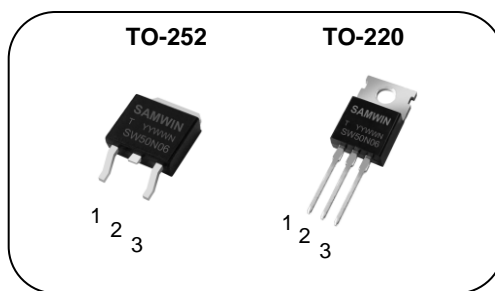


## N-channel D-PAK/TO-220 MOSFET

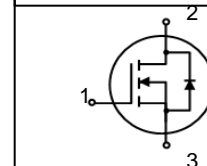
### Features

- High ruggedness
- $R_{DS(ON)}$  (Max 16.8mΩ) @  $V_{GS}=10V$
- Gate Charge (Typ 41nC)
- Improved dv/dt Capability
- 100% Avalanche Tested



1. Gate 2. Drain 3. Source

$BV_{DSS}$  : 60V  
 $I_D$  : 50A  
 $R_{DS(ON)}$  : 16.8mΩ



### General Description

This power MOSFET is produced with advanced VDMOS technology of SAMWIN. This technology enable power MOSFET to have better characteristics, such as fast switching time, low on resistance, low gate charge and especially excellent avalanche characteristics. It is mainly suitable for half bridge or full bridge resonant topology like a electronic ballast, and also low power switching mode power appliances.

### Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SW D 50N06	SW50N06T	TO-252	REEL
2	SW P 50N06	SW50N06T	TO-220	TUBE

### Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-252	TO-220	
$V_{DSS}$	Drain to Source Voltage	60		V
$I_D$	Continuous Drain Current (@ $T_C=25^\circ C$ )	50*		A
	Continuous Drain Current (@ $T_C=100^\circ C$ )	32*		A
$I_{DM}$	Drain current pulsed (note 1)	200		A
$V_{GS}$	Gate to Source Voltage	$\pm 20$		V
$E_{AS}$	Single pulsed Avalanche Energy (note 2)	180		mJ
$E_{AR}$	Repetitive Avalanche Energy (note 1)	23.4		mJ
dv/dt	Peak diode Recovery dv/dt (note 3)	5		V/ns
$P_D$	Total power dissipation (@ $T_C=25^\circ C$ )	87.4	114.7	W
	Derating Factor above 25°C	0.7	0.9	W/°C
$T_{STG}, T_J$	Operating Junction Temperature & Storage Temperature	-55 ~ + 150		°C
$T_L$	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-252	TO-220	
$R_{thjc}$	Thermal resistance, Junction to case	1.43	1.09	°C/W
$R_{thcs}$	Thermal resistance, Case to Sink			°C/W
$R_{thja}$	Thermal resistance, Junction to ambient	71.8	53.1	°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>						
$BV_{DSS}$	Drain to source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	60			V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown voltage temperature coefficient	$I_D=250\mu A$ , referenced to $25^\circ\text{C}$		0.07		$V/^\circ\text{C}$
$I_{DSS}$	Drain to source leakage current	$V_{DS}=60V, V_{GS}=0V$			1	$\mu A$
		$V_{DS}=48V, T_C=125^\circ\text{C}$			50	$\mu A$
$I_{GSS}$	Gate to source leakage current, forward	$V_{GS}=20V, V_{DS}=0V$			100	nA
	Gate to source leakage current, reverse	$V_{GS}=-20V, V_{DS}=0V$			-100	nA
<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	$V_{GS}=10V, I_D = 25A$		13	16.8	$m\Omega$
$G_{fs}$	Forward Transconductance	$V_{DS} = 20V, I_D = 20A$		58		S
<b>Dynamic characteristics</b>						
$C_{iss}$	Input capacitance	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$		2178		pF
$C_{oss}$	Output capacitance			195		
$C_{riss}$	Reverse transfer capacitance			141		
$t_{d(on)}$	Turn on delay time	$V_{DS}=30V, I_D=50A, R_G=25\Omega$ (note 4,5)		26		ns
$t_r$	Rising time			80		
$t_{d(off)}$	Turn off delay time			82		
$t_f$	Fall time			46		
$Q_g$	Total gate charge	$V_{DS}=50V, V_{GS}=10V, I_D=50A$ (note 4,5)		41		nC
$Q_{gs}$	Gate-source charge			7		
$Q_{gd}$	Gate-drain charge			19		

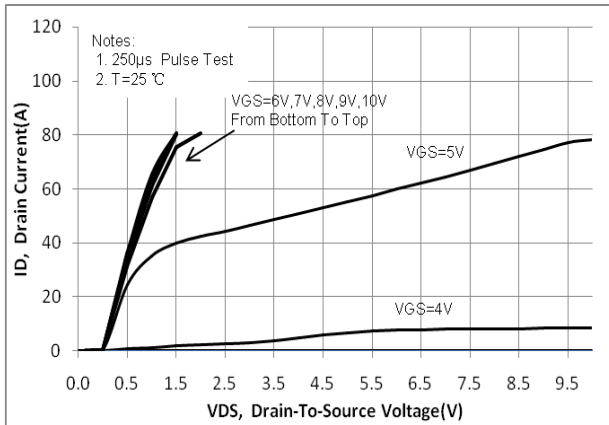
### Source to drain diode ratings characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			50	A
$I_{SM}$	Pulsed source current				200	A
$V_{SD}$	Diode forward voltage drop.	$I_S=50A, V_{GS}=0V$			1.5	V
$T_{rr}$	Reverse recovery time	$I_S=50A, V_{GS}=0V,$		20		ns
$Q_{rr}$	Breakdown voltage charge	$dI_F/dt=100A/\mu s$		16		nC

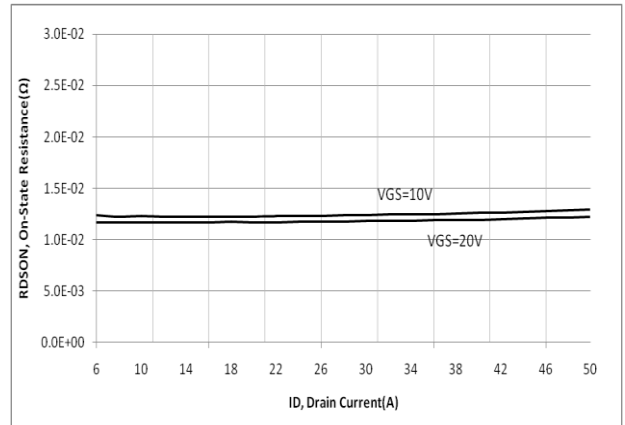
※. Notes

1. Repetitive rating : pulse width limited by junction temperature.
2.  $L = 0.4\text{mH}, I_{AS} = 30A, V_{DD} = 30V, R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 50A, di/dt = 100A/\mu s, V_{DD} \leq BV_{DSS}$ , 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.

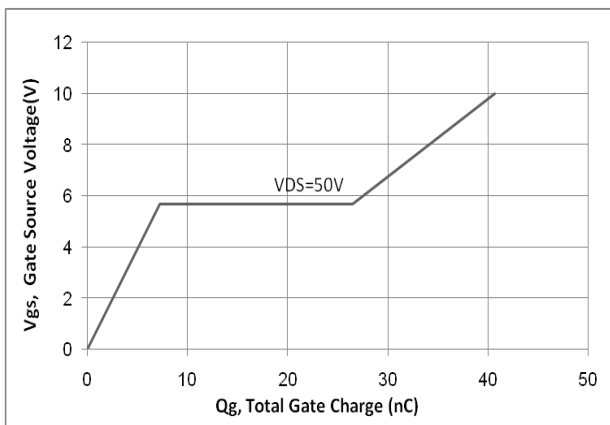
**Fig. 1. On-state characteristics**



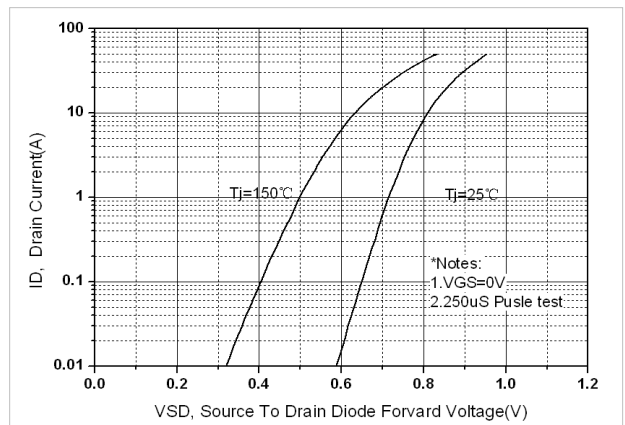
**Fig. 2. On-resistance variation vs. drain current and gate voltage**



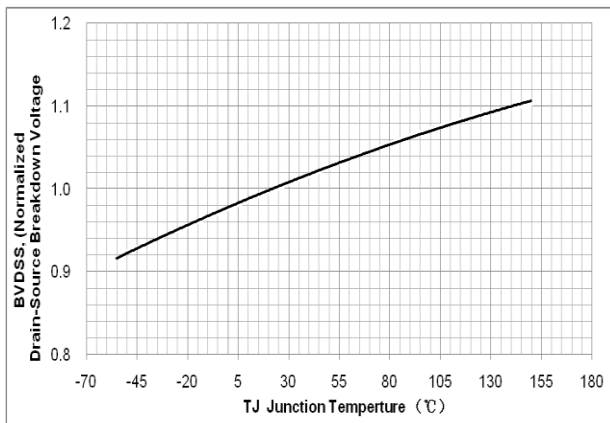
**Fig. 3. Gate charge characteristics**



**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**

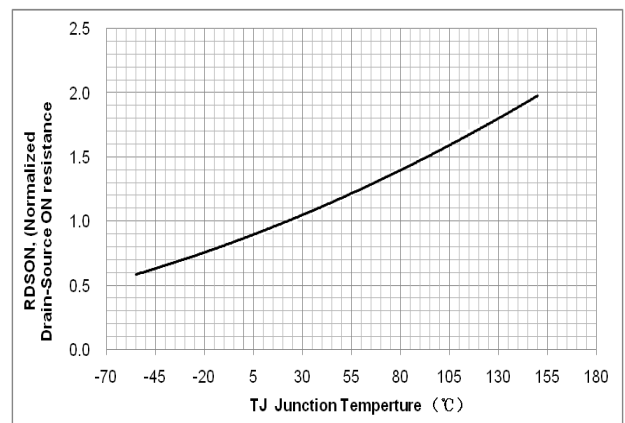


Fig. 7. Maximum safe operating area (TO-252)

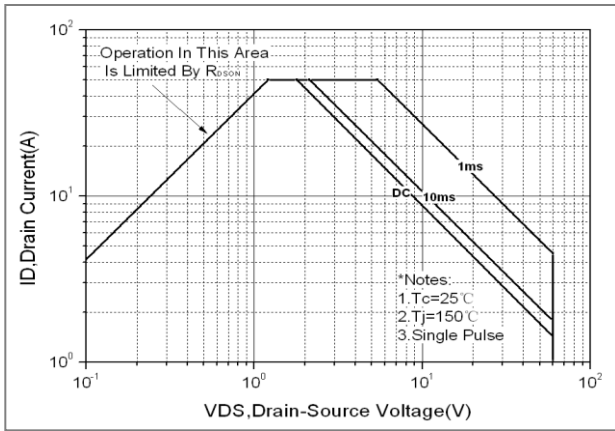


Fig. 8. Transient thermal response curve (TO-252)

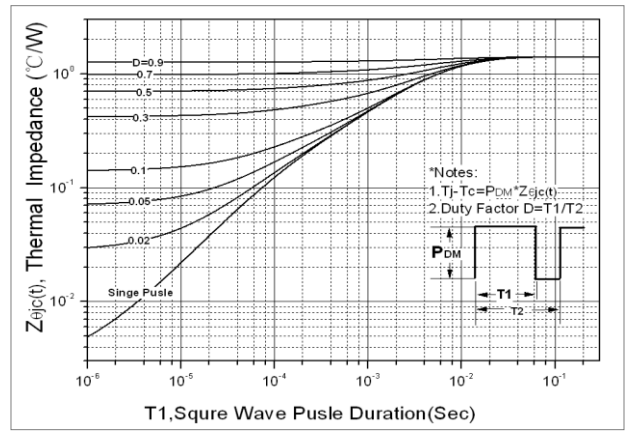


Fig. 9. Maximum safe operating area (TO-220)

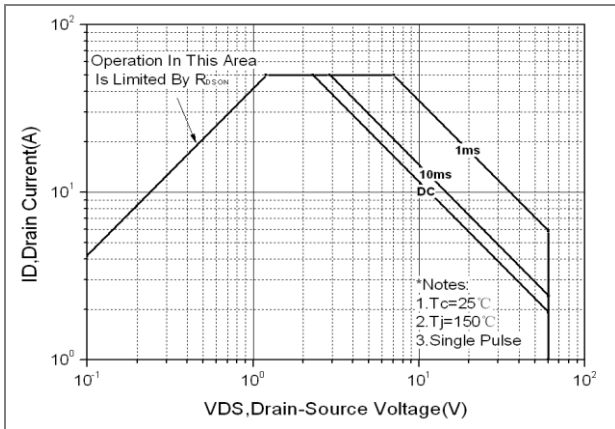


Fig. 10. Transient thermal response curve (TO-220)

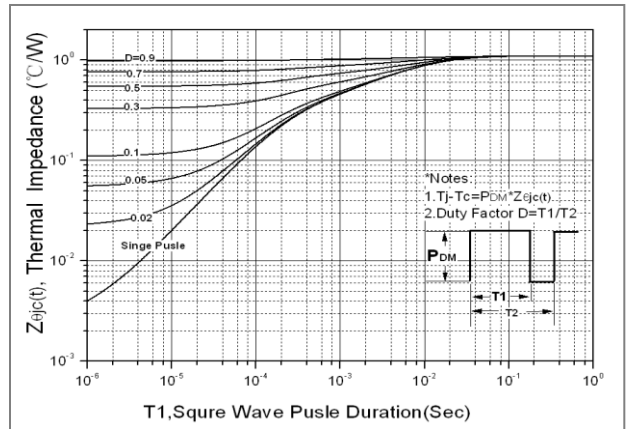
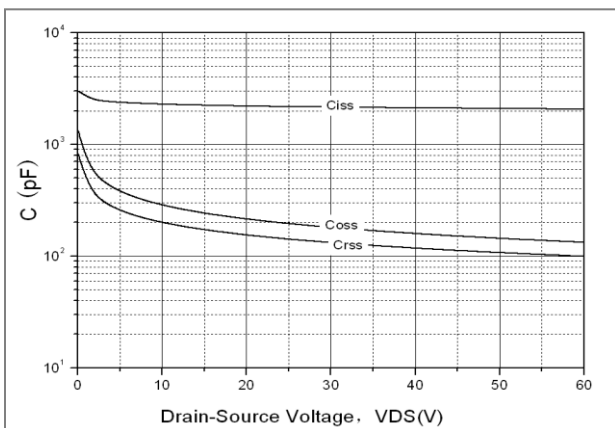
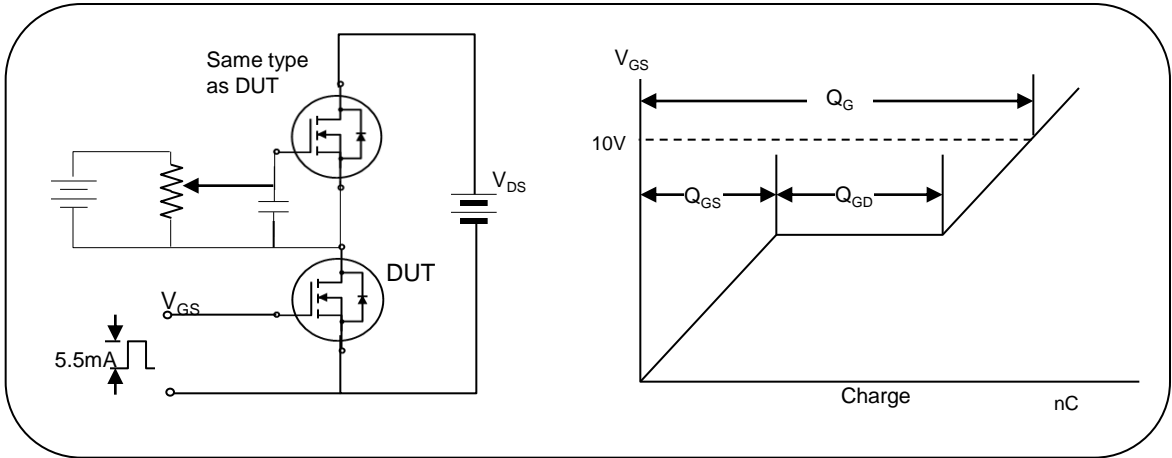


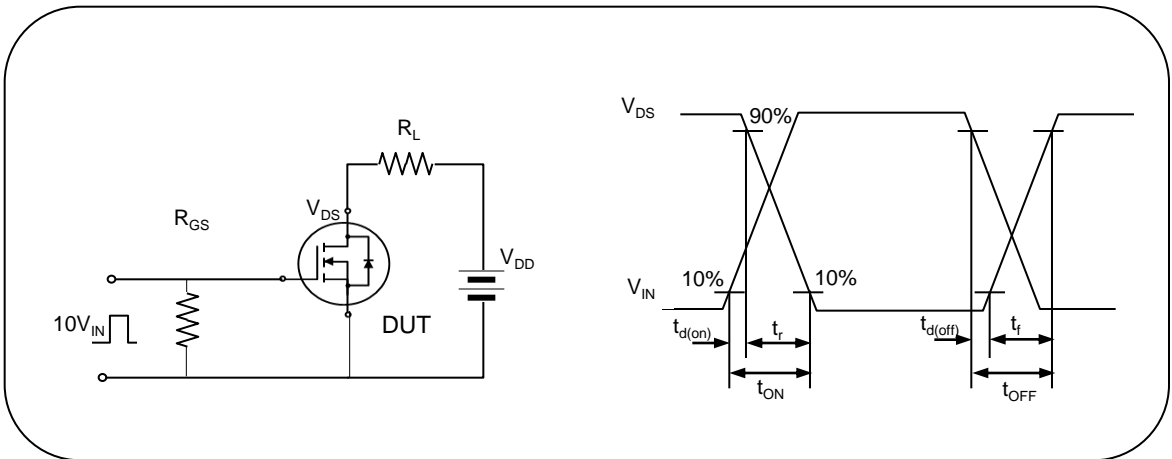
Fig. 11. Capacitance Characteristics



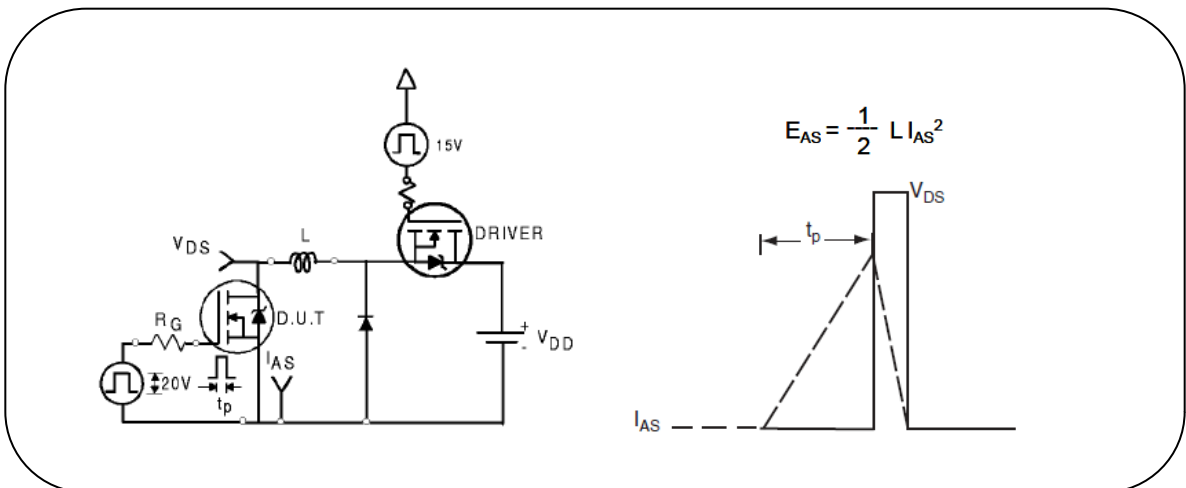
**Fig. 12. Gate charge test circuit & waveform**



**Fig. 13. Switching time test circuit & waveform**



**Fig. 14. Unclamped Inductive switching test circuit & waveform**



**Fig. 15. Peak diode recovery dv/dt test circuit & waveform**

