

NTS4173P

MOSFET – Power, Single, P-Channel, SC-70 -30 V, -1.3 A

Features

- -30 V BV_{DS} , Low $R_{DS(on)}$ in SC-70 Package
- Low Threshold Voltage
- Fast Switching Speed
- This is a Halide-Free Device
- This is a Pb-Free Device

Applications

- Load Switch
- Low Current Inverter and DC-DC Converters
- Power Switch for Printers, Communication Equipment

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

| Parameter | | Symbol | Value | Unit |
|---|--------------------------|--------------------------|--------------------------|------------------|
| Drain-to-Source Voltage | | V_{DSS} | -30 | V |
| Gate-to-Source Voltage | | V_{GS} | ± 12 | V |
| Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | -1.2 | A |
| | | | $T_A = 85^\circ\text{C}$ | |
| | $t \leq 5$ s | $T_A = 25^\circ\text{C}$ | -1.3 | |
| Power Dissipation (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | 0.29 | W |
| | | | $t \leq 5$ s | |
| Pulsed Drain Current | $t_p = 10$ μs | I_{DM} | -5.0 | A |
| Operating Junction and Storage Temperature | | T_J, T_{stg} | -55 to 150 | $^\circ\text{C}$ |
| Source Current (Body Diode) | | I_S | -1.0 | A |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | T_L | 260 | $^\circ\text{C}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|-----|---------------------------|
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 425 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – $t \leq 5$ s (Note 1) | $R_{\theta JA}$ | 360 | |

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)

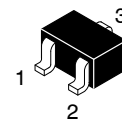
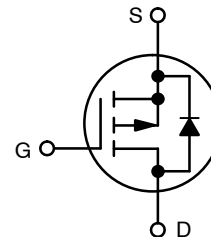


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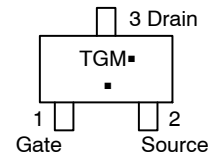
| $V_{(BR)DSS}$ | $R_{DS(on)}$ MAX | I_D MAX |
|---------------|-------------------------|-----------|
| -30 V | 150 m Ω @ -10 V | -1.2 A |
| | 200 m Ω @ -4.5 V | -1.0 A |
| | 280 m Ω @ -2.5 V | -0.9 A |

SC-70/SOT-323 (3 LEADS)



SC-70/SOT-323
CASE 419
STYLE 8

MARKING DIAGRAM/ PIN ASSIGNMENT



TG = Specific Device Code
M = Date Code*
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|-----------------|------------------|
| NTS4173PT1G | SC-70 (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.

* Date code orientation may vary depending upon manufacturing location

NTS4173P

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

| Parameter | Symbol | Test Condition | Min | Typ | Max | Units |
|-----------|--------|----------------|-----|-----|-----|-------|
|-----------|--------|----------------|-----|-----|-----|-------|

OFF CHARACTERISTICS

| | | | | | | |
|-----------------------------------|----------------------|--|-----|--|--------------|----|
| Drain-to-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = -250 μA | -30 | | | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = -24 V, T _J = 25°C V _{GS} = 0 V, V _{DS} = -24 V, T _J = 85°C | | | -1.0 -5.0 | μA |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±12 V | | | ±0.1 | μA |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|-------------------------------|---------------------|--|------|-------|------|----|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = -250 μA | -0.7 | -1.15 | -1.5 | V |
| Drain-to-Source On-Resistance | R _{DS(on)} | V _{GS} = -10 V, I _D = -1.2 A | | 90 | 150 | mΩ |
| | | V _{GS} = -4.5 V, I _D = -1.0 A | | 110 | 200 | |
| | | V _{GS} = -2.5 V, I _D = -0.9 A | | 165 | 280 | |
| Forward Transconductance | g _{FS} | V _{DS} = -5 V, I _D = -1.2 A | | 3.6 | | S |

CHARGES, CAPACITANCES AND GATE RESISTANCE

| | | | | | | |
|------------------------------|---------------------|---|--|------|--|----|
| Input Capacitance | C _{iss} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = -15 V | | 430 | | pF |
| Output Capacitance | C _{oss} | | | 55 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 40 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = -4.5 V, V _{DS} = -15 V, I _D = -1.2 A | | 4.8 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 0.6 | | |
| Gate-to-Source Charge | Q _{GS} | | | 1.1 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 1.5 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = -10 V, V _{DS} = -15 V, I _D = -1.2 A | | 10.1 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 0.6 | | |
| Gate-to-Source Charge | Q _{GS} | | | 1.1 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 1.5 | | |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|---------------------|---|--|------|--|----|
| Turn-On Delay Time | t _{d(on)} | V _{GS} = -4.5 V, V _{DS} = -15 V, I _D = -1.2 A, R _G = 3 Ω | | 7.7 | | ns |
| Rise Time | t _r | | | 5.2 | | |
| Turn-Off Delay Time | t _{d(off)} | | | 16.2 | | |
| Fall Time | t _f | | | 6.7 | | |
| Turn-On Delay Time | t _{d(on)} | V _{GS} = -10 V, V _{DS} = -15 V, I _D = -1.2 A, R _G = 3 Ω | | 5.3 | | ns |
| Rise Time | t _r | | | 6.7 | | |
| Turn-Off Delay Time | t _{d(off)} | | | 19.9 | | |
| Fall Time | t _f | | | 7.1 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|-----------------|--|--|------|------|----|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = -1.0 A | | -0.8 | -1.0 | V |
| Reverse Recovery Time | t _{RR} | V _{DS} = 20 V, V _{GS} = 0 V, I _S = -1.0 A, dI _{SD} /dt = 100 A/μs | | 12 | | ns |
| Charge Time | t _a | | | 10 | | |
| Discharge Time | t _b | | | 2.0 | | |
| Reverse Recovery Charge | Q _{RR} | | | 7.0 | | nC |

- Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
- Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%
- Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS

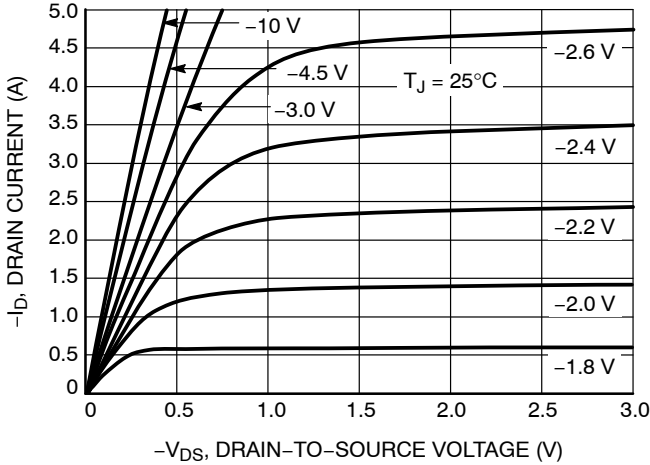


Figure 1. On-Region Characteristics

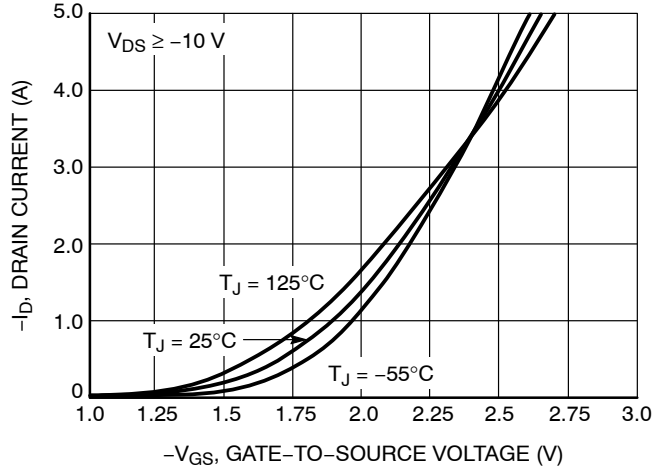


Figure 2. Transfer Characteristics

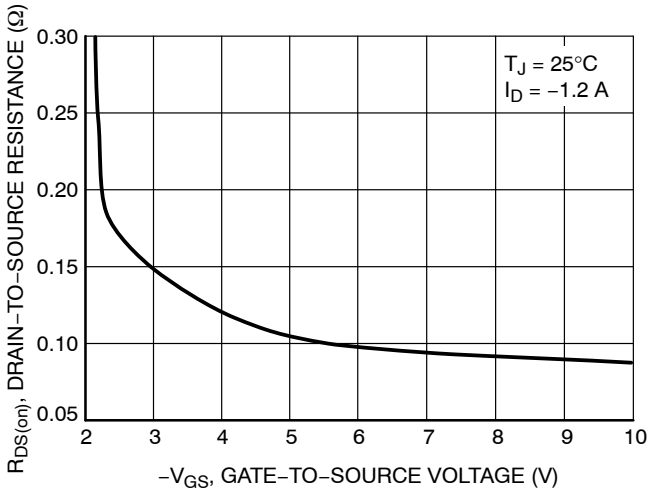


Figure 3. On-Resistance vs. Gate Voltage

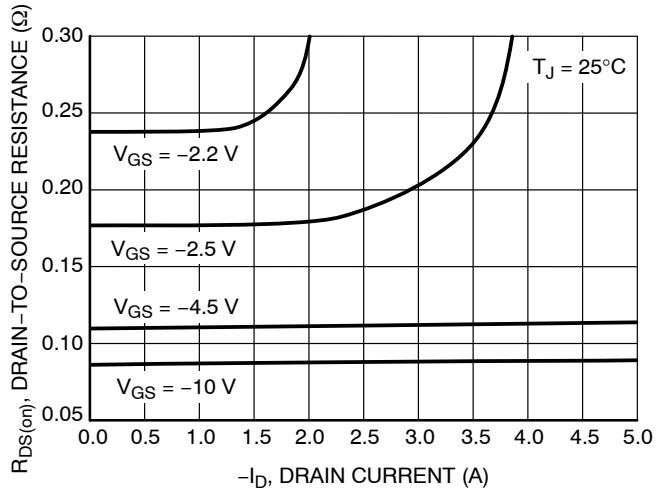


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

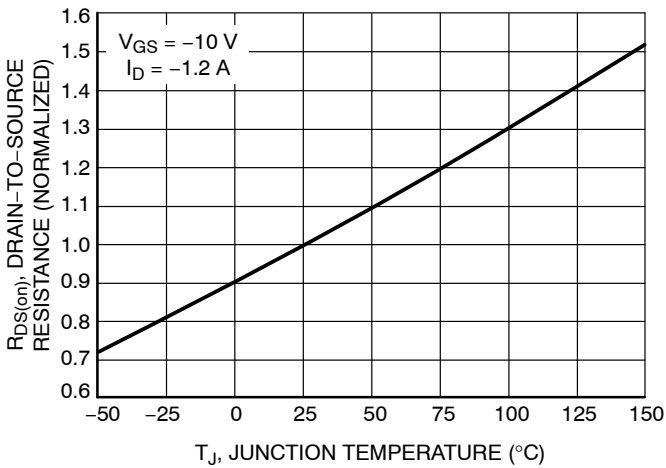


Figure 5. On-Resistance Variation with Temperature

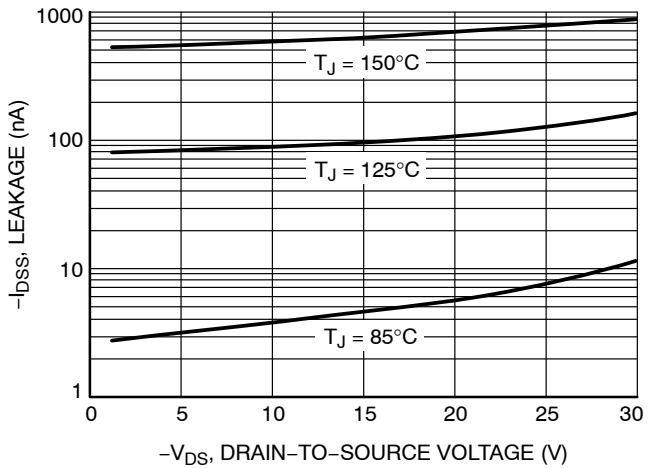


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

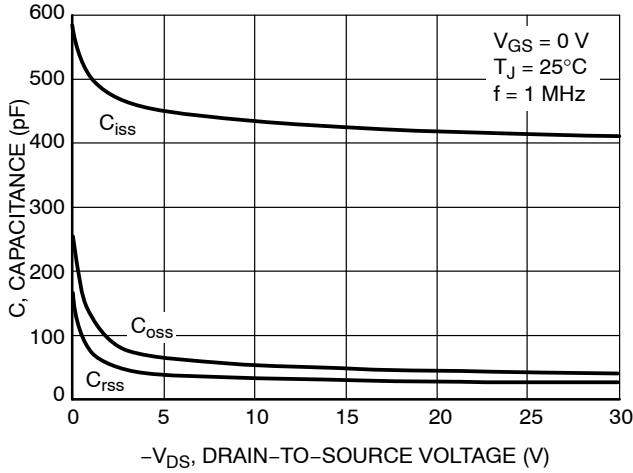


Figure 7. Capacitance Variation

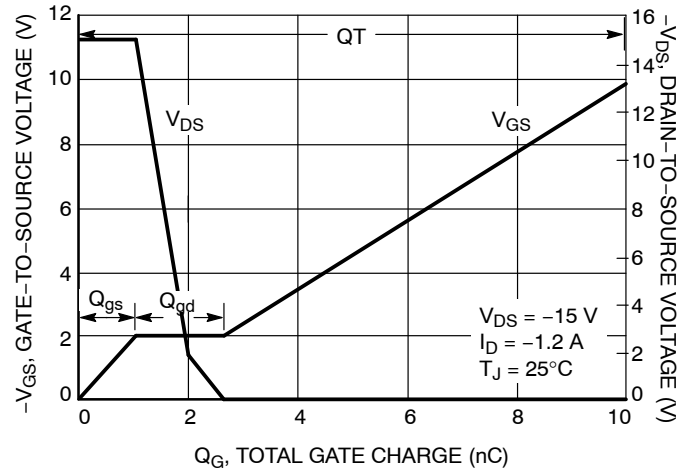


Figure 8. Gate-to-Source Voltage vs. Total Charge

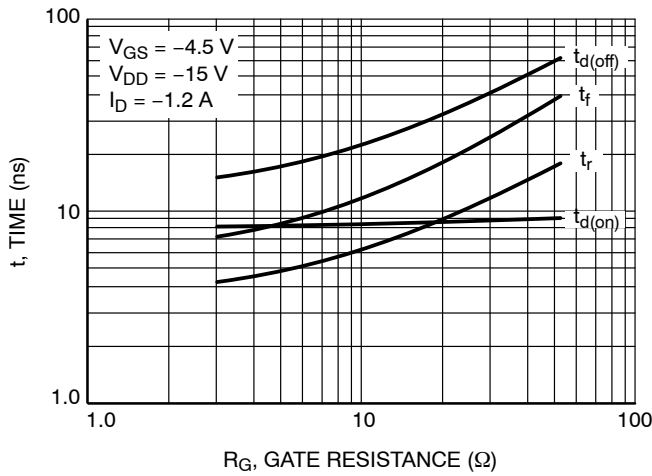


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

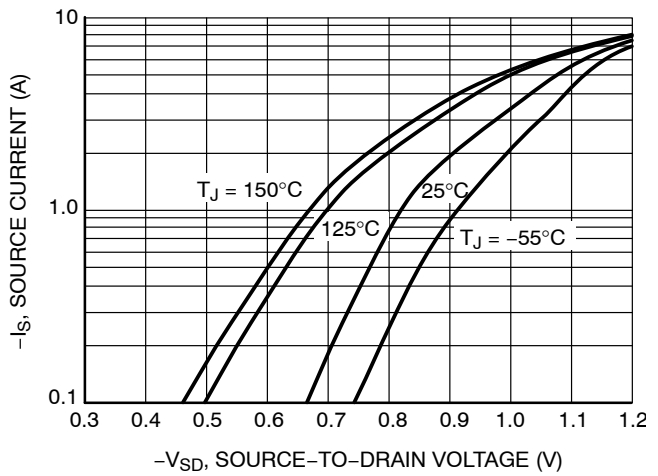


Figure 10. Diode Forward Voltage vs. Current

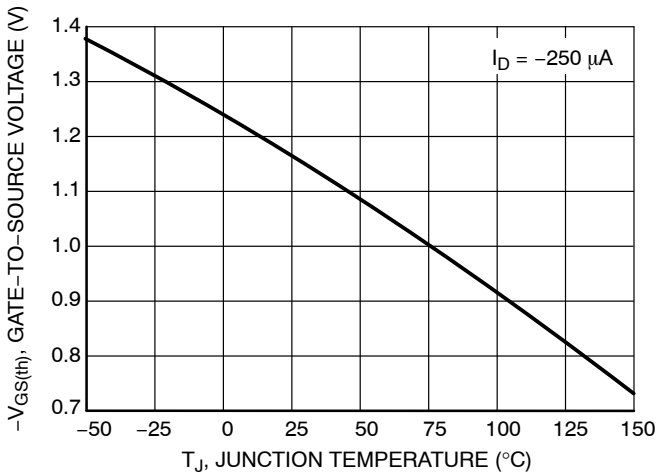


Figure 11. Threshold Voltage

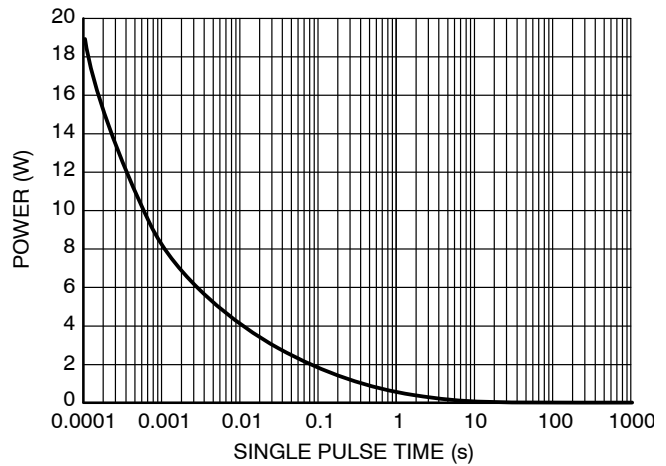


Figure 12. Single Pulse Maximum Power Dissipation

NTS4173P

TYPICAL PERFORMANCE CURVES

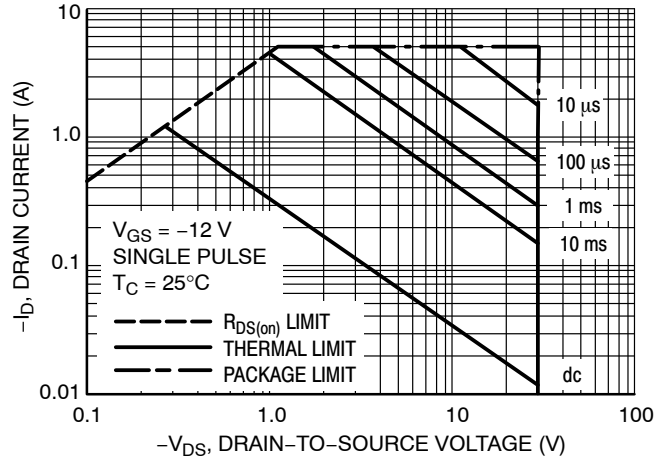


Figure 13. Maximum Rated Forward Biased Safe Operating Area

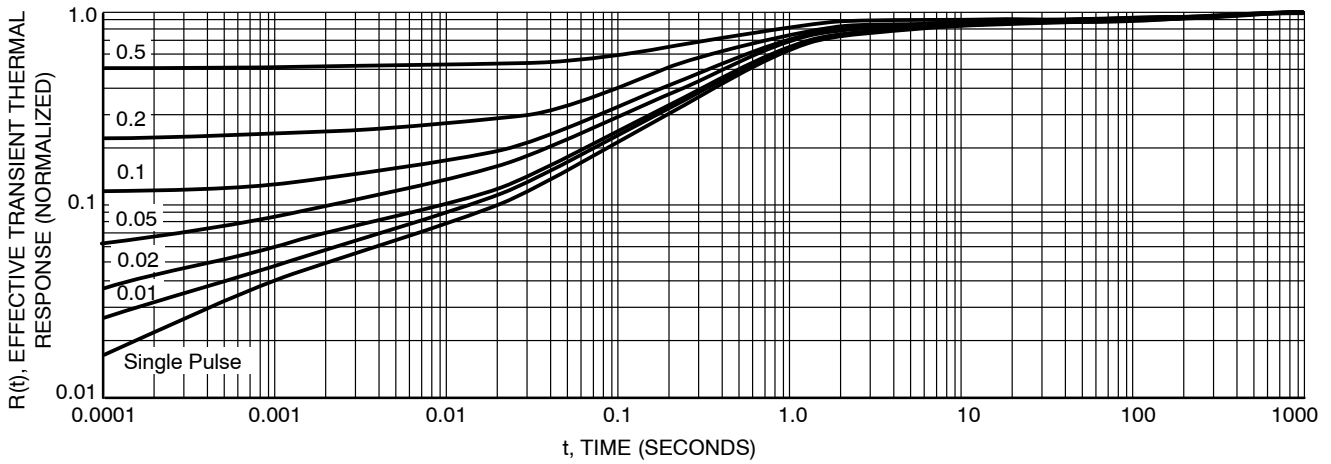
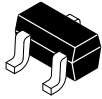


Figure 14. FET Thermal Response

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



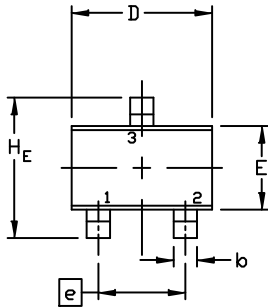
SCALE 4:1

SC-70 (SOT-323)
CASE 419
ISSUE P

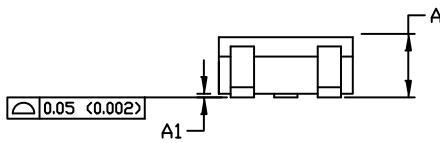
DATE 07 OCT 2021

NOTES:

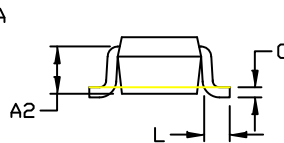
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH



TOP VIEW



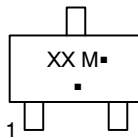
SIDE VIEW



END VIEW

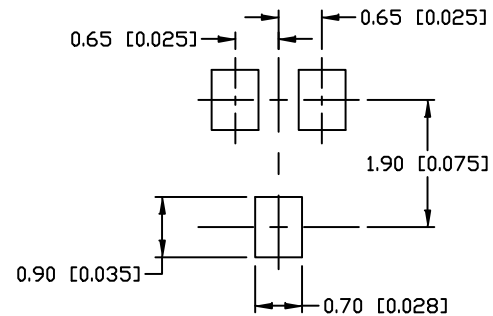
| DIM | MILLIMETERS | | | INCHES | | |
|----------------|-------------|------|------|-----------|-------|-------|
| | MIN. | NDM. | MAX. | MIN. | NDM. | MAX. |
| A | 0.80 | 0.90 | 1.00 | 0.032 | 0.035 | 0.040 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A2 | 0.70 REF | | | 0.028 BSC | | |
| b | 0.30 | 0.35 | 0.40 | 0.012 | 0.014 | 0.016 |
| c | 0.10 | 0.18 | 0.25 | 0.004 | 0.007 | 0.010 |
| D | 1.80 | 2.10 | 2.20 | 0.071 | 0.083 | 0.087 |
| E | 1.15 | 1.24 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e1 | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.20 | 0.38 | 0.56 | 0.008 | 0.015 | 0.022 |
| H _E | 2.00 | 2.10 | 2.40 | 0.079 | 0.083 | 0.095 |

GENERIC MARKING DIAGRAM



- XX = 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 IN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

SOLDERING FOOTPRINT

- | | | | | | |
|---|---|---|--|---|---|
| STYLE 1: CANCELLED | STYLE 2: PIN 1. ANODE 2. N.C. 3. CATHODE | STYLE 3: PIN 1. BASE 2. EMITTER 3. COLLECTOR | STYLE 4: PIN 1. CATHODE 2. CATHODE 3. ANODE | STYLE 5: PIN 1. ANODE 2. ANODE 3. CATHODE | |
| STYLE 6: PIN 1. EMITTER 2. BASE 3. COLLECTOR | STYLE 7: PIN 1. BASE 2. EMITTER 3. COLLECTOR | STYLE 8: PIN 1. GATE 2. SOURCE 3. DRAIN | STYLE 9: PIN 1. ANODE 2. CATHODE 3. CATHODE-ANODE | STYLE 10: PIN 1. CATHODE 2. ANODE 3. ANODE-CATHODE | STYLE 11: PIN 1. CATHODE 2. CATHODE 3. CATHODE |

| | | |
|------------------|-----------------|--|
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| DESCRIPTION: | SC-70 (SOT-323) | PAGE 1 OF 1 |

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