MOSFET – Power, Single, **P-Channel, Enhancement** Mode, SOIC-8

-5.4 A, -20 V

Features

- High Density Power MOSFET with Ultra Low R_{DS(on)} Providing Higher Efficiency
- Miniature SOIC-8 Surface Mount Package Saves Board Space
- Diode Exhibits High Speed with Soft Recovery
- IDSS Specified at Elevated Temperature
- Drain-to-Source Avalanche Energy Specified
- Mounting Information for the SOIC-8 Package is Provided
- These Devices are Pb-Free and are RoHS Compliant
- NVMS Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

Applications

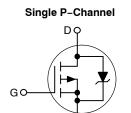
• Power Management in Portable and Battery-Powered Products, i.e.: Computers, Printers, PCMCIA Cards, Cellular & Cordless Telephones



ON Semiconductor®

http://onsemi.com

V _{DSS}	R _{DS(ON)} TYP	I _D MAX
–20 V	26 mΩ @ -4.5 V	–5.4 A



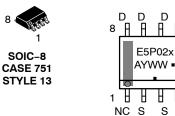
MARKING DIAGRAM & PIN ASSIGNMENT

D D

Η Η

SG

S



E5P02	= Specific Device Code
х	= Blank or S
Α	= Assembly Location
Υ	= Year
WW	= Work Week

= Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMS5P02R2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NVMS5P02R2G	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

MAXIMUM RATINGS (T_J = 25° C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	-20	V
Drain-to-Gate Voltage (R_{GS} = 1.0 m Ω)	V _{DGR}	-20	V
Gate-to-Source Voltage - Continuous	V _{GS}	±10	V
Thermal Resistance – Junction-to-Ambient (Note 1) Total Power Dissipation @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $25^{\circ}C$ Continuous Drain Current @ $70^{\circ}C$ Maximum Operating Power Dissipation Maximum Operating Drain Current Pulsed Drain Current (Note 4)	R _{0JA} P _D I _D P _D I _D I _D	50 2.5 -7.05 -5.62 1.2 -4.85 -28	°C/W W A A W A A
Thermal Resistance – Junction-to-Ambient (Note 2) Total Power Dissipation @ T _A = 25°C Continuous Drain Current @ 25°C Continuous Drain Current @ 70°C Maximum Operating Power Dissipation Maximum Operating Drain Current Pulsed Drain Current (Note 4)	R _{θJA} PD ID ID ID ID IDM	85 1.47 -5.40 -4.30 0.7 -3.72 -20	°C/W W A A W A A
Thermal Resistance – Junction-to-Ambient (Note 3) Total Power Dissipation @ $T_A = 25^{\circ}C$ Continuous Drain Current @ $25^{\circ}C$ Continuous Drain Current @ $70^{\circ}C$ Maximum Operating Power Dissipation Maximum Operating Drain Current Pulsed Drain Current (Note 4)	R _{0JA} PD ID ID PD ID IDM	159 0.79 -3.95 -3.15 0.38 -2.75 -12	°C/W W A A W A A
Operating and Storage Temperature Range	T _J , T _{stg}	-55 to +150	°C
Single Pulse Drain-to-Source Avalanche Energy – Starting T_J = 25°C (V _{DD} = -20 Vdc, V _{GS} = -5.0 Vdc, Peak I _L = -8.5 Apk, L = 10 mH, R _G = 25 Ω)	E _{AS}	360	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	ΤL	260	°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.

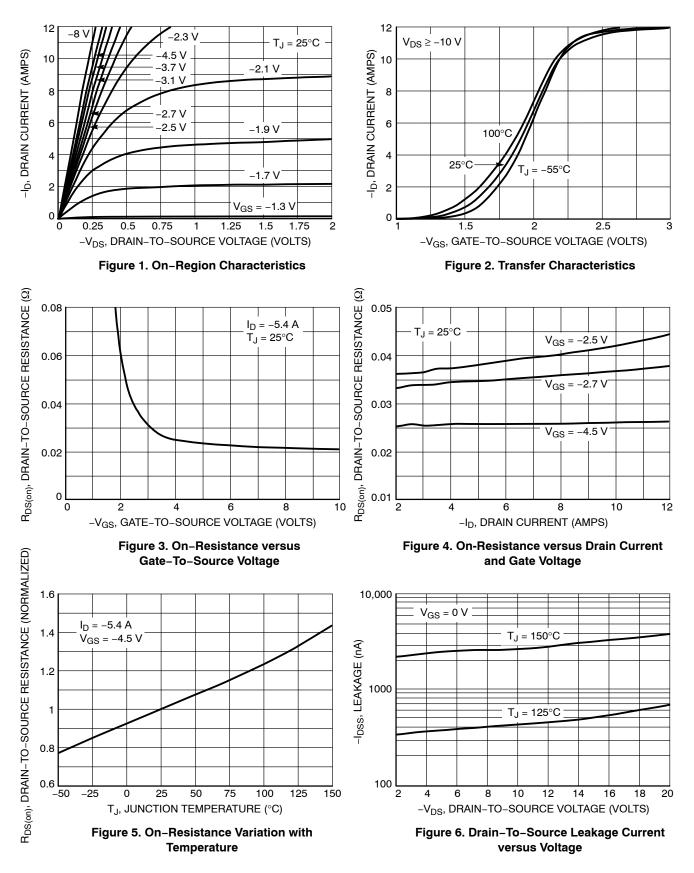
1. Mounted onto a 2" square FR-4 Board (1" sq. 2 oz Cu 0.06" thick single sided), $t \le 10$ seconds. 2. Mounted onto a 2" square FR-4 Board (1" sq. 2 oz Cu 0.06" thick single sided), t = steady state. 3. Minimum FR-4 or G-10 PCB, t = Steady State.

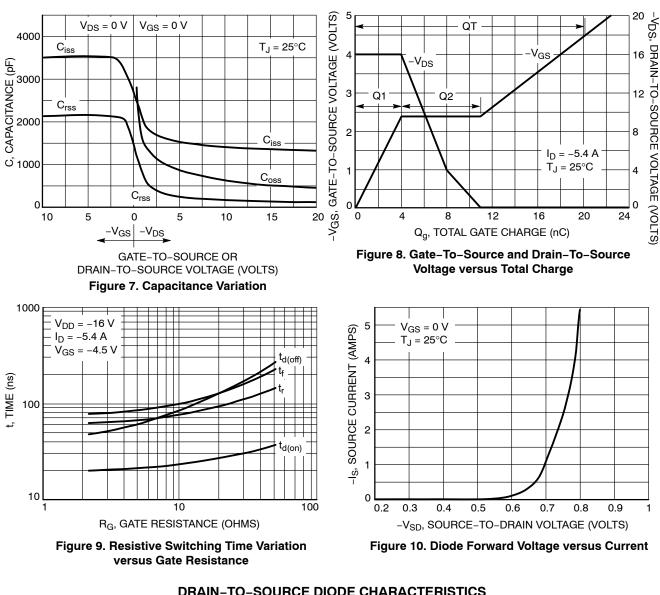
4. Pulse Test: Pulse Width = 300 μ s, Duty Cycle = 2%.

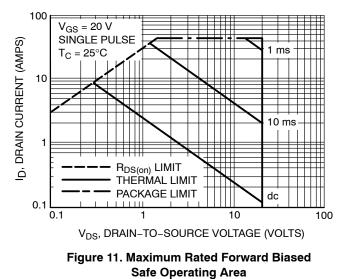
ELECTRICAL CHARACTERISTICS ($T_C = 25^{\circ}C$ unless otherwise noted) (Note 5)

Characteristic			Min	Тур	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage (V _{GS} = 0 Vdc, I _D = -250 μAdc) Temperature Coefficient (Pocifice)		V _{(BR)DSS}	-20 -	_ _15	-	Vdc mV/°C
Temperature Coefficient (Positive) Zero Gate Voltage Drain Current		I _{DSS}	_	-10		μAdc
$(V_{DS} = -16 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T, (V_{DS} = -16 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T, (V_{DS} = -20 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T, T, (V_{DS} = -20 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T, T, (V_{DS} = -20 \text{ Vdc}, V_{SS} = 0 \text{ Vdc}, T, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = 0 \text{ Vdc}, T, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = 0 \text{ Vdc}, T, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = 0 \text{ Vdc}, T, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 \text{ Vdc}, V_{SS} = -20 \text{ Vdc}, T, (V_{SS} = -20 $	_J = 125°C)		- - -	- - -0.2	-1.0 -10 -	
Gate-Body Leakage Current (V_{GS} = -10 Vdc, V_{DS} = 0 Vdc)		I _{GSS}	_	-	-100	nAdc
Gate-Body Leakage Current (V_{GS} = +10 Vdc, V_{DS} = 0 Vdc)		I _{GSS}	-	-	100	nAdc
ON CHARACTERISTICS						÷
Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = -250 μAdc) Temperature Coefficient (Negative)		V _{GS(th)}	-0.65 -	-0.9 2.9	-1.25 -	Vdc mV/°C
Static Drain-to-Source On-State Resistance $(V_{GS} = -4.5 \text{ Vdc}, I_D = -5.4 \text{ Adc})$ $(V_{GS} = -2.5 \text{ Vdc}, I_D = -2.7 \text{ Adc})$		R _{DS(on)}	- -	0.026 0.037	0.033 0.048	Ω
Forward Transconductance (V _{DS} = -9.0 Vdc, I _D = -5.4 Adc)		9 FS	-	15	-	Mhos
OYNAMIC CHARACTERISTICS						
Input Capacitance		C _{iss}	-	1375	1900	pF
Output Capacitance	− (V _{DS} = −16 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz)	C _{oss}	-	510	900	
Reverse Transfer Capacitance		C _{rss}	-	200	380	-
SWITCHING CHARACTERISTICS (Notes 6 & 7)				•	
Turn-On Delay Time		t _{d(on)}	_	18	35	ns
Rise Time	$(V_{DD} = -16 \text{ Vdc}, I_D = -1.0 \text{ Adc},$	t _r	_	25	50	
Turn-Off Delay Time	– V _{GS} = –4.5 Vdc, R _G = 6.0 Ω)	t _{d(off)}	_	70	125	
Fall Time		t _f	_	55	100	
Turn-On Delay Time		t _{d(on)}	-	22	-	ns
Rise Time	$(V_{DD} = -16 \text{ Vdc}, I_D = -5.4 \text{ Adc},$	t _r	-	70	-	
Turn-Off Delay Time	- V _{GS} = -4.5 Vdc, R _G = 6.0 Ω)	t _{d(off)}	-	65	-	
Fall Time		t _f	_	90	_	
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 _D = -5.4 Adc)	Q _{gd}	_	7.0	_	
BODY-DRAIN DIODE RATINGS (N	ote 6)					•
Diode Forward On-Voltage	$(I_{S} = -5.4 \text{ Adc}, V_{GS} = 0 \text{ V}) (I_{S} = -5.4 \text{ Adc}, V_{GS} = 0 \text{ Vdc}, T_{J} = 125^{\circ}\text{C})$	V _{SD}	- -	-0.95 -0.72	-1.25 -	Vdc
Reverse Recovery Time	(I _S = -5.4 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs)	t _{rr}	-	40	75	ns
		t _a	-	20	-	
		t _b	-	20	-	1
Reverse Recovery Stored Charge		Q _{RR}	-	0.03	-	μC

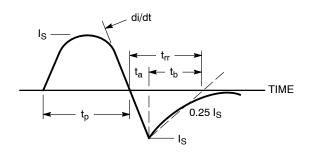
5. Handling precautions to protect against electrostatic discharge is mandatory. 6. Indicates Pulse Test: Pulse Width = $300 \ \mu s \ max$, Duty Cycle = 2%. 7. Switching characteristics are independent of operating junction temperature.

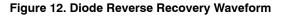






DRAIN-TO-SOURCE DIODE CHARACTERISTICS





TYPICAL ELECTRICAL CHARACTERISTICS

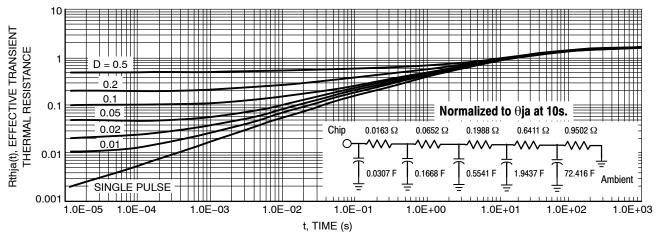
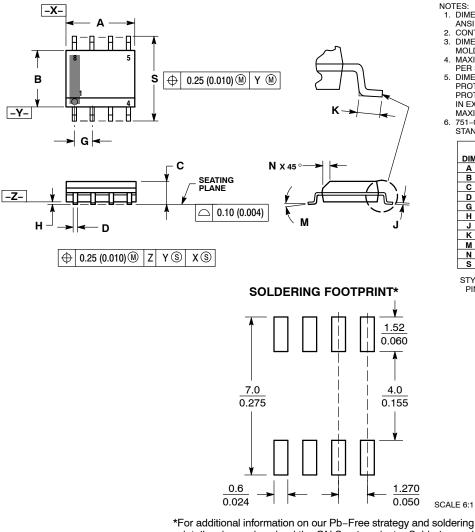


Figure 13. Thermal Response

PACKAGE DIMENSIONS

SOIC-8 NB CASE 751-07 ISSUE AK



NOTES

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982
- CONTROLLING DIMENSION: MILLIMETER. DIMENSION A AND B DO NOT INCLUDE
- MOLD PROTRUSION.
- MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
- PER SIDE. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION. 6. 751–01 THRU 751–06 ARE OBSOLETE. NEW
- STANDARD IS 751-07

	MILLIMETERS		ETERS INCHES	
DIM	MIN	MAX	MIN	MAX
Α	4.80	5.00	0.189	0.197
в	3.80	4.00	0.150	0.157
С	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27	7 BSC	0.050 BSC	
н	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
Κ	0.40	1.27	0.016	0.050
М	0 °	8 °	0 °	8 °
Ν	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

STYLE 13: PIN 1 NC

2.	SOURCE
З.	SOURCE

З. 4. GATE

- DRAIN 5. 6. DRAIN
- 7. DRAIN 8 DRAIN

 $\left(\frac{mm}{inches}\right)$

details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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