

# NTGS3446T1

## Power MOSFET 5.1 Amps, 20 Volts N-Channel TSOP-6

### Features

- Ultra Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Logic Level Gate Drive
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- $I_{DSS}$  Specified at Elevated Temperature

### Applications

- Power Management in portable and battery-powered products, i.e. computers, printers, PCMCIA cards, cellular and cordless
- Lithium Ion Battery Applications
- Notebook PC

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

Rating	Symbol	Value	Unit
Thermal Resistance			
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 @ $T_A = 25^\circ\text{C}$	$I_D$	2.5	Amps
- Pulsed Drain Current ( $t_p < 10 \mu\text{s}$ )	$I_{DM}$	10	Amps
Thermal Resistance			
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 @ $T_A = 25^\circ\text{C}$	$I_D$	3.6	Amps
- Pulsed Drain Current ( $t_p < 10 \mu\text{s}$ )	$I_{DM}$	14	Amps
Thermal Resistance			
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 @ $T_A = 25^\circ\text{C}$	$I_D$	5.1	Amps
- Pulsed Drain Current ( $t_p < 10 \mu\text{s}$ )	$I_{DM}$	2.0	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	$^\circ\text{C}$

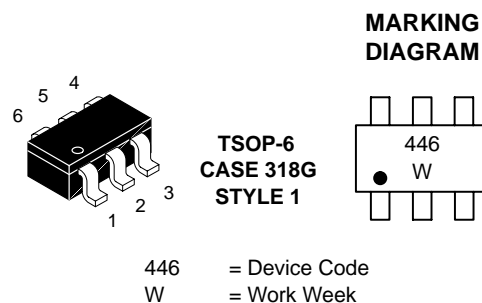
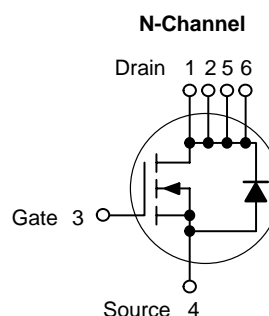
1. Minimum FR-4 or G-10PCB, operating to steady state.
2. Mounted onto a 2" square FR-4 board (1" sq. 2 oz. cu. 0.06" thick single-sided), operating to steady state.
3. Mounted onto a 2" square FR-4 board (1" sq. 2 oz. cu. 0.06" thick single-sided),  $t < 5.0$  seconds.



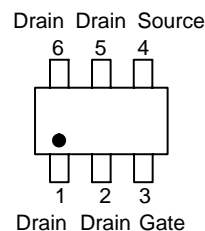
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**5.1 AMPERES  
20 VOLTS  
 $R_{DS(on)} = 45 \text{ m}\Omega$**



### PIN ASSIGNMENT



### ORDERING INFORMATION

Device	Package	Shipping
NTGS3446T1	TSOP-6	3000 Tape & Reel

# NTGS3446T1

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 0.25 mAdc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	20 -	- 22	- -	Vdc mV/°C
Zero Gate Voltage Collector Current (V <sub>DS</sub> = 20 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 20 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 85°C)	I <sub>DSS</sub>	- -	- -	1.0 25	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±12 Vdc, V <sub>DS</sub> = 0)	I <sub>GSS(f)</sub> I <sub>GSS(r)</sub>	- -	- -	100 -100	nAdc

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage I <sub>D</sub> = 0.25 mA, V <sub>DS</sub> = V <sub>GS</sub> Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	0.6 -	0.85 -2.5	1.2 -	Vdc mV/°C
Static Drain-to-Source On-Resistance (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 5.1 Adc) (V <sub>GS</sub> = 2.5 Vdc, I <sub>D</sub> = 4.4 Adc)	R <sub>DS(on)</sub>	- -	36 44	45 55	mΩ
Forward Transconductance (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 5.1 Adc)	g <sub>FS</sub>	-	12	-	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 10 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	-	510	750	pF
Output Capacitance		C <sub>oss</sub>	-	200	350	
Transfer Capacitance		C <sub>rss</sub>	-	60	100	

### SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	(V <sub>DD</sub> = 10 Vdc, I <sub>D</sub> = 1.0 Adc, V <sub>GS</sub> = 4.5 Vdc, R <sub>G</sub> = 6.0 Ω)	t <sub>d(on)</sub>	-	9.0	16	ns
Rise Time		t <sub>r</sub>	-	12	20	
Turn-Off Delay Time		t <sub>d(off)</sub>	-	35	60	
Fall Time		t <sub>f</sub>	-	20	35	
Gate Charge	(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 5.1 Adc, V <sub>GS</sub> = 4.5 Vdc)	Q <sub>T</sub>	-	8.0	15	nC
		Q <sub>gs</sub>	-	2.0	-	
		Q <sub>gd</sub>	-	2.0	-	

### SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage (Note 4)	(I <sub>S</sub> = 1.7 Adc, V <sub>GS</sub> = 0 Vdc) (I <sub>S</sub> = 1.7 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 85°C)	V <sub>SD</sub>	- -	0.74 0.66	1.1 -	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 1.7 Adc, V <sub>GS</sub> = 0 Vdc, dis/dt = 100 A/μs)	t <sub>rr</sub>	-	20	-	ns
		t <sub>a</sub>	-	11	-	
		t <sub>b</sub>	-	9.0	-	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	-	0.01	-	μC

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperature.

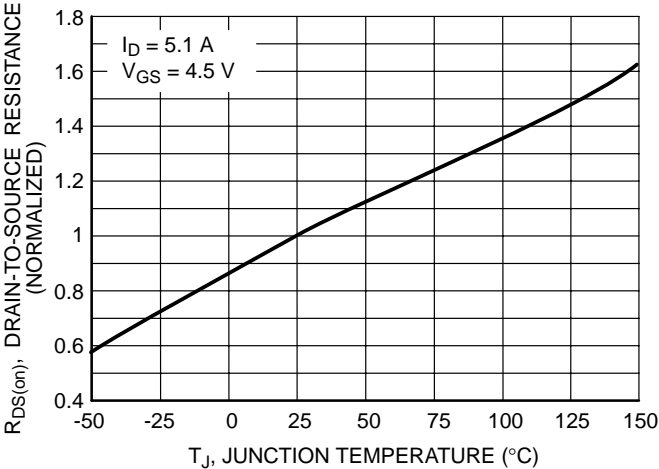


Figure 1. On-Resistance Variation with Temperature

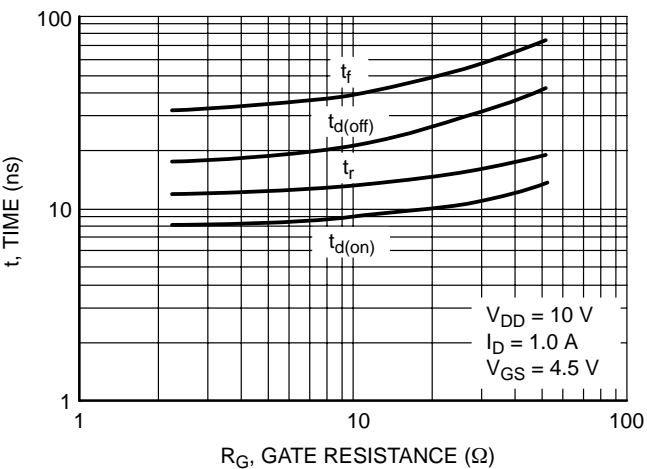
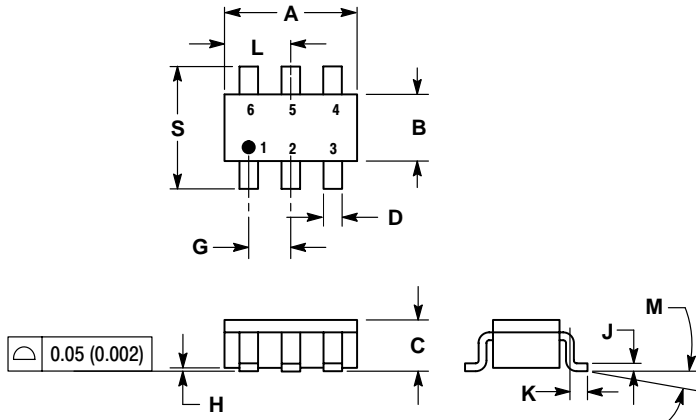


Figure 2. Resistive Switching Time Variation vs. Gate Resistance

# NTGS3446T1

## PACKAGE DIMENSIONS

TSOP-6  
CASE 318G-02  
ISSUE H




### 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.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.1142	0.1220
B	1.30	1.70	0.0512	0.0669
C	0.90	1.10	0.0354	0.0433
D	0.25	0.50	0.0098	0.0197
G	0.85	1.05	0.0335	0.0413
H	0.013	0.100	0.0005	0.0040
J	0.10	0.26	0.0040	0.0102
K	0.20	0.60	0.0079	0.0236
L	1.25	1.55	0.0493	0.0610
M	0°	10°	0°	10°
S	2.50	3.00	0.0985	0.1181

### STYLE 1:

- PIN 1: DRAIN  
2: DRAIN  
3: GATE  
4: SOURCE  
5: DRAIN  
6: DRAIN

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