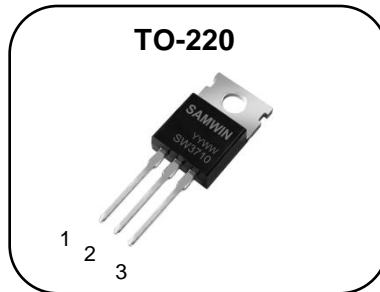


## N-channel MOSFET

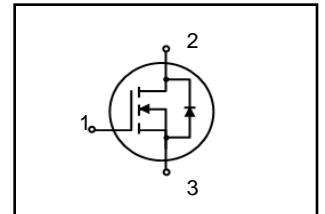
### Features

- High ruggedness
- $R_{DS(ON)}$  (Max 0.023  $\Omega$ )@ $V_{GS}=10V$
- Gate Charge (Typ 100nC)
- Improved dv/dt Capability
- 100% Avalanche Tested



1. Gate 2. Drain 3. Source

$BV_{DSS}$  : 100V  
 $I_D$  : 57A  
 $R_{DS(ON)}$  : 0.023 ohm



### General Description

This N-channel enhancement mode field-effect power transistor using SAMWIN semiconductor's advanced planar stripe, DMOS technology intended for battery Operated systems like a DC-DC converter motor control , ups ,audio amplifier. Also, especially designed to minimize  $R_{DS(ON)}$ , low gate charge and high rugged avalanche characteristics.

### Order Codes

| Item | Sales Type | Marking | Package | Packaging |
|------|------------|---------|---------|-----------|
| 1    | SW P 3710  | SW3710  | TO-220  | TUBE      |

### Absolute maximum ratings

| Symbol         | Parameter  | Value       | Unit |
|----------------|--|-------------|------|
| $V_{DSS}$      | Drain to Source Voltage  | 100         | V    |
| $I_D$          | Continuous Drain Current (@ $T_C=25^\circ C$ )                               | 57          | A    |
|                | Continuous Drain Current (@ $T_C=100^\circ C$ )                              | 40          | A    |
| $I_{DM}$       | Drain current pulsed (note 1)  | 235         | A    |
| $V_{GS}$       | Gate to Source Voltage   | $\pm 20$    | V    |
| $E_{AS}$       | Single pulsed Avalanche Energy (note 2)                                      | 482         | mJ   |
| $E_{AR}$       | Repetitive Avalanche Energy (note 1)   | 7           | mJ   |
| dv/dt          | Peak diode Recovery dv/dt (note 3)   | 5           | V/ns |
| $P_D$          | Total power dissipation (@ $T_C=25^\circ C$ )                                | 160         | W    |
|                | Derating Factor above 25°C   | 1.05        | 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   |

### Thermal characteristics

| Symbol     | Parameter                               | Value |      |      | Unit |
|------------|---|-------|------|------|------|
|            |   | Min.  | Typ. | Max. |      |
| $R_{thjc}$ | Thermal resistance, Junction to case    |       |      | 0.92 | °C/W |
| $R_{thcs}$ | Thermal resistance, Case to Sink        |       | 0.5  |      | °C/W |
| $R_{thia}$ | Thermal resistance, Junction to ambient |       |      | 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>     |   |   |      |       |       |                    |
| $BV_{DSS}$                     | Drain to source breakdown voltage         | $V_{GS}=0V, I_D=250\mu A$                         | 100  | -     | -     | V                  |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown voltage temperature coefficient | $I_D=250\mu A$ , referenced to $25^\circ\text{C}$ | -    | 0.066 | -     | $V/^\circ\text{C}$ |
| $I_{DSS}$                      | Drain to source leakage current           | $V_{DS}=100V, V_{GS}=0V$                          | -    | -     | 1     | $\mu A$            |
|                                |   | $V_{DS}=80V, T_C=125^\circ\text{C}$               | -    | -     | 100   | $\mu A$            |
| $I_{GSS}$                      | 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                    | $V_{DS}=V_{GS}, I_D=250\mu A$                     | 2.0  | -     | 4.0   | V                  |
| $R_{DS(ON)}$                   | Drain to source on state resistance       | $V_{GS}=10V, I_D = 30A$                           |      |       | 0.023 | $\Omega$           |
| <b>Dynamic characteristics</b> |   |   |      |       |       |                    |
| $C_{ISS}$                      | Input capacitance                         | $V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$            |      | 3400  | 4250  | pF                 |
| $C_{OSS}$                      | Output capacitance                        |   |      | 1320  | 1650  |                    |
| $C_{rSS}$                      | Reverse transfer capacitance              |   |      | 215   | 340   |                    |
| $t_{d(on)}$                    | Turn on delay time                        | $V_{DS}=50V, I_D=57A, R_G=25\Omega$               |      | 60    | 120   | ns                 |
| $t_r$                          | Rising time                               |   |      | 70    | 160   |                    |
| $t_{d(off)}$                   | Turn off delay time                       |   |      | 195   | 310   |                    |
| $t_f$                          | Fall time                                 |   |      | 120   | 260   |                    |
| $Q_g$                          | Total gate charge                         | $V_{DS}=80V, V_{GS}=10V, I_D=57A$                 |      | 96    | 140   | nC                 |
| $Q_{gs}$                       | Gate-source charge                        |   |      | 23    | -     |                    |
| $Q_{gd}$                       | Gate-drain charge                         |   |      | 36    | -     |                    |

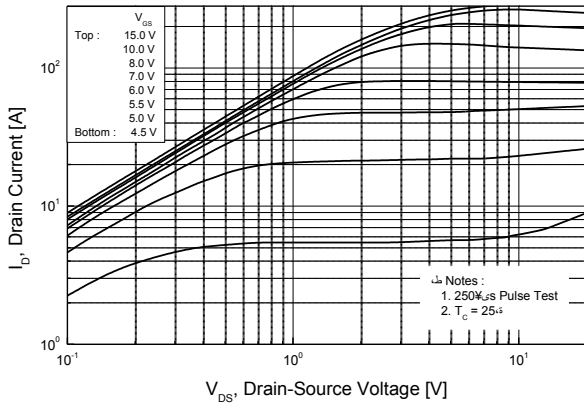
### Source to drain diode ratings characteristics

| Symbol   | Parameter                     | Test conditions                                   | Min. | Typ. | Max. | Unit |
|----------|-------------------------------|---|------|------|------|------|
| $I_S$    | Continuous source current     | Integral reverse p-n Junction diode in the MOSFET | -    | -    | 57   | A    |
| $I_{SM}$ | Pulsed source current         |   | -    | -    | 235  | A    |
| $V_{SD}$ | Diode forward voltage drop.   | $I_S=57A, V_{GS}=0V$                              | -    | -    | 1.5  | V    |
| $T_{rr}$ | Reverse recovery time         | $I_S=57A, V_{GS}=0V,$                             | -    | 92   | -    | ns   |
| $Q_{rr}$ | Breakdown voltage temperature | $di_f/dt=100A/\mu s$                              | -    | 160  | -    | nC   |

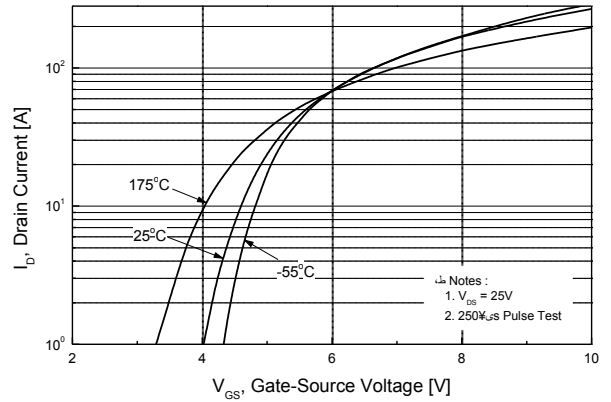
#### ※. Notes

1. Repeitative rating : pulse width limited by junction temperature.
2.  $L = 270\mu H, I_{AS} = 57A, V_{DD} = 25V, R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 57A, di/dt = 300A/\mu s, V_{DD} \leq BV_{DSS}$ , Staring  $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
5. Essentially independent of operating temperature.

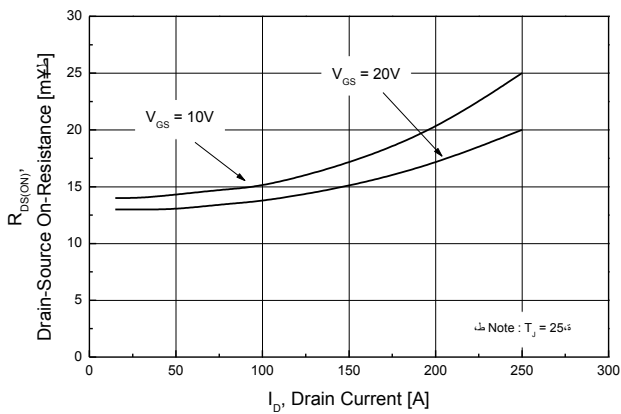
**Fig. 1. On-state characteristics**



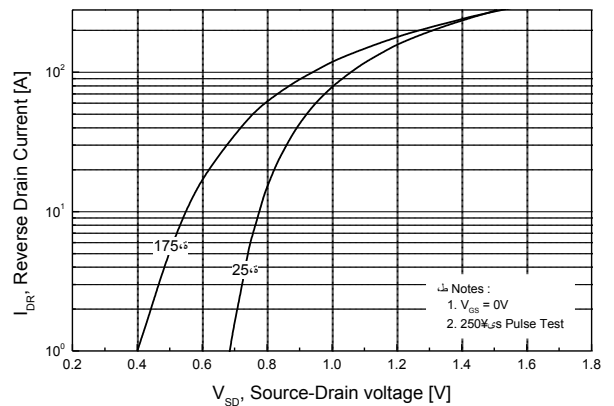
**Fig. 2. Transfer characteristics**



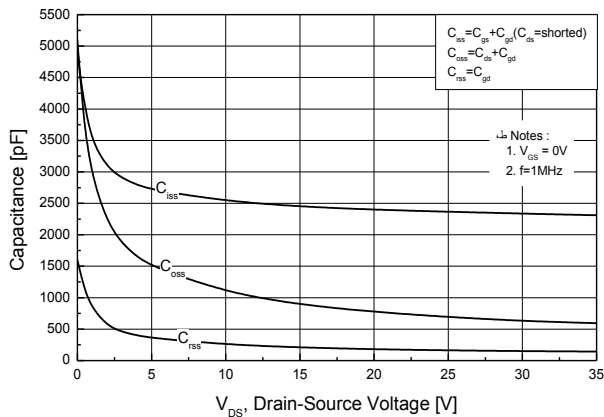
**Fig. 3. On-resistance variation vs. drain current and gate voltage**



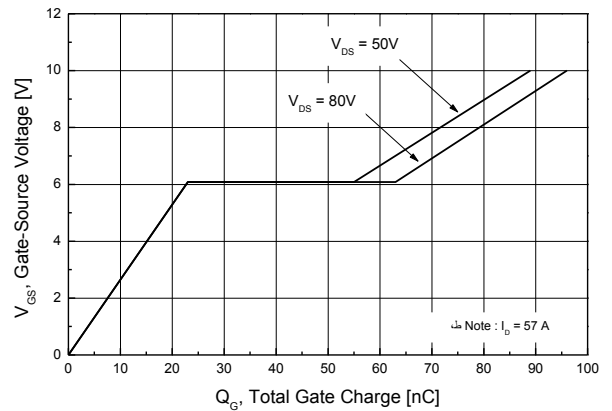
**Fig. 4. On state current vs. diode forward voltage**



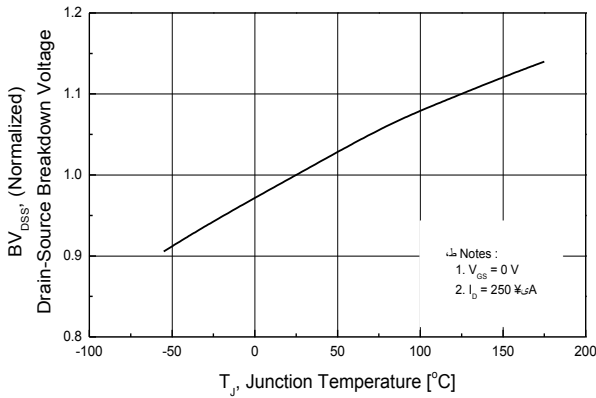
**Fig. 5. Capacitance characteristics (Non-Repetitive)**



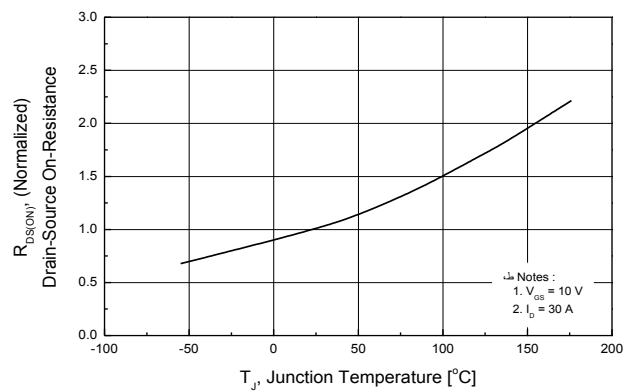
**Fig. 6. Gate charge characteristics**



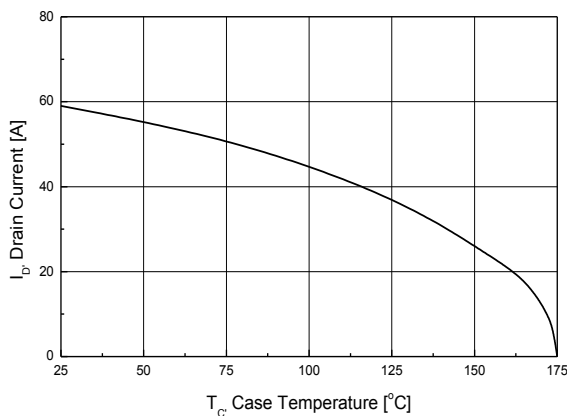
**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**



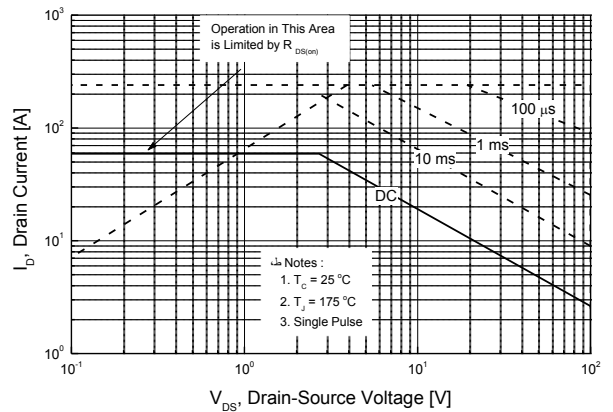
**Fig. 8. On resistance variation vs. junction temperature**



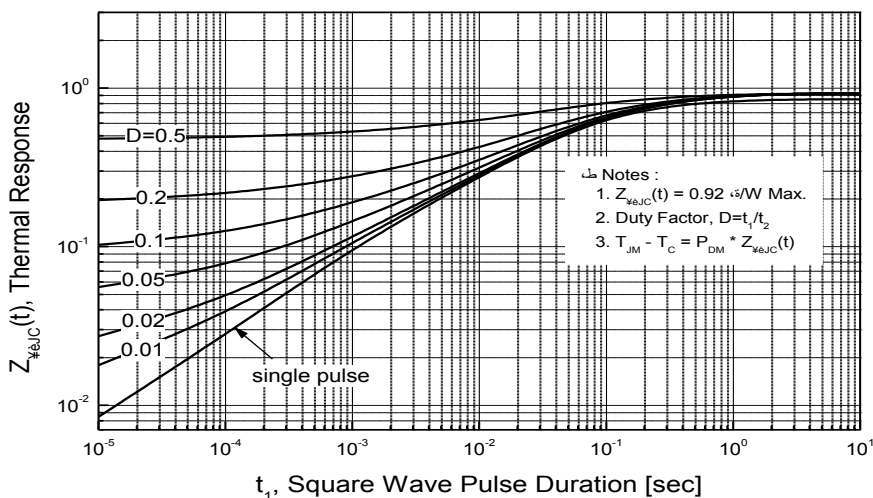
**Fig. 9. Maximum drain current vs. case temperature.**



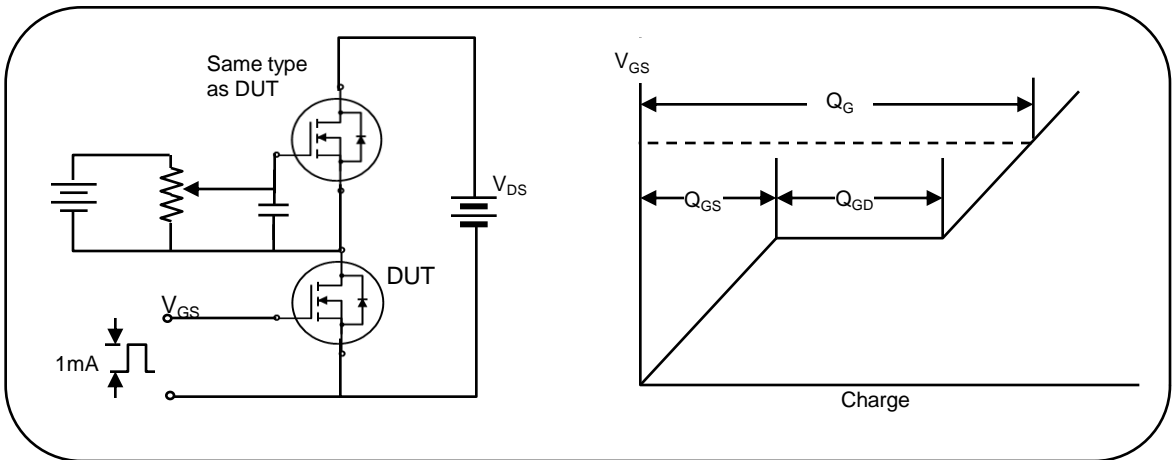
**Fig. 10. Maximum safe operating area**



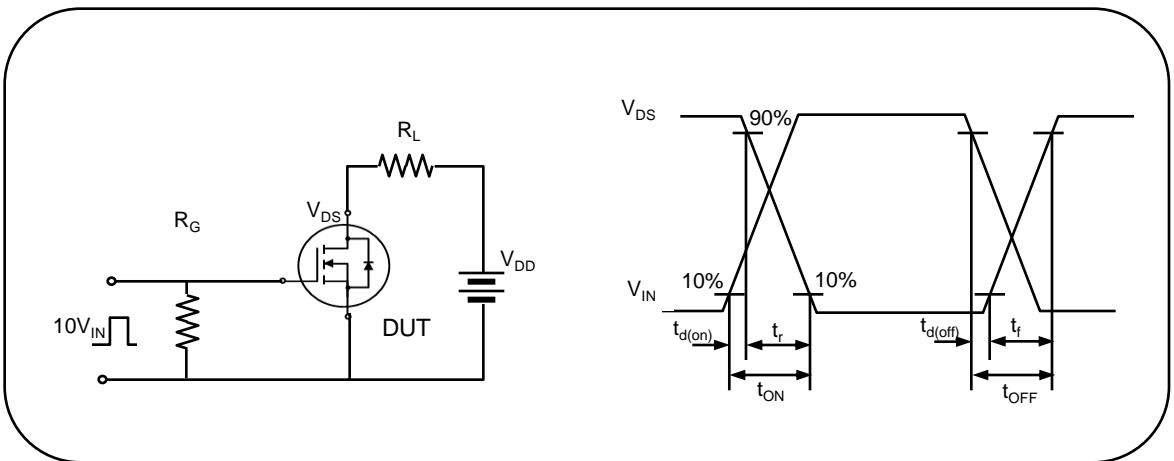
**Fig. 11. Transient thermal response curve**



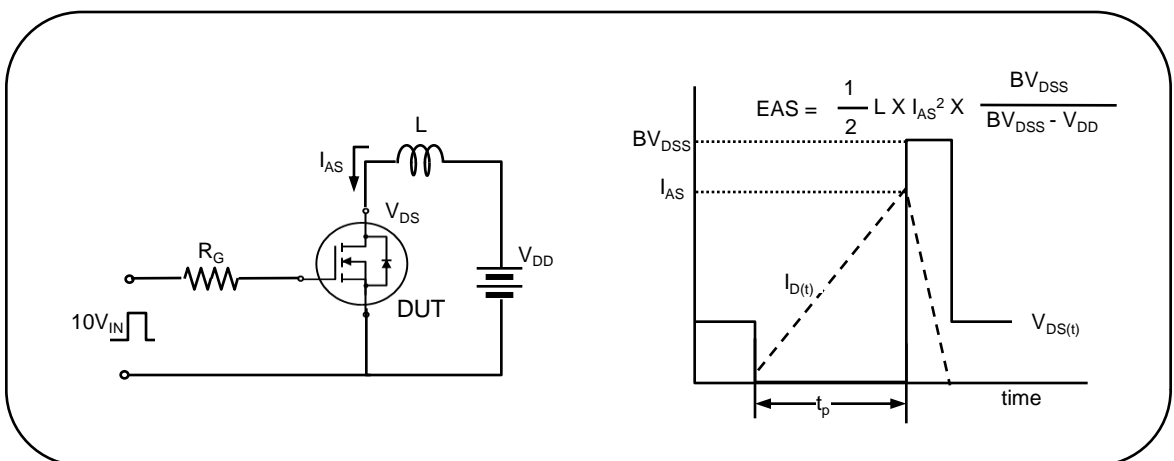
**Fig. 12. Gate charge test circuit & waveform**



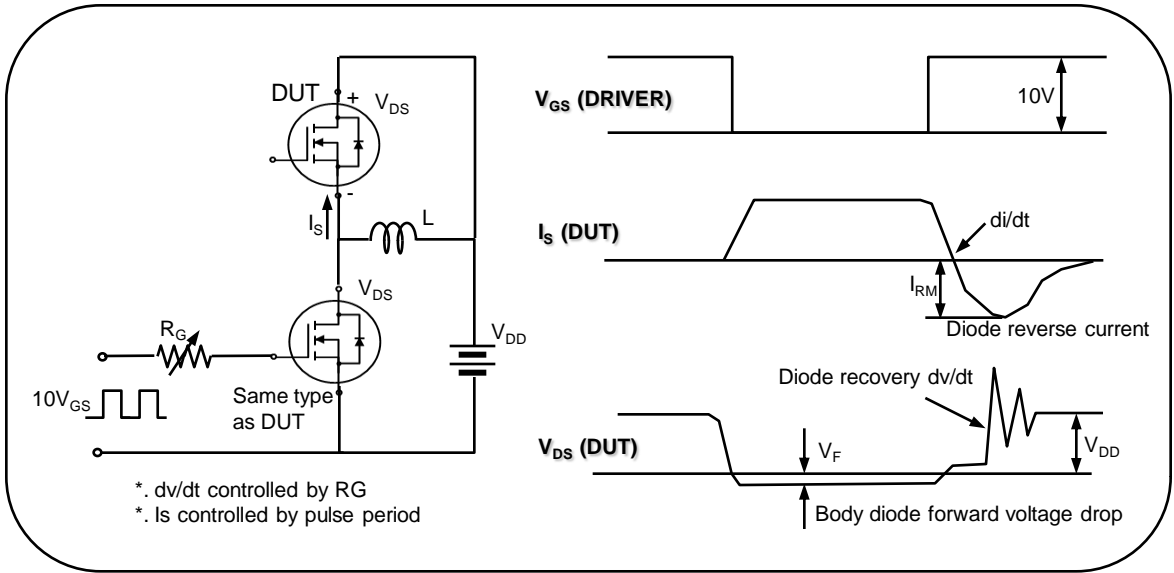
**Fig. 13. Switching time test circuit & waveform**



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



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



## REVISION HISTORY

| Revision No. | Changed Characteristics                                | Responsible | Date       | Issuer |
|--------------|--|-------------|------------|--------|
| REV 1.0      | Origination, First Release                             | Alice Nie   | 2007.12.05 | XZQ    |
| REV 2.0      | Updated the format of datasheet and added Order Codes. | Alice Nie   | 2011.03.24 | XZQ    |

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**芯派科技**  
SEMIPOWER

西安芯派电子科技有限公司

地址：西安市高新区高新一路25号创新大厦MF6

电话：029 - 88253717 传真：029 - 88251977



**芯源科技**

深圳市南方芯源科技有限公司

地址：深圳市福田区天安数码城时代大厦A座2005

电话：0755 - 83981818 传真：0755 - 83476838