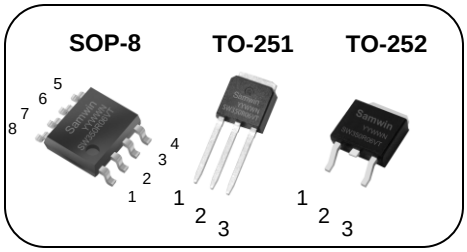
N-channel Enhanced mode SOP-8/TO-251/TO-252 MOSFET

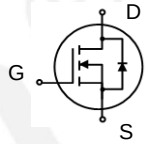
Features

- High ruggedness
- SOP-8 Low $R_{DS(ON)}$
  (Typ 38mΩ)@V_{GS}=4.5V
  (Typ 33mΩ)@V_{GS}=10V
- TO-251&TO-252 Low $R_{DS(ON)}$
  (Typ 37mΩ)@V_{GS}=4.5V
  (Typ 32mΩ)@V_{GS}=10V
- Low Gate Charge (Typ 21nC)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Application: DC-DC Converter, Motor Control, Synchronous Rectification, Inverter



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

BV_{DSS} : 60V
SOP8 I_D : 5A
$R_{DS(ON)}$: 38mΩ@VGS=4.5V
33mΩ@VGS=10V
TO-251 & TO-252 I_D : 24A
$R_{DS(ON)}$: 37mΩ@VGS=4.5V
32mΩ@VGS=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.

Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SW K 350R06VT	SW350R06VT	SOP-8	REEL
2	SW I 350R06VT	SW350R06VT	TO-251	TUBE
3	SW D 350R06VT	SW350R06VT	TO-252	REEL

Absolute maximum ratings

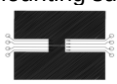
Symbol	Parameter	Value			Unit
		SOP-8	TO-251	TO-252	
V_{DSS}	Drain to source voltage	60			V
I_D	Continuous drain current (@T_C=25°C)	5*	24*		A
	Continuous drain current (@T_C=100°C)	3*	17*		A
I_{DM}	Drain current pulsed (note 1)	20	96		A
V_{GS}	Gate to source voltage	±20			V
dv/dt	Peak diode recovery dv/dt (note 2)	5			V/ns
P_D	Total power dissipation (@T_C=25°C)		104	65.8	W
	Total power dissipation (@T_a=25°C)	2.6			
	Derating factor above 25°C	0.02	0.8	0.5	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
		SOP-8	TO-251	TO-252	
R_{thjc}	Thermal resistance, Junction to case		1.2	1.9	°C/W
R_{thja}	Thermal resistance, Junction to ambient	48	85.2		°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} : 48°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	60			V
ΔBV_{DSS} / ΔT_J	Breakdown voltage temperature coefficient	I_D=250uA, referenced to 25°C		0.06		V/°C
I_{DSS}	Drain to source leakage current	V_{DS}=60V, V_{GS}=0V			1	uA
		V_{DS}=48V, 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	1.2		2.5	V
$R_{DS(ON)}$	Drain to source on state resistance (SOP-8)	V_{GS}=4.5V, I_D=5A		38	47	mΩ
		V_{GS}=10V, I_D=5A		33	41	
	Drain to source on state resistance (TO-251&TO-252)	V_{GS}=4.5V, I_D=12A		37	46	mΩ
		V_{GS}=10V, I_D=12A		32	40	
G_{fs}	Forward transconductance(SOP-8)	V_{DS}=5V, I_D=2.5A		14		S
	Forward transconductance (TO-251&TO-252)	V_{DS}=5V, I_D=12A		35		S
Dynamic characteristics						
C_{iss}	Input capacitance	V_{GS}=0V, V_{DS}=30V, f=1MHz		962		pF
C_{oss}	Output capacitance			66		
C_{rss}	Reverse transfer capacitance			47		
$t_{d(on)}$	Turn on delay time	V_{DS}=30V, I_D=5A, R_G=25Ω, V_{GS}=10V (note 3,4)		4		ns
t_r	Rising time			29		
$t_{d(off)}$	Turn off delay time			82		
t_f	Fall time			38		
Q_g	Total gate charge	V_{DS}=48V, V_{GS}=10V, I_D=5A , I_g=3mA (note 3,4)		21		nC
Q_{gs}	Gate-source charge			3		
Q_{gd}	Gate-drain charge			5		
R_g	Gate resistance	V_{DS}=0V, Scan F mode		6.0		Ω

Source to drain diode ratings characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.			Unit
					SOP-8	TO-251	TO-252	
I_S	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			5	24		A
I_{SM}	Pulsed source current				20	96		A
V_{SD}	Diode forward voltage drop	I_S=5A, V_{GS}=0V(SOP-8)			1.4			V
		I_S=24A, V_{GS}=0V (TO-251&TO-252)				1.4		
t_{rr}	Reverse recovery time	I_S=5A, V_{GS}=0V, dI_F/dt=100A/us		16				ns
Q_{rr}	Reverse recovery charge			3				nC

※. Notes

1. Repeatitive rating : pulse width limited by junction temperature.
2. I_{SD} ≤5A, di/dt = 100A/us, V_{DD} ≤ BV_{DSS}, Staring T_J =25°C
3. Pulse Test : Pulse Width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

Fig. 1. On-state characteristics

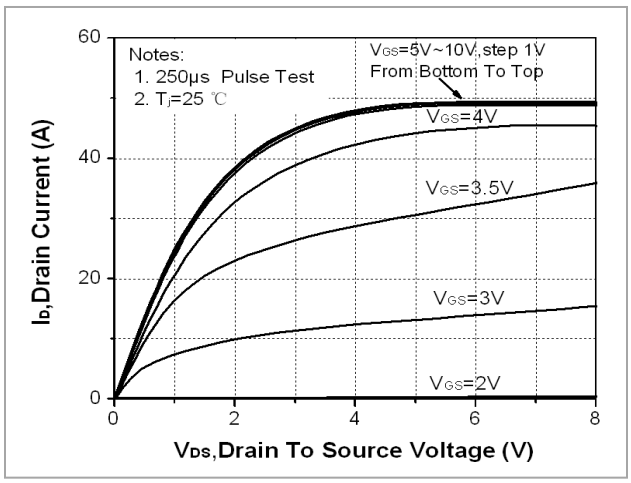


Fig. 2. Transfer Characteristics

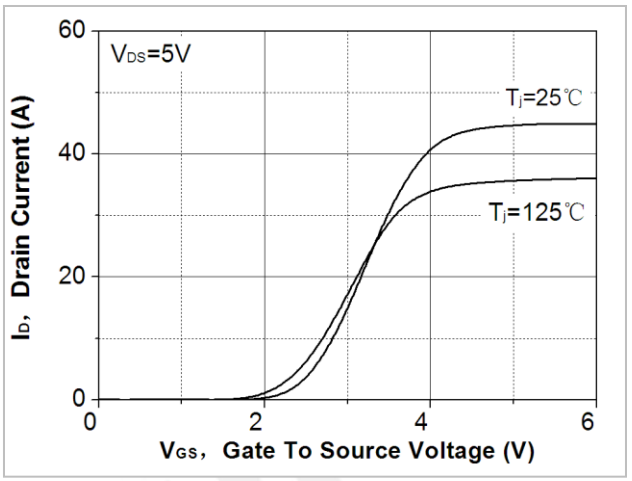


Fig. 3. On-resistance variation vs. drain current and gate voltage

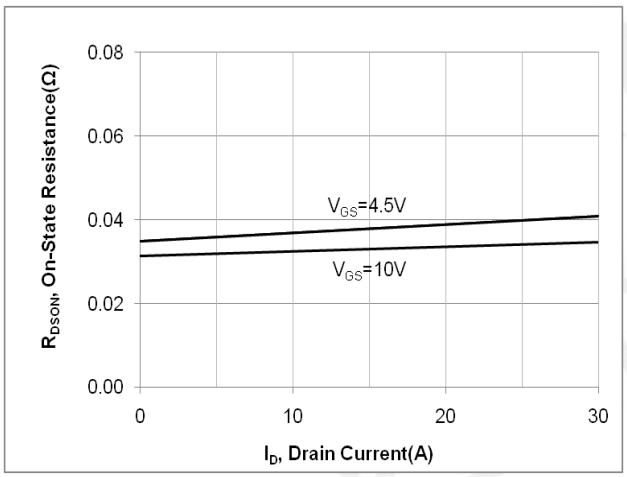


Fig. 4. On-state current vs. diode forward voltage

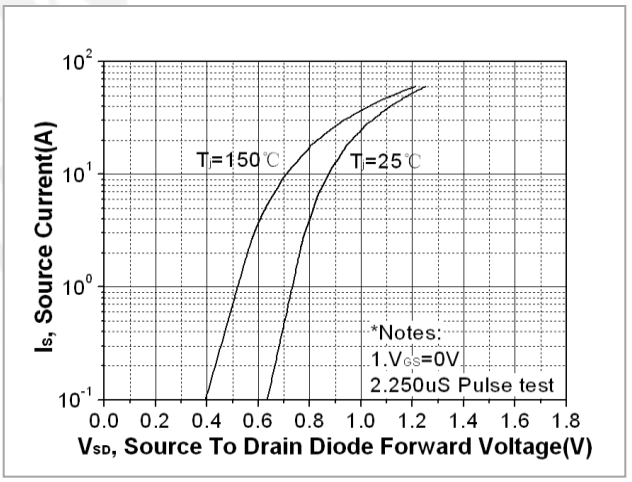


Fig 5. Breakdown voltage variation vs. junction temperature

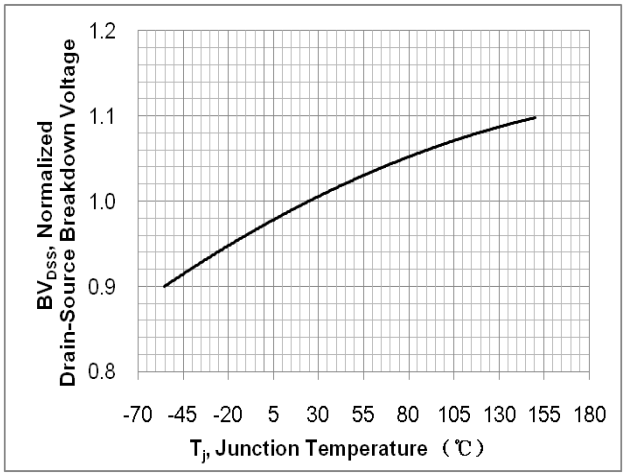


Fig. 6. On-resistance variation vs. junction temperature

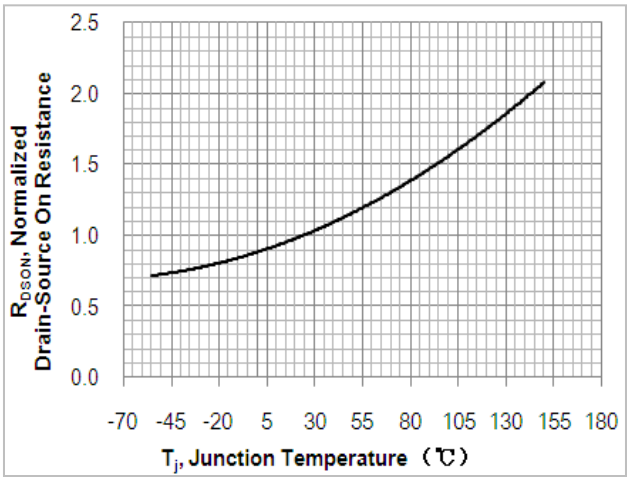


Fig. 7. Gate charge characteristics

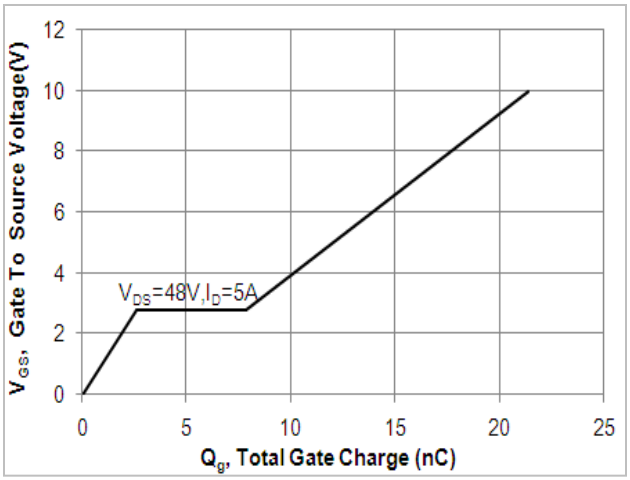


Fig. 8. Capacitance Characteristics

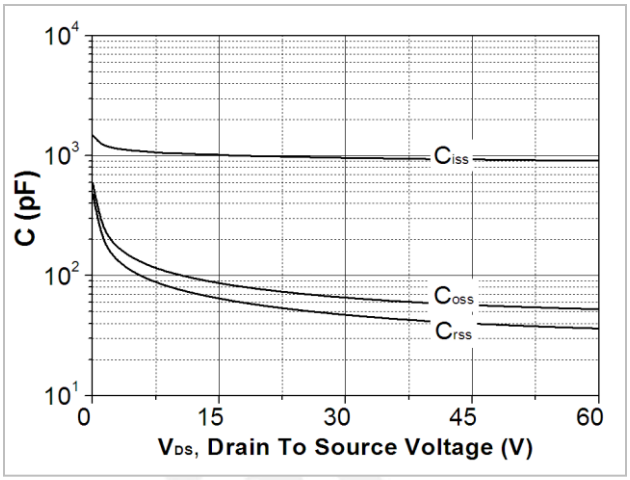


Fig. 9. Maximum safe operating area (SOP-8)

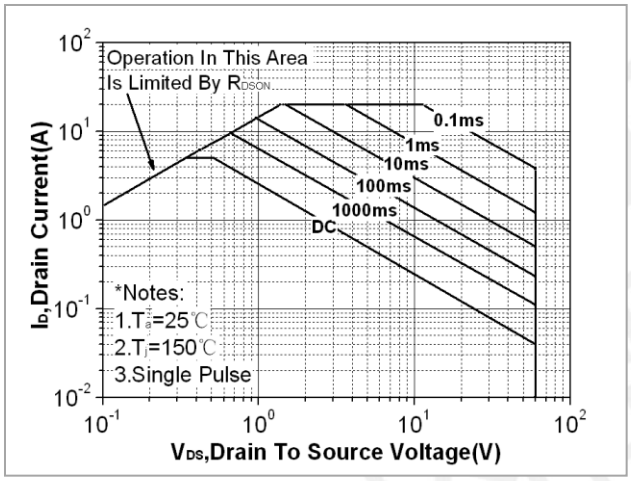


Fig. 10. Maximum safe operating area (TO-251)

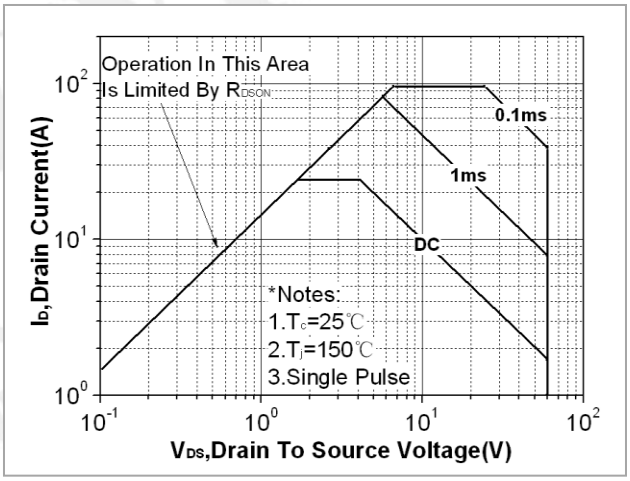


Fig. 11 Maximum safe operating area (TO-252)

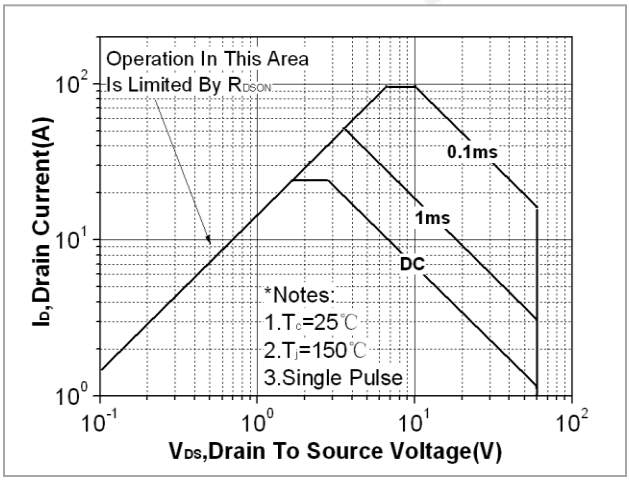


Fig. 12. Transient thermal response curve (SOP-8)

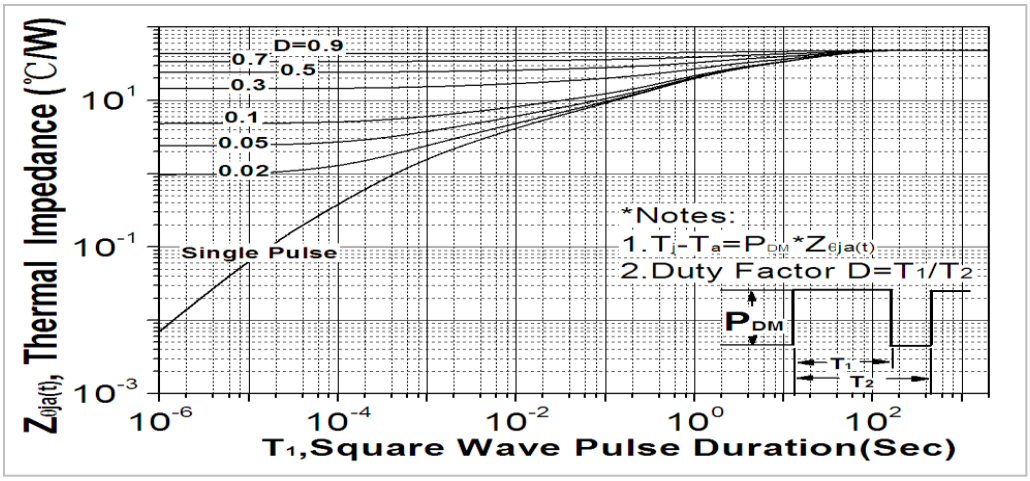


Fig. 13. Transient thermal response curve (TO-251)

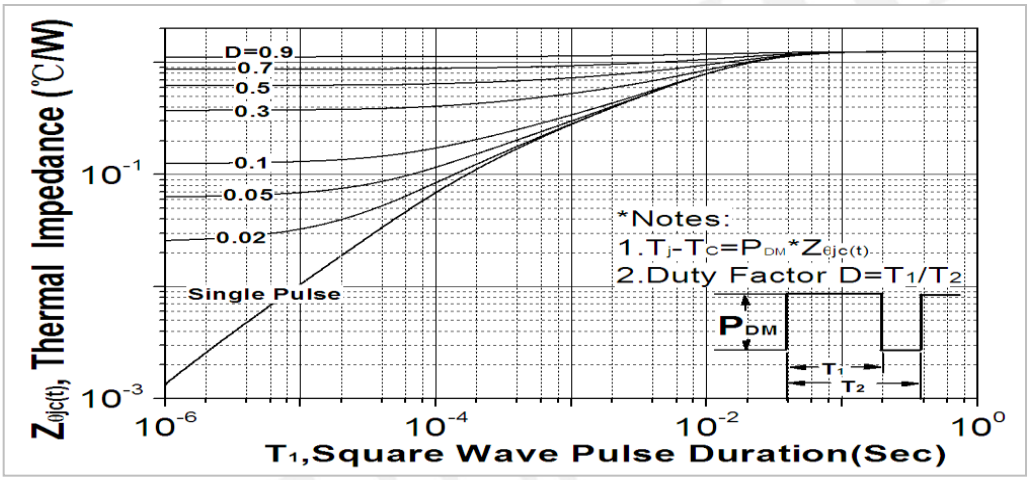


Fig. 14. Transient thermal response curve (TO-252)

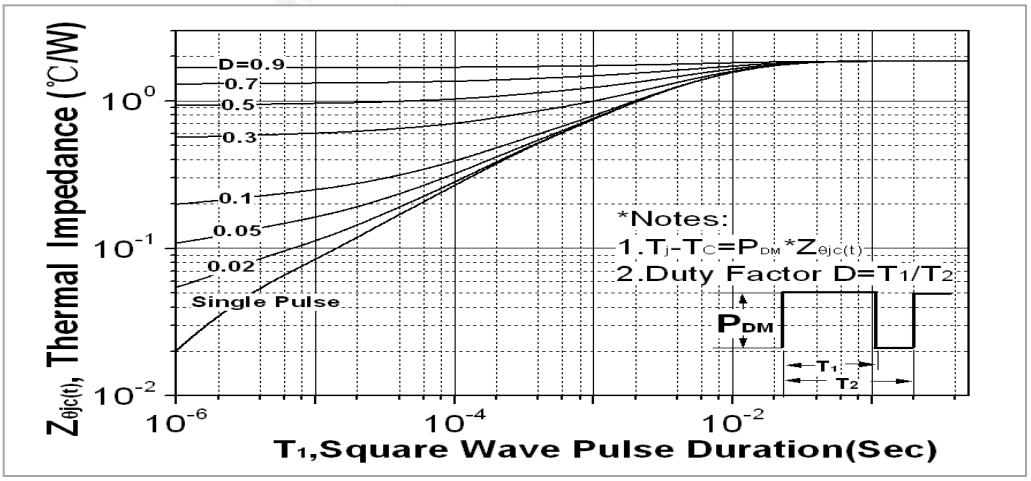


Fig. 15. Gate charge test circuit & waveform

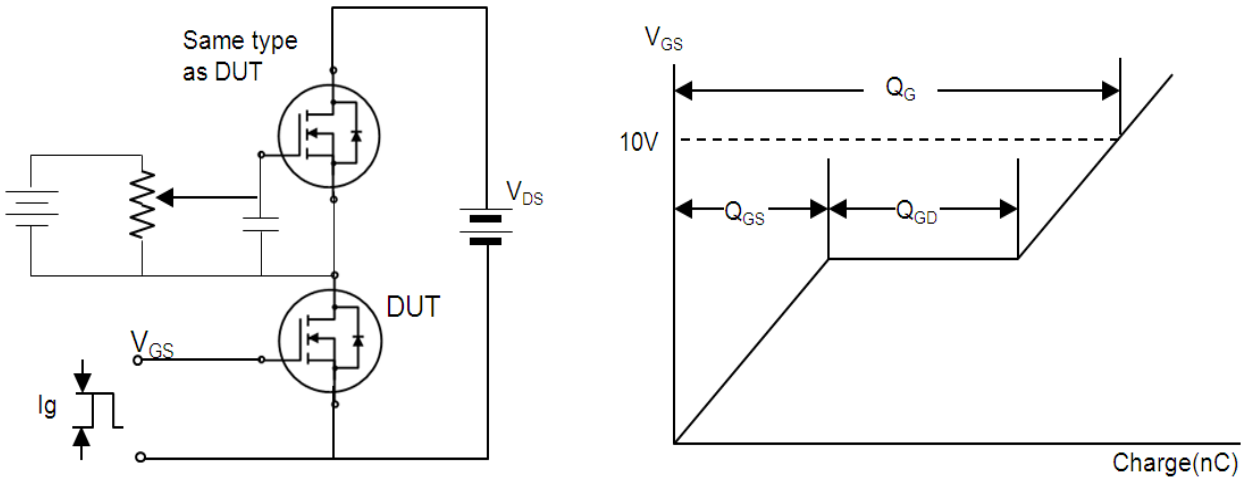


Fig. 16. Switching time test circuit & waveform

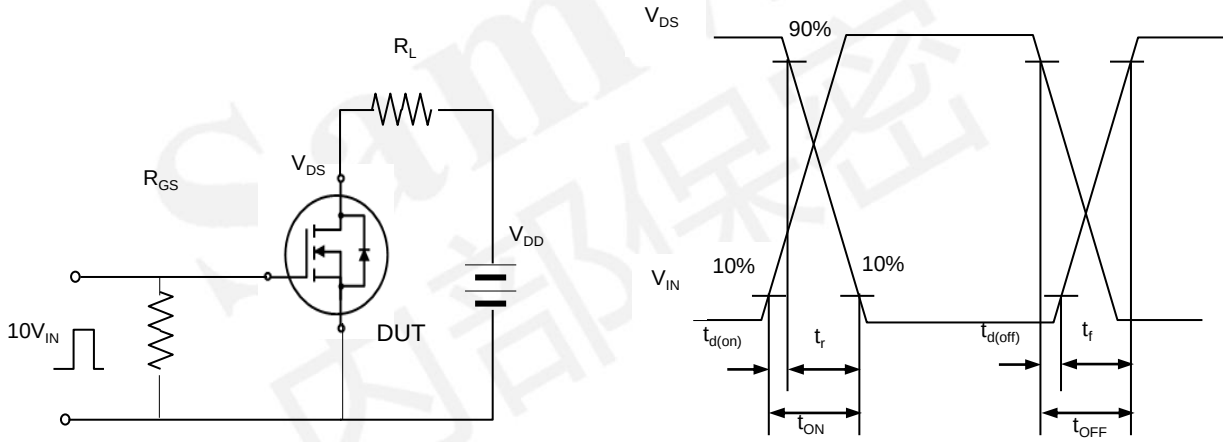


Fig. 17. Unclamped Inductive switching test circuit & waveform

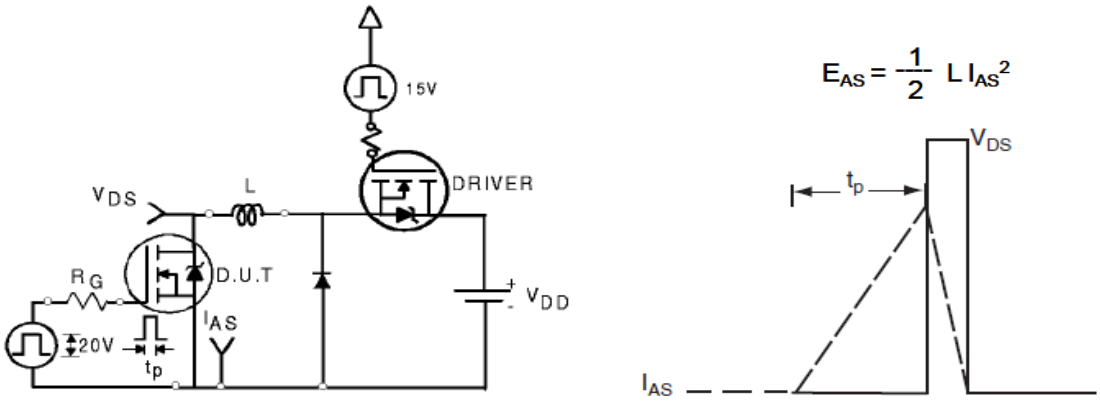
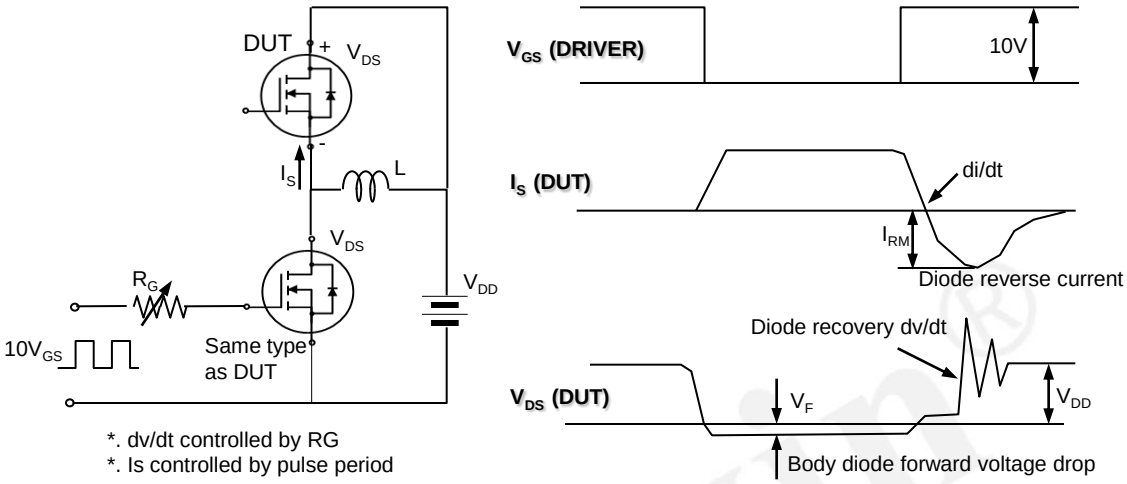


Fig. 18. Peak diode recovery dv/dt test circuit & waveform



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.cn**)

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