

NTGS4141N

Power MOSFET

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

Features

- Low $R_{DS(on)}$
- Low Gate Charge
- 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 |
| | | | | $T_A = 85^\circ\text{C}$ | |
| | $t \leq 10$ 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 | |
| Continuous Drain Current (Note 2) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 3.5 | A |
| | | | | $T_A = 85^\circ\text{C}$ | |
| Power Dissipation (Note 2) | | $T_A = 25^\circ\text{C}$ | P_D | 0.5 | W |
| Pulsed Drain Current | $t_p = 10$ μs | I_{DM} | 21 | 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 | $^\circ\text{C}$ | |

THERMAL RESISTANCE RATINGS

| Rating | Symbol | Max | Unit |
|--|-----------------|------|---------------------------|
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 125 | $^\circ\text{C}/\text{W}$ |
| 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).

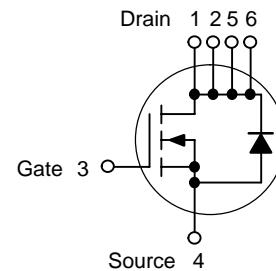


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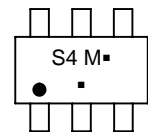
| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D MAX |
|---------------|------------------------|-----------|
| 30 V | 21.5 m Ω @ 10 V | 7.0 A |
| | 30 m Ω @ 4.5 V | |

N-Channel



TSOP-6
CASE 318G
STYLE 1

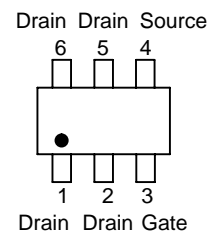
MARKING DIAGRAM



S4 = Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

PIN ASSIGNMENT



ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|------------------|------------------|
| NTGS4141NT1 | TSOP-6 | 3000/Tape & Reel |
| NTGS4141NT1G | 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 Specification Brochure, BRD8011/D.

NTGS4141N

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 | | |

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

NTGS4141N

TYPICAL PERFORMANCE CURVES

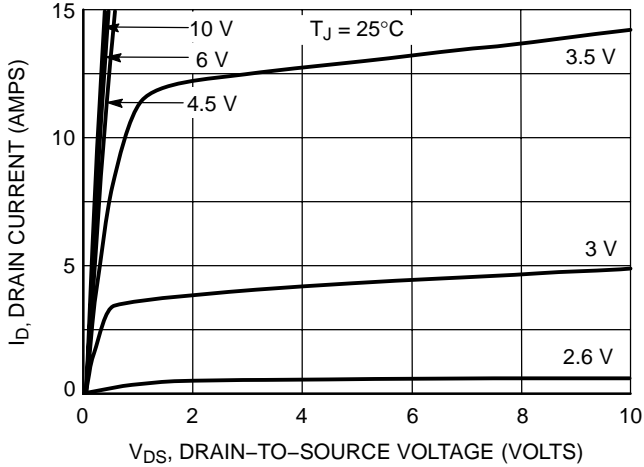


Figure 1. On-Region Characteristics

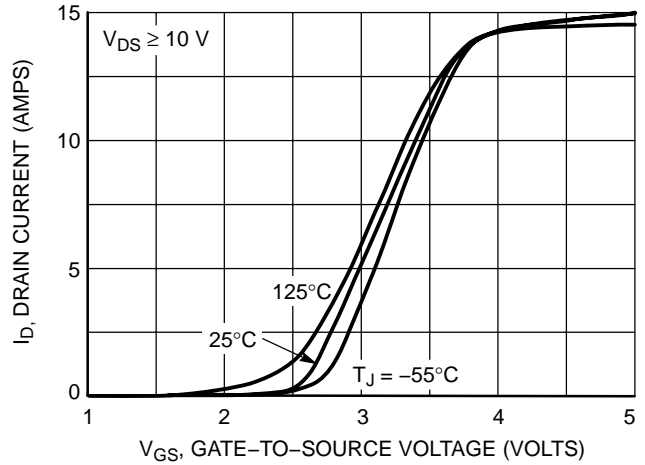


Figure 2. Transfer Characteristics

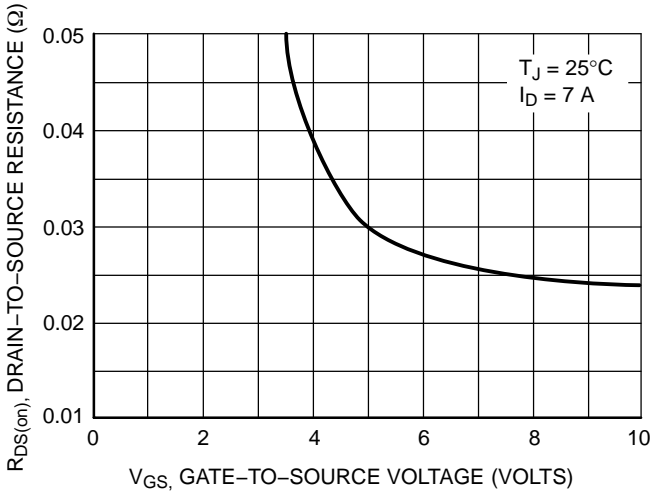


Figure 3. On-Resistance vs. Gate-to-Source Voltage

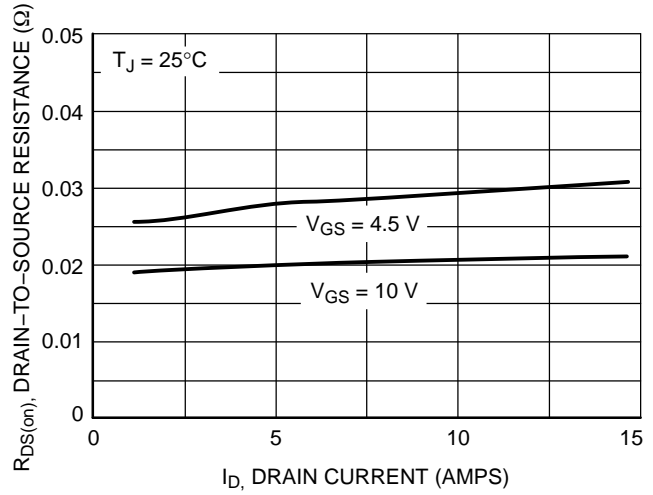


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

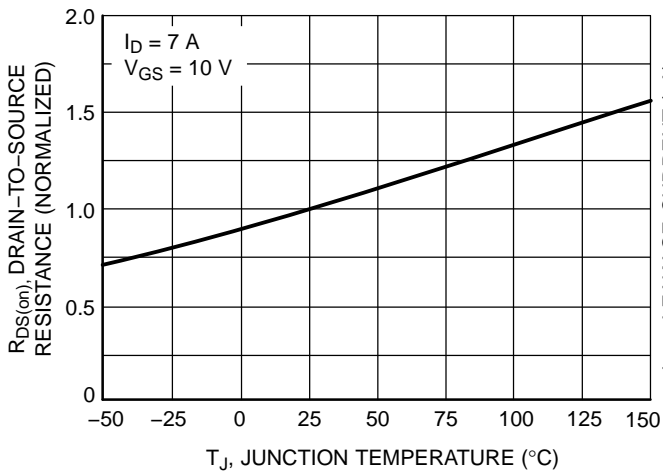


Figure 5. On-Resistance Variation with Temperature

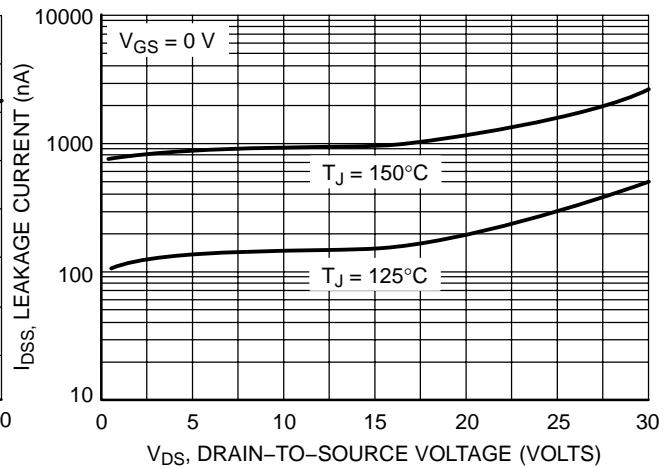
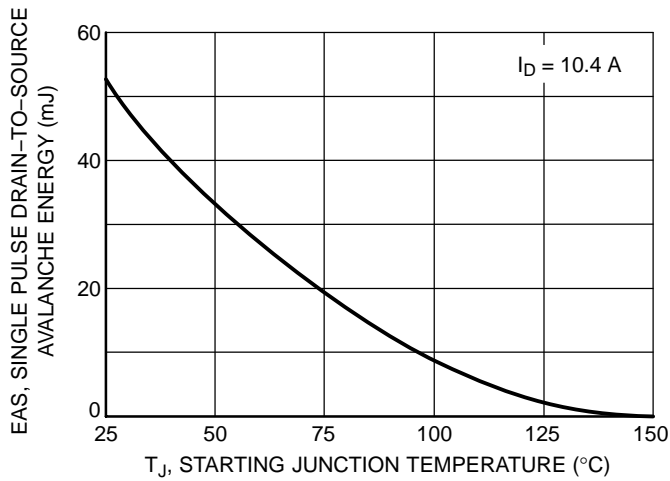
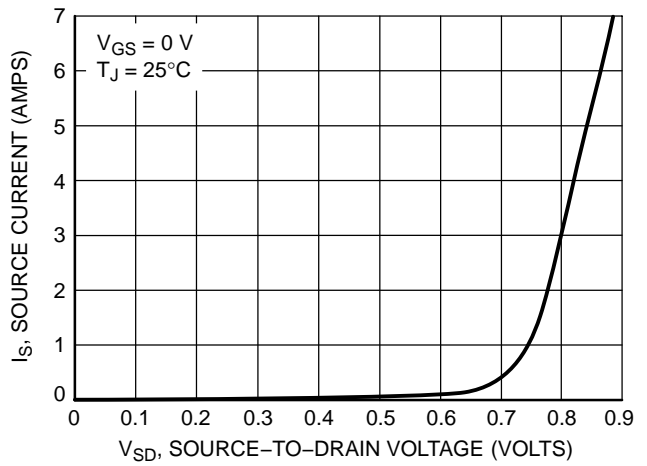
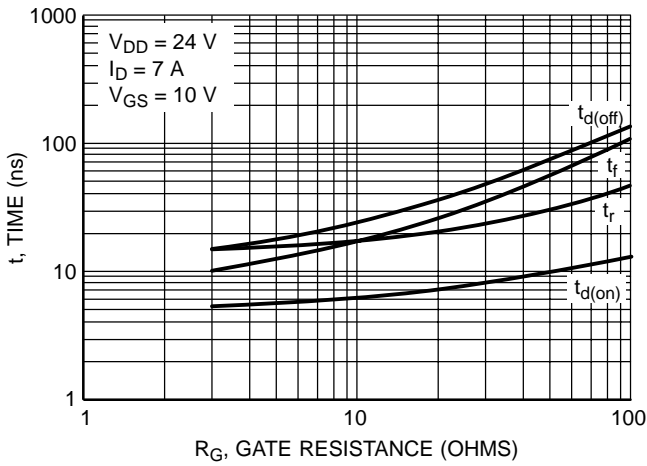
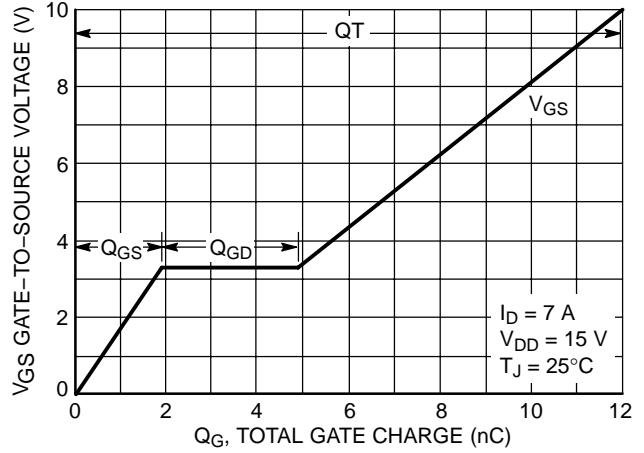
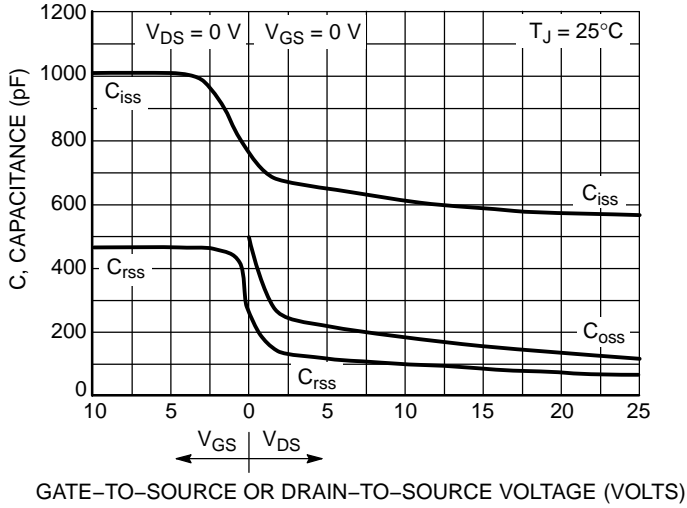


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTGS4141N

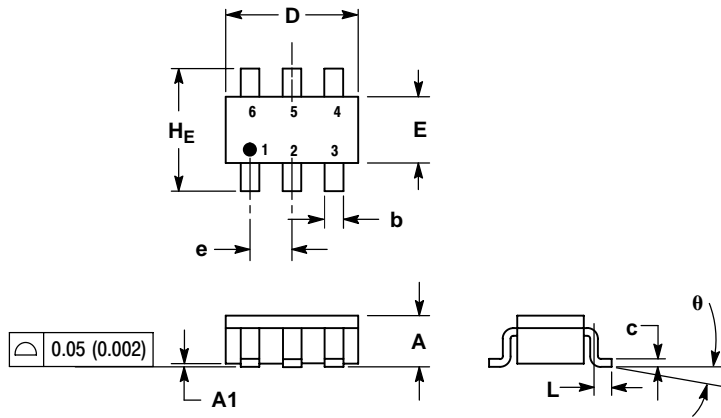
TYPICAL PERFORMANCE CURVES



NTGS4141N

PACKAGE DIMENSIONS

TSOP-6
CASE 318G-02
ISSUE P



NOTES:

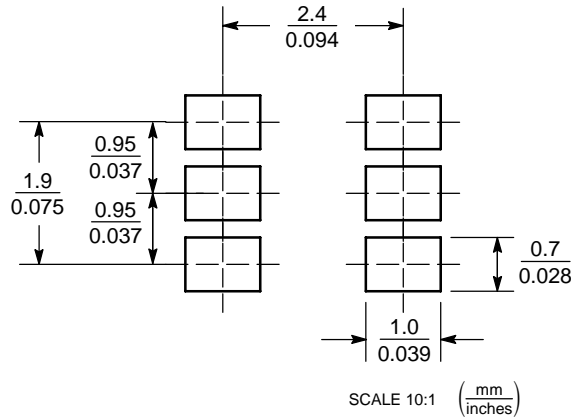
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.25 | 0.38 | 0.50 | 0.010 | 0.014 | 0.020 |
| c | 0.10 | 0.18 | 0.26 | 0.004 | 0.007 | 0.010 |
| D | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| E | 1.30 | 1.50 | 1.70 | 0.051 | 0.059 | 0.067 |
| e | 0.85 | 0.95 | 1.05 | 0.034 | 0.037 | 0.041 |
| L | 0.20 | 0.40 | 0.60 | 0.008 | 0.016 | 0.024 |
| HE | 2.50 | 2.75 | 3.00 | 0.099 | 0.108 | 0.118 |
| θ | 0° | - | 10° | 0° | - | 10° |

STYLE 1:

- PIN 1. DRAIN
- DRAIN
- GATE
- SOURCE
- DRAIN
- DRAIN

SOLDERING FOOTPRINT*



*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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