Advanced Power MOSFET

SFS9Z24

FEATURES

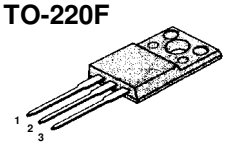
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- 175°C Operating Temperature
- Extended Safe Operating Area
- Lower Leakage Current : 10 μA (Max.) @ V_{DS} = -60V
- Low $R_{DS(ON)}$: 0.206 Ω (Typ.)

BV_{DSS} = -60 V

$R_{DS(on)}$ = 0.28 Ω

I_D = -7.5 A

TO-220F



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_C=25°C)	-7.5	A
	Continuous Drain Current (T_C=100°C)	-5.3	
I_{DM}	Drain Current-Pulsed ①	-30	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy ②	145	mJ
I_{AR}	Avalanche Current ①	-7.5	A
E_{AR}	Repetitive Avalanche Energy ①	2.9	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.5	V/ns
P_D	Total Power Dissipation (T_C=25°C)	29	W
	Linear Derating Factor	0.19	W/°C
T_J , T_{STG}	Operating Junction and Storage Temperature Range	- 55 to +175	°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	--	5.2	°C/W
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

Electrical Characteristics (T_C=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=-250μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	-0.04	--	V/°C	I_D=-250μA ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	--	-4.0	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}=-60V
		--	--	-100		V_{DS}=-48V,T_C=150°C
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.28	Ω	V_{GS}=-10V,I_D=-3.8A ④
g_{fs}	Forward Transconductance	--	3.6	--	S	V_{DS}=-30V,I_D=-3.8A ④
C_{iss}	Input Capacitance	--	465	600	pF	V_{GS}=0V,V_{DS}=-25V,f =1MHz ***See Fig 5***
C_{oss}	Output Capacitance	--	140	215		
C_{rss}	Reverse Transfer Capacitance	--	40	60		
$t_{d(on)}$	Turn-On Delay Time	--	11	30	ns	V_{DD}=-30V,I_D=-9.7A, R_G=18 Ω ***See Fig 13*** ④⑤
t_r	Rise Time	--	21	50		
$t_{d(off)}$	Turn-Off Delay Time	--	29	65		
t_f	Fall Time	--	20	50		
Q_g	Total Gate Charge	--	15	19	nC	V_{DS}=-48V,V_{GS}=-10V, I_D=-9.7A ***See Fig 6 & Fig 12*** ④⑤
Q_{gs}	Gate-Source Charge	--	2.9	--		
Q_{gd}	Gate-Drain("Miller") Charge	--	6.0	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	-7.5	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	-30		
V_{SD}	Diode Forward Voltage ④	--	--	-3.8	V	T_J=25°C,I_S=-7.5A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	80	--	ns	T_J=25°C,I_F=-9.7A
Q_{rr}	Reverse Recovery Charge	--	0.22	--	μC	di_F/dt=100A/μs ④

Notes ;

① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature

② L=3.0mH, I_{AS}=-7.5A, V_{DD}=-25V, R_G=27Ω*, Starting T_J=25°C

③ I_{SD} ≤ -9.7A, di/dt ≤ 250A/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 1. Output Characteristics

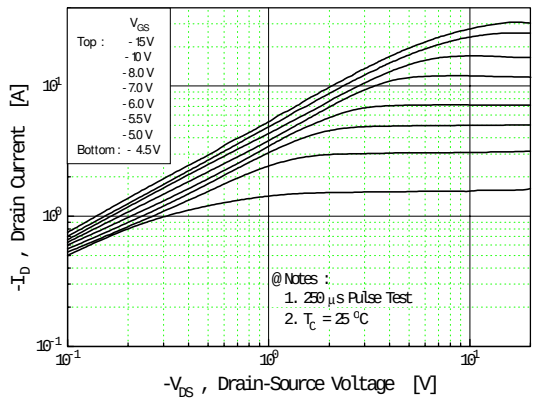


Fig 2. Transfer Characteristics

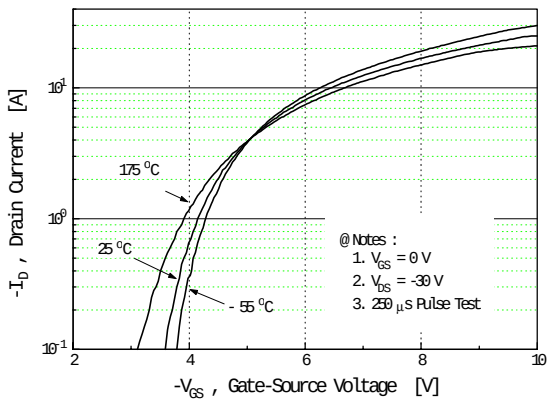


Fig 3. On-Resistance vs. Drain Current

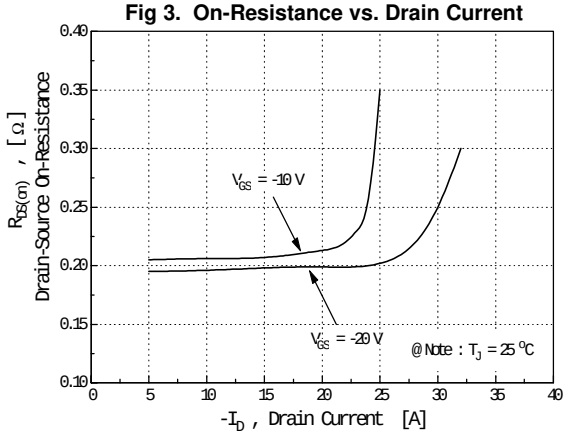


Fig 4. Source-Drain Diode Forward Voltage

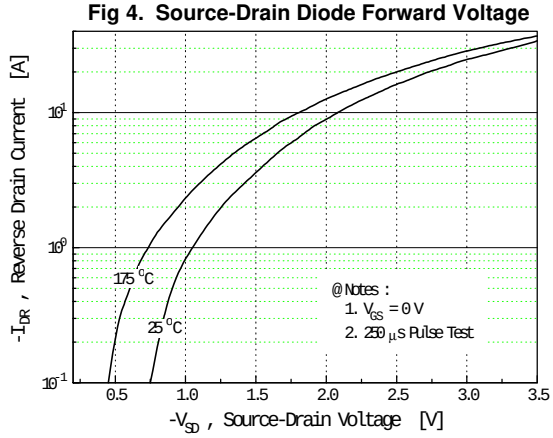


Fig 5. Capacitance vs. Drain-Source Voltage

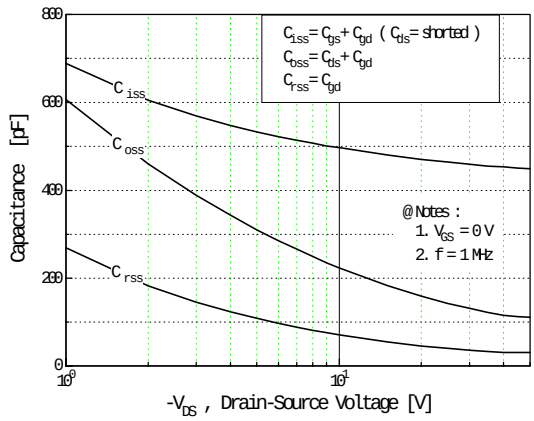


Fig 6. Gate Charge vs. Gate-Source Voltage

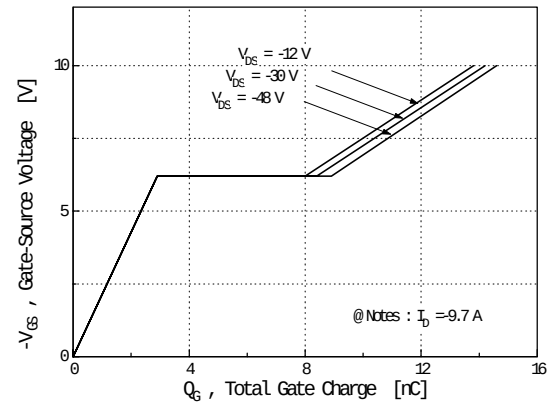


Fig 7. Breakdown Voltage vs. Temperature

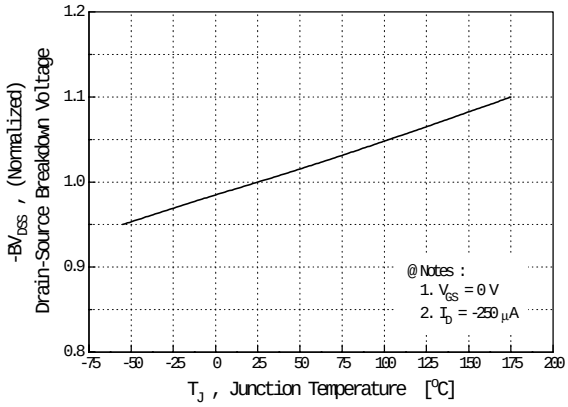


Fig 8. On-Resistance vs. Temperature

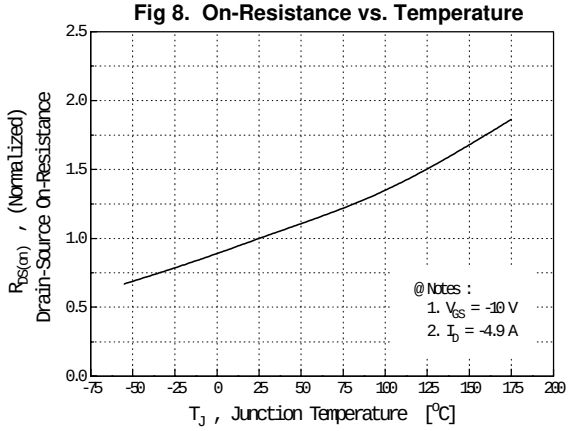


Fig 9. Max. Safe Operating Area

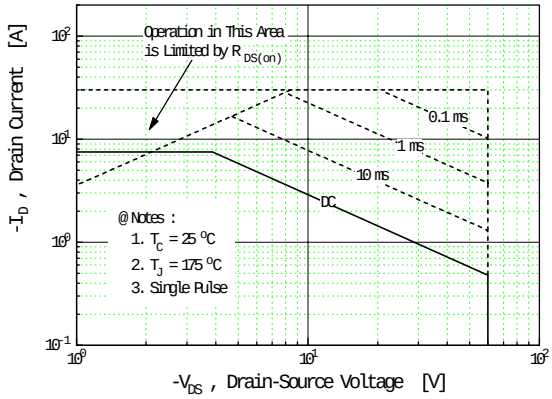


Fig 10. Max. Drain Current vs. Case Temperature

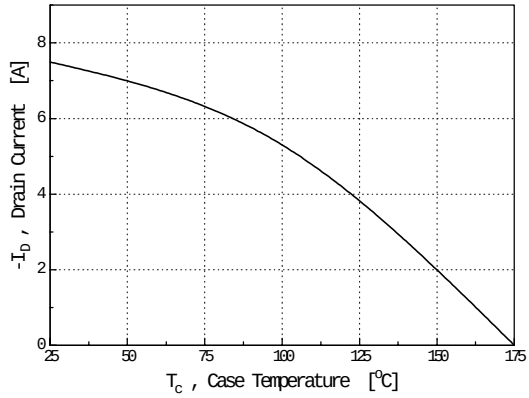


Fig 11. Thermal Response

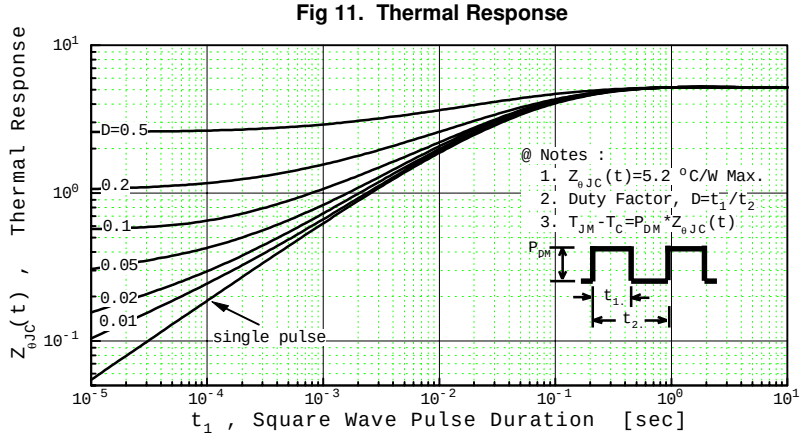


Fig 12. Gate Charge Test Circuit & Waveform

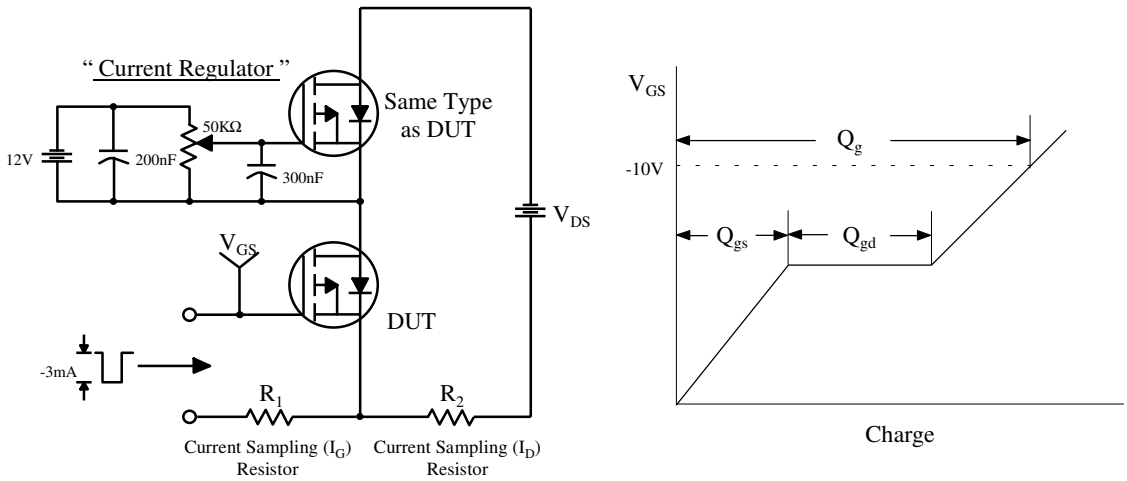


Fig 13. Resistive Switching Test Circuit & Waveforms

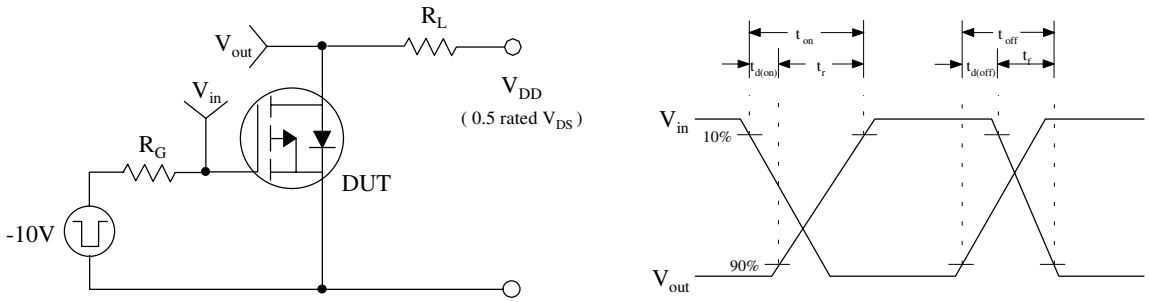


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

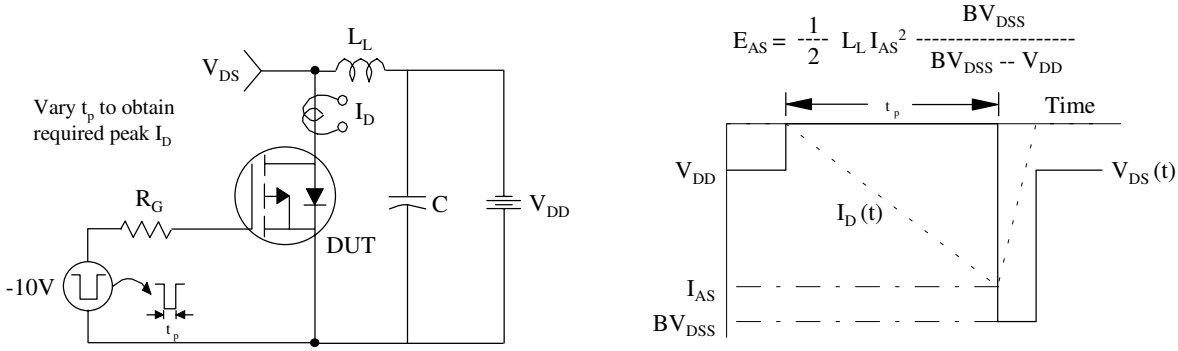
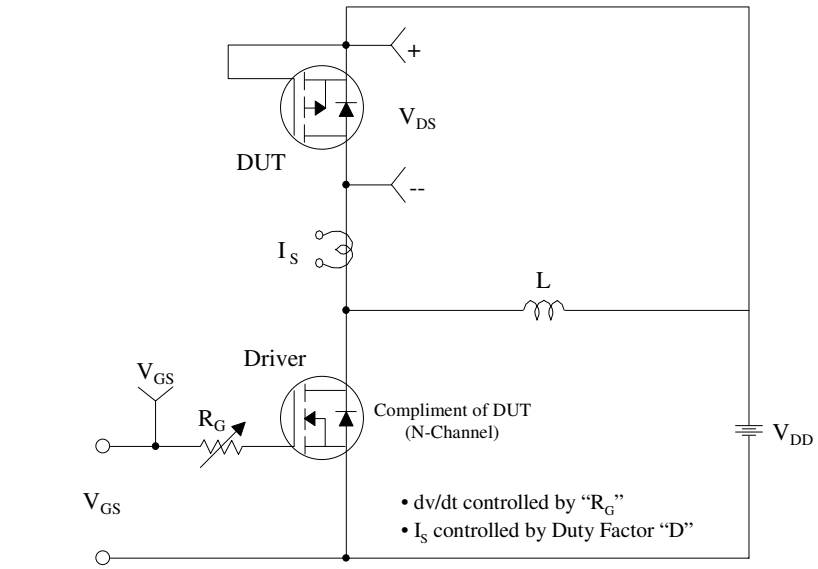
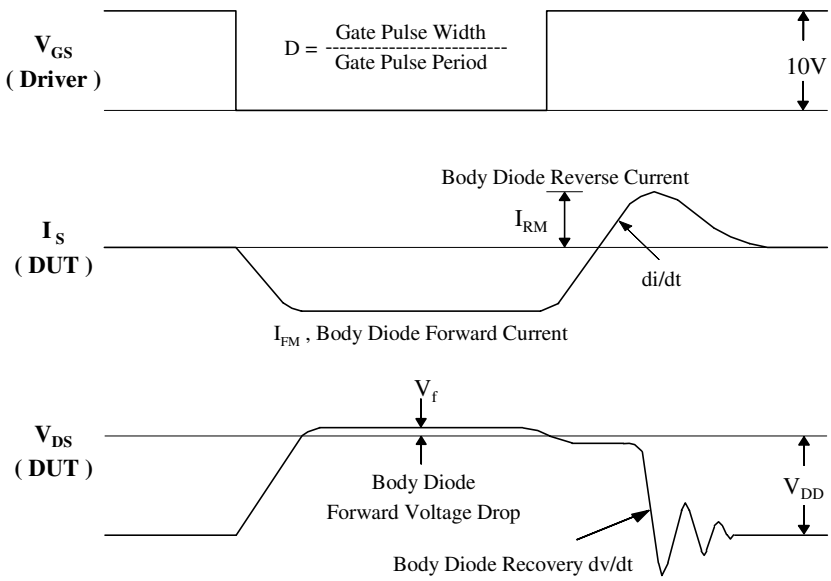


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





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