SAMSUNG ELECTRONICS

IRFU410A

Advanced Power MOSFET

- Improved Inductive Ruggedness
- Rugged Polysilicon Gate Cell Structure
- Fast Switching Times
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Improved High Temperature Reliability

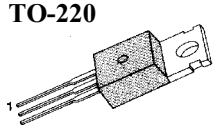
IRFU410A

BV_{DSS} = 520 V

$R_{DS(on)}$ = 10.0Ω

I_D = 1.2 A

TO-220



1.Gate 2. Drain 3. Source

Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	520	V
I_D	Continuous Drain Current (T_C=25℃)	1.2	A
	Continuous Drain Current (T_C=100℃)	0.8	
I_{DM}	Drain Current-Pulsed ①	4.0	A
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy ②	40	mJ
I_{AR}	Avalanche Current ①	1.2	A
E_{AR}	Repetitive Avalanche Energy ①	4.2	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.5	V/ns
P_D	Total Power Dissipation (T_C=25℃)	42	W
	Linear Derating Factor	0.33	W/℃
T_J , T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	℃
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	--	3.0	℃/W
$R_{\theta CS}$	Case-to-Sink	1.7	--	
$R_{\theta JA}$	Junction-to-Ambient	--	110	

Electrical Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	520	--	--	V	V_{GS}=0V,I_D=250 μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.60	--	V/℃	I_D=250 μA ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{DS}=4V,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}=520V
		--	--	1000		V_{DS}=416V,T_C=125℃
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	10	Ω	V_{GS}=10V,I_D=0.6A ④
g_{fs}	Forward Transconductance	--	0.70	--	℧	V_{DS}≥50V,I_D=0.6A ④
C_{iss}	Input Capacitance	--	-	300	pF	V_{GS}=0V,V_{DS}=25V,f =1MHz ***See Fig 5***
C_{oss}	Output Capacitance	--	-	80		
C_{rss}	Reverse Transfer Capacitance	--	-	40		
$t_{d(on)}$	Turn-On Delay Time	--	-	20	ns	V_{DD}=260V,I_D=1.2A,R_G=9.1Ω ***See Fig 13*** ④⑤
t_r	Rise Time	--	-	30		
$t_{d(off)}$	Turn-Off Delay Time	--	-	60		
t_f	Fall Time	--	-	45		
Q_g	Total Gate Charge	--	--	21	nC	V_{DS}=416V,V_{GS}=10V,I_D=1.2A ***See Fig 6 & Fig 12*** ④⑤
Q_{gs}	Gate-Source Charge	--	4.5	--		
Q_{gd}	Gate-Drain("Miller") Charge	--	9.5	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	1.2	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	4.0		
V_{SD}	Diode Forward Voltage ④	--	--	1.15	V	T_J=25℃,I_S=1.2A,V_{GS}= 0V
t_{rr}	Reverse Recovery Time	--	350	--	ns	T_J=25℃,I_F=1.2A di$_F$/dt=100A/ μs ④
Q_{rr}	Reverse Recovery Charge	--	506	-	μC	

Notes ;

① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature

② L=40mH, V_{dd}=25V, R_G=25Ω, Starting T_J=25℃

③ dv/dt Test Condition

④ Pulse Test : Pulse Width = 250μs, Duty Cycle ≤ 2%

⑤ Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

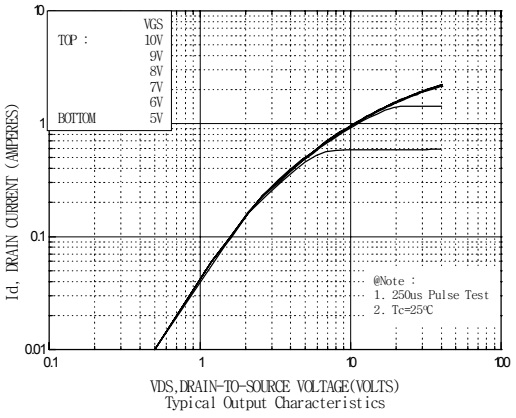


Fig 2. Transfer Characteristics

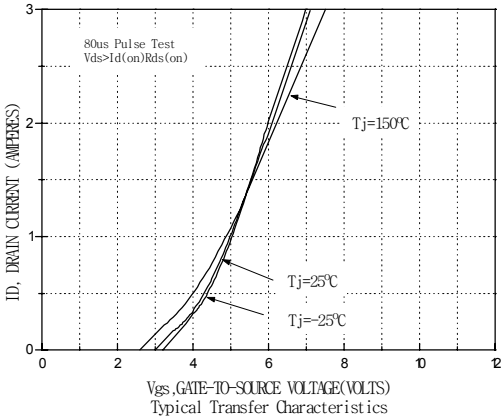


Fig 3. On-Resistance vs. Drain Current

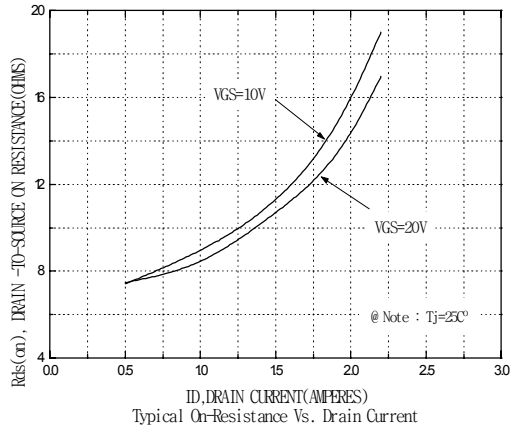


Fig 4. Source-Drain Diode Forward Voltage

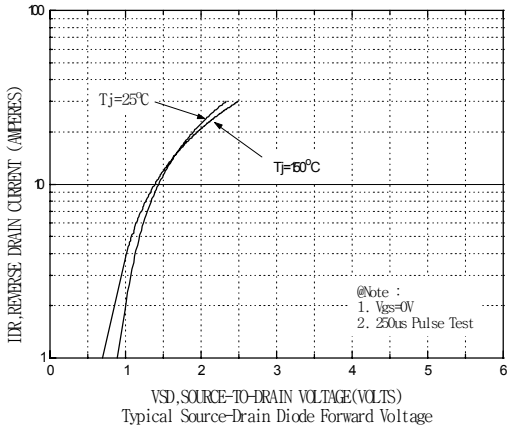


Fig 5. Capacitance vs. Drain-Source Voltage

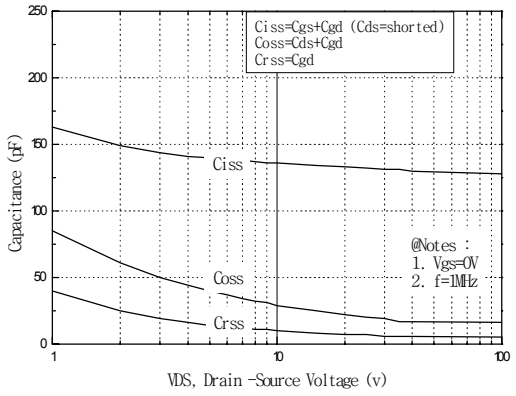


Fig 6. Gate Charge vs. Gate-Source Voltage

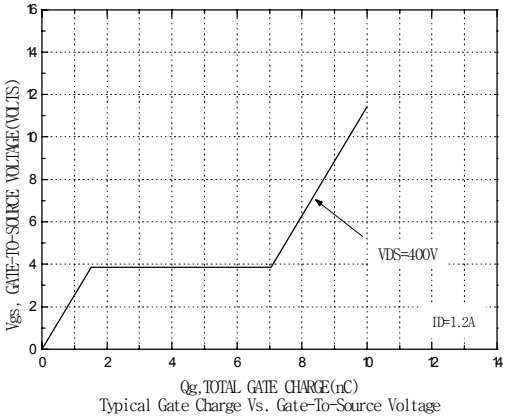


Fig 7. Breakdown Voltage vs. Temperature

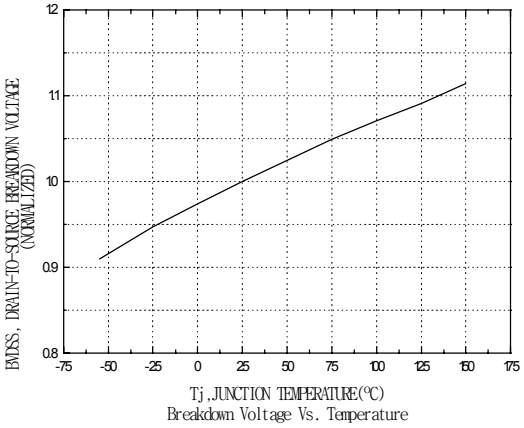


Fig 8. On-Resistance vs. Temperature

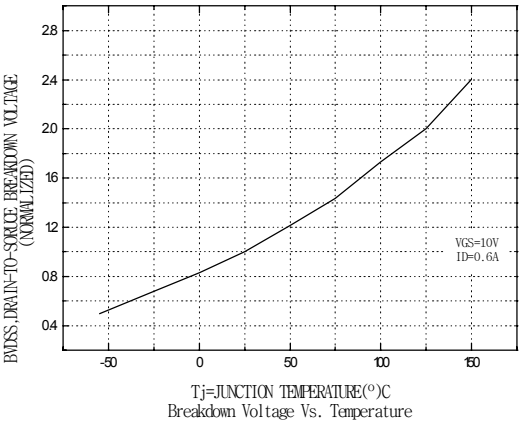


Fig 10. Max. Drain Current vs. Case Temperature

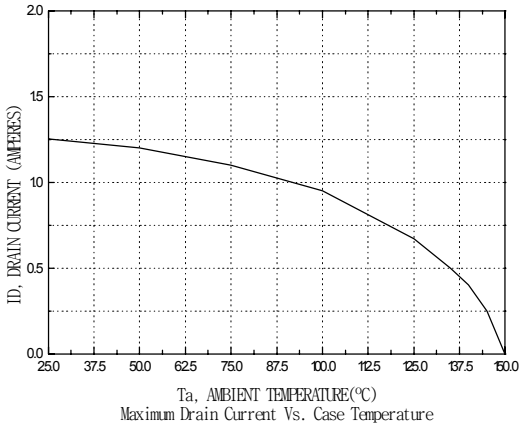


Fig 12. Gate Charge Test Circuit & Waveform

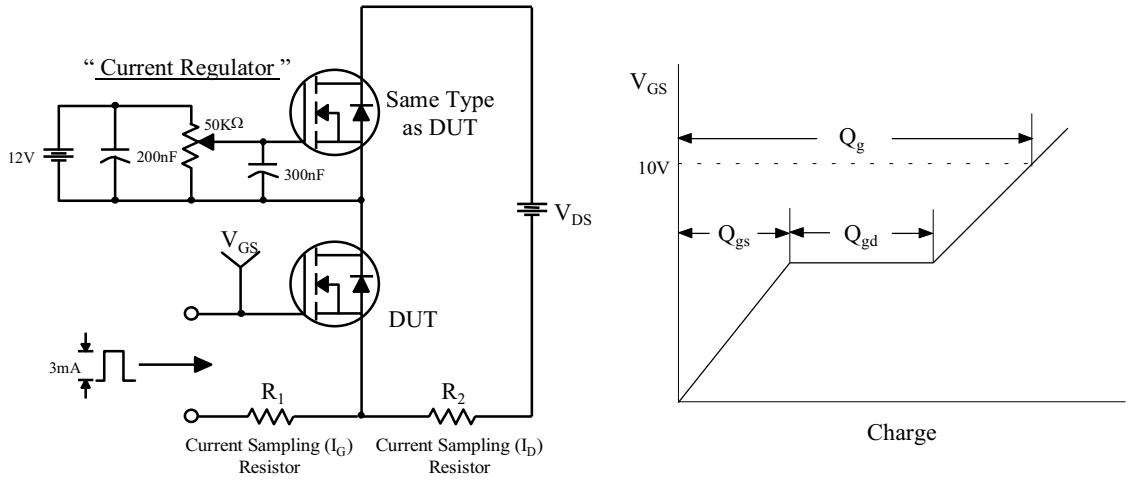


Fig 13. Resistive Switching Test Circuit & Waveforms

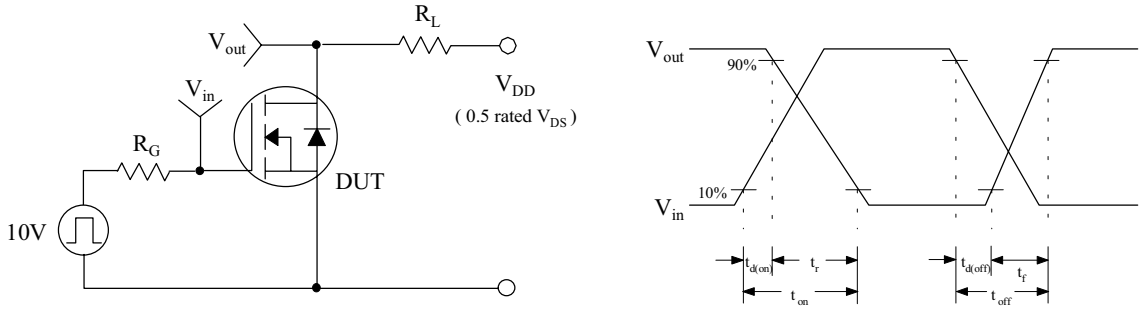


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

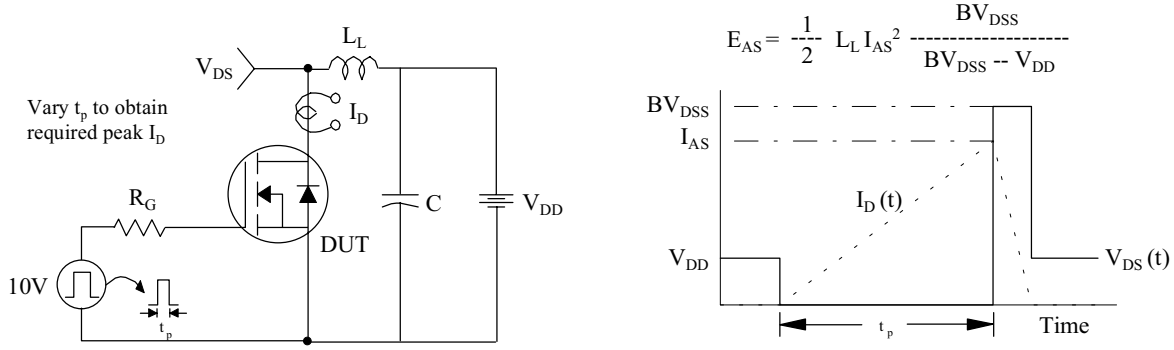


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms