

NTGS4141N, NVGS4141N

Power MOSFET

30 V, 7.0 A, Single N-Channel, TSOP-6

Features

- Low $R_{DS(on)}$
- Low Gate Charge
- NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Pb-Free Package is Available

Applications

- Load Switch
- Notebook PC
- Desktop PC

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

| Rating | | Symbol | Value | Unit | |
|---|--|--------------------------|--------------------------|------------------|---|
| Drain-to-Source Voltage | | V_{DSS} | 30 | V | |
| Gate-to-Source Voltage | | V_{GS} | ± 20 | V | |
| Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 5.0 | A |
| | | | $T_A = 85^\circ\text{C}$ | 3.6 | |
| | $t \leq 10$ s | $T_A = 25^\circ\text{C}$ | 7.0 | | |
| Power Dissipation (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | P_D | 1.0 | W |
| | | | $t \leq 10$ s | 2.0 | |
| Continuous Drain Current (Note 2) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 3.5 | A |
| | | | $T_A = 85^\circ\text{C}$ | 2.5 | |
| | | $T_A = 25^\circ\text{C}$ | P_D | 0.5 | |
| Pulsed Drain Current | $t_p = 10$ μs , $V_{GS}=10\text{V}$ | I_{DM} | 45 | A | |
| Pulsed Drain Current | $t_p = 30$ μs , $V_{GS}=5\text{V}$ | I_D | 30 | A | |
| Operating Junction and Storage Temperature | | T_J , T_{STG} | -55 to 150 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | | I_S | 2.0 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 30$ V, $I_L = 10.4$ A, $V_{GS} = 10$ V, $L = 1.0$ mH, $R_G = 25$ Ω) | | EAS | 54 | mJ | |
| 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

| Rating | Symbol | Max | Unit |
|--|-----------------|------|--------------------|
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 125 | $^\circ\text{C/W}$ |
| Junction-to-Ambient – $t \leq 10$ s (Note 1) | $R_{\theta JA}$ | 62.5 | |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 248 | |

1. Surface-mounted on FR4 board using 1 inch sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 0.0773 in sq).

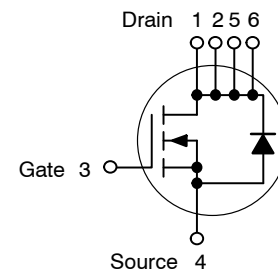


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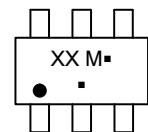
| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D MAX |
|---------------|------------------------|-----------|
| 30 V | 21.5 m Ω @ 10 V | 7.0 A |
| | 30 m Ω @ 4.5 V | |

N-Channel



TSOP-6
CASE 318G
STYLE 1

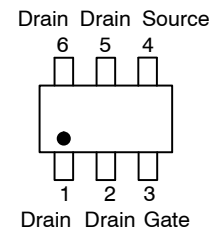
MARKING DIAGRAM



XX = Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

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

| Characteristic | 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 | 30 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V _{(BR)DSS} /T _J | | | 18.4 | | mV/°C |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = 24 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 3)

| | | | | | | |
|--|-------------------------------------|---|-----|------|-----|-------|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = 250 μA | 1.0 | | 3.0 | V |
| Negative Threshold Temperature Coefficient | V _{GS(TH)} /T _J | | | 5.7 | | mV/°C |
| Drain-to-Source On Resistance | R _{DS(on)} | V _{GS} = 10 V, I _D = 7.0 A | | 21.5 | 25 | mΩ |
| | | V _{GS} = 4.5 V, I _D = 6.0 A | | 30 | 35 | |
| Forward Transconductance | g _{FS} | V _{DS} = 10 V, I _D = 7.0 A | | 30 | | S |

CHARGES, CAPACITANCES AND GATE RESISTANCE

| | | | | | | |
|------------------------------|---------------------|--|--|------|--|----|
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 24 V | | 560 | | pF |
| Output Capacitance | C _{OSS} | | | 115 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 75 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 10 V, V _{DS} = 15 V, I _D = 7.0 A | | 12 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 0.85 | | |
| Gate-to-Source Charge | Q _{GS} | | | 1.9 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 3.0 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 4.5 V, V _{DS} = 15 V, I _D = 7.0 A | | 6.0 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 0.8 | | |
| Gate-to-Source Charge | Q _{GS} | | | 1.85 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 3.0 | | |
| Gate Resistance | R _G | | | 2.8 | | Ω |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|---------------------|---|--|-----|--|----|
| Turn-On Delay Time | t _{d(ON)} | V _{GS} = 10 V, V _{DS} = 24 V, I _D = 7.0 A, R _G = 3.0 Ω | | 6.0 | | ns |
| Rise Time | t _r | | | 15 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | 18 | | |
| Fall Time | t _f | | | 4.0 | | |

DRAIN - SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|-----------------|---|------------------------|------|-----|----|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = 2.0 A | T _J = 25°C | 0.78 | 1.0 | V |
| | | | T _J = 125°C | 0.63 | | |
| Reverse Recovery Time | t _{RR} | V _{GS} = 0 V dI _S /dt = 100 A/μs, I _S = 2.0 A | | 15 | | ns |
| Charge Time | t _a | | | 9.0 | | |
| Discharge Time | t _b | | | 6.0 | | |
| Reverse Recovery Charge | Q _{RR} | | | 8.0 | | |

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 ≤ 300 μs, duty cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

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TYPICAL PERFORMANCE CURVES

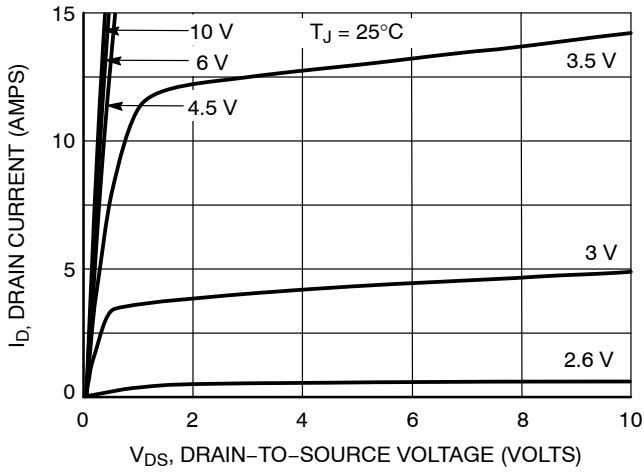


Figure 1. On-Region Characteristics

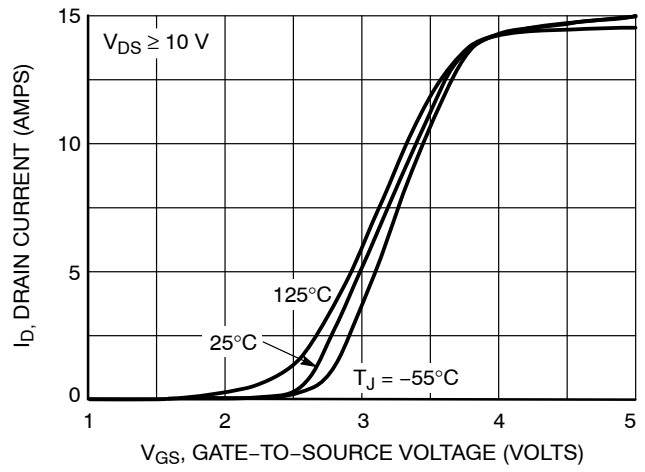


Figure 2. Transfer Characteristics

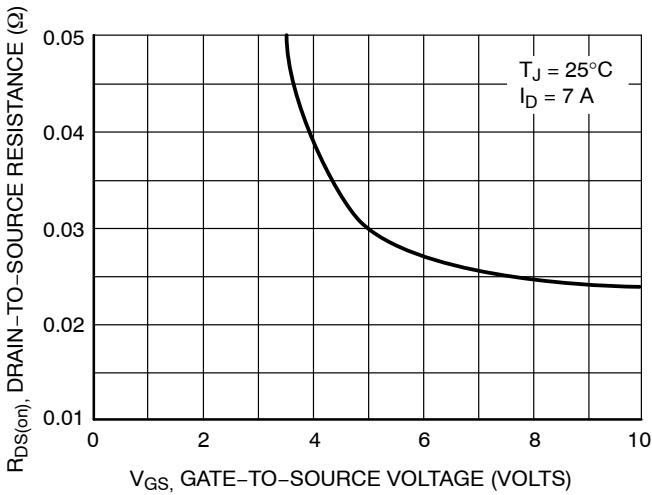


Figure 3. On-Resistance vs. Gate-to-Source Voltage

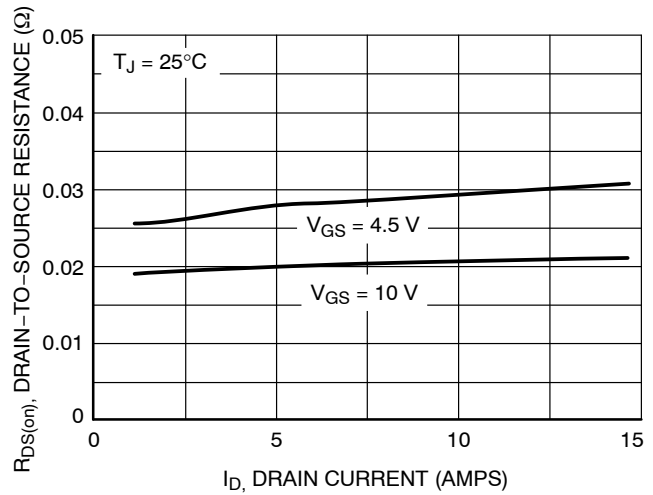


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

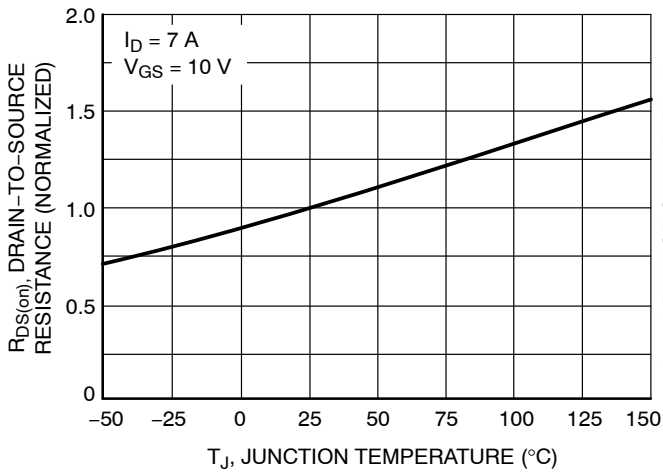


Figure 5. On-Resistance Variation with Temperature

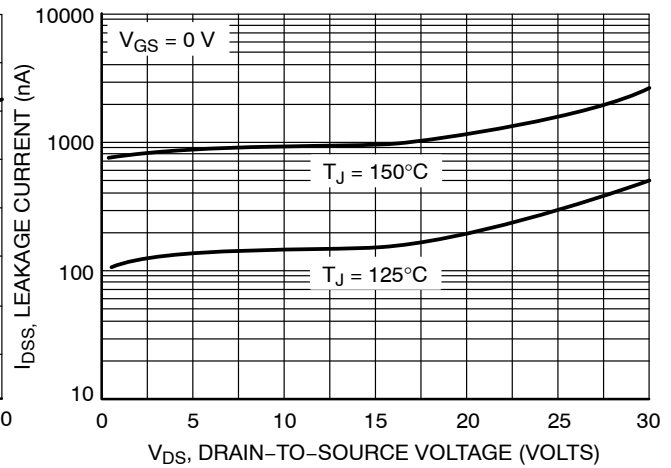


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL PERFORMANCE CURVES

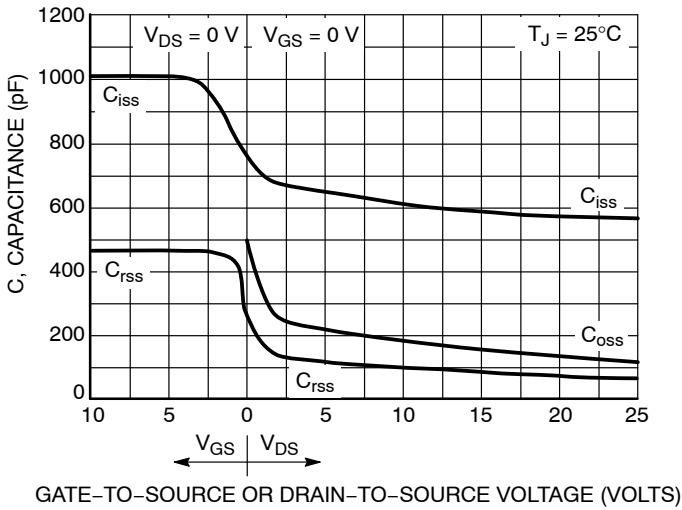


Figure 7. Capacitance Variation

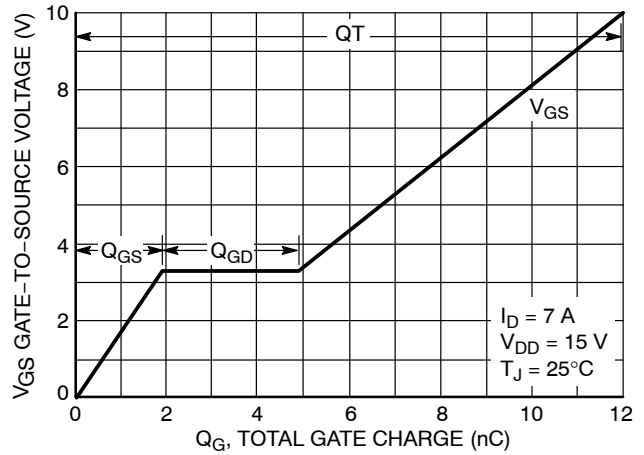


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

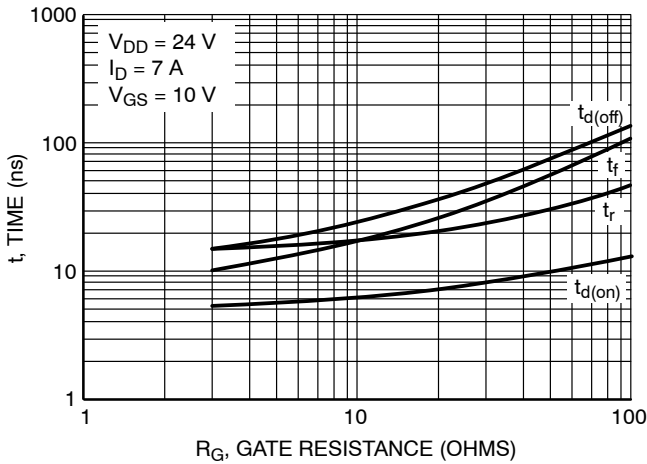


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

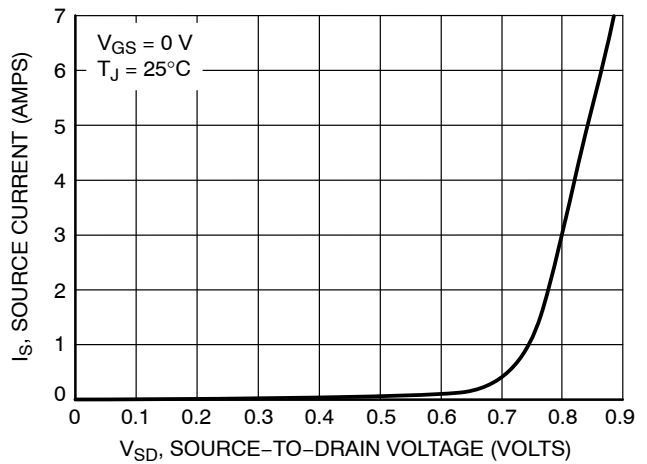


Figure 10. Diode Forward Voltage vs. Current

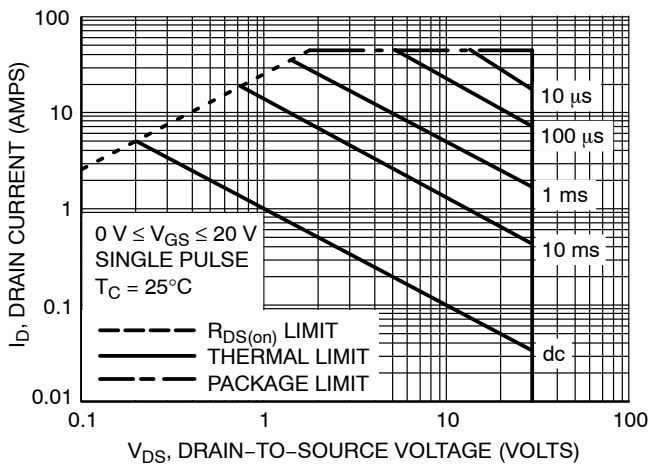


Figure 11. Maximum Rated Forward Biased Safe Operating Area

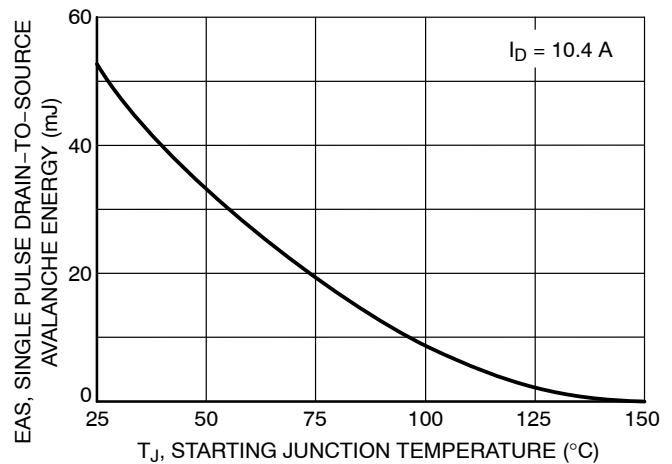


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL PERFORMANCE CURVES

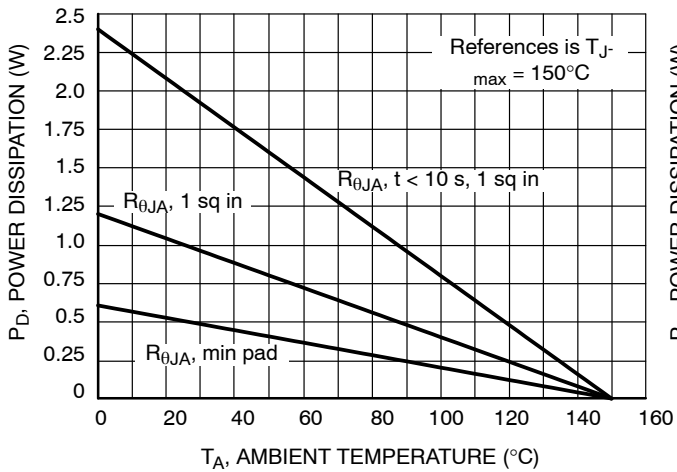


Figure 13. Maximum Power Derating Chart

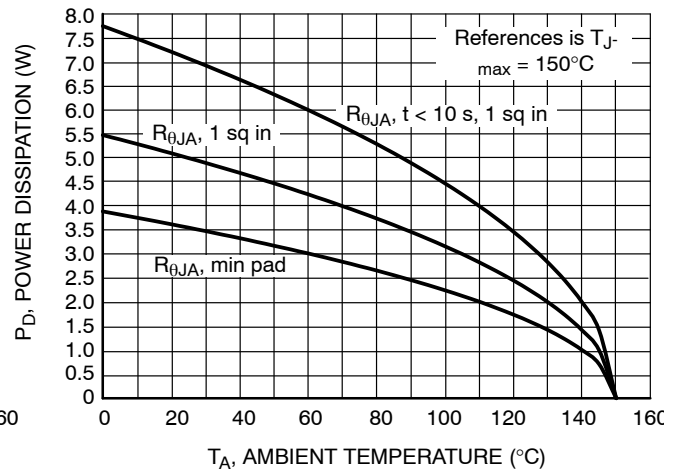


Figure 14. Current Derating Chart

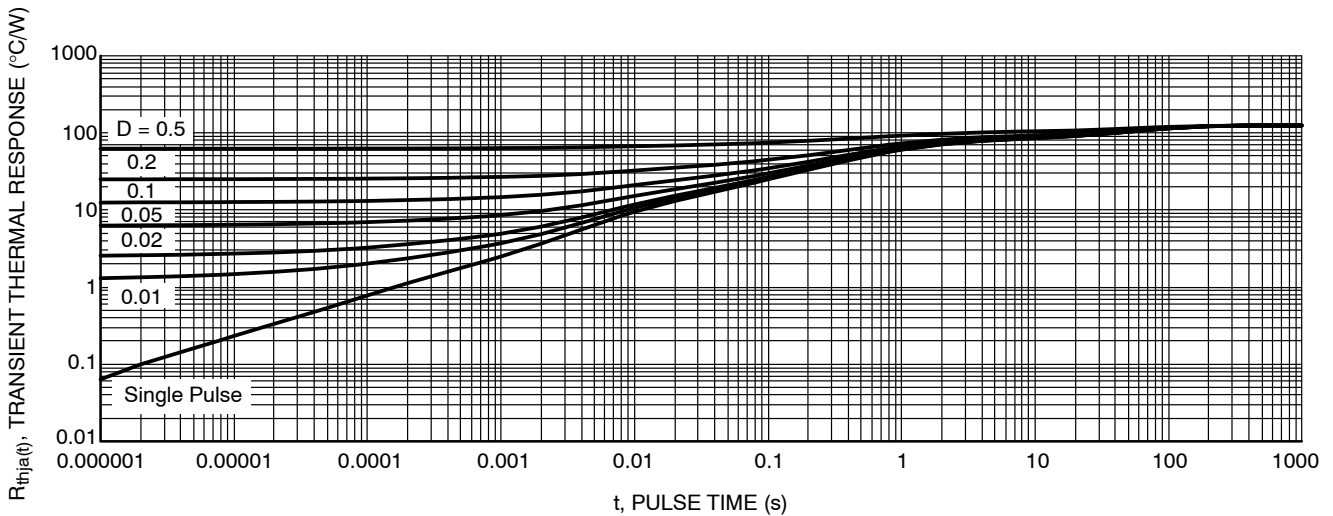


Figure 15. Thermal Response

Table 1. ORDERING INFORMATION

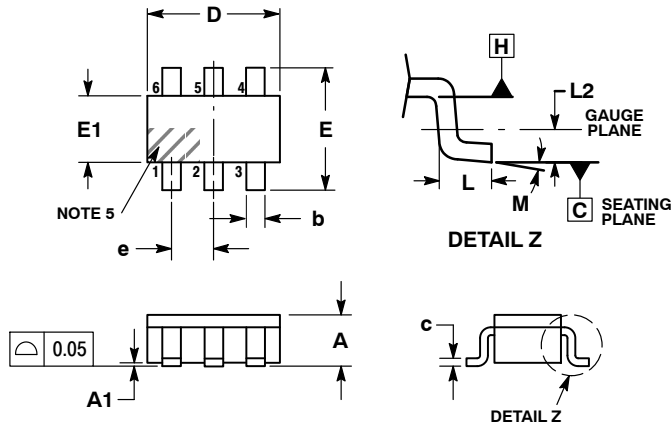
| Part Number | Marking (XX) | Package | Shipping [†] |
|--------------|--------------|------------------|-----------------------|
| NTGS4141NT1 | S4 | TSOP-6 | 3000 / Tape & Reel |
| NTGS4141NT1G | S4 | TSOP-6 (Pb-Free) | 3000 / Tape & Reel |
| NVGS4141NT1G | VS4 | TSOP-6 (Pb-Free) | 3000 / Tape & Reel |

[†]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.

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PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE V



NOTES:

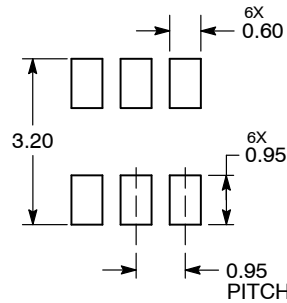
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.01 | 0.06 | 0.10 |
| b | 0.25 | 0.38 | 0.50 |
| c | 0.10 | 0.18 | 0.26 |
| D | 2.90 | 3.00 | 3.10 |
| E | 2.50 | 2.75 | 3.00 |
| E1 | 1.30 | 1.50 | 1.70 |
| e | 0.85 | 0.95 | 1.05 |
| L | 0.20 | 0.40 | 0.60 |
| L2 | 0.25 BSC | | |
| M | 0° | - | 10° |

STYLE 1:

1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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