

# NTGS3441T1

## Power MOSFET 1 Amp, 20 Volts

### P-Channel TSOP-6

#### Features

- Ultra Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Miniature TSOP-6 Surface Mount Package

#### 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	$V_{DS}$	-20	Volts
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 8.0$	Volts
Thermal Resistance Junction-to-Ambient (Note 1) Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$R_{\theta JA}$ $P_d$ $I_D$ $I_{DM}$	244 0.5 -1.65 -10	$^\circ\text{C/W}$ Watts Amps Amps
Thermal Resistance Junction-to-Ambient (Note 2) Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$R_{\theta JA}$ $P_d$ $I_D$ $I_{DM}$	128 1.0 -2.35 -14	$^\circ\text{C/W}$ Watts Amps Amps
Thermal Resistance Junction-to-Ambient (Note 3) Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$R_{\theta JA}$ $P_d$ $I_D$ $I_{DM}$	62.5 2.0 -3.3 -20	$^\circ\text{C/W}$ Watts Amps 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.

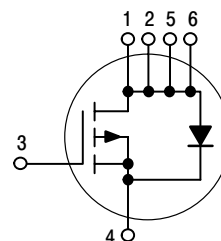


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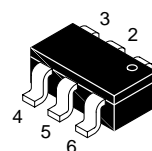
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**1 AMPERE  
20 VOLTS**  
 $R_{DS(on)} = 90 \text{ m}\Omega$

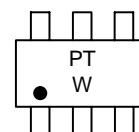
#### P-Channel



#### MARKING DIAGRAM

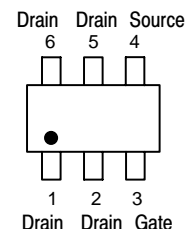


**TSOP-6  
CASE 318G  
STYLE 1**



PT = Device Code  
W = Work Week

#### PIN ASSIGNMENT



#### ORDERING INFORMATION

Device	Package	Shipping
NTGS3441T1	TSOP-6	3000 Tape & Reel

# NTGS3441T1

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain–Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = -10\text{ }\mu\text{A}$ )	$V_{(BR)DSS}$	-20	–	–	Vdc
Zero Gate Voltage Drain Current ( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 25^\circ\text{C}$ ) ( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 70^\circ\text{C}$ )	$I_{DSS}$	– –	– –	-1.0 -5.0	$\mu\text{Adc}$
Gate–Body Leakage Current ( $V_{GS} = -8.0\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	–	–	-100	nAdc
Gate–Body Leakage Current ( $V_{GS} = +8.0\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	–	–	100	nAdc

### ON CHARACTERISTICS

Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{Adc}$ )	$V_{GS(th)}$	-0.45	-1.05	-1.50	Vdc
Static Drain–Source On–State Resistance ( $V_{GS} = -4.5\text{ Vdc}$ , $I_D = -3.3\text{ Adc}$ ) ( $V_{GS} = -2.5\text{ Vdc}$ , $I_D = -2.9\text{ Adc}$ )	$R_{DS(on)}$	– –	0.069 0.117	0.090 0.135	$\Omega$
Forward Transconductance ( $V_{DS} = -10\text{ Vdc}$ , $I_D = -3.3\text{ Adc}$ )	$g_{FS}$	–	6.8	–	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	( $V_{DS} = -5.0\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$	–	480	–	pF
Output Capacitance		$C_{oss}$	–	265	–	pF
Reverse Transfer Capacitance		$C_{rss}$	–	100	–	pF

### SWITCHING CHARACTERISTICS

Turn–On Delay Time	( $V_{DD} = -20\text{ Vdc}$ , $I_D = -1.6\text{ Adc}$ , $V_{GS} = -4.5\text{ Vdc}$ , $R_g = 6.0\text{ }\Omega$ )	$t_{d(on)}$	–	13	25	ns
Rise Time		$t_r$	–	23.5	45	ns
Turn–Off Delay Time		$t_{d(off)}$	–	27	50	ns
Fall Time		$t_f$	–	24	45	ns
Total Gate Charge	( $V_{DS} = -10\text{ Vdc}$ , $V_{GS} = -4.5\text{ Vdc}$ , $I_D = -3.3\text{ Adc}$ )	$Q_{tot}$	–	6.2	14	nC
Gate–Source Charge		$Q_{gs}$	–	1.3	–	nC
Gate–Drain Charge		$Q_{gd}$	–	2.5	–	nC

### BODY–DRAIN DIODE RATINGS

Diode Forward On–Voltage	( $I_S = -1.6\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ )	$V_{SD}$	–	-0.88	-1.2	Vdc
Diode Forward On–Voltage	( $I_S = -3.3\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ )	$V_{SD}$	–	-0.98	–	Vdc
Reverse Recovery Time	( $I_S = -1.6\text{ Adc}$ , $dI_S/dt = 100\text{ A}/\mu\text{s}$ )	$t_{rr}$	–	30	60	ns

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

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

TYPICAL ELECTRICAL CHARACTERISTICS

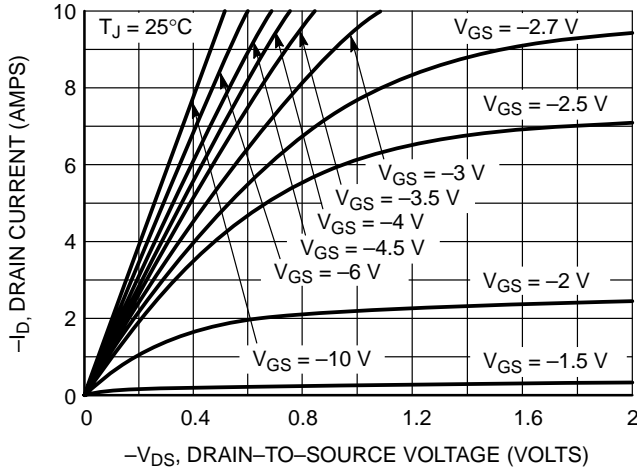


Figure 1. On-Region Characteristics

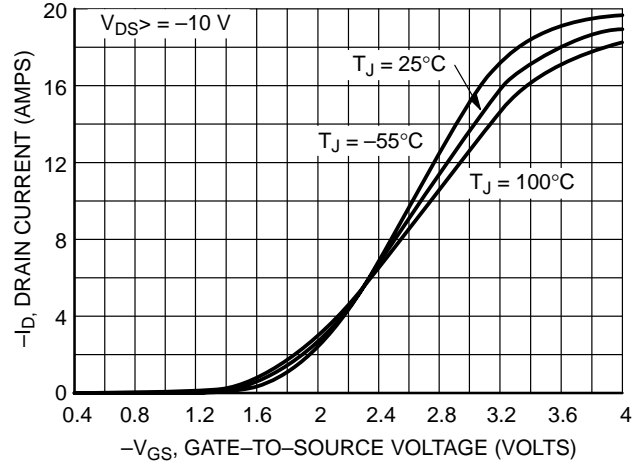


Figure 2. Transfer Characteristics

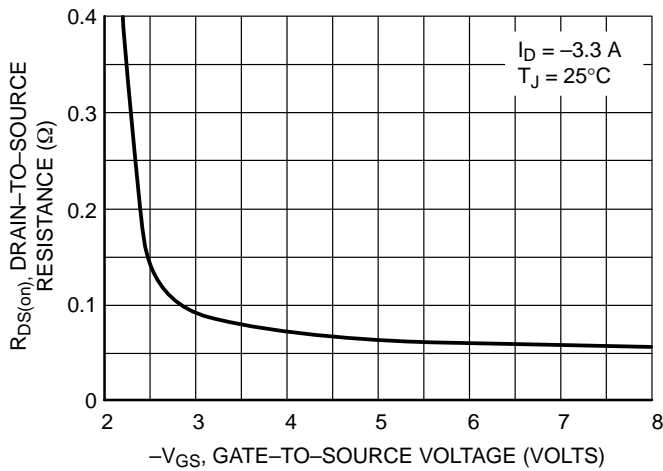


Figure 3. On-Resistance vs. Gate-to-Source Voltage

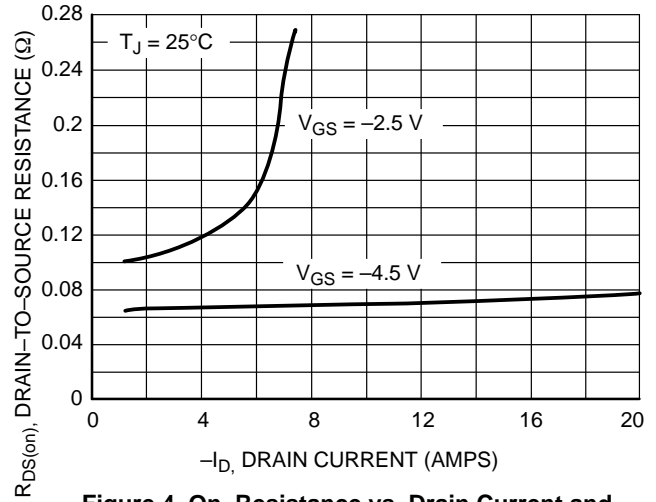


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

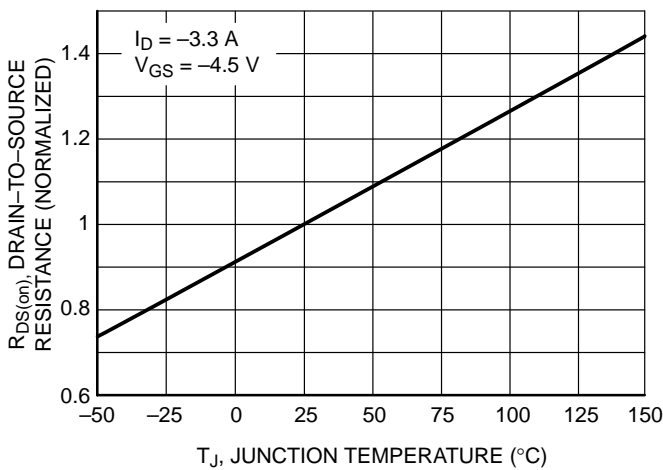


Figure 5. On-Resistance Variation with Temperature

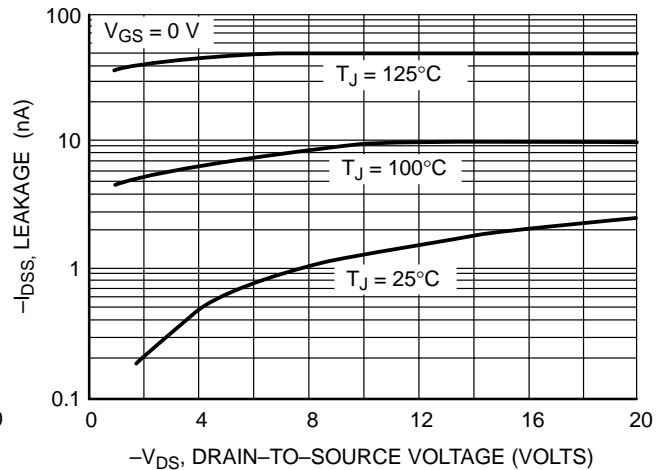
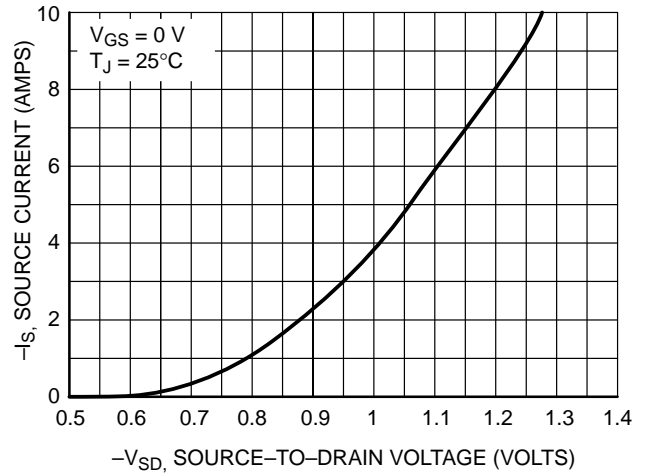
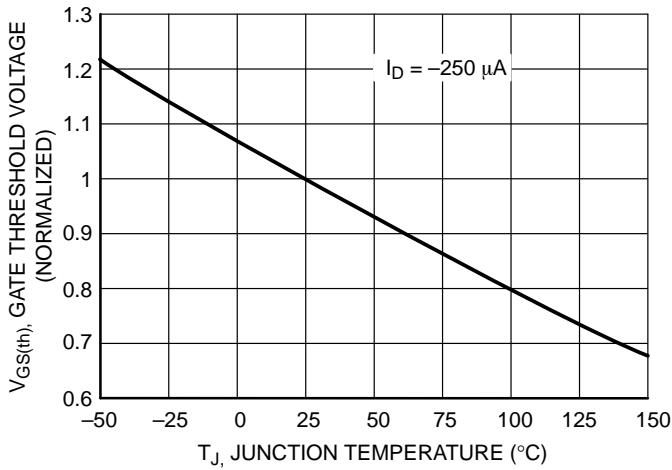
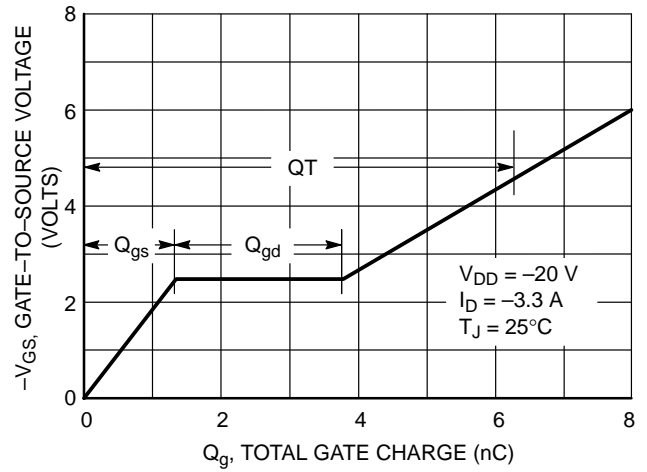
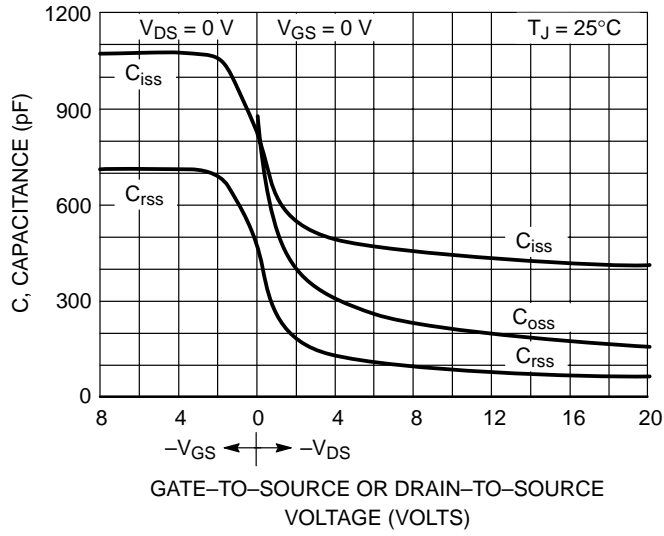


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL ELECTRICAL CHARACTERISTICS



# NTGS3441T1

## TYPICAL ELECTRICAL CHARACTERISTICS

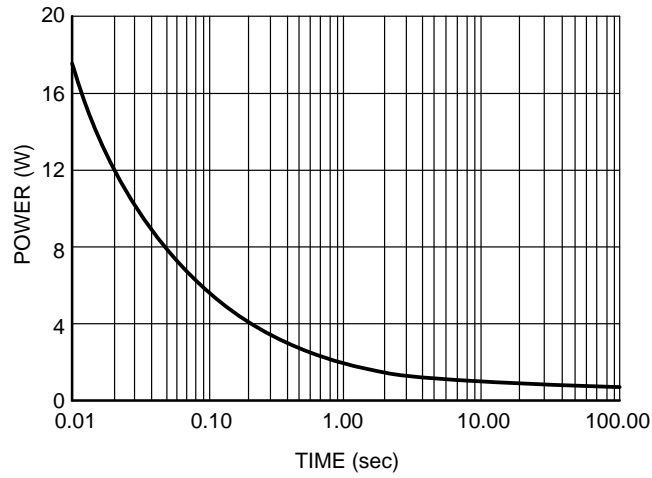


Figure 11. Single Pulse Power

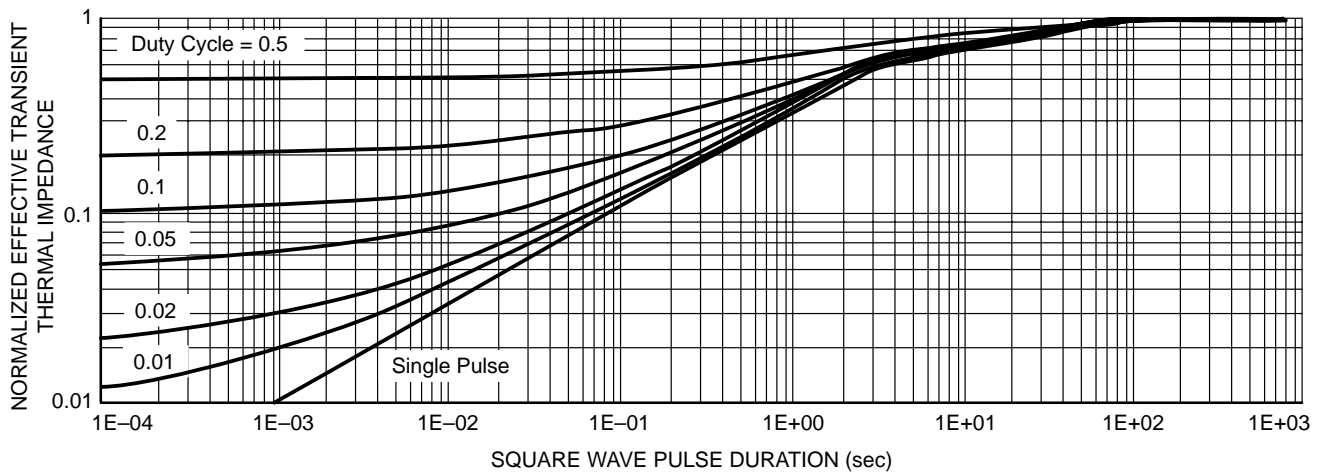


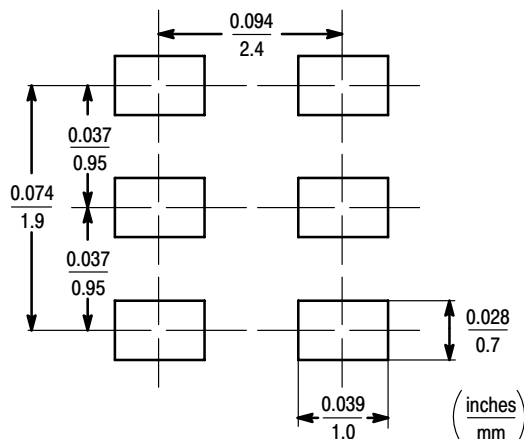
Figure 12. Normalized Thermal Transient Impedance, Junction-to-Ambient

## INFORMATION FOR USING THE TSOP-6 SURFACE MOUNT PACKAGE

### MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection

interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



### SOLDERING PRECAUTIONS

The melting temperature of solder is higher than the rated temperature of the device. When the entire device is heated to a high temperature, failure to complete soldering within a short time could result in device failure. Therefore, the following items should always be observed in order to minimize the thermal stress to which the devices are subjected.

- Always preheat the device.
- The delta temperature between the preheat and soldering should be 100°C or less.\*
- When preheating and soldering, the temperature of the leads and the case must not exceed the maximum temperature ratings as shown on the data sheet. When using infrared heating with the reflow soldering method, the difference shall be a maximum of 10°C.

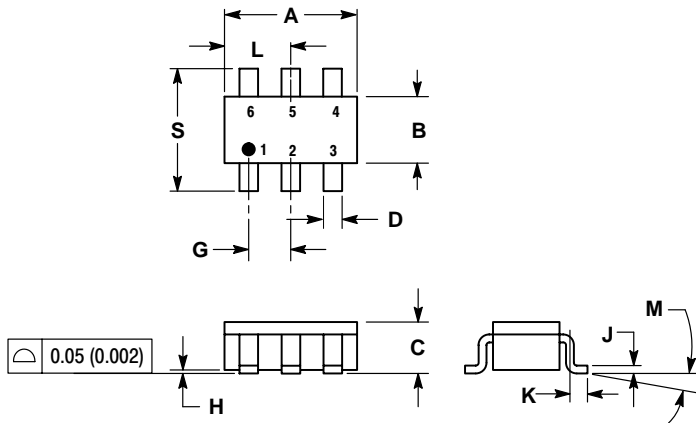
- The soldering temperature and time shall not exceed 260°C for more than 10 seconds.
- When shifting from preheating to soldering, the maximum temperature gradient shall be 5°C or less.
- After soldering has been completed, the device should be allowed to cool naturally for at least three minutes. Gradual cooling should be used as the use of forced cooling will increase the temperature gradient and result in latent failure due to mechanical stress.
- Mechanical stress or shock should not be applied during cooling.

\* \* Soldering a device without preheating can cause excessive thermal shock and stress which can result in damage to the device.

# NTGS3441T1

## 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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