

Power MOSFET



N-Channel MOSFET

FEATURES

- Dynamic dV/dt rating
- Repetitive avalanche rated
- For automatic insertion
- End stackable
- 175 °C Operating Temperature
- Fast switching and ease of paralleling
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

PRODUCT SUMMARY

V_{DS} (V)	100	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V	0.54
Q_g (Max.) (nC)	8.3	
Q_{gs} (nC)	2.3	
Q_{gd} (nC)	3.8	
Configuration	Single	

DESCRIPTION

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The 4 pin DIP package is a low cost machine-insertable case style which can be stacked in multiple combinations on standard 0.1" pin centers. The dual drain serves as a thermal link to the mounting surface for power dissipation levels up to 1 W.

ORDERING INFORMATION

Package	HVMDIP
Lead (Pb)-free	IRFD110PbF

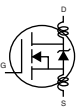

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	V_{DS}	100	V	
Gate-source voltage	V_{GS}	± 20		
Continuous drain current	V_{GS} at 10 V	$T_A = 25$ °C	A	
		$T_A = 100$ °C		0.71
Pulsed drain current ^a	I_{DM}	8.0		
Linear derating factor		0.0083	W/°C	
Single pulse avalanche energy ^b	E_{AS}	140	mJ	
Repetitive avalanche current ^a	I_{AR}	1.0	A	
Repetitive avalanche energy ^a	E_{AR}	0.13	mJ	
Maximum power dissipation	$T_A = 25$ °C	P_D	1.3	W
Peak diode recovery dV/dt ^c		dV/dt	5.5	V/ns
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature)	For 10 s		300 ^d	

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 52$ mH, $R_g = 25$ Ω , $I_{AS} = 2.0$ A (see fig. 12)
- $I_{SD} \leq 5.6$ A, $dI/dt \leq 75$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °C
- 1.6 mm from case

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	120	$^{\circ}\text{C}/\text{W}$

SPECIFICATIONS ($T_J = 25^{\circ}\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	100	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1\ \text{mA}$	-	0.12	-	$\text{V}/^{\circ}\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\ \text{V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100\ \text{V}, V_{GS} = 0\ \text{V}$	-	-	25	μA
		$V_{DS} = 80\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 150^{\circ}\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\ \text{V}, I_D = 0.60\ \text{A}^b$	-	-	0.54	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\ \text{V}, I_D = 0.60\ \text{A}^b$	0.80	-	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\ \text{V}, V_{DS} = 25\ \text{V}, f = 1.0\ \text{MHz}$, see fig. 5	-	180	-	μF
Output Capacitance	C_{oss}		-	81	-	
Reverse Transfer Capacitance	C_{rss}		-	15	-	
Total Gate Charge	Q_g	$V_{GS} = 10\ \text{V}, I_D = 5.6\ \text{A}, V_{DS} = 80\ \text{V}$, see fig. 6 and 13 ^b	-	-	8.3	nC
Gate-Source Charge	Q_{gs}		-	-	2.3	
Gate-Drain Charge	Q_{gd}		-	-	3.8	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50\ \text{V}, I_D = 5.6\ \text{A}, R_g = 24\ \Omega, R_D = 8.4\ \Omega$, see fig. 10 ^b	-	6.9	-	ns
Rise Time	t_r		-	16	-	
Turn-Off Delay Time	$t_{d(off)}$		-	15	-	
Fall Time	t_f		-	9.4	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 	-	4.0	-	nH
Internal Source Inductance	L_S		-	6.0	-	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	1.0	A
Pulsed Diode Forward Current ^a	I_{SM}		-	-	8.0	
Body Diode Voltage	V_{SD}	$T_J = 25^{\circ}\text{C}, I_S = 1.0\ \text{A}, V_{GS} = 0\ \text{V}^b$	-	-	2.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}, I_F = 5.6\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}^b$	-	100	200	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.44	0.88	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- b. Pulse width $\leq 300\ \mu\text{s}$; duty cycle $\leq 2\ \%$



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

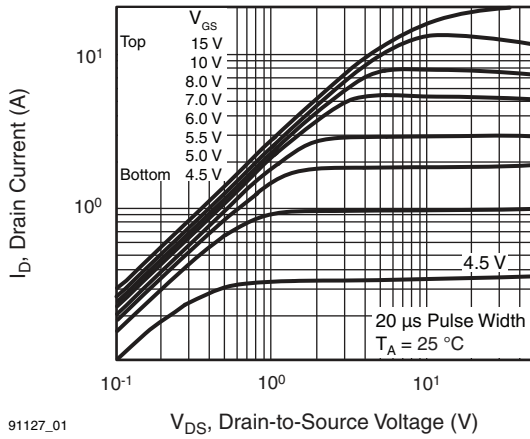


Fig. 1 - Typical Output Characteristics, $T_A = 25\text{ }^\circ\text{C}$

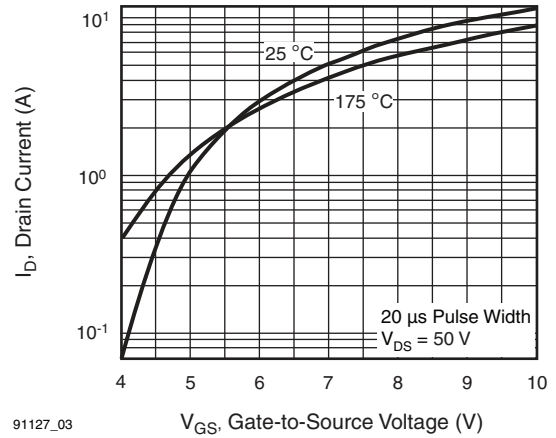


Fig. 3 - Typical Transfer Characteristics

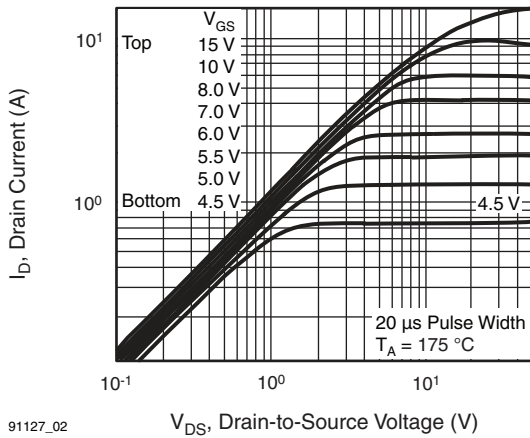


Fig. 2 - Typical Output Characteristics, $T_A = 175\text{ }^\circ\text{C}$

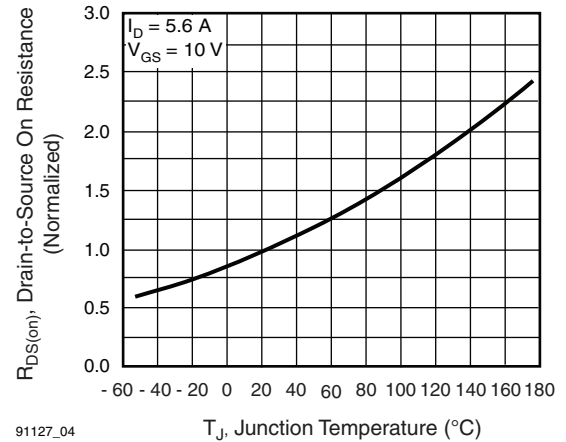
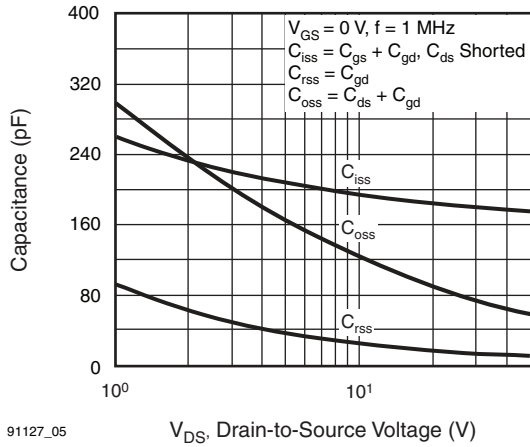
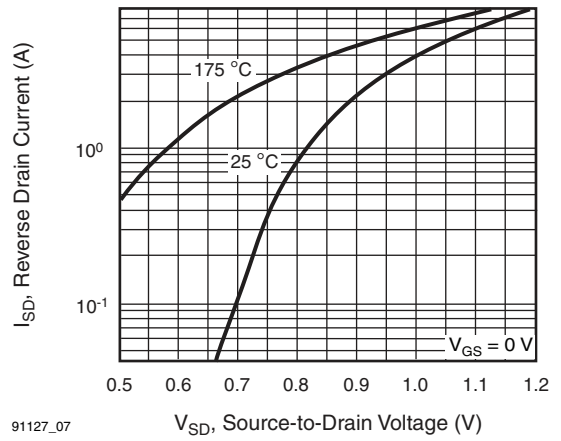


Fig. 4 - Normalized On-Resistance vs. Temperature



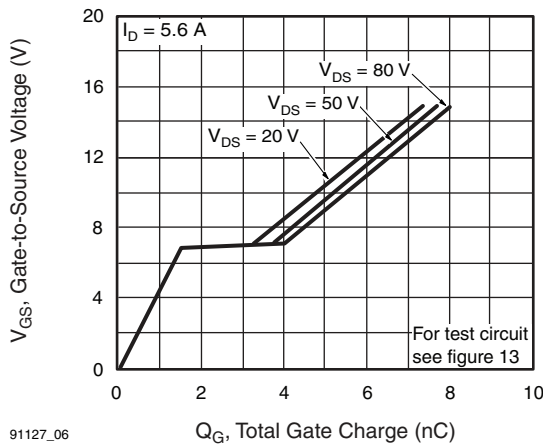
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Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



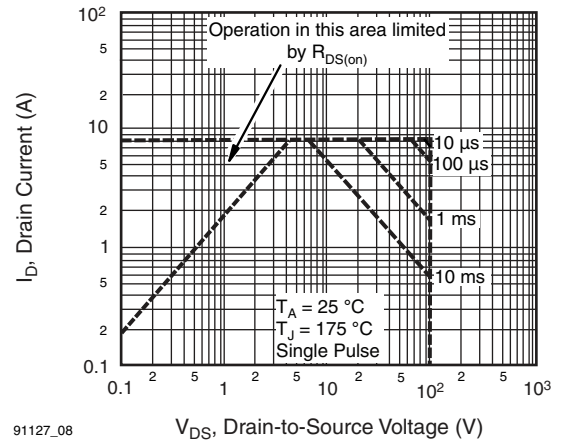
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



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Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



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Fig. 8 - Maximum Safe Operating Area

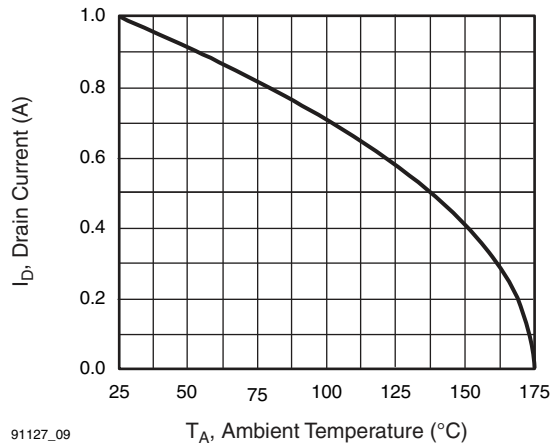


Fig. 9 - Maximum Drain Current vs. Ambient Temperature

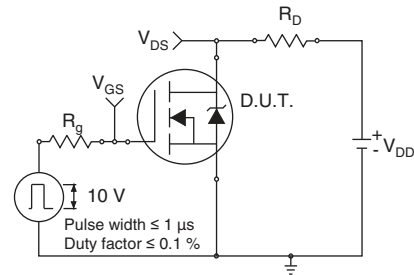


Fig. 10a - Switching Time Test Circuit



Fig. 10b - Switching Time Waveforms

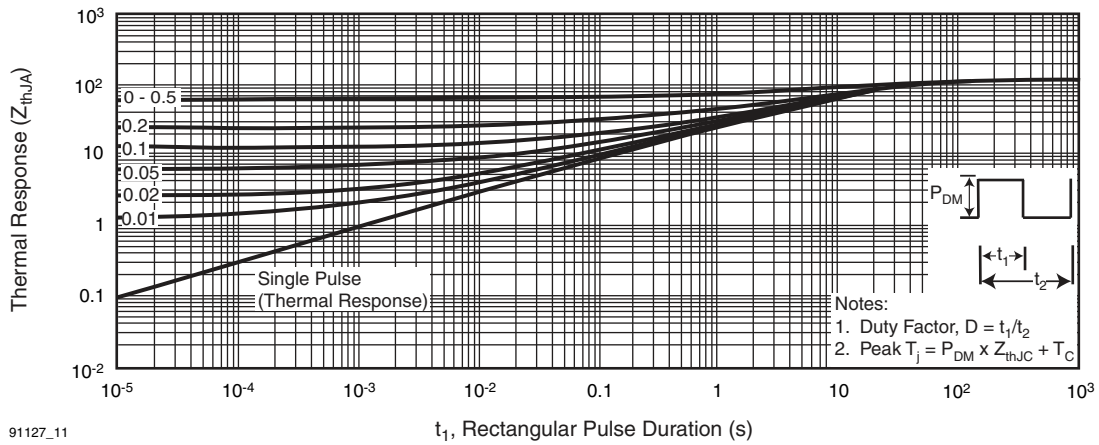


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

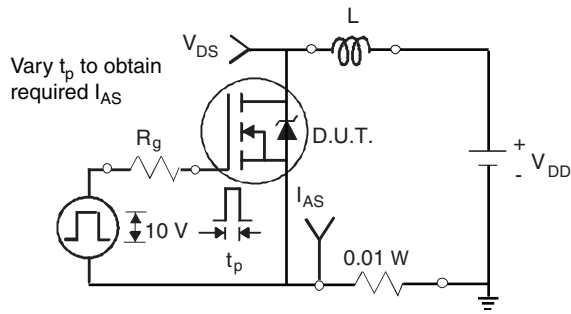


Fig. 12a - Unclamped Inductive Test Circuit



Fig. 12b - Unclamped Inductive Waveforms

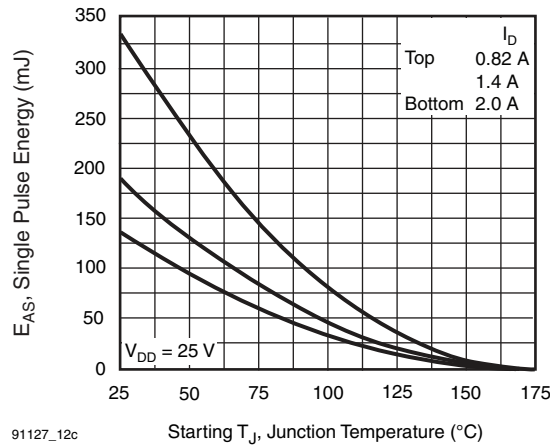


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

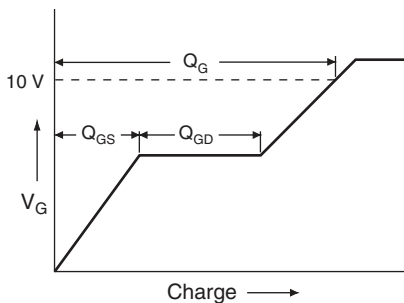


Fig. 13a - Basic Gate Charge Waveform

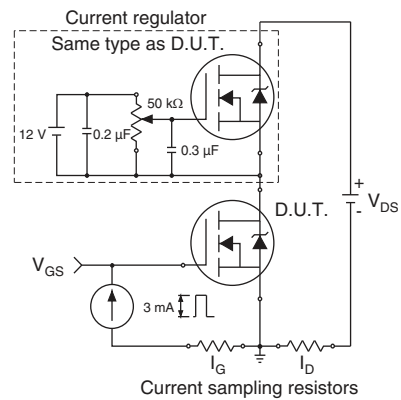
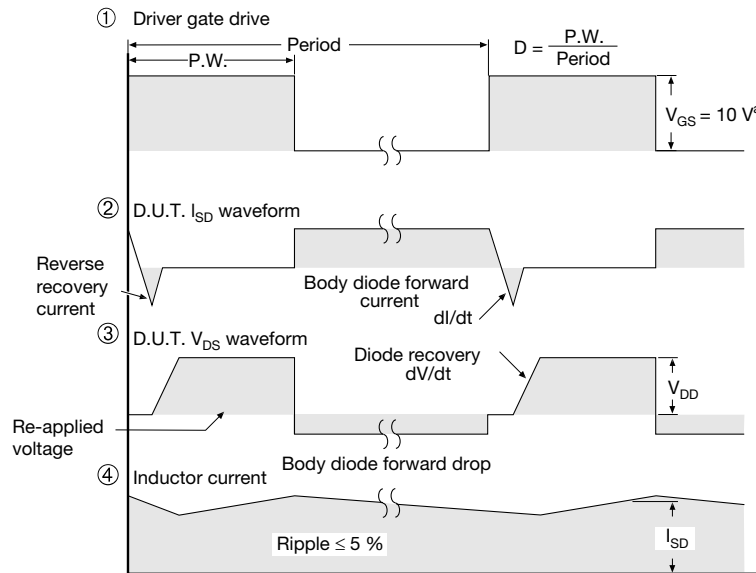
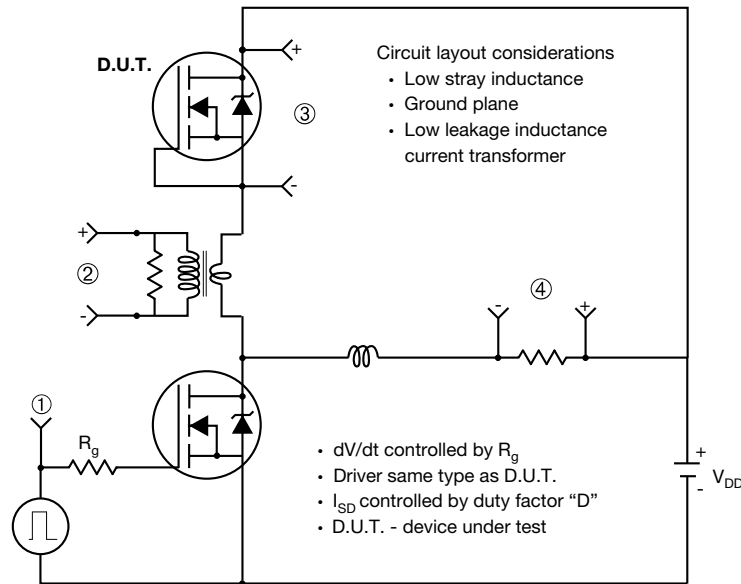


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note

a. $V_{GS} = 5 V$ for logic level devices

Fig. 14 - For N-Channel

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HVM DIP (High voltage)



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.310	0.330	7.87	8.38
E	0.300	0.425	7.62	10.79
L	0.270	0.290	6.86	7.36

ECN: X10-0386-Rev. B, 06-Sep-10
DWG: 5974

Note

- Package length does not include mold flash, protrusions or gate burrs. Package width does not include interlead flash or protrusions.



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