

## Power MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	450	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10$ V	0.63
$Q_g$ (Max.) (nC)	80	
$Q_{gs}$ (nC)	12	
$Q_{gd}$ (nC)	41	
Configuration	Single	

### FEATURES

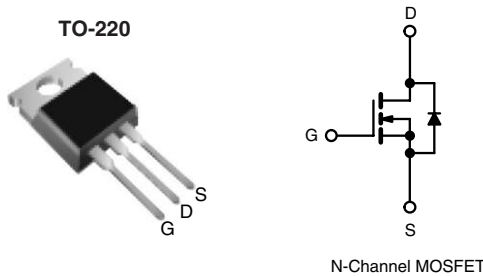
- Dynamic  $dV/dt$  Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Lead (Pb)-free Available


**RoHS\***  
 COMPLIANT

### DESCRIPTION

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

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 W. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



ORDERING INFORMATION	
Package	TO-220
Lead (Pb)-free	IRF744PbF
	SiHF744-E3
SnPb	IRF744
	SiHF744

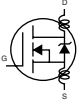
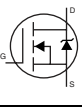
ABSOLUTE MAXIMUM RATINGS $T_C = 25^\circ\text{C}$ , unless otherwise noted			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	450	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current	$I_D$	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	35	
Linear Derating Factor		1.0	$W/^\circ\text{C}$
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	540	mJ
Repetitive Avalanche Current <sup>a</sup>	$I_{AR}$	8.8	A
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	13	mJ
Maximum Power Dissipation	$P_D$	125	W
Peak Diode Recovery $dV/dt^c$	$dV/dt$	3.5	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s	300 <sup>d</sup>	
Mounting Torque	6-32 or M3 screw	10	
		1.1	N · m

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50$  V, starting  $T_J = 25^\circ\text{C}$ ,  $L = 12$  mH,  $R_G = 25\ \Omega$ ,  $I_{AS} = 8.8$  A (see fig. 12).
- $I_{SD} \leq 8.8$  A,  $dV/dt \leq 200$  A/ $\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150^\circ\text{C}$ .
- 1.6 mm from case.

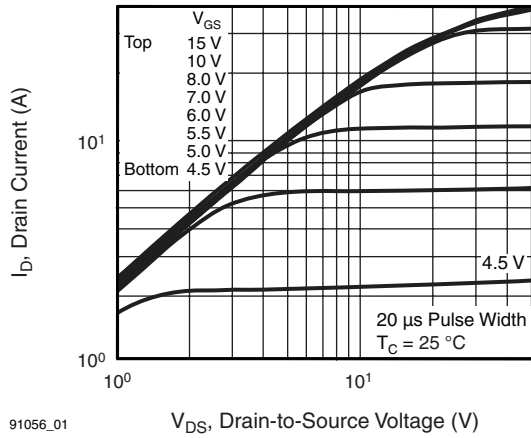
\* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	62	°C/W
Case-to-Sink, Flat, Greased Surface	$R_{thCS}$	0.50	-	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	1.0	

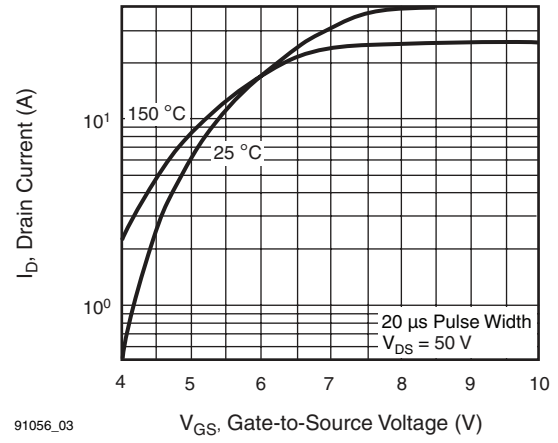
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	450	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$	-	0.59	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 450\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	25	$\mu\text{A}$
		$V_{DS} = 360\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$   $I_D = 5.3\text{ A}^b$	-	-	0.63	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50\text{ V}$ , $I_D = 5.3\text{ A}^b$	4.5	-	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ $V_{DS} = 25\text{ V}$ $f = 1.0\text{ MHz}$ , see fig. 5	-	1400	-	pF
Output Capacitance	$C_{oss}$		-	370	-	
Reverse Transfer Capacitance	$C_{rss}$		-	140	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$   $I_D = 8.8\text{ A}$ , $V_{DS} = 360\text{ V}$ , see fig. 6 and 13 <sup>b</sup>	-	-	80	nC
Gate-Source Charge	$Q_{gs}$		-	-	12	
Gate-Drain Charge	$Q_{gd}$		-	-	41	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 225\text{ V}$ , $I_D = 8.8\text{ A}$ $R_G = 9.1\text{ }\Omega$ , $R_D = 25\text{ }\Omega$ , see fig. 10 <sup>b</sup>	-	8.7	-	ns
Rise Time	$t_r$		-	28	-	
Turn-Off Delay Time	$t_{d(off)}$		-	58	-	
Fall Time	$t_f$		-	27	-	
Internal Drain Inductance	$L_D$	Between lead, 6 mm (0.25") from package and center of die contact 	-	4.5	-	nH
Internal Source Inductance	$L_S$		-	7.5	-	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	8.8	A
Pulsed Diode Forward Current <sup>a</sup>	$I_{SM}$		-	-	35	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_S = 8.8\text{ A}$ , $V_{GS} = 0\text{ V}^b$	-	-	2.0	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = 8.8\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}^b$	-	490	740	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	3.2	4.8	$\mu\text{C}$
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )				

### Notes

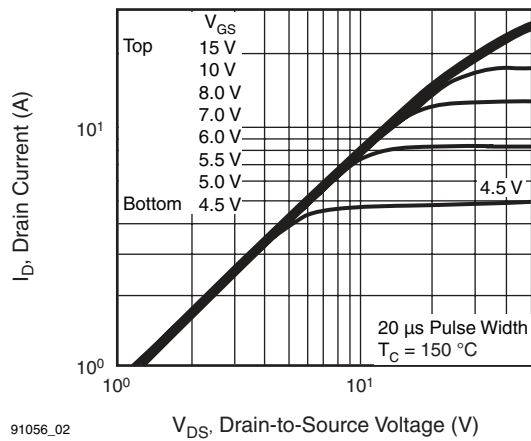
- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Pulse width  $\leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted


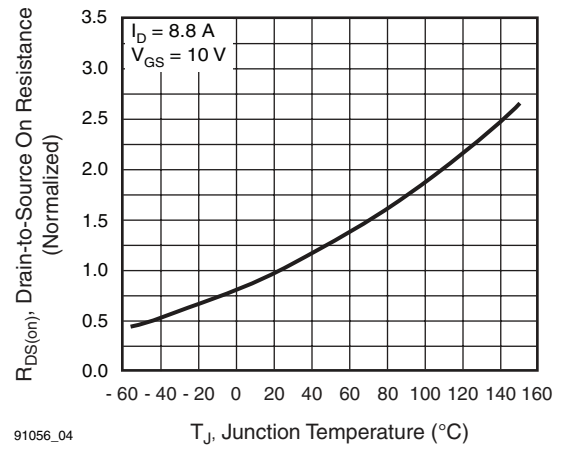
91056\_01

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


91056\_03

**Fig. 3 - Typical Transfer Characteristics**


91056\_02

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


91056\_04

**Fig. 4 - Normalized On-Resistance vs. Temperature**

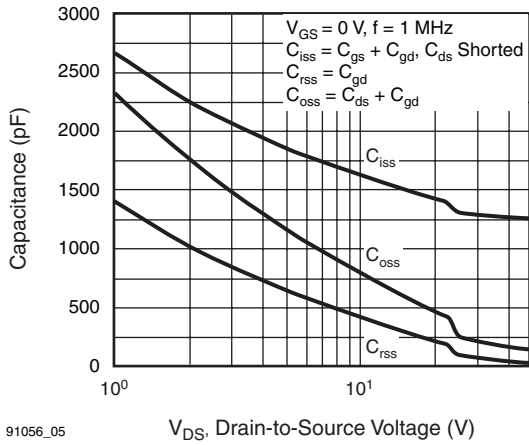


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

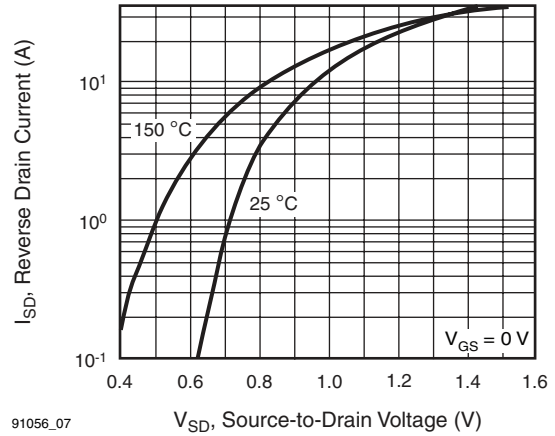


Fig. 7 - Typical Source-Drain Diode Forward Voltage

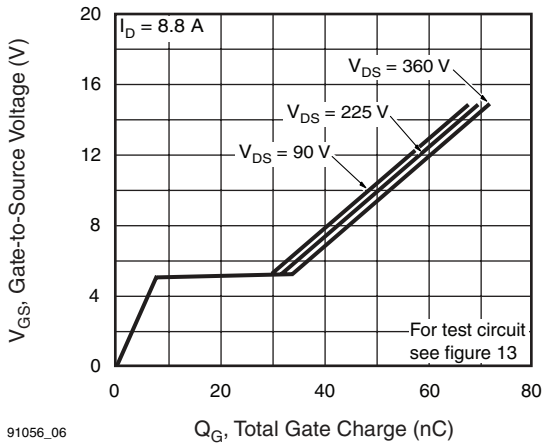


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

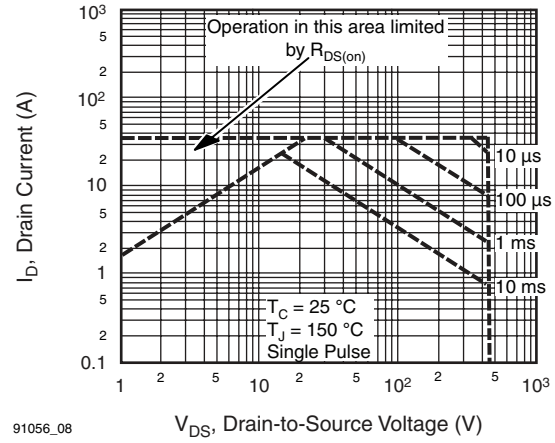
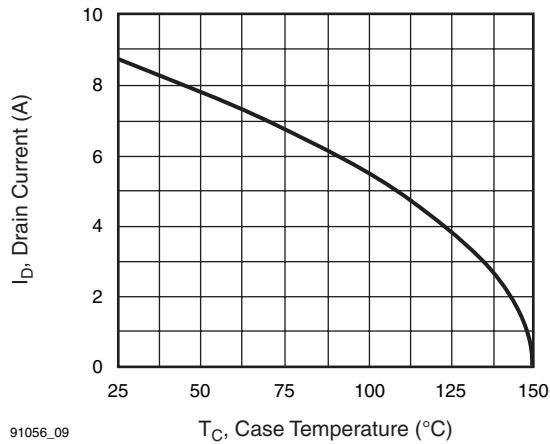
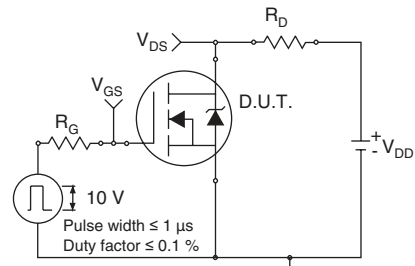


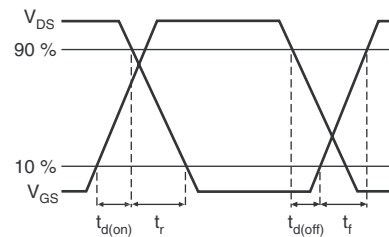
Fig. 8 - Maximum Safe Operating Area



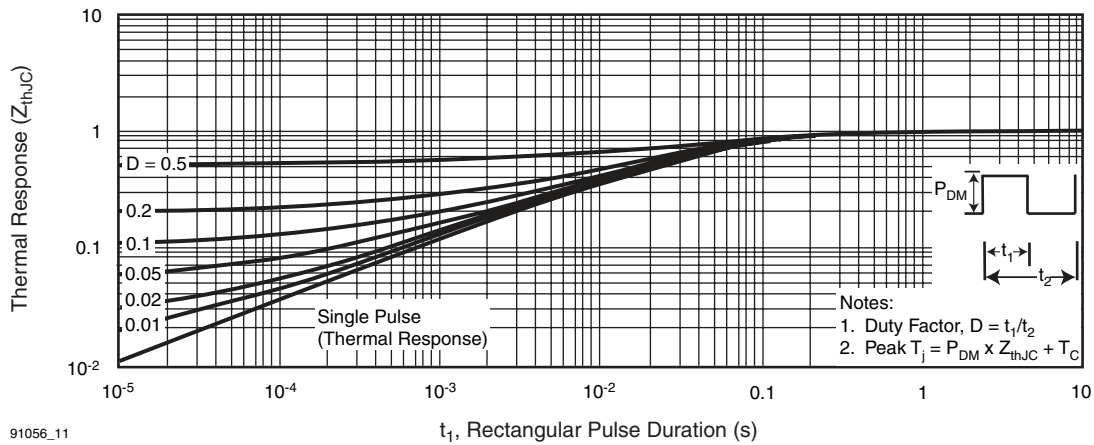
**Fig. 9 - Maximum Drain Current vs. Case Temperature**



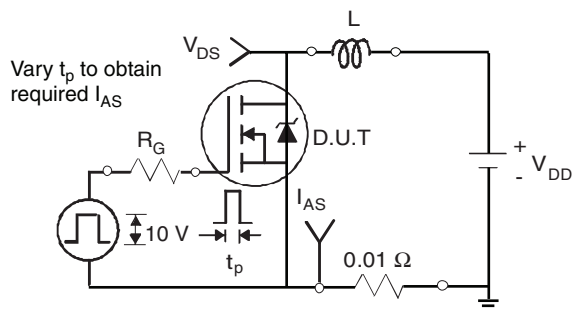
**Fig. 10a - Switching Time Test Circuit**



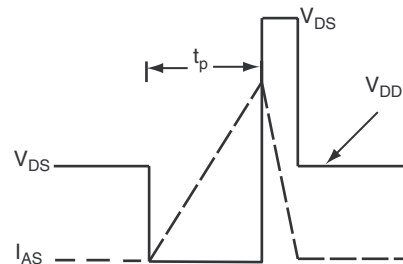
**Fig. 10b - Switching Time Waveforms**



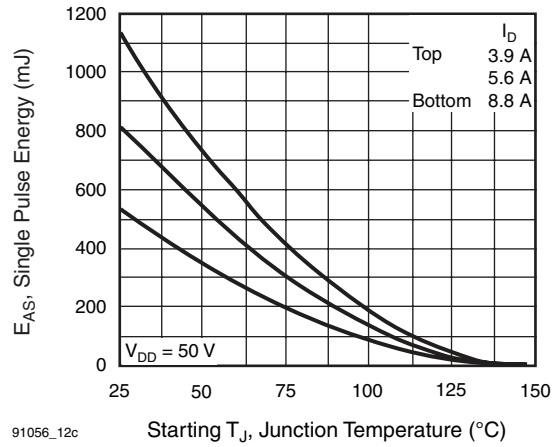
**Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**



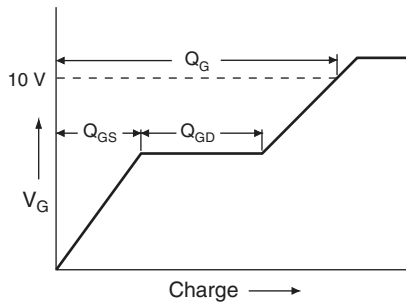
**Fig. 12a - Unclamped Inductive Test Circuit**



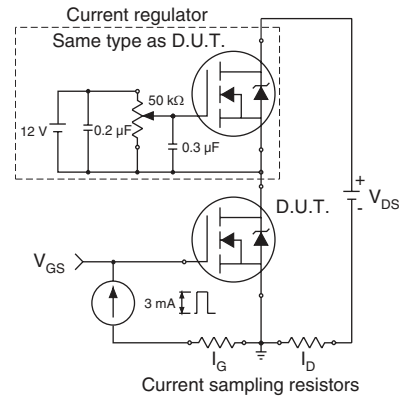
**Fig. 12b - Unclamped Inductive Waveforms**



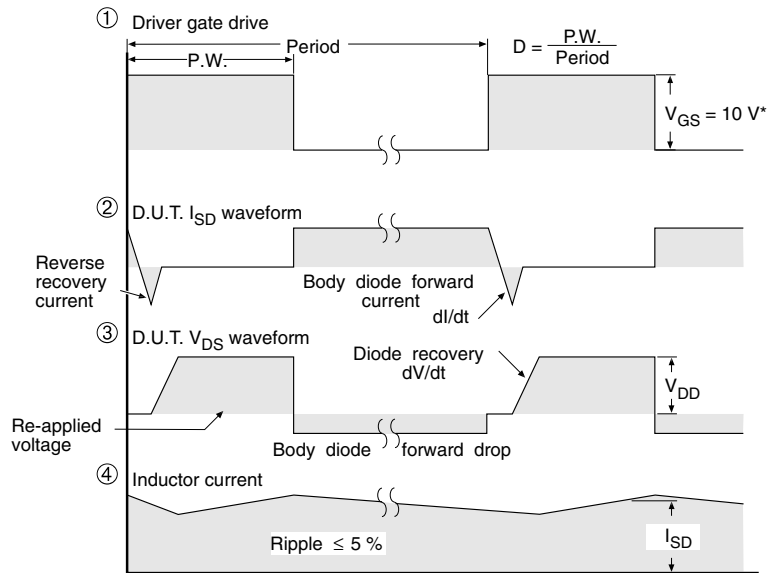
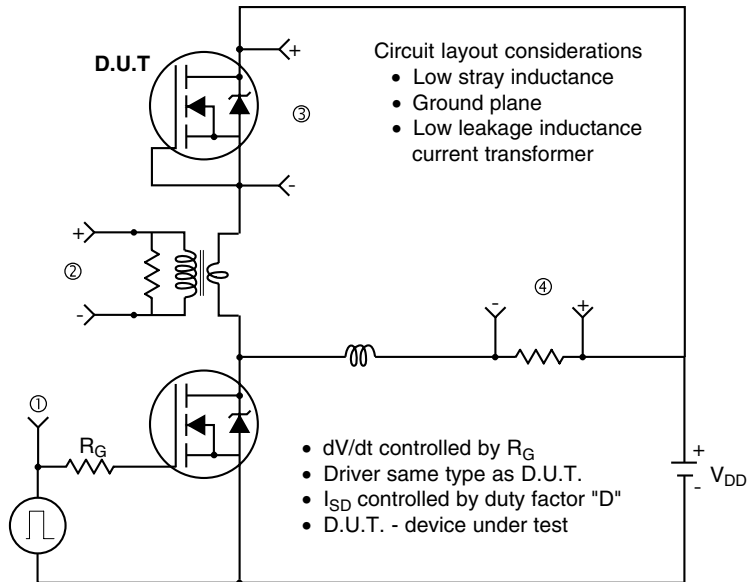
**Fig. 12c - Maximum Avalanche Energy vs. Drain Current**



**Fig. 13a - Basic Gate Charge Waveform**



**Fig. 13b - Gate Charge Test Circuit**

**Peak Diode Recovery dV/dt Test Circuit**


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

**Fig. 14 - For N-Channel**

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