NTGS4111P, NVGS4111P

Power MOSFET

−30 V, −4.7 A, Single P−Channel, TSOP−6

Features

- Leading −30 V Trench Process for Low $R_{DS(on)}$
- Low Profile Package Suitable for Portable Applications
- Surface Mount TSOP−6 Package Saves Board Space
- Improved Efficiency for Battery Applications
- NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- Pb−Free Package is Available

Applications

- Battery Management and Switching
- Load Switching
- Battery Protection

MAXIMUM RATINGS (T_J = 25°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°C	I_D	−3.7	A
		T_A = 85°C		−2.7	
	t ≤ 5 s	T_A = 25°C		−4.7	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	1.25	W
	t ≤ 5 s			2.0	
Continuous Drain Current (Note 2)	Steady State	T_A = 25°C	I_D	−2.6	A
		T_A = 85°C		−1.9	
Power Dissipation (Note 2)		T_A = 25°C	P_D	0.63	W
Pulsed Drain Current	tp = 10 μs		I_{DM}	−15	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 150	°C
Source Current (Body Diode)			I_S	−1.7	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

THERMAL RESISTANCE RATINGS

Rating	Symbol	Max	Unit
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	100	°C/W
Junction−to−Ambient − t ≤ 5 s (Note 1)	$R_{\theta JA}$	62.5	
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	200	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface−mounted on FR4 board using 1 in 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 = 0.006 in sq).

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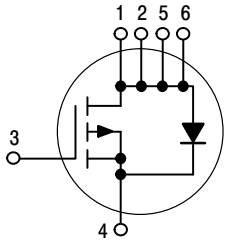
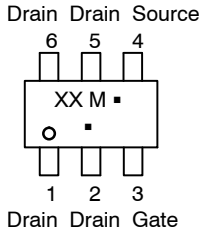
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
−30 V	38 mΩ @ −10 V	−4.7 A
	68 mΩ @ −4.5 V	

P−Channel



MARKING DIAGRAM & PIN ASSIGNMENT

TSOP−6
CASE 318G
STYLE 1



XX = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering and shipping information ion page 5 of this data sheet.

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	$V_{(BR)DSS}/T_J$				−17		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			−100	
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	$V_{GS(TH)}/T_J$				5.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = −10 V, I_D = −3.7 A			38	60	mΩ
		V_{GS} = −4.5 V, I_D = −2.7 A			68	110	
Forward Transconductance	g_{FS}	V_{DS} = −10 V, I_D = −3.7 A			6.0		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −15 V			750		pF
Output Capacitance	C_{OSS}				140		
Reverse Transfer Capacitance	C_{RSS}				105		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −10 V, V_{DD} = −15 V, I_D = −3.7 A			15.25	32	nC
Threshold Gate Charge	$Q_{G(TH)}$				0.8		
Gate−to−Source Charge	Q_{GS}				2.6		
Gate−to−Drain Charge	Q_{GD}				3.4		
SWITCHING CHARACTERISTICS, VGS = −10 V (Note 4)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −10 V, V_{DD} = −15 V, I_D = −1.0 A, R_G = 6.0 Ω			9.0	17	ns
Rise Time	t_r				9.0	18	
Turn−Off Delay Time	$t_{d(OFF)}$				38	85	
Fall Time	t_f				22	45	
SWITCHING CHARACTERISTICS, VGS = −4.5 V (Note 4)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −4.5 V, V_{DD} = −15 V, I_D = −1.0 A, R_G = 6.0 Ω			11	20	ns
Rise Time	t_r				15	28	
Turn−Off Delay Time	$t_{d(OFF)}$				28	56	
Fall Time	t_f				22	50	
DRAIN − SOURCE DIODE CHARACTERISTICS							
Characteristic	**Symbol**	**Test Condition**		**Min**	**Typ**	**Max**	**Unit**
Forward Diode Voltage	V_{DS}	V_{GS} = 0 V, I_S = −1.0 A	T_J = 25°C		−0.76	−1.2	V
			T_J = 125°C		−0.60		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = −1.0 A			17	40	ns
Charge Time	t_a				9.0		
Discharge Time	t_b				8.0		
Reverse Recovery Charge	Q_{RR}				8.0		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

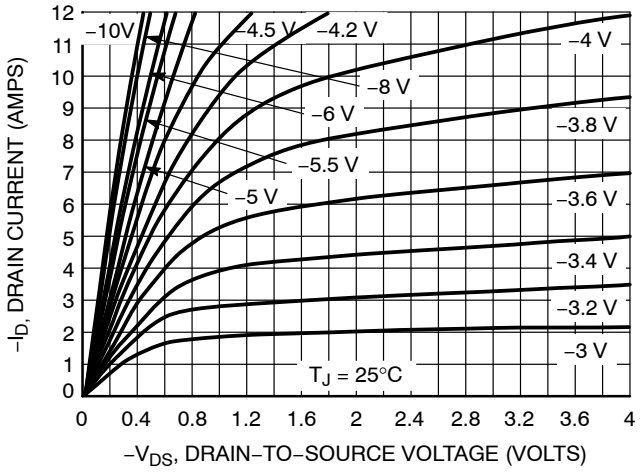


Figure 1. On−Region Characteristics

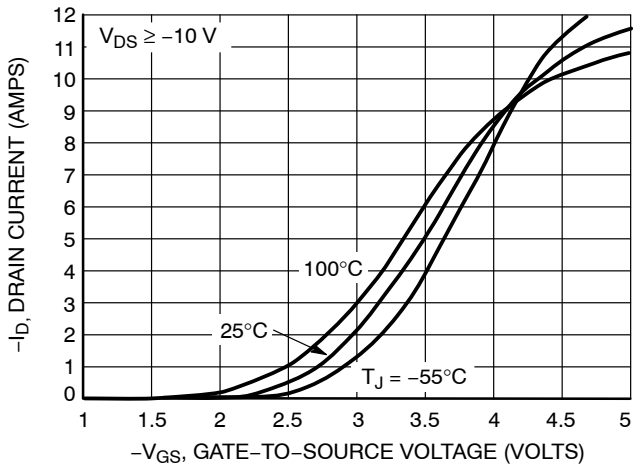


Figure 2. Transfer Characteristics

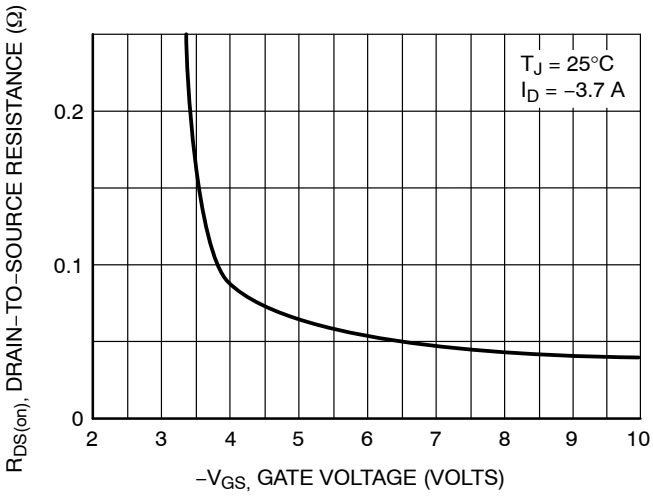


Figure 3. On−Resistance vs. Gate−to−Source Voltage

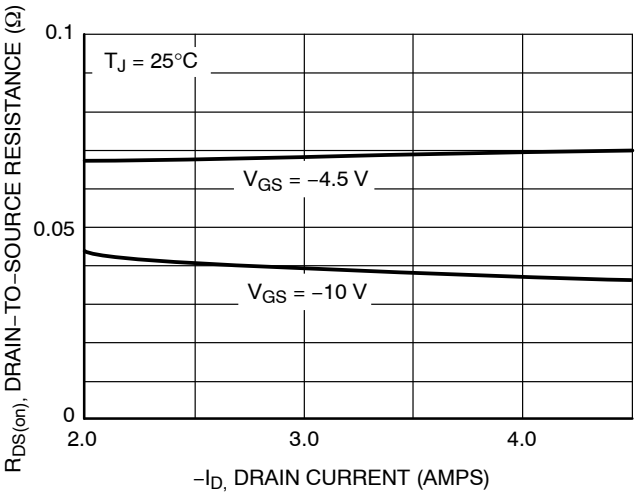


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

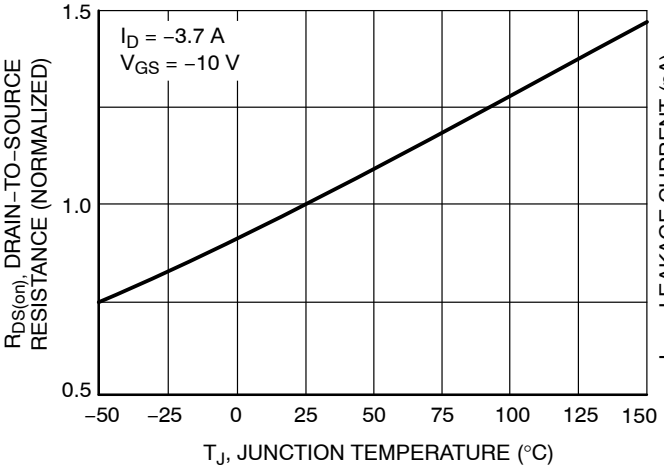


Figure 5. On−Resistance Variation with Temperature

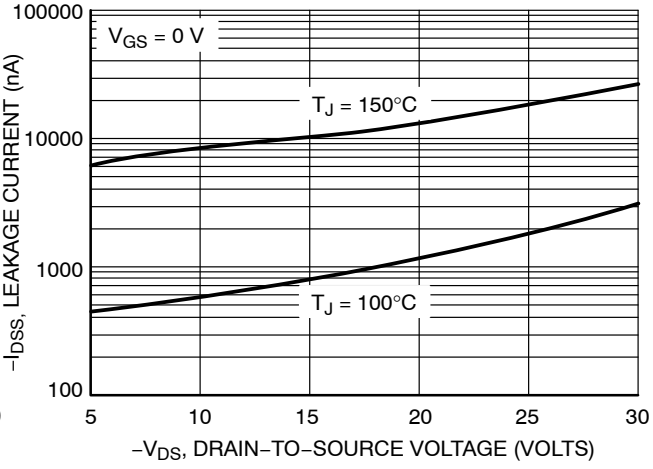


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

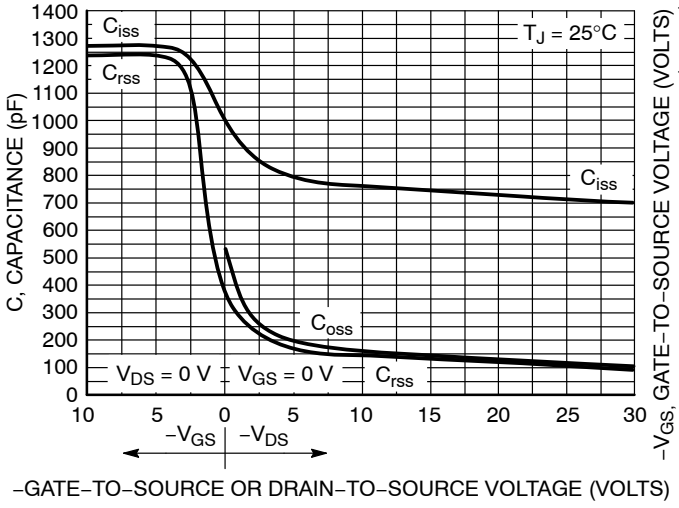


Figure 7. Capacitance Variation

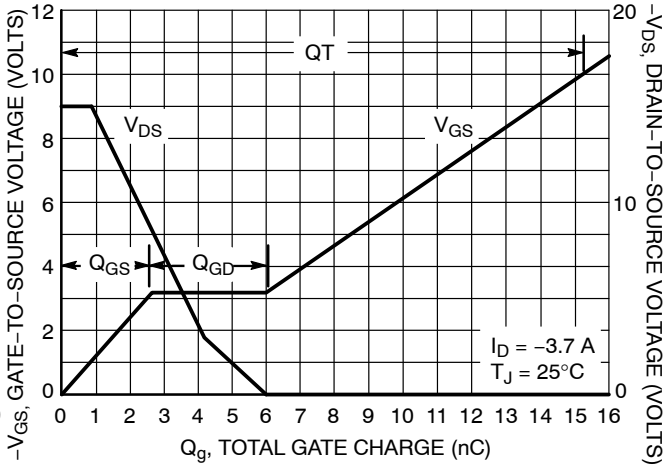


Figure 8. Gate−to−Source Voltage vs. Total Gate Charge

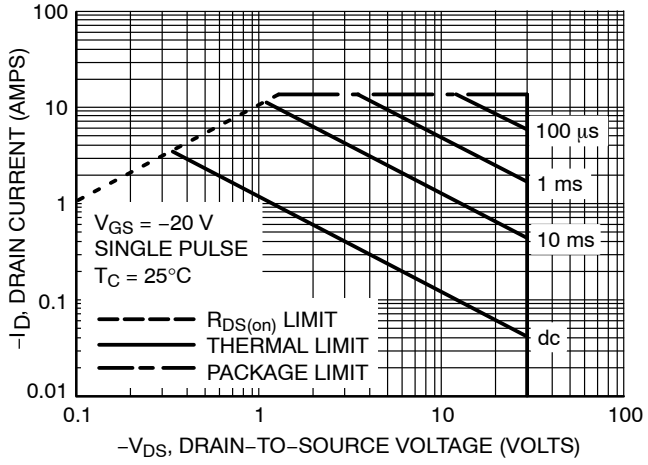


Figure 9. Maximum Rated Forward Biased Safe Operating Area

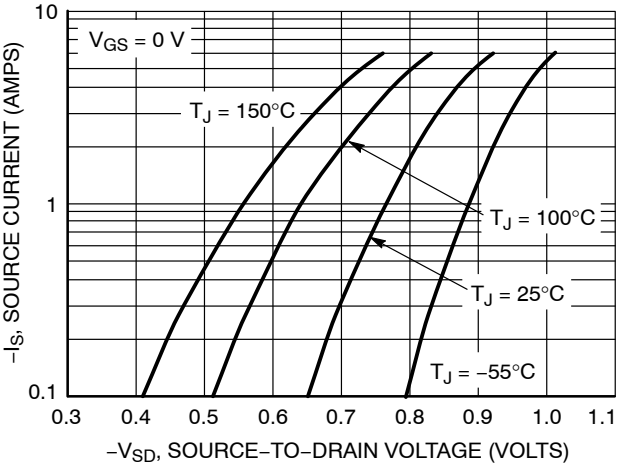


Figure 10. Diode Forward Voltage vs. Current

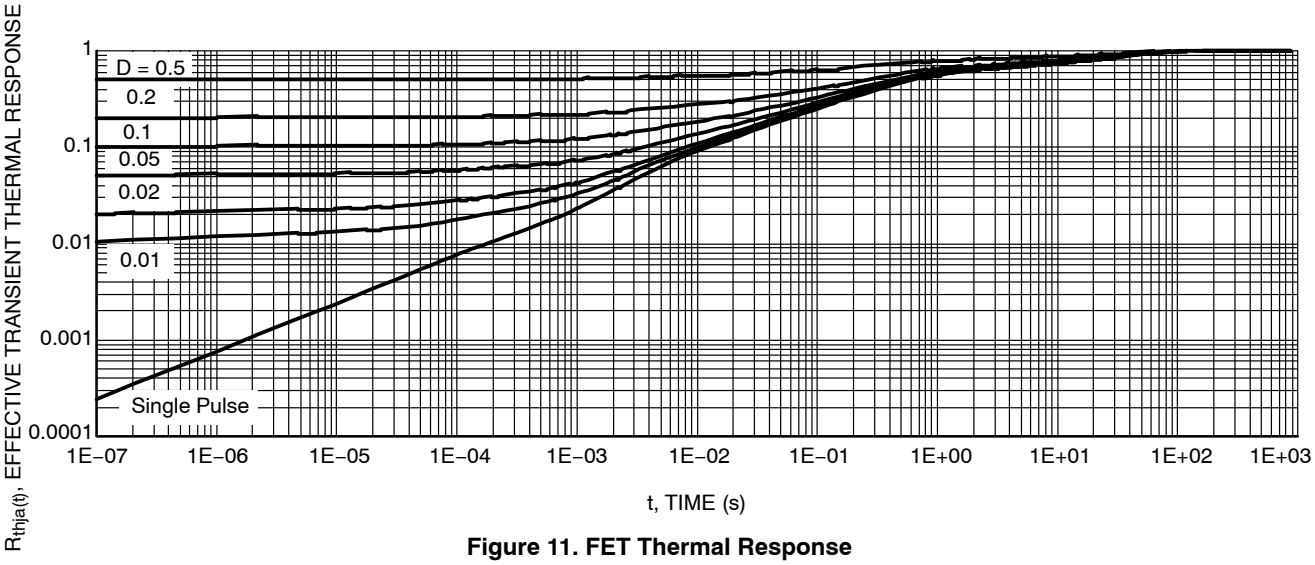


Figure 11. FET Thermal Response

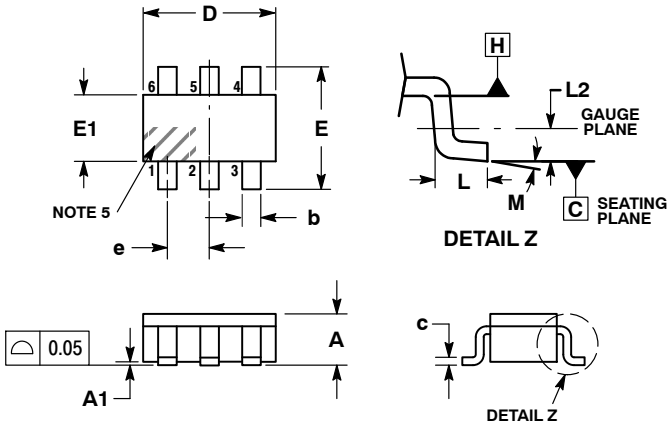
Table 1. ORDERING INFORMATION

Part Number	Marking (XX)	Package	Shipping†
NTGS4111PT1	TG	SC−88	3000 / Tape & Reel
NTGS4111PT1G	TG	SC−88 (Pb−Free)	3000 / Tape & Reel
NVGS4111PT1G	VTG	SC−88 (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.

PACKAGE DIMENSIONS

TSOP−6
CASE 318G−02
ISSUE V

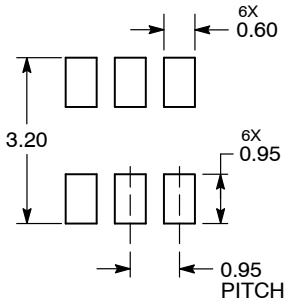


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	–	10°

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
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