

NVGS4111P

Product Preview

Power MOSFET

–30 V, –6.2 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
- AEC–Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR–Free and are RoHS Compliant

Applications

- Battery Management and Switching
- Load Switching
- Battery Protection

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

Rating		Symbol	Value	Unit	
Drain–to–Source Voltage		V_{DS}	–30	V	
Gate–to–Source Voltage		V_{GS}	± 20	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	I_D	–4.9	A
			$T_A = 85^\circ\text{C}$	–3.8	
	$t \leq 5\text{ s}$	$T_A = 25^\circ\text{C}$	–6.2		
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	P_D	1.5	W
			$t \leq 5\text{ s}$	2.4	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	I_D	–3.5	A
		$T_A = 85^\circ\text{C}$	–2.7		
Power Dissipation (Note 2)		$T_A = 25^\circ\text{C}$	P_D	0.75	W
Pulsed Drain Current	$t_p = 10\ \mu\text{s}$	I_{DM}	–19.6	A	
Operating Junction and Storage Temperature		T_J, T_{STG}	–55 to 175	$^\circ\text{C}$	
Source Current (Body Diode)		I_S	–1.25	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	$^\circ\text{C}$	

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.

THERMAL RESISTANCE RATINGS

Rating	Symbol	Max	Unit
Junction–to–Ambient – Steady State (Note 1)	$R_{\theta JA}$	100	$^\circ\text{C}/\text{W}$
Junction–to–Ambient – $t \leq 5\text{ s}$ (Note 1)	$R_{\theta JA}$	62.5	
Junction–to–Ambient – Steady State (Note 2)	$R_{\theta JA}$	200	

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).

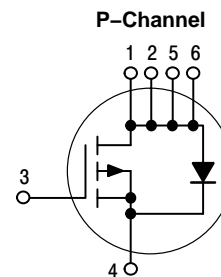
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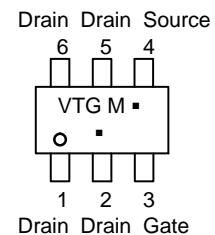
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
–30 V	38 m Ω @ –10 V	–6.2 A
	68 m Ω @ –4.5 V	



MARKING DIAGRAM & PIN ASSIGNMENT



TSOP–6
CASE 318G
STYLE 1



VTG = 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

Device	Package	Shipping†
NVGS4111PT1G	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.

NVGS4111P

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, V_{GS} = -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, V_{GS} = -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

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

NVGS4111P

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

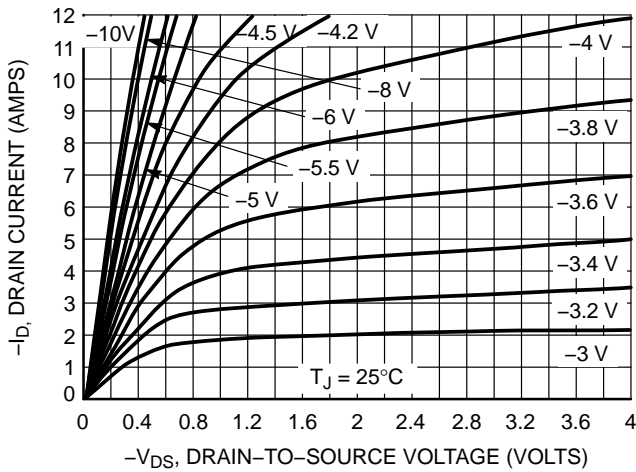


Figure 1. On-Region Characteristics

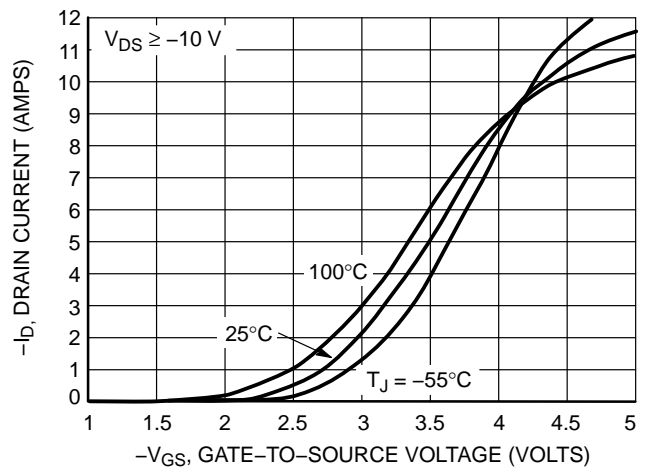


Figure 2. Transfer Characteristics

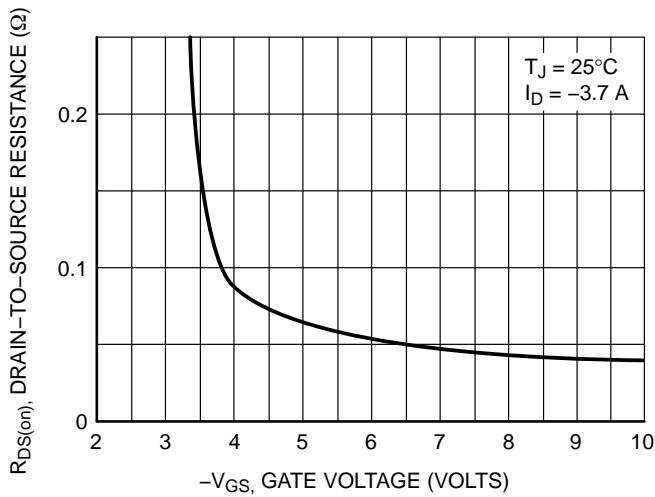


Figure 3. On-Resistance vs. Gate-to-Source Voltage

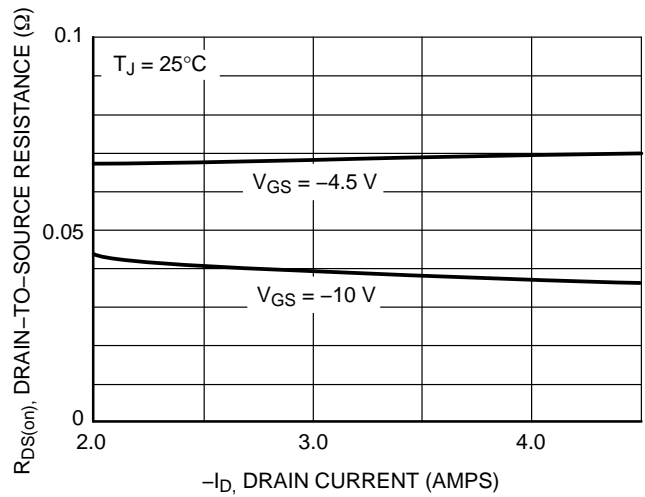


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

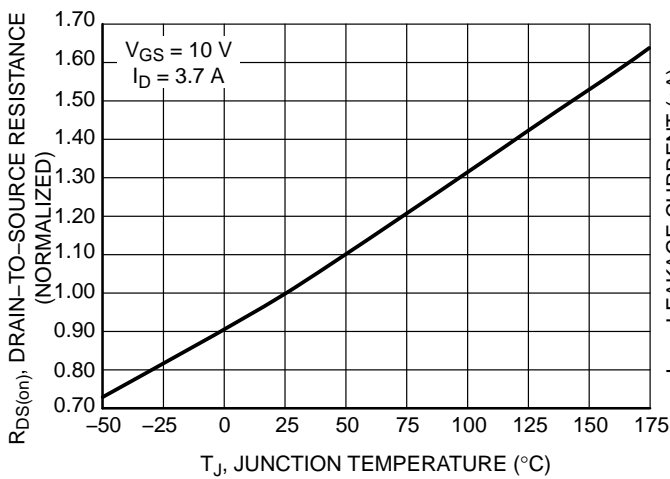


Figure 5. On-Resistance Variation with Temperature

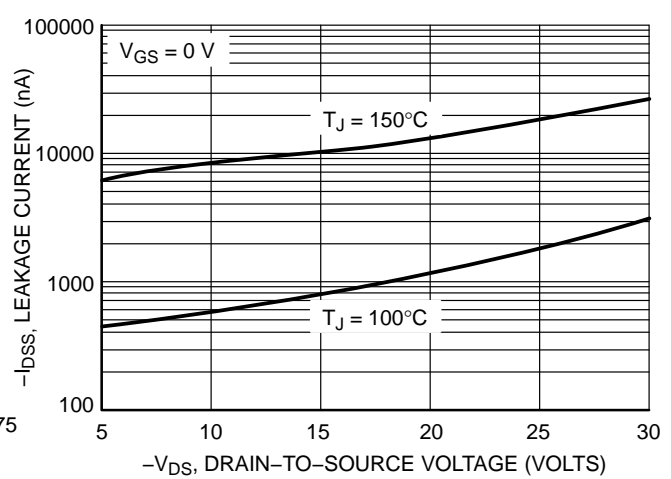


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

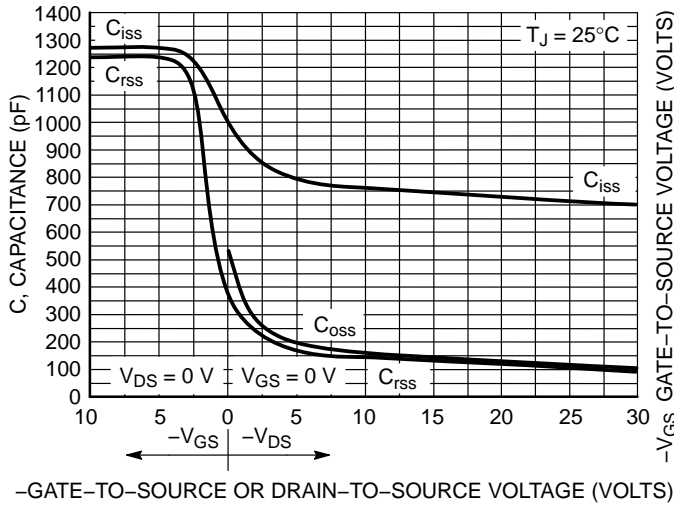


Figure 7. Capacitance Variation

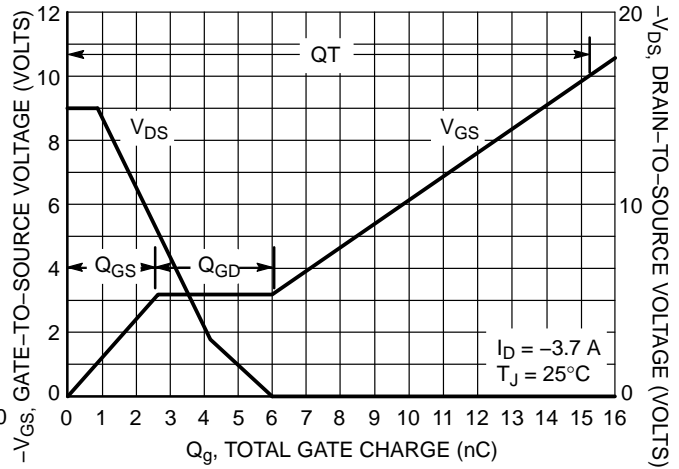


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

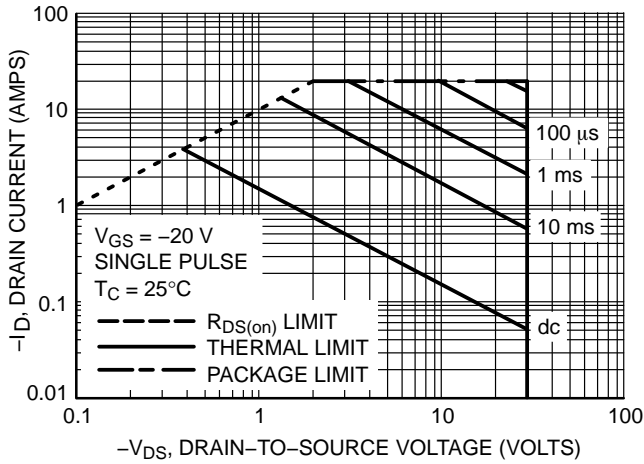


Figure 9. Maximum Rated Forward Biased Safe Operating Area

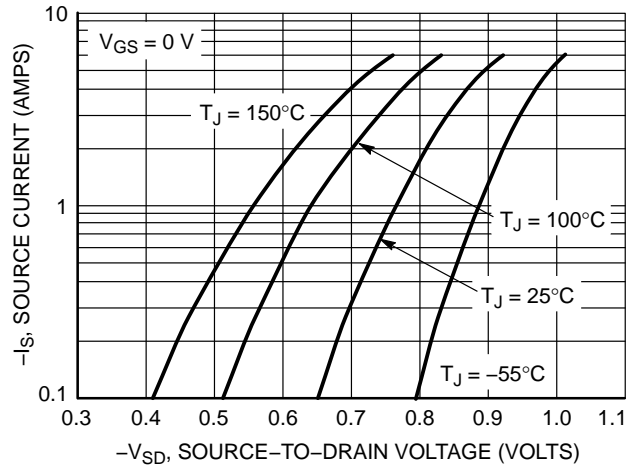


Figure 10. Diode Forward Voltage vs. Current

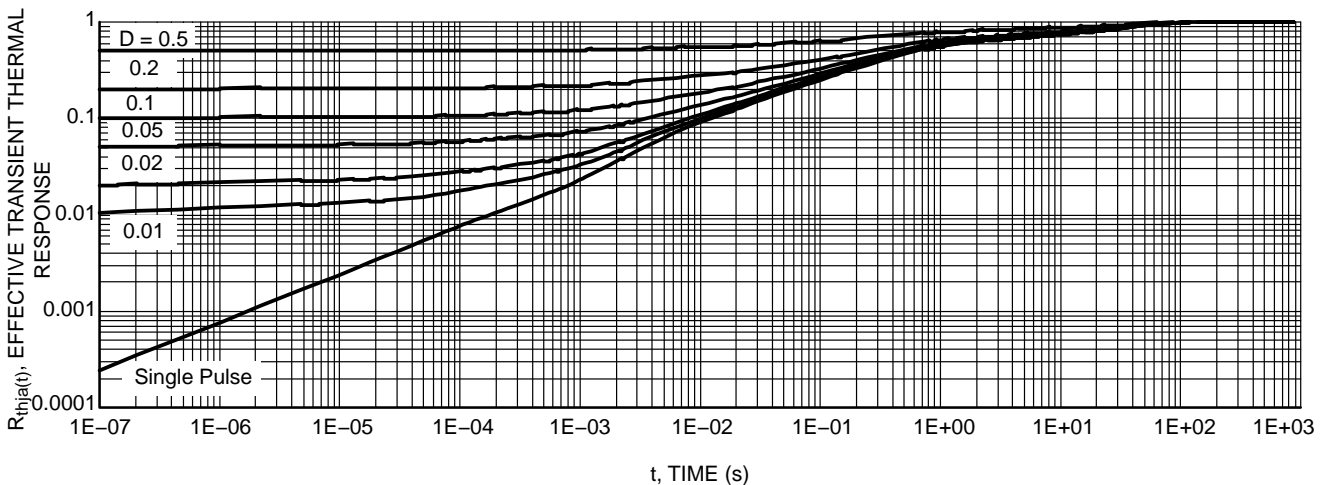
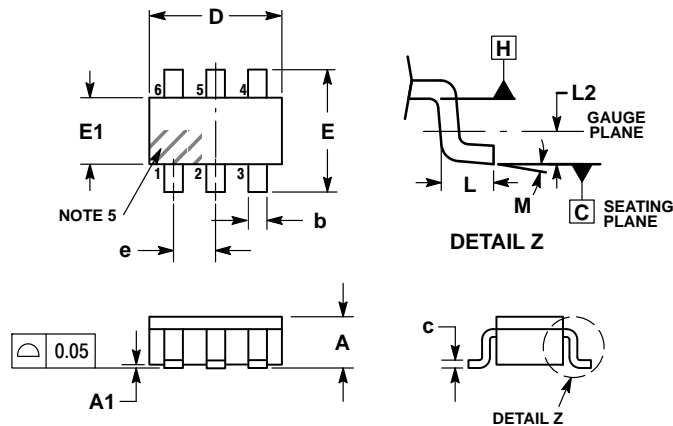


Figure 11. FET Thermal Response

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PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE V



NOTES:

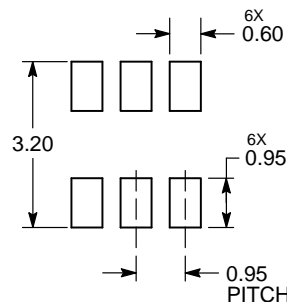
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, 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.

DIM	MILLIMETERS		
	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:


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.

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