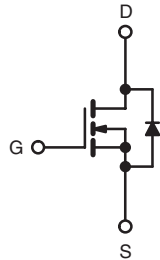
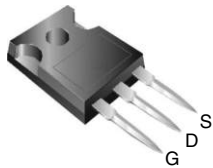


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	500	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	0.27
Q_g (Max.) (nC)	105	
Q_{gs} (nC)	26	
Q_{gd} (nC)	42	
Configuration	Single	

TO-247



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
- Effective C_{oss} Specified
- Lead (Pb)-free Available



Available

RoHS*
COMPLIANT

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptable Power Supply
- High Speed Power Switching

TYPICAL SMPS TOPOLOGIES

- Full Bridge
- PFC Boost

ORDERING INFORMATION	
Package	TO-247
Lead (Pb)-free	IRP460APbF
	SiHFP460A-E3
SnPb	IRP460A
	SiHFP460A


ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, 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	$T_C = 25\text{ }^\circ\text{C}$	20	A	
		$T_C = 100\text{ }^\circ\text{C}$	13		
Pulsed Drain Current ^a	I_{DM}		80		
Linear Derating Factor			2.2	$W/^\circ\text{C}$	
Single Pulse Avalanche Energy ^b	E_{AS}		960	mJ	
Repetitive Avalanche Current ^a	I_{AR}		20	A	
Repetitive Avalanche Energy ^a	E_{AR}		28	mJ	
Maximum Power Dissipation	$T_C = 25\text{ }^\circ\text{C}$		P_D	280	W
Peak Diode Recovery dV/dt ^c	dV/dt		3.8	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 ^d		
Mounting Torque	6-32 or M3 screw		10		
			1.1		

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting $T_J = 25\text{ }^\circ\text{C}$, $L = 4.3\text{ mH}$, $R_G = 25\text{ }^\circ\Omega$, $I_{AS} = 20\text{ A}$ (see fig. 12).
- $I_{SD} \leq 20\text{ A}$, $dI/dt \leq 125\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 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}	-	40	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.24	-	
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	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30\text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	25	μA	
		$V_{DS} = 400\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 12\text{ A}^b$	-	-	0.27	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 12\text{ A}^b$	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	-	3100	-	pF	
Output Capacitance	C_{oss}		-	480	-		
Reverse Transfer Capacitance	C_{rss}		-	18	-		
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}$, $f = 1.0\text{ MHz}$	4430		pF	
			$V_{DS} = 400\text{ V}$, $f = 1.0\text{ MHz}$	130			
Effective Output Capacitance	$C_{oss\text{ eff.}}$		$V_{DS} = 0\text{ V to }400\text{ V}^c$	140			
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	-	-	105	nC
Gate-Source Charge	Q_{gs}			-	-	26	
Gate-Drain Charge	Q_{gd}			-	-	42	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}$, $I_D = 20\text{ A}$, $R_G = 4.3\text{ }\Omega$, $R_D = 13\text{ }\Omega$, see fig. 10 ^b	-	18	-	ns	
Rise Time	t_r		-	55	-		
Turn-Off Delay Time	$t_{d(off)}$		-	45	-		
Fall Time	t_f		-	39	-		
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}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = 20\text{ A}$, $V_{GS} = 0\text{ V}^b$	-	-	1.8	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = 20\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$	-	480	710	ns	
Body Diode Reverse Recovery Charge	Q_{rr}		-	5.0	7.5	μC	
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

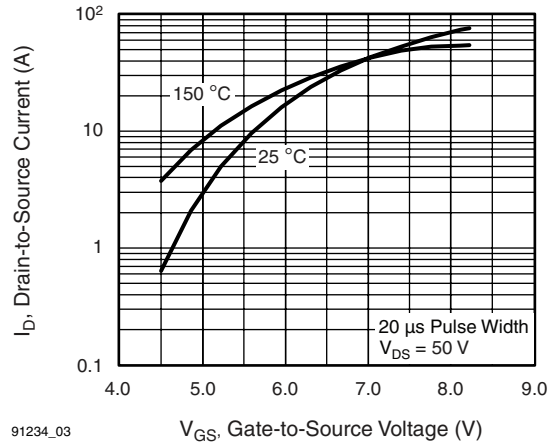
- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.
- c. $C_{oss\text{ eff.}}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80 % V_{DS} .

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



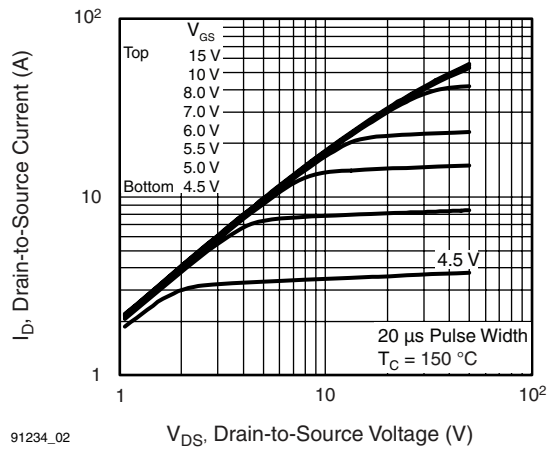
91234_01

Fig. 1 - Typical Output Characteristics



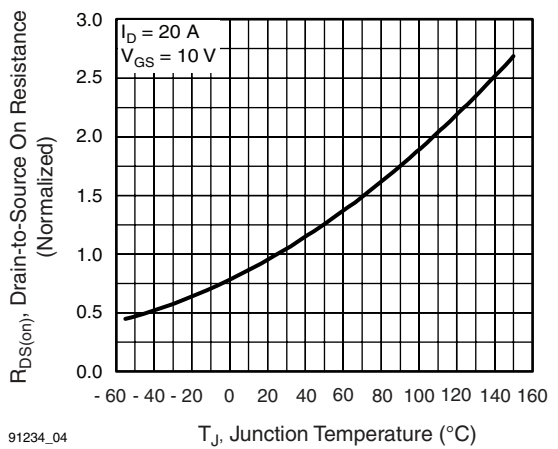
91234_03

Fig. 3 - Typical Transfer Characteristics



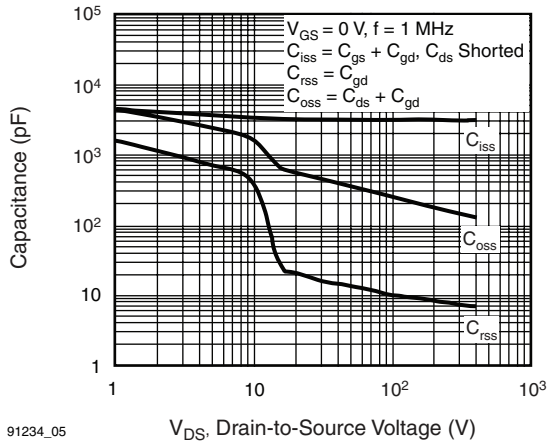
91234_02

Fig. 2 - Typical Output Characteristics



91234_04

Fig. 4 - Normalized On-Resistance vs. Temperature



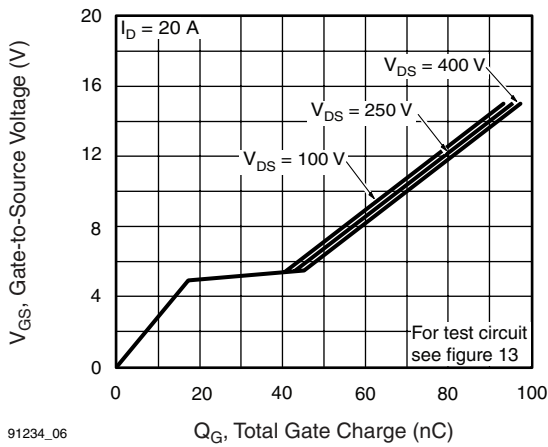
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Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



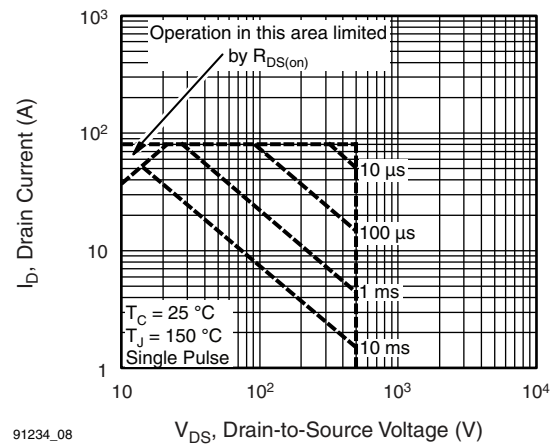
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



91234_06

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



91234_08

Fig. 8 - Maximum Safe Operating Area



Fig. 9 - Maximum Drain Current vs. Case Temperature

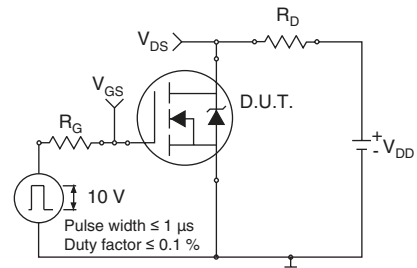


Fig. 10a - Switching Time Test Circuit

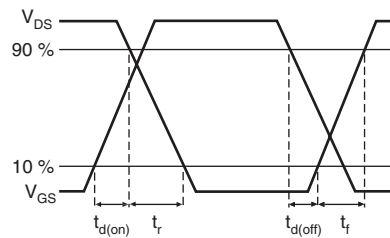


Fig. 10b - Switching Time Waveforms

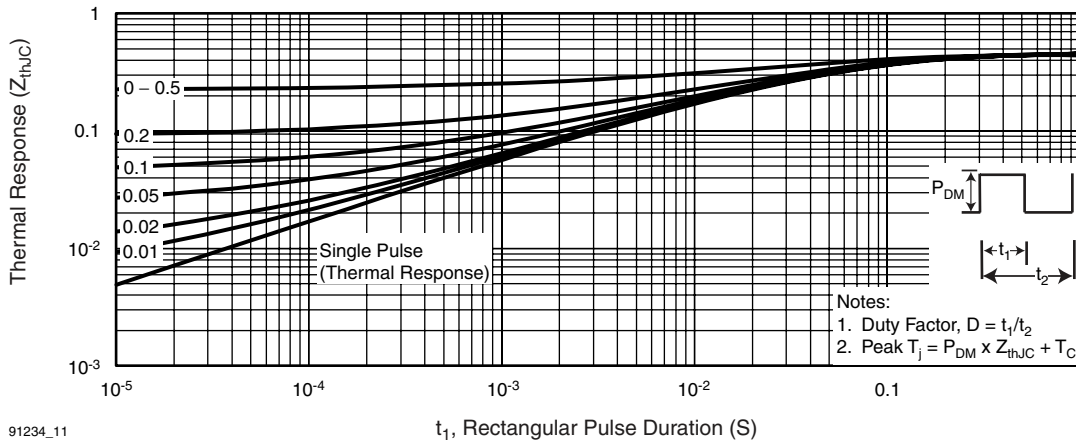


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

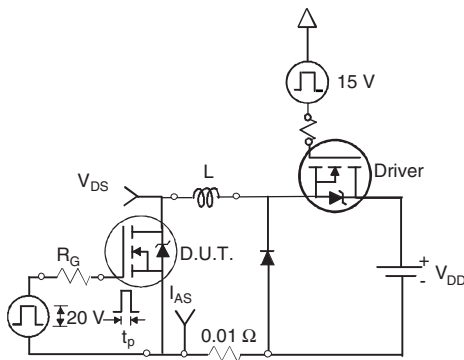


Fig. 12a - Unclamped Inductive Test Circuit



Fig. 12b - Unclamped Inductive Waveforms

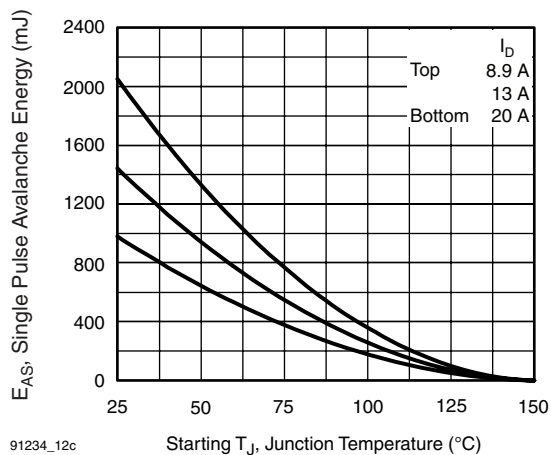


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

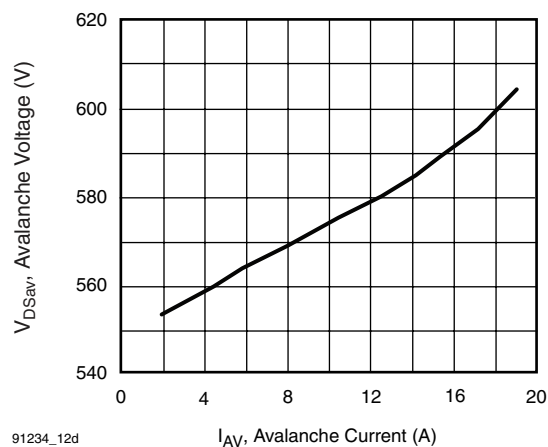


Fig. 12d - Typical Drain-to-Source Voltage vs. Avalanche Current

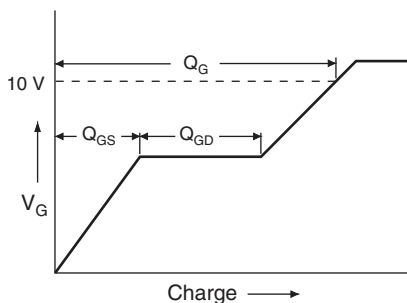


Fig. 13a - Basic Gate Charge Waveform

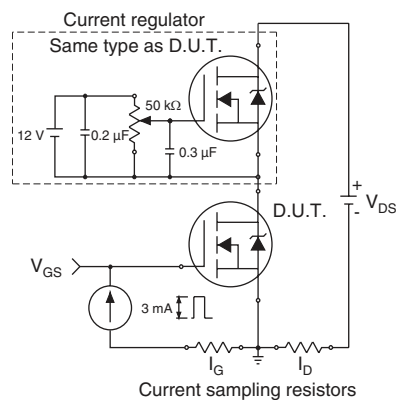


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Fig. 14 - For N-Channel

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