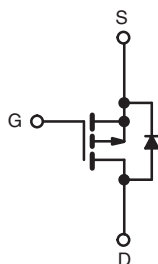
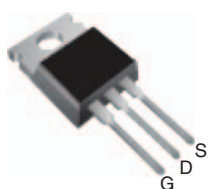


## Power MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V)	- 200	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = -10$ V	1.5
$Q_g$ (Max.) (nC)	22	
$Q_{gs}$ (nC)	12	
$Q_{gd}$ (nC)	10	
Configuration	Single	

**TO-220**

**P-Channel MOSFET**

### FEATURES

- Dynamic  $dV/dt$  Rating
- P-Channel
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Lead (Pb)-free 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-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	IRF9620PbF
	SiHF9620-E3
SnPb	IRF9620
	SiHF9620

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

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			$V_{DS}$	- 200	V
Gate-Source Voltage			$V_{GS}$	$\pm 20$	
Continuous Drain Current	$V_{GS}$ at - 10 V	$T_C = 25\text{ }^{\circ}\text{C}$	$I_D$	- 3.5	A
		$T_C = 100\text{ }^{\circ}\text{C}$		- 2.0	
Pulsed Drain Current <sup>a</sup>			$I_{DM}$	- 14	
Linear Derating Factor				0.32	W/ $^{\circ}\text{C}$
Maximum Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$		$P_D$	40	W
Peak Diode Recovery $dV/dt^b$			$dV/dt$	- 5.0	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 $^{\circ}$	
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).
- $I_{SD} \leq -3.5$  A,  $dI/dt \leq 95$  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**

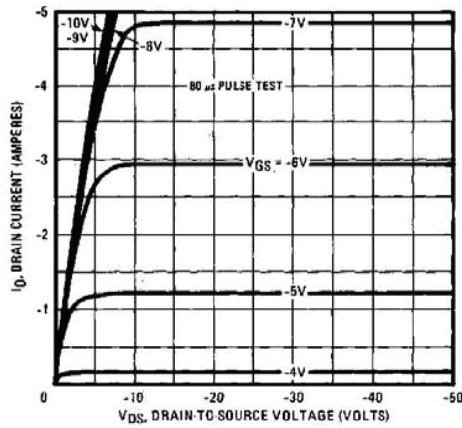
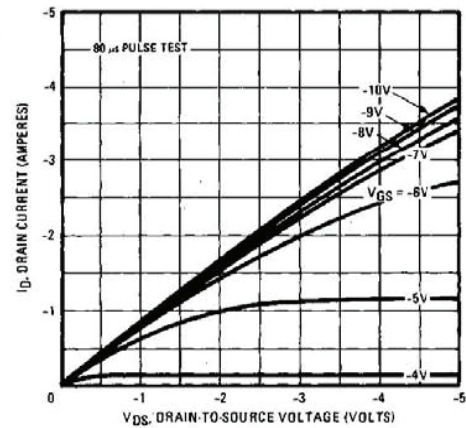
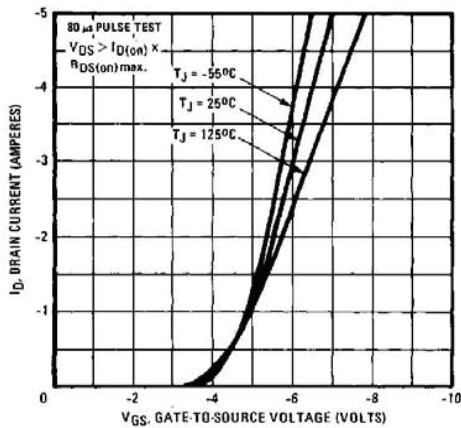
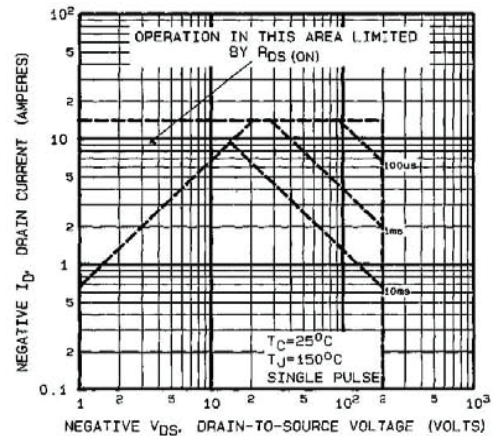
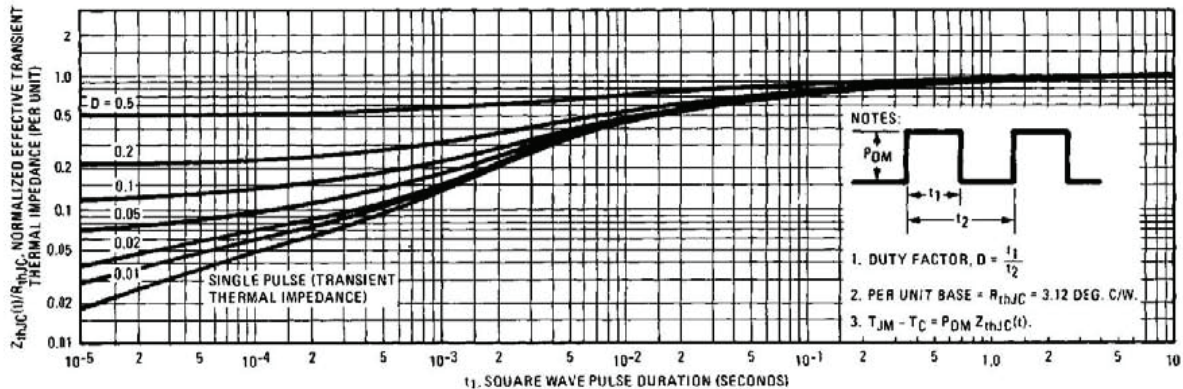
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	62	°C/W
Case-to-Sink, Flat, Greased Surface	$R_{thCS}$	0.50	-	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	3.1	

**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 <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA		- 200	-	-	V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	Reference to 25 °C, I <sub>D</sub> = - 1 mA		-	- 0.22	-	V/°C
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA		- 2.0	-	- 4.0	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 200 V, V <sub>GS</sub> = 0 V		-	-	- 100	μA
		V <sub>DS</sub> = - 160 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C		-	-	- 500	
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 1.5 A <sup>b</sup>	-	-	1.5	Ω
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = - 50 V, I <sub>D</sub> = - 1.5 A <sup>b</sup>		1.0	-	-	S
Dynamic							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = - 25 V, f = 1.0 MHz, see fig. 5		-	350	-	pF
Output Capacitance	C <sub>oss</sub>			-	100	-	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	30	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 4.0 A, V <sub>DS</sub> = - 160 V, see fig. 11 and 18 <sup>b</sup>	-	-	22	nC
Gate-Source Charge	Q <sub>gs</sub>			-	-	12	
Gate-Drain Charge	Q <sub>gd</sub>			-	-	10	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 100 V, I <sub>D</sub> = - 1.5 A, R <sub>G</sub> = 50 Ω, R <sub>D</sub> = 67 Ω, see fig. 17 <sup>b</sup>		-	15	-	ns
Rise Time	t <sub>r</sub>			-	25	-	
Turn-Off Delay Time	t <sub>d(off)</sub>			-	20	-	
Fall Time	t <sub>f</sub>			-	15	-	
Internal Drain Inductance	L <sub>D</sub>	Between lead, 6 mm (0.25") from package and center of die contact		-	4.5	-	nH
Internal Source Inductance	L <sub>S</sub>			-	7.5	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I <sub>S</sub>	MOSFET symbol showing the integral reverse p - n junction diode		-	-	- 3.5	A
Pulsed Diode Forward Current <sup>a</sup>	I <sub>SM</sub>			-	-	- 14	
Body Diode Voltage	V <sub>SD</sub>	T <sub>J</sub> = 25 °C, I <sub>S</sub> = - 3.5 A, V <sub>GS</sub> = 0 V <sup>b</sup>		-	-	- 7.0	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C, I <sub>F</sub> = - 3.5 A, dI/dt = 100 A/μs <sup>b</sup>		-	300	450	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			-	1.9	2.9	μC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> and L <sub>D</sub> )					

**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**

**Fig. 3 - Typical Saturation Characteristics**

**Fig. 2 - Typical Transfer Characteristics**

**Fig. 4 - Maximum Safe Operating Area**

**Fig. 5 - Maximum Effective Transient Thermal Impedance, Junction-to-Case vs. Pulse Duration**

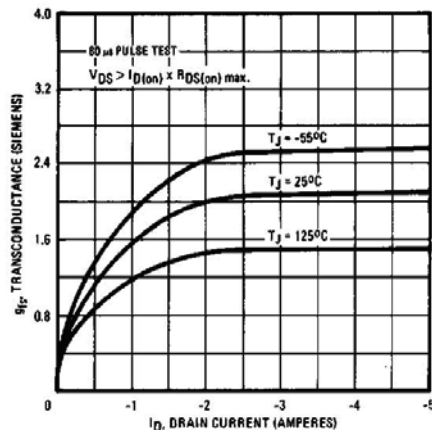


Fig. 6 - Typical Transconductance vs. Drain Current

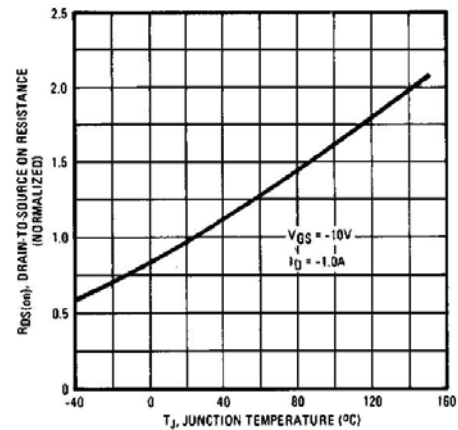


Fig. 9 - Normalized On-Resistance vs. Temperature

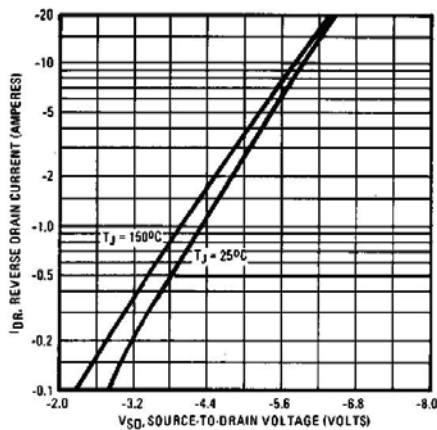


Fig. 7 - Typical Source-Drain Diode Forward Voltage

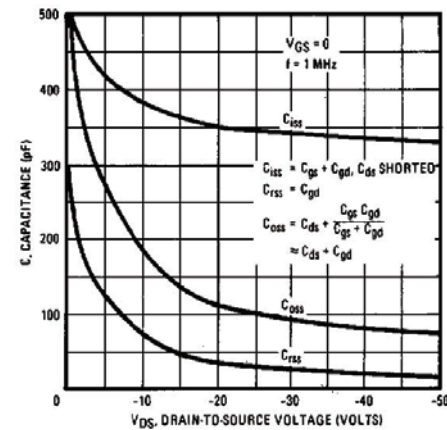


Fig. 10 - Typical Capacitance vs. Drain-to-Source Voltage

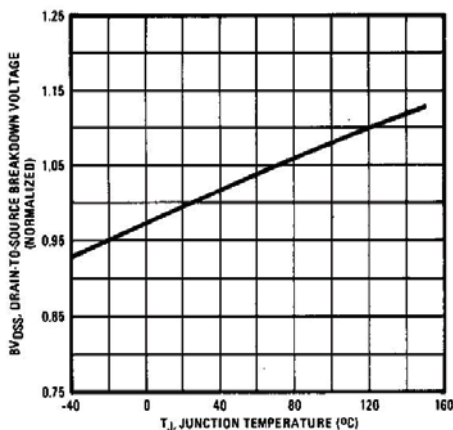


Fig. 8 - Breakdown Voltage vs. Temperature

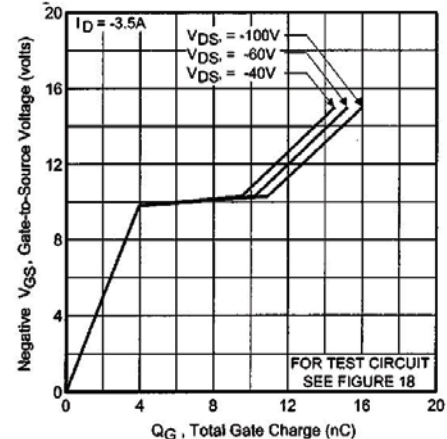


Fig. 11 - Typical Gate Charge vs. Gate-to-Source Voltage

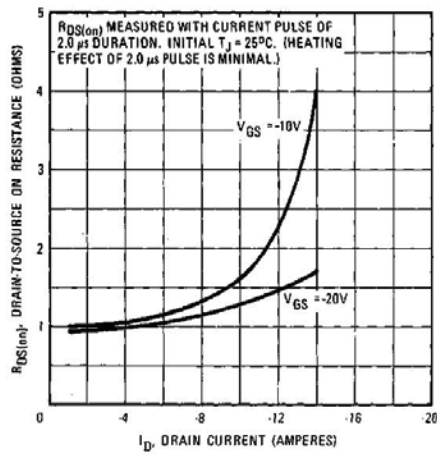


Fig. 12 - Typical On-Resistance vs. Drain Current

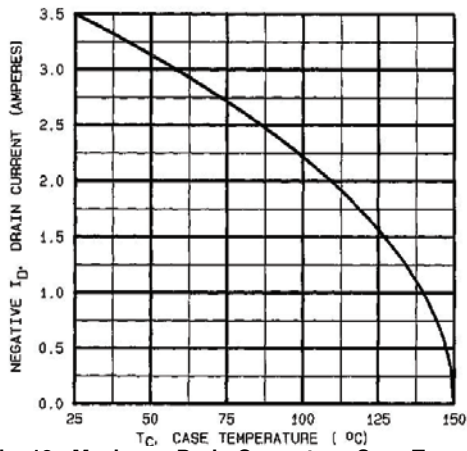


Fig. 13 - Maximum Drain Current vs. Case Temperature

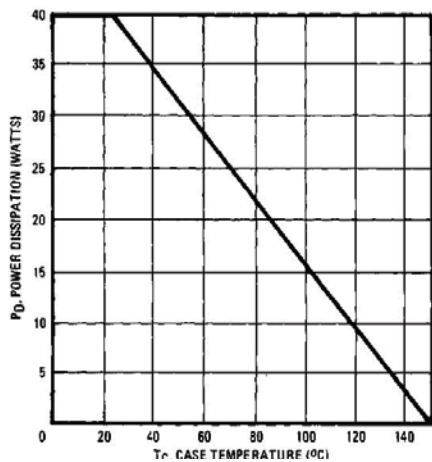


Fig. 14 - Power vs. Temperature Derating Curve

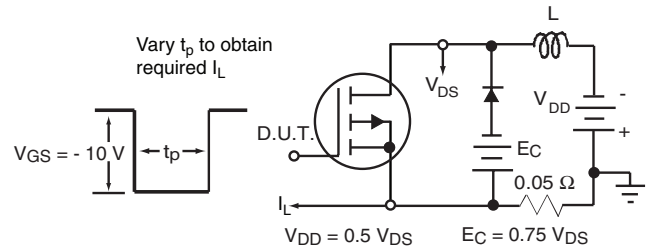


Fig. 15 - Clamped Inductive Test Circuit

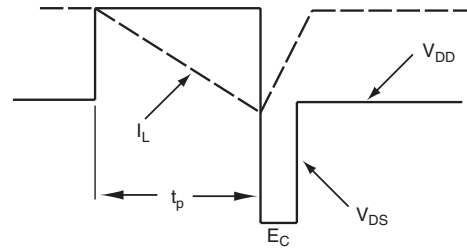


Fig. 16 - Clamped Inductive Waveforms

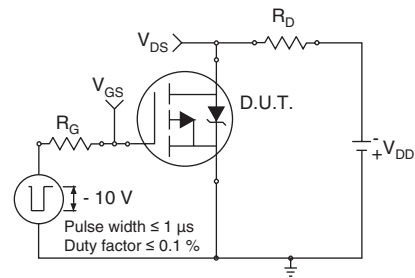


Fig. 17a - Switching Time Test Circuit

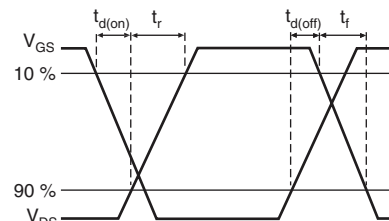


Fig. 17b - Switching Time Waveforms

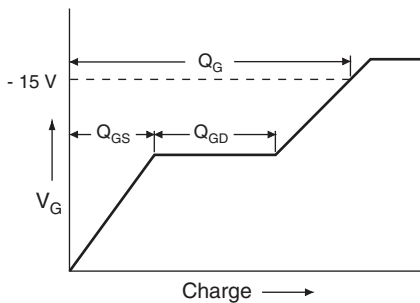


Fig. 18a - Basic Gate Charge Waveform

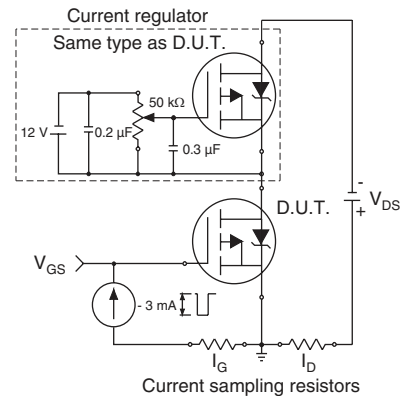
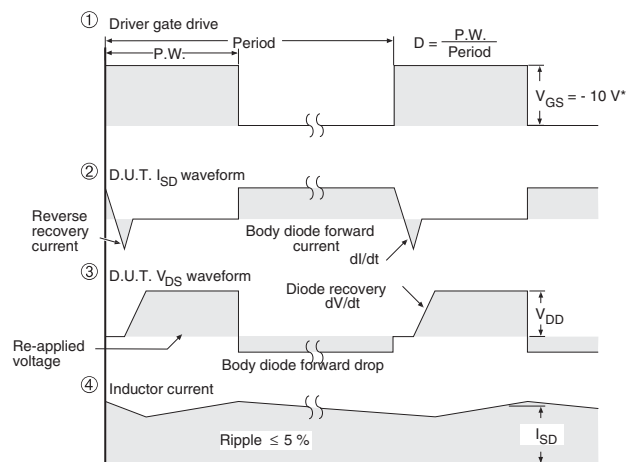
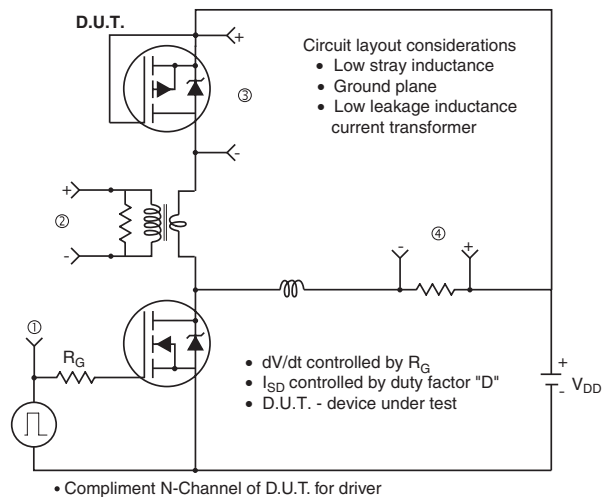


Fig. 18b - Gate Charge Test Circuit

## Peak Diode Recovery $dV/dt$ Test Circuit



\*  $V_{GS} = -5$  V for logic level and -3 V drive devices

Fig. 19 - For P-Channel

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