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[ON Semiconductor](#)  
[NTGS1135PT1G](#)

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# NTGS1135P

## Power MOSFET

-8 V, -5.8 A, Single P-Channel, TSOP-6

### Features

- Ultra Low  $R_{DS(on)}$
- 1.2 V  $R_{DS(on)}$  Rating
- This is a Pb-Free Device

### Applications

- Load Switch
- Battery Management

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

Parameter	Symbol	Value	Unit		
Drain-to-Source Voltage	$V_{DSS}$	-8.0	V		
Gate-to-Source Voltage	$V_{GS}$	$\pm 6.0$	V		
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	-4.6	A	
		$T_A = 85^\circ\text{C}$			-3.3
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$	-5.8		
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	0.97	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	-9.2	A	
Operating Junction and Storage Temperature	$T_J$ , $T_{STG}$	-55 to	150	$^\circ\text{C}$	
Source Current (Body Diode)	$I_S$	-1.0	A		
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	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. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1 in sq [2 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size. (Cu area = 0.0751 in sq)

### THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	128	$^\circ\text{C/W}$
Junction-to-Ambient - $t = 5 \text{ s}$ (Note 1)	$R_{\theta JA}$	78	
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	188	

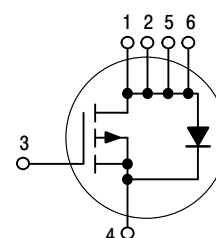


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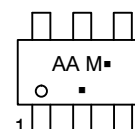
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
-8 V	31 m $\Omega$ @ -4.5 V	-4.6 A
	38 m $\Omega$ @ -2.5 V	
	57 m $\Omega$ @ -1.8 V	
	300 m $\Omega$ @ -1.2 V	

### P-Channel

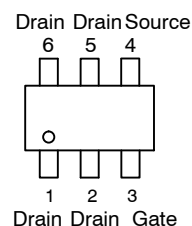


### MARKING DIAGRAM



- AA = Device Code
  - M = Date Code
  - = Pb-Free Package
- (Note: Microdot may be in either location)

### PIN ASSIGNMENT



### ORDERING INFORMATION

Device	Package	Shipping†
NTGS1135PT1G	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.

## NTGS1135P

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-8.0			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\ \mu\text{A}, \text{Ref to } 25^\circ\text{C}$		-8.4		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = -6\text{ V}$			-1.0	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 6\text{ V}$			$\pm 100$	nA

**ON CHARACTERISTICS** (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-0.35	-0.57	-0.85	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			2.8		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -4.6\text{ A}$		22	31	m $\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -2.5\text{ A}$		28	38	
		$V_{GS} = -1.8\text{ V}, I_D = -2.0\text{ A}$		37	57	
		$V_{GS} = -1.5\text{ V}, I_D = -1.0\text{ A}$		47	73	
		$V_{GS} = -1.2\text{ V}, I_D = -0.1\text{ A}$		100	300	
Forward Transconductance	$g_{FS}$	$V_{DS} = -4.0\text{ V}, I_D = -3.0\text{ A}$		1.2		S

**CHARGES, CAPACITANCES AND GATE RESISTANCE**

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -6.0\text{ V}$		2200		pF
Output Capacitance	$C_{OSS}$			400		
Reverse Transfer Capacitance	$C_{RSS}$			200		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -8.0\text{ V}; I_D = -2.5\text{ A}$		21		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.9		
Gate-to-Source Charge	$Q_{GS}$			2.8		
Gate-to-Drain Charge	$Q_{GD}$			3.9		

**SWITCHING CHARACTERISTICS** (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -8.0\text{ V}, I_D = -2.5\text{ A}, R_G = 6.2\ \Omega$		10		ns
Rise Time	$t_r$			16		
Turn-Off Delay Time	$t_{d(OFF)}$			128		
Fall Time	$t_f$			71		

**DRAIN-SOURCE DIODE CHARACTERISTICS**

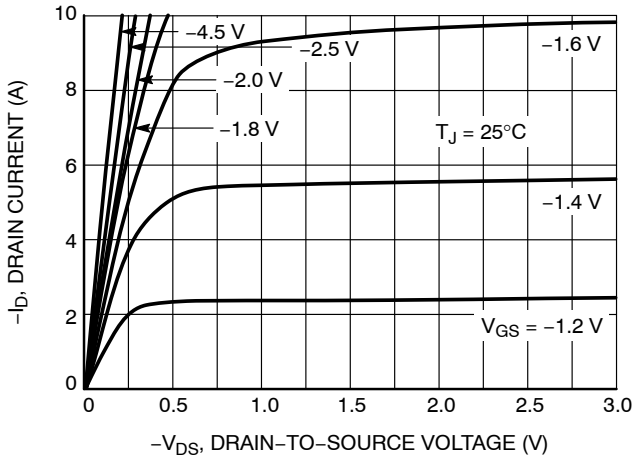
Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = -1.0\text{ A}$	$T_J = 25^\circ\text{C}$		-0.6	-1.0	V
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = -1.0\text{ A}$			25		ns
Charge Time	$t_a$				11		
Discharge Time	$t_b$				14		
Reverse Recovery Charge	$Q_{RR}$				13		

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

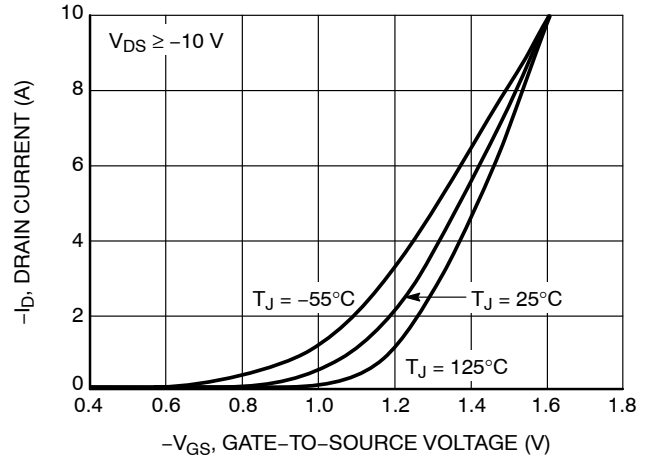
4. Switching characteristics are independent of operating junction temperatures

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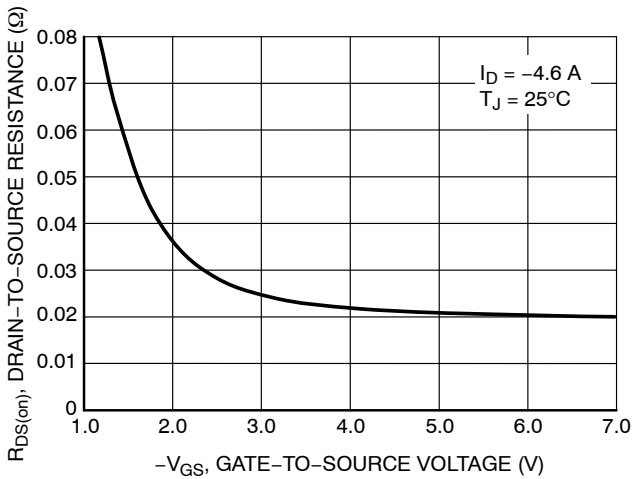
**TYPICAL CHARACTERISTICS**



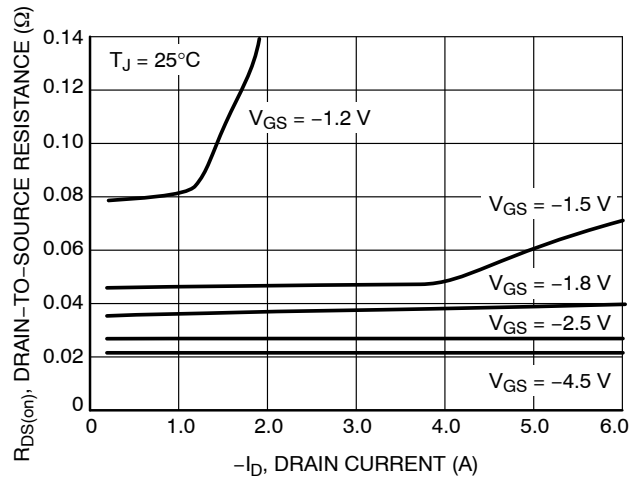
**Figure 1. On-Region Characteristics**



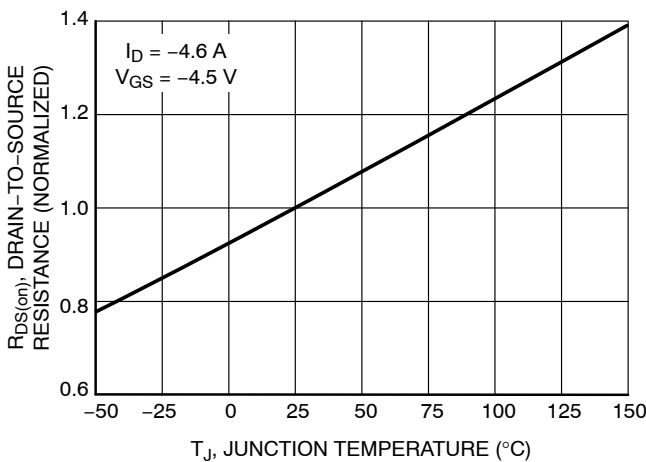
**Figure 2. Transfer Characteristics**



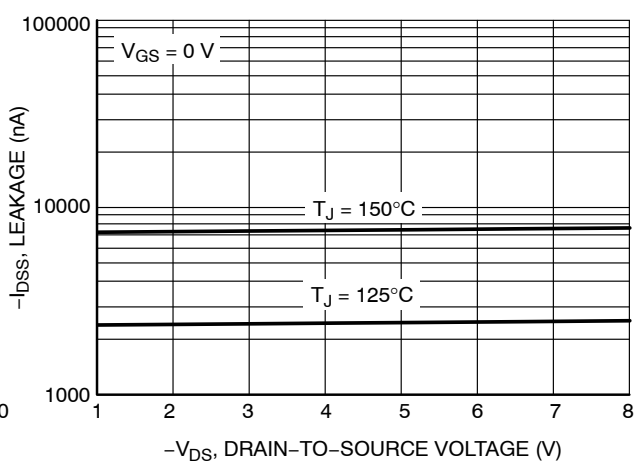
**Figure 3. On-Resistance vs. Gate Voltage**



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



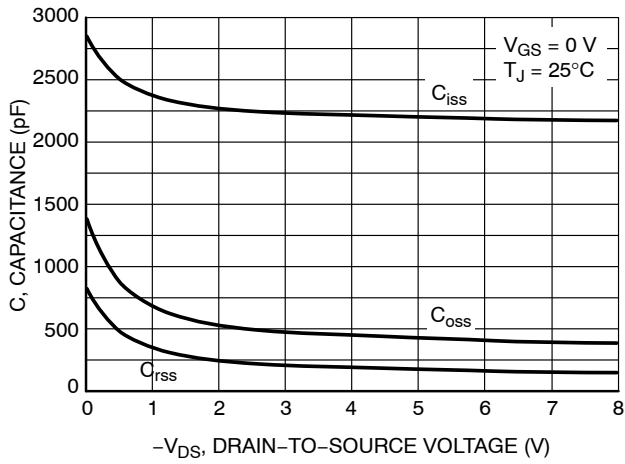
**Figure 5. On-Resistance Variation with Temperature**



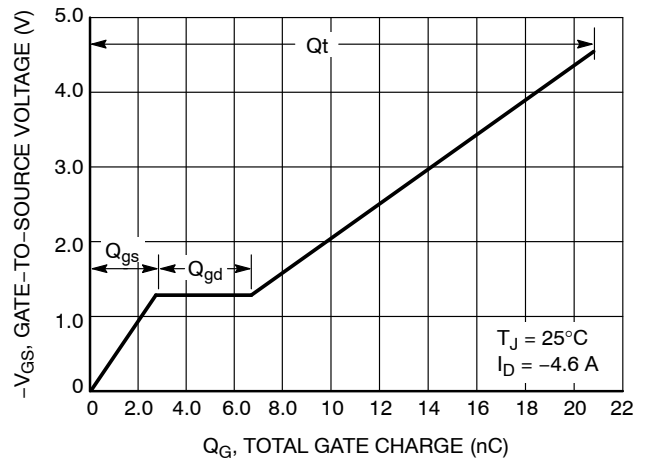
**Figure 6. Drain-to-Source Leakage Current vs. Voltage**

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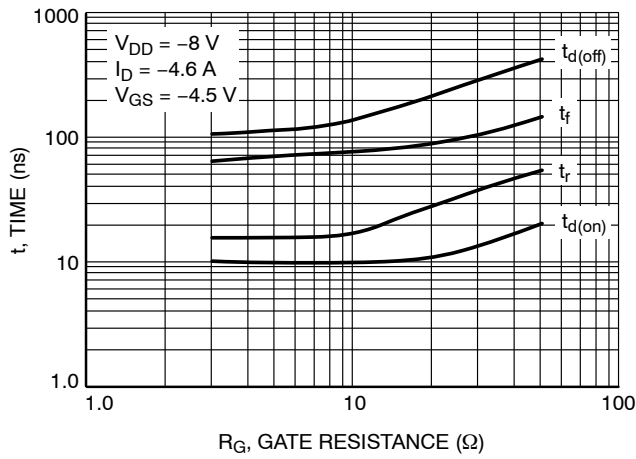
**TYPICAL CHARACTERISTICS**



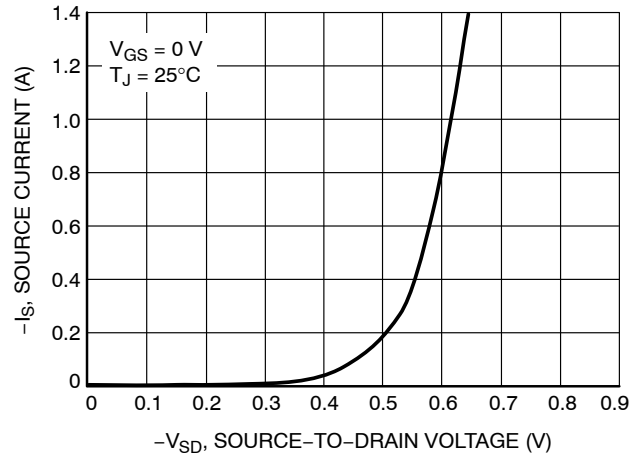
**Figure 7. Capacitance Variation**



**Figure 8. Gate-to-Source Voltage vs. Total Charge**



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

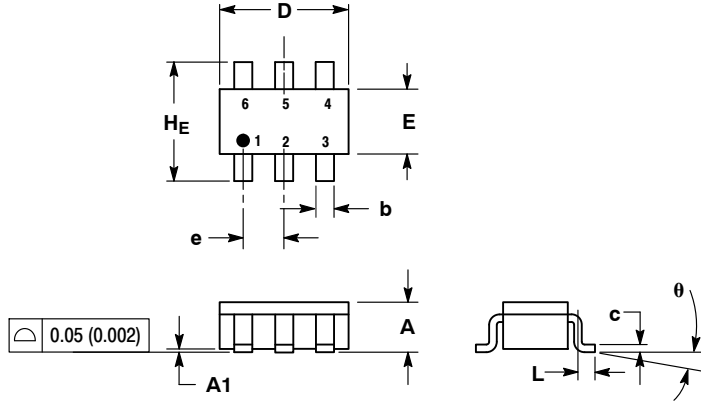


**Figure 10. Diode Forward Voltage vs. Current**

## NTGS1135P

### PACKAGE DIMENSIONS

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

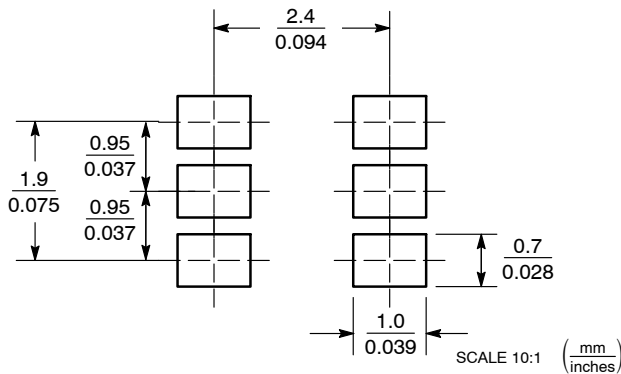


NOTES:

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°

#### SOLDERING FOOTPRINT\*



STYLE 1:

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

\*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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