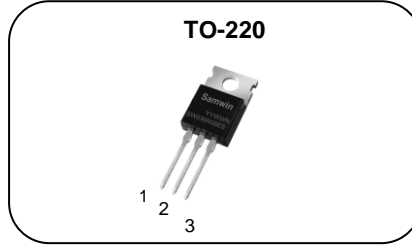


N-channel Enhanced mode TO-220 MOSFET

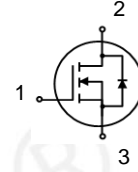
Features

- High ruggedness
- Low $R_{DS(ON)}$ (Typ $3.5m\Omega$) @ $V_{GS}=10V$
- Low Gate Charge (Typ $64nC$)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Application: Synchronous Rectification, Li Battery Protect Board, Motor Drives



1. Gate 2. Drain 3. Source

BV_{DSS} : 80V
 I_D : 160A
 $R_{DS(ON)}$: $3.5m\Omega$



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 036R08ES	SW036R08ES	TO-220	TUBE

Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain to source voltage	80	V
I_D	Continuous drain current (@ $T_C=25^\circ C$)	160*	A
	Continuous drain current (@ $T_C=100^\circ C$)	120*	A
I_{DM}	Drain current pulsed (note 1)	640	A
V_{GS}	Gate to source voltage	± 20	V
E_{AS}	Single pulsed avalanche energy (note 2)	361	mJ
E_{AR}	Repetitive avalanche energy (note 1)	30	mJ
dv/dt	Peak diode recovery dv/dt (note 3)	5	V/ns
P_D	Total power dissipation (@ $T_C=25^\circ C$)	219.3	W
	Derating factor above $25^\circ C$	1.8	W/ $^\circ C$
T_{STG}, T_J	Operating junction temperature & storage temperature	$-55 \sim +150$	$^\circ C$
T_L	Maximum lead temperature for soldering purpose, 1/8 from case for 5 seconds.	300	$^\circ C$

*. Drain current is limited by junction temperature.

Thermal characteristics

Symbol	Parameter	Value	Unit
R_{thjc}	Thermal resistance, Junction to case	0.57	$^\circ C/W$
R_{thja}	Thermal resistance, Junction to ambient	54	$^\circ C/W$

Electrical characteristic (T_J = 25°C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Off characteristics						
BV _{DSS}	Drain to source breakdown voltage	V _{GS} =0V, I _D =250μA	80			V
ΔBV _{DSS} / ΔT _J	Breakdown voltage temperature coefficient	I _D =250μA, referenced to 25°C		0.05		V/°C
I _{DSS}	Drain to source leakage current	V _{DS} =80V, V _{GS} =0V			1	μA
		V _{DS} =64V, T _J =125°C			50	μA
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
On characteristics						
V _{GS(TH)}	Gate threshold voltage	V _{DS} =V _{GS} , I _D =250μA	2		4	V
R _{DS(ON)}	Drain to source on state resistance	V _{GS} =10V, I _D =20A, T _J =25°C		3.5	4.5	mΩ
		V _{GS} =10V, I _D =20A, T _J =125°C		5.5		mΩ
G _{fs}	Forward transconductance	V _{DS} =5V, I _D =30A		74		S
Dynamic characteristics						
C _{iss}	Input capacitance	V _{GS} =0V, V _{DS} =40V, f=100kHz		4301		pF
C _{oss}	Output capacitance			1167		
C _{rss}	Reverse transfer capacitance			37		
t _{d(on)}	Turn on delay time	V _{DS} =40V, I _D =30A, R _G =4.7Ω, V _{GS} =10V (note 4,5)		23		ns
t _r	Rising time			35		
t _{d(off)}	Turn off delay time			34		
t _f	Fall time			16		
Q _g	Total gate charge	V _{DS} =64V, V _{GS} =10V, I _D =30A , I _G =3mA (note 4,5)		64		nC
Q _{gs}	Gate-source charge			20		
Q _{gd}	Gate-drain charge			15		
R _g	Gate resistance		f=1MHz		0.8	

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			160	A
I _{SM}	Pulsed source current				640	A
V _{SD}	Diode forward voltage drop.	I _S =50A, V _{GS} =0V			1.4	V
t _{rr}	Reverse recovery time	I _S =30A, V _{GS} =0V,		59		ns
Q _{rr}	Reverse recovery charge	di _f /dt=100A/μs		89		nC

※. Notes

1. Repeattive rating : pulse width limited by junction temperature.
2. L =0.5mH, I_{AS} =38A, V_{DD}=50V, R_G=25Ω, Starting T_J = 25°C
3. I_{SD} ≤30A, di/dt = 100A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J =25°C
4. Pulse Test : Pulse Width ≤ 300us, duty cycle ≤ 2%.
5. Essentially independent of operating temperature.

Fig. 1. On-state characteristics

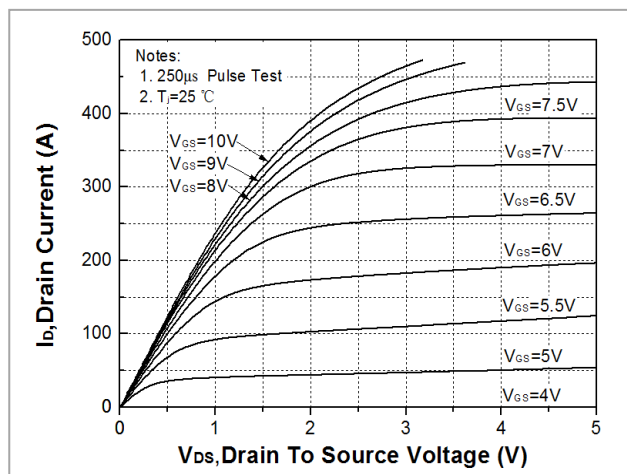


Fig. 2. Transfer Characteristics

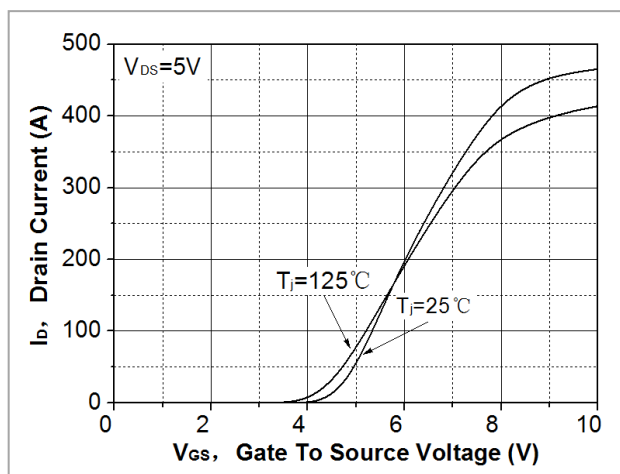


Fig. 3. On-resistance variation vs. drain current and gate voltage

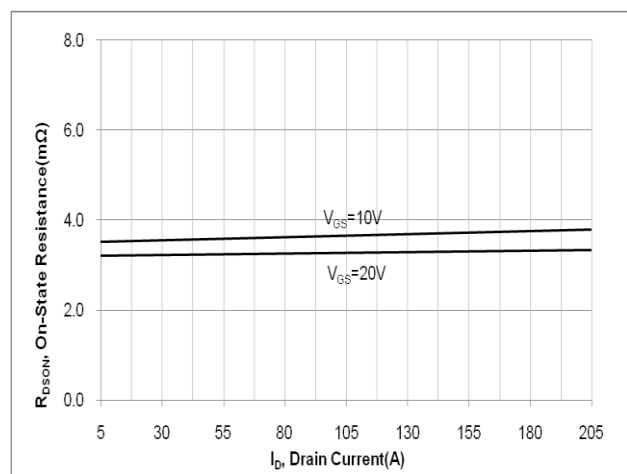


Fig. 4. On-state current vs. diode forward voltage

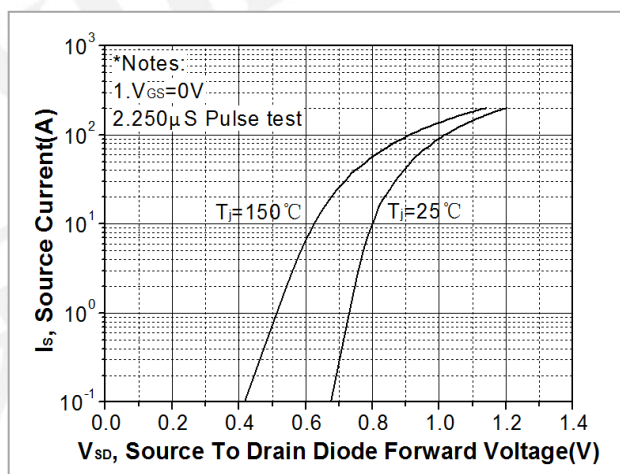


Fig 5. Breakdown voltage variation vs. junction temperature

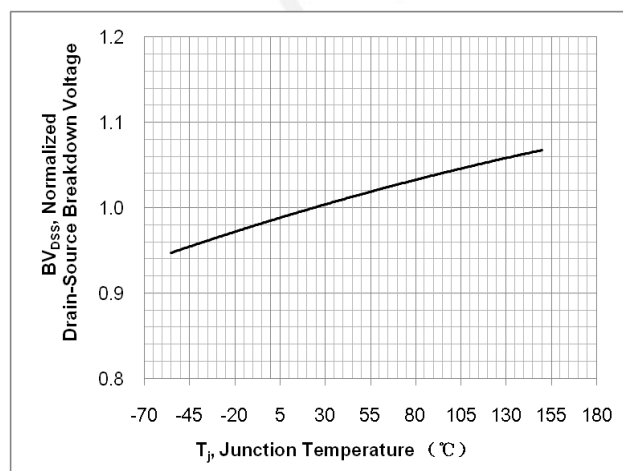


Fig. 6. On-resistance variation vs. junction temperature

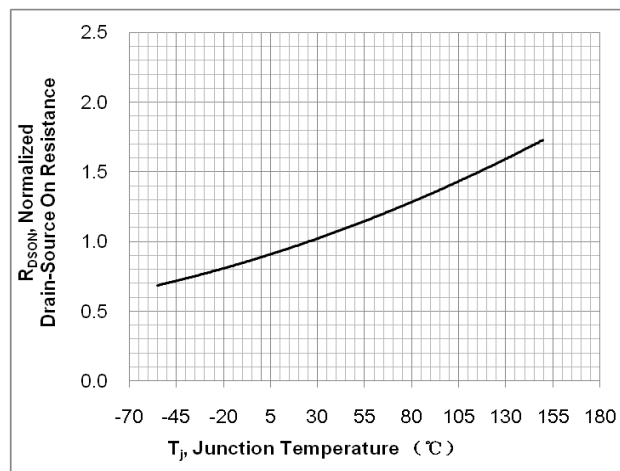


Fig. 7. Gate charge characteristics

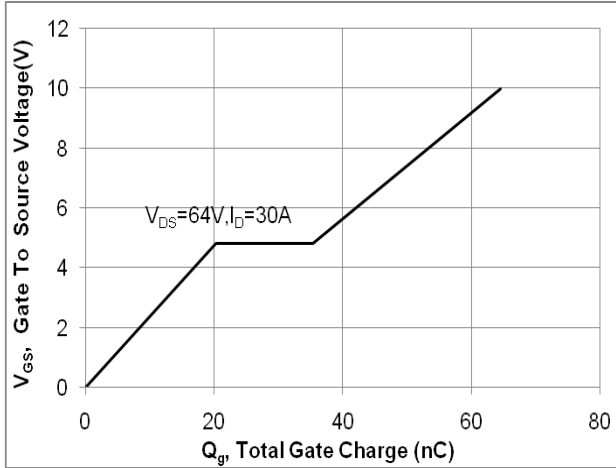


Fig. 8. Capacitance Characteristics

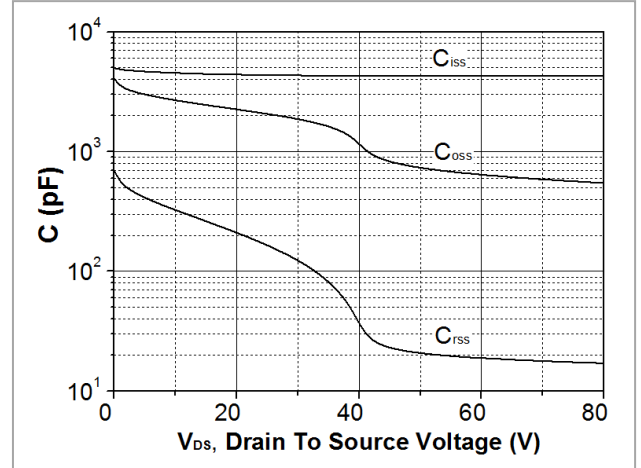


Fig. 9. Maximum safe operating area

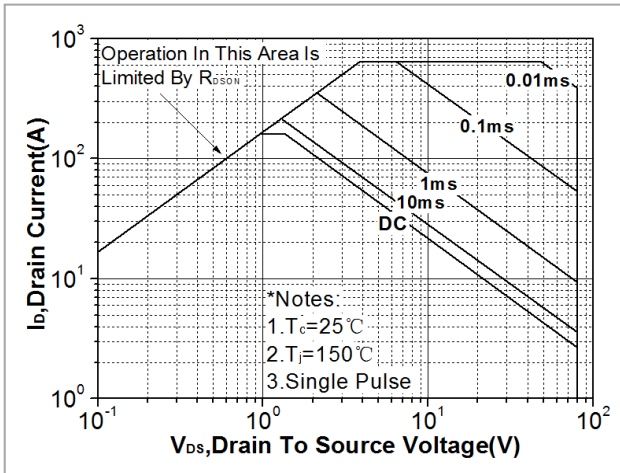


Fig. 10. Maximum drain current vs. case temperature

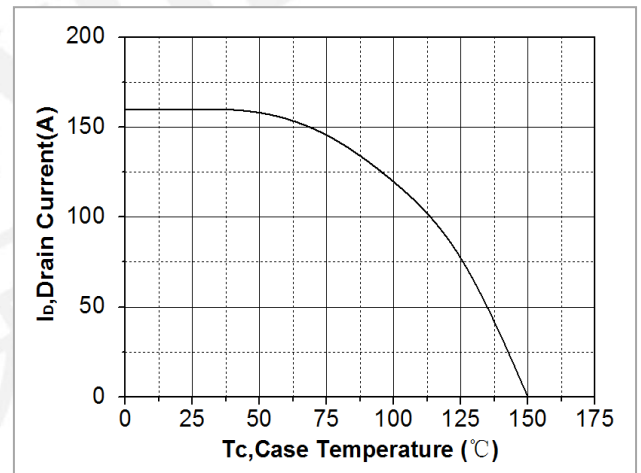


Fig. 11. Transient thermal response curve

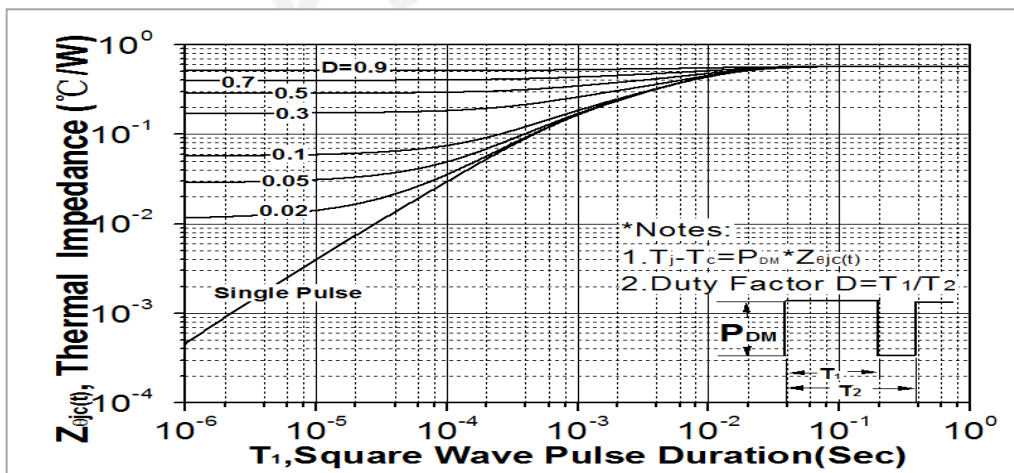


Fig. 12. Gate charge test circuit & waveform

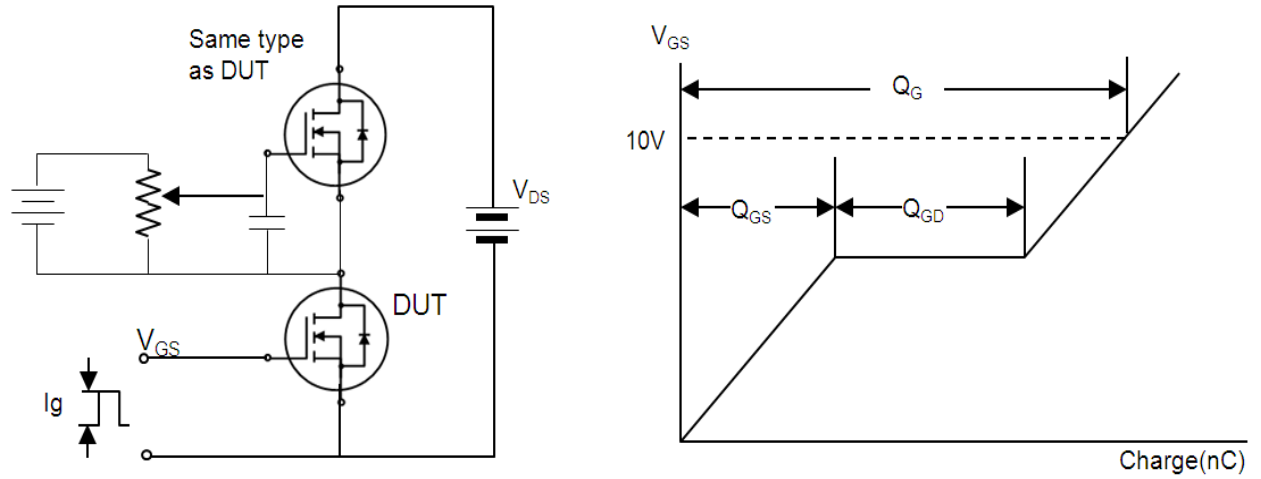


Fig. 13. Switching time test circuit & waveform

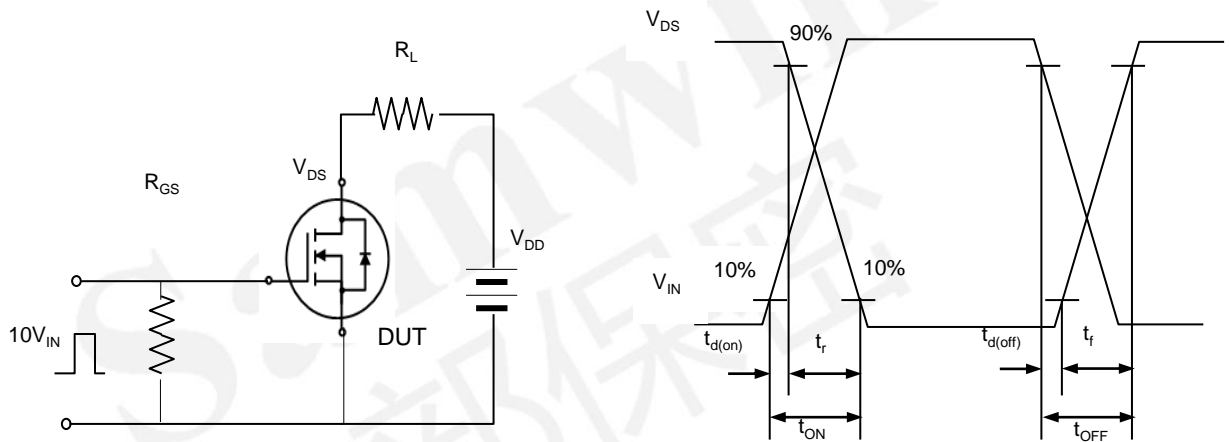


Fig. 14. Unclamped Inductive switching test circuit & waveform

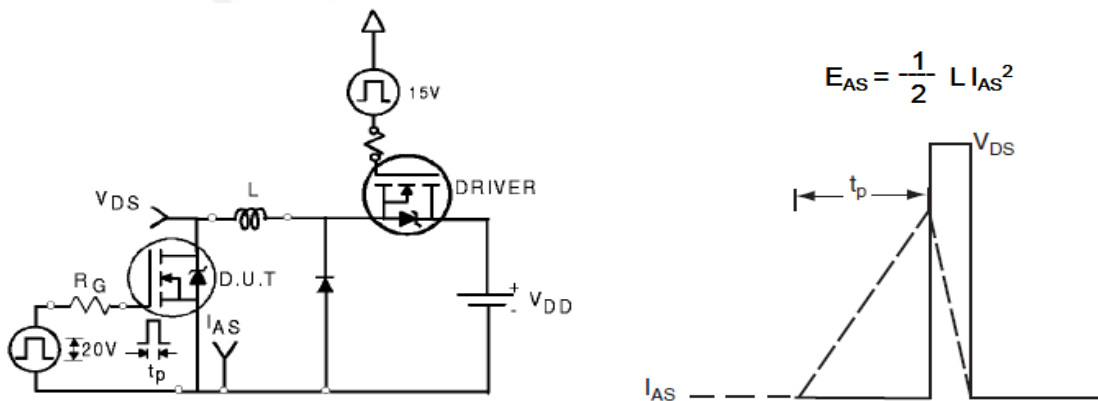
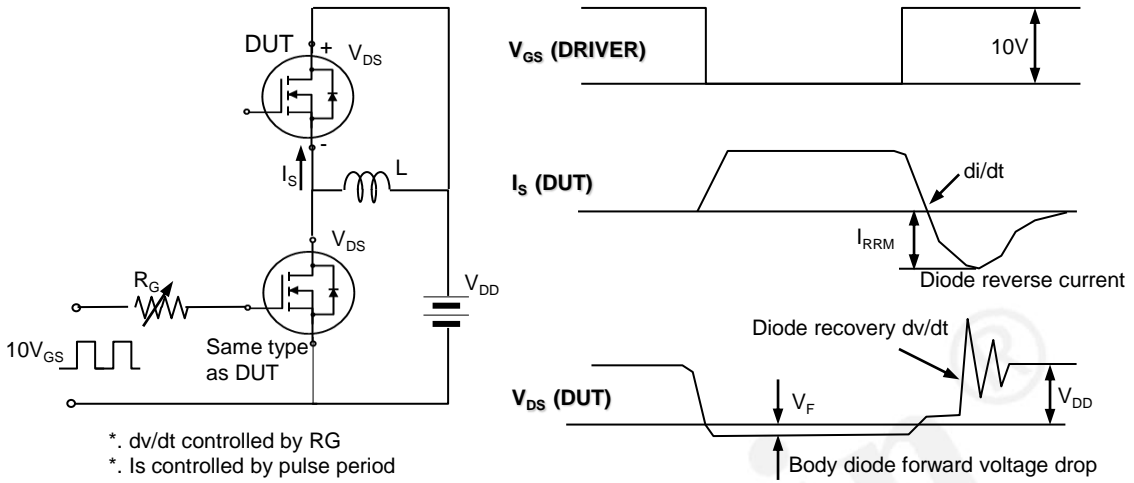


Fig. 15. Peak diode recovery dv/dt test circuit & waveform



DISCLAIMER

* All the data & curve in this document was tested in 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