Advanced Power MOSFET

SSW/I4N90AS

FEATURES

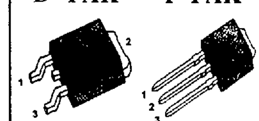
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current : 25 μA (Max.) @ V_{DS} = 900V
- Low $R_{DS(ON)}$: 3.054 Ω (Typ.)

BV_{DSS} = 900 V

$R_{DS(on)}$ = 3.7 Ω

I_D = 4.5 A

D²-PAK I²-PAK



1. Gate 2. Drain 3. Source

Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	900	V
I_D	Continuous Drain Current (T_C=25 °C)	4.5	A
	Continuous Drain Current (T_C=100 °C)	2.8	
I_{DM}	Drain Current-Pulsed ①	18	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy ②	536	mJ
I_{AR}	Avalanche Current ①	4.5	A
E_{AR}	Repetitive Avalanche Energy ①	13	mJ
dv/dt	Peak Diode Recovery dv/dt ③	1.5	V/ns
P_D	Total Power Dissipation (T_A=25 °C)*	3.1	W
	Total Power Dissipation (T_C=25 °C)	130	W
	Linear Derating Factor	1.04	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	--	0.96	°C /W
$R_{\theta JA}$	Junction-to-Ambient *	--	40	
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

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

SAMSUNG ELECTRONICS

Electrical Characteristics (T_C=25 ℃ unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	900	--	--	V	V_{GS}=0V,I_D=250μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	1.04	--	V/ ℃	I_D=250μA *See Fig 7*
$V_{GS(th)}$	Gate Threshold Voltage	2.0	--	3.5	V	V_{DS}=5V,I_D=250μA
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	--	--	25	μA	V_{DS}=900V
		--	--	250		V_{DS}=720V,T_C=125 ℃
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	3.7	Ω	V_{GS}=10V,I_D=2.25A ④*
g_{fs}	Forward Transconductance	--	3.66	--	℧	V_{DS}=50V,I_D=2.25A ④
C_{iss}	Input Capacitance	--	910	1180	pF	V_{GS}=0V,V_{DS}=25V,f =1MHz *See Fig 5*
C_{oss}	Output Capacitance	--	85	100		
C_{rss}	Reverse Transfer Capacitance	--	34	40		
$t_{d(on)}$	Turn-On Delay Time	--	19	50	ns	V_{DD}=450V,I_D=4.5A, R_G=13.6 Ω *See Fig 13* ④ ⑤
t_r	Rise Time	--	31	70		
$t_{d(off)}$	Turn-Off Delay Time	--	68	145		
t_f	Fall Time	--	30	70		
Q_g	Total Gate Charge	--	42	55	nC	V_{DS}=720V,V_{GS}=10V, I_D=4.5A *See Fig 6 & Fig 12* ④ ⑤
Q_{gs}	Gate-Source Charge	--	8.1	--		
Q_{gd}	Gate-Drain ("Miller") Charge	--	18.1	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	4.5	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	18		
V_{SD}	Diode Forward Voltage ④	--	--	1.4	V	T_J=25℃ ,I_S=4.5A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	490	--	ns	T_J=25℃ ,I_F=4.5A
Q_{rr}	Reverse Recovery Charge	--	4.24	--	μC	di_F/dt=100A/μs ④

Notes ;

- • Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- • L=50mH, I_{AS}=4.5A, V_{DD}=50V, R_G=27Ω, Starting T_J =25 ℃
- • I_{SD} ≤ 4.5A, di/dt ≤ 110A/μs, V_{DD} ≤ BV_{DSS} , Starting T_J =25 ℃
- • Pulse Test : Pulse Width = 250μs, Duty Cycle ≤ 2%
- • Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

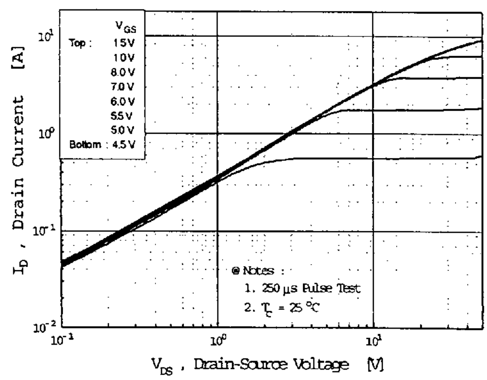


Fig 2. Transfer Characteristics

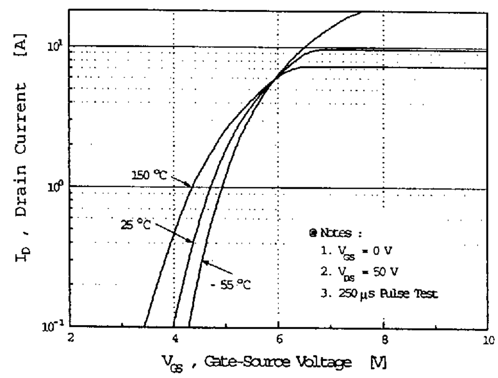


Fig 3. On-Resistance vs. Drain Current

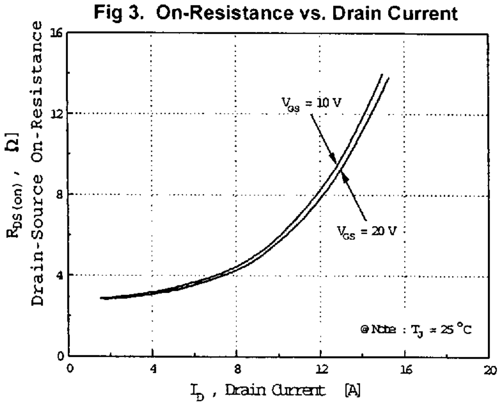


Fig 4. Source-Drain Diode Forward Voltage

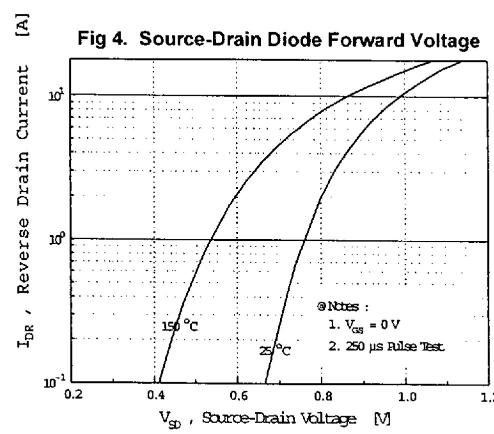


Fig 5. Capacitance vs. Drain-Source Voltage

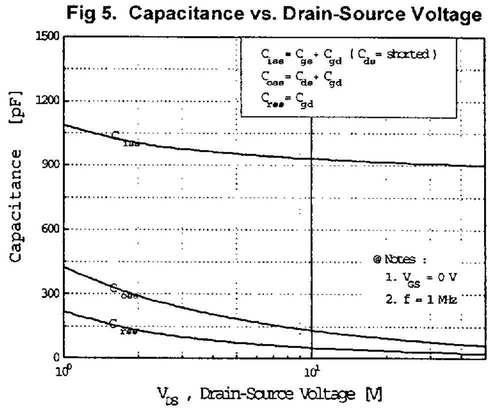


Fig 6. Gate Charge vs. Gate-Source Voltage

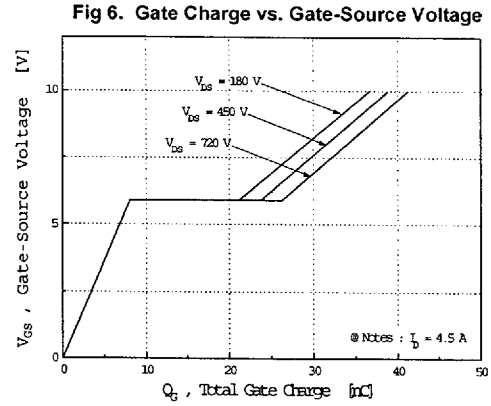


Fig 7. Breakdown Voltage vs. Temperature

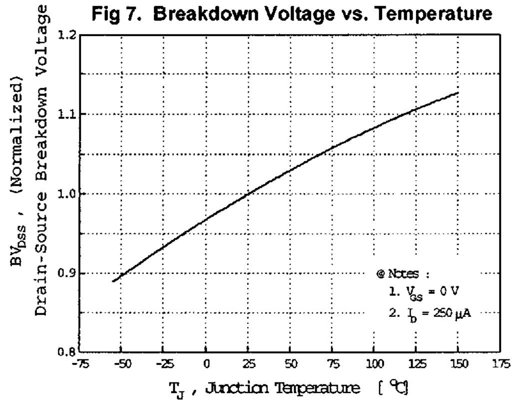


Fig 8. On-Resistance vs. Temperature

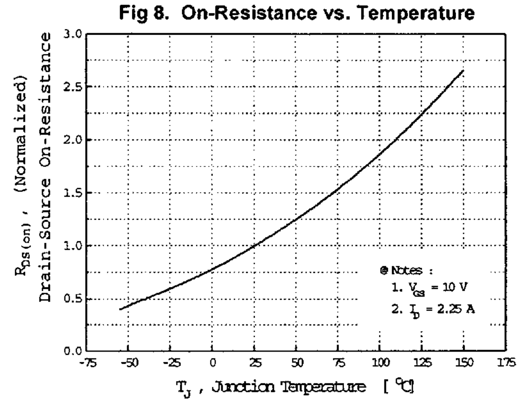


Fig 9. Max. Safe Operating Area

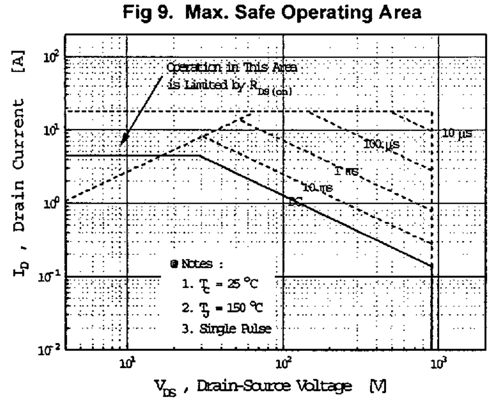


Fig 10. Max. Drain Current vs. Case Temperature

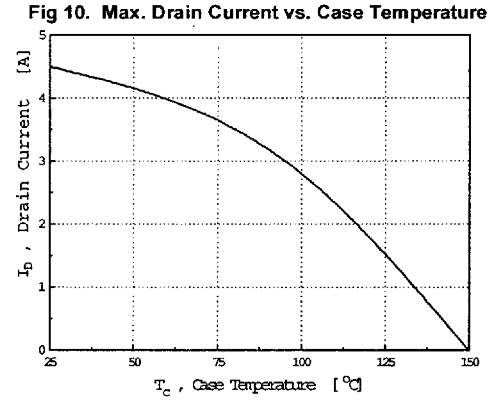


Fig 11. Thermal Response

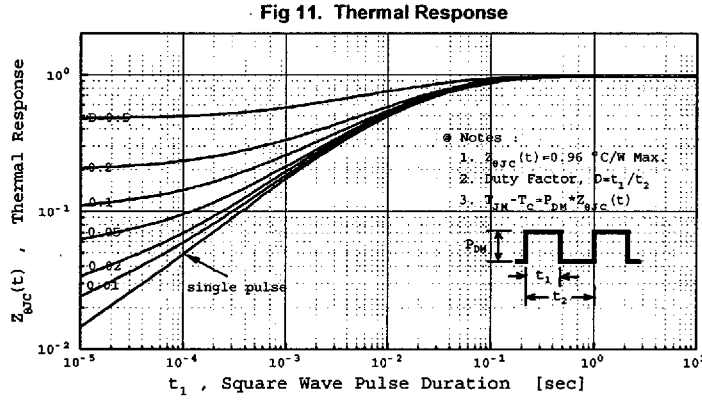
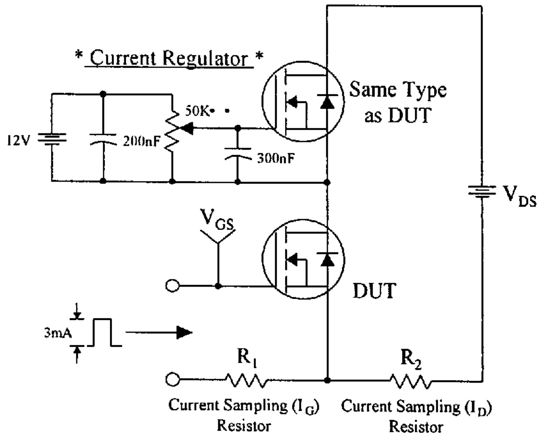


Fig 12. Gate Charge Test Circuit & Waveform



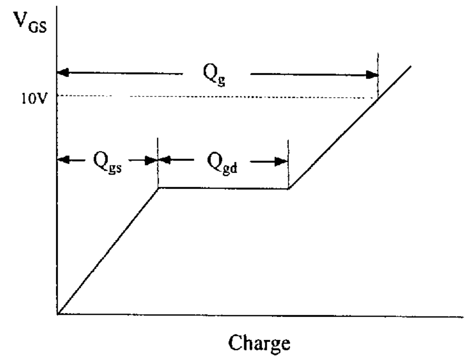
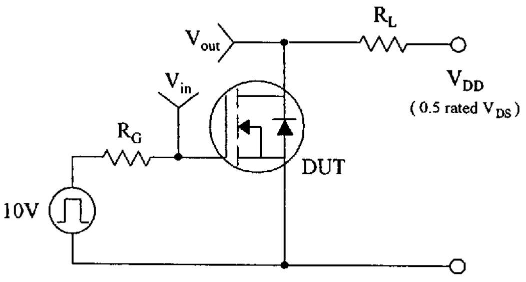


Fig 13. Resistive Switching Test Circuit & Waveforms



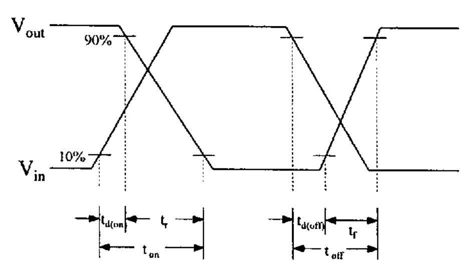
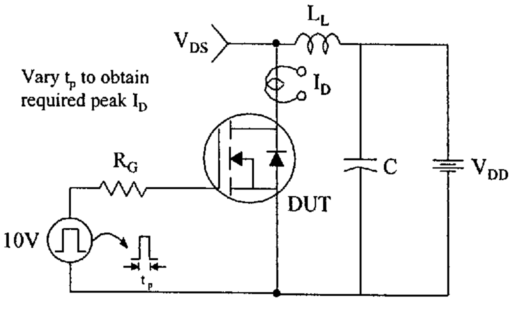


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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

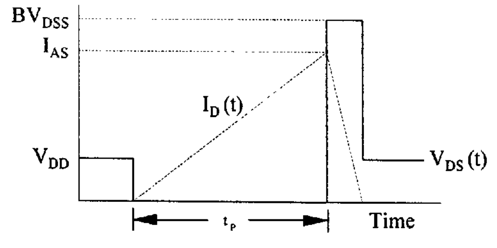
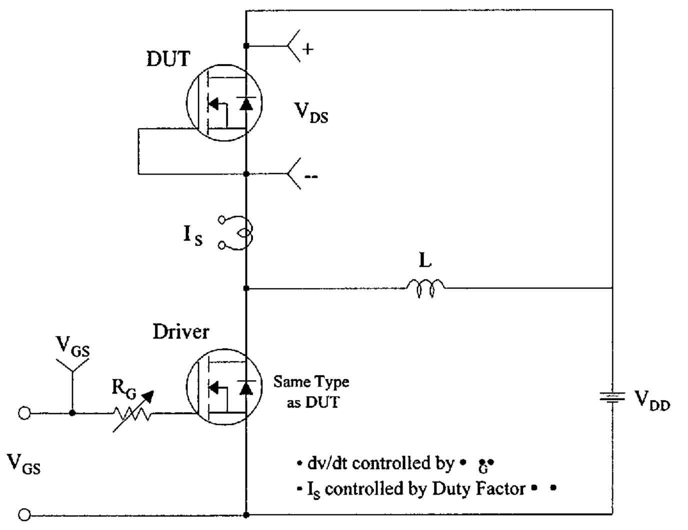
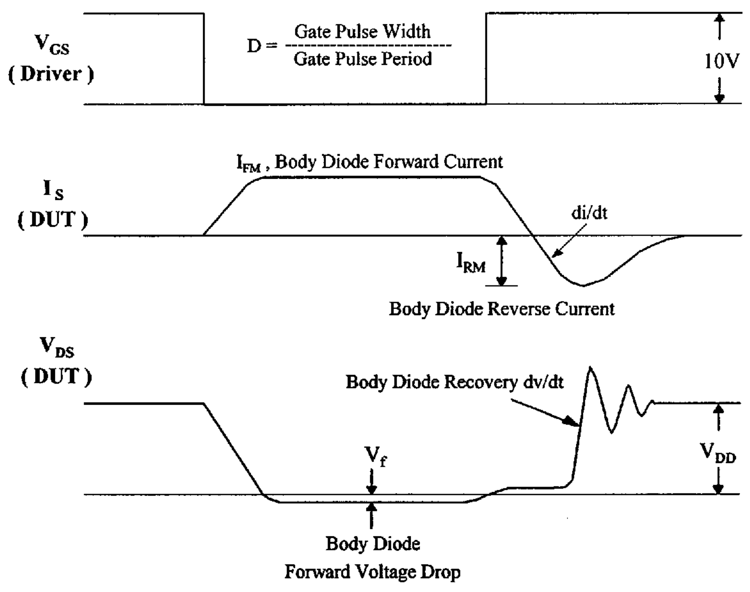


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





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