

# NTGS3443, NVGS3443

## Power MOSFET 4.4 Amps, 20 Volts

### P-Channel TSOP-6

#### Features

- Ultra Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Miniature TSOP-6 Surface Mount Package
- These Devices are Pb-Free and are RoHS Compliant
- NVGS Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

#### Applications

- Power Management in Portable and Battery-Powered Products, i.e.: Cellular and Cordless Telephones, and PCMCIA Cards

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

| Rating   | Symbol          | Value      | Unit               |
|--|-----------------|------------|--------------------|
| Drain-to-Source Voltage  | $V_{DSS}$       | -20        | Volts              |
| Gate-to-Source Voltage - Continuous                            | $V_{GS}$        | $\pm 12$   | Volts              |
| Thermal Resistance<br>Junction-to-Ambient (Note 1)             | $R_{\theta JA}$ | 244        | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$             | $P_d$           | 0.5        | Watts              |
| Drain Current - Continuous @ $T_A = 25^\circ\text{C}$          | $I_D$           | -2.2       | Amps               |
| - Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )              | $I_{DM}$        | -10        | Amps               |
| Thermal Resistance<br>Junction-to-Ambient (Note 2)             | $R_{\theta JA}$ | 128        | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$             | $P_d$           | 1.0        | Watts              |
| Drain Current - Continuous @ $T_A = 25^\circ\text{C}$          | $I_D$           | -3.1       | Amps               |
| - Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )              | $I_{DM}$        | -14        | Amps               |
| Thermal Resistance<br>Junction-to-Ambient (Note 3)             | $R_{\theta JA}$ | 62.5       | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$             | $P_d$           | 2.0        | Watts              |
| Drain Current - Continuous @ $T_A = 25^\circ\text{C}$          | $I_D$           | -4.4       | Amps               |
| - Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )              | $I_{DM}$        | -20        | Amps               |
| Operating and Storage Temperature Range                        | $T_J, T_{stg}$  | -55 to 150 | $^\circ\text{C}$   |
| Maximum Lead Temperature for Soldering Purposes for 10 Seconds | $T_L$           | 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.

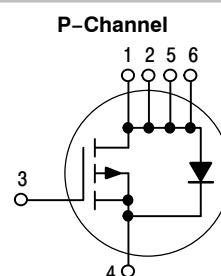
1. Minimum FR-4 or G-10 PCB, operating to steady state.
2. Mounted onto a 2 in square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided), operating to steady state.
3. Mounted onto a 2 in square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided),  $t < 5.0$  seconds.



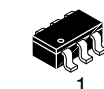
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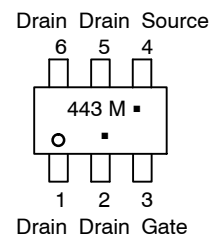
**4.4 AMPERES**  
**20 VOLTS**  
 **$R_{DS(on)} = 65 \text{ m}\Omega$**



#### MARKING DIAGRAM & PIN ASSIGNMENT



TSOP-6  
CASE 318G  
STYLE 1



443 = Specific 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†          |
|-------------|------------------|--------------------|
| NTGS3443T1G | TSOP-6 (Pb-Free) | 3000 / Tape & Reel |
| NVGS3443T1G | 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.

# NTGS3443, NVGS3443

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (Notes 4 & 5)

| Characteristic  | Symbol   | Min          | Typ                     | Max                     | Unit            |     |
|---|--|--------------|-------------------------|-------------------------|-----------------|-----|
| <b>OFF CHARACTERISTICS</b>  |  |              |                         |                         |                 |     |
| Drain-Source Breakdown Voltage<br>( $V_{GS} = 0\text{ Vdc}$ , $I_D = -10\ \mu\text{A}$ )  | $V_{(BR)DSS}$  | -20          | -                       | -                       | Vdc             |     |
| Zero Gate Voltage Drain Current<br>( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 25^\circ\text{C}$ )<br>( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 70^\circ\text{C}$ )                 | $I_{DSS}$  | -            | -                       | -1.0<br>-5.0            | $\mu\text{Adc}$ |     |
| Gate-Body Leakage Current<br>( $V_{GS} = -12\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )  | $I_{GSS}$  | -            | -                       | -100                    | nAdc            |     |
| Gate-Body Leakage Current<br>( $V_{GS} = +12\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )  | $I_{GSS}$  | -            | -                       | 100                     | nAdc            |     |
| <b>ON CHARACTERISTICS</b>   |  |              |                         |                         |                 |     |
| Gate Threshold Voltage<br>( $V_{DS} = V_{GS}$ , $I_D = -250\ \mu\text{Adc}$ )   | $V_{GS(th)}$   | -0.60        | -0.95                   | -1.50                   | Vdc             |     |
| Static Drain-Source On-State Resistance<br>( $V_{GS} = -4.5\text{ Vdc}$ , $I_D = -4.4\text{ Adc}$ )<br>( $V_{GS} = -2.7\text{ Vdc}$ , $I_D = -3.7\text{ Adc}$ )<br>( $V_{GS} = -2.5\text{ Vdc}$ , $I_D = -3.5\text{ Adc}$ ) | $R_{DS(on)}$   | -            | 0.058<br>0.082<br>0.092 | 0.065<br>0.090<br>0.100 | $\Omega$        |     |
| Forward Transconductance<br>( $V_{DS} = -10\text{ Vdc}$ , $I_D = -4.4\text{ Adc}$ )   | $g_{FS}$   | -            | 8.8                     | -                       | mhos            |     |
| <b>DYNAMIC CHARACTERISTICS</b>  |  |              |                         |                         |                 |     |
| Input Capacitance   | $(V_{DS} = -5.0\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ,<br>$f = 1.0\text{ MHz}$ )                            | $C_{iss}$    | -                       | 565                     | -               | pF  |
| Output Capacitance  |  | $C_{oss}$    | -                       | 320                     | -               | pF  |
| Reverse Transfer Capacitance  |  | $C_{rss}$    | -                       | 120                     | -               | pF  |
| <b>SWITCHING CHARACTERISTICS</b>  |  |              |                         |                         |                 |     |
| Turn-On Delay Time  | $(V_{DD} = -20\text{ Vdc}$ , $I_D = -1.0\text{ Adc}$ ,<br>$V_{GS} = -4.5\text{ Vdc}$ , $R_g = 6.0\ \Omega$ ) | $t_{d(on)}$  | -                       | 10                      | 25              | ns  |
| Rise Time   |  | $t_r$        | -                       | 18                      | 45              | ns  |
| Turn-Off Delay Time   |  | $t_{d(off)}$ | -                       | 30                      | 50              | ns  |
| Fall Time   |  | $t_f$        | -                       | 31                      | 50              | ns  |
| Total Gate Charge   | $(V_{DS} = -10\text{ Vdc}$ , $V_{GS} = -4.5\text{ Vdc}$ ,<br>$I_D = -4.4\text{ Adc}$ )                       | $Q_{tot}$    | -                       | 7.5                     | 15              | nC  |
| Gate-Source Charge  |  | $Q_{gs}$     | -                       | 1.4                     | -               | nC  |
| Gate-Drain Charge   |  | $Q_{gd}$     | -                       | 2.9                     | -               | nC  |
| <b>BODY-DRAIN DIODE RATINGS</b>   |  |              |                         |                         |                 |     |
| Diode Forward On-Voltage  | $(I_S = -1.7\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ )   | $V_{SD}$     | -                       | -0.83                   | -1.2            | Vdc |
| Reverse Recovery Time   | $(I_S = -1.7\text{ Adc}$ , $dI_S/dt = 100\text{ A}/\mu\text{s}$ )  | $t_{rr}$     | -                       | 30                      | -               | ns  |

4. Indicates Pulse Test: P.W. = 300  $\mu\text{sec}$  max, Duty Cycle = 2%.

5. Handling precautions to protect against electrostatic discharge are mandatory.

TYPICAL ELECTRICAL CHARACTERISTICS

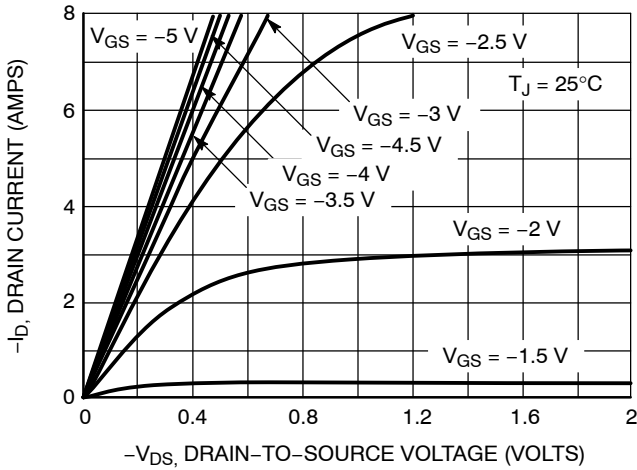


Figure 1. On-Region Characteristics

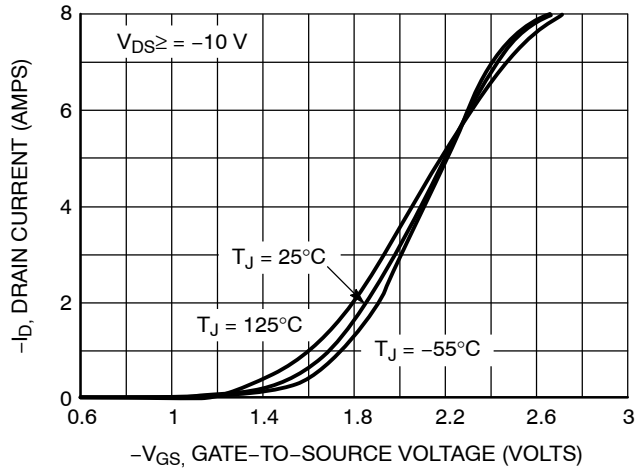


Figure 2. Transfer Characteristics

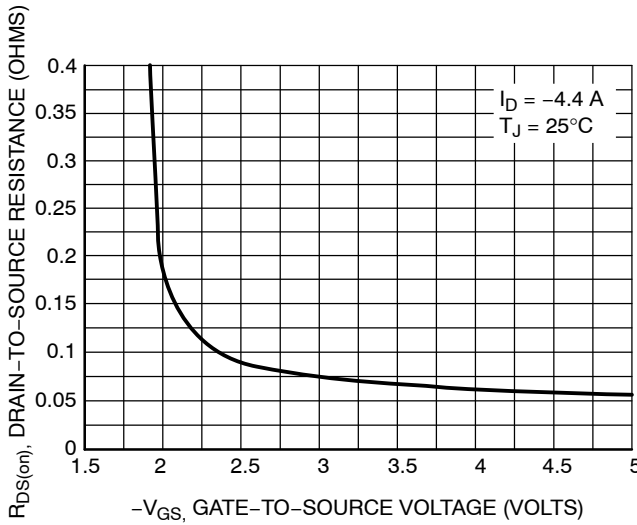


Figure 3. On-Resistance vs. Gate-to-Source Voltage

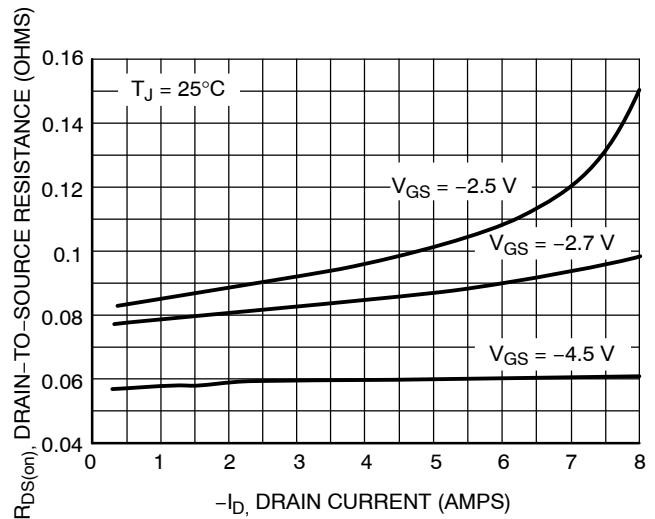


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

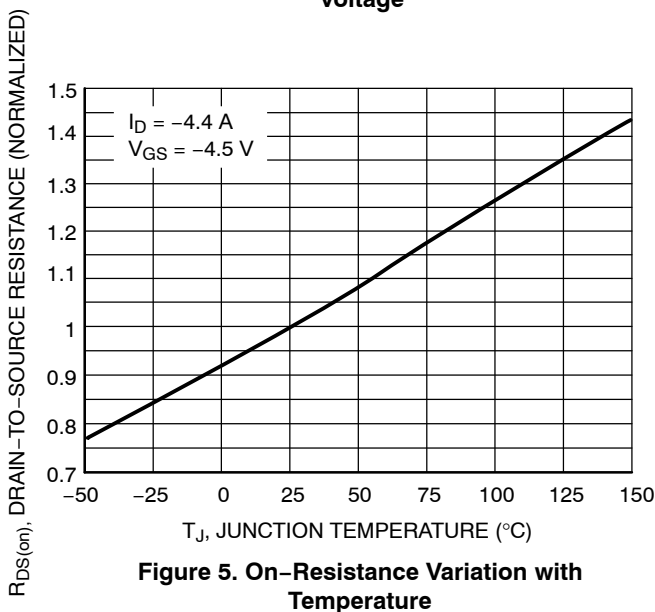


Figure 5. On-Resistance Variation with Temperature

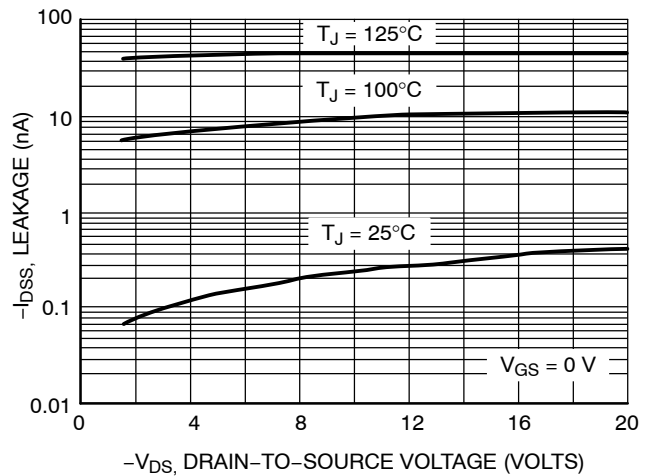


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL ELECTRICAL CHARACTERISTICS

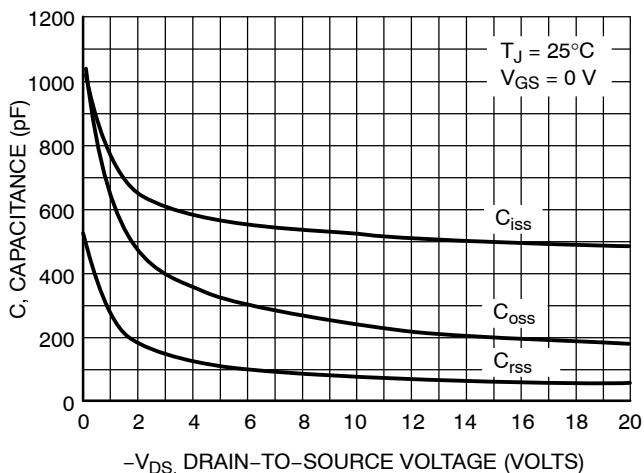


Figure 7. Capacitance Variation

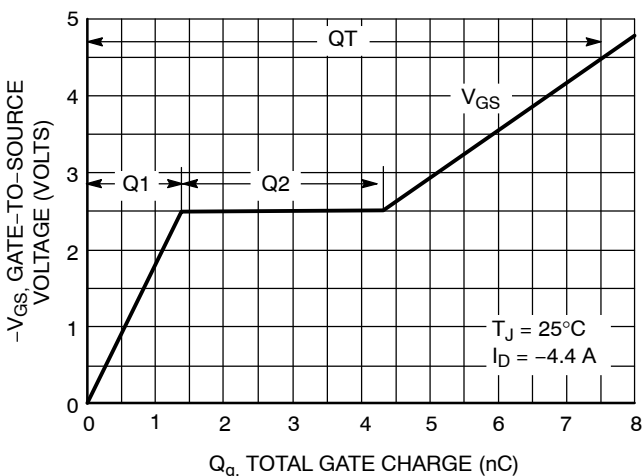


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

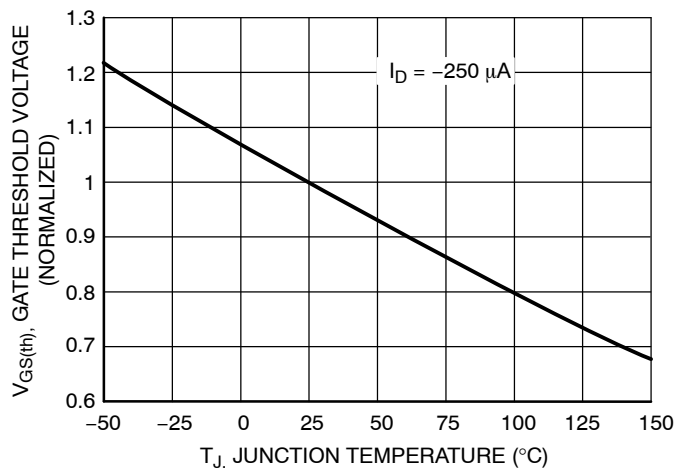


Figure 9. Gate Threshold Voltage Variation with Temperature

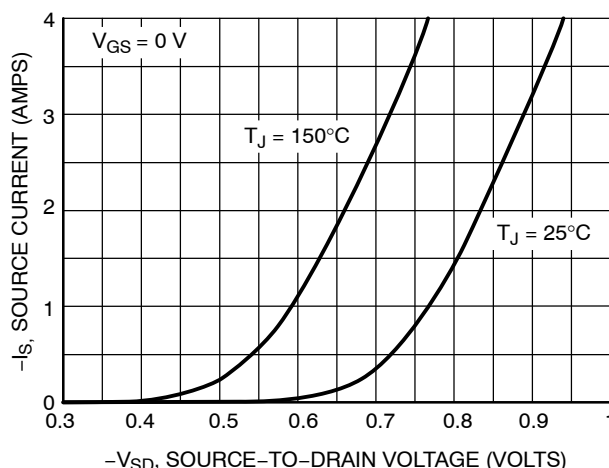


Figure 10. Diode Forward Voltage vs. Current

# NTGS3443, NVGS3443

## TYPICAL ELECTRICAL CHARACTERISTICS

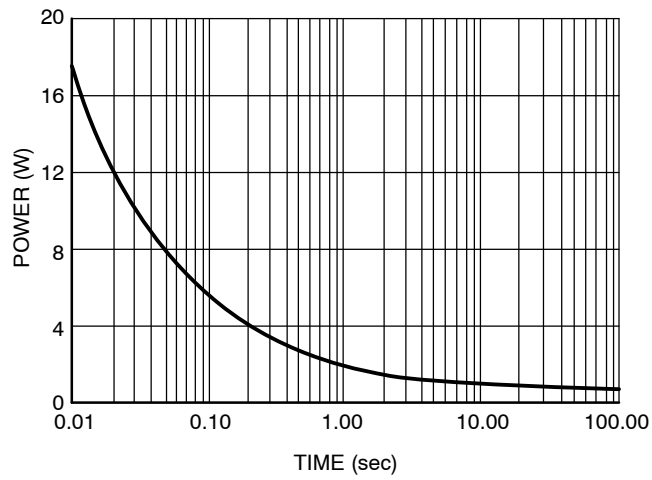


Figure 11. Single Pulse Power

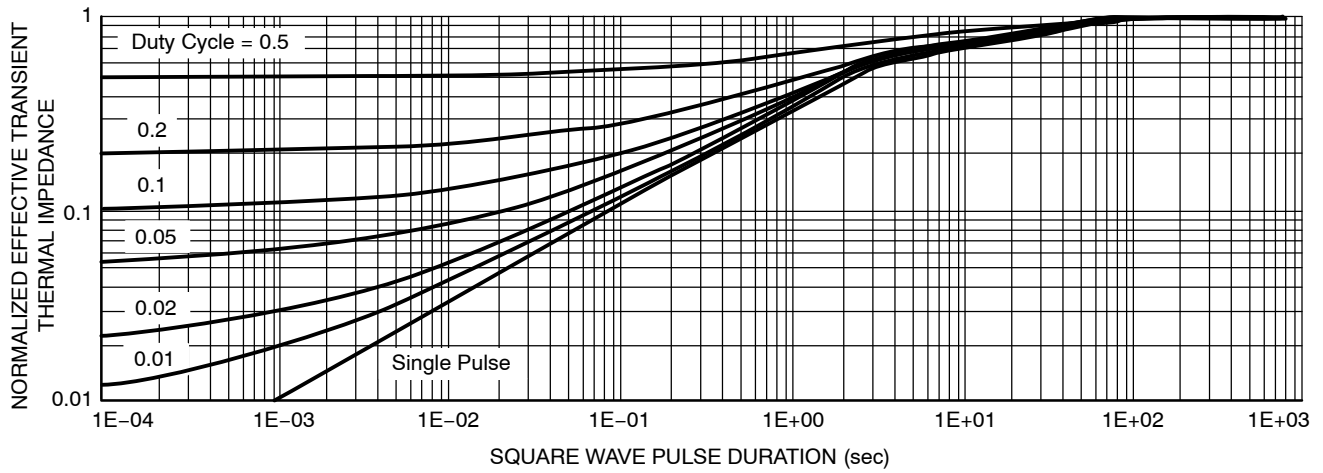
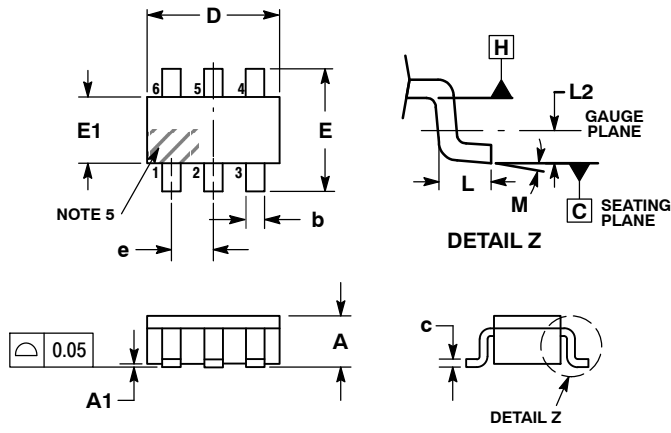


Figure 12. Normalized Thermal Transient Impedance, Junction-to-Ambient

# NTGS3443, NVGS3443

## PACKAGE DIMENSIONS

### TSOP-6 CASE 318G-02 ISSUE V

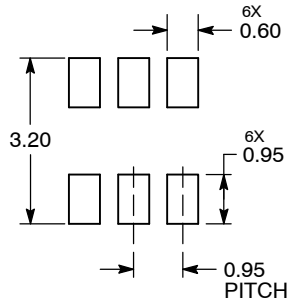


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. 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:  
 PIN 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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