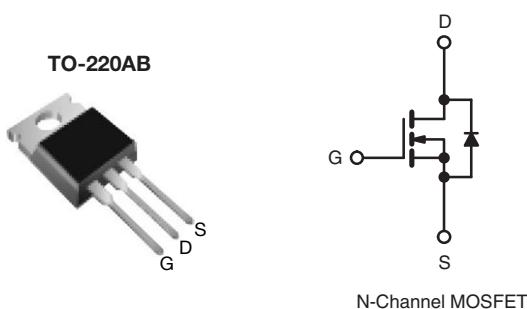


Power MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	500
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V 3.0
Q_g (Max.) (nC)	24
Q_{gs} (nC)	3.3
Q_{gd} (nC)	13
Configuration	Single

FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC


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

ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free	IRF820PbF SiHF820-E3
SnPb	IRF820 SiHF820

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current	I_D	2.5	A
		1.6	
Pulsed Drain Current ^a	I_{DM}	8.0	
Linear Derating Factor		0.40	W/°C
Single Pulse Avalanche Energy ^b	E_{AS}	210	mJ
Repetitive Avalanche Current ^a	I_{AR}	2.5	A
Repetitive Avalanche Energy ^a	E_{AR}	5.0	mJ
Maximum Power Dissipation	P_D	50	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	°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).
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 60$ mH, $R_g = 25$ Ω , $I_{AS} = 2.5$ A (see fig. 12).
- $I_{SD} \leq 2.5$ A, $dI/dt \leq 50$ 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}	-	2.5	

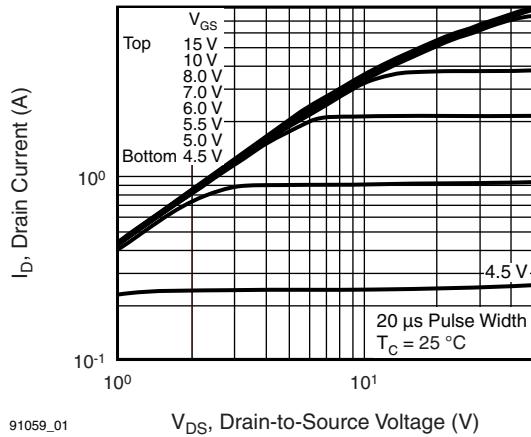
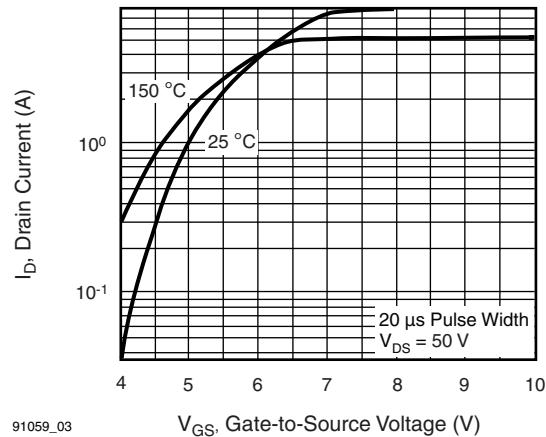
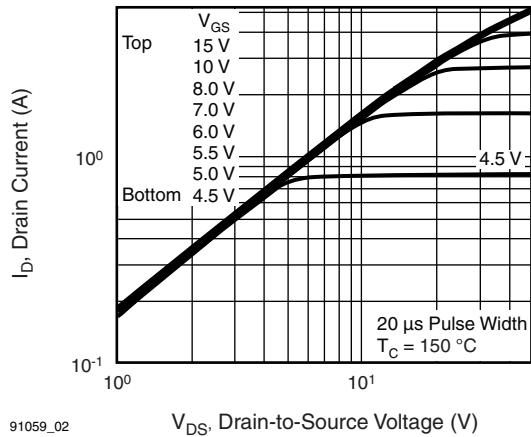
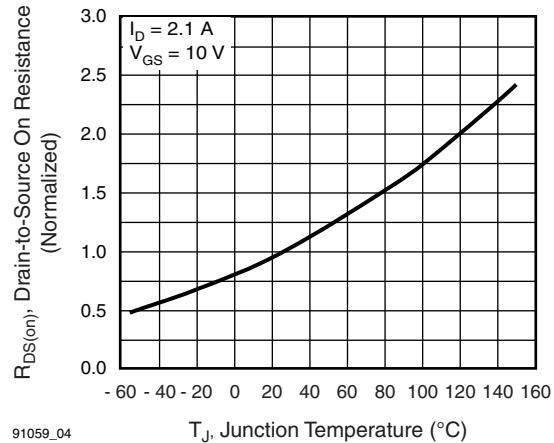
 SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$		500	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1 \text{ mA}$		-	0.59	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$		2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20 \text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSSS}	$V_{DS} = 500 \text{ V}$, $V_{GS} = 0 \text{ V}$		-	-	25	μA
		$V_{DS} = 400 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 125 \text{ °C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 1.5 \text{ A}^b$	-	-	3.0	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50 \text{ V}$	$I_D = 1.5 \text{ A}$	1.5	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1.0 \text{ MHz}$, see fig. 5		-	360	-	pF
Output Capacitance	C_{oss}			-	92	-	
Reverse Transfer Capacitance	C_{rss}			-	37	-	
Total Gate Charge	Q_g	$V_{GS} = 10 \text{ V}$	$I_D = 2.1 \text{ A}$, $V_{DS} = 400 \text{ V}$, see fig. 6 and 13 ^b	-	-	24	nC
Gate-Source Charge	Q_{gs}			-	-	3.3	
Gate-Drain Charge	Q_{gd}			-	-	13	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250 \text{ V}$, $I_D = 2.1 \text{ A}$, $R_g = 18 \Omega$, $R_D = 100 \Omega$, see fig. 10 ^b		-	8.0	-	ns
Rise Time	t_r			-	8.6	-	
Turn-Off Delay Time	$t_{d(off)}$			-	33	-	
Fall Time	t_f			-	16	-	
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		-	-	2.5	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	8.0	
Body Diode Voltage	V_{SD}	$T_J = 25 \text{ °C}$, $I_S = 2.5 \text{ A}$, $V_{GS} = 0 \text{ V}^b$		-	-	1.6	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25 \text{ °C}$, $I_F = 2.1 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}$		-	260	520	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.7	1.4	nC
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 $\leq 300 \mu\text{s}$; duty cycle $\leq 2 \%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

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

Fig. 3 - Typical Transfer Characteristics

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

Fig. 4 - Normalized On-Resistance vs. Temperature

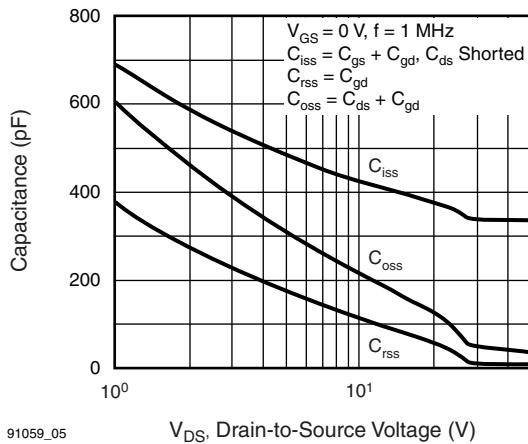


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

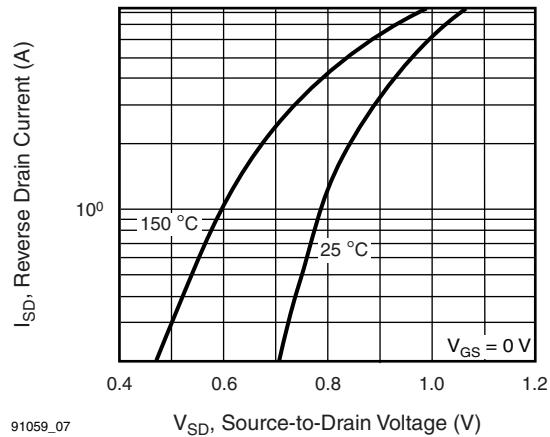


Fig. 7 - Typical Source-Drain Diode Forward Voltage

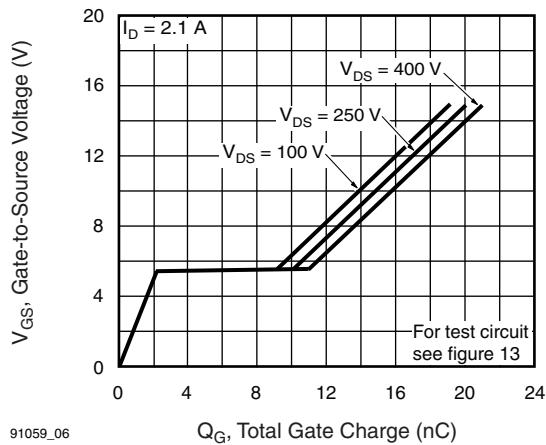


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

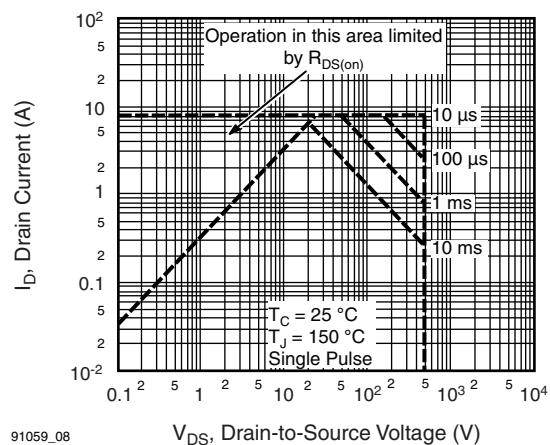
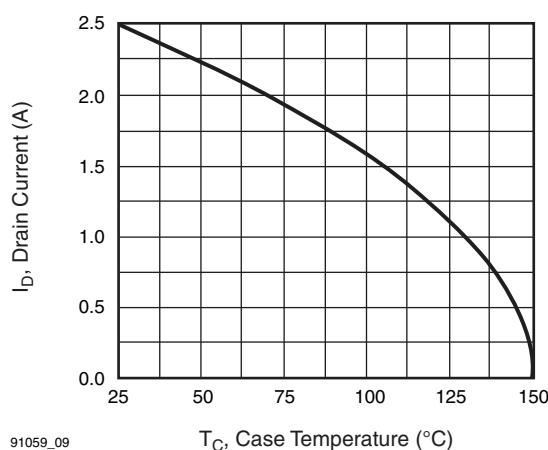
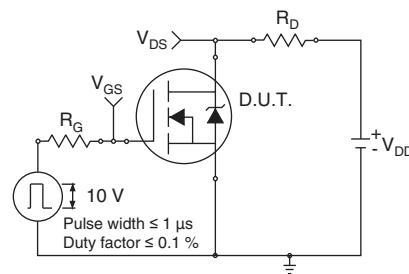
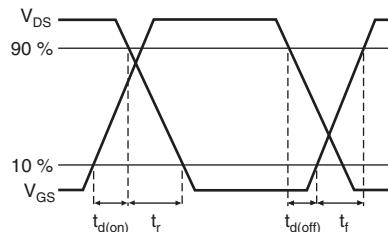
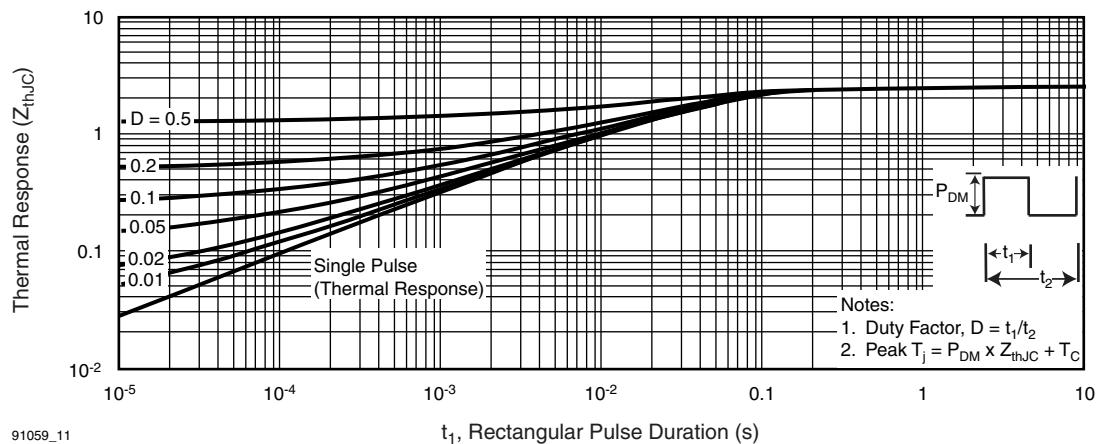
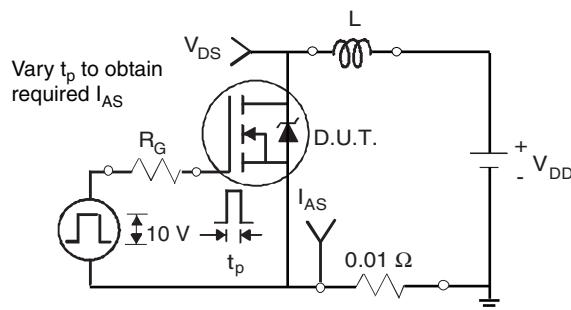
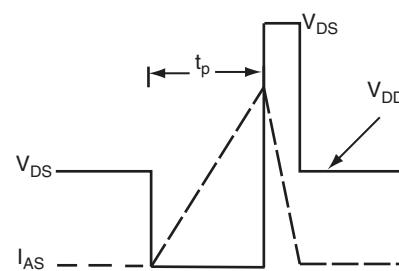


Fig. 8 - Maximum Safe Operating Area


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

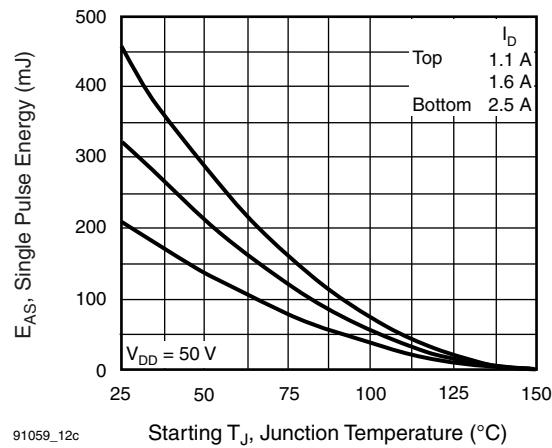


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

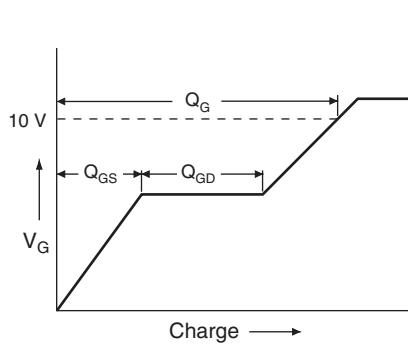


Fig. 13a - Basic Gate Charge Waveform

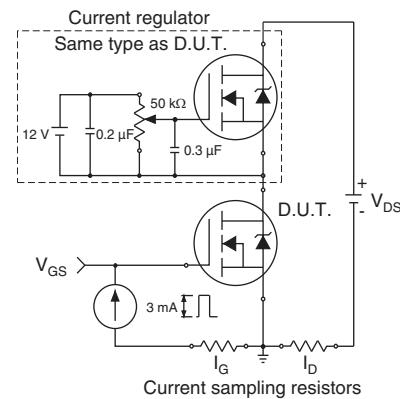
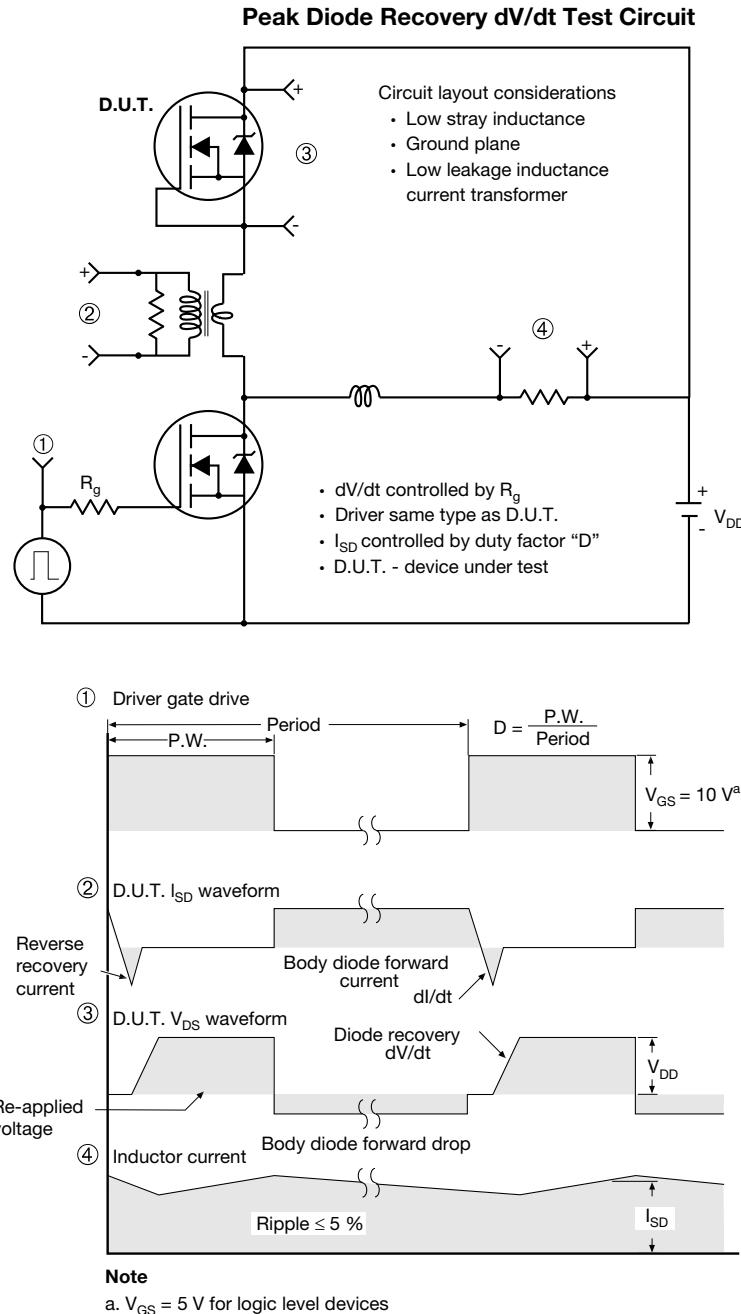


Fig. 13b - Gate Charge Test


Fig. 14 - For N-Channel

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