

# 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  |                          | $V_{GS}$                 | $\pm 20$   | V                        |
| Continuous Drain Current (Note 1)   | Steady State             | $T_A = 25^\circ\text{C}$ | $I_D$      | 5.0                      |
|   |                          |                          |            | $T_A = 85^\circ\text{C}$ |
|   | $t \leq 10$ 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                      |
|   |                          |                          |            | $t \leq 10$ s            |
| Continuous Drain Current (Note 2)   | Steady State             | $T_A = 25^\circ\text{C}$ | $I_D$      | 3.5                      |
|   |                          |                          |            | $T_A = 85^\circ\text{C}$ |
| Power Dissipation (Note 2)  |                          | $T_A = 25^\circ\text{C}$ | $P_D$      | 0.5                      |
| Pulsed Drain Current  | $t_p = 10$ $\mu\text{s}$ | $I_{DM}$                 | 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, $R_G = 25$ $\Omega$ ) |                          | EAS                      | 54         | mJ                       |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)   |                          | $T_L$                    | 260        | $^\circ\text{C}$         |

### THERMAL RESISTANCE RATINGS

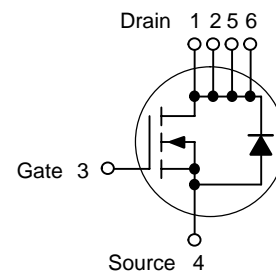
| Rating                                       | Symbol          | Max  | Unit               |
|--|-----------------|------|--------------------|
| Junction-to-Ambient – Steady State (Note 1)  | $R_{\theta JA}$ | 125  | $^\circ\text{C/W}$ |
| Junction-to-Ambient – $t \leq 10$ s (Note 1) | $R_{\theta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

# NTGS4141N

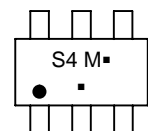
| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP       | $I_D$ MAX |
|---------------|------------------------|-----------|
| 30 V          | 21.5 m $\Omega$ @ 10 V | 7.0 A     |
|               | 30 m $\Omega$ @ 4.5 V  |           |

### N-Channel



TSOP-6  
CASE 318G  
STYLE 1

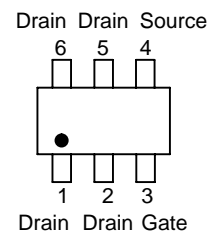
### MARKING DIAGRAM



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

| Characteristic | Symbol | Test Condition | Min | Typ | Max | Unit |
|----------------|--------|----------------|-----|-----|-----|------|
|----------------|--------|----------------|-----|-----|-----|------|

**OFF CHARACTERISTICS**

|   |                   |   |                           |      |           |               |
|---|-------------------|---|---------------------------|------|-----------|---------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$   | 30                        |      |           | V             |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |   |                           | 18.4 |           | mV/°C         |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$     | $T_J = 25^\circ\text{C}$  |      | 1.0       | $\mu\text{A}$ |
|   |                   |   | $T_J = 125^\circ\text{C}$ |      | 10        |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ |                           |      | $\pm 100$ | nA            |

**ON CHARACTERISTICS** (Note 3)

|  |                  |   |     |      |     |            |
|--|------------------|---|-----|------|-----|------------|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$   | 1.0 |      | 3.0 | V          |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |   |     | 5.7  |     | mV/°C      |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 10\text{ V}, I_D = 7.0\text{ A}$  |     | 21.5 | 25  | m $\Omega$ |
|  |                  | $V_{GS} = 4.5\text{ V}, I_D = 6.0\text{ A}$ |     | 30   | 35  |            |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = 10\text{ V}, I_D = 7.0\text{ A}$  |     | 30   |     | S          |

**CHARGES, CAPACITANCES AND GATE RESISTANCE**

|                              |              |   |  |      |  |          |
|------------------------------|--------------|---|--|------|--|----------|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 24\text{ V}$   |  | 560  |  | pF       |
| Output Capacitance           | $C_{OSS}$    |   |  | 115  |  |          |
| Reverse Transfer Capacitance | $C_{RSS}$    |   |  | 75   |  |          |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 7.0\text{ A}$  |  | 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            | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 7.0\text{ A}$ |  | 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  |  | $\Omega$ |

**SWITCHING CHARACTERISTICS** (Note 4)

|                     |              |   |  |     |  |    |
|---------------------|--------------|---|--|-----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 24\text{ V}, I_D = 7.0\text{ A}, R_G = 3.0\ \Omega$ |  | 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   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = 2.0\text{ A}$                                     | $T_J = 25^\circ\text{C}$  |     | 0.78 | 1.0 | V  |
|                         |          |   | $T_J = 125^\circ\text{C}$ |     | 0.63 |     |    |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 2.0\text{ A}$ |                           | 15  |      | ns  |    |
| Charge Time             | $t_a$    |   |                           | 9.0 |      |     |    |
| Discharge Time          | $t_b$    |   |                           | 6.0 |      |     |    |
| Reverse Recovery Charge | $Q_{RR}$ |   |                           | 8.0 |      |     | nC |

3. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

4. Switching characteristics are independent of operating junction temperatures.