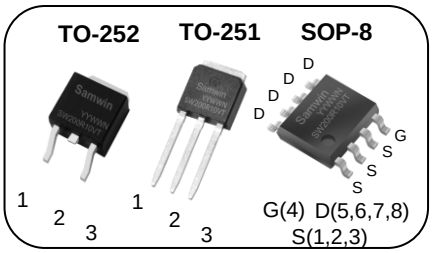
N-channel Enhanced mode TO-252/TO-251/SOP-8 MOSFET

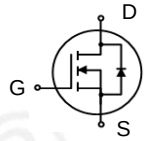
Features

- High ruggedness
- Low $R_{DS(ON)}$ (Typ 19.5mΩ)@V_{GS}=4.5V
  (Typ 18.7mΩ)@V_{GS}=10V
- Low Gate Charge (Typ 86nC)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Application: Synchronous Rectification, Li Battery Protect Board, Inverter.



TO-252/TO-251：1. Gate 2. Drain 3. Source
SOP-8: 4.Gate 5,6,7,8.Drain 1,2,3.Source

BV_{DSS} : 100V
I_D : 36A
$R_{DS(ON)}$: 19.5mΩ@V_{GS}=4.5V
18.7mΩ@V_{GS}=10V



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.

LEAD-FREE RoHS

Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SW D 200R10VT	SW200R10VT	TO-252	REEL
2	SW I 200R10VT	SW200R10VT	TO-251	TUBE
3	SW K 200R10VT	SW200R10VT	SOP-8	REEL

Absolute maximum ratings

Symbol	Parameter		Value			Unit
			TO-252	TO-251	SOP-8	
V_{DSS}	Drain to source voltage		100			V
I_D	Continuous drain current (@T_C=25°C)		36*			A
	Continuous drain current (@T_C=100°C)		23*			A
I_{DM}	Drain current pulsed	(note 1)	144			A
V_{GS}	Gate to source voltage		±20			V
E_{AS}	Single pulsed avalanche energy	(note 2)	72			mJ
E_{AR}	Repetitive avalanche energy	(note 1)	11			mJ
dv/dt	Peak diode recovery dv/dt	(note 3)	5			V/ns
P_D	Total power dissipation (@T_C=25°C)		117	160		W
	Total power dissipation (@T_A=25°C)				2.9	W
	Derating factor above 25°C		0.9	1.3	0.02	W/°C
T_{STG}, T_J	Operating junction temperature & storage temperature		-55 ~ + 150			°C

*. Drain current is limited by junction temperature.

Thermal characteristics

Symbol	Parameter	Value			Unit
		TO-252	TO-251	SOP-8	
R_{thjc}	Thermal resistance, Junction to case	1.07	0.78		°C/W
R_{thja}	Thermal resistance, Junction to ambient		73	43	°C/W

Note: R_{thja} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{thjc} is guaranteed by design while R_{thca} is determined by the user's board design.
SOP-8 R_{thja} : 43°C/W on a 1 in^2 pad of 2oz copper.

Electrical characteristic (T_C = 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=250uA	100			V
ΔBV_{DSS} / ΔT_J	Breakdown voltage temperature coefficient	I_D=250uA, referenced to 25°C		0.07		V/°C
I_{DSS}	Drain to source leakage current	V_{DS}=100V, V_{GS}=0V			1	uA
		V_{DS}=80V, T_C=125°C			50	uA
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=250uA	1.5		2.5	V
$R_{DS(ON)}$	Drain to source on state resistance(TO251&TO252)	V_{GS}=4.5V, I_D=18A		19.5	25	mΩ
		V_{GS}=10V, I_D=18A		18.7	23	
		V_{GS}=10V, I_D=36A		19.1	24	
	Drain to source on state resistance(SOP8)	V_{GS}=4.5V, I_D=18A		22.8	28.5	
		V_{GS}=10V, I_D=18A		22.0	27.5	
G_{fs}	Forward transconductance	V_{DS}=10V, I_D=18A		77		S
Dynamic characteristics						
C_{iss}	Input capacitance	V_{GS}=0V, V_{DS}=50V, f=1MHz		4410		pF
C_{oss}	Output capacitance			165		
C_{rss}	Reverse transfer capacitance			153		
$t_{d(on)}$	Turn on delay time	V_{DS}=50V, I_D=36A, R_G=25Ω, V_{GS}=10V (note 4,5)		26		ns
t_r	Rising time			61		
$t_{d(off)}$	Turn off delay time			321		
t_f	Fall time			116		
Q_g	Total gate charge	V_{DS}=80V, V_{GS}=10V, I_D=36A (note 4,5)		86		nC
Q_{gs}	Gate-source charge			15		
Q_{gd}	Gate-drain charge			20		
R_g	Gate resistance	V_{DS}=0V, Scan F mode		1.5		Ω

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			36	A
I_{SM}	Pulsed source current				144	A
V_{SD}	Diode forward voltage drop.	I_S=36A, V_{GS}=0V			1.4	V
t_{rr}	Reverse recovery time	I_S=36A, V_{GS}=0V, dI_F/dt=100A/us		42		ns
Q_{rr}	Reverse recovery charge			70		nC

※. Notes
1. Repeatitive rating : pulse width limited by junction temperature.
2. L =0.5mH, I_{AS} =17A, V_{DD}=50V, R_G=25Ω, Starting T_J = 25°C
3. I_{SD} ≤36A, di/dt = 100A/us, V_{DD} ≤ BV_{DSS}, Staring T_J =25°C
4. Pulse Test : Pulse Width ≤ 300us, duty cycle ≤ 2%.
5. Essentially independent of operating temperature.

Fig. 1. On-state characteristics

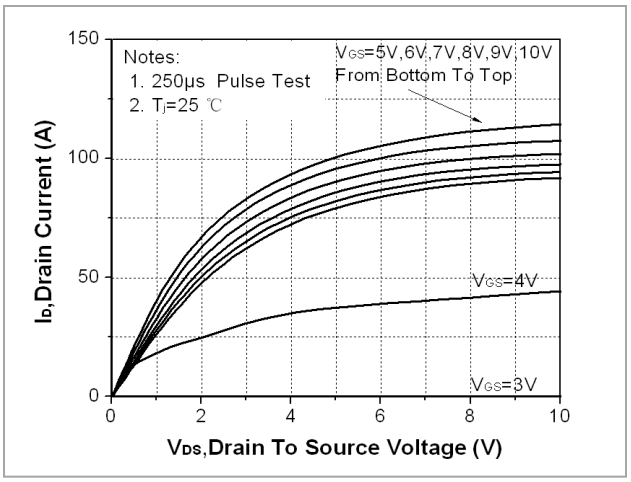


Fig. 2. Transfer Characteristics

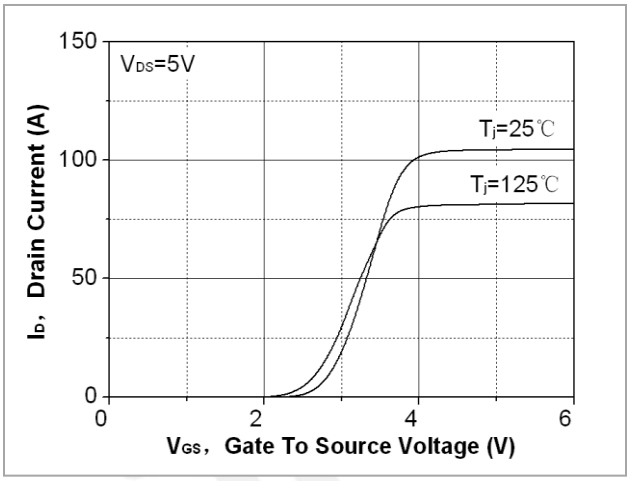


Fig. 3. On-resistance variation vs. drain current and gate voltage

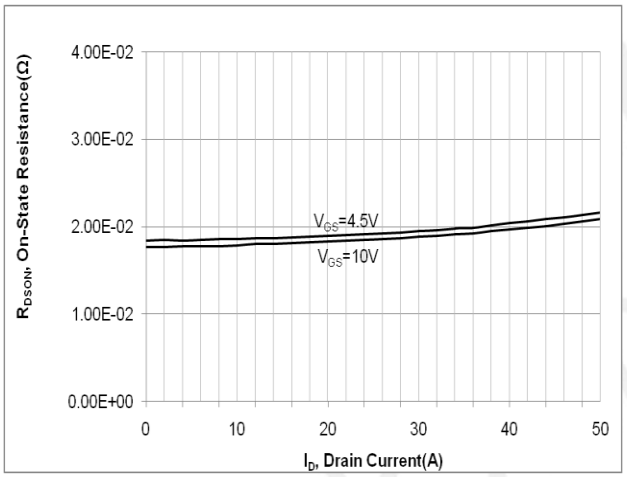


Fig. 4. On-state current vs. diode forward voltage

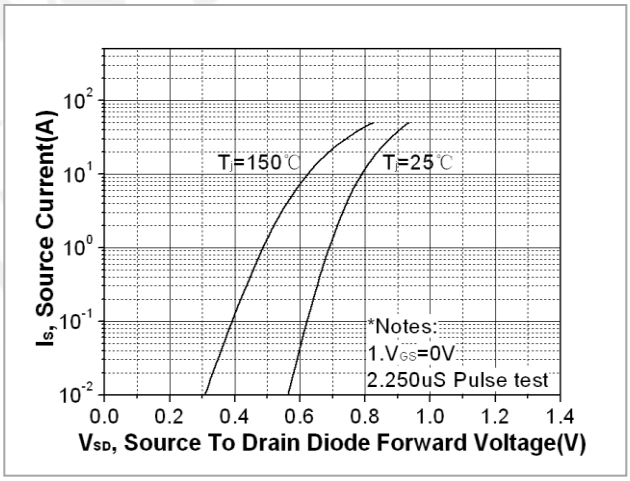


Fig 5. Breakdown voltage variation vs. junction temperature

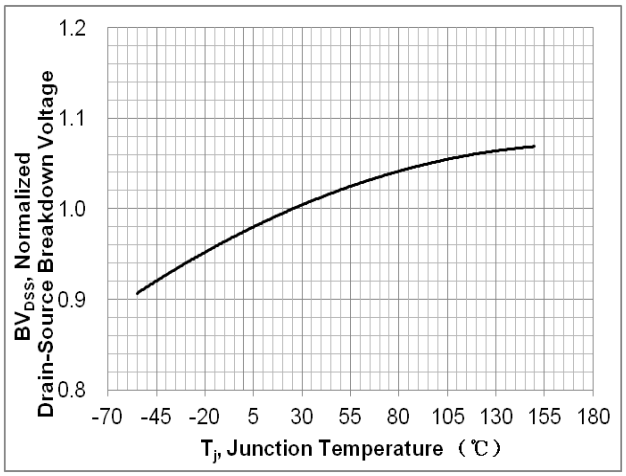


Fig. 6. On-resistance variation vs. junction temperature

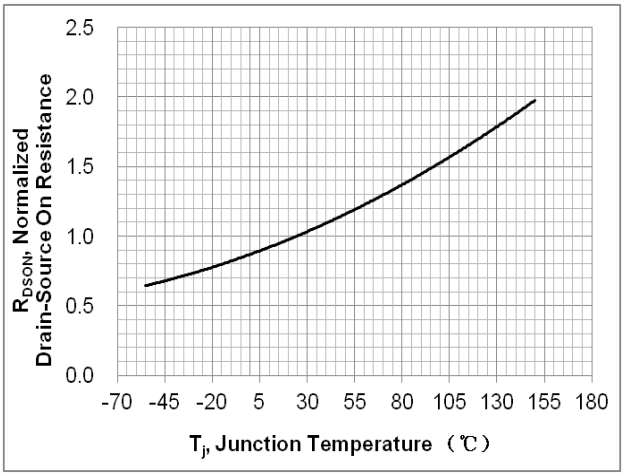


Fig. 7. Gate charge characteristics

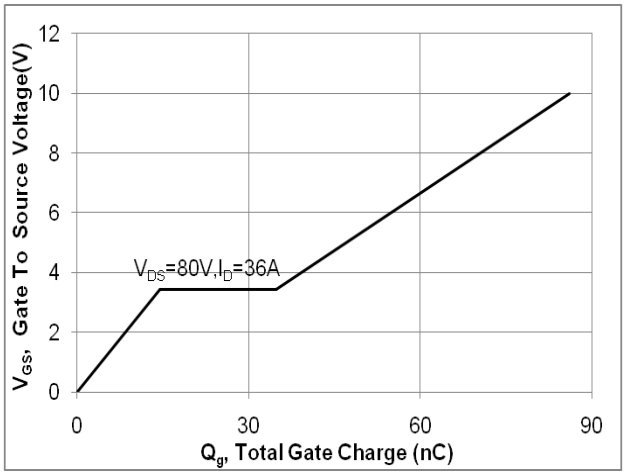


Fig. 8. Capacitance Characteristics

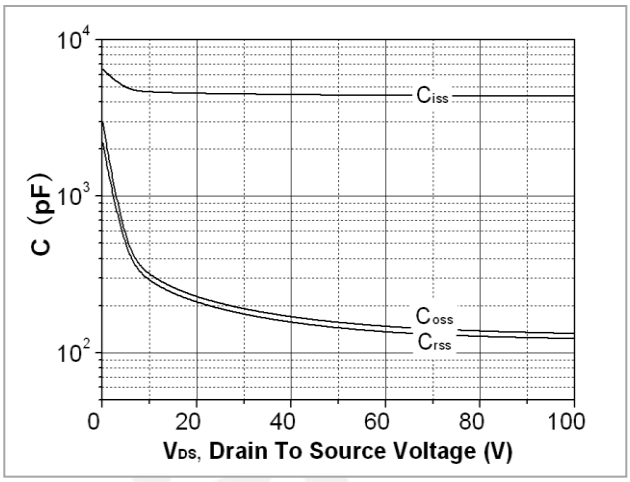


Fig. 9. Maximum safe operating area(TO-252)

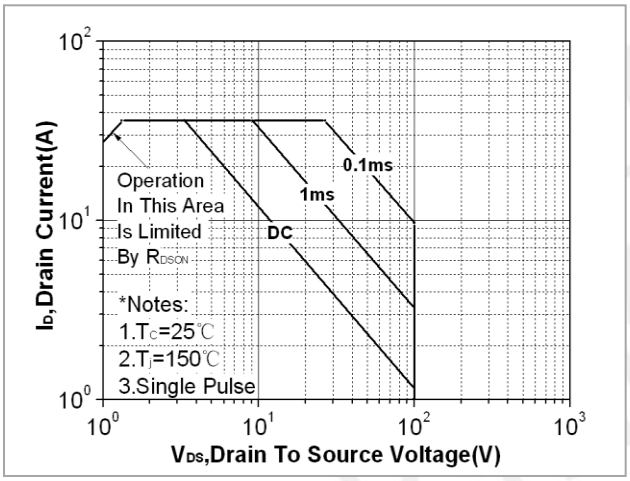


Fig. 10. Maximum safe operating area(TO-251)

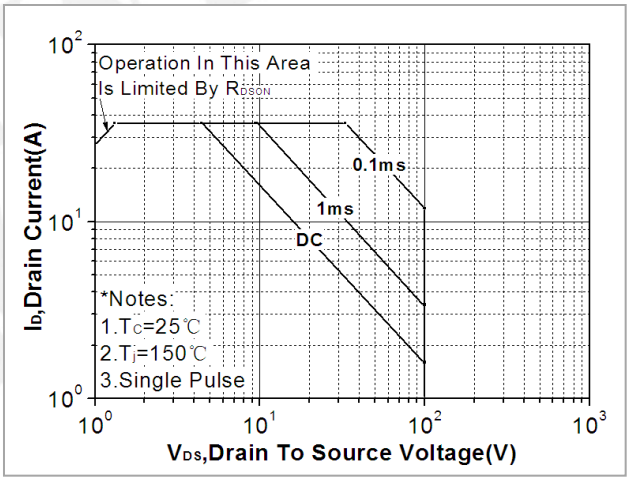


Fig. 11. Maximum safe operating area(SOP-8)

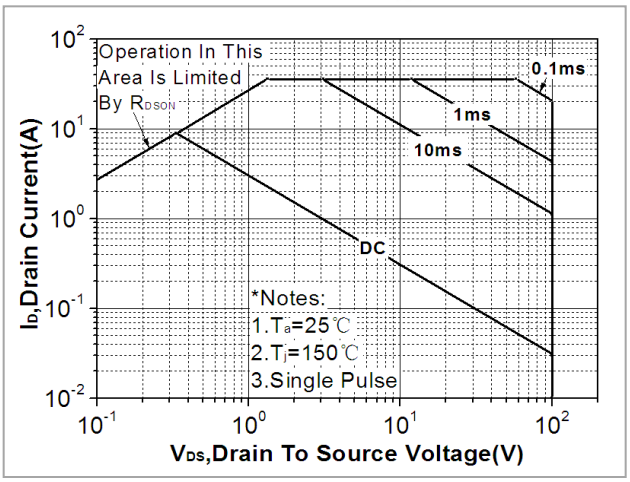


Fig. 12. Transient thermal response curve(TO-252)

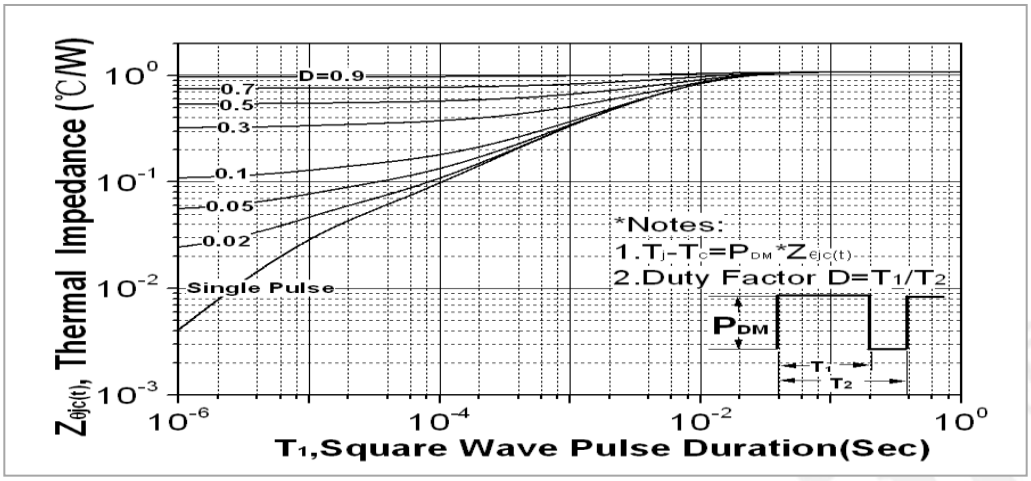


Fig. 13. Transient thermal response curve(TO-251)

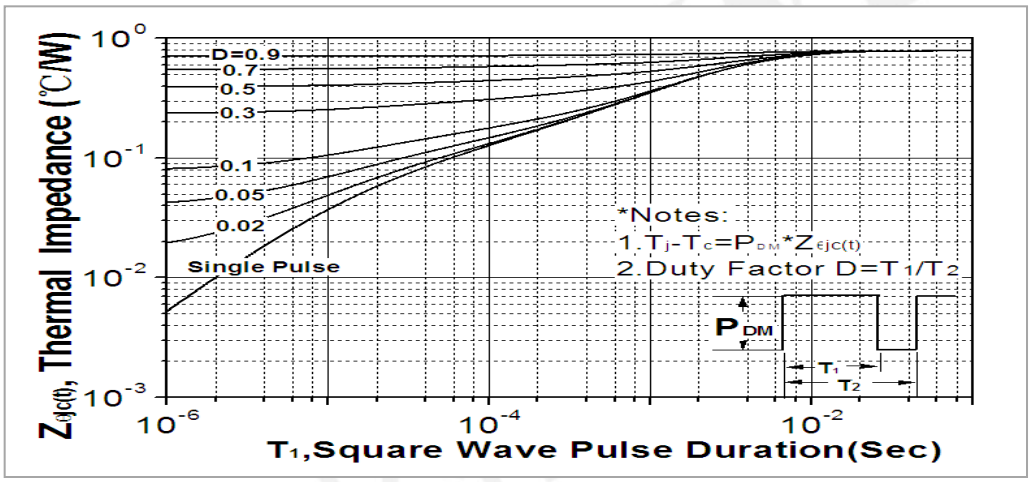


Fig. 14. Transient thermal response curve(SOP-8)

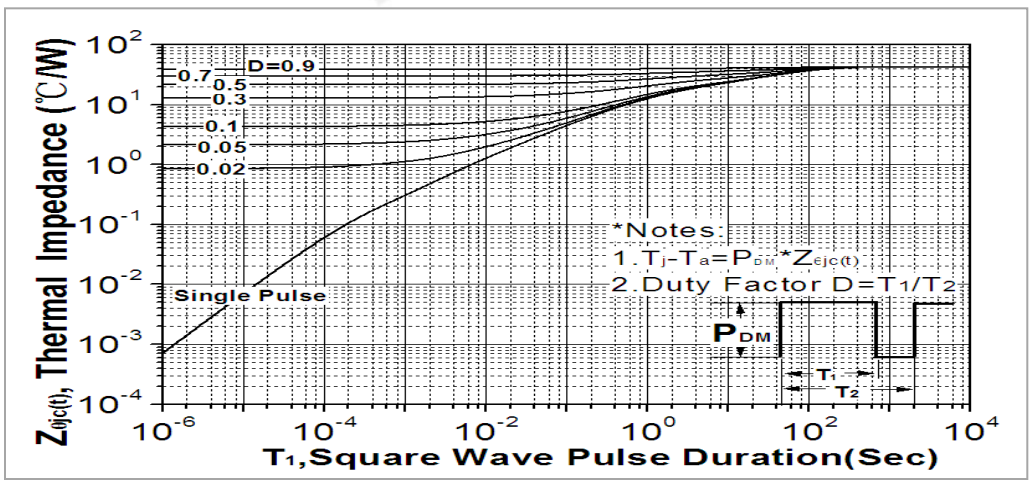


Fig. 15. Gate charge test circuit & waveform

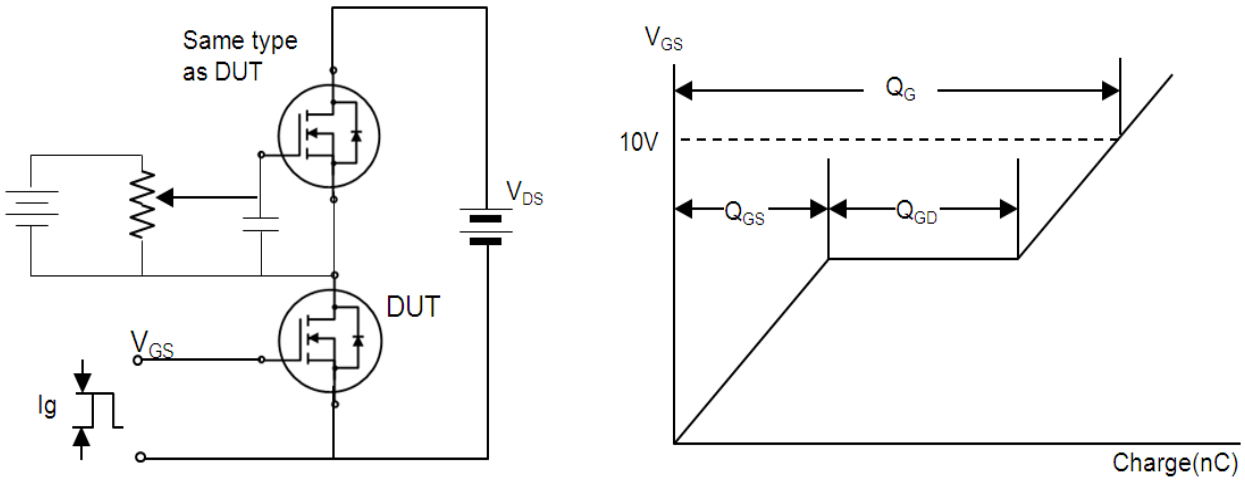


Fig. 16. Switching time test circuit & waveform

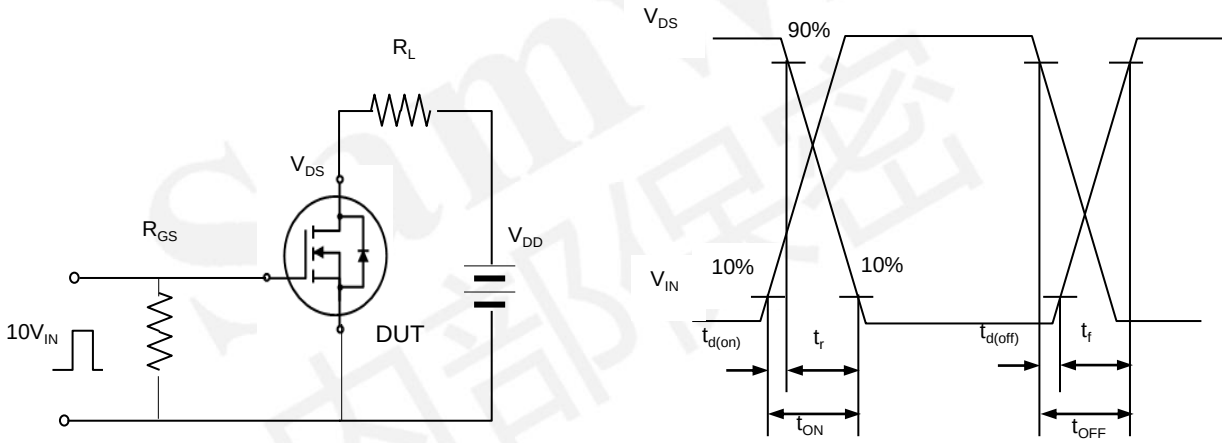
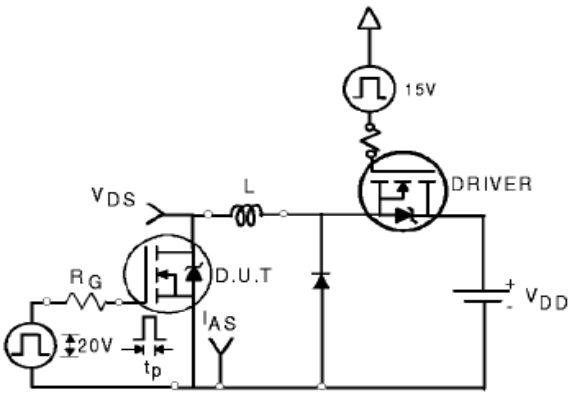


Fig. 17. Unclamped Inductive switching test circuit & waveform



$$E_{AS} = \frac{1}{2} L I_{AS}^2$$

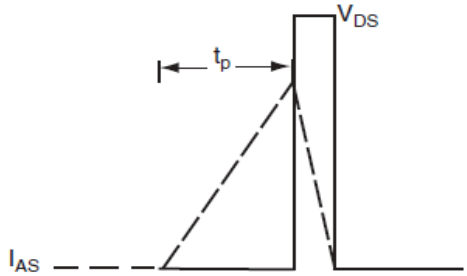
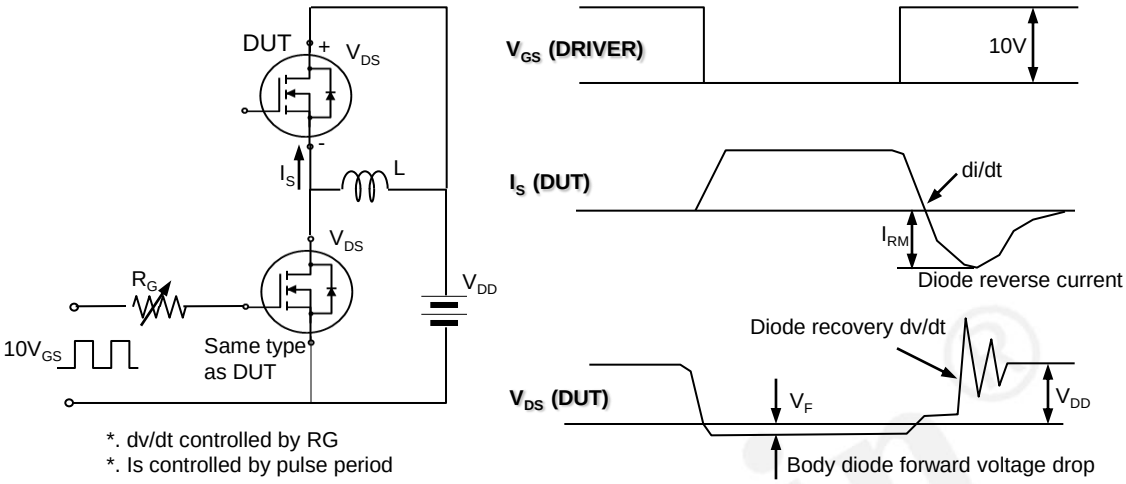


Fig. 18. Peak diode recovery dv/dt test circuit & waveform



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**

* Suggestions for improvement are appreciated, Please send your suggestions to **samwin@samwinsemi.com**