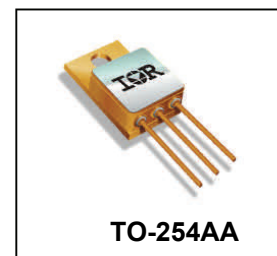


POWER MOSFET THRU-HOLE (TO-254AA)

100V, P-CHANNEL
HEXFET MOSFET TECHNOLOGY

Product Summary

Part Number	$R_{DS(on)}$	I_D
IRF5M5210	0.07Ω	-34A



Description

Fifth Generation HEXFET power MOSFETs from IR HiRel utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon unit area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient device for use in a wide variety of applications.

These devices are well-suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers and high-energy pulse circuits.

Features

- Low $R_{DS(on)}$
- Avalanche Energy Ratings
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Light Weight

Absolute Maximum Ratings

	Parameter		Units
$I_D @ V_{GS} = -10V, T_C = 25^\circ C$	Continuous Drain Current	-34	A
$I_D @ V_{GS} = -10V, T_C = 100^\circ C$	Continuous Drain Current	-21	
I_{DM}	Pulsed Drain Current ①	-136	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	125	W
	Linear Derating Factor	1.0	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ②	520	mJ
I_{AR}	Avalanche Current ①	-21	A
E_{AR}	Repetitive Avalanche Energy ①	12.5	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-3.4	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Lead Temperature	300 (0.063 in. /1.6 mm from case for 10s)	
	Weight	9.3 (Typical)	g

For Footnotes refer to the page 2.

Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (Unless Otherwise Specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	-100	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.12	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = -1.0\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	0.07	Ω	$V_{GS} = -10V, I_D = -21A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	—	-4.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Gfs	Forward Transconductance	10	—	—	S	$V_{DS} = -15V, I_D = -21A$ ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	-25	μA	$V_{DS} = -100V, V_{GS} = 0V$
		—	—	-250		$V_{DS} = -80V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Leakage Forward	—	—	-100	nA	$V_{GS} = -20V$
	Gate-to-Source Leakage Reverse	—	—	100		$V_{GS} = 20V$
Q_G	Total Gate Charge	—	—	180	nC	$I_D = -21A$
Q_{GS}	Gate-to-Source Charge	—	—	25		$V_{DS} = -80V$
Q_{GD}	Gate-to-Drain ('Miller') Charge	—	—	100		$V_{GS} = -10V$
$t_{d(on)}$	Turn-On Delay Time	—	—	28	ns	$V_{DD} = -50V$
tr	Rise Time	—	—	150		$I_D = -21A$
$t_{d(off)}$	Turn-Off Delay Time	—	—	100		$R_G = 2.5\Omega$
t_f	Fall Time	—	—	120		$V_{GS} = -10V$
$L_S + L_D$	Total Inductance	—	6.8	—	nH	Measured from Drain lead (6mm / 0.25 in from package) to Source lead (6mm/ 0.25 in from package) with Source wire internally bonded from Source pin to Drain pad
C_{iss}	Input Capacitance	—	2730	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	824	—		$V_{DS} = -25V$
C_{riss}	Reverse Transfer Capacitance	—	465	—		$f = 1.0\text{MHz}$

Source-Drain Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-34	A	
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	-136		
V_{SD}	Diode Forward Voltage	—	—	-1.6	V	$T_J = 25^\circ\text{C}, I_S = -21A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	—	260	ns	$T_J = 25^\circ\text{C}, I_F = -21A, V_{DD} \leq -30V$
Q_{rr}	Reverse Recovery Charge	—	—	1.8	μC	di/dt = 100A/ μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	1.0	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Case -to-Sink	—	0.21	—	
$R_{\theta JA}$	Junction-to-Ambient (Typical socket mount)	—	—	48	

Footnotes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ② $V_{DD} = -25V$, starting $T_J = 25^\circ\text{C}$, $L = 2.4\text{mH}$, Peak $I_L = -21A$, $V_{GS} = -10V, R_G = 25\Omega$.
- ③ $I_{SD} \leq -21A$, di/dt $\leq -400A/\mu\text{s}$, $V_{DD} \leq -100V$, $T_J \leq 150^\circ\text{C}$
- ④ Pulse width $\leq 300 \mu\text{s}$; Duty Cycle $\leq 2\%$.

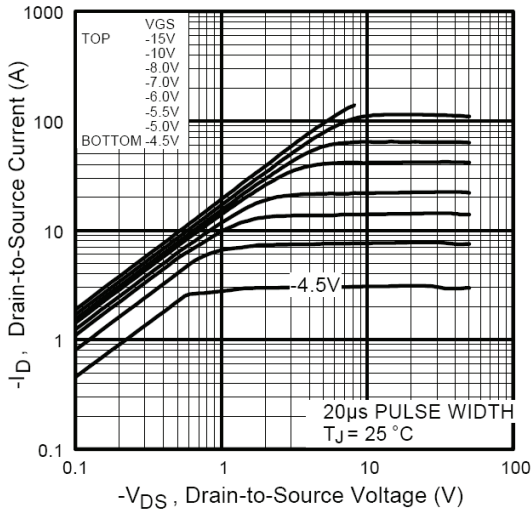


Fig 1. Typical Output Characteristics

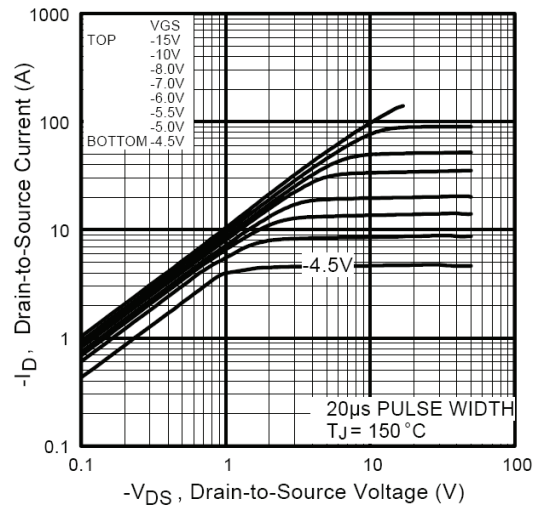


Fig 2. Typical Output Characteristics

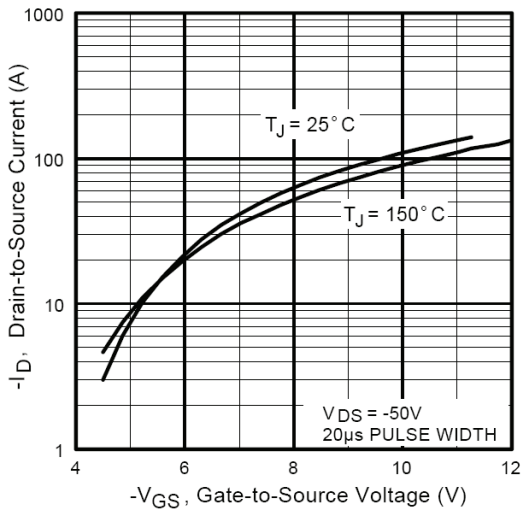


Fig 3. Typical Transfer Characteristics

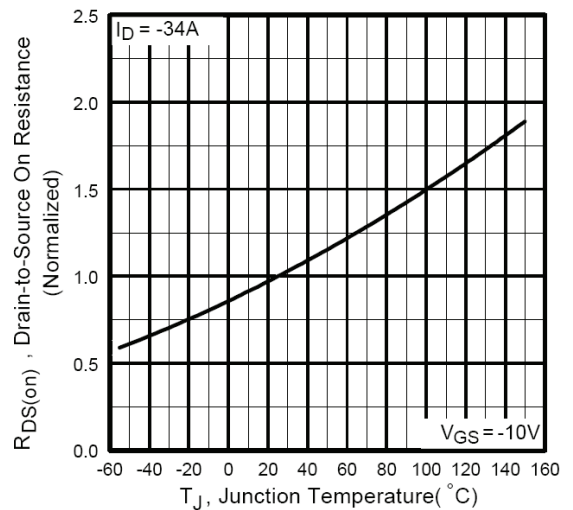


Fig 4. Normalized On-Resistance Vs. Temperature

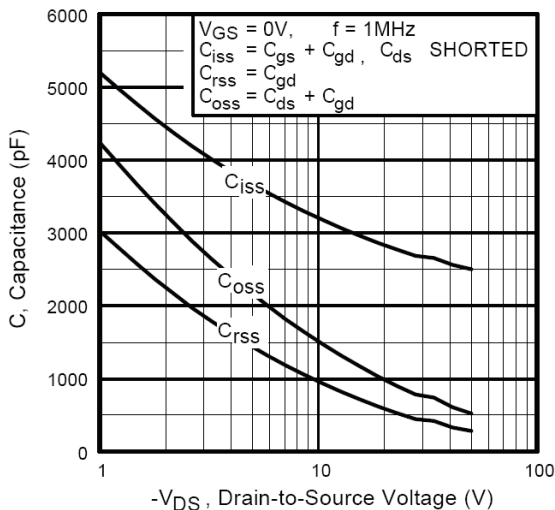


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

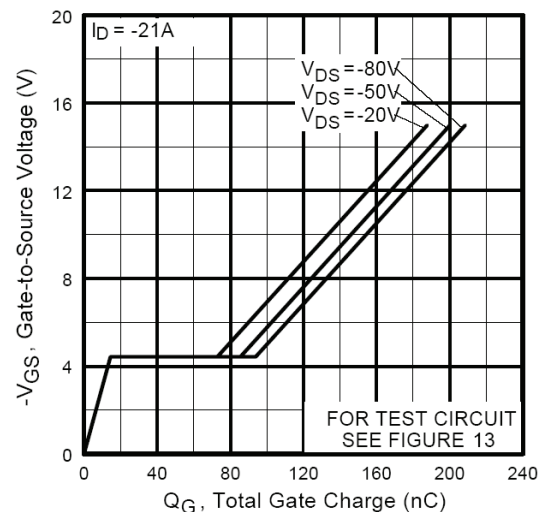


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

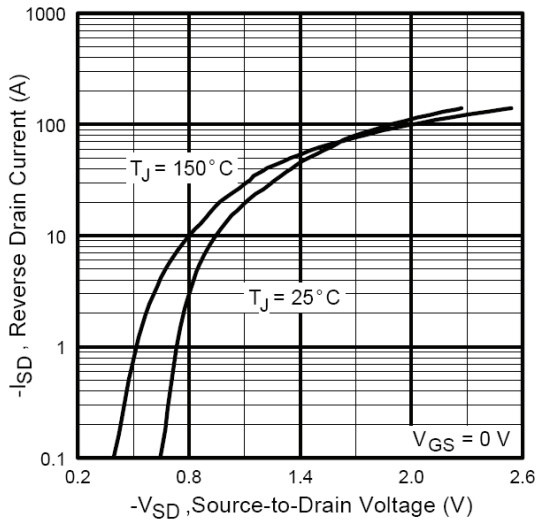


Fig 7. Typical Source-Drain Diode Forward Voltage

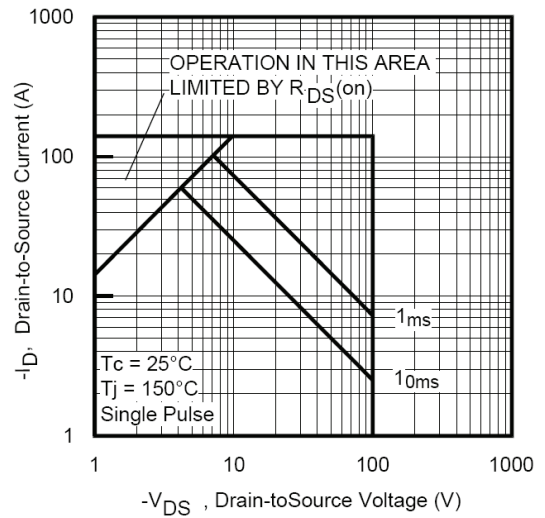


Fig 8. Maximum Safe Operating Area

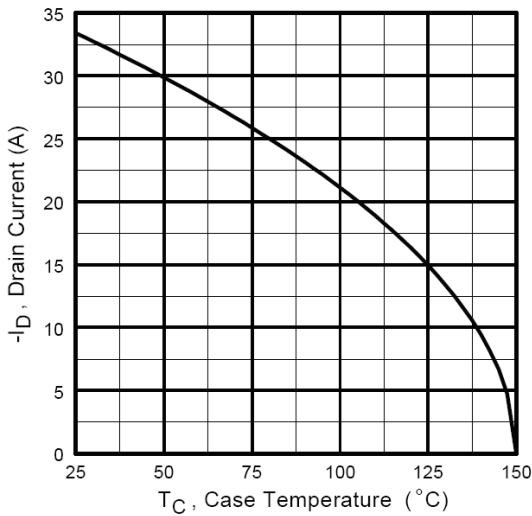


Fig 9. Maximum Drain Current Vs. Case Temperature

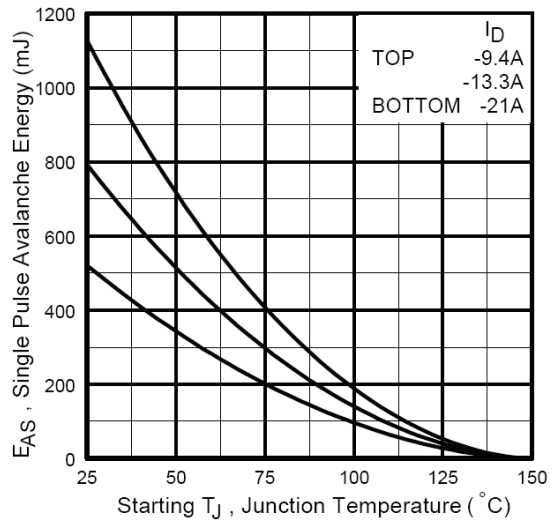


Fig 10. Maximum Avalanche Energy Vs. Drain Current

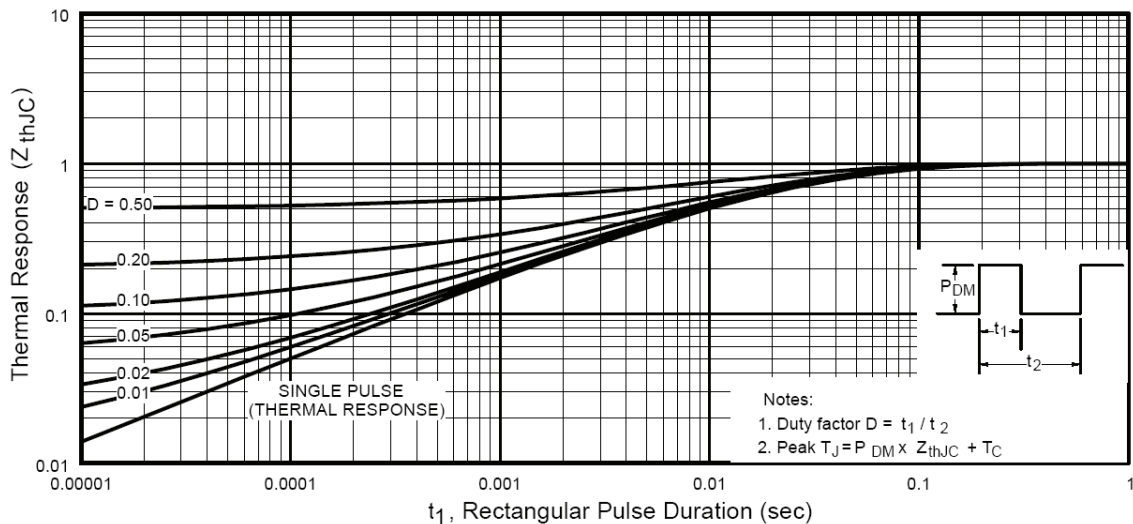


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

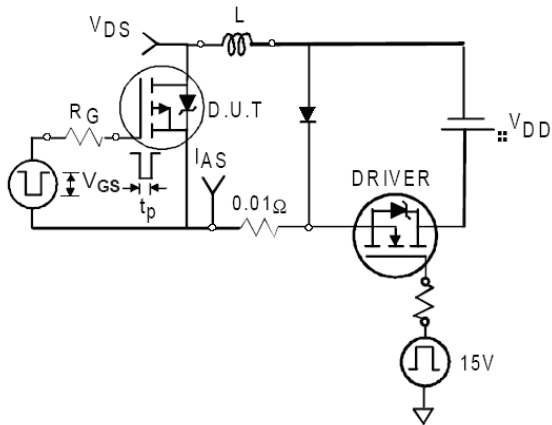


Fig 12a. Unclamped Inductive Test Circuit

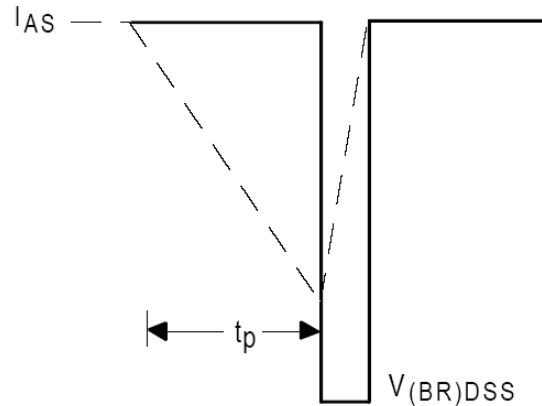


Fig 12b. Unclamped Inductive Waveforms

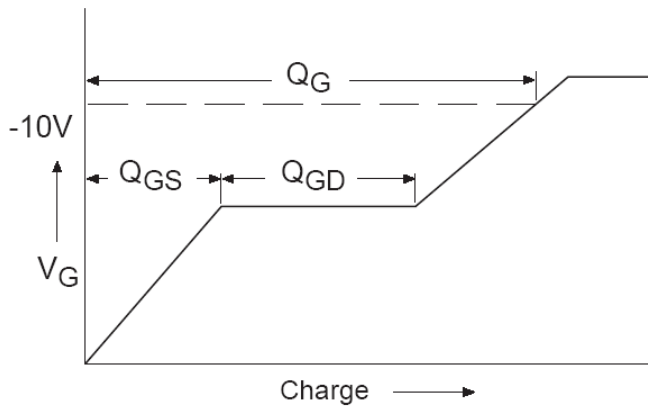


Fig 13a. Basic Gate Charge Waveform

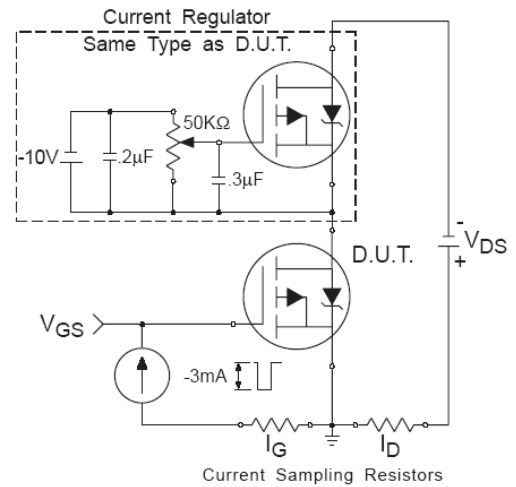


Fig 13b. Gate Charge Test Circuit

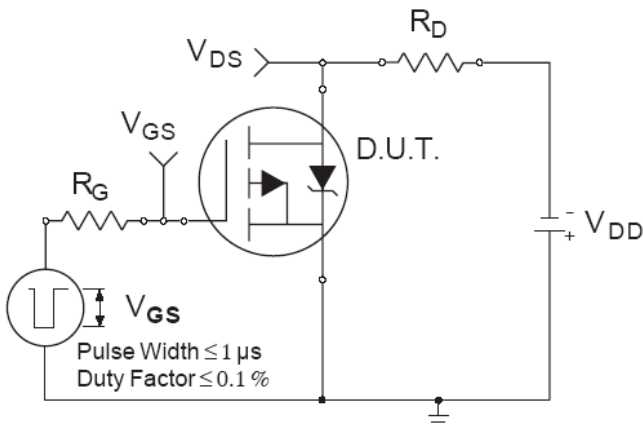


Fig 14a. Switching Time Test Circuit

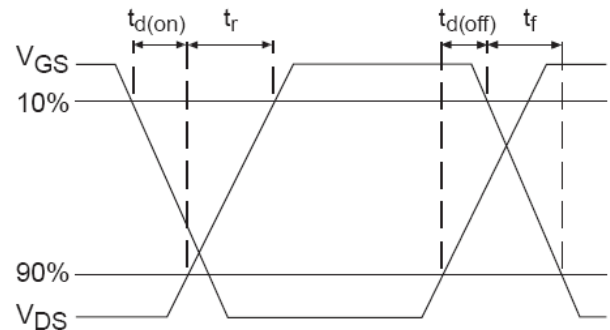


Fig 14b. Switching Time Waveforms

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