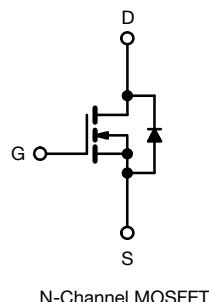
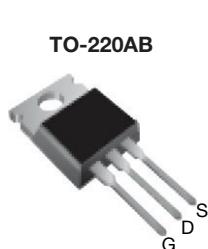


## Power MOSFET



### PRODUCT SUMMARY

$V_{DS}$ (V)	100	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10$ V	0.27
$Q_g$ max. (nC)	16	
$Q_{gs}$ (nC)	4.4	
$Q_{gd}$ (nC)	7.7	
Configuration	Single	

### FEATURES

- Dynamic dv/dt rating
- Repetitive avalanche rated
- 175 °C operating temperature
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS\***  
Available  
**HALOGEN FREE**  
Available

### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

### 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 all 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	IRF520PbF
Lead (Pb)-free and halogen-free	IRF520PbF-BE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	100	V
Gate-source voltage	$V_{GS}$	$\pm 20$	
Continuous drain current	$I_D$	9.2	A
		6.5	
Pulsed drain current <sup>a</sup>	$I_{DM}$	37	
Linear derating factor		0.40	W/°C
Single pulse avalanche energy <sup>b</sup>	$E_{AS}$	200	mJ
Repetitive avalanche current <sup>a</sup>	$I_{AR}$	9.2	A
Repetitive avalanche energy <sup>a</sup>	$E_{AR}$	6.0	mJ
Maximum power dissipation	$P_D$	60	W
Peak diode recovery dv/dt <sup>c</sup>	dv/dt	5.5	V/ns
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +175	°C
Soldering recommendations (peak temperature) <sup>d</sup>	For 10 s	300	
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)
- $V_{DD} = 25$  V, starting  $T_J = 25$  °C,  $L = 3.5$  mH,  $R_g = 25$  Ω,  $I_{AS} = 9.2$  A (see fig. 12)
- $I_{SD} \leq 9.2$  A,  $dI/dt \leq 110$  A/μs,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 175$  °C
- 1.6 mm from case

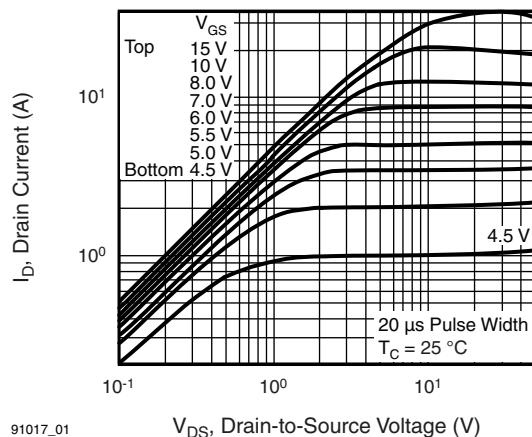
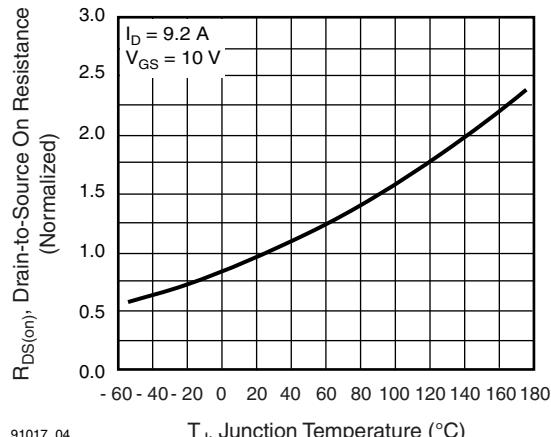
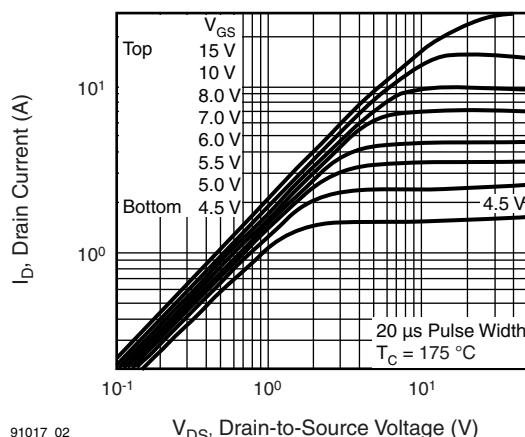
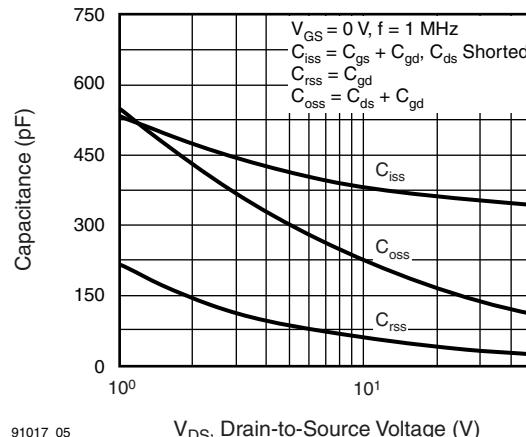
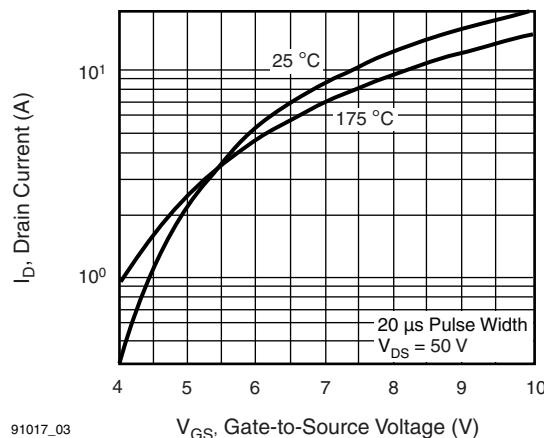
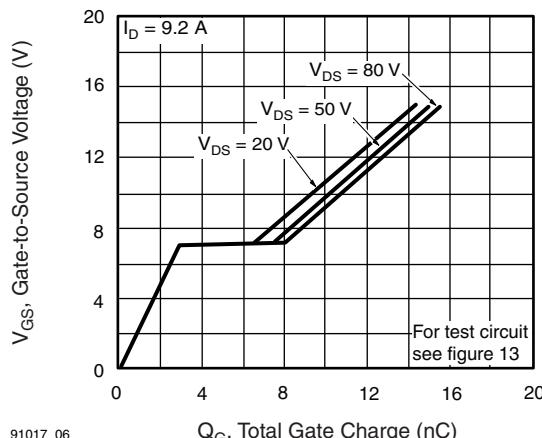
<b>THERMAL RESISTANCE RATINGS</b>						
PARAMETER	SYMBOL	TYP.	MAX.	UNIT		
Maximum junction-to-ambient	$R_{thJA}$	-	62	$^{\circ}\text{C}/\text{W}$		
Case-to-sink, flat, greased surface	$R_{thCS}$	0.50	-			
Maximum junction-to-case (drain)	$R_{thJC}$	-	2.5			

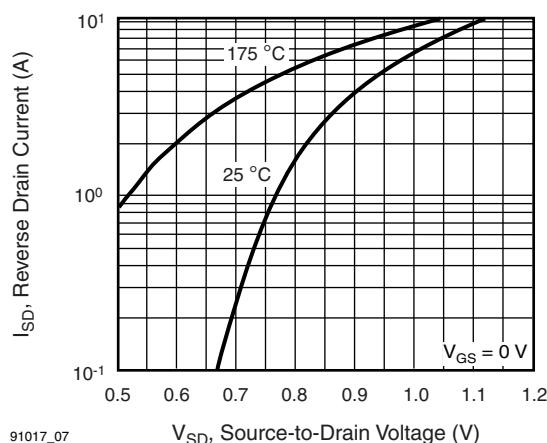
  

<b>SPECIFICATIONS</b> ( $T_J = 25 \text{ }^{\circ}\text{C}$ , unless otherwise noted)								
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
<b>Static</b>								
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$	$I_D = 250 \mu\text{A}$	100	-	-	V	
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25 \text{ }^{\circ}\text{C}$ , $I_D = 1 \text{ mA}$		-	0.13	-	$\text{V}/^{\circ}\text{C}$	
Gate-source threshold voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$	$I_D = 250 \mu\text{A}$	2.0	-	4.0	V	
Gate-source leakage	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$		-	-	$\pm 100$	nA	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 100 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	-	25	$\mu\text{A}$	
		$V_{DS} = 80 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 150 \text{ }^{\circ}\text{C}$		-	-	250		
Drain-source on-state resistance	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$	$I_D = 5.5 \text{ A}^b$	-	-	0.27	$\Omega$	
Forward transconductance	$g_{fs}$	$V_{DS} = 50 \text{ V}$ , $I_D = 5.5 \text{ A}^b$		2.7	-	-	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		-	360	-	pF	
Output capacitance	$C_{oss}$			-	150	-		
Reverse transfer capacitance	$C_{rss}$			-	34	-		
Total gate charge	$Q_g$	$V_{GS} = 10 \text{ V}$	$I_D = 9.2 \text{ A}$ , $V_{DS} = 80 \text{ V}$ , see fig. 6 and 13 <sup>b</sup>	-	-	16	nC	
Gate-source charge	$Q_{gs}$			-	-	4.4		
Gate-drain charge	$Q_{gd}$			-	-	7.7		
Turn-on delay time	$t_{d(\text{on})}$	$V_{DD} = 50 \text{ V}$ , $I_D = 9.2 \text{ A}$ , $R_g = 18 \Omega$ , $R_D = 5.2 \Omega$ , see fig. 10 <sup>b</sup>		-	8.8	-	ns	
Rise time	$t_r$			-	30	-		
Turn-off delay time	$t_{d(\text{off})}$			-	19	-		
Fall time	$t_f$			-	20	-		
Gate input resistance	$R_g$	$f = 1 \text{ MHz}$ , open drain		1.0	-	5.0	$\Omega$	
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		-	-	9.2	A	
Pulsed diode forward current <sup>a</sup>	$I_{SM}$			-	-	37		
Body diode voltage	$V_{SD}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_S = 9.2 \text{ A}$ , $V_{GS} = 0 \text{ V}^b$		-	-	1.8	V	
Body diode reverse recovery time	$t_{rr}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_F = 9.2 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}^b$		-	110	260	ns	
Body diode reverse recovery charge	$Q_{rr}$			-	0.53	1.3	$\mu\text{C}$	
Forward turn-on time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )						

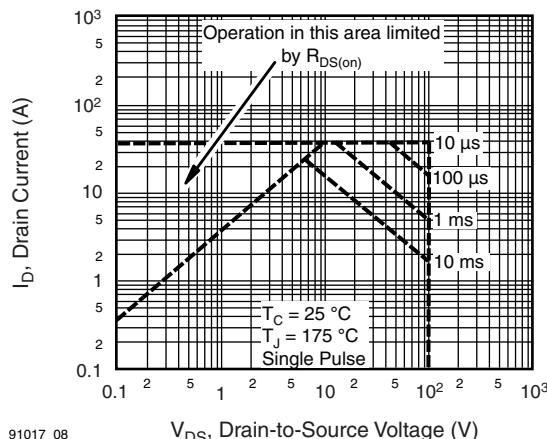
**Notes**

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

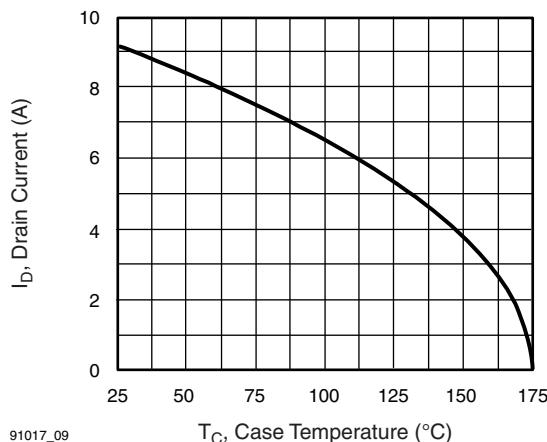
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

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

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

**Fig. 2 - Typical Output Characteristics,  $T_C = 175 \text{ }^{\circ}\text{C}$** 

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

**Fig. 3 - Typical Transfer Characteristics**

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



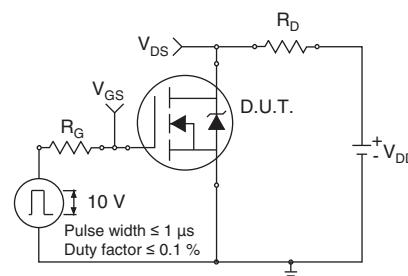
**Fig. 7 - Typical Source-Drain Diode Forward Voltage**



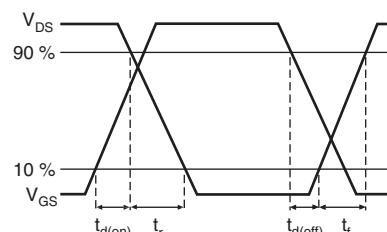
**Fig. 8 - Maximum Safe Operating Area**



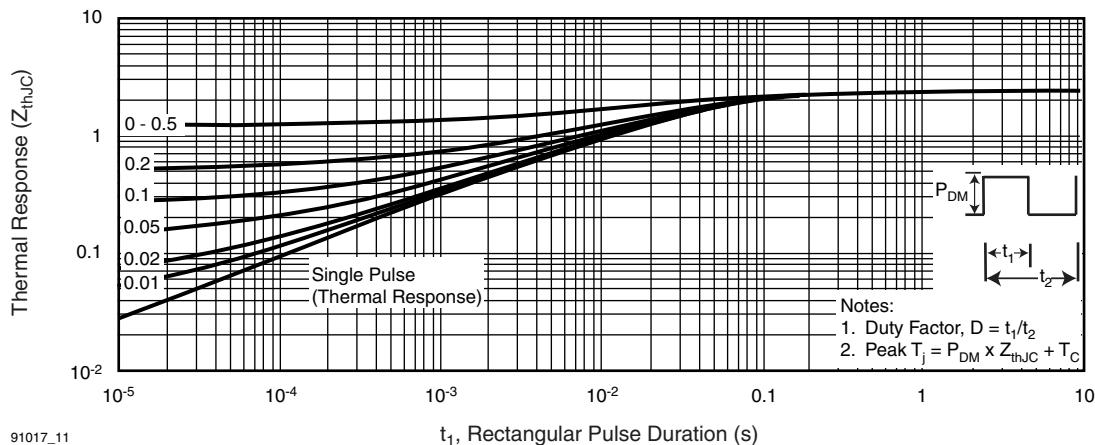
**Fig. 9 - Maximum Drain Current vs. Case Temperature**



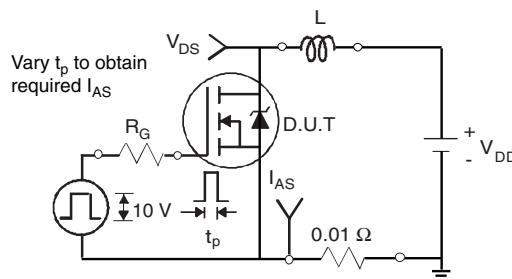
**Fig. 10a - Switching Time Test Circuit**



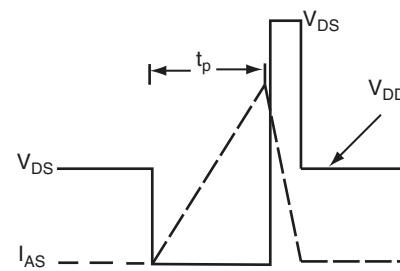
**Fig. 10b - Switching Time Waveforms**



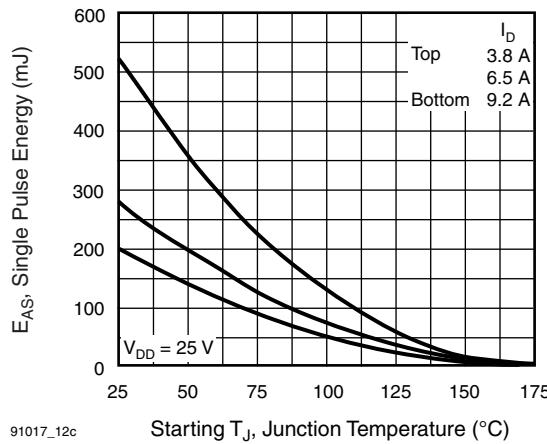
**Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**



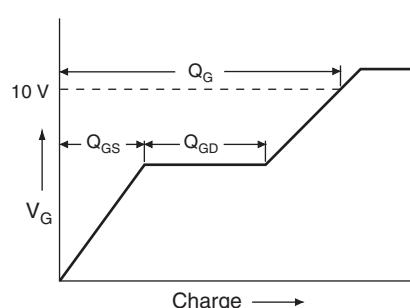
**Fig. 12a - Unclamped Inductive Test Circuit**



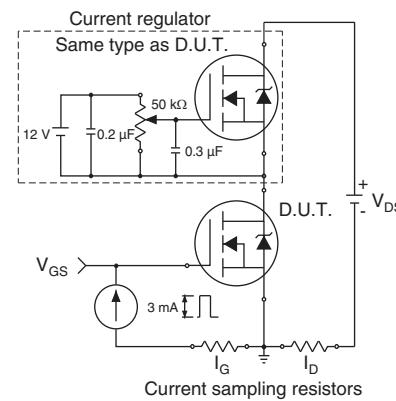
**Fig. 12b - Unclamped Inductive Waveforms**



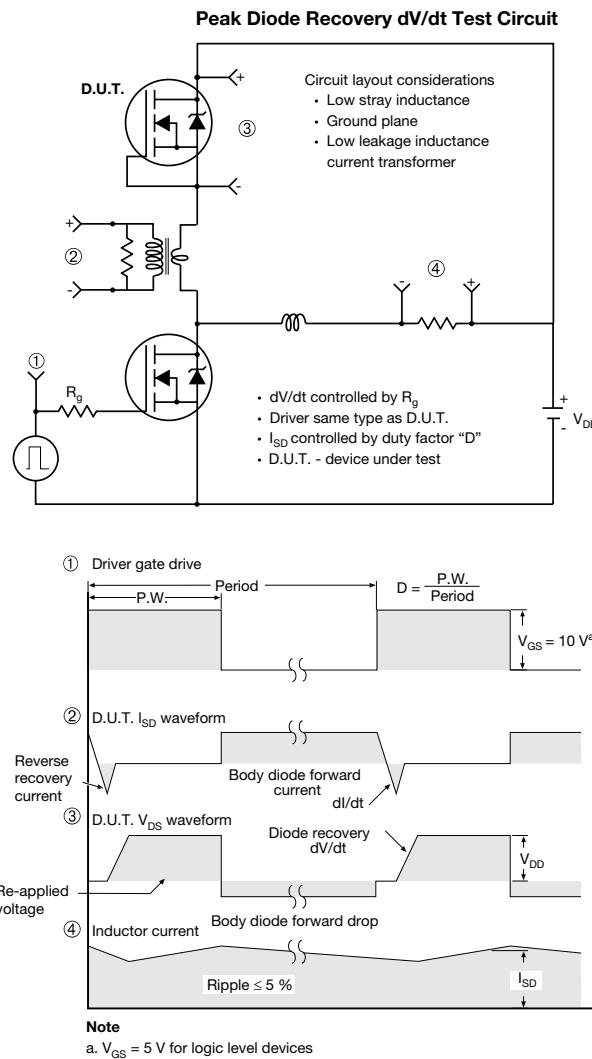
**Fig. 12c - Maximum Avalanche Energy vs. Drain Current**



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



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



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

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