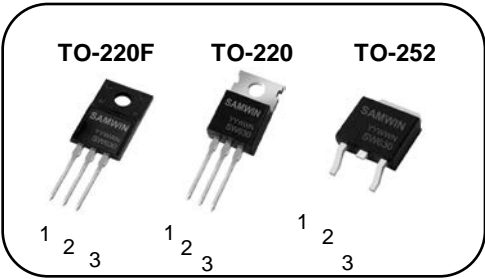


N-channel Enhanced mode TO-220F/TO-220/TO-252 MOSFET

Features

- High ruggedness
- Low  $R_{DS(ON)}$  (Typ 0.3Ω) @  $V_{GS}=10V$
- Low Gate Charge (Typ 21nC)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Application:Synchronous Rectification, DC-DC



1. Gate 2. Drain 3. Source

**BV<sub>DSS</sub> : 200V**  
**I<sub>D</sub> : 10A**  
**R<sub>DS(ON)</sub> : 0.3Ω**

General Description

This power MOSFET is produced with advanced technology of SAMWIN.  
This technology enable the power MOSFET to have better characteristics, including fast switching time, low on resistance, low gate charge and especially excellent avalanche characteristics.



Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SW P 630	SW630	TO-220	TUBE
2	SW F 630	SW630	TO-220F	TUBE
3	SW D 630	SW630	TO-252	REEL

Absolute maximum ratings

Symbol	Parameter	Value			Unit
		TO-220	TO-220F	TO-252	
V <sub>DSS</sub>	Drain to source voltage	200			V
I <sub>D</sub>	Continuous drain current (@T <sub>C</sub> =25°C)	10*			A
	Continuous drain current (@T <sub>C</sub> =100°C)	5.5*			A
I <sub>DM</sub>	Drain current pulsed (note 1)	40			A
V <sub>GS</sub>	Gate to source voltage	±30			V
E <sub>AS</sub>	Single pulsed avalanche energy (note 2)	214			mJ
E <sub>AR</sub>	Repetitive avalanche energy (note 1)	19			mJ
dv/dt	Peak diode recovery dv/dt (note 3)	4			V/ns
P <sub>D</sub>	Total power dissipation (@T <sub>C</sub> =25°C)	120	70	48	W
	Derating factor above 25°C	0.95	0.55	0.38	W/°C
T <sub>STG</sub> , T <sub>J</sub>	Operating junction temperature & storage temperature	-55 ~ + 150			°C
T <sub>L</sub>	Maximum lead temperature for soldering purpose, 1/8 from case for 5 seconds.	300			°C

\*. Drain current is limited by junction temperature.

Thermal characteristics

Symbol	Parameter	Value			Unit
		TO-220	TO-220F	TO-252	
R <sub>thjc</sub>	Thermal resistance, Junction to case	1.05	1.8	2.6	°C/W
R <sub>thja</sub>	Thermal resistance, Junction to ambient	62.5	62.5		°C/W

Electrical characteristic (  $T_C = 25^\circ\text{C}$  unless otherwise specified )

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
<b>Off characteristics</b>						
BVDSS	Drain to source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	200			V
$\Delta BVDSS / \Delta T_J$	Breakdown voltage temperature coefficient	$I_D=250\mu A$ , referenced to $25^\circ\text{C}$		0.19		V/oC
IDSS	Drain to source leakage current	$V_{DS}=200V, V_{GS}=0V$			1	$\mu A$
		$V_{DS}=160V, T_C=125^\circ\text{C}$			20	$\mu A$
IGSS	Gate to source leakage current, forward	$V_{GS}=30V, V_{DS}=0V$			100	nA
		$V_{GS}=-30V, V_{DS}=0V$			-100	nA
	Gate to source leakage current, reverse	$V_{GS}=0V, I_D=250\mu A$	200			
<b>On characteristics</b>						
$V_{GS(TH)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2		4	V
$R_{DS(ON)}$	Drain to source on state resistance	$V_{GS}=10V, I_D=5A$		0.3	0.41	$\Omega$
$G_{fs}$	Forward transconductance	$V_{DS}=40V, I_D=5A$		3.2		S
<b>Dynamic characteristics</b>						
$C_{iss}$	Input capacitance	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$		447		pF
$C_{oss}$	Output capacitance			102		
$C_{rss}$	Reverse transfer capacitance			46		
$t_{d(on)}$	Turn on delay time	$V_{DS}=100V, I_D=10A, V_{GS}=10V, R_G=25\Omega$ (note 4,5)		7.2		ns
$t_r$	Rising time			40		
$t_{d(off)}$	Turn off delay time			52		
$t_f$	Fall time			33		
$Q_g$	Total gate charge	$V_{DS}=160V, V_{GS}=10V, I_D=10A$ (note 4,5)		21		nC
$Q_{gs}$	Gate-source charge			3		
$Q_{gd}$	Gate-drain charge			13		

### Source to drain diode ratings characteristicsa

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			10	A
$I_{SM}$	Pulsed source current				40	A
$V_{SD}$	Diode forward voltage drop.	$I_S=10A, V_{GS}=0V$			1.4	V
$t_{rr}$	Reverse recovery time	$I_S=10A, V_{GS}=0V, di_f/dt=100A/\mu s$		140		ns
$Q_{rr}$	Reverse recovery charge			0.70		$\mu C$

※. Notes

1. Repetitive rating : pulse width limited by junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3.  $L = 4.3\text{mH}, I_{AS} = 10A, V_{DD} = 50V, R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
5. Essentially independent of operating temperature.

Fig. 1. On-state characteristics

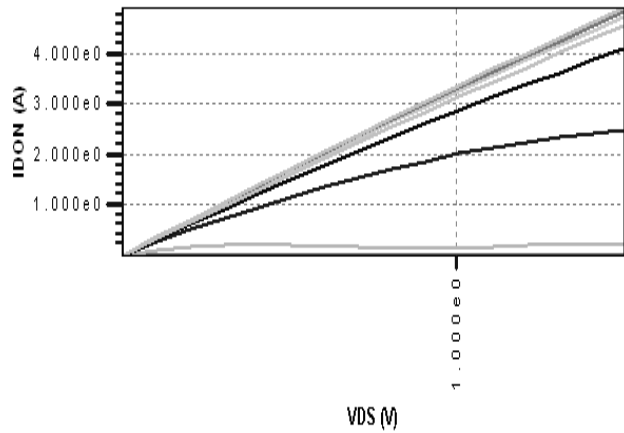


Fig. 2. On-resistance variation vs. drain current and gate voltage

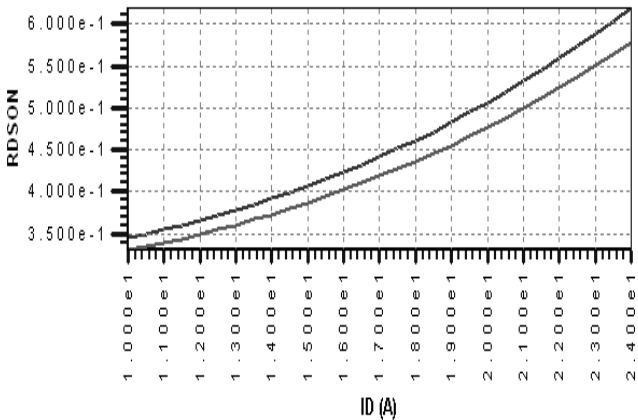


Fig. 3. Gate charge characteristics

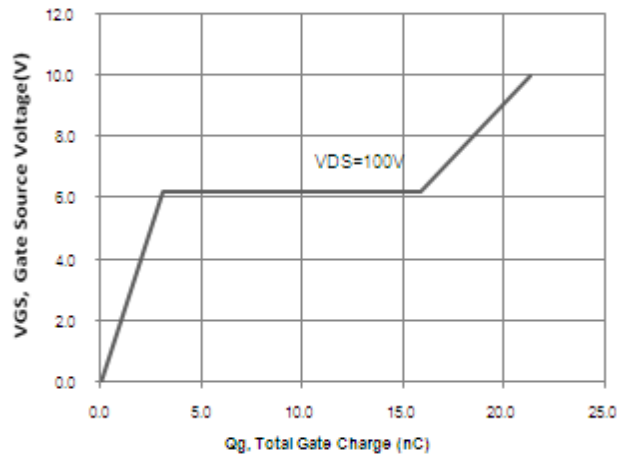


Fig. 4. On state current vs. diode forward voltage

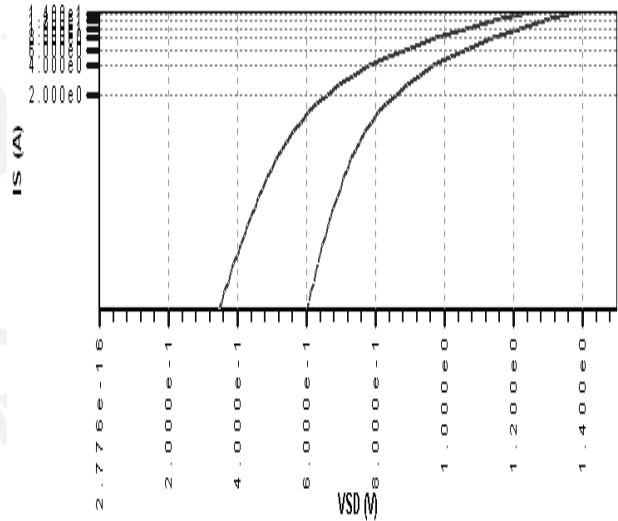


Fig 5. Breakdown Voltage Variation vs. Junction Temperature

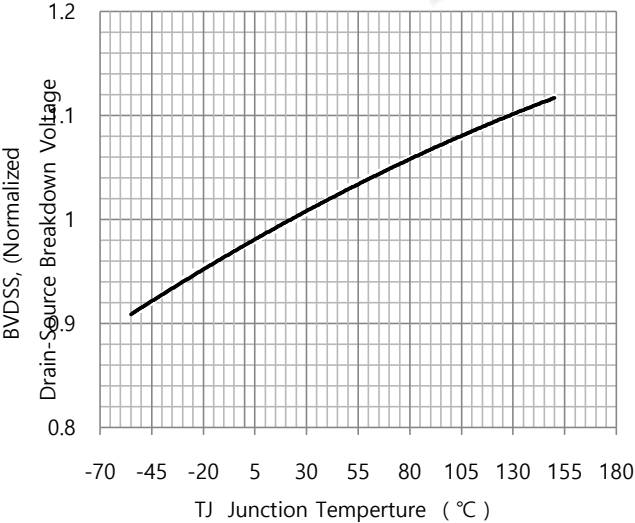


Fig. 6. On resistance variation vs. junction temperature

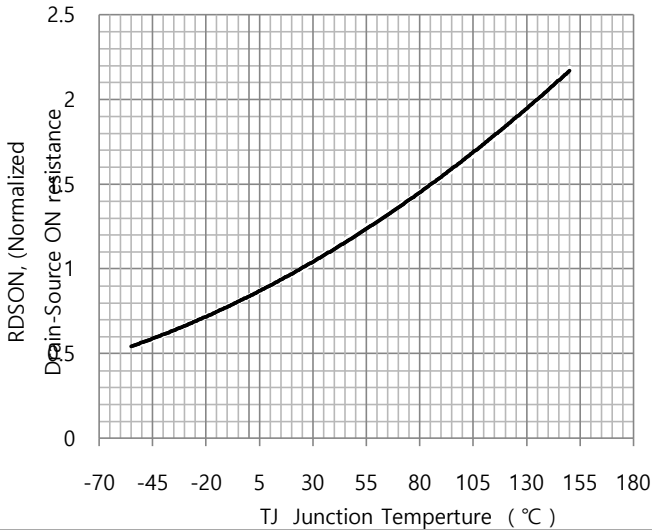


Fig. 7. Maximum safe operating area

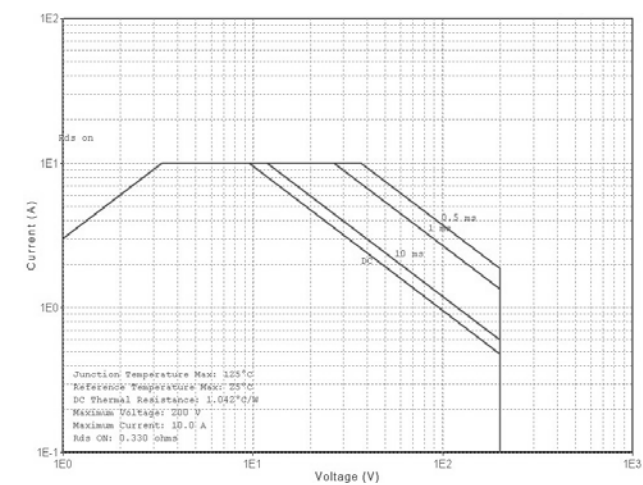


Fig. 8. Transient thermal response curve

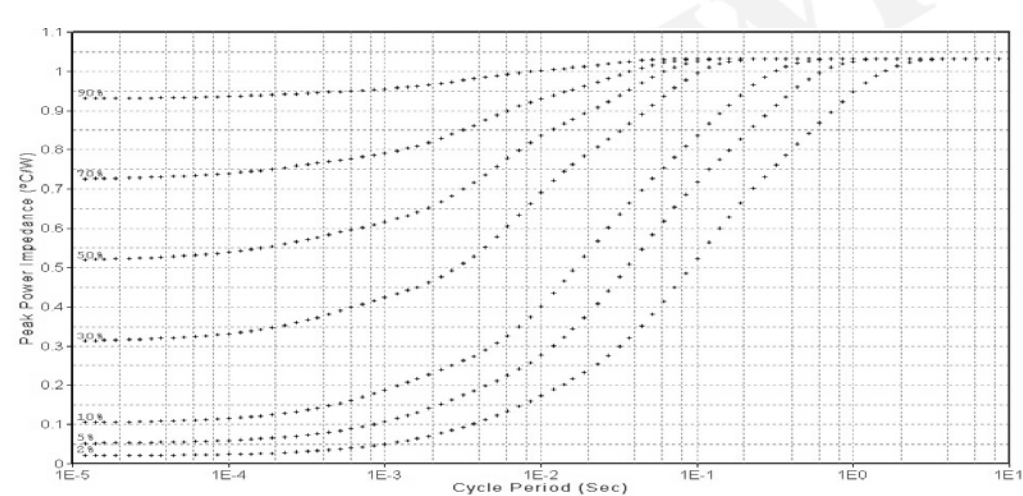


Fig. 9. Gate charge test circuit & waveform

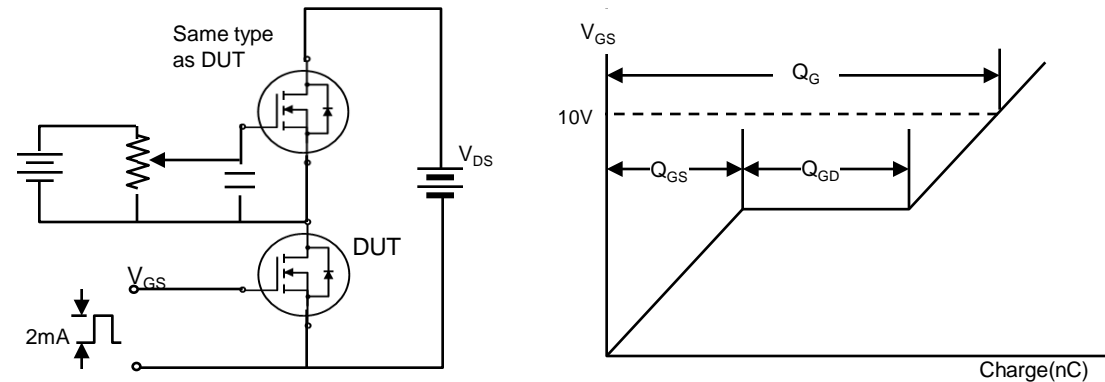


Fig. 10. Switching time test circuit & waveform

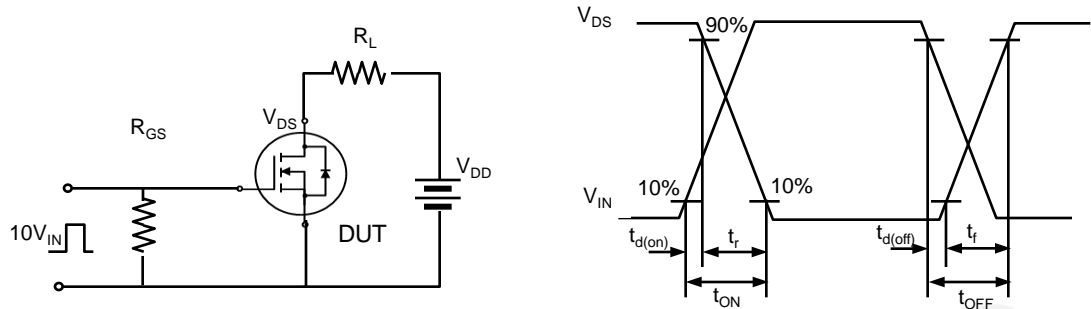


Fig. 11. Unclamped Inductive switching test circuit & waveform

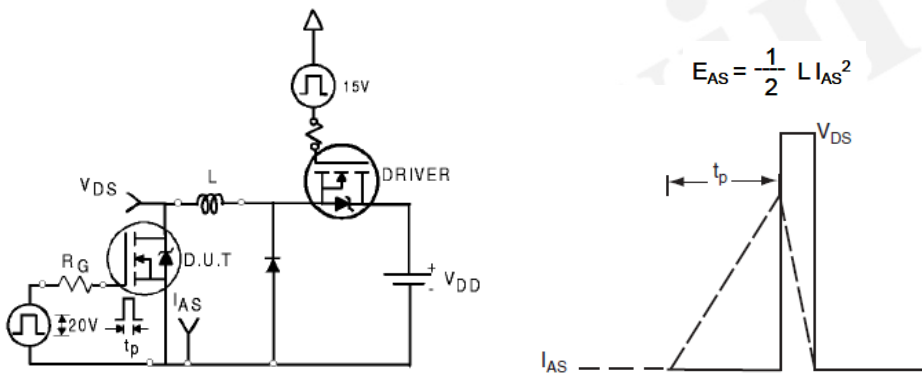
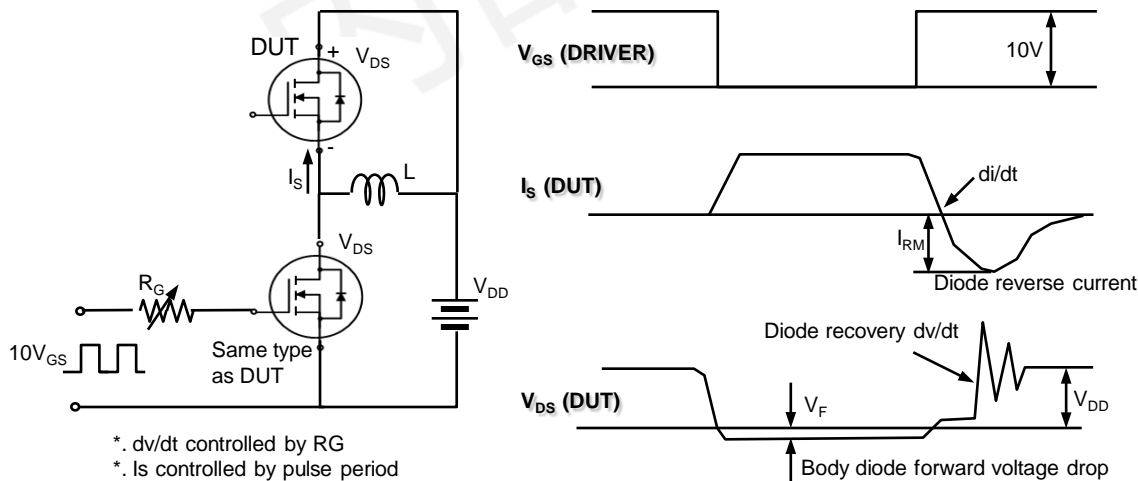



Fig. 12. Peak diode recovery dv/dt test circuit & waveform



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### DISCLAIMER

- \* All the data & curve in this document was tested in XI'AN SEMIPOWER TESTING & APPLICATION CENTER.
- \* This product has passed the PCT,TC,HTRB,HTGB,HAST,PC and Solderdunk reliability testing.
- \* Qualification standards can also be found on the Web site (<http://www.semipower.com.cn>) 
- \* Suggestions for improvement are appreciated, Please send your suggestions to [samwin@samwinsemi.com](mailto:samwin@samwinsemi.com)