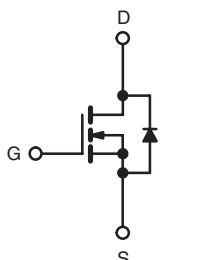
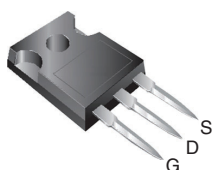


Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	600	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	0.60
Q_g (Max.) (nC)	140	
Q_{gs} (nC)	20	
Q_{gd} (nC)	69	
Configuration	Single	

TO-247


N-Channel MOSFET

FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Lead (Pb)-free Available



Available
RoHS*
COMPLIANT

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 TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole. It also provides greater creepage distance between pins to meet the requirements of most safety specifications.

ORDERING INFORMATION

Package	TO-247
Lead (Pb)-free	IRFPC50PbF
	SiHFPC50-E3
SnPb	IRFPC50
	SiHFPC50

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V _{DS}	600	V
Gate-Source Voltage			V _{GS}	± 20	
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	I _D	11	A
		T _C = 100 °C		7.0	
Pulsed Drain Current ^a			I _{DM}	44	
Linear Derating Factor				1.4	W/°C
Single Pulse Avalanche Energy ^b			E _{AS}	920	mJ
Repetitive Avalanche Current ^a			I _{AR}	10	A
Repetitive Avalanche Energy ^a			E _{AR}	18	mJ
Maximum Power Dissipation	T _C = 25 °C		P _D	180	W
Peak Diode Recovery dV/dt ^c			dV/dt	3.0	V/ns
Operating Junction and Storage Temperature Range			T _J , T _{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s			300 ^d	
Mounting Torque	6-32 or M3 screw			10	lbf · in
				1.1	N · m

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 13\text{ mH}$, $R_G = 25\text{ }\Omega$, $I_{AS} = 11\text{ A}$ (see fig. 12).
- $I_{SD} \leq 11\text{ A}$, $dI/dt \leq 100\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	-	40	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	-	0.24	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	-	0.65	

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		600	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.78	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.0	-	4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 600 V, V _{GS} = 0 V		-	-	100	μA
		V _{DS} = 480 V, V _{GS} = 0 V, T _J = 125 °C		-	-	500	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 6.0 A ^b	-	-	0.60	Ω
Forward Transconductance	g _{fs}	V _{DS} = 100 V, I _D = 6.0 A ^b		5.7	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	2700	-	pF
Output Capacitance	C _{oss}			-	300	-	
Reverse Transfer Capacitance	C _{rss}			-	61	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 11 A, V _{DS} = 360 V see fig. 6 and 13 ^b	-	-	140	nC
Gate-Source Charge	Q _{gs}			-	-	20	
Gate-Drain Charge	Q _{gd}			-	-	69	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 300 V, I _D = 11 A, R _G = 6.2 Ω, R _D = 30 Ω, see fig. 10 ^b		-	18	-	ns
Rise Time	t _r			-	37	-	
Turn-Off Delay Time	t _{d(off)}			-	88	-	
Fall Time	t _f			-	36	-	
Internal Drain Inductance	L _D	Between lead, 6 mm (0.25") from package and center of die contact		-	5.0	-	nH
Internal Source Inductance	L _S			-	13	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	11	A
Pulsed Diode Forward Current ^a	I _{SM}			-	-	44	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = 11 A, V _{GS} = 0 V ^b		-	-	1.4	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = 11 A, dI/dt = 100 A/μs ^b		-	550	830	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	3.9	5.9	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 $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

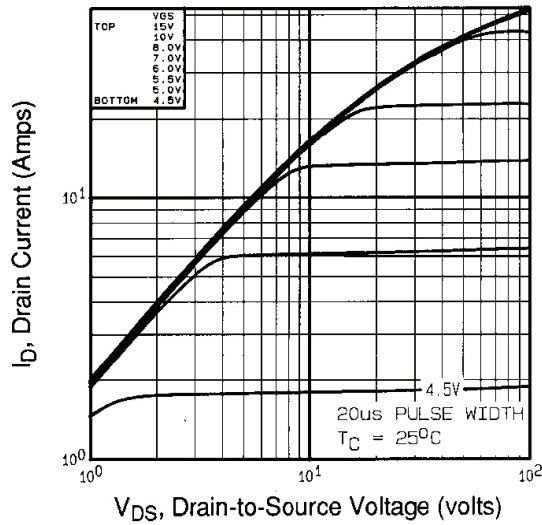


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

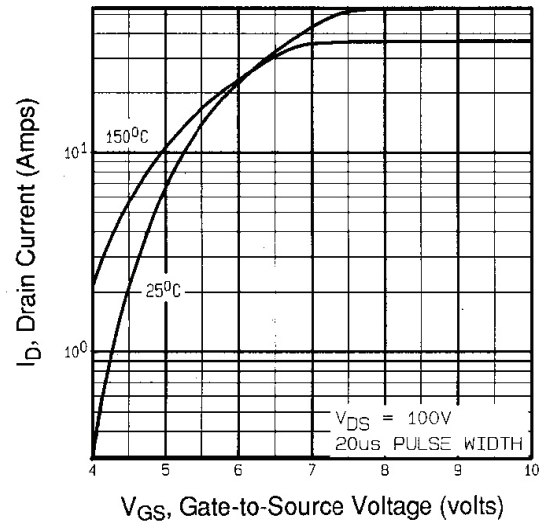


Fig. 3 - Typical Transfer Characteristics

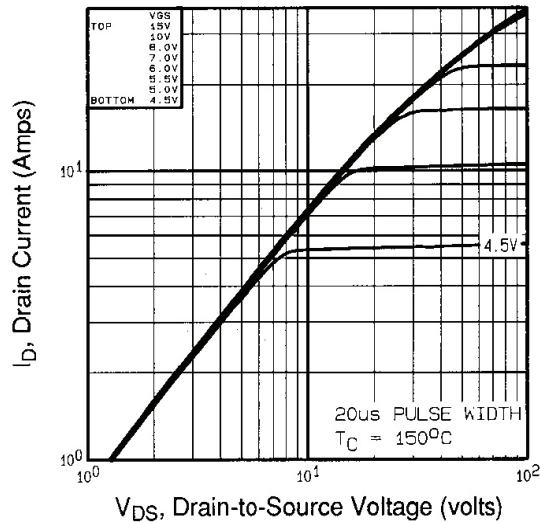


Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

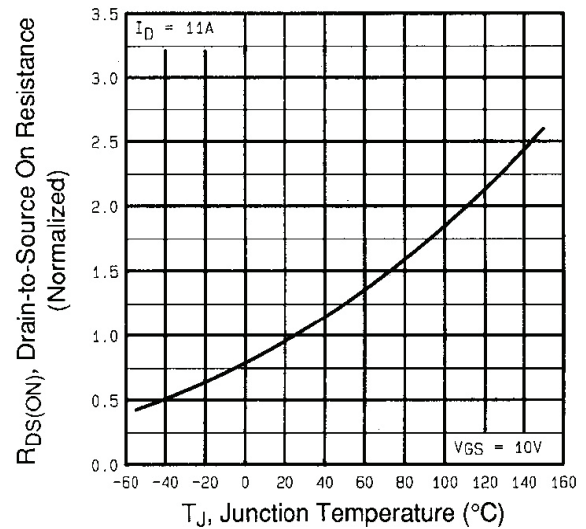


Fig. 4 - Normalized On-Resistance vs. Temperature

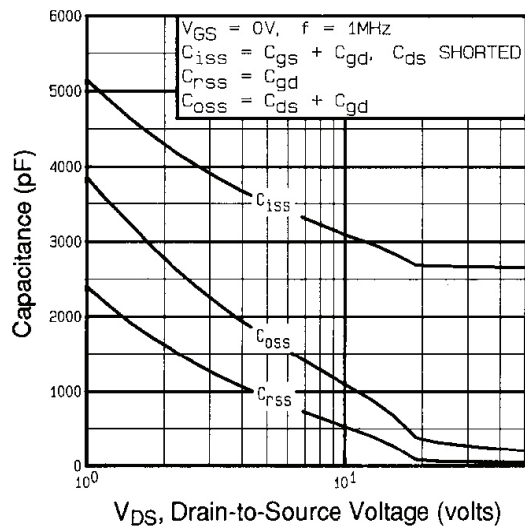


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

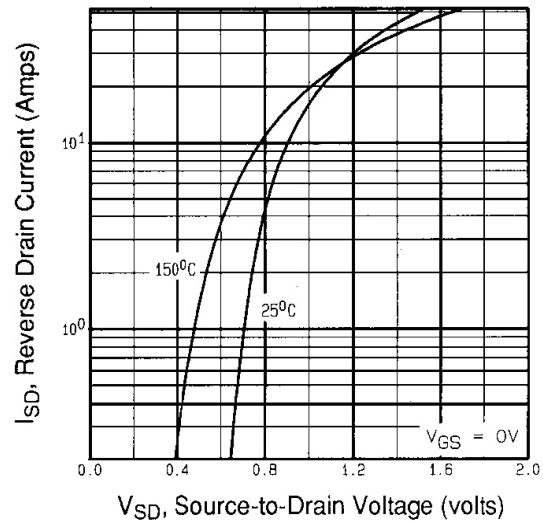


Fig. 7 - Typical Source-Drain Diode Forward Voltage

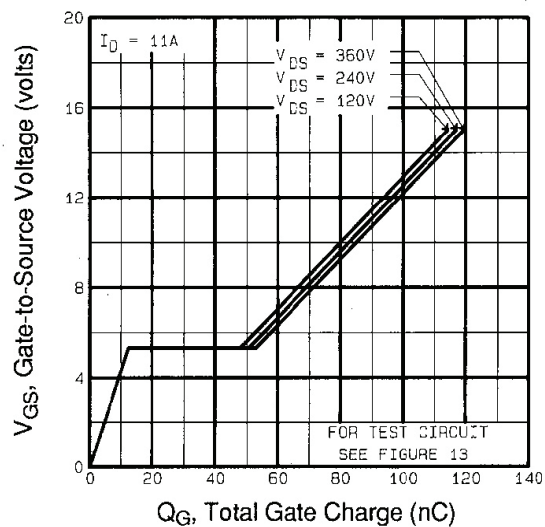


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

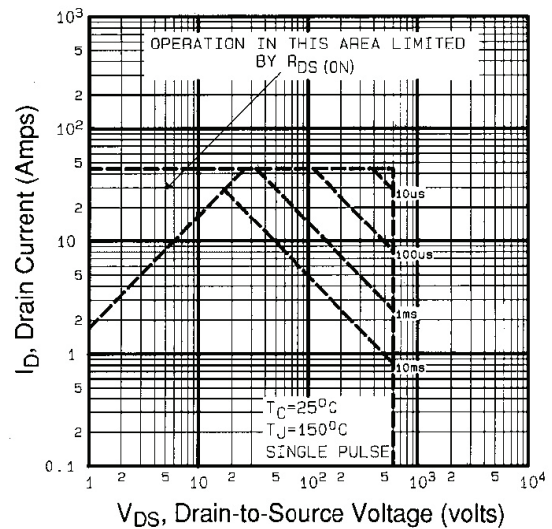


Fig. 8 - Maximum Safe Operating Area

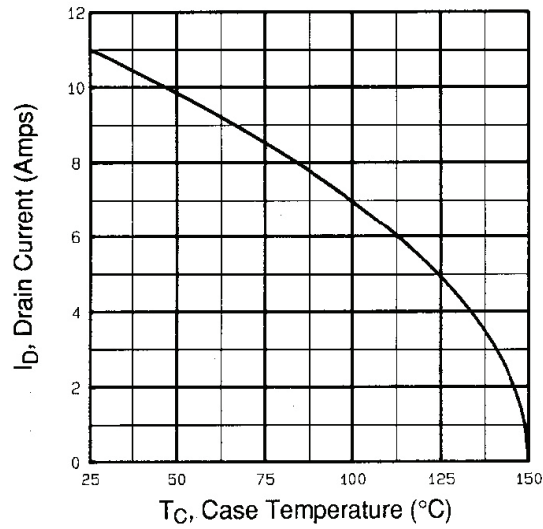


Fig. 9 - Maximum Drain Current vs. Case Temperature



Fig. 10a - Switching Time Test Circuit

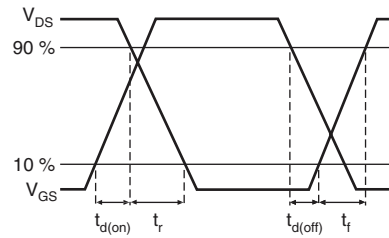


Fig. 10b - Switching Time Waveforms

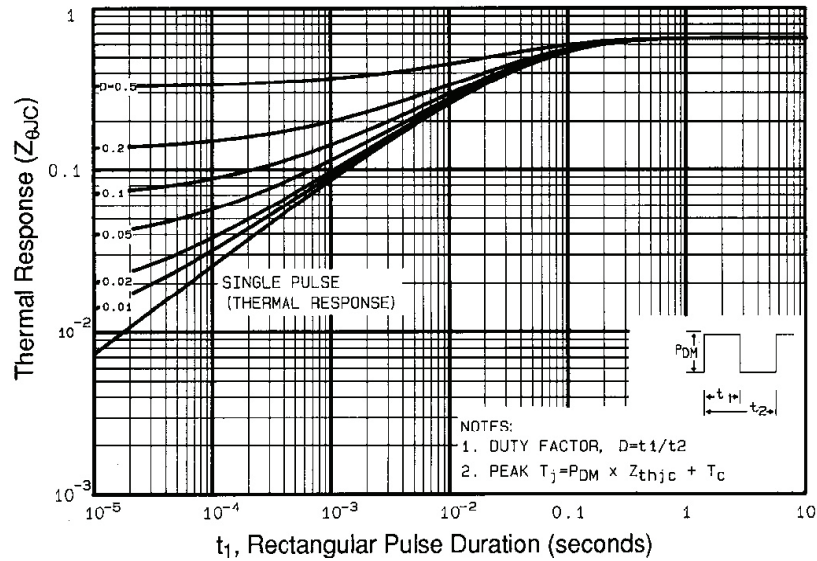


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

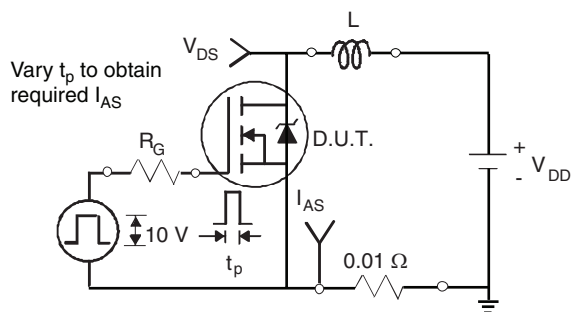


Fig. 12a - Unclamped Inductive Test Circuit

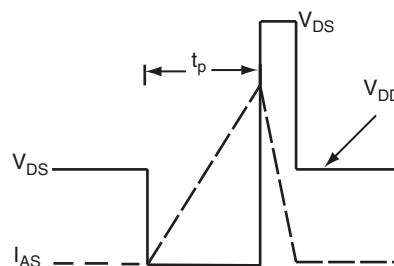


Fig. 12b - Unclamped Inductive Waveforms

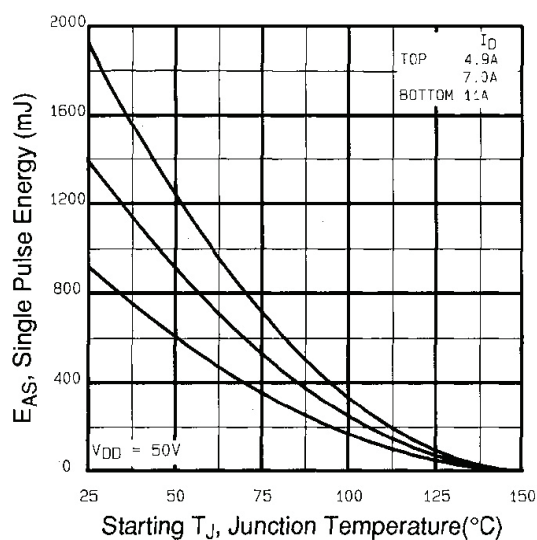


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

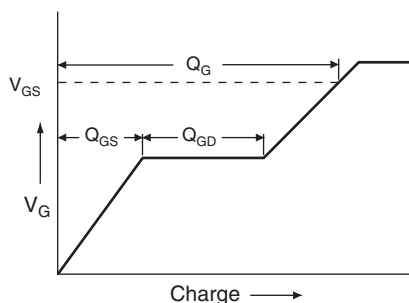


Fig. 13a - Basic Gate Charge Waveform

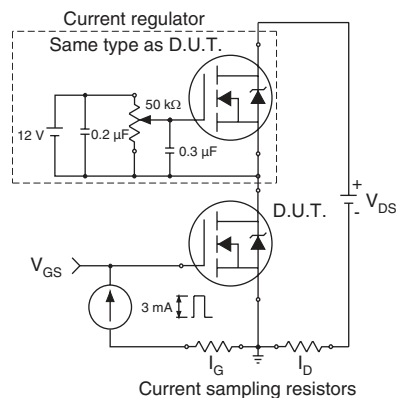


Fig. 13b - Gate Charge Test Circuit

① Driver gate drive

P.W. Period $D = \frac{\text{P.W.}}{\text{Period}}$

$V_{GS} = 10 \text{ V}^*$

② D.U.T. I_{SD} waveform

Reverse recovery current

Body diode forward current

di/dt

③ D.U.T. V_{DS} waveform

Diode recovery dv/dt

V_{DD}

Body diode forward drop

④ Inductor current

Ripple $\leq 5\%$

I_{SD}

* $V_{GS} = 5 \text{ V}$ for logic level devices

5



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