

NTR5105P

MOSFET – Power, Single, P-Channel, SOT-23 -60 V, -211 mA

Features

- Trench Technology
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Small Signal Load Switch
- Analog Switch

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 | $T_A = 25^{\circ}\text{C}$ | I_D | -196 | mA |
| | | $T_A = 85^{\circ}\text{C}$ | | -141 | |
| | $t \leq 5\text{ s}$ | $T_A = 25^{\circ}\text{C}$ | | -211 | |
| | | $T_A = 85^{\circ}\text{C}$ | | -152 | |
| Power Dissipation (Note 1) | Steady State | $T_A = 25^{\circ}\text{C}$ | P_D | 347 | mW |
| | $t \leq 5\text{ s}$ | | | 403 | |
| Pulsed Drain Current | $t_p = 10\text{ }\mu\text{s}$ | | I_{DM} | -784 | mA |
| Operating Junction and Storage Temperature | | | T_J, T_{stg} | -55 to 150 | $^{\circ}\text{C}$ |
| Source Current (Body Diode) (Note 2) | | | I_S | -347 | mA |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | | T_L | 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

| Parameter | Symbol | Max | Unit |
|---|-----------------|-----|--------------------|
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 360 | $^\circ\text{C/W}$ |
| Junction-to-Ambient – $t \leq 5$ s (Note 1) | $R_{\theta JA}$ | 310 | $^\circ\text{C/W}$ |

1. Surface-mounted on FR4 board using 1 in. sq. pad size (Cu area – 1.127 in. sq. [2 oz.] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 2 oz. Cu pad.

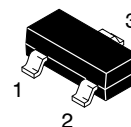
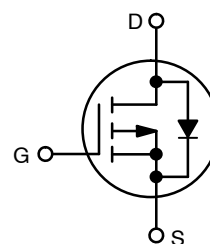


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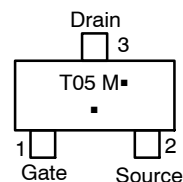
| $V_{(BR)DSS}$ | $R_{DS(on)}$ MAX | I_D MAX |
|---------------|---------------------|-----------|
| -60 V | 5 Ω @ -10 V | -211 mA |
| | 6 Ω @ -4.5 V | |

P-Channel



SOT-23
CASE 318
STYLE 21

MARKING DIAGRAM/ PIN ASSIGNMENT



T05 = 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† |
|-------------|---------------------|--------------------|
| NTR5105PT1G | 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.

NTR5105P

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------|--------|-----------------|-----|-----|-----|------|
|-----------|--------|-----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|-------------------|---|---------------------------|-----|-----------|----------------------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$ | -60 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | Reference to 25°C , $I_D = -250\text{ }\mu\text{A}$ | | 6.5 | | $\text{mV}/^\circ\text{C}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = -60\text{ V}$ | $T_J = 25^\circ\text{C}$ | | -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 3)

| | | | | | | |
|--|------------------|--|------|-----|------|----------------------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$ | -1.0 | | -3.0 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | 4.2 | | $\text{mV}/^\circ\text{C}$ |
| Drain-to-Source On-Resistance | $R_{DS(on)}$ | $V_{GS} = -10\text{ V}, I_D = -100\text{ mA}$ | | 1.6 | 5.0 | Ω |
| | | $V_{GS} = -4.5\text{ V}, I_D = -100\text{ mA}$ | | 2.2 | 6.0 | |
| Forward Transconductance | g_{FS} | $V_{DS} = -5.0\text{ V}, I_D = -100\text{ mA}$ | | 227 | | mS |

CHARGES, CAPACITANCES & GATE RESISTANCE

| | | | | | | |
|------------------------------|--------------|---|--|------|--|----|
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -25\text{ V}$ | | 30.3 | | pF |
| Output Capacitance | C_{oss} | | | 4.7 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 3.2 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = -5\text{ V}, V_{DS} = -25\text{ V}, I_D = -100\text{ mA}$ | | 1.0 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 0.2 | | |
| Gate-to-Source Charge | Q_{GS} | | | 0.4 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 0.3 | | |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|--------------|--|--|------|--|----|
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS} = -5\text{ V}, V_{DD} = -48\text{ V}, I_D = -100\text{ mA}, R_G = 1\text{ }\Omega$ | | 5.8 | | ns |
| Rise Time | t_r | | | 4.0 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 8.8 | | |
| Fall Time | t_f | | | 12.8 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-----------------------|----------|---|---------------------------|--|------|-----|---|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = -100\text{ mA}$ | $T_J = 25^\circ\text{C}$ | | 0.78 | 1.0 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.59 | | |

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 $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

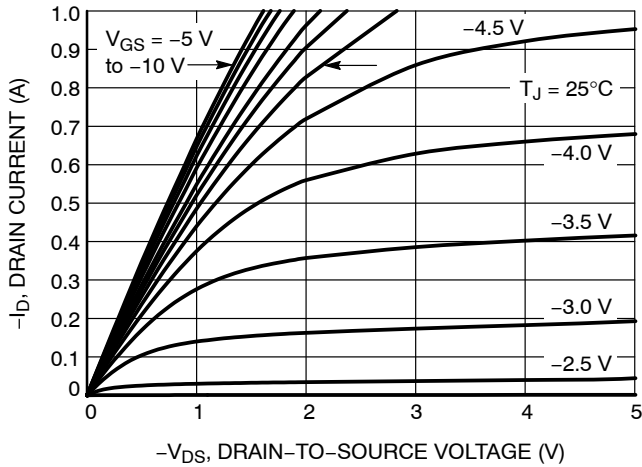


Figure 1. On-Region Characteristics

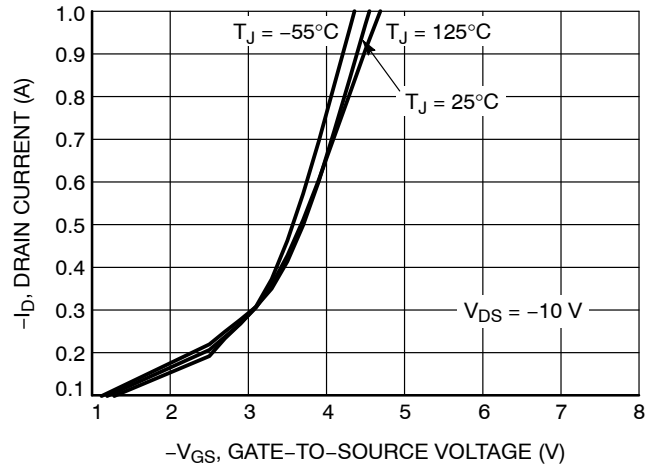


Figure 2. Transfer Characteristics

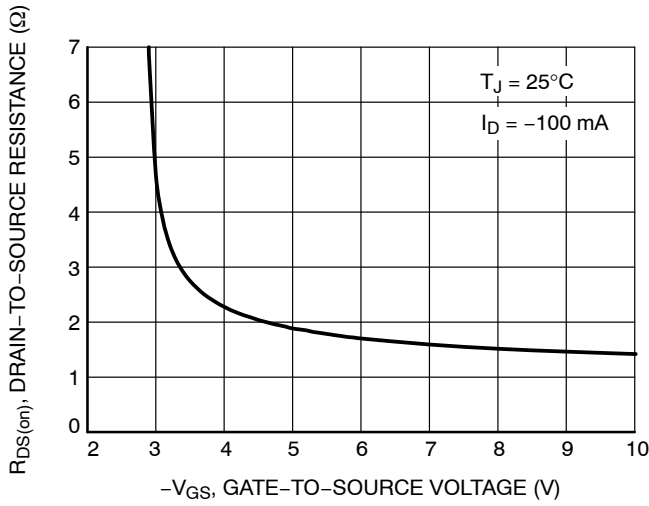


Figure 3. On-Resistance vs. Gate-to-Source Voltage

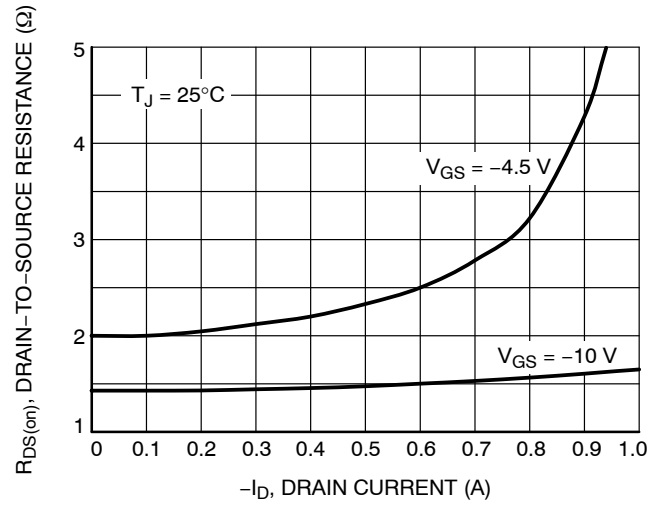


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

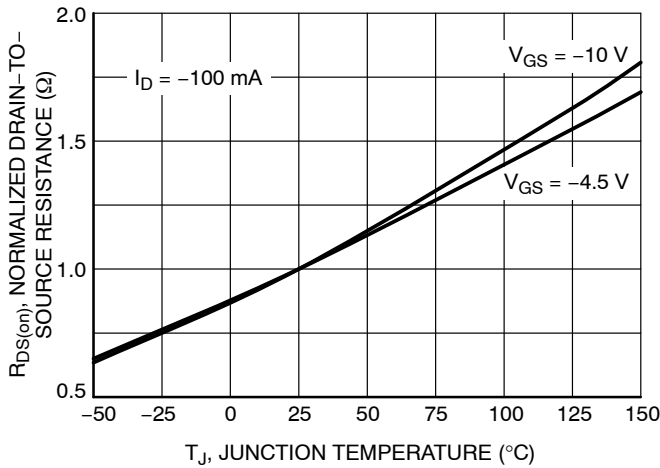


Figure 5. On-Resistance Variation with Temperature

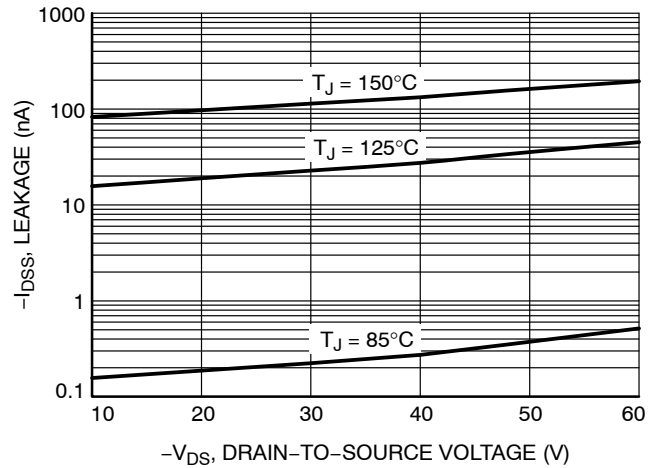


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

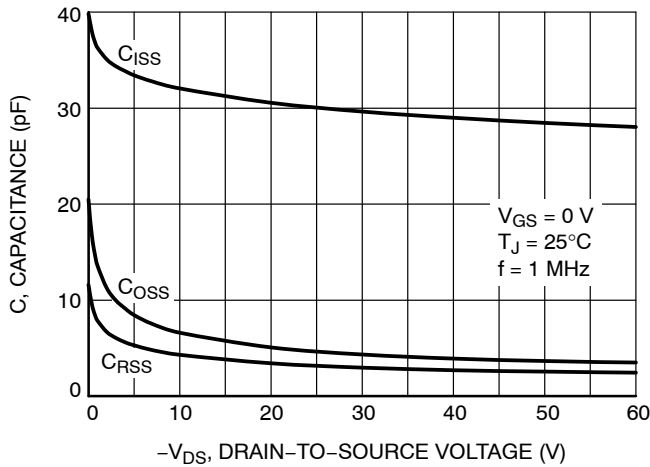


Figure 7. Capacitance Variation

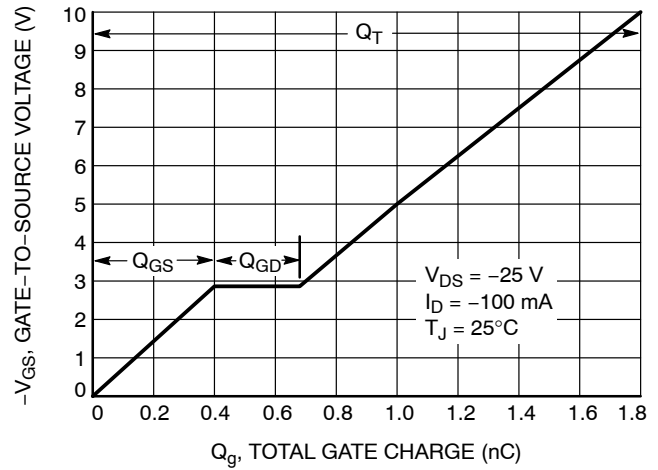


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

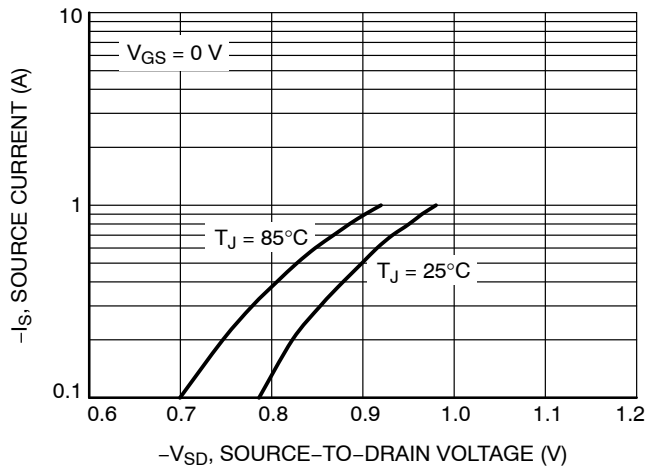


Figure 9. Diode Forward Voltage vs. Current

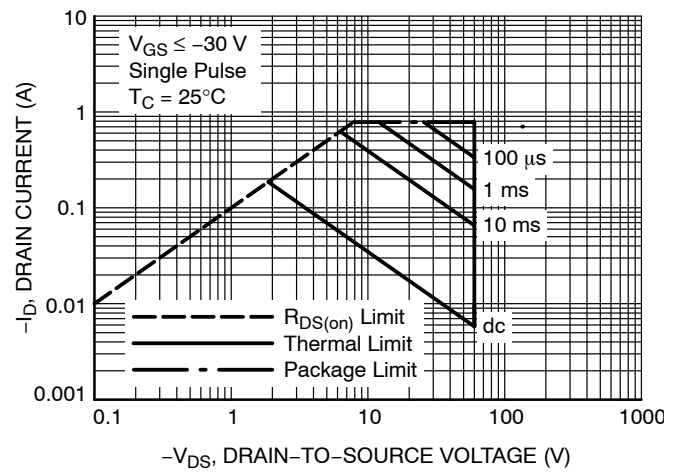


Figure 10. Maximum Rated Forward Biased Safe Operating Area

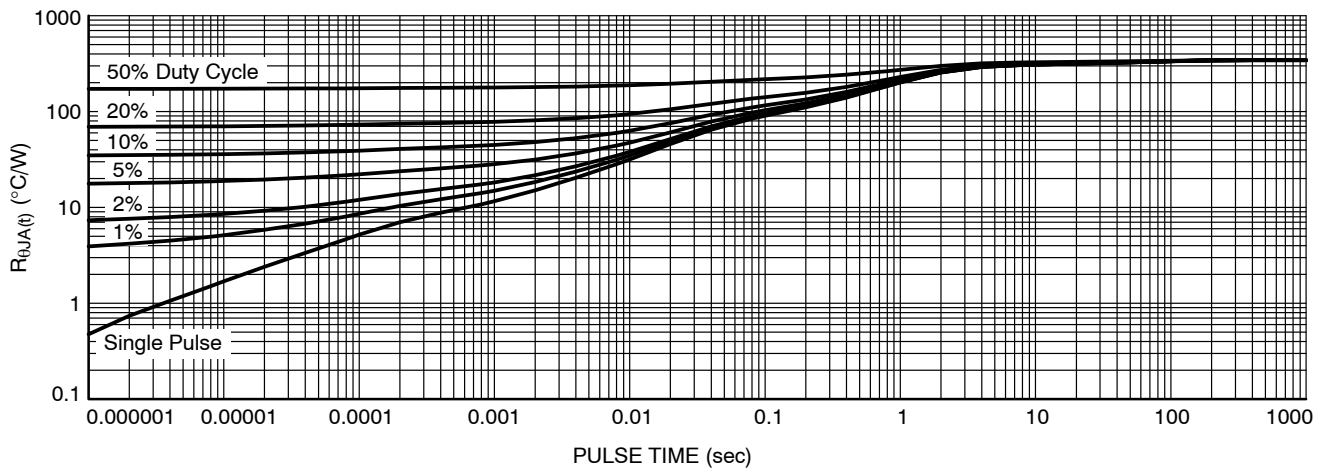


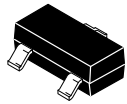
Figure 11. Thermal Response

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

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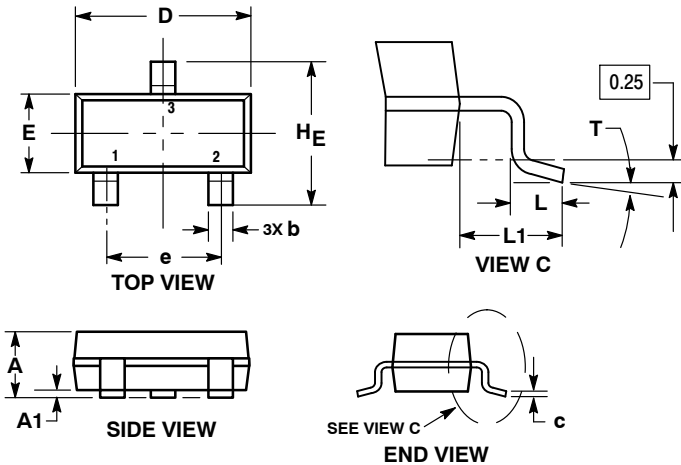
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SOT-23 (TO-236) CASE 318-08 ISSUE AS

DATE 30 JAN 2018

SCALE 4:1

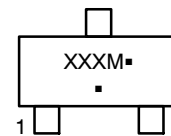


NOTES:

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 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

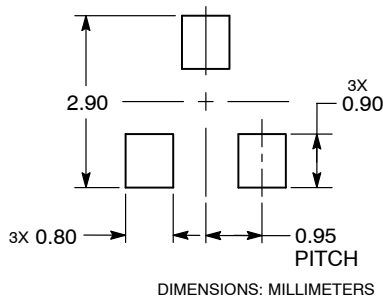
GENERIC MARKING DIAGRAM*



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.

RECOMMENDED SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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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