

Advanced Power MOSFET

IRFR/U220A

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 $R_{DS(ON)}$: 0.626 Ω (Typ.)

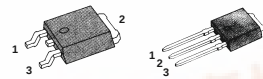
$$BV_{DSS} = 200 V$$

$$R_{DS(on)} = 0.8 \Omega$$

$$I_D = 4.6 A$$

D-PAK

I-PAK



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 ($T_C=25^\circ C$)	4.6	A
	Continuous Drain Current ($T_C=100^\circ C$)	2.9	
I_{DM}	Drain Current-Pulsed ①	18	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy ②	71	mJ
I_{AR}	Avalanche Current ①	4.6	A
E_{AR}	Repetitive Avalanche Energy ①	4	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
P_D	Total Power Dissipation ($T_A=25^\circ C$) *	2.5	W
	Total Power Dissipation ($T_C=25^\circ C$)	40	W
	Linear Derating Factor	0.32	W/ $^\circ C$
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
$R_{\theta JC}$	Junction-to-Case	--	3.14	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient *	--	50	
$R_{\theta A}$	Junction-to-Ambient	--	110	

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

Rev. B

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N-CHANNEL POWER MOSFET

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV _{DSS}	Drain-Source Breakdown Voltage	200	--	--	V	V _{GS} =0V, I _D =250μA
ΔBV/ΔT _J	Breakdown Voltage Temp. Coeff.	--	0.24	--	V/°C	I _D =250 μA See Fig 7
V _{GS(th)}	Gate Threshold Voltage	2.0	--	4.0	V	V _{DS} =5V, I _D =250 μA
I _{GSS}	Gate-Source Leakage , Forward	--	--	100	nA	V _{GS} =30V
	Gate-Source Leakage , Reverse	--	--	-100		V _{GS} =-30V
I _{DSS}	Drain-to-Source Leakage Current	--	--	10	μA	V _{DS} =200V
		--	--	100		V _{DS} =160V, T _C =125 °C
R _{DS(on)}	Static Drain-Source On-State Resistance	--	--	0.8	Ω	V _{GS} =10V, I _D =2.3A ④
g _{fs}	Forward Transconductance	--	2.36	--	Ω	V _{DS} =40V, I _D =2.3A ④
C _{iss}	Input Capacitance	--	275	360	pF	V _{GS} =0V, V _{DS} =25V, f =1MHz See Fig 5
C _{oss}	Output Capacitance	--	55	65		
C _{rss}	Reverse Transfer Capacitance	--	25	30		
t _{d(on)}	Turn-On Delay Time	--	10	30	ns	V _{DD} =100V, I _D =5A, R _G =18Ω See Fig 13 ④ ⑤
t _r	Rise Time	--	11	30		
t _{d(off)}	Turn-Off Delay Time	--	26	60		
t _f	Fall Time	--	15	40		
Q _g	Total Gate Charge	--	12	17	nC	V _{DS} =160V, V _{GS} =10V, I _D =5A See Fig 6 & Fig 12 ④ ⑤
Q _{gs}	Gate-Source Charge	--	2.4	--		
Q _{gd}	Gate-Drain(" Miller ") Charge	--	6.2	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I _S	Continuous Source Current	--	--	4.6	A	Integral reverse pn-diode in the MOSFET
I _{SM}	Pulsed-Source Current ①	--	--	18		
V _{SD}	Diode Forward Voltage ④	--	--	1.5	V	T _J =25°C, I _S =4.6A, V _{GS} =0V
t _{rr}	Reverse Recovery Time	--	122	--	ns	T _J =25°C, I _F =5A di _F /dt=100A/μs ④
Q _{rr}	Reverse Recovery Charge	--	0.51	--	μC	

Notes ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=5mH, I_{AS}=4.6A, V_{DD}=50V, R_G=27Ω, Starting T_J=25 °C
- ③ I_{SD}≤5A, di/dt≤180A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25 °C
- ④ Pulse Test : Pulse Width = 250 μs, Duty Cycle ≤2%
- ⑤ Essentially Independent of Operating Temperature

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Fig 1. Output Characteristics

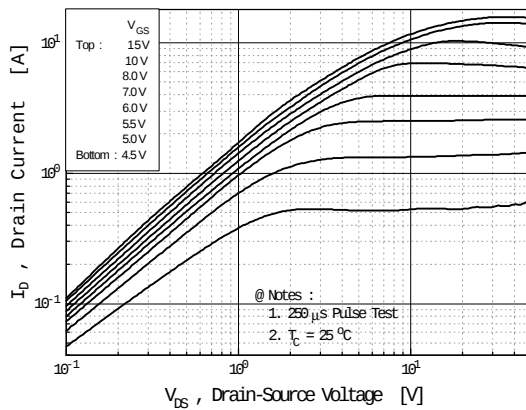


Fig 2. Transfer Characteristics

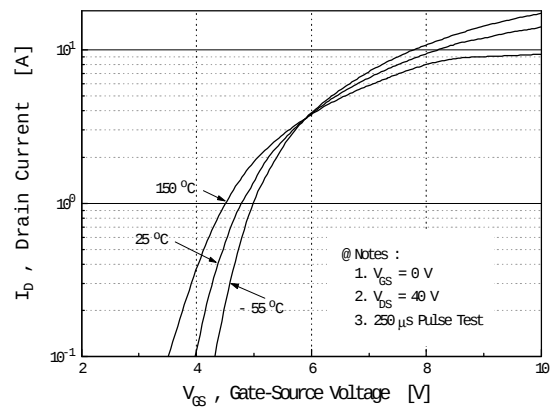


Fig 3. On-Resistance vs. Drain Current

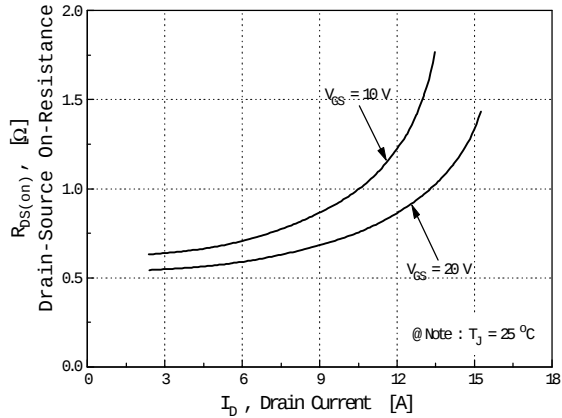


Fig 4. Source-Drain Diode Forward Voltage

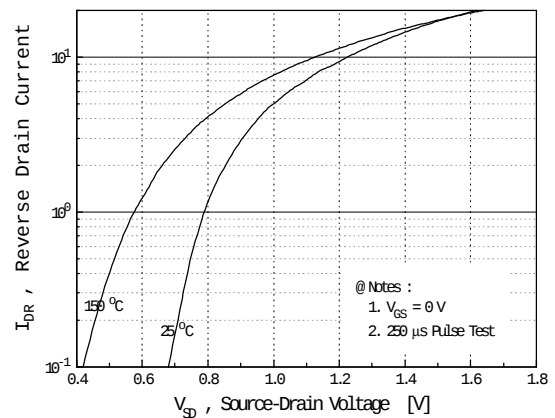


Fig 5. Capacitance vs. Drain-Source Voltage

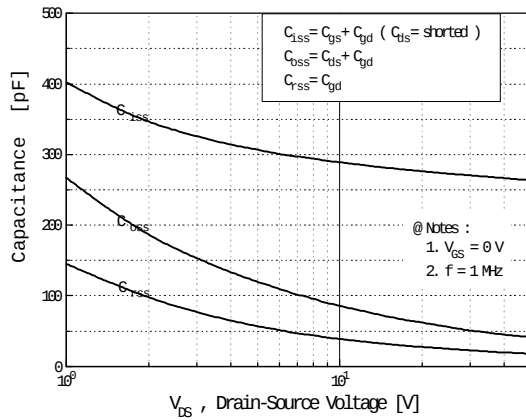
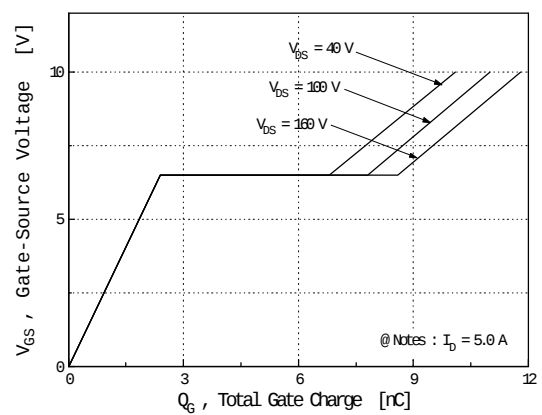


Fig 6. Gate Charge vs. Gate-Source Voltage



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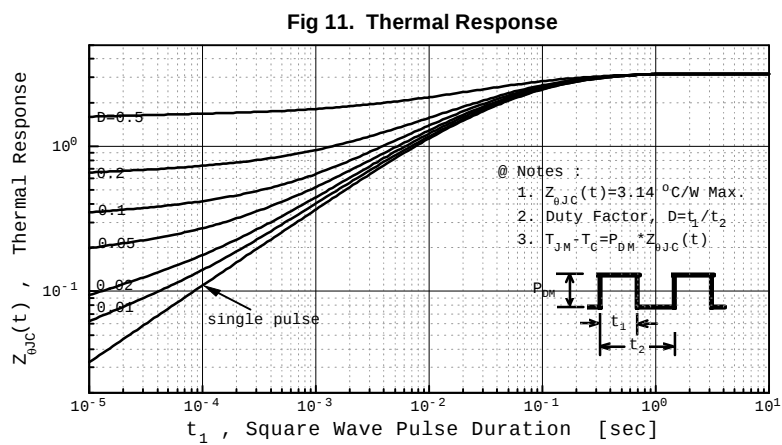
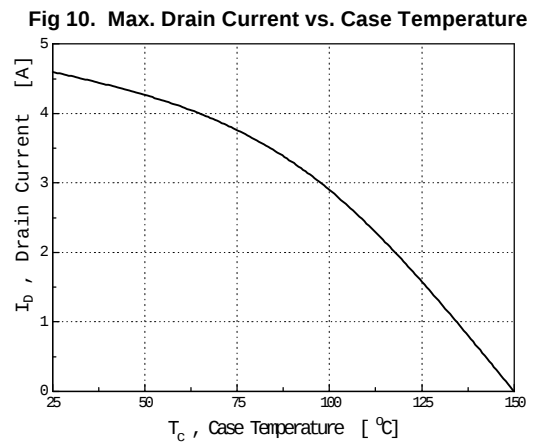
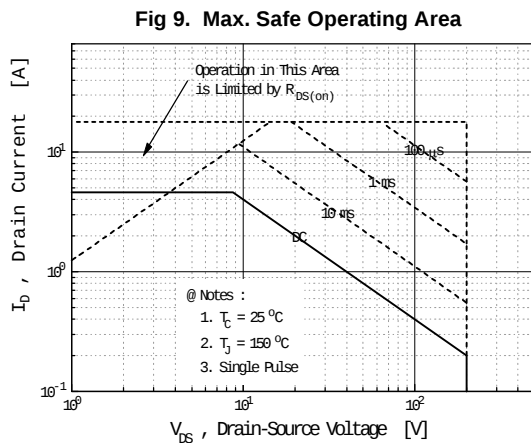
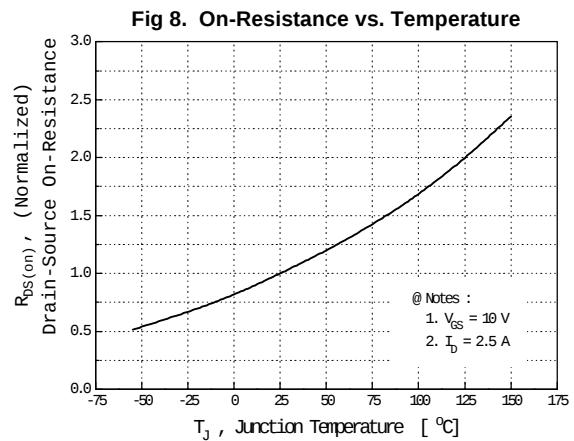
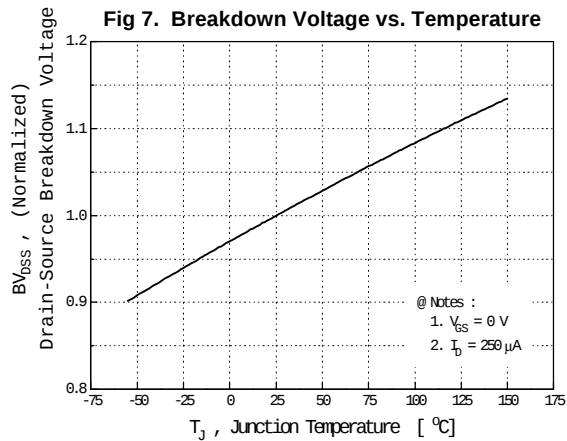


Fig 12. Gate Charge Test Circuit & Waveform

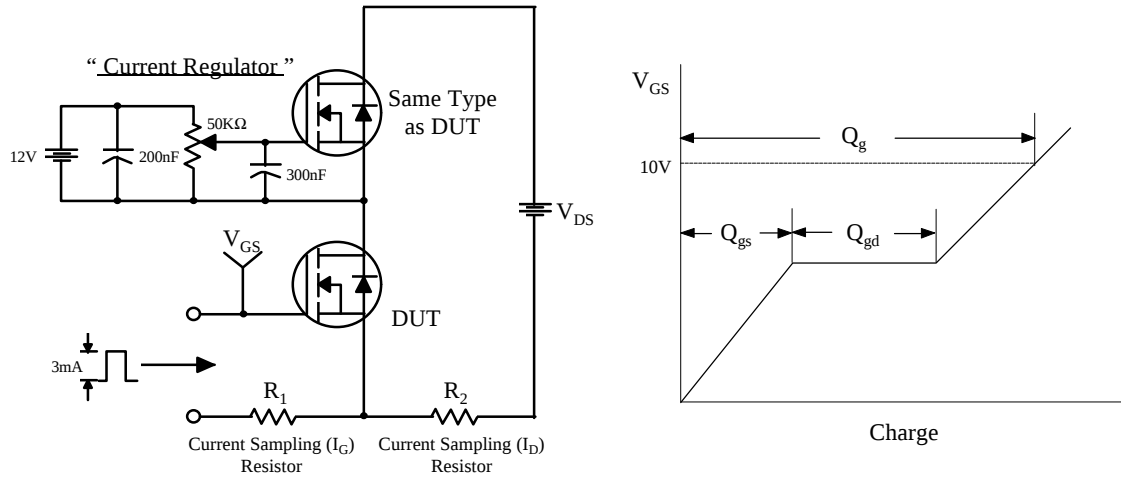


Fig 13. Resistive Switching Test Circuit & Waveforms

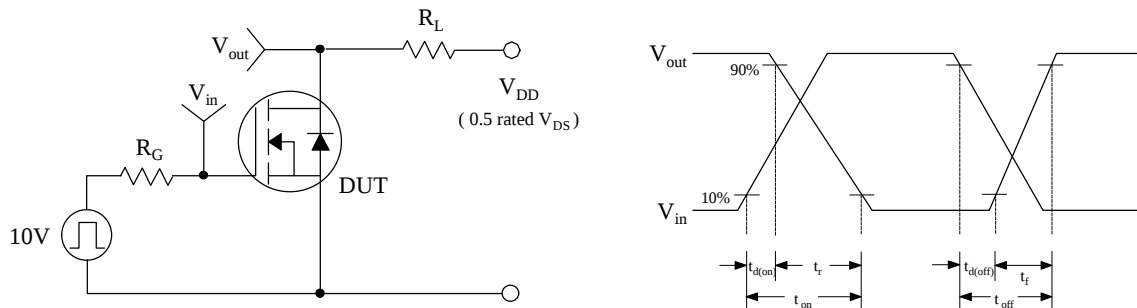
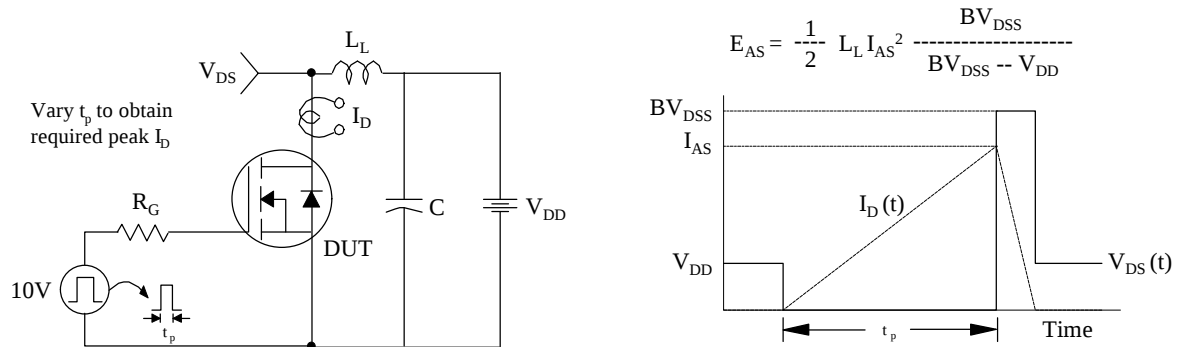


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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