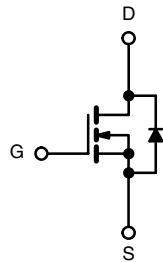
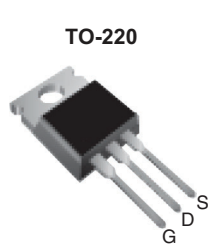


Power MOSFET

PRODUCT SUMMARY	
V _{DS} (V)	500
R _{DS(on)} (Ω)	V _{GS} = 10 V 0.21
Q _g (Max.) (nC)	110
Q _{gs} (nC)	33
Q _{gd} (nC)	54
Configuration	Single



N-Channel MOSFET

FEATURES

- Low Gate Charge Q_g Results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Low R_{DS(on)}
- Lead (Pb)-free Available



RoHS*
COMPLIANT

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits

ORDERING INFORMATION	
Package	TO-220
Lead (Pb)-free	IRFB20N50KPbF
	SiHFB20N50K-E3
SnPb	IRFB20N50K
	SiHFB20N50K


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}	± 30		
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	A	
		T _C = 100 °C		12
Pulsed Drain Current ^a	I _{DM}	80		
Linear Derating Factor		2.2	W/°C	
Single Pulse Avalanche Energy ^b	E _{AS}	330	mJ	
Repetitive Avalanche Current ^a	I _{AR}	20	A	
Repetitive Avalanche Energy ^a	E _{AR}	28	mJ	
Maximum Power Dissipation	T _C = 25 °C	P _D	280	W
Peak Diode Recovery dV/dt ^c	dV/dt	6.9	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		

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- Starting T_J = 25 °C, L = 1.6 mH, R_G = 25 Ω, I_{AS} = 20 A.
- I_{SD} ≤ 20 A, dI/dt ≤ 350 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 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}	-	58	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.45	

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	500	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$	-	0.61	-	V/°C	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3.0	-	5.0	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30\text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	-	-	50	μA	
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 12\text{ A}^b$	-	0.21	0.25	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 12\text{ A}$	11	-	-	S	
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = 25\text{ V},$ $f = 1.0\text{ MHz}$, see fig. 5	-	2870	-	pF	
Output Capacitance	C_{oss}		-	320	-		
Reverse Transfer Capacitance	C_{riss}		-	34	-		
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}, f = 1.0\text{ MHz}$	-	3480	-	
Effective Output Capacitance	$C_{oss\text{ eff.}}$		$V_{DS} = 400\text{ V}, f = 1.0\text{ MHz}$	-	85	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, V_{DS} = 400\text{ V}$ see fig. 6 and 13 ^b	-	-	110	nC
Gate-Source Charge	Q_{gs}			-	-	33	
Gate-Drain Charge	Q_{gd}			-	-	54	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 20\text{ A}$ $R_G = 7.5\text{ }\Omega, V_{GS} = 10\text{ V}$, see fig. 10 ^b	-	22	-	ns	
Rise Time	t_r		-	74	-		
Turn-Off Delay Time	$t_{d(off)}$		-	45	-		
Fall Time	t_f		-	33	-		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	20	A	
Pulsed Diode Forward Current ^a	I_{SM}		-	-	80		
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 20\text{ A}, V_{GS} = 0\text{ V}^b$	-	-	1.5	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$	-	520	780	ns	
Body Diode Reverse Recovery Charge	Q_{rr}		-	5.3	8.0	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.
- Pulse width $\leq 400\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

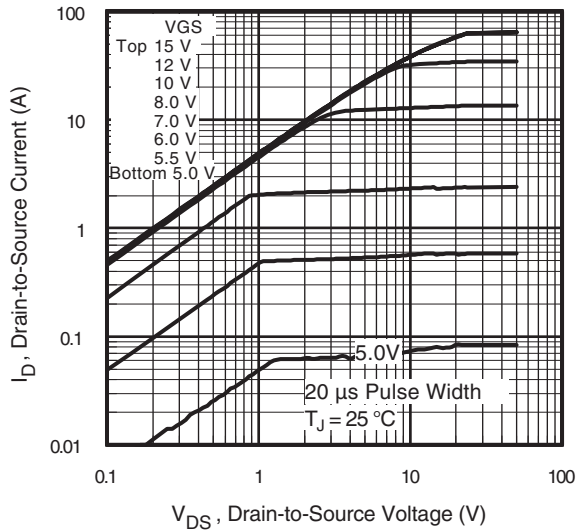


Fig. 1 - Typical Output Characteristics

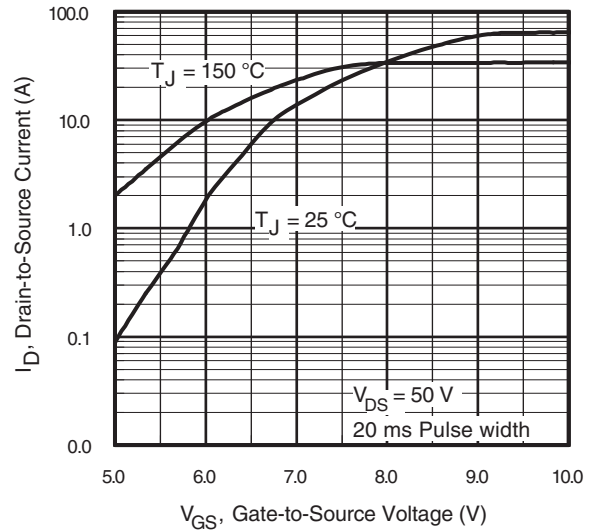


Fig. 3 - Typical Transfer Characteristics

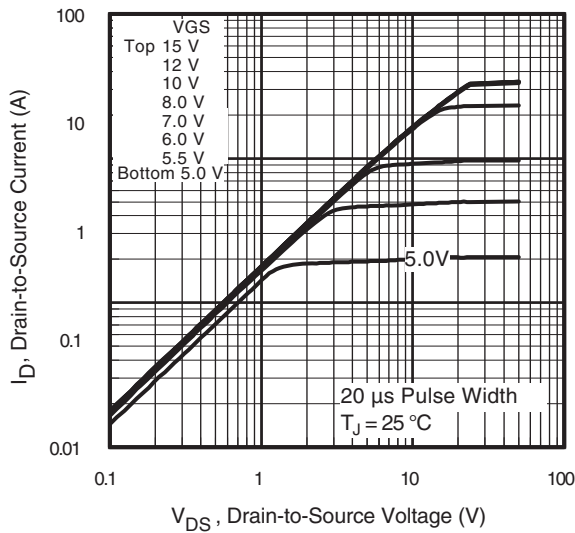


Fig. 2 - Typical Output Characteristics

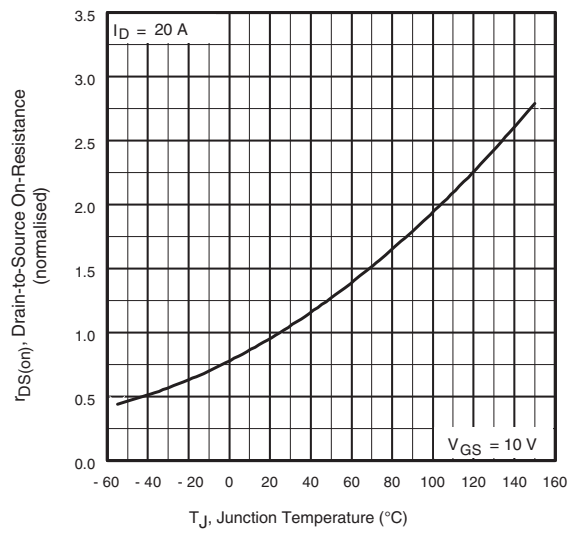


Fig. 4 - Normalized On-Resistance vs. Temperature

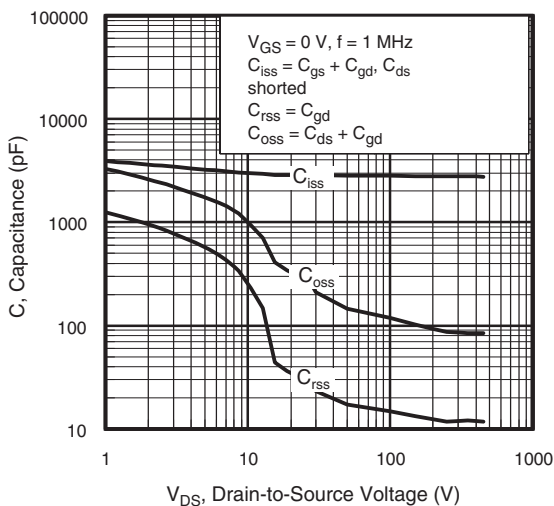


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

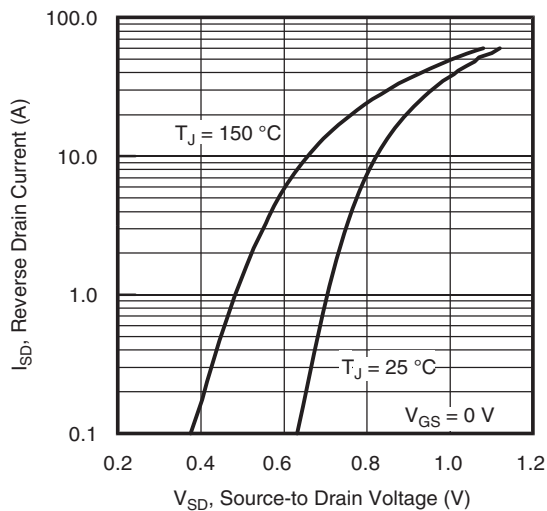


Fig. 7 - Typical Source-Drain Diode Forward Voltage

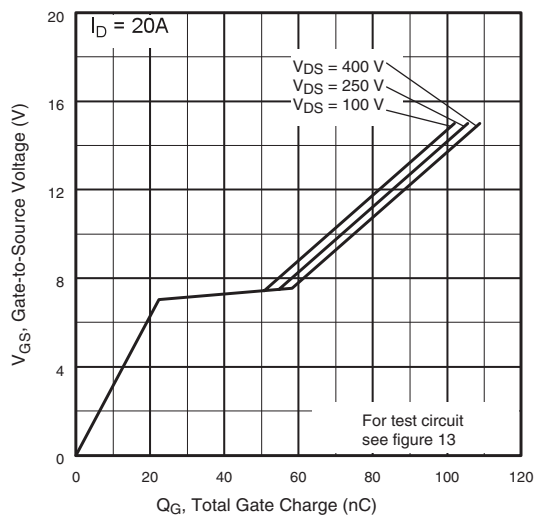


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

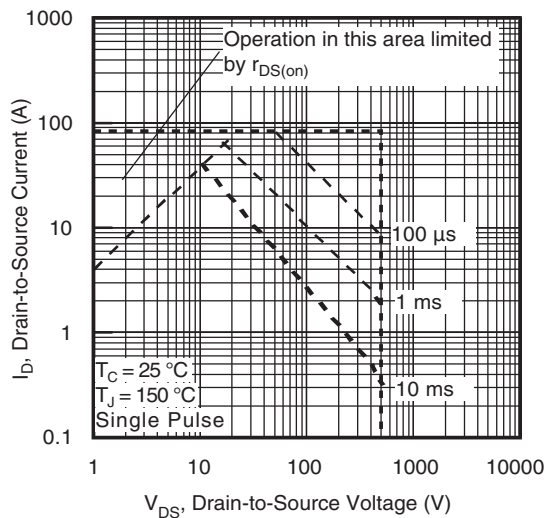


Fig. 8 - Maximum Safe Operating Area

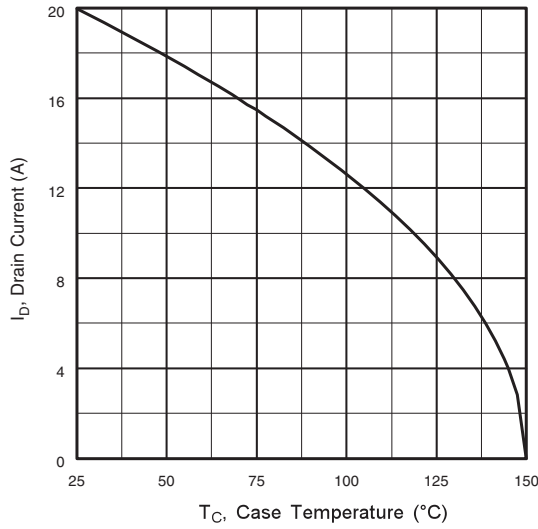


Fig. 9 - Maximum Drain Current vs. Case Temperature

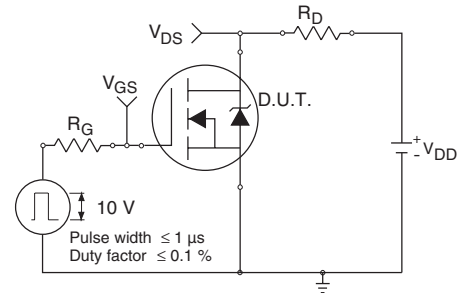


Fig. 10a - Switching Time Test Circuit

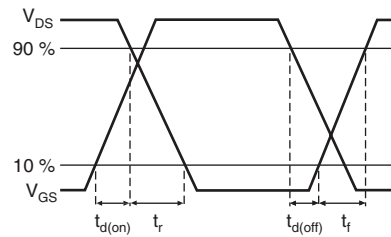


Fig. 10b - Switching Time Waveforms

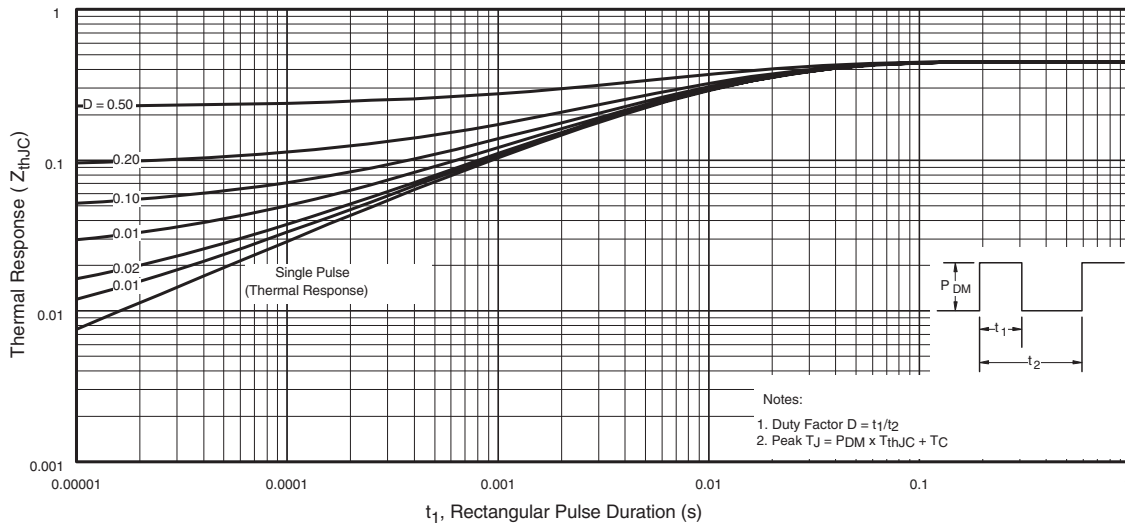


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

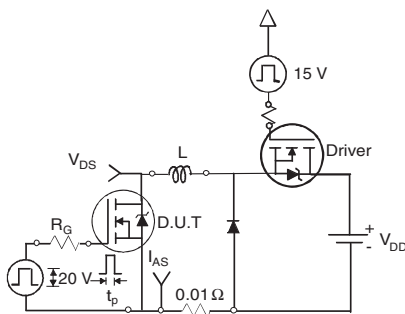


Fig. 12a - Unclamped Inductive Test Circuit

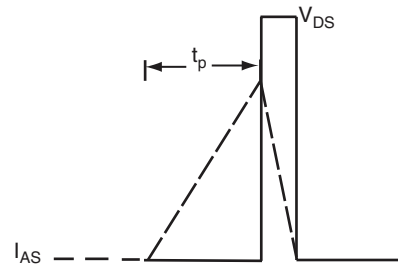


Fig. 12b - Unclamped Inductive Waveforms

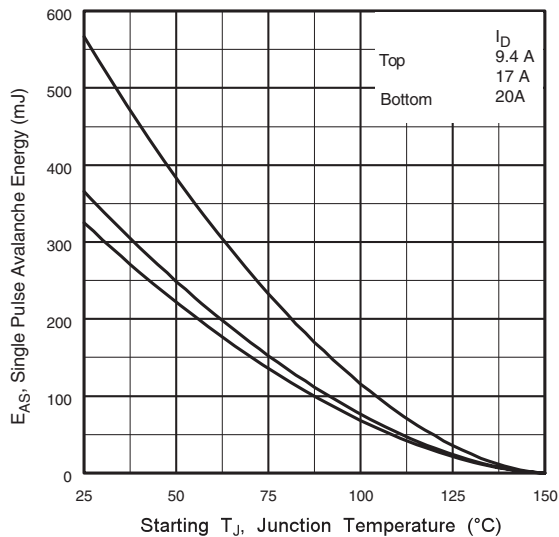


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

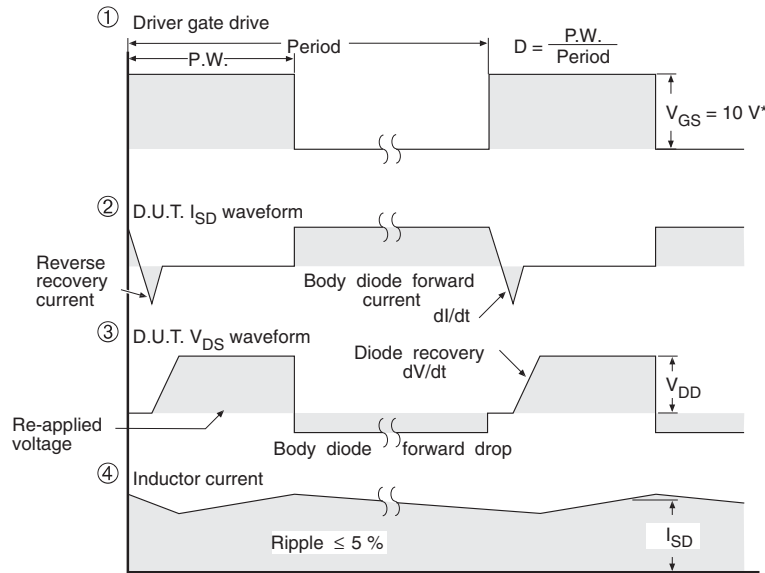
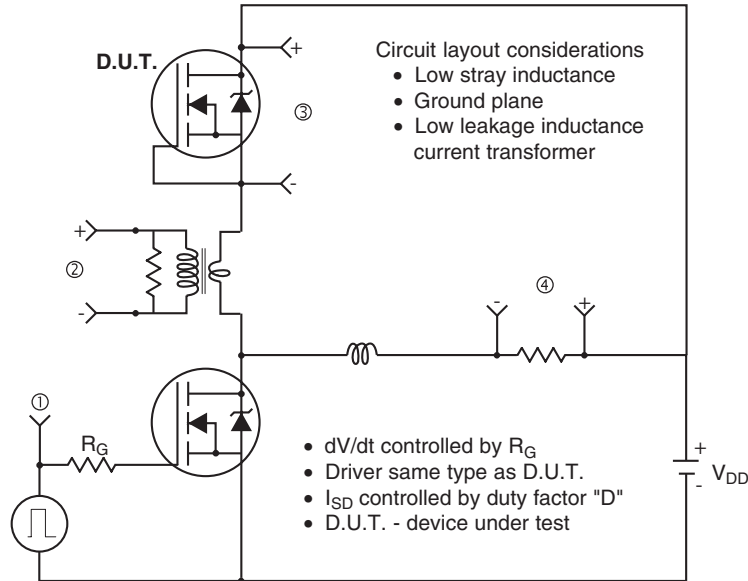


Fig. 13a - Basic Gate Charge Waveform



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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