

FEATURES

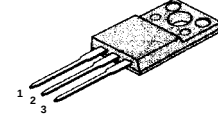
- Logic-Level Gate Drive
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current : 10 μ A (Max.) @ $V_{DS} = 100V$
- Lower $R_{DS(ON)}$: 0.336 Ω (Typ.)

$$BV_{DSS} = 100 V$$

$$R_{DS(on)} = 0.44 \Omega$$

$$I_D = 4.5 A$$

TO-220F



1. Gate 2. Drain 3. Source

Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	100	V
I_D	Continuous Drain Current ($T_C=25^\circ C$)	4.5	A
	Continuous Drain Current ($T_C=100^\circ C$)	3.1	
I_{DM}	Drain Current-Pulsed ①	20	A
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy ②	54	mJ
I_{AR}	Avalanche Current ③	4.5	A
E_{AR}	Repetitive Avalanche Energy ③	2.3	mJ
dv/dt	Peak Diode Recovery dv/dt ③	6.5	V/ns
P_D	Total Power Dissipation ($T_C=25^\circ C$)	23	W
	Linear Derating Factor	0.15	W/ $^\circ C$
T_J, T_{STG}	Operating Junction and Storage Temperature Range	- 55 to +175	$^\circ C$
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	--	6.5	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

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	100	--	--	V	$V_{GS}=0V, I_D=250\mu A$
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.1	--	$V/^{\circ}C$	$I_D=250\mu A$ See Fig 7
$V_{GS(th)}$	Gate Threshold Voltage	1.0	--	2.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
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	$V_{DS}=100V$
		--	--	100		$V_{DS}=80V, T_C=150^{\circ}C$
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.44	Ω	$V_{GS}=5V, I_D=2.25A$ ④
g_{fs}	Forward Transconductance	--	3.2	--	S	$V_{DS}=40V, I_D=2.25A$ ④
C_{iss}	Input Capacitance	--	180	235	pF	$V_{GS}=0V, V_{DS}=25V, f=1MHz$ See Fig 5
C_{oss}	Output Capacitance	--	50	65		
C_{rss}	Reverse Transfer Capacitance	--	20	25		
$t_{d(on)}$	Turn-On Delay Time	--	8	25	ns	$V_{DD}=50V, I_D=5.6A,$ $R_G=12\Omega$ See Fig 13 ④ ⑤
t_r	Rise Time	--	10	30		
$t_{d(off)}$	Turn-Off Delay Time	--	17	45		
t_f	Fall Time	--	8	25		
Q_g	Total Gate Charge	--	5.5	8	nC	$V_{DS}=80V, V_{GS}=5V,$ $I_D=5.6A$ See Fig 6 & Fig 12 ④ ⑤
Q_{gs}	Gate-Source Charge	--	0.9	--		
Q_{gd}	Gate-Drain("Miller") Charge	--	3.5	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	5.6	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	20		
V_{SD}	Diode Forward Voltage ④	--	--	1.5	V	$T_J=25^{\circ}C, I_S=4.5A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	--	85	--	ns	$T_J=25^{\circ}C, I_F=5.6A$
Q_{rr}	Reverse Recovery Charge	--	0.23	--	μC	$di_F/dt=100A/\mu s$ ④

Notes ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
 ② $L=4mH, I_{AS}=4.5A, V_{DD}=25V, R_G=27\Omega$, Starting $T_J=25^{\circ}C$
 ③ $I_{SD} \leq 5.6A, di/dt \leq 250A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J=25^{\circ}C$
 ④ Pulse Test : Pulse Width = $250\mu s$, Duty Cycle $\leq 2\%$
 ⑤ Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

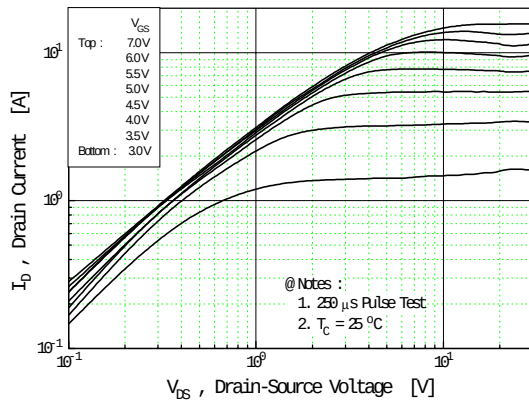


Fig 2. Transfer Characteristics

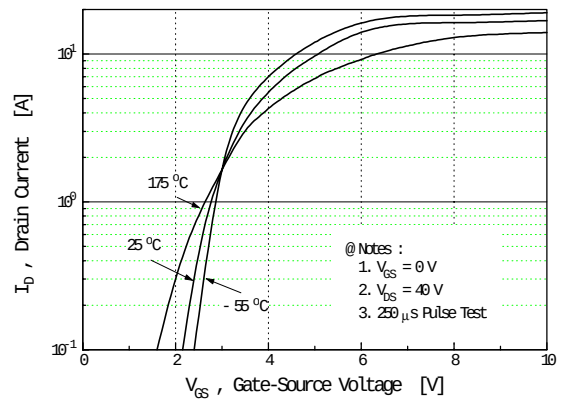


Fig 3. On-Resistance vs. Drain Current

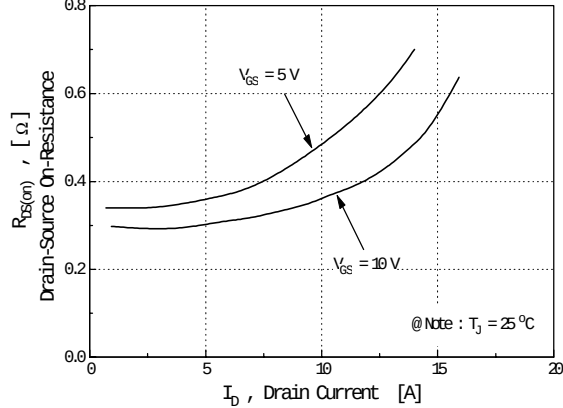


Fig 4. Source-Drain Diode Forward Voltage

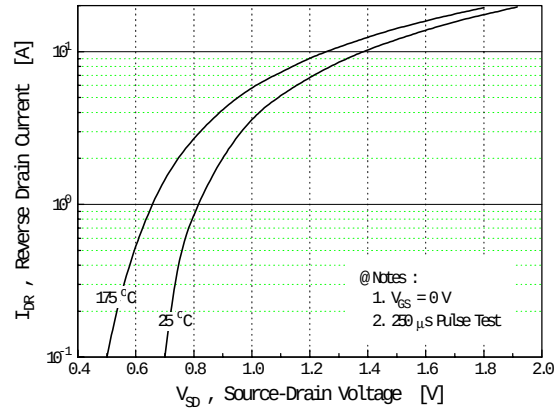


Fig 5. Capacitance vs. Drain-Source Voltage

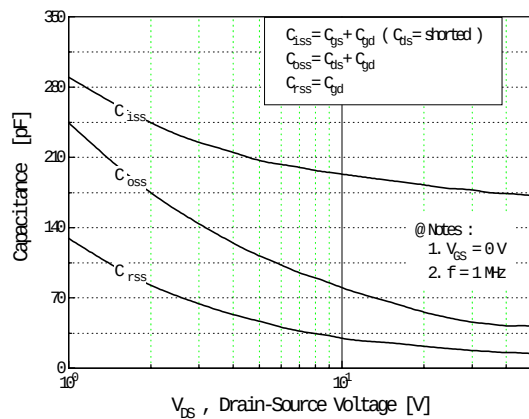
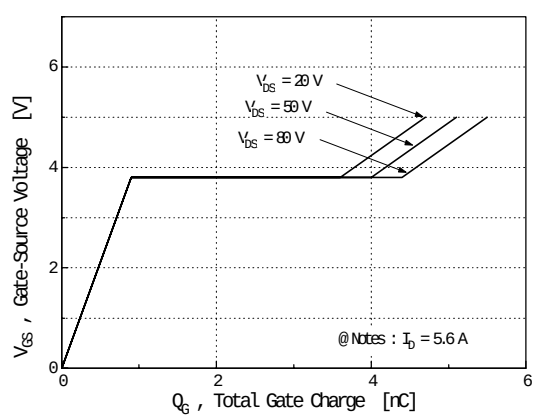


Fig 6. Gate Charge vs. Gate-Source Voltage



IRLS510A

N-CHANNEL POWER MOSFET

Fig 7. Breakdown Voltage vs. Temperature

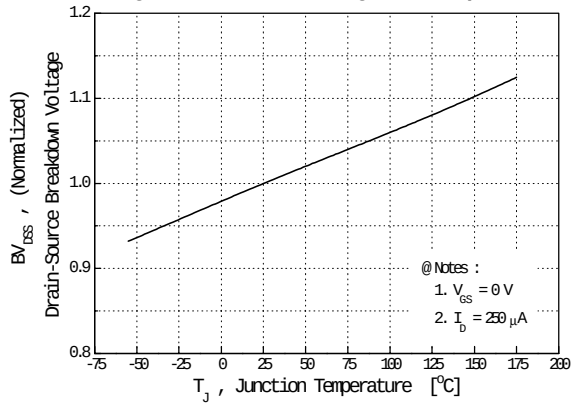


Fig 8. On-Resistance vs. Temperature

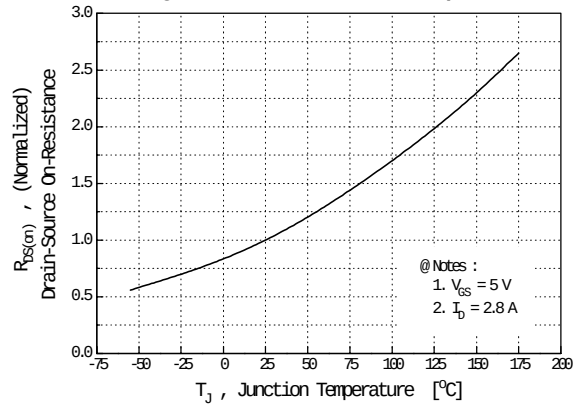


Fig 9. Max. Safe Operating Area

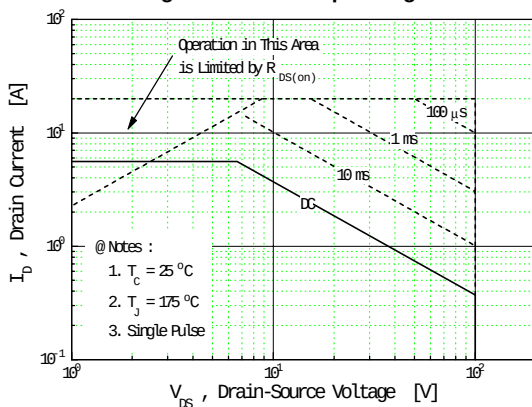


Fig 10. Max. Drain Current vs. Case Temperature

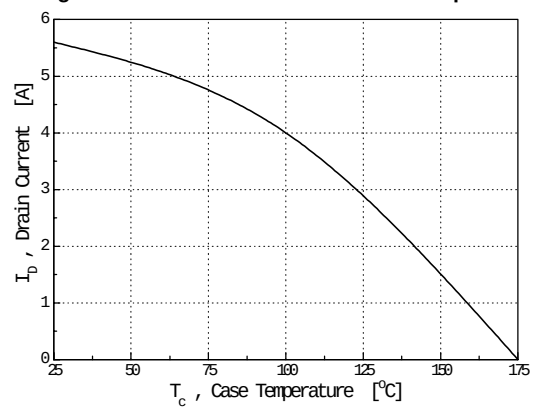


Fig 11. Thermal Response

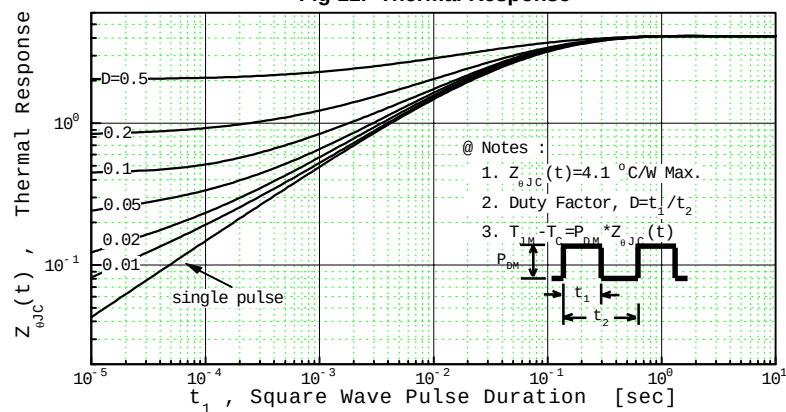


Fig 12. Gate Charge Test Circuit & Waveform

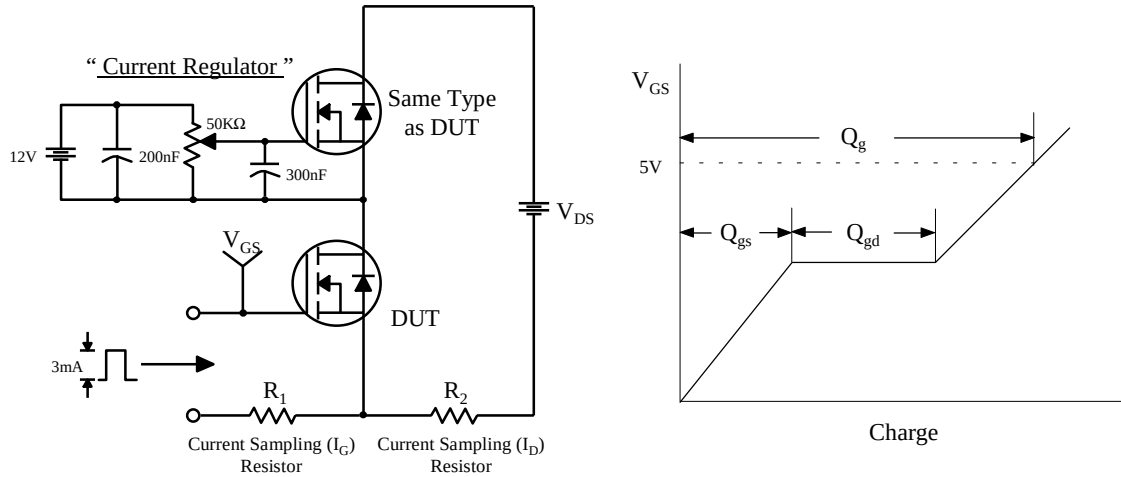


Fig 13. Resistive Switching Test Circuit & Waveforms

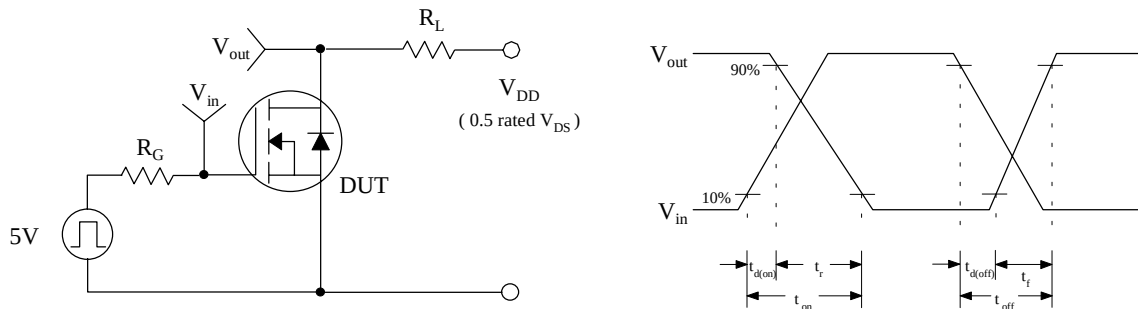


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

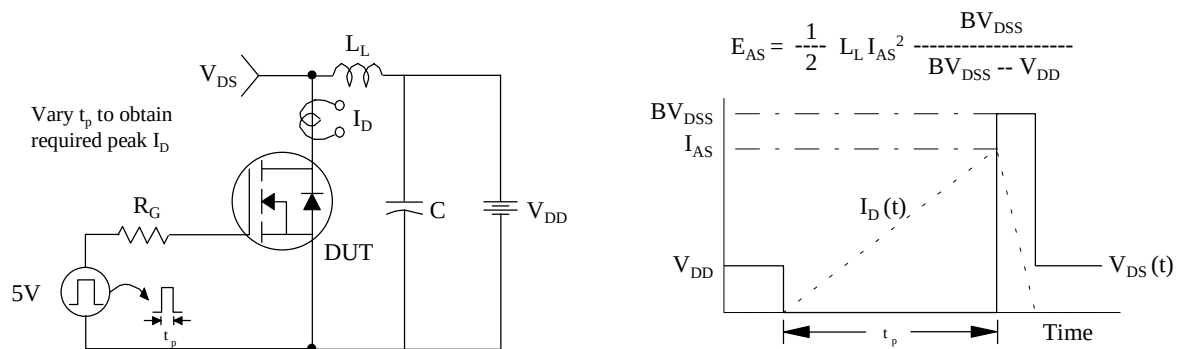
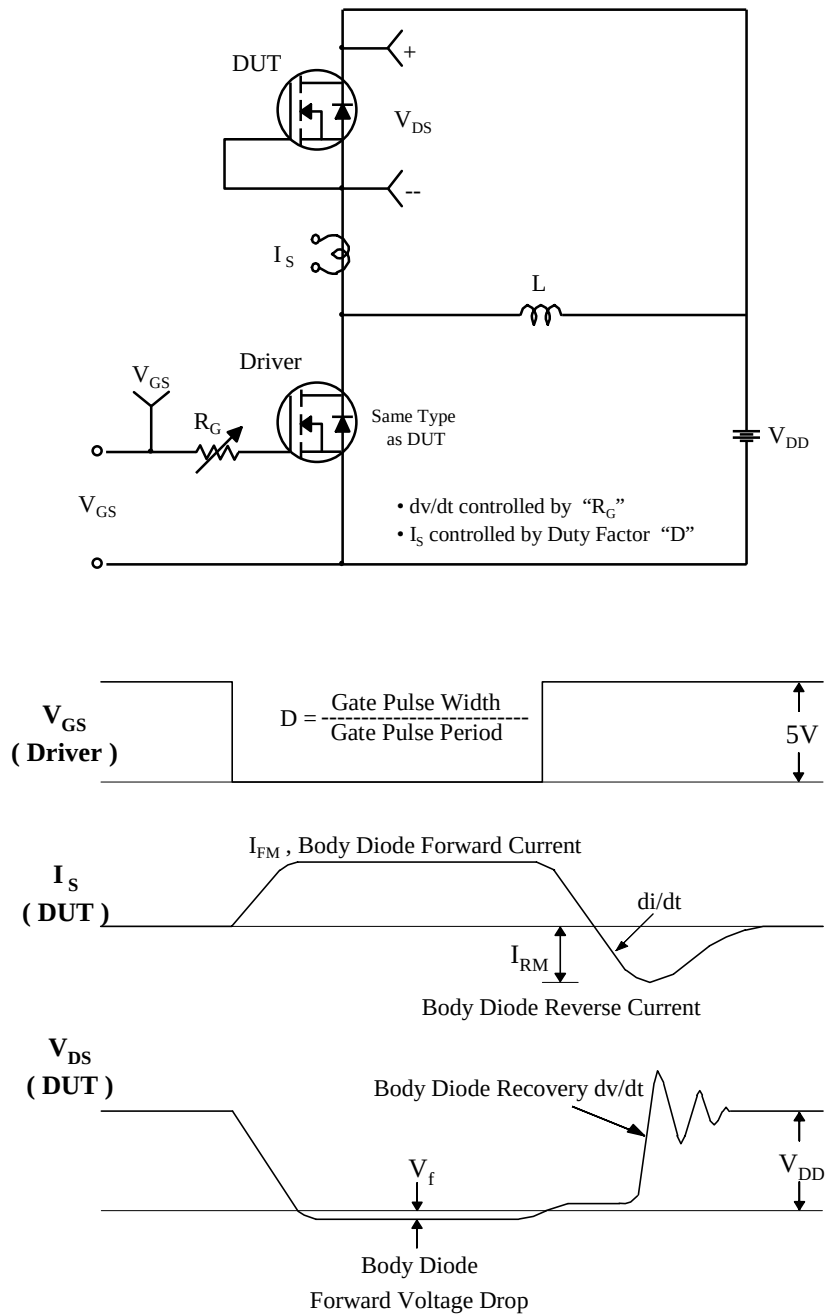


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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