

# Advanced Power MOSFET

# SSP6N70A

## FEATURES

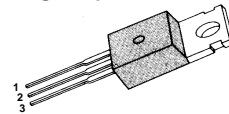
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current : 25  $\mu$ A (Max.) @  $V_{DS} = 700V$
- Low  $R_{DS(on)}$  : 1.552  $\Omega$  (Typ.)

$$BV_{DSS} = 700 V$$

$$R_{DS(on)} = 1.8 \Omega$$

$$I_D = 6 A$$

### TO-220



1.Gate 2. Drain 3. Source

## Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
$V_{DSS}$	Drain-to-Source Voltage	700	V
$I_D$	Continuous Drain Current ( $T_C=25^\circ C$ )	6	A
	Continuous Drain Current ( $T_C=100^\circ C$ )	3.8	
$I_{DM}$	Drain Current-Pulsed	24	A
$V_{GS}$	Gate-to-Source Voltage ①		V
$E_{AS}$	Single Pulsed Avalanche Energy ②	582	mJ
$I_{AR}$	Avalanche Current ①	6	A
$E_{AR}$	Repetitive Avalanche Energy ①	13	mJ
dv/dt	Peak Diode Recovery dv/dt ③	2.5	V/ns
$P_D$	Total Power Dissipation ( $T_C=25^\circ C$ )	130	W
	Linear Derating Factor	1.04	
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	- 55 to +150	$^\circ C$
$T_L$	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	--	0.96	$^\circ C/W$
$R_{\theta_{CS}}$	Case-to-Sink	0.5	--	
$R_{\theta_{JA}}$	Junction-to-Ambient	--	62.5	

Rev. B

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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	700	--	--	V	$V_{GS}=0V, I_D=250\ \mu\text{A}$
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.79	--	V/°C	$I_D=250\ \mu\text{A}$ <b>See Fig 7</b>
$V_{GS(th)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=5V, I_D=250\ \mu\text{A}$
$I_{GSS}$	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	$\mu\text{A}$	$V_{DS}=700V$
		--	--	250		$V_{DS}=560V, T_C=125^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	1.8	$\Omega$	$V_{GS}=10V, I_D=3A$ ④*
$g_{fs}$	Forward Transconductance	--	4.12	--	$\Omega$	$V_{DS}=50V, I_D=3A$ ④
$C_{iss}$	Input Capacitance	--	920	1200	pF	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$ <b>See Fig 5</b> ④ ⑤
$C_{oss}$	Output Capacitance	--	100	115		
$C_{rss}$	Reverse Transfer Capacitance	--	45	55		
$t_{d(on)}$	Turn-On Delay Time	--	18	45	ns	$V_{DD}=350V, I_D=6A,$ $R_G=11.5\Omega$ <b>See Fig 13</b>
$t_r$	Rise Time	--	23	55		
$t_{d(off)}$	Turn-Off Delay Time	--	76	160		
$t_f$	Fall Time	--	26	60		
$Q_g$	Total Gate Charge	--	51	67	nC	$V_{DS}=560V, V_{GS}=10V,$ $I_D=6A$ <b>See Fig 6 &amp; Fig 12</b> ④ ⑤
$Q_{gs}$	Gate-Source Charge	--	8.3	--		
$Q_{gd}$	Gate-Drain(" Miller" ) Charge	--	23.1	--		

### Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
$I_S$	Continuous Source Current	--	--	6	A	Integral reverse pn-diode in the MOSFET
$I_{SM}$	Pulsed-Source Current ①	--	--	24		
$V_{SD}$	Diode Forward Voltage ④	--	--	1.4	V	$T_J=25^\circ\text{C}, I_S=6A, V_{GS}=0V$
$t_{rr}$	Reverse Recovery Time	--	440	--	ns	$T_J=25^\circ\text{C}, I_F=6A$
$Q_{rr}$	Reverse Recovery Charge	--	4.05	--	$\mu\text{C}$	$di_F/dt=100A/\mu\text{s}$ ④

#### Notes ;

① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature

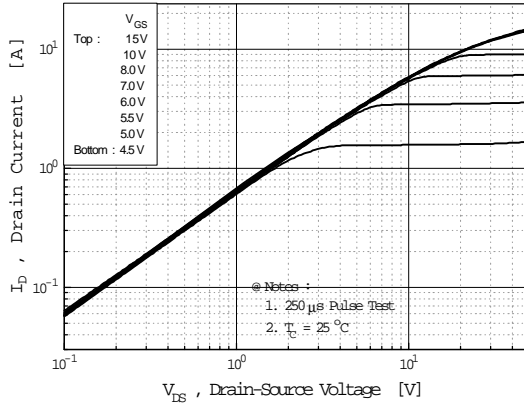
②  $L=30\text{mH}, I_{AS}=6A, V_{DD}=50V, R_G=27\Omega$ , Starting  $T_J=25^\circ\text{C}$

③  $I_{SD}\leq 6A, di/dt\leq 140A/\mu\text{s}, V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

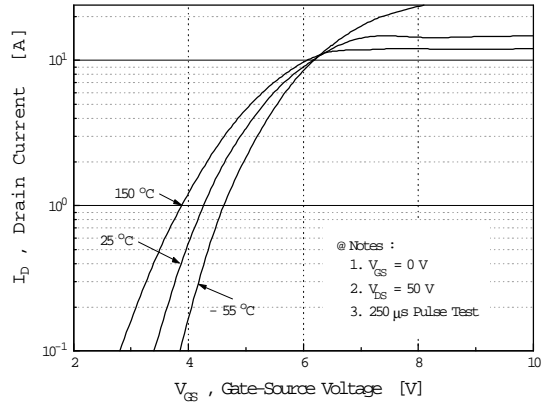
④ Pulse Test : Pulse Width = 250  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$

⑤ Essentially Independent of Operating Temperature

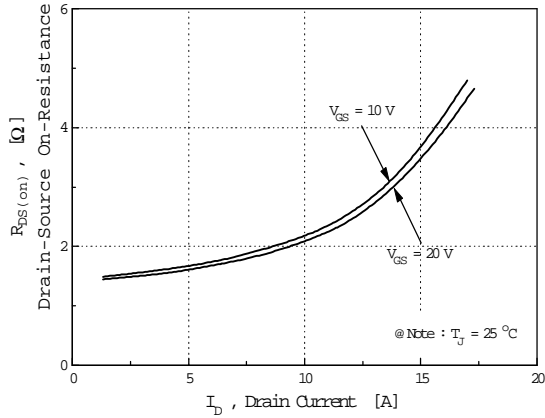
**Fig 1. Output Characteristics**



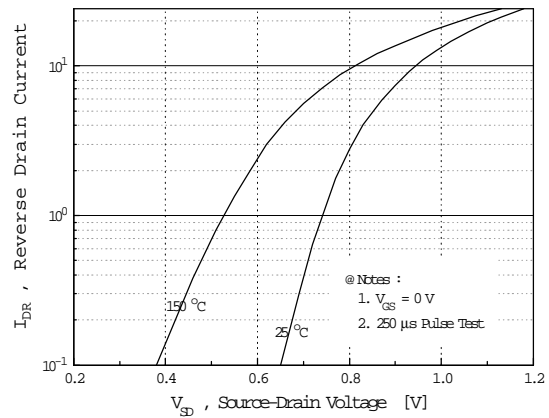
**Fig 2. Transfer Characteristics**



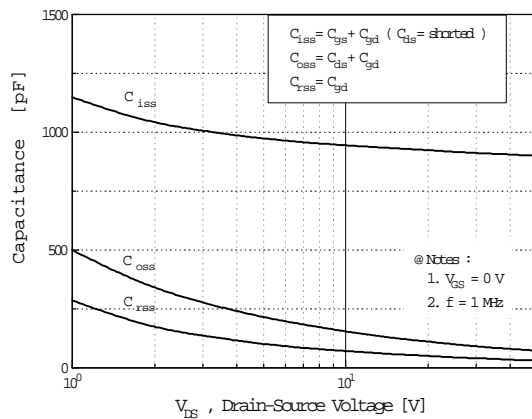
**Fig 3. On-Resistance vs. Drain Current**



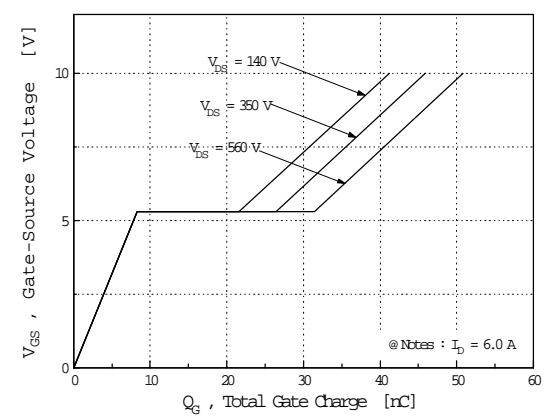
**Fig 4. Source-Drain Diode Forward Voltage**



**Fig 5. Capacitance vs. Drain-Source Voltage**



**Fig 6. Gate Charge vs. Gate-Source Voltage**



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## N-CHANNEL POWER MOSFET

Fig 7. Breakdown Voltage vs. Temperature

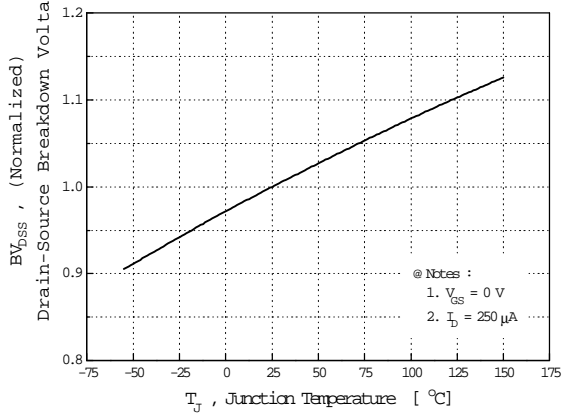


Fig 8. On-Resistance vs. Temperature

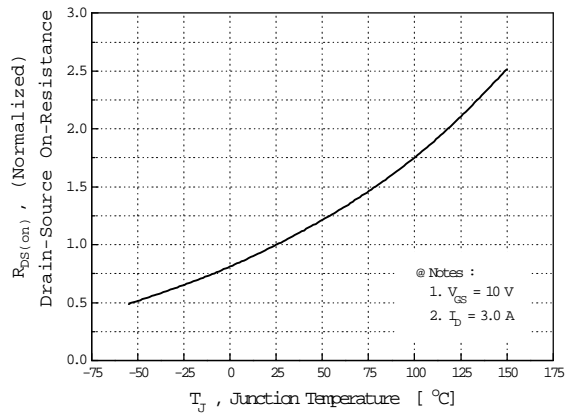


Fig 9. Max. Safe Operating Area

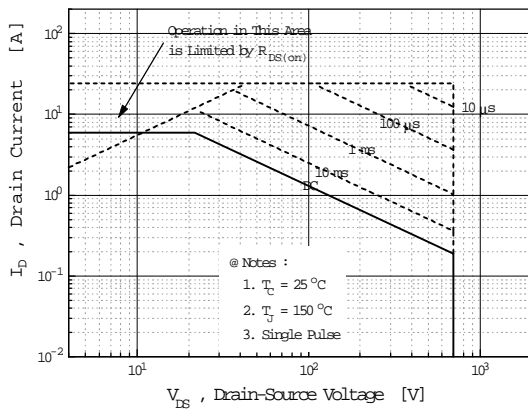


Fig 10. Max. Drain Current vs. Case Temperature

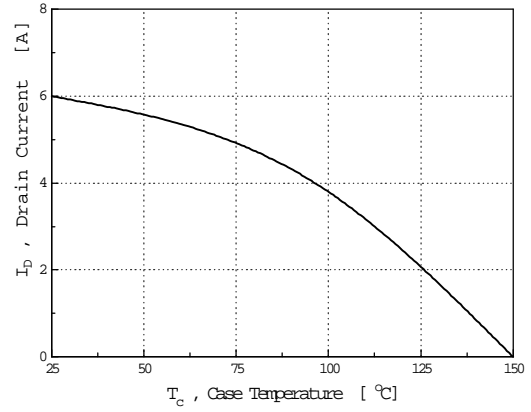
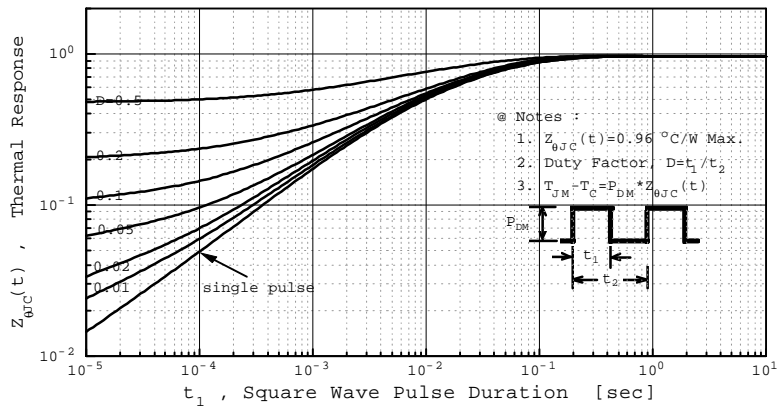
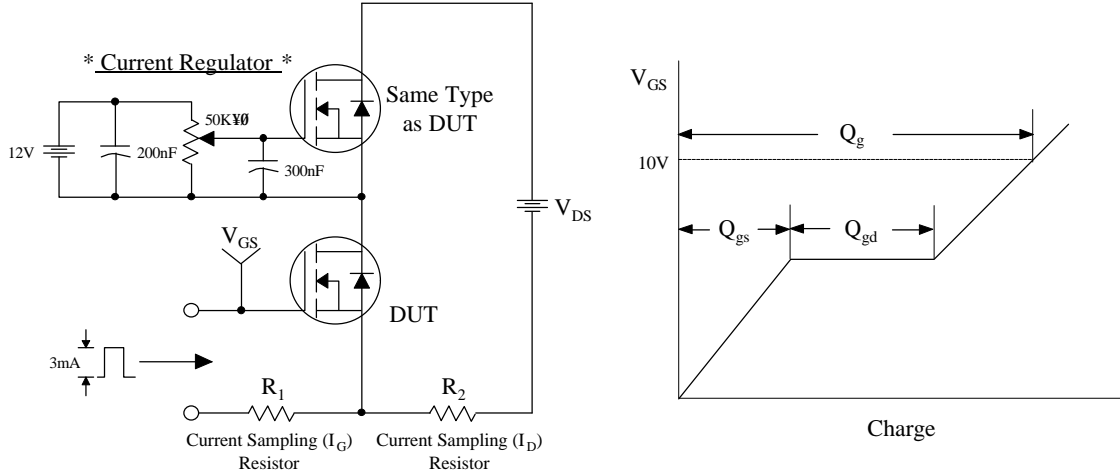


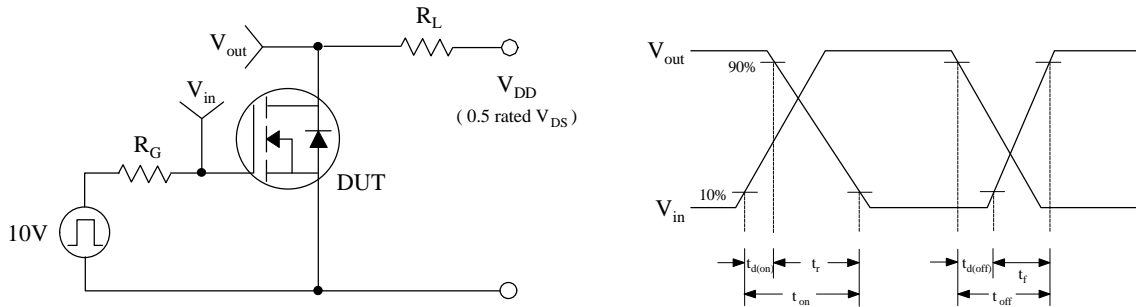
Fig 11. Thermal Response



**Fig 12. Gate Charge Test Circuit & Waveform**



**Fig 13. Resistive Switching Test Circuit & Waveforms**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**

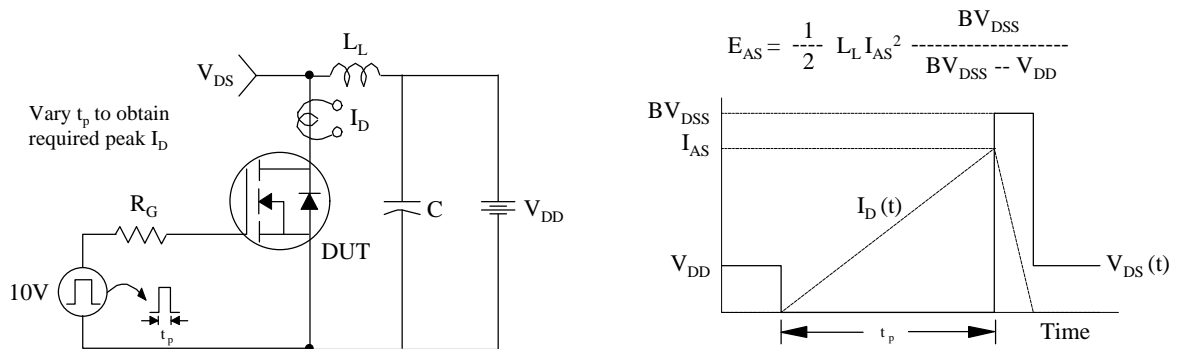
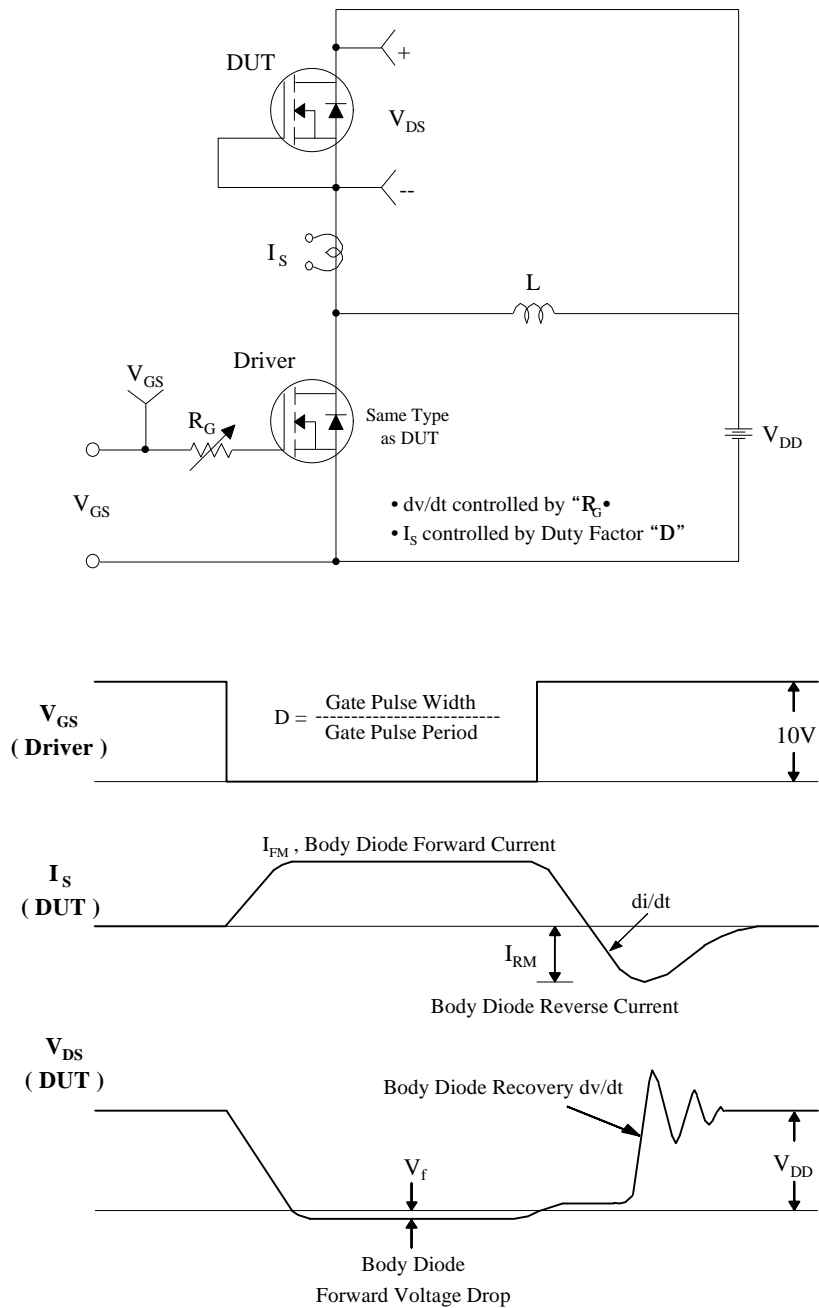


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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