MOSFET – Power, Dual, P-Channel, SOIC-8 6 A, 20 V

Features

- Ultra Low RDS(on)
- Higher Efficiency Extending Battery Life
- Logic Level Gate Drive
- Miniature Dual SOIC-8 Surface Mount Package
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- These Devices are Pb-Free and are RoHS Compliant
- NVMD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

Applications

• Power Management in Portable and Battery–Powered Products, i.e.: Cellular and Cordless Telephones, and PCMCIA Cards

MAXIMUM RATINGS

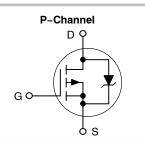
Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	-20	V
Gate-to-Source Voltage - Continuous	V _{GS}	±12	V
Thermal Resistance – Junction–to–Ambient (Note 1) Total Power Dissipation @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $T_A = 70^{\circ}C$ Maximum Operating Power Dissipation Maximum Operating Drain Current Pulsed Drain Current (Note 4)	R _{0JA} P _D I _D P _D I _D I _{DM}	62.5 2.0 -7.8 -5.7 0.5 -3.89 -40	°C/W W A A W A A
Thermal Resistance – Junction-to-Ambient (Note 2) Total Power Dissipation @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $T_A = 70^{\circ}C$ Maximum Operating Power Dissipation Maximum Operating Drain Current Pulsed Drain Current (Note 4)	R _{θJA} P _D I _D P _D I _D I _{DM}	98 -6.2 -4.6 0.3 -3.01 -35	× A A A A A A A
Thermal Resistance – Junction-to-Ambient (Note 3) Total Power Dissipation @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $T_A = 70^{\circ}C$ Maximum Operating Power Dissipation Maximum Operating Drain Current Pulsed Drain Current (Note 4) Operating and Storage Temperature Range	R _{0JA} PD ID ID ID ID TJ, Tstg	166 0.75 -4.8 -3.5 0.2 -2.48 -30 -55 to +150	\hat{o} $\mathbf{A} \mathbf{A} \mathbf{A} \mathbf{A}$ $\mathbf{A}^{\hat{o}}$
Single Pulse Drain-to-Source Avalanche Energy – Starting T _J = 25°C (V _{DD} = -20 Vdc, V _{GS} = -5.0 Vdc, Peak I _L = -5.0 Apk, L = 40 mH, R _G = 25 Ω)	E _{AS}	500	mJ
Maximum Lead Temperature for Soldering Purposes for 10 seconds	ΤL	260	°C

ON

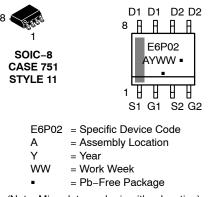
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6 AMPERES, 20 VOLTS



MARKING DIAGRAM & PIN ASSIGNMENT



(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMD6P02R2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NVMD6P02R2G	SOIC-8 (Pb-Free)	2500 / 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

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. Mounted onto a 2" square FR-4 Board (1 in sq, 2 oz. Cu 0.06" thick single sided), t = 10 seconds.

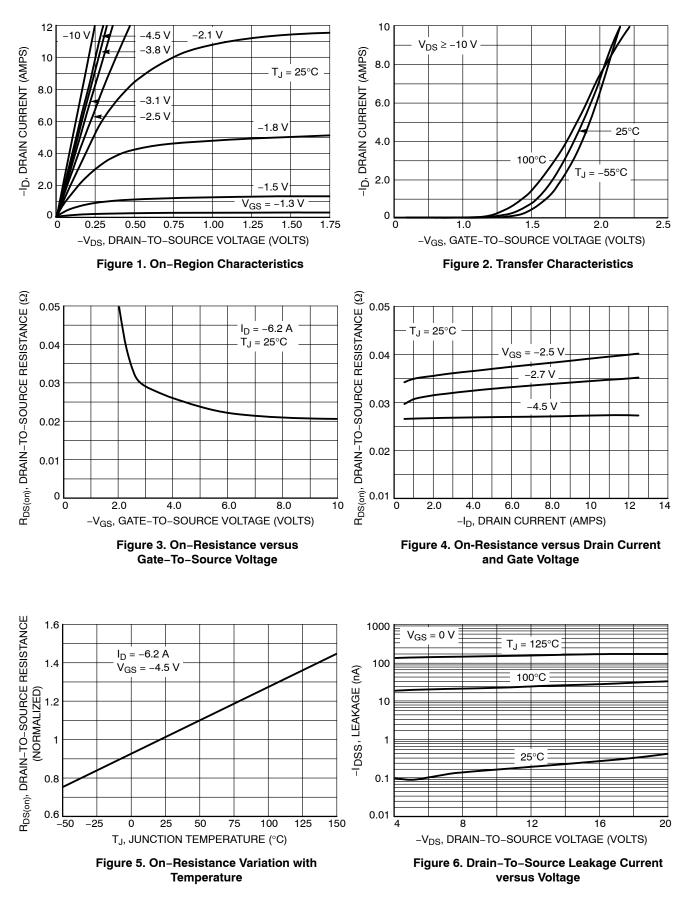
- Mounted onto a 2" square FR-4 Board (1 in sq, 2 oz. Cu 0.06" thick single sided), t = steady state.
 Minimum FR-4 or G-10 PCB, t = steady state.
 Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.

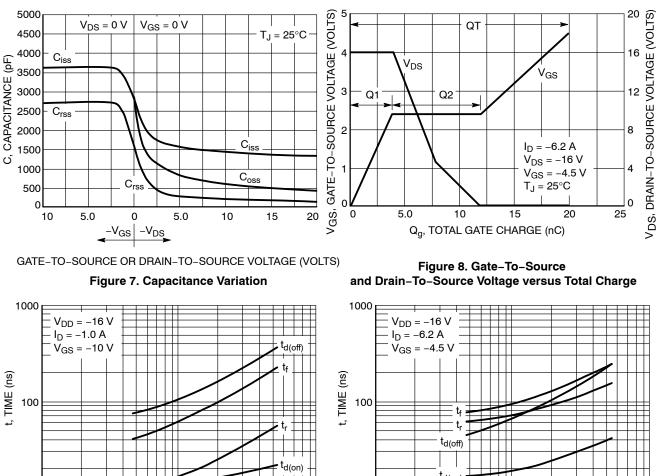
ELECTRICAL CHARACTERISTICS ($T_C = 25^{\circ}C$ unless otherwise noted)*

Characteristic			Min	Тур	Max	Unit
OFF CHARACTERISTICS					-	
Drain-to-Source Breakdown Voltage			-20			Vdc
(V _{GS} = 0 Vdc, I _D = -250 μAdc) Temperature Coefficient (Positive)			-20	-11.6	_	mV/°C
Zero Gate Voltage Drain Current		I _{DSS}				μAdc
$(V_{DS} = -20 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T_J = 25^{\circ}\text{C})$ $(V_{DS} = -20 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T_J = 70^{\circ}\text{C})$		200	-	-	-1.0 -5.0	•
] = 70 0)	I _{GSS}	-	-	-3.0	n A do
Gate-Body Leakage Current (V _{GS} = -12 Vdc, V _{DS} = 0 Vdc)			-	-	-100	nAdc
Gate-Body Leakage Current						nAdc
(V _{GS} = +12 Vdc, V _{DS} = 0 Vdc)			_	-	100	
				1		
Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = -250 \ \mu Adc$)		V _{GS(th)}	-0.6	-0.88	-1.20	Vdc
Temperature Coefficient (Negative)			-	2.6	-	mV/°C
Static Drain-to-Source On-State R	esistance	R _{DS(on)}			_	Ω
$(V_{GS} = -4.5 \text{ Vdc}, I_D = -6.2 \text{ Adc})$ $(V_{GS} = -2.5 \text{ Vdc}, I_D = -5.0 \text{ Adc})$			-	0.027 0.038	0.033 0.050	
$(V_{GS} = -2.5 \text{ Vdc}, I_D = -3.1 \text{ Adc})$ $(V_{GS} = -2.5 \text{ Vdc}, I_D = -3.1 \text{ Adc})$			_	0.038	-	
Forward Transconductance (V _{DS} = -	-10 Vdc, I _D = -6.2 Adc)	9 FS	-	15	-	Mhos
OYNAMIC CHARACTERISTICS					•	
Input Capacitance		C _{iss}	-	1380	1700	pF
Output Capacitance	(V _{DS} = -16 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz)	C _{oss}	_	515	775	
Reverse Transfer Capacitance		C _{rss}	-	250	450	
SWITCHING CHARACTERISTICS (I	Notes 5 and 6)					
Turn-On Delay Time		t _{d(on)}	-	15	25	ns
Rise Time	$(V_{DD} = -10 \text{ Vdc}, I_D = -1.0 \text{ Adc}, V_{GS} = -10 \text{ Vdc},$	t _r	-	20	50	
Turn-Off Delay Time	$R_{\rm G} = 6.0 \ \Omega)$	t _{d(off)}	-	85	125	
Fall Time		t _f	_	50	110	
Turn-On Delay Time		t _{d(on)}	_	17	-	ns
Rise Time	$(V_{DD} = -16 \text{ Vdc}, I_D = -6.2 \text{ Adc},$	t _r	_	65	-	
Turn-Off Delay Time	$V_{GS} = -4.5 \text{ Vdc},$ $R_G = 6.0 \Omega)$	t _{d(off)}	_	50	-	
Fall Time		t _f	-	80	-	
Total Gate Charge	(V _{DS} = -16 Vdc,	Q _{tot}	-	20	35	nC
Gate-Source Charge	$V_{GS} = -4.5 \text{ Vdc},$	Q _{gs}	-	4.0	_	
Gate-Drain Charge	$I_{\rm D}^{\rm o} = -6.2 \rm Adc)$	Q _{gd}	_	8.0	_	1
BODY-DRAIN DIODE RATINGS (No	ote 5)					
Diode Forward On-Voltage	$(I_{S} = -1.7 \text{ Adc}, V_{GS} = 0 \text{ Vdc}) \\ (I_{S} = -1.7 \text{ Adc}, V_{GS} = 0 \text{ Vdc}, T_{J} = 125^{\circ}\text{C})$	V _{SD}	-	-0.80 -0.65	-1.2 -	Vdc
Diode Forward On-Voltage		V _{SD}		-0.95 -0.80		Vdc
Reverse Recovery Time	(I _S = −1.7 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/µs)	t _{rr}	-	50	80	ns
		ta	_	20	_	1
	αιδιατ = 100 μμα)	t _r	-	30	_	1
Reverse Recovery Stored Charge			_	0.04	_	μC

5. Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.
 6. Switching characteristics are independent of operating junction temperature.

*Handling precautions to protect against electrostatic discharge are mandatory.





10 R_G, GATE RESISTANCE (OHMS)

10

Figure 9. Resistive Switching Time Variation versus Gate Resistance

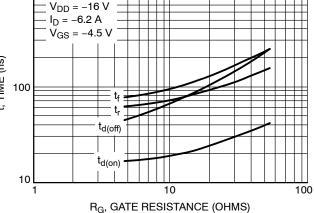
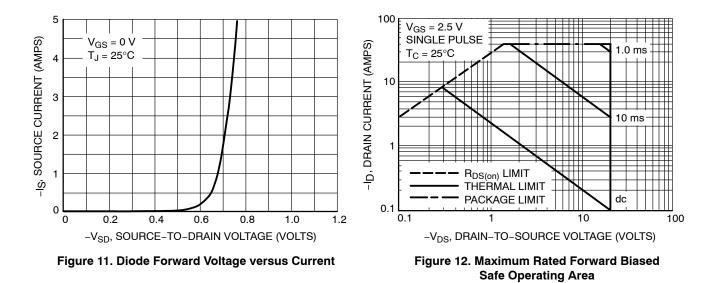


Figure 10. Resistive Switching Time Variation versus Gate Resistance



DRAIN-TO-SOURCE DIODE CHARACTERISTICS

100

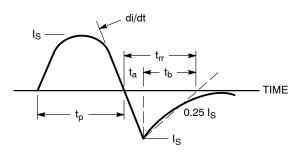


Figure 13. Diode Reverse Recovery Waveform

TYPICAL ELECTRICAL CHARACTERISTICS

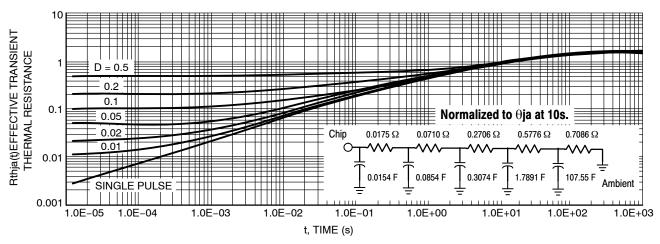


Figure 14. Thermal Response





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

STYLES ON PAGE 2

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STYLE 1: PIN 1. EMITTER COLLECTOR 2. COLLECTOR 3. 4. EMITTER EMITTER 5. BASE 6. 7 BASE EMITTER 8. STYLE 5: PIN 1. DRAIN 2. DRAIN 3. DRAIN DRAIN 4. GATE 5. 6. GATE SOURCE 7. 8. SOURCE STYLE 9: PIN 1. EMITTER, COMMON COLLECTOR, DIE #1 COLLECTOR, DIE #2 2. З. EMITTER, COMMON 4. 5. EMITTER, COMMON 6 BASE. DIE #2 BASE, DIE #1 7. 8. EMITTER, COMMON STYLE 13: PIN 1. N.C. 2. SOURCE 3 GATE 4. 5. DRAIN 6. DRAIN DRAIN 7. DRAIN 8. STYLE 17: PIN 1. VCC 2. V2OUT V10UT З. TXE 4. 5. RXE 6. VFF 7. GND 8. ACC STYLE 21: CATHODE 1 PIN 1. 2. CATHODE 2 3 CATHODE 3 CATHODE 4 4. 5. CATHODE 5 6. COMMON ANODE COMMON ANODE 7. 8. CATHODE 6 STYLE 25: PIN 1. VIN 2 N/C REXT З. 4. GND 5. IOUT 6. IOUT IOUT 7. 8. IOUT STYLE 29: BASE, DIE #1 PIN 1. 2 EMITTER, #1 BASE, #2 З. EMITTER, #2 4. 5 COLLECTOR, #2 COLLECTOR, #2 6.

STYLE 2: PIN 1. COLLECTOR, DIE, #1 2. COLLECTOR, #1 COLLECTOR, #2 3. 4 COLLECTOR, #2 BASE, #2 5. EMITTER, #2 6. 7 BASE #1 EMITTER, #1 8. STYLE 6: PIN 1. SOURCE 2. DRAIN 3. DRAIN SOURCE 4. SOURCE 5. 6. GATE GATE 7. 8. SOURCE STYLE 10: PIN 1. GROUND BIAS 1 OUTPUT 2. З. GROUND 4. 5. GROUND 6 BIAS 2 INPUT 7. 8. GROUND STYLE 14: PIN 1. N-SOURCE 2. N-GATE P-SOURCE 3 P-GATE 4. P-DRAIN 5 6. P-DRAIN N-DRAIN 7. N-DRAIN 8. STYLE 18: PIN 1. ANODE 2. ANODE SOURCE 3. GATE 4. 5. DRAIN 6 DRAIN CATHODE 7. CATHODE 8. STYLE 22 PIN 1. I/O LINE 1 2. COMMON CATHODE/VCC COMMON CATHODE/VCC 3 4. I/O LINE 3 5. COMMON ANODE/GND 6. I/O LINE 4 7. I/O LINE 5 COMMON ANODE/GND 8. STYLE 26: PIN 1. GND 2 dv/dt З. ENABLE 4. ILIMIT 5. SOURCE SOURCE 6. SOURCE 7. 8. VCC STYLE 30: DRAIN 1 PIN 1. DRAIN 1 2 GATE 2 З. SOURCE 2 4. SOURCE 1/DRAIN 2 SOURCE 1/DRAIN 2 5. 6.

STYLE 3: PIN 1. DRAIN, DIE #1 DRAIN, #1 2. DRAIN, #2 З. 4. DRAIN, #2 GATE, #2 5. SOURCE, #2 6. 7 GATE #1 8. SOURCE, #1 STYLE 7: PIN 1. INPUT 2. EXTERNAL BYPASS THIRD STAGE SOURCE GROUND З. 4. 5. DRAIN 6. GATE 3 SECOND STAGE Vd 7. FIRST STAGE Vd 8. STYLE 11: PIN 1. SOURCE 1 GATE 1 SOURCE 2 2. 3. GATE 2 4. 5. DRAIN 2 6. DRAIN 2 DRAIN 1 7. 8. DRAIN 1 STYLE 15: PIN 1. ANODE 1 2. ANODE 1 ANODE 1 3 ANODE 1 4. 5. CATHODE, COMMON CATHODE, COMMON CATHODE, COMMON 6. 7. CATHODE, COMMON 8. STYLE 19: PIN 1. SOURCE 1 GATE 1 SOURCE 2 2. 3. GATE 2 4. 5. DRAIN 2 6. MIRROR 2 DRAIN 1 7. 8. **MIRROR 1** STYLE 23: PIN 1. LINE 1 IN COMMON ANODE/GND COMMON ANODE/GND 2. 3 LINE 2 IN 4. LINE 2 OUT 5. COMMON ANODE/GND COMMON ANODE/GND 6. 7. LINE 1 OUT 8. STYLE 27: PIN 1. ILIMIT 2 OVI 0 UVLO З. 4. INPUT+ 5. SOURCE SOURCE 6. SOURCE 7. 8 DRAIN

DATE 16 FEB 2011

STYLE 4: ANODE ANODE PIN 1. 2. ANODE З. 4. ANODE ANODE 5. 6. ANODE 7 ANODE COMMON CATHODE 8. STYLE 8: PIN 1. COLLECTOR, DIE #1 2. BASE, #1 BASE #2 3. COLLECTOR, #2 4. COLLECTOR, #2 5. 6. EMITTER, #2 EMITTER, #1 7. 8. COLLECTOR, #1 STYLE 12: PIN 1. SOURCE SOURCE 2. 3. 4. GATE 5. DRAIN 6. DRAIN DRAIN 7. 8. DRAIN STYLE 16: PIN 1. EMITTER, DIE #1 2. BASE, DIE #1 EMITTER, DIE #2 3 BASE, DIE #2 4. 5. COLLECTOR, DIE #2 6. COLLECTOR, DIE #2 COLLECTOR, DIE #1 7. COLLECTOR, DIE #1 8. STYLE 20: PIN 1. SOURCE (N) GATE (N) SOURCE (P) 2. 3. 4. GATE (P) 5. DRAIN 6. DRAIN DRAIN 7. 8. DRAIN STYLE 24: PIN 1. BASE 2. EMITTER 3 COLLECTOR/ANODE COLLECTOR/ANODE 4. 5. CATHODE 6. CATHODE COLLECTOR/ANODE 7. 8. COLLECTOR/ANODE STYLE 28: PIN 1. SW_TO_GND 2. DASIC OFF DASIC_SW_DET З. 4. GND 5. 6. V MON VBULK 7. VBULK 8 VIN

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SOURCE 1/DRAIN 2

7.

8. GATE 1

7.

8

rights of others

COLLECTOR, #1

COLLECTOR, #1

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