Power MOSFET

–60 V, –6 A, 260 m Ω , Single P-Channel

Features

- Small Footprint (3.3 x 3.3 mm) for Compact Design
- Low R_{DS(on)} to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- NVTFS5124PLWF Wettable Flanks Product
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltag	V _{DSS}	-60	V		
Gate-to-Source Voltage	9		V _{GS}	±20	V
Continuous Drain Cur-		T _{mb} = 25°C	I _D	-6.0	Α
rent R $_{\Psi J-mb}$ (Notes 1, 2, 3, 4)	Steady State	T _{mb} = 100°C		-4.0	
Power Dissipation		T _{mb} = 25°C	P_{D}	18	W
R _{ΨJ-mb} (Notes 1, 2, 3)		T _{mb} = 100°C		9.0	
Continuous Drain Cur-		T _A = 25°C	I _D	-2.4	Α
rent $R_{\theta JA}$ (Notes 1, 3, 4)	Steady State	T _A = 100°C		-1.7	
Power Dissipation		T _A = 25°C	P _D	3.0	W
R _{θJA} (Notes 1, 3)		T _A = 100°C		1.5	
Pulsed Drain Current $T_A = 25^{\circ}C$, $t_p = 10 \mu s$			I _{DM}	-24	Α
Operating Junction and Storage Temperature			T _J , T _{stg}	-55 to +175	°C
Source Current (Body Diode)			I _S	-18	Α
Single Pulse Drain-to-Source Avalanche Energy (T _J = 25°C, V _{DD} = -50 V, V _{GS} = -10 V, $I_{L(pk)}$ = -13 A, L = 0.1 mH, R_G = 25 Ω)			E _{AS}	8.5	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	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.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit	
Junction-to-Mounting Board (top) - Steady State (Note 2 and 3)	$R_{\Psi J-mb}$	8.4	°C/W	
Junction-to-Ambient - Steady State (Note 3)	$R_{\theta JA}$	49.2		

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- 2. Psi (Ψ) is used as required per JESD51-12 for packages in which substantially less than 100% of the heat flows to single case surface.
- 3. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
- Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

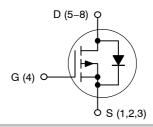


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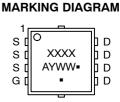
V _{(BR)DSS}	R _{DS(on)} MAX	I _D MAX	
-60 V	260 mΩ @ -10 V	-6 A	
	380 mΩ @ -4.5 V	-07	

P-Channel MOSFET





¹ WDFN8 (μ8FL) CASE 511AB



XXXX = Specific Device Code A = Assembly Location Y = Year

WW = Work Week
■ Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

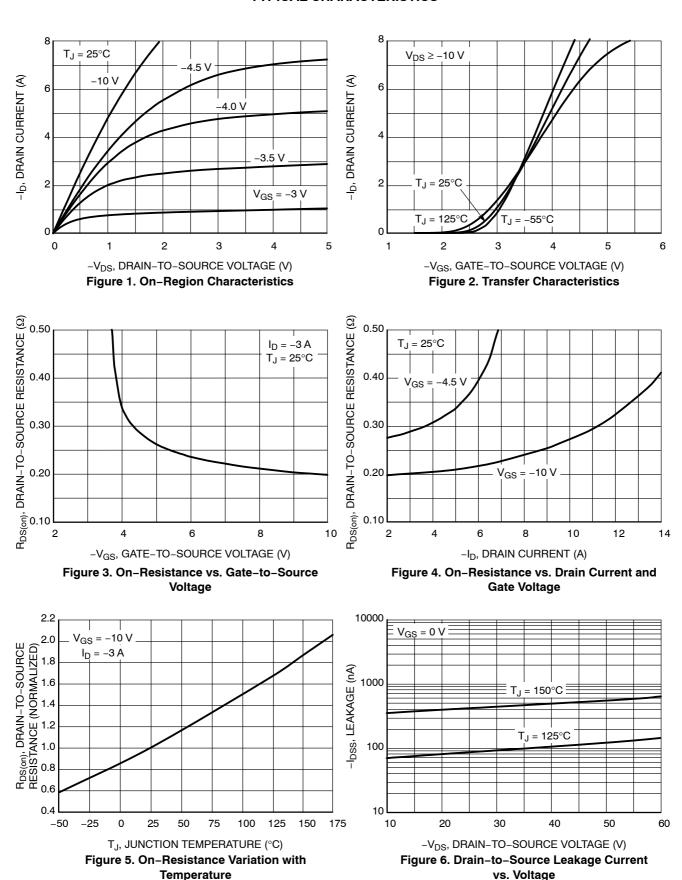
See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

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

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit	
OFF CHARACTERISTICS					-		-	
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	$V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$		-60			V	
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V,	T _J = 25°C			-1.0	μΑ	
		$V_{DS} = -60 \text{ V}$	T _J = 125°C			-10		
Gate-to-Source Leakage Current	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS}$	s = ±20 V			±100	nA	
ON CHARACTERISTICS (Note 5)								
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}, I_D$	= -250 μΑ	-1.5		-2.5	V	
Drain-to-Source On Resistance	R _{DS(on)}	$V_{GS} = -10 \text{ V},$	I _D = -3 A		200	260	mΩ	
		$V_{GS} = -4.5 \text{ V},$	I _D = -3 A		290	380		
Forward Transconductance	9FS	$V_{DS} = -15 V$,	I _D = -5 A	4			S	
CHARGES AND CAPACITANCES								
Input Capacitance	C _{iss}				250			
Output Capacitance	C _{oss}	$V_{GS} = 0 \text{ V, f} = V_{DS} = -2$	1.0 MHz, 25 V		27		pF	
Reverse Transfer Capacitance	C _{rss}	v _{DS} = -23 v			17		1	
Total Gate Charge	Q _{G(TOT)}				3.5			
Threshold Gate Charge	Q _{G(TH)}	VGS = -4.5 V. VI	ns = -48 V.		0.4			
Gate-to-Source Charge	Q _{GS}	$V_{GS} = -4.5 \text{ V}, V_{DS} = -48 \text{ V},$ $I_{D} = -3 \text{ A}$			1.2		nC	
Gate-to-Drain Charge	Q_{GD}				1.9			
Total Gate Charge	Q _{G(TOT)}	$V_{GS} = -10 \text{ V}, V_{DS} = -48 \text{ V},$ $I_{D} = -3 \text{ A}$			6			
SWITCHING CHARACTERISTICS (No	te 6)				•	•		
Turn-On Delay Time	t _{d(on)}				7			
Rise Time	t _r	VG9 = -4.5 V. VI	ns = -48 V.		14		1	
Turn-Off Delay Time	t _{d(off)}	$V_{GS} = -4.5 \text{ V}, V_{DS} = -48 \text{ V},$ $I_{D} = -3 \text{ A}, R_{G} = 2.5 \Omega$			13		ns	
Fall Time	t _f				10			
DRAIN-SOURCE DIODE CHARACTER	RISTICS				•			
Forward Diode Voltage	V _{SD}	V _{GS} = 0 V,	T _J = 25°C		-0.87	-1.0	V	
		$I_S = -3 A$	T _J = 125°C		-0.74		1	
Reverse Recovery Time	t _{RR}	$V_{GS} = 0 \text{ V},$ $dI_{S}/dt = 100 \text{ A}/\mu s,$ $I_{S} = -3 \text{ A}$			17		ns	
Charge Time	ta				14			
Discharge Time	t _b				3			
Reverse Recovery Charge	Q_{RR}				19		nC	

^{5.} Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

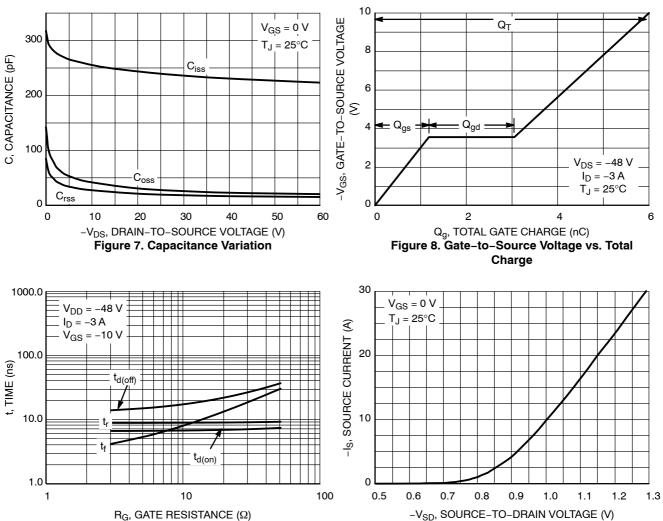


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

Figure 11. Diode Forward Voltage vs. Current

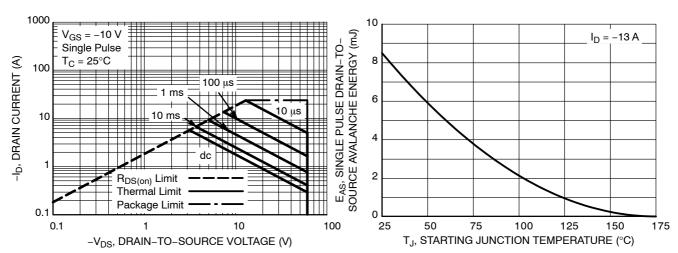


Figure 10. Maximum Rated Forward Biased Safe Operating Area

Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

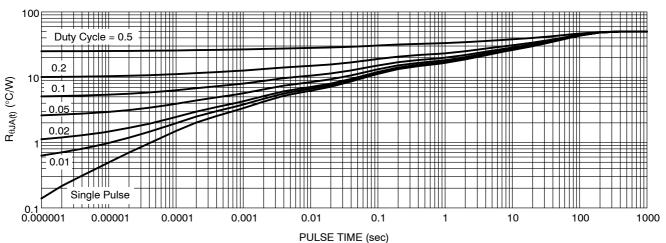


Figure 13. Thermal Response

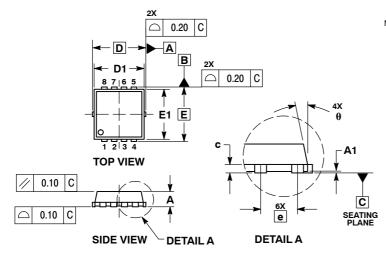
DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVTFS5124PLTAG	5124	WDFN8 (Pb-Free)	1500 / Tape & Reel
NVTFS5124PLWFTAG	24LW	WDFN8 (Pb-Free)	1500 / Tape & Reel
NVTFS5124PLTWG	5124	WDFN8 (Pb-Free)	5000 / Tape & Reel
NVTFS5124PLWFTWG	24LW	WDFN8 (Pb-Free)	5000 / 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

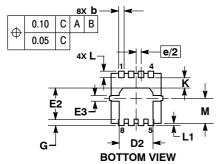
WDFN8 3.3x3.3, 0.65P CASE 511AB ISSUE D

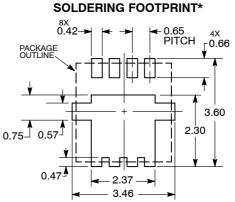


NOTES

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
- CONTROLLING DIMENSION: MILLIMETERS.
 DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00		0.05	0.000		0.002
b	0.23	0.30	0.40	0.009	0.012	0.016
С	0.15	0.20	0.25	0.006	0.008	0.010
D	3.30 BSC			0.130 BSC		
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
E	3.30 BSC			0.130 BSC		
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	0.23	0.30	0.40	0.009	0.012	0.016
е	0.65 BSC			(0.026 BS	2
G	0.30	0.41	0.51	0.012	0.016	0.020
K	0.65	0.80	0.95	0.026	0.032	0.037
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
M	1.40	1.50	1.60	0.055	0.059	0.063
θ	0 °		12 °	0 °		12 °





DIMENSION: 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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