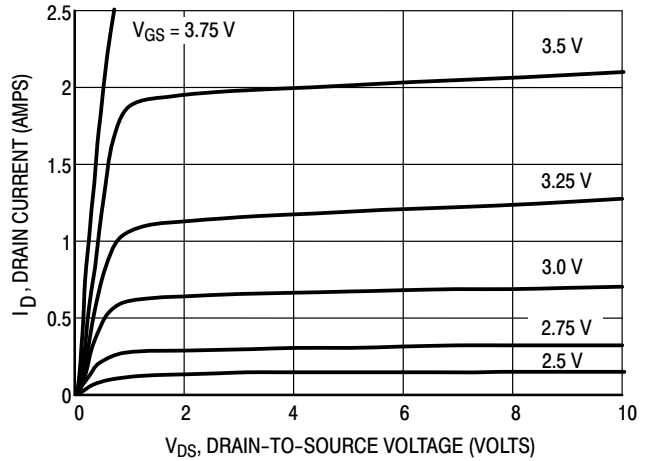


Figure 2. On-Region Characteristics

TYPICAL ELECTRICAL CHARACTERISTICS

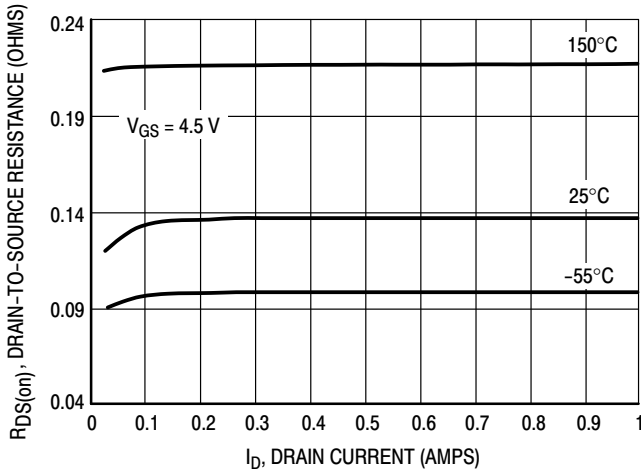


Figure 3. On-Resistance versus Drain Current

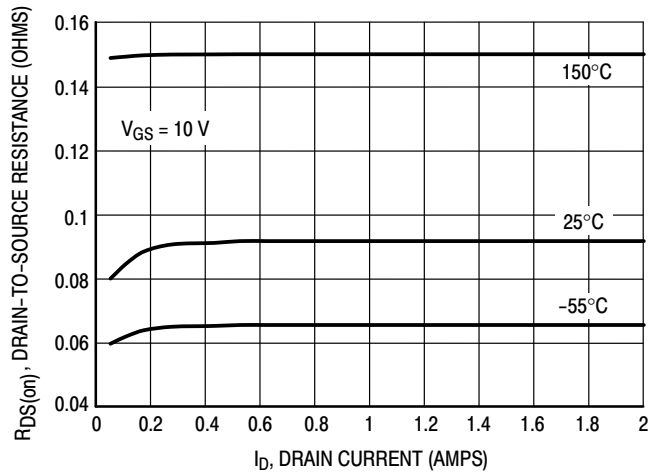


Figure 4. On-Resistance versus Drain Current

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TYPICAL ELECTRICAL CHARACTERISTICS

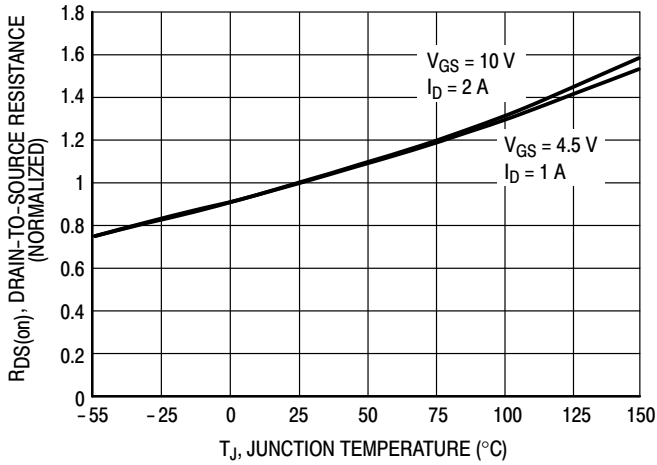


Figure 5. On-Resistance Variation with Temperature

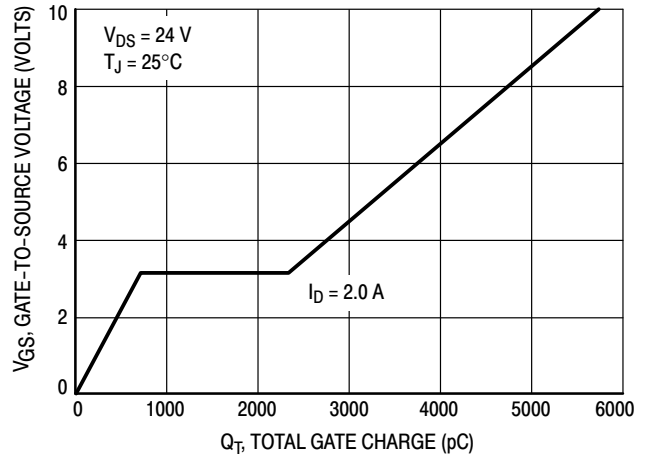


Figure 6. Gate Charge

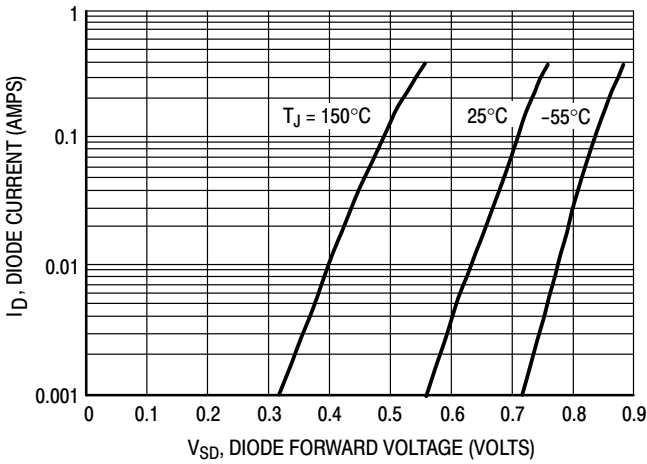


Figure 7. Body Diode Forward Voltage

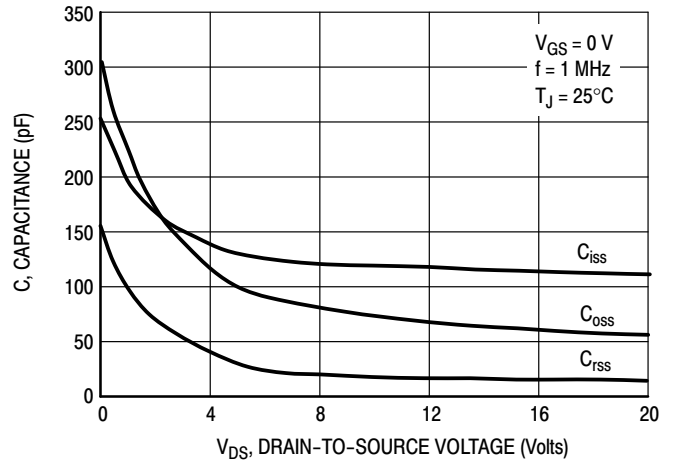


Figure 8. Capacitance

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TYPICAL ELECTRICAL CHARACTERISTICS

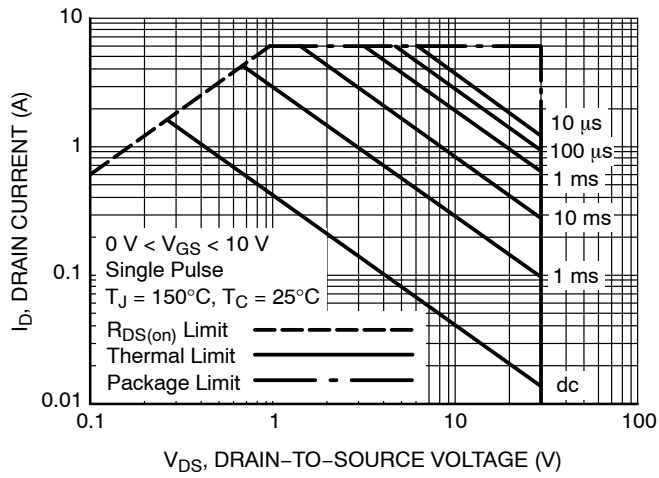


Figure 9. Maximum Rated Forward Biased Safe Operating Area

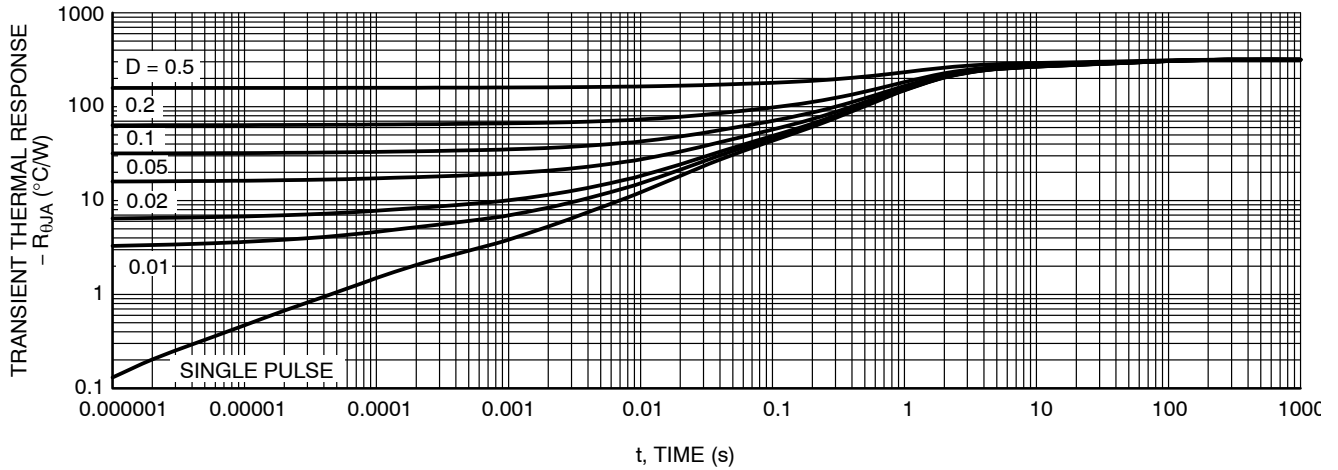


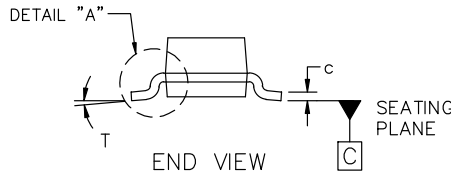
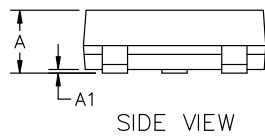
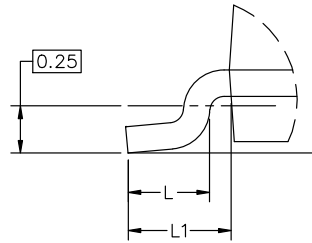
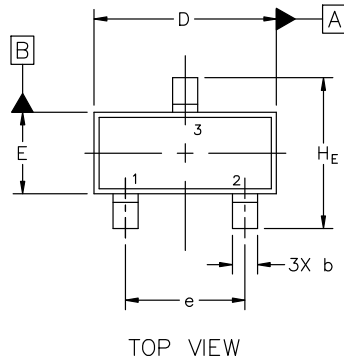
Figure 10. Thermal Response



SCALE 4:1

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

DATE 14 AUG 2024

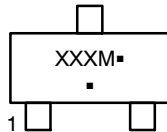


| MILLIMETERS | | | |
|-------------|------|------|------|
| DIM | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 |
| A1 | 0.01 | 0.06 | 0.10 |
| b | 0.37 | 0.44 | 0.50 |
| c | 0.08 | 0.14 | 0.20 |
| D | 2.80 | 2.90 | 3.04 |
| E | 1.20 | 1.30 | 1.40 |
| e | 1.78 | 1.90 | 2.04 |
| L | 0.30 | 0.43 | 0.55 |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

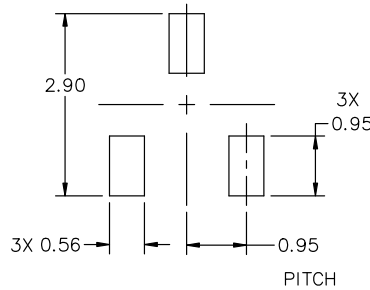
NOTES:

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



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

*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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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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