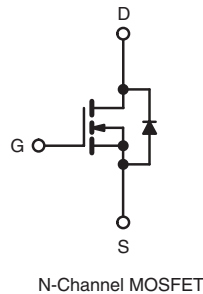
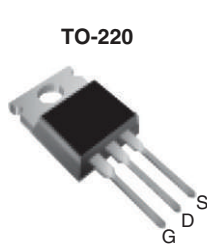


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	200	
$R_{DS(on)}$ (Ω)	$V_{GS} = 5.0$ V	0.18
Q_g (Max.) (nC)	66	
Q_{gs} (nC)	9.0	
Q_{gd} (nC)	38	
Configuration	Single	



FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at $V_{GS} = 4$ V and 5 V
- 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	IRL640PbF
	SiHL640-E3
SnPb	IRL640
	SiHL640

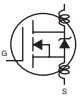
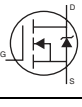
ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	200	V
Gate-Source Voltage			V_{GS}	± 10	
Continuous Drain Current	V_{GS} at 5.0 V	$T_C = 25$ °C	I_D	17	A
		$T_C = 100$ °C		11	
Pulsed Drain Current ^a			I_{DM}	68	
Linear Derating Factor				1.0	W/°C
Single Pulse Avalanche Energy ^b			E_{AS}	580	mJ
Repetitive Avalanche Current ^a			I_{AR}	10	A
Repetitive Avalanche Energy ^a			E_{AR}	13	mJ
Maximum Power Dissipation	$T_C = 25$ °C		P_D	125	W
Peak Diode Recovery dV/dt^c			dV/dt	5.0	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	
				1.1	N · m

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 3.0$ mH, $R_G = 25$ Ω , $I_{AS} = 17$ A (see fig. 12).
- $I_{SD} \leq 17$ A, $dI/dt \leq 150$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °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
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	200	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$	-	0.27	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1.0	-	2.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 10$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	25	μA
		$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 5.0\text{ V}$, $I_D = 10\text{ A}^b$	-	-	0.18	Ω
		$V_{GS} = 4.0\text{ V}$, $I_D = 8.5\text{ A}^b$	-	-	0.27	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 10\text{ A}^b$	16	-	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$ $V_{DS} = 25\text{ V}$ $f = 1.0\text{ MHz}$, see fig. 5	-	1800	-	μF
Output Capacitance	C_{oss}		-	400	-	
Reverse Transfer Capacitance	C_{rss}		-	120	-	
Total Gate Charge	Q_g	$V_{GS} = 5.0\text{ V}$, $I_D = 17\text{ A}$, $V_{DS} = 160\text{ V}$, see fig. 6 and 13 ^b	-	-	66	nC
Gate-Source Charge	Q_{gs}		-	-	9.0	
Gate-Drain Charge	Q_{gd}		-	-	38	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 100\text{ V}$, $I_D = 17\text{ A}$ $R_G = 4.6\text{ }\Omega$, $R_D = 5.7\text{ }\Omega$, see fig. 10 ^b	-	8.0	-	ns
Rise Time	t_r		-	83	-	
Turn-Off Delay Time	$t_{d(off)}$		-	44	-	
Fall Time	t_f		-	52	-	
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	-	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	17	A
Pulsed Diode Forward Current ^a	I_{SM}		-	-	68	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = 17\text{ A}$, $V_{GS} = 0\text{ V}^b$	-	-	2.0	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = 17\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}^b$	-	310	470	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	3.2	4.8	μC
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

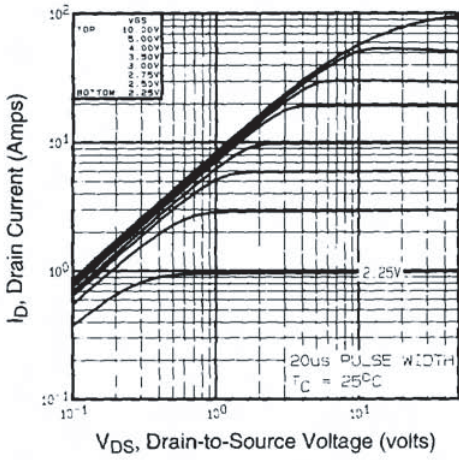


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

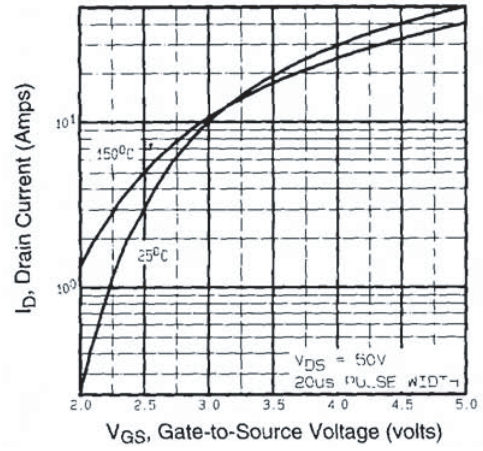


Fig. 3 - Typical Transfer Characteristics

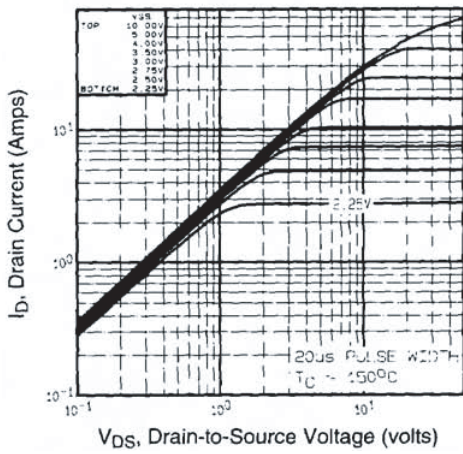


Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

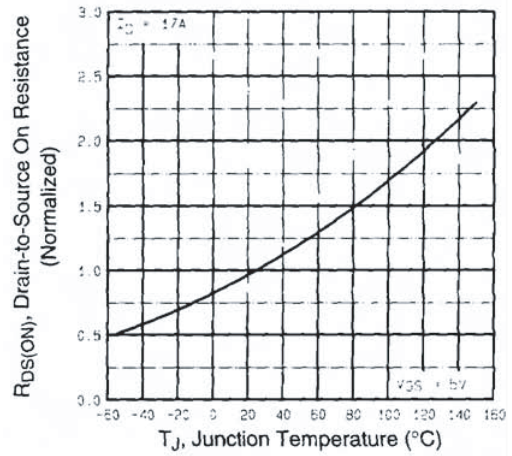


Fig. 4 - Normalized On-Resistance vs. Temperature

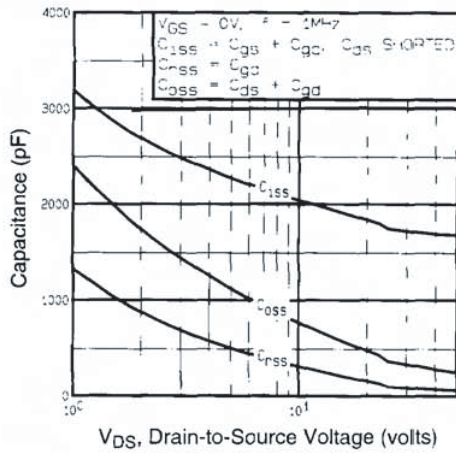


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

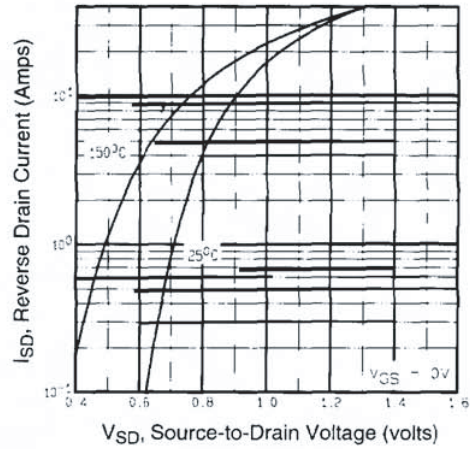


Fig. 7 - Typical Source-Drain Diode Forward Voltage

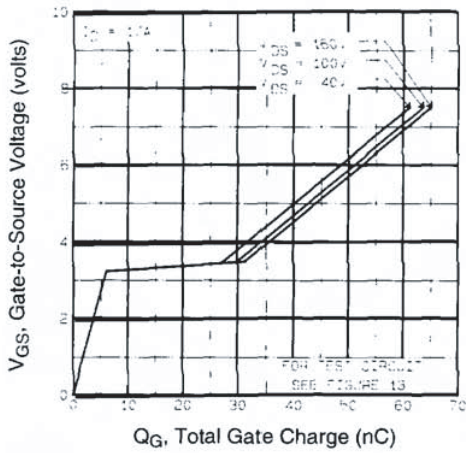


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

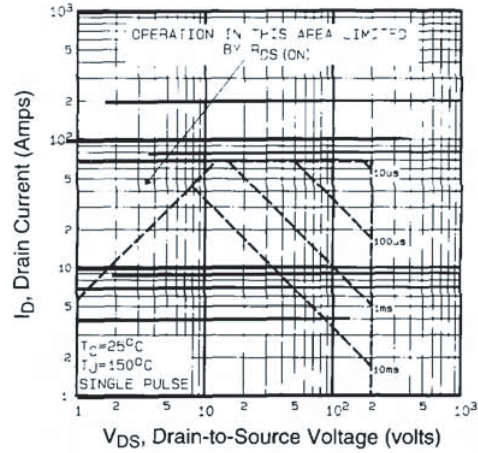


Fig. 8 - Maximum Safe Operating Area

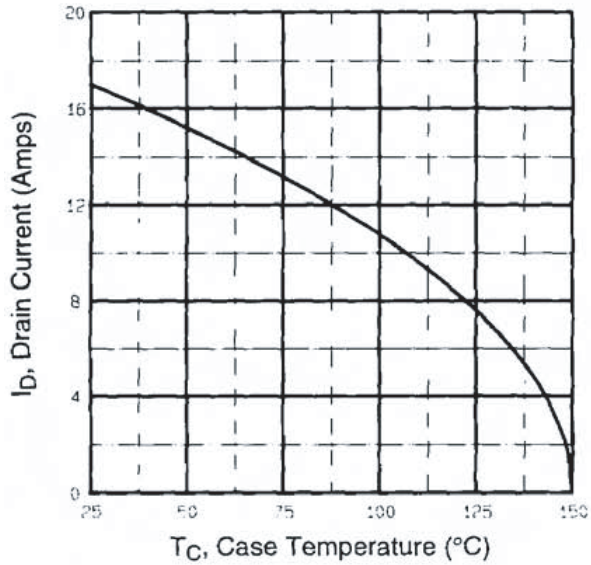


Fig. 9 - Maximum Drain Current vs. Case Temperature

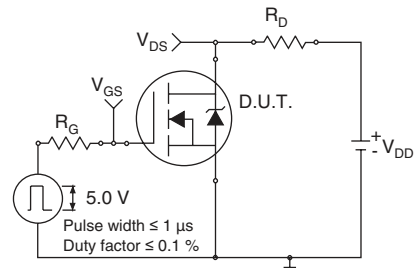


Fig. 10a - Switching Time Test Circuit

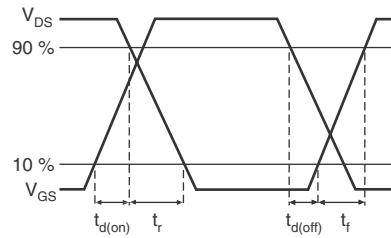


Fig. 10b - Switching Time Waveforms

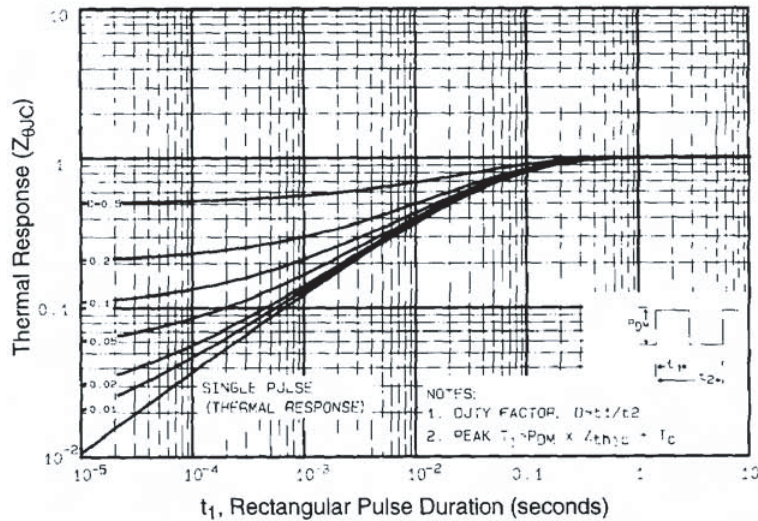


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

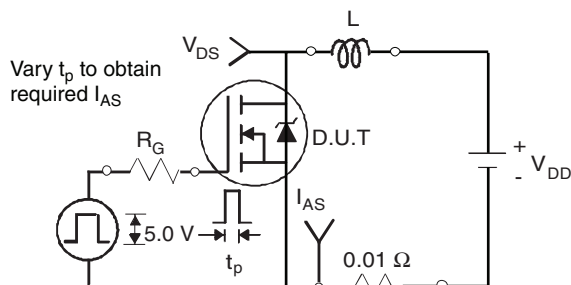


Fig. 12a - Unclamped Inductive Test Circuit

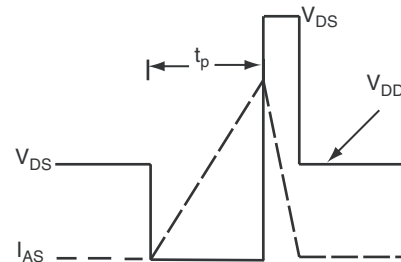


Fig. 12b - Unclamped Inductive Waveforms

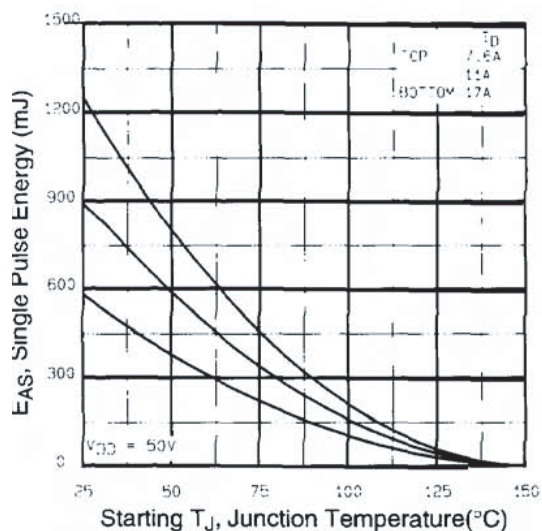


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

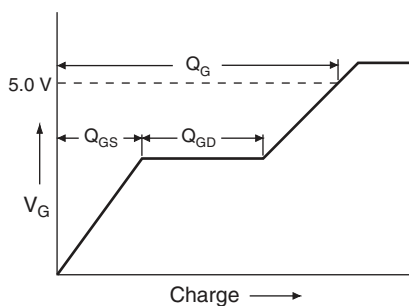


Fig. 13a - Basic Gate Charge Waveform

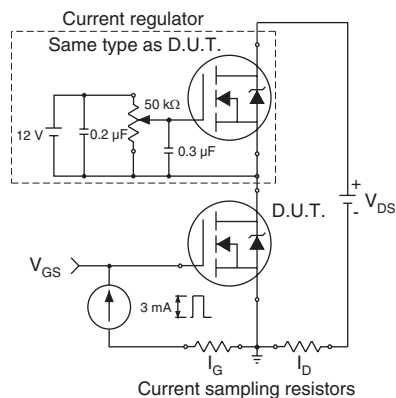
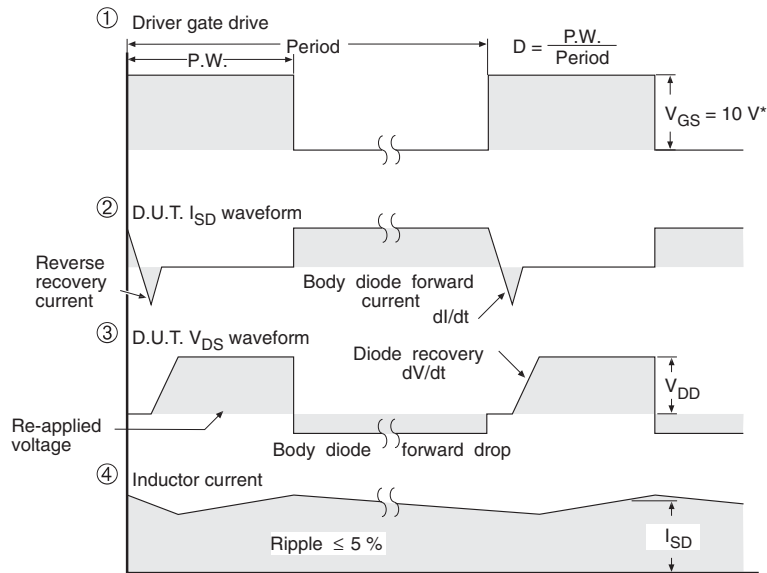
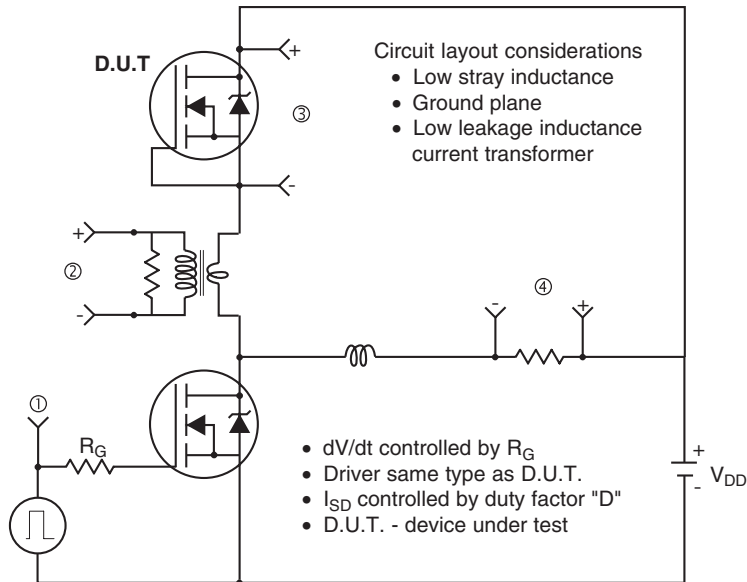


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



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

Fig. 14 - For N-Channel

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