Advanced Power MOSFET

IRLS610A

FEATURES

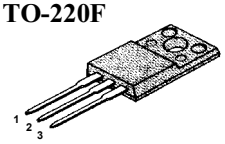
- Logic Level Gate Drive
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current : 10 μA (Max.) @ V_{DS} = 200V
- Lower $R_{DS(ON)}$: 1.185 Ω (Typ.)

BV_{DSS} = 200 V

$R_{DS(on)}$ = 1.5 Ω

I_D = 2.5 A

TO-220F



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°C)	2.5	A
	Continuous Drain Current (T_C=100°C)	1.6	
I_{DM}	Drain Current-Pulsed ①	12	A
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy ②	20	mJ
I_{AR}	Avalanche Current ①	2.5	A
E_{AR}	Repetitive Avalanche Energy ①	1.9	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
P_D	Total Power Dissipation (T_C=25°C)	19	W
	Linear Derating Factor	0.15	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
$R_{\theta JC}$	Junction-to-Case	--	6.6	°C/W
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

SAMSUNG ELECTRONICS

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
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.19	--	V/°C	I_D=250μA ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	1.0	--	2.0	V	V_{DS}=5V,I_D=250μA
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}=200V
		--	--	100		V_{DS}=160V,T_C=125°C
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	1.5	Ω	V_{GS}=5V,I_D=1.25A ④
g_{fs}	Forward Transconductance	--	1.9	--	℧	V_{DS}=40V,I_D=1.25A ④
C_{iss}	Input Capacitance	--	185	240	pF	V_{GS}=0V,V_{DS}=25V,f =1MHz ***See Fig 5***
C_{oss}	Output Capacitance	--	35	45		
C_{rss}	Reverse Transfer Capacitance	--	14	20		
$t_{d(on)}$	Turn-On Delay Time	--	9	30	ns	V_{DD}=100V,I_D=3.3A, R_G=22Ω ***See Fig 13*** ④ ⑤
t_r	Rise Time	--	9	30		
$t_{d(off)}$	Turn-Off Delay Time	--	20	50		
t_f	Fall Time	--	6	20		
Q_g	Total Gate Charge	--	6.1	9	nC	V_{DS}=160V,V_{GS}=5V, I_D=3.3A ***See Fig 6 & Fig 12*** ④ ⑤
Q_{gs}	Gate-Source Charge	--	1.4	--		
Q_{gd}	Gate-Drain(“Miller”) Charge	--	2.8	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	2.5	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	12		
V_{SD}	Diode Forward Voltage ④	--	--	1.5	V	T_J=25°C ,I_S=2.5A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	123	--	ns	T_J=25°C ,I_F=3.3A
Q_{rr}	Reverse Recovery Charge	--	0.38	--	μC	di_F/dt=100A/μs ④

Notes ;

① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature

② L=5mH, I_{AS}=2.5A, V_{DD}=50V, R_G=27Ω, Starting T_J=25°C

③ I_{SD} ≤ 3.3A, di/dt ≤ 140A/μs, V_{DD} ≤ BV_{DSS} , Starting T_J=25°C

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

⑤ Essentially Independent of Operating Temperature

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
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.19	--	V/°C	I_D=250μA ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	1.0	--	2.0	V	V_{DS}=5V,I_D=250μA
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}=200V
		--	--	100		V_{DS}=160V,T_C=125°C
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	1.5	Ω	V_{GS}=5V,I_D=1.25A ④
g_{fs}	Forward Transconductance	--	1.9	--	℧	V_{DS}=40V,I_D=1.25A ④
C_{iss}	Input Capacitance	--	185	240	pF	V_{GS}=0V,V_{DS}=25V,f =1MHz ***See Fig 5***
C_{oss}	Output Capacitance	--	35	45		
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$t_{d(on)}$	Turn-On Delay Time	--	9	30	ns	V_{DD}=100V,I_D=3.3A, R_G=22Ω ***See Fig 13*** ④ ⑤
t_r	Rise Time	--	9	30		
$t_{d(off)}$	Turn-Off Delay Time	--	20	50		
t_f	Fall Time	--	6	20		
Q_g	Total Gate Charge	--	6.1	9	nC	V_{DS}=160V,V_{GS}=5V, I_D=3.3A ***See Fig 6 & Fig 12*** ④ ⑤
Q_{gs}	Gate-Source Charge	--	1.4	--		
Q_{gd}	Gate-Drain(“Miller”) Charge	--	2.8	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	2.5	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	12		
V_{SD}	Diode Forward Voltage ④	--	--	1.5	V	T_J=25°C ,I_S=2.5A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	123	--	ns	T_J=25°C ,I_F=3.3A
Q_{rr}	Reverse Recovery Charge	--	0.38	--	μC	di_F/dt=100A/μs ④

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① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature

② L=5mH, I_{AS}=2.5A, V_{DD}=50V, R_G=27Ω, Starting T_J=25°C

③ I_{SD} ≤ 3.3A, di/dt ≤ 140A/μs, V_{DD} ≤ BV_{DSS} , Starting T_J=25°C

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

⑤ Essentially Independent of Operating Temperature

Fig 7. Breakdown Voltage vs. Temperature

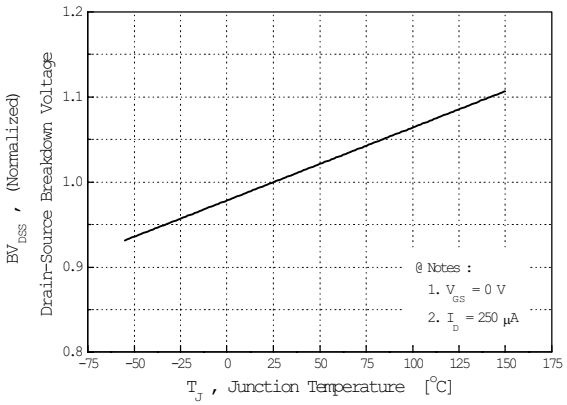

Fig 8. On-Resistance vs. Temperature

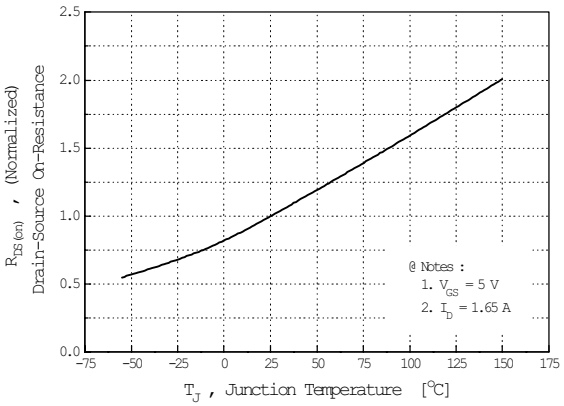

Fig 9. Max. Safe Operating Area

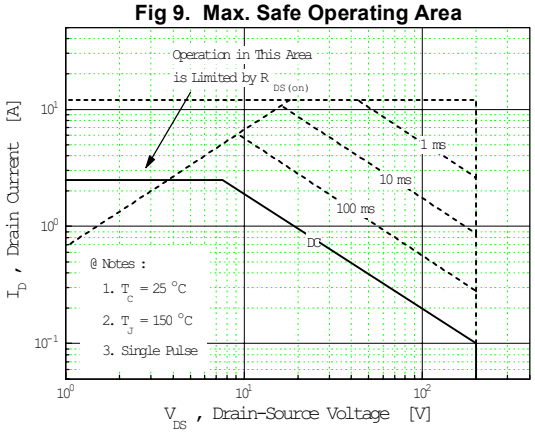

Fig 10. Max. Drain Current vs. Case Temperature

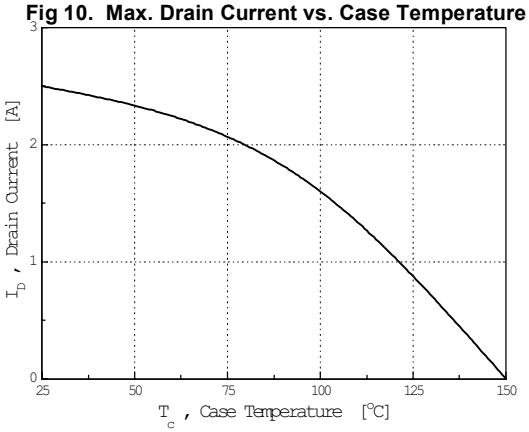

Fig 11. Thermal Response

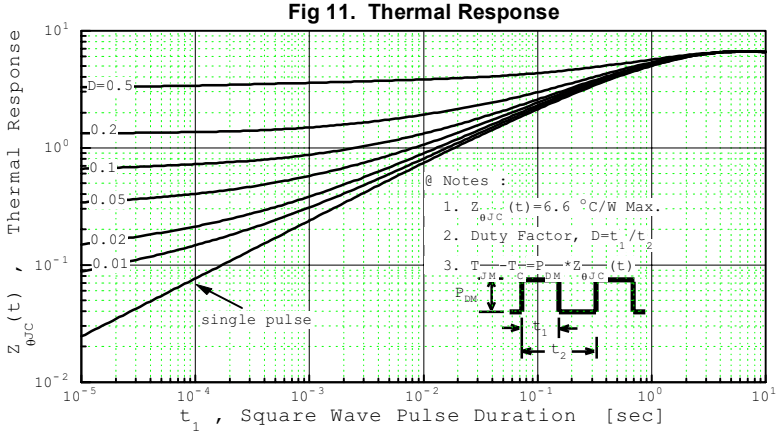

Fig 12. Gate Charge Test Circuit & Waveform

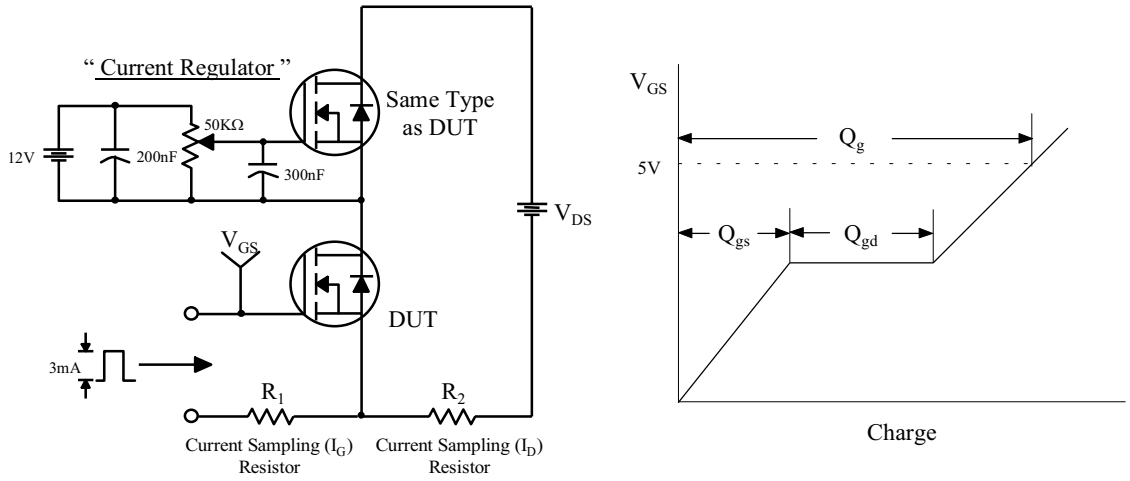

Fig 13. Resistive Switching Test Circuit & Waveforms

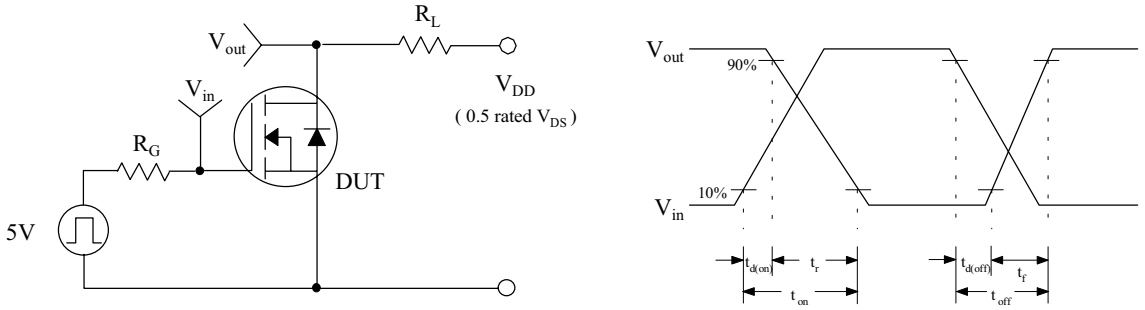

Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

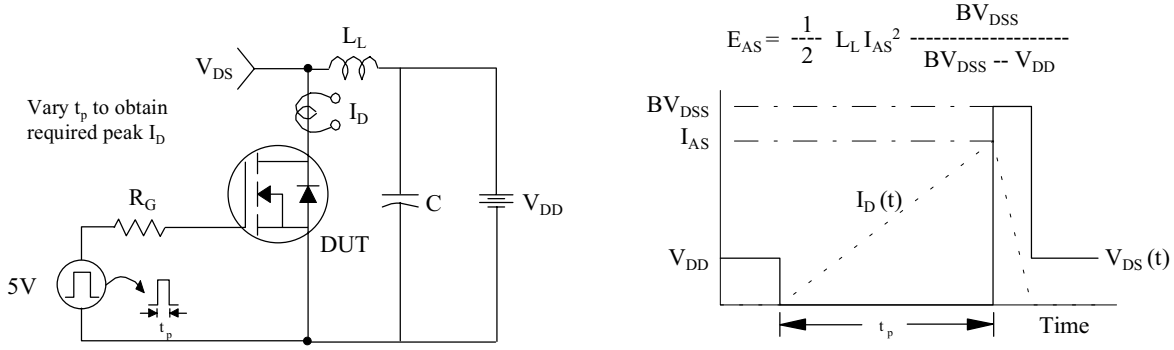

Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms