

Advanced Power MOSFET

IRFR/U230A

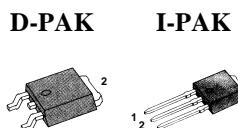
FEATURES

- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current : 10 μ A (Max.) @ $V_{DS} = 200V$
- Low $R_{DS(ON)}$: 0.333 Ω (Typ.)

$BV_{DSS} = 200 V$

$R_{DS(on)} = 0.4 \Omega$

$I_D = 7.5 A$



1. Gate 2. Drain 3. Source

Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	200	V
I_D	Continuous Drain Current ($T_C=25^\circ C$)	7.5	A
	Continuous Drain Current ($T_C=100^\circ C$)	4.8	
I_{DM}	Drain Current-Pulsed	30	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy	150	mJ
I_{AR}	Avalanche Current	7.5	A
E_{AR}	Repetitive Avalanche Energy	5	mJ
dv/dt	Peak Diode Recovery dv/dt	5.0	V/ns
P_D	Total Power Dissipation ($T_A=25^\circ C$) [*]	2.5	W
	Total Power Dissipation ($T_C=25^\circ C$)	50	W
	Linear Derating Factor	0.4	$W/\text{ }^\circ C$
T_J, T_{STG}	Operating Junction and Storage Temperature Range	- 55 to +150	$^\circ C$
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8 " from case for 5-seconds	300	

Thermal Resistance

Symbol	Characteristic	Typ.	Max.	Units
R_{JC}	Junction-to-Case	--	2.5	$^\circ C/W$
R_{JA}	Junction-to-Ambient *	--	50	
R_{JA}	Junction-to-Ambient	--	110	

* When mounted on the minimum pad size recommended (PCB Mount).

Rev. B

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Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	200	--	--	V	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_D=250\mu\text{A}$
$\Delta \text{BV}/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.21	--	$\text{V}/^\circ\text{C}$	$\text{I}_D=250\mu\text{A}$ See Fig 7
$\text{V}_{\text{GS(th)}}$	Gate Threshold Voltage	2.0	--	4.0	V	$\text{V}_{\text{DS}}=5\text{V}, \text{I}_D=250\mu\text{A}$
I_{GSS}	Gate-Source Leakage , Forward	--	--	100	nA	$\text{V}_{\text{GS}}=30\text{V}$
	Gate-Source Leakage , Reverse	--	--	-100		$\text{V}_{\text{GS}}=-30\text{V}$
I_{DSS}	Drain-to-Source Leakage Current	--	--	10	μA	$\text{V}_{\text{DS}}=200\text{V}$
		--	--	100		$\text{V}_{\text{DS}}=160\text{V}, \text{T}_C=125^\circ\text{C}$
$\text{R}_{\text{DS(on)}}$	Static Drain-Source On-State Resistance	--	--	0.4	Ω	$\text{V}_{\text{GS}}=10\text{V}, \text{I}_D=3.75\text{A}$ ④
g_{fs}	Forward Transconductance	--	3.73	--	Ω	$\text{V}_{\text{DS}}=40\text{V}, \text{I}_D=3.75\text{A}$ ④
C_{iss}	Input Capacitance	--	500	650	pF	$\text{V}_{\text{GS}}=0\text{V}, \text{V}_{\text{DS}}=25\text{V}, f=1\text{MHz}$ See Fig 5
C_{oss}	Output Capacitance	--	95	110		
C_{rss}	Reverse Transfer Capacitance	--	45	55		
$t_{\text{d(on)}}$	Turn-On Delay Time	--	13	40	ns	$\text{V}_{\text{DD}}=100\text{V}, \text{I}_D=9\text{A},$ $\text{R}_G=12\Omega$ See Fig 13 ④ ⑤
t_r	Rise Time	--	13	40		
$t_{\text{d(off)}}$	Turn-Off Delay Time	--	30	70		
t_f	Fall Time	--	18	50		
Q_g	Total Gate Charge	--	22	29	nC	$\text{V}_{\text{DS}}=160\text{V}, \text{V}_{\text{GS}}=10\text{V},$ $\text{I}_D=9\text{A}$ See Fig 6 & Fig 12 ④ ⑤
Q_{gs}	Gate-Source Charge	--	4.3	--		
Q_{gd}	Gate-Drain("Miller") Charge	--	10.9	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	7.5	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	30		
V_{SD}	Diode Forward Voltage ④	--	--	1.5	V	$\text{T}_J=25^\circ\text{C}, \text{I}_S=7.5\text{A}, \text{V}_{\text{GS}}=0\text{V}$
t_{rr}	Reverse Recovery Time	--	137	--	ns	$\text{T}_J=25^\circ\text{C}, \text{I}_F=9\text{A}$ $d\text{I}_F/dt=100\text{A}/\mu\text{s}$ ④
Q_{rr}	Reverse Recovery Charge	--	0.68	--		

Notes :

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② $L=4\text{mH}, \text{I}_{AS}=7.5\text{A}, \text{V}_{DD}=50\text{V}, \text{R}_G=27\Omega$, Starting $\text{T}_J=25^\circ\text{C}$
- ③ $\text{I}_{SD} \leq 9\text{A}, d\text{I}/dt \leq 220\text{A}/\mu\text{s}, \text{V}_{DD} \leq \text{BV}_{DSS}$, Starting $\text{T}_J=25^\circ\text{C}$
- ④ Pulse Test : Pulse Width = $250\mu\text{s}$, Duty Cycle $\leq 2\%$
- ⑤ Essentially Independent of Operating Temperature

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Fig 1. Output Characteristics

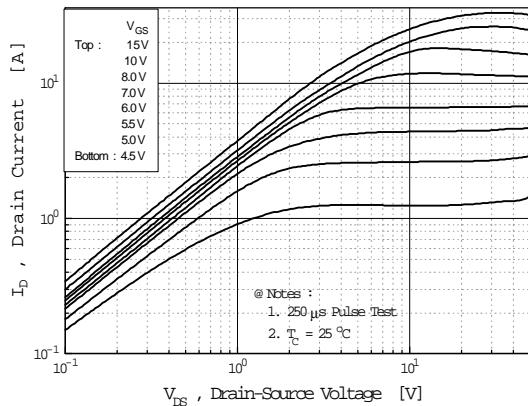


Fig 2. Transfer Characteristics

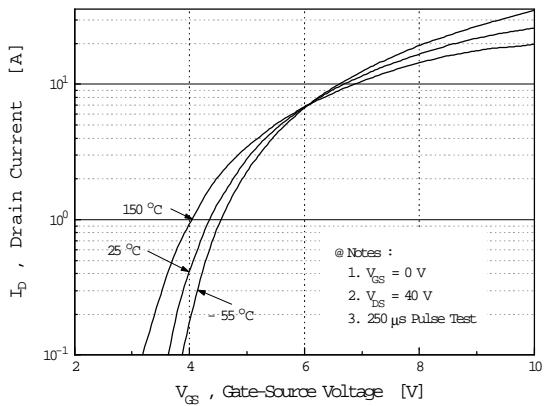


Fig 3. On-Resistance vs. Drain Current

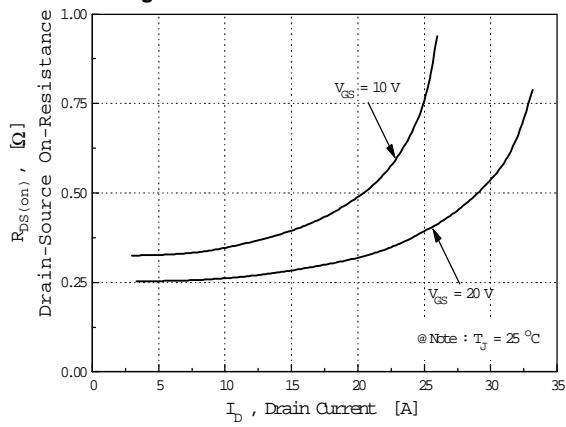


Fig 4. Source-Drain Diode Forward Voltage

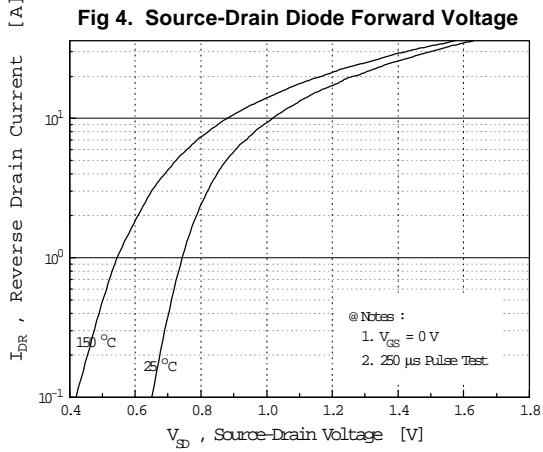


Fig 5. Capacitance vs. Drain-Source Voltage

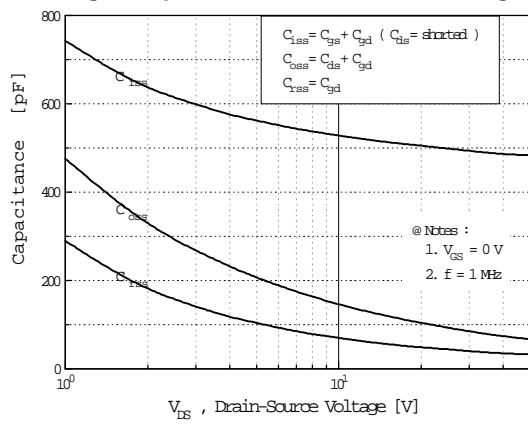
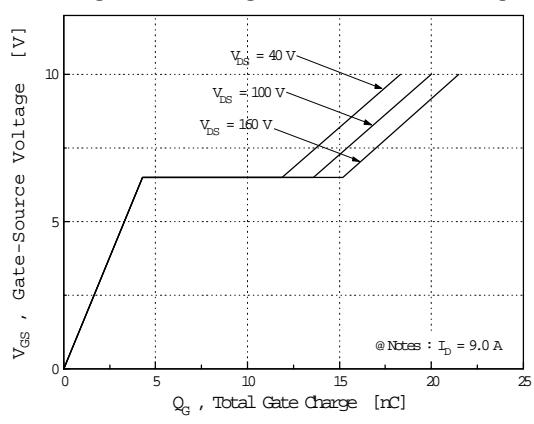
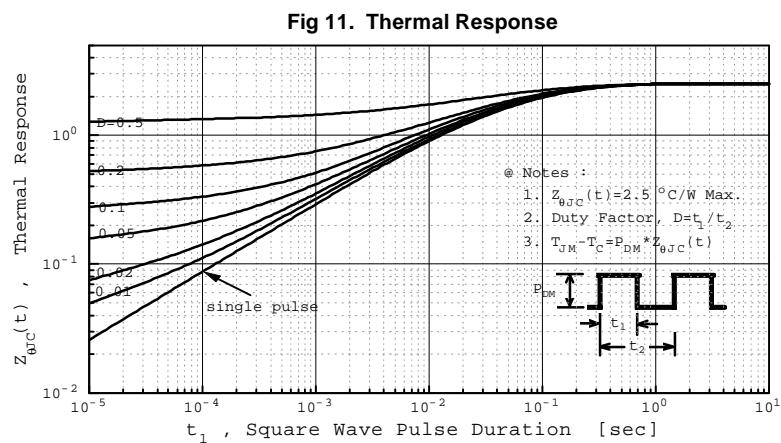
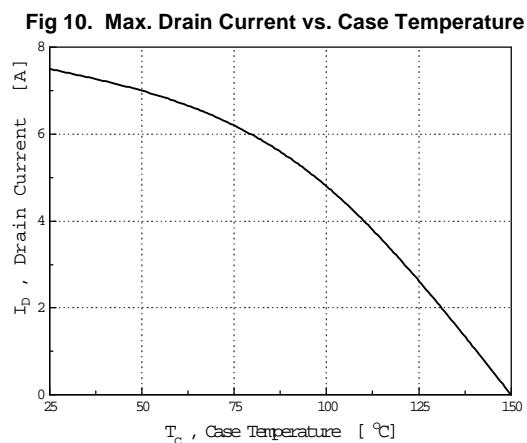
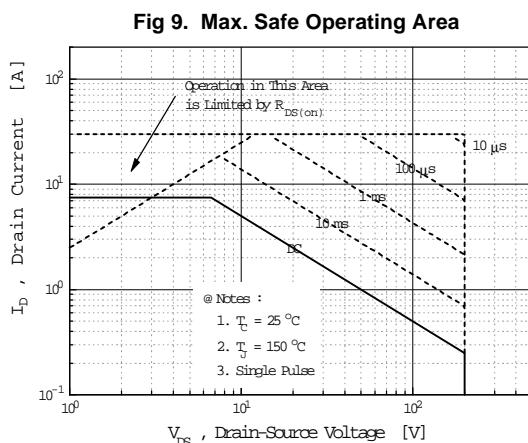
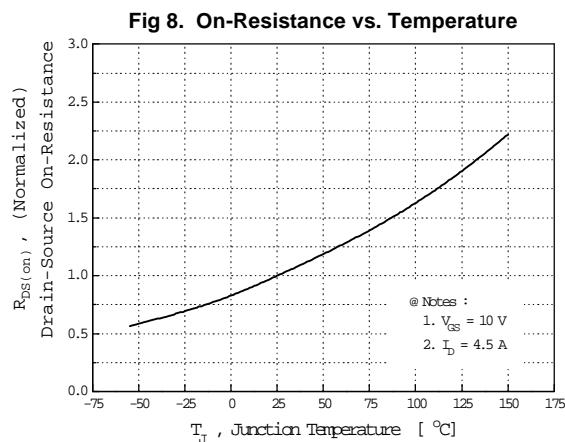
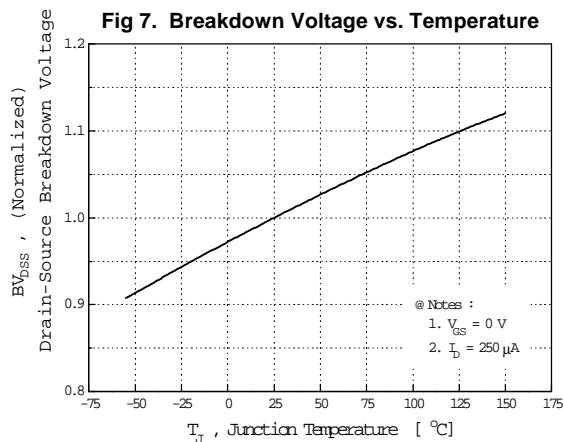


Fig 6. Gate Charge vs. Gate-Source Voltage



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Fig 12. Gate Charge Test Circuit & Waveform

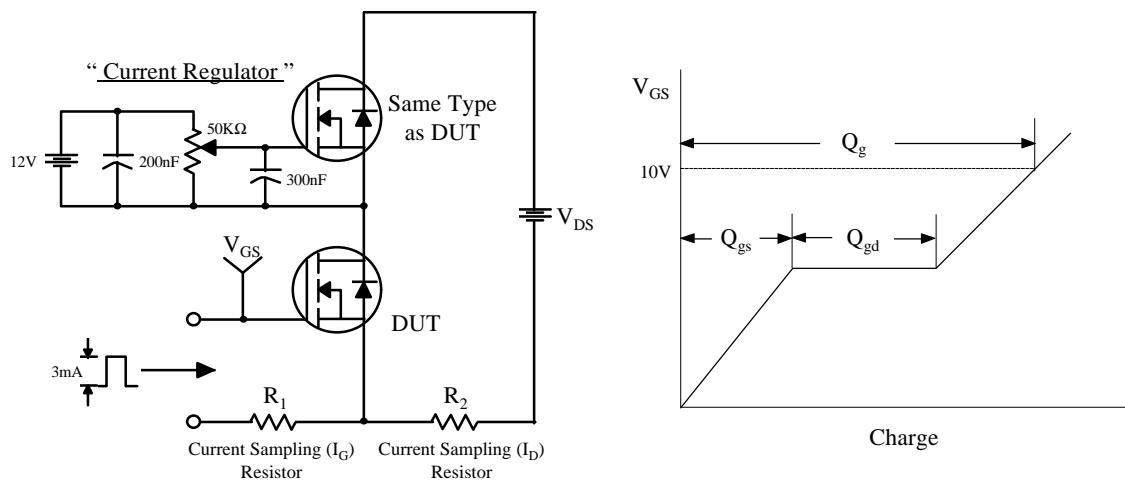


Fig 13. Resistive Switching Test Circuit & Waveforms

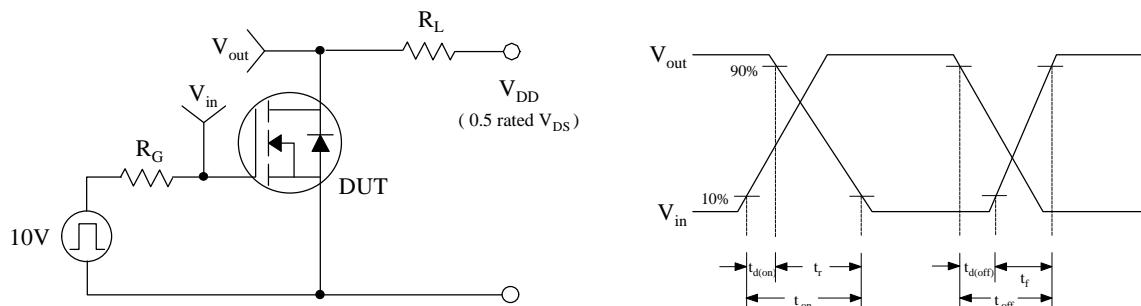
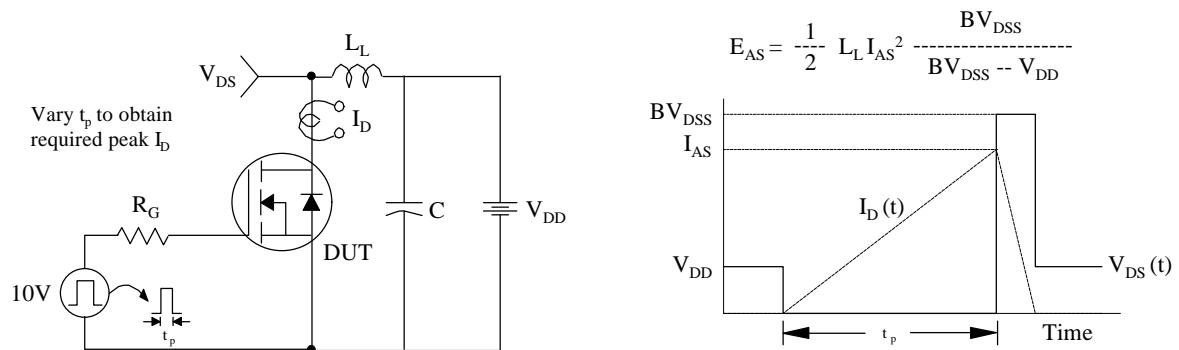


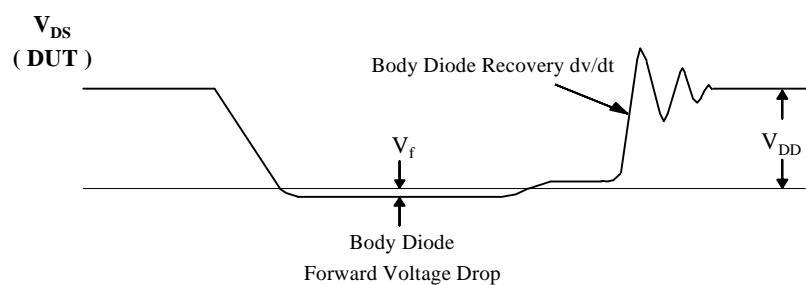
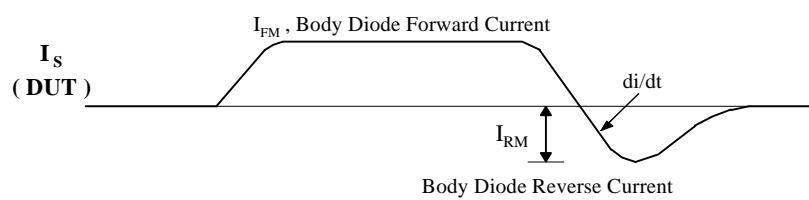
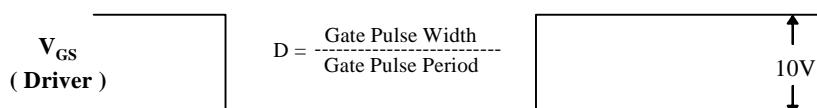
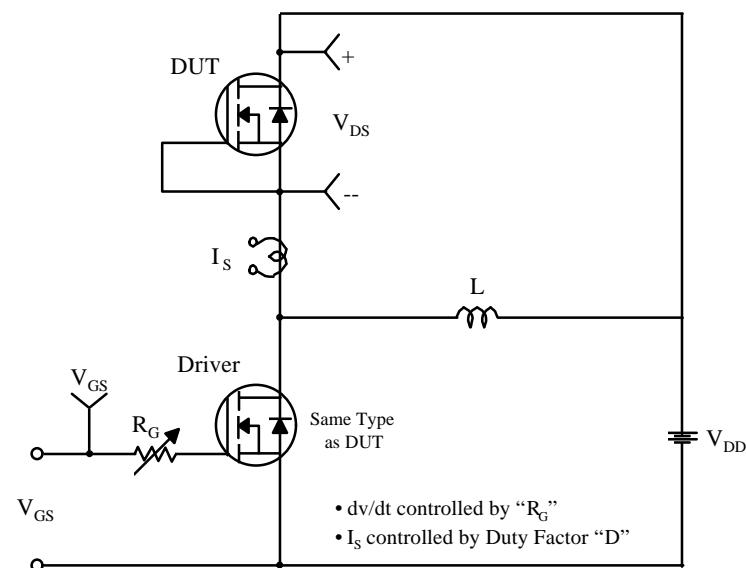
Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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