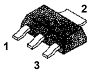
Advanced Power MOSFET IRFM014A

FEATURES

- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current : 10 μA (Max.) @ V_{DS} = 60V
- Lower $R_{DS(ON)}$: 0.097 Ω (Typ.)

BV_{DSS} = 60 V
$R_{DS(on)}$ = 0.14 Ω
I_D = 2.8 A

SOT-223



1. Gate 2. Drain 3. Source

Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	60	V
I_D	Continuous Drain Current (T_A=25°C)	2.8	A
	Continuous Drain Current (T_A=70°C)	2.25	
I_{DM}	Drain Current-Pulsed ①	22	A
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulsed Avalanche Energy ②	67	mJ
I_{AR}	Avalanche Current ①	2.8	A
E_{AR}	Repetitive Avalanche Energy ①	0.21	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.5	V/ns
P_D	Total Power Dissipation (T_A=25°C)* Linear Derating Factor *	2.1 0.017	W W/°C
T_J , T_{STG}	Operating Junction and Storage Temperature Range	- 55 to +150	°C
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5-seconds	300	

Thermal Resistance

Symbol	Characteristic	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient *	--	60	°C /W

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

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

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	60	--	--	V	V_{GS}=0V,I_D=250 μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.060	--	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}=20V
	Gate-Source Leakage , Reverse	--	--	-100		V_{GS}=-20V
I_{DSS}	Drain-to-Source Leakage Current	--	--	10	μA	V_{DS}=60V
		--	--	100		V_{DS}=48V,T_A=125 °C
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.14	Ω	V_{GS}=10V,I_D=1.4A ④
g_{fs}	Forward Transconductance	--	3.85	--	℧	V_{DS}=30V,I_D=1.4A ④
C_{iss}	Input Capacitance	--	280	360	pF	V_{GS}=0V,V_{DS}=25V,f =1MHz **_See Fig 5_**
C_{oss}	Output Capacitance	--	110	125		
C_{rss}	Reverse Transfer Capacitance	--	40	46		
$t_{d(on)}$	Turn-On Delay Time	--	11	25	ns	V_{DD}=30V,I_D=10A, R_G=24 Ω **_See Fig 13_** ④⑤
t_r	Rise Time	--	17	40		
$t_{d(off)}$	Turn-Off Delay Time	--	27	60		
t_f	Fall Time	--	28	60		
Q_g	Total Gate Charge	--	12	17	nC	V_{DS}=48V,V_{GS}=10V, I_D=10A **_See Fig 6 & Fig 12_** ④⑤
Q_{gs}	Gate-Source Charge	--	2.4	--		
Q_{gd}	Gate-Drain(“ Miller “) Charge	--	5.4	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	2.8	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	22		
V_{SD}	Diode Forward Voltage ④	--	--	1.5	V	T_J=25°C,I_S=2.8A,V_{GS}= 0V
t_{rr}	Reverse Recovery Time	--	55	--	ns	T_J=25°C,I_F=10A di_F/dt=100A/ μs ④
Q_{rr}	Reverse Recovery Charge	--	0.11	--	μC	

Notes ;

① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature

② L=10mH, I_{AS}=2.8A, V_{DD}=25V, R_G=27 Ω , Starting T_J =25 °C

③ I_{SD} ≤10A, di/dt ≤200A/ 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

Fig 1. Output Characteristics

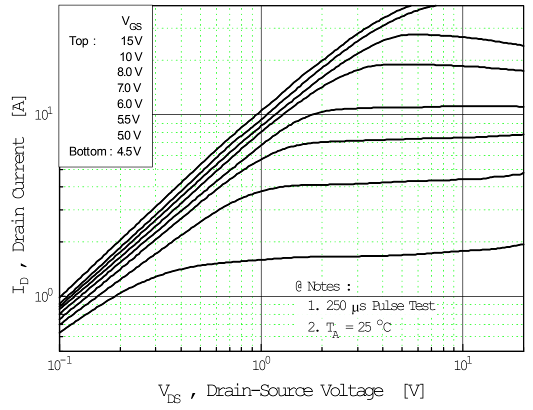


Fig 2. Transfer Characteristics

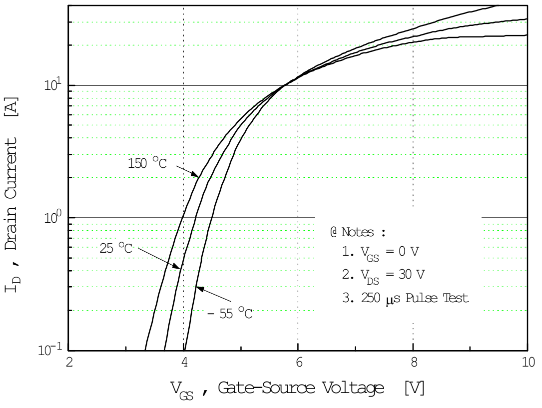


Fig 3. On-Resistance vs. Drain Current

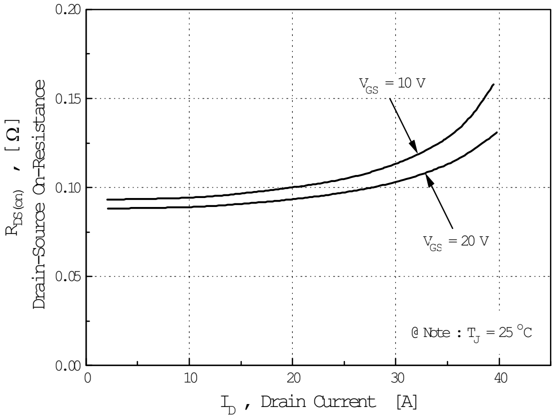


Fig 4. Source-Drain Diode Forward Voltage

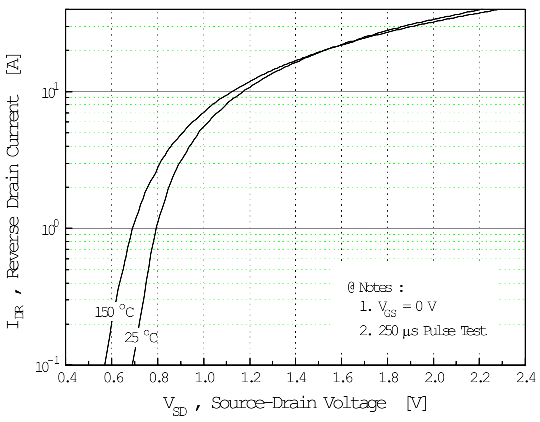


Fig 5. Capacitance vs. Drain-Source Voltage

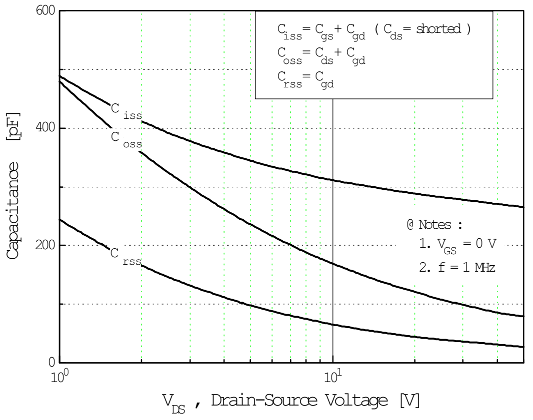
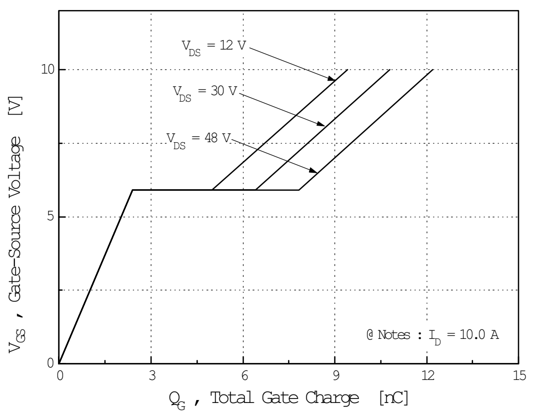


Fig 6. Gate Charge vs. Gate-Source Voltage



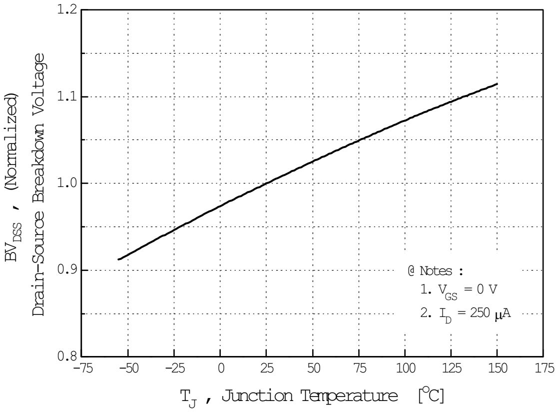


Fig 7. Breakdown Voltage vs. Temperature

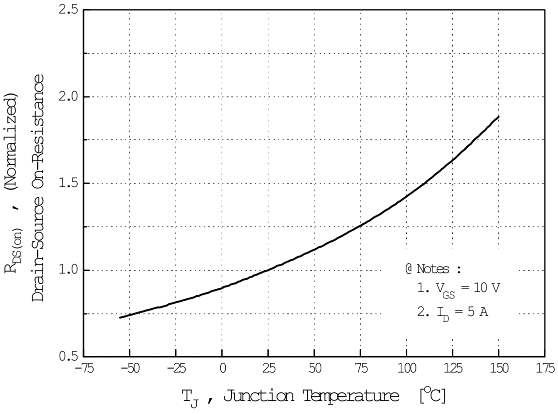


Fig 8. On-Resistance vs. Temperature

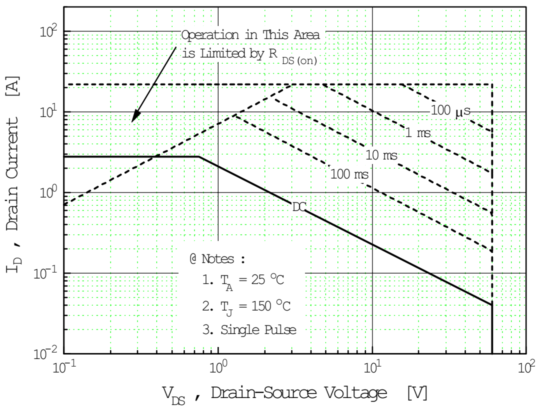


Fig 9. Max. Safe Operating Area

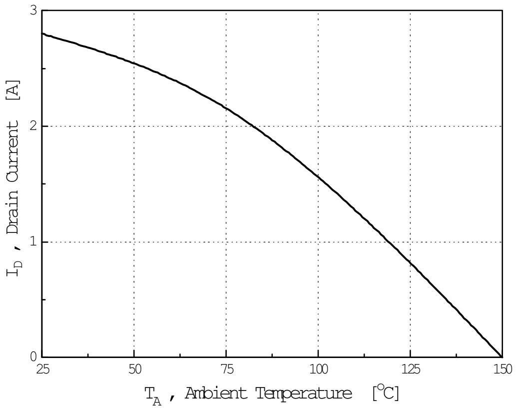


Fig 10. Max. Drain Current vs. Ambient Temperature

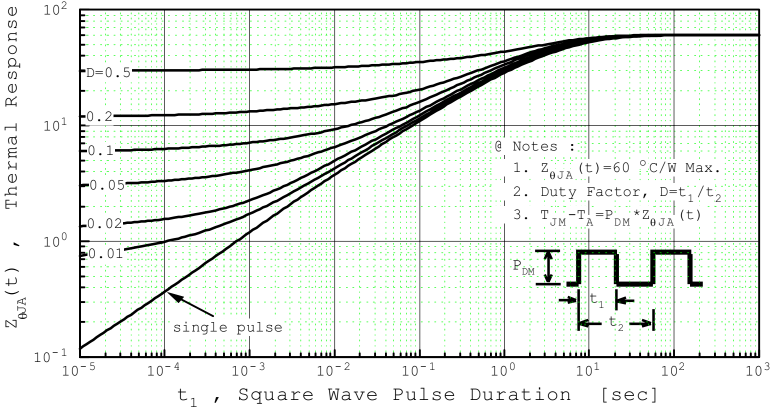


Fig 11. Thermal Response

Fig 12. Gate Charge Test Circuit & Waveform

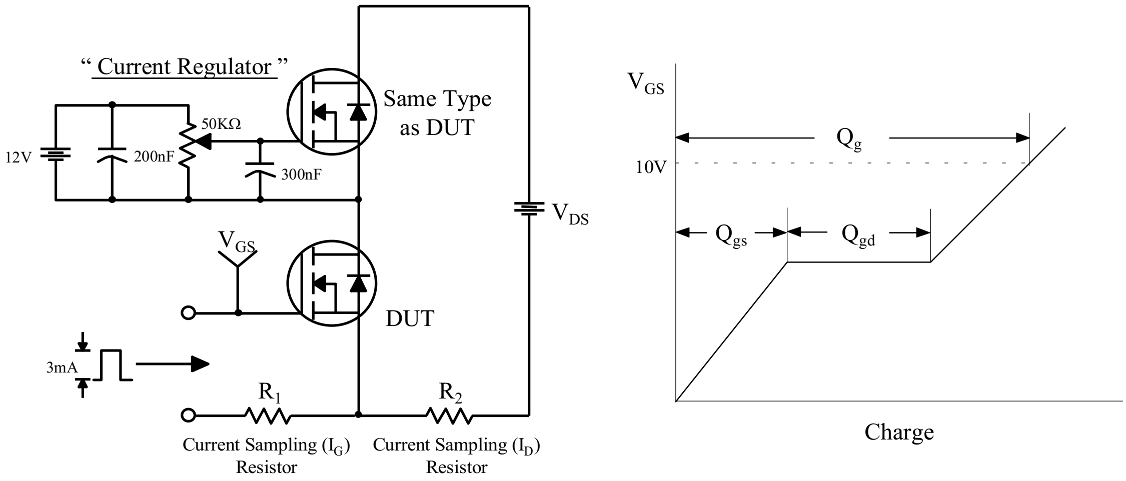


Fig 13. Resistive Switching Test Circuit & Waveforms

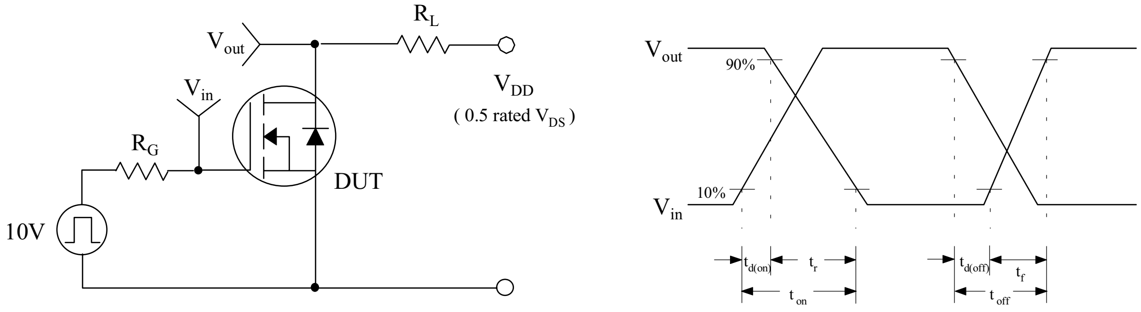
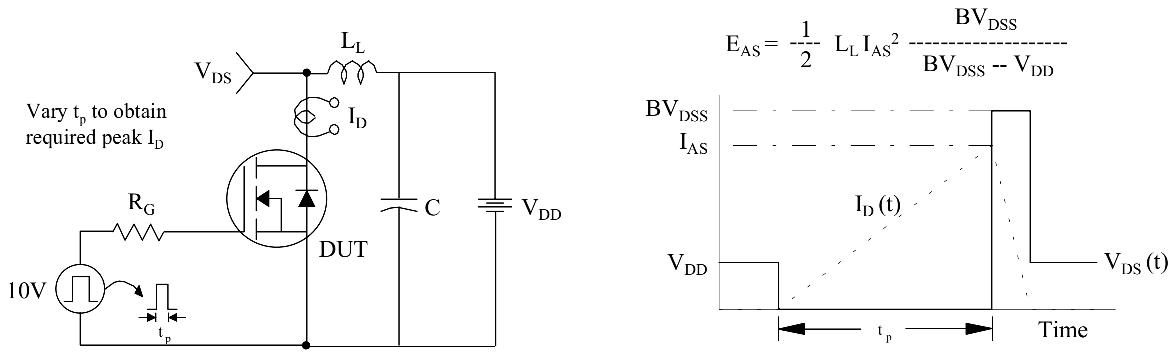


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2}\, L_L\, I_{AS}^2\, \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

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