Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	250	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	0.075
Q_g (Max.) (nC)	210	
Q_{gs} (nC)	35	
Q_{gd} (nC)	98	
Configuration	Single	

TO-247

D

G o——

S
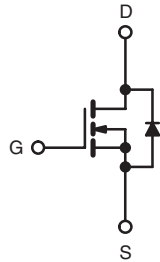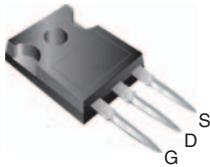
N-Channel MOSFET

FEATURES

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

RoHS*
COMPLIANT

Pb
Available

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 its isolated mounting hole. It also provides greater creepage distances between pins to meet the requirements of most safety specifications.

ORDERING INFORMATION

Package	TO-247
Lead (Pb)-free	IRFP264PbF
	SiHFP264-E3
SnPb	IRFP264
	SiHFP264

ABSOLUTE MAXIMUM RATINGS T_C = 25 °C, unless otherwise noted
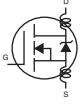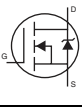
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	250	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	T_C = 25 °C	I_D	38	A
		T_C = 100 °C		24	
Pulsed Drain Current[a]			I_{DM}	150	
Linear Derating Factor				2.2	W/°C
Single Pulse Avalanche Energy[b]			E_{AS}	1000	mJ
Repetitive Avalanche Current[a]			I_{AR}	38	A
Repetitive Avalanche Energy[a]			E_{AR}	28	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	280	W
Peak Diode Recovery dV/dt[c]			dV/dt	4.8	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
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. V_{DD} = 50 V, starting T_J = 25 °C, L = 1.1 mH, R_G = 25 Ω, I_{AS} = 38 A (see fig. 12).
c. $I_{SD} \leq$ 38 A, dI/dt $\leq$ 210 A/µs, $V_{DD} \leq V_{DS}$, $T_J \leq$ 150 °C.
d. 1.6 mm from case.

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

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	40	
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.24	-	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.45	

SPECIFICATIONS T_J = 25 °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		250	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA		-	0.37	-	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} = 250 V, V_{GS} = 0 V		-	-	25	µA
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 125 °C		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 23 A[b]	-	-	0.075	Ω
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 23 A[b]		20	-	-	S
Dynamic							
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	5400	-	pF
Output Capacitance	C_{oss}			-	870	-	
Reverse Transfer Capacitance	C_{rss}			-	150	-	
Total Gate Charge	Q_g	V_{GS} = 10 V	I_D = 38 A, V_{DS} = 200 V, see fig. 6 and 13[b]	-	-	210	nC
Gate-Source Charge	Q_{gs}			-	-	35	
Gate-Drain Charge	Q_{gd}			-	-	98	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 125 V, I_D = 38 A , R_G = 4.3 Ω, R_D = 3.2 Ω, see fig. 10[b]		-	22	-	ns
Rise Time	t_r			-	99	-	
Turn-Off Delay Time	$t_{d(off)}$			-	110	-	
Fall Time	t_f			-	92	-	
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		-	-	38	A
Pulsed Diode Forward Current[a]	I_{SM}			-	-	150	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 38 A, V_{GS} = 0 V[b]		-	-	1.8	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 38 A, dI/dt = 100 A/µs[b]		-	410	620	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	5.7	8.6	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 ≤ 300 µs; duty cycle ≤ 2 %.
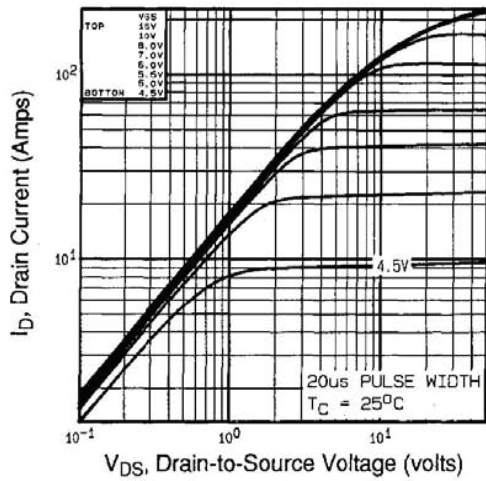
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Fig. 1 - Typical Output Characteristics, T_C = 25 °C
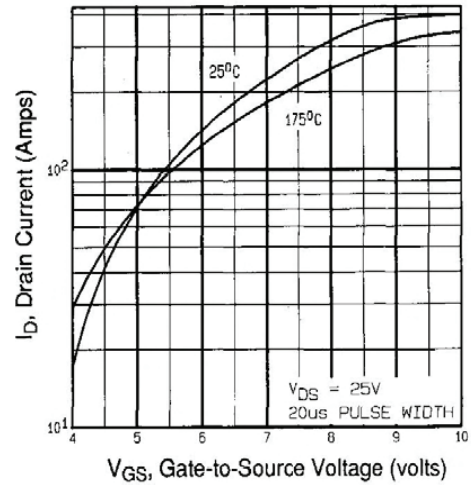

Fig. 3 - Typical Transfer Characteristics

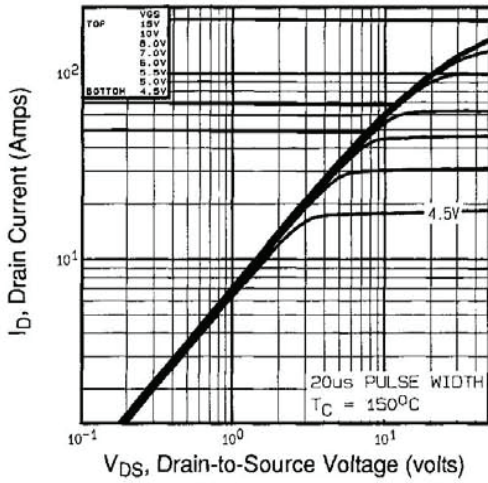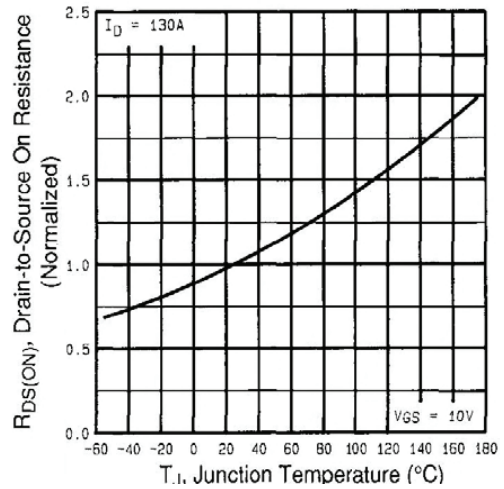Fig. 2 - Typical Output Characteristics, T_C = 150 °C

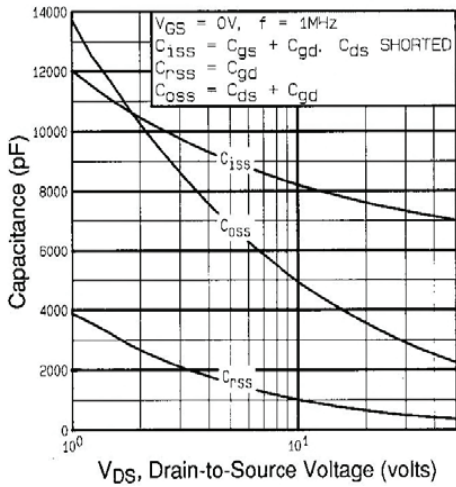Fig. 4 - Normalized On-Resistance vs. Temperature

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

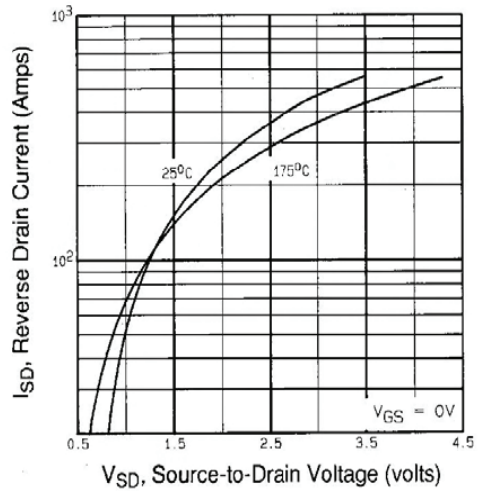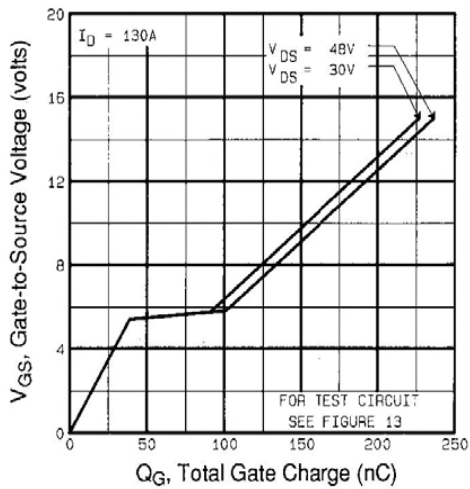**Fig. 7 - Typical Source-Drain Diode Forward Voltage**
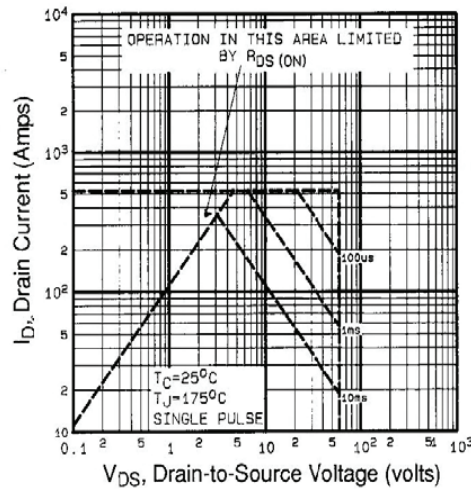

Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

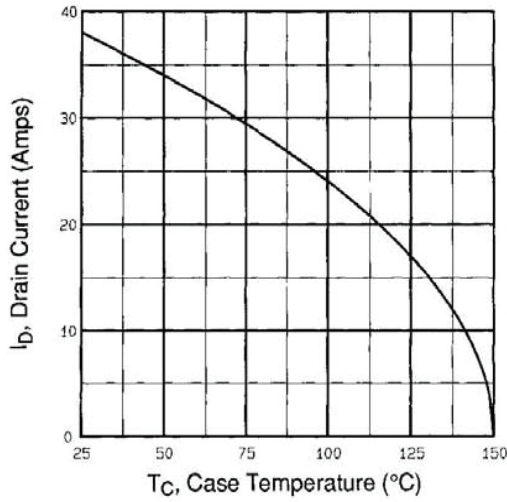**Fig. 8 - Maximum Safe Operating Area**

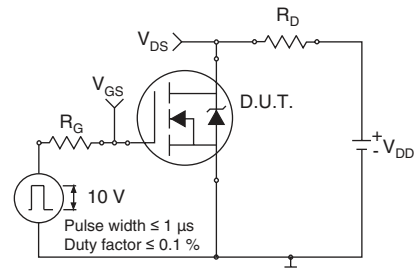Fig. 9 - Maximum Drain Current vs. Case Temperature

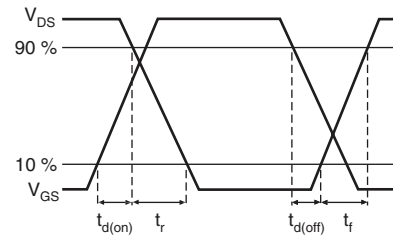Fig. 10a - Switching Time Test Circuit

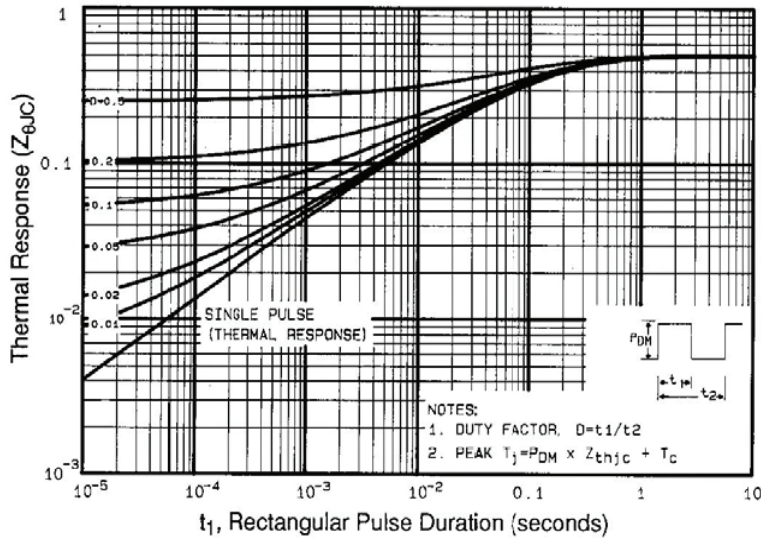Fig. 10b - Switching Time Waveforms

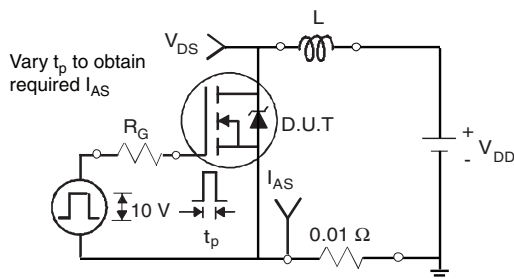Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case
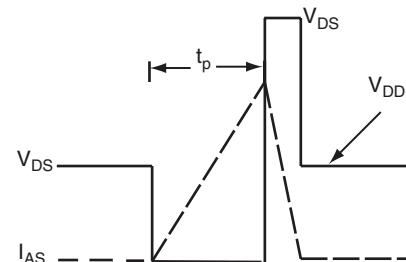

Fig. 12a - Unclamped Inductive Test Circuit

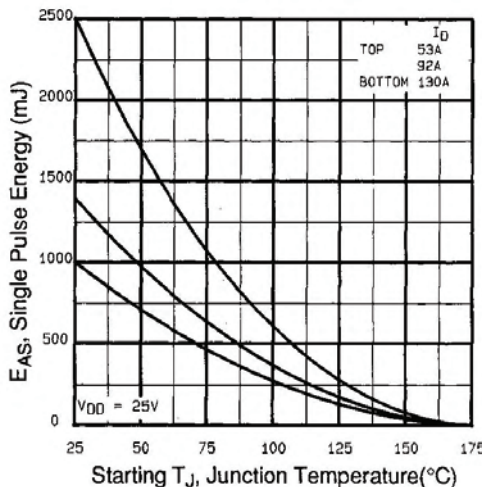Fig. 12b - Unclamped Inductive Waveforms
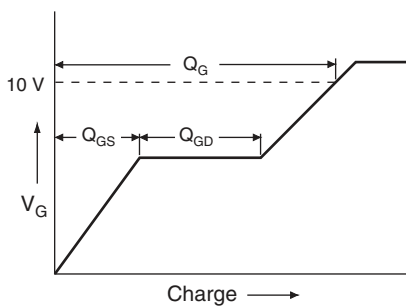
Fig. 12c - Maximum Avalanche Energy vs. Drain Current

Fig. 13a - Basic Gate Charge Waveform

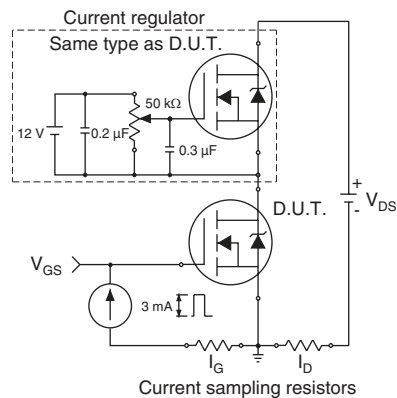

Fig. 13b - Gate Charge Test Circuit
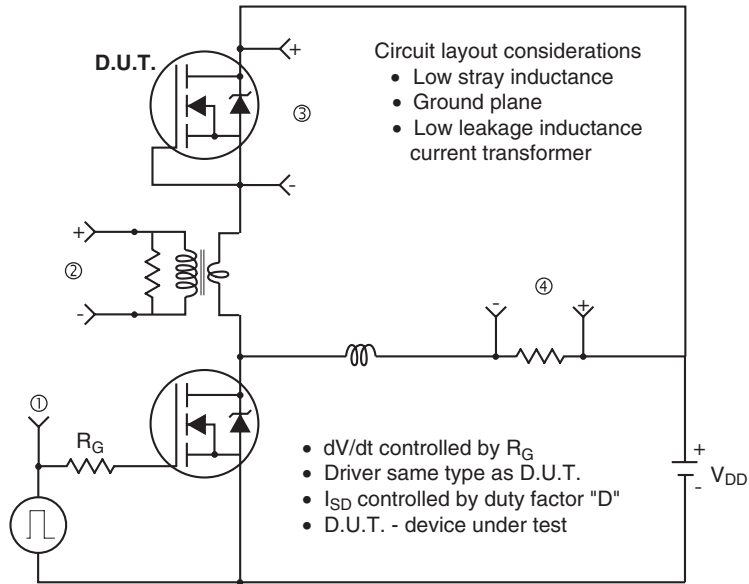
Peak Diode Recovery dV/dt Test Circuit
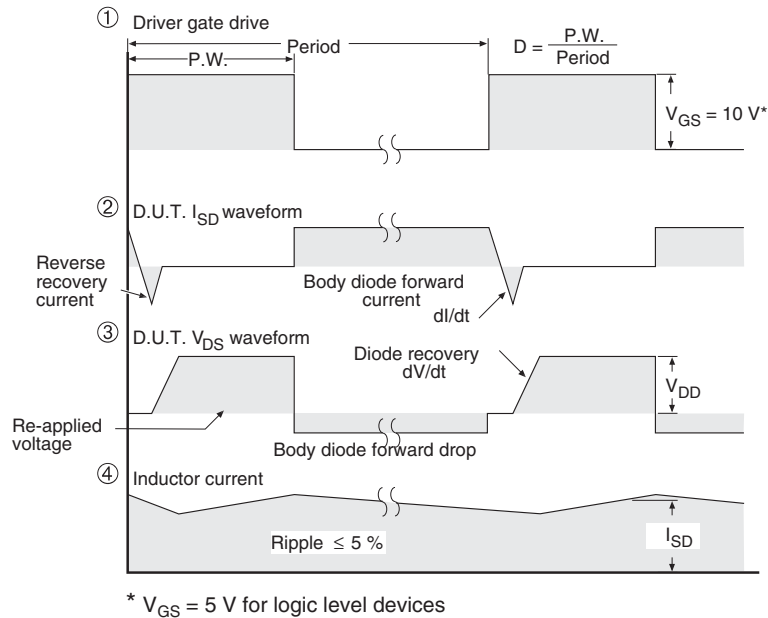
D.U.T.

Circuit layout considerations
- Low stray inductance
- Ground plane
- Low leakage inductance current transformer

- dV/dt controlled by R_G
- Driver same type as D.U.T.
- I_{SD} controlled by duty factor "D"
- D.U.T. - device under test

R_G

V_{DD}

① Driver gate drive

$D = \dfrac{P.W.}{Period}$

P.W.

Period

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

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}

Re-applied voltage

Body diode forward drop

④ Inductor current

Ripple ≤ 5 %

I_{SD}

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

Fig. 14 - For N-Channel

Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.