

Advanced Power MOSFET

SFF9140

FEATURES

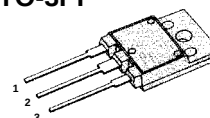
- ❑ Avalanche Rugged Technology
- ❑ Rugged Gate Oxide Technology
- ❑ Lower Input Capacitance
- ❑ Improved Gate Charge
- ❑ 175°C Operating Temperature
- ❑ Extended Safe Operating Area
- ❑ Lower Leakage Current : 10 μ A (Max.) @ $V_{DS} = -100V$
- ❑ Lower $R_{DS(ON)}$: 0.161 Ω (Typ.)

$$BV_{DSS} = -100 \text{ V}$$

$$R_{DS(on)} = 0.2 \Omega$$

$$I_D = -13.2 \text{ A}$$

TO-3PF



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 ($T_C=25^\circ\text{C}$)	-13.2	A
	Continuous Drain Current ($T_C=100^\circ\text{C}$)	-9.2	
I_{DM}	Drain Current-Pulsed ①	53	A
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy ②	580	mJ
I_{AR}	Avalanche Current ③	-13.2	A
E_{AR}	Repetitive Avalanche Energy ③	8.0	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-6.5	V/ns
P_D	Total Power Dissipation ($T_C=25^\circ\text{C}$)	80	W
	Linear Derating Factor	0.53	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	--	1.88	°C/W
$R_{\theta JA}$	Junction-to-Ambient	--	40	

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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.	--	-0.11	--	$V/^{\circ}\text{C}$	$I_D=-250\mu A$ See Fig 7
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	--	-4.0	V	$V_{DS}=-5V, I_D=-250\mu A$
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		$V_{DS}=-80V, T_C=150^{\circ}\text{C}$
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.2	Ω	$V_{GS}=-10V, I_D=-6.6A$ ④
g_{fs}	Forward Transconductance	--	8.9	--	S	$V_{DS}=-40V, I_D=-6.6A$ ④
C_{iss}	Input Capacitance	--	1180	1535	pF	$V_{GS}=0V, V_{DS}=-25V, f=1\text{MHz}$ See Fig 5
C_{oss}	Output Capacitance	--	240	360		
C_{rss}	Reverse Transfer Capacitance	--	83	125		
$t_{d(on)}$	Turn-On Delay Time	--	14	40	ns	$V_{DD}=-50V, I_D=-17A,$ $R_G=12\Omega$ See Fig 13 ④⑤
t_r	Rise Time	--	22	55		
$t_{d(off)}$	Turn-Off Delay Time	--	45	100		
t_f	Fall Time	--	26	60		
Q_g	Total Gate Charge	--	43	54	nC	$V_{DS}=-80V, V_{GS}=-10V,$ $I_D=-17A$ See Fig 6 & Fig 12 ④⑤
Q_{gs}	Gate-Source Charge	--	7.4	--		
Q_{gd}	Gate-Drain ("Miller") Charge	--	17.8	--		

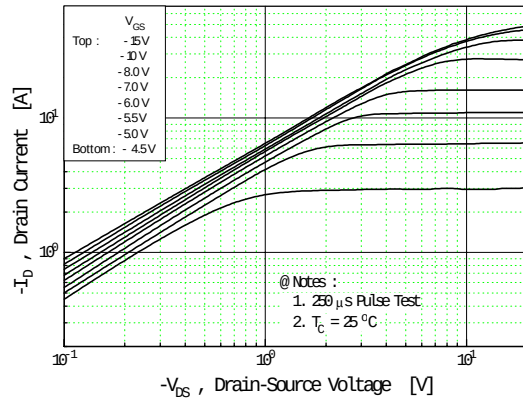
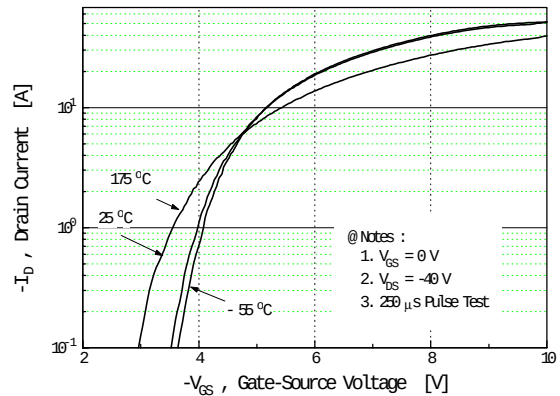
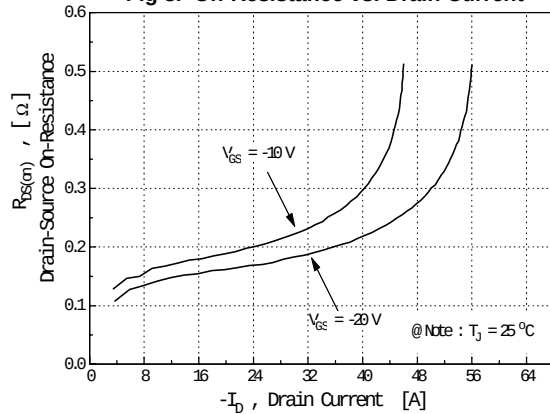
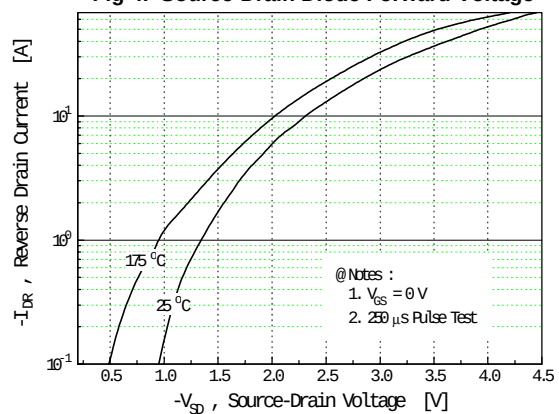
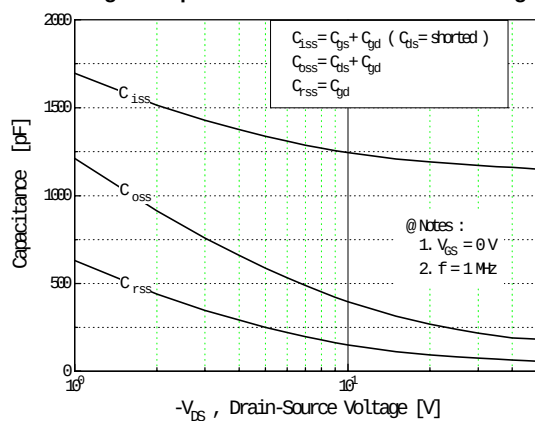
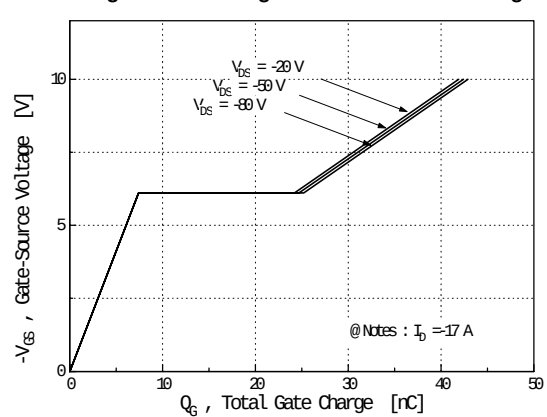
Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	-13.2	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	-53		
V_{SD}	Diode Forward Voltage ④	--	--	-4.0	V	$T_J=25^{\circ}\text{C}, I_S=-13.2A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	--	135	--	ns	$T_J=25^{\circ}\text{C}, I_F=-17A$
Q_{rr}	Reverse Recovery Charge	--	0.7	--	μC	$di_F/dt=100A/\mu s$ ④

Notes ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② $L=5.0\text{mH}, I_{AS}=-13.2A, V_{DD}=-25V, R_G=27\Omega^*,$ Starting $T_J=25^{\circ}\text{C}$
- ③ $I_{SD} \leq -17A, di/dt \leq 450A/\mu s, V_{DD} \leq BV_{DSS},$ Starting $T_J=25^{\circ}\text{C}$
- ④ Pulse Test : Pulse Width = $250\mu s,$ Duty Cycle $\leq 2\%$
- ⑤ Essentially Independent of Operating Temperature

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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

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Fig 7. Breakdown Voltage vs. Temperature

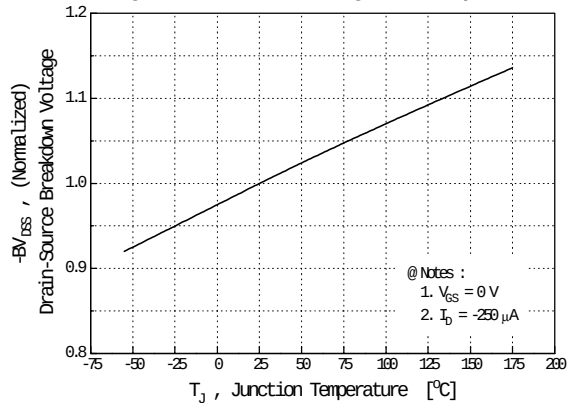


Fig 8. On-Resistance vs. Temperature

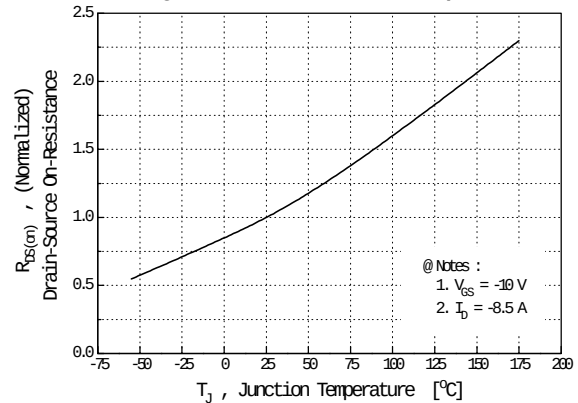


Fig 9. Max. Safe Operating Area

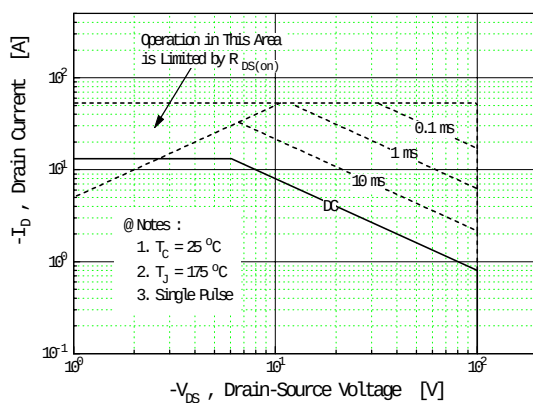


Fig 10. Max. Drain Current vs. Case Temperature

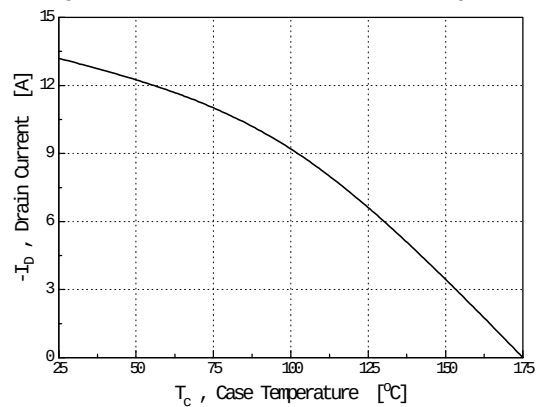
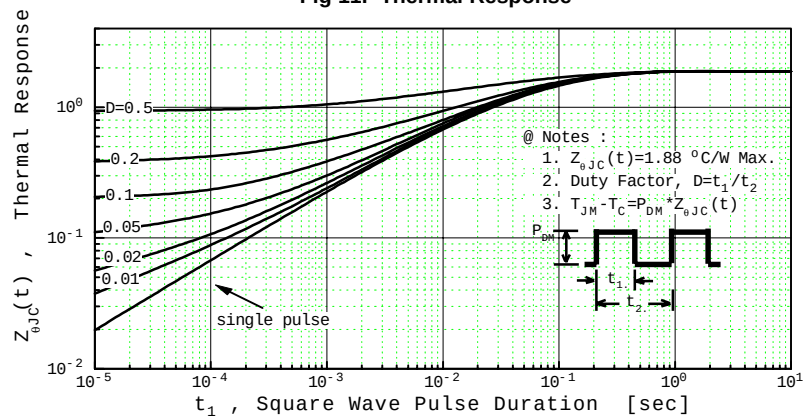
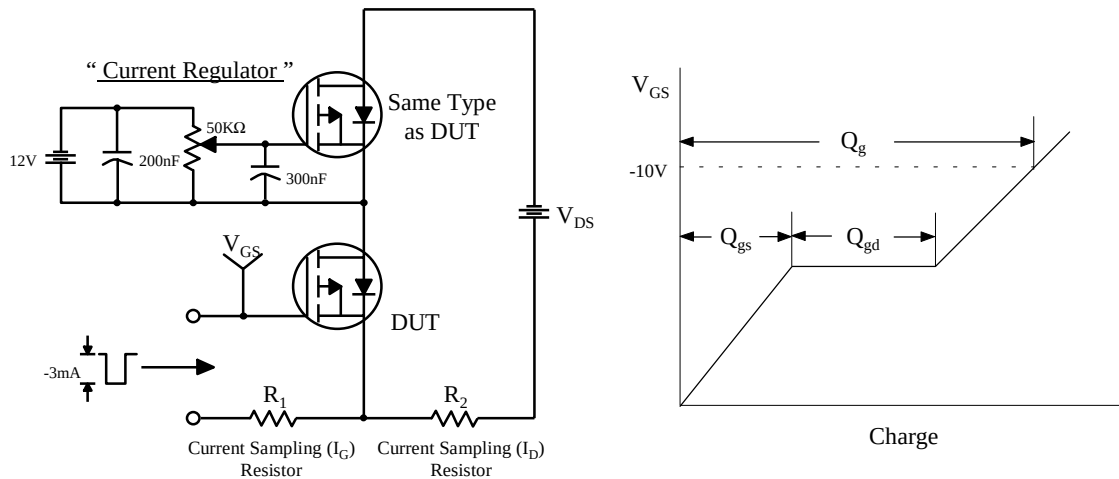
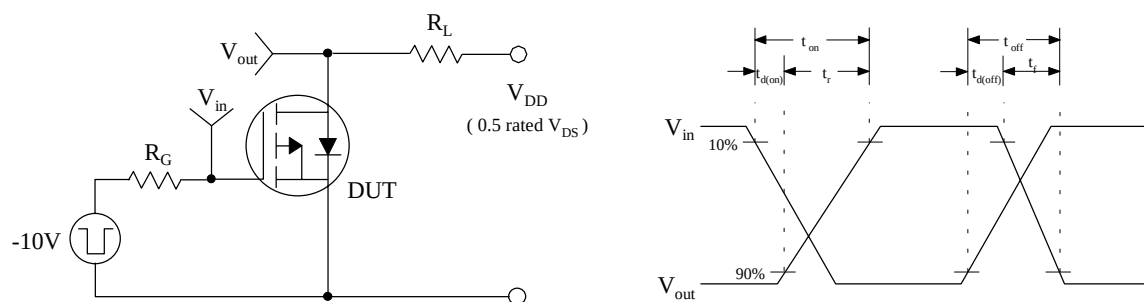
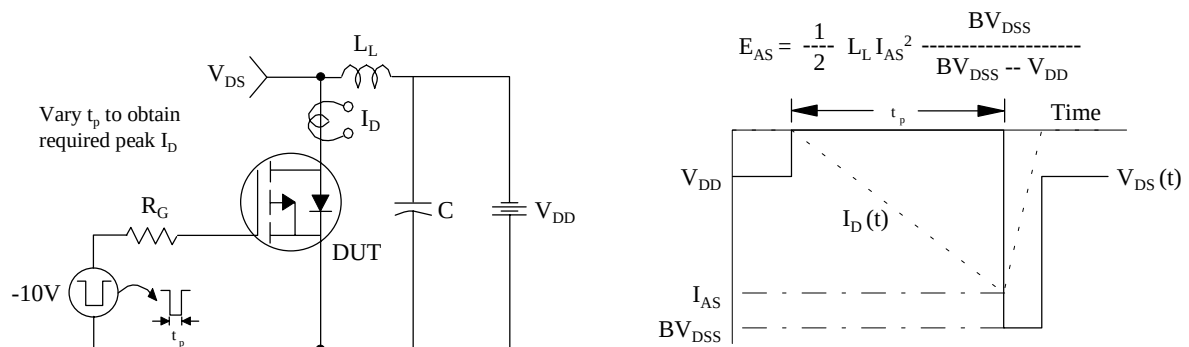


Fig 11. Thermal Response

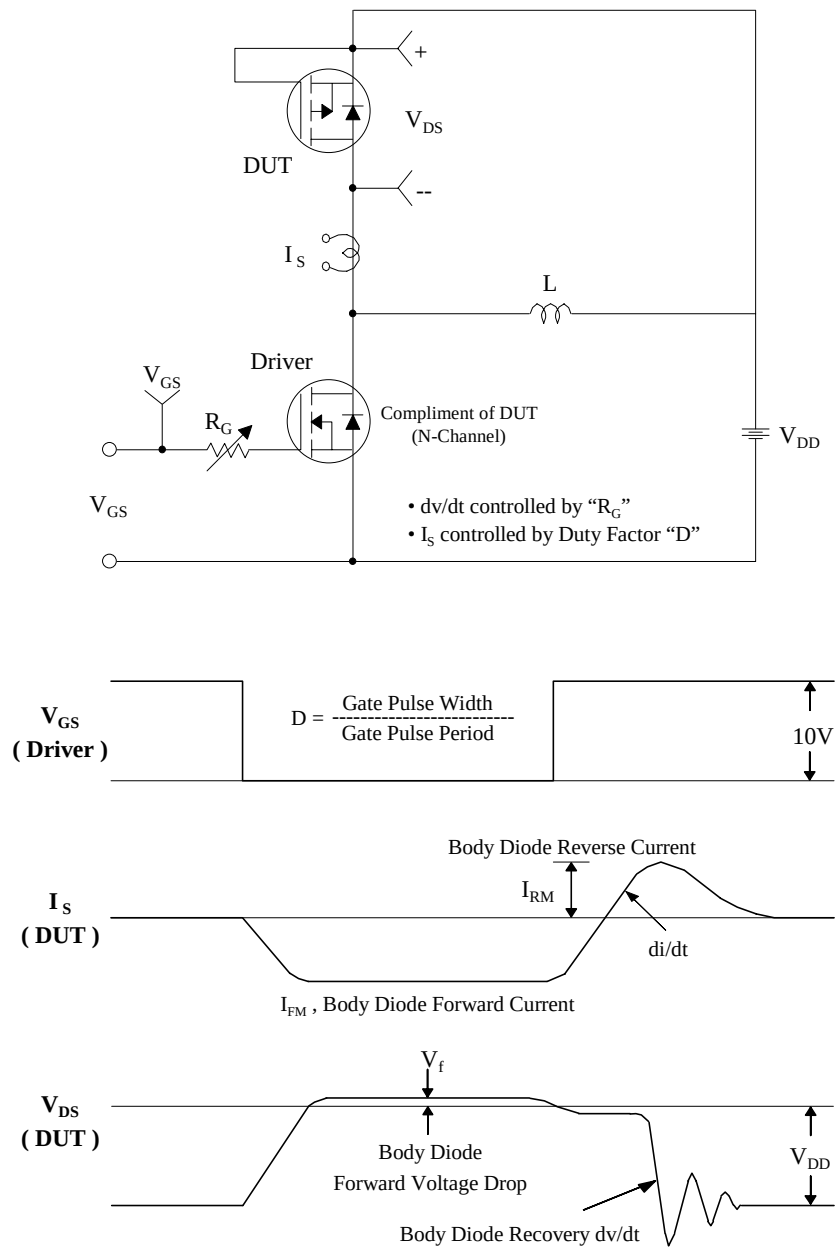


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Fig 12. Gate Charge Test Circuit & Waveform

Fig 13. Resistive Switching Test Circuit & Waveforms

Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

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



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