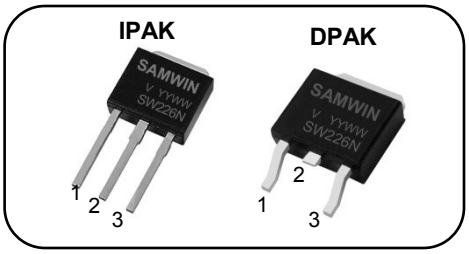
## *N-channel MOSFET*

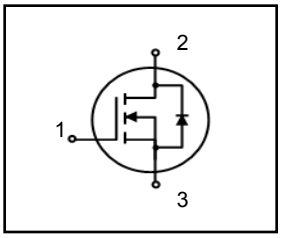
**$BV_{DSS}$ : 600V**
**$I_D$ : 4.0A**
**$R_{DS(ON)}$ : 2.5ohm**

### Features

- High ruggedness
- $R_{DS(ON)}$ (Max 2.5 Ω)@$V_{GS}$=10V
- Gate Charge (Typical 34nC)
- Improved dv/dt Capability
- 100% Avalanche Tested




**1. Gate 2. Drain 3. Source**




### 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. This power MOSFET is usually used at high efficient DC to DC converter block and switch mode power supply.

#### Order Codes

| Item | Sales Type | Marking | Package | Packaging |
|---|---|---|---|---|
| 1 | SW I 226NV | SW226NV | IPAK | TUBE |
| 2 | SW D 226NV | SW226NV | DPAK | REEL |

#### Absolute maximum ratings

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | | 600 | V |
| $I_D$ | Continuous Drain Current (@$T_C$=25°C) | | 4.0* | A |
| | Continuous Drain Current (@$T_C$=100°C) | | 2.2* | A |
| $I_{DM}$ | Drain current pulsed | (note 1) | 16 | A |
| $V_{GS}$ | Gate to Source Voltage | | ±30 | V |
| $E_{AS}$ | Single pulsed Avalanche Energy | (note 2) | 342 | mJ |
| $E_{AR}$ | Repetitive Avalanche Energy | (note 1) | 32 | mJ |
| dv/dt | Peak diode Recovery dv/dt | (note 3) | 4.5 | V/ns |
| $P_D$ | Total power dissipation (@$T_C$=25°C) | | 270 | W |
| | Derating Factor above 25°C | | 2.16 | 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 |
|---|---|---|---|
| $R_{thjc}$ | Thermal resistance, Junction to case | 0.46 | °C/W |
| $R_{thja}$ | Thermal resistance, Junction to ambient | 80 | °C/W |

**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 | 600 | - | - | V |
| $\Delta BV_{DSS}$ / $\Delta T_J$ | Breakdown voltage temperature coefficient | $I_D$=250uA, referenced to 25°C | - | 0.65 | - | V/°C |
| $I_{DSS}$ | Drain to source leakage current | $V_{DS}$=600V, $V_{GS}$=0V | - | - | 1 | uA |
| | | $V_{DS}$=480V, $T_C$=125°C | - | - | 10 | uA |
| $I_{GSS}$ | Gate to source leakage current, forward | $V_{GS}$=30V, $V_{DS}$=0V | - | - | 100 | nA |
| | Gate to source leakage current, reverse | $V_{GS}$=-30V, $V_{DS}$=0V | - | - | -100 | nA |
| **On characteristics** | | | | | | |
| $V_{GS(TH)}$ | Gate threshold voltage | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 2.0 | - | 4.0 | V |
| $R_{DS(ON)}$ | Drain to source on state resistance | $V_{GS}$=10V, $I_D$ = 2.0A | | 2.0 | 2.5 | Ω |
| Gfs | Forward Transconductance | VDS =40 V, ID = 2 A | 3 | | | S |
| **Dynamic characteristics** | | | | | | |
| $C_{iss}$ | Input capacitance | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | | 571 | 740 | pF |
| $C_{oss}$ | Output capacitance | | | 70 | 90 | |
| $C_{rss}$ | Reverse transfer capacitance | | | 18 | 24 | |
| $t_{d(on)}$ | Turn on delay time | $V_{DS}$=300V, $I_D$=4.0A, $R_G$=25Ω (note 4, 5) | | 11 | 30 | ns |
| tr | Rising time | | | 27 | 60 | |
| $t_{d(off)}$ | Turn off delay time | | | 86 | 200 | |
| $t_f$ | Fall time | | | 34 | 80 | |
| $Q_g$ | Total gate charge | $V_{DS}$=480V, $V_{GS}$=10V, $I_D$=4.0A, (note 4, 5) | | 27 | 60 | nC |
| $Q_{gs}$ | Gate-source charge | | | 3.2 | - | |
| $Q_{gd}$ | Gate-drain charge | | | 14 | - | |

**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 | - | - | 4 | A |
| $I_{SM}$ | Pulsed source current | | - | - | 16 | A |
| $V_{SD}$ | Diode forward voltage drop. | $I_S$=4.0A, $V_{GS}$=0V | - | - | 1.5 | V |
| $T_{rr}$ | Reverse recovery time | $I_S$=4.0A, $V_{GS}$=0V, $dI_F/dt$=100A/us | - | 338 | - | ns |
| $Q_{rr}$ | Reverse recovery Charge | | - | 2.62 | - | uC |

※. Notes
1. Repeatitive rating : pulse width limited by junction temperature.
2. L = 42mH, $I_{AS}$ = 4.0A, $V_{DD}$ = 50V, $R_G$=25Ω, Starting $T_J$ = 25°C
3. $I_{SD}$ ≤ 4.0A, 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**

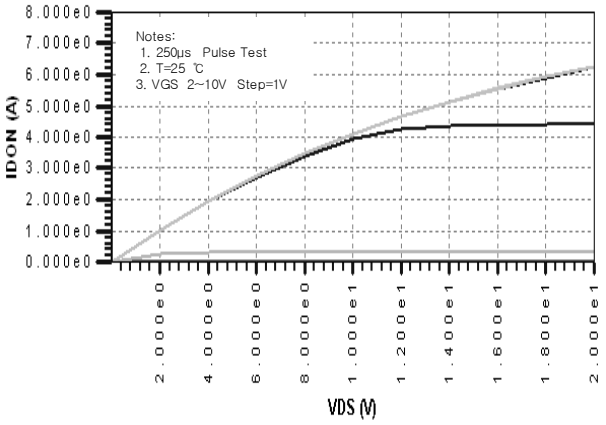



**Fig. 2. On-resistance variation vs. drain current and gate voltage**

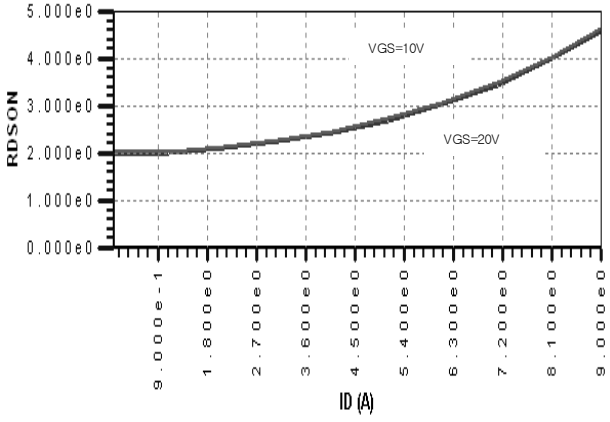



**Fig. 3. Gate charge characteristics**

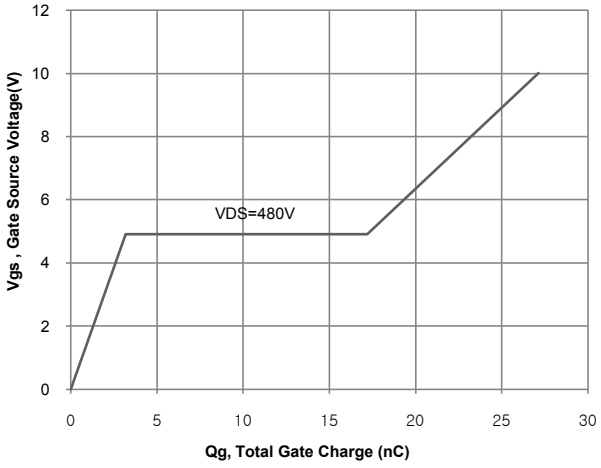



**Fig. 4. On state current vs. diode forward voltage**

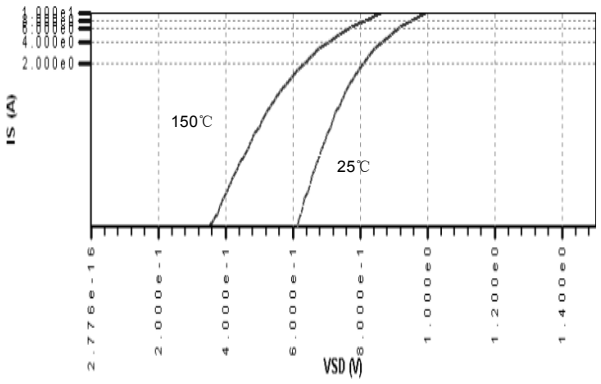



**Fig 5. Breakdown Voltage Variation vs. Junction Temperature**

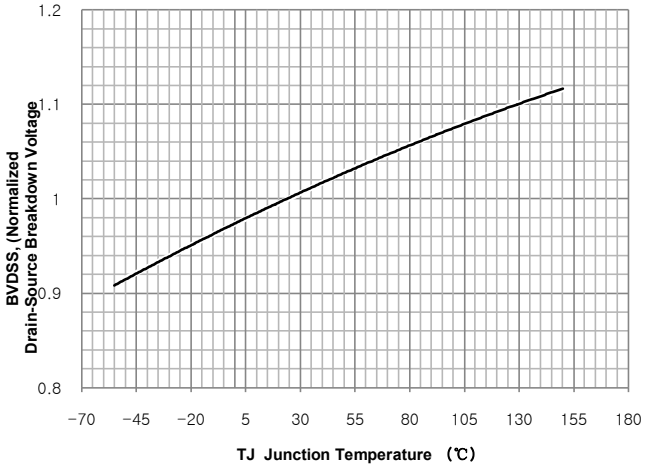



**Fig. 6. On resistance variation vs. junction temperature**

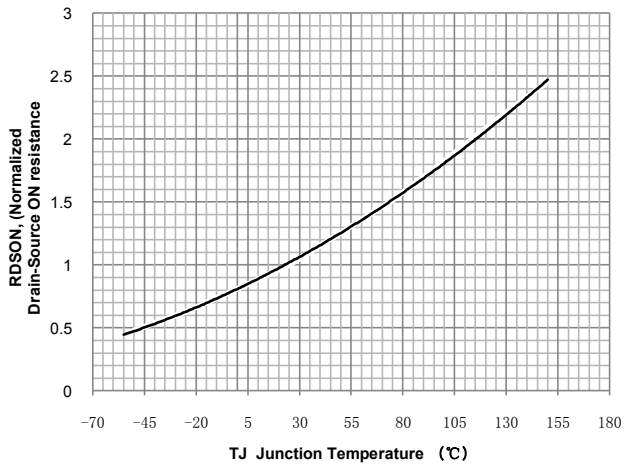


**Fig. 7. Maximum safe operating area (TO-251)**

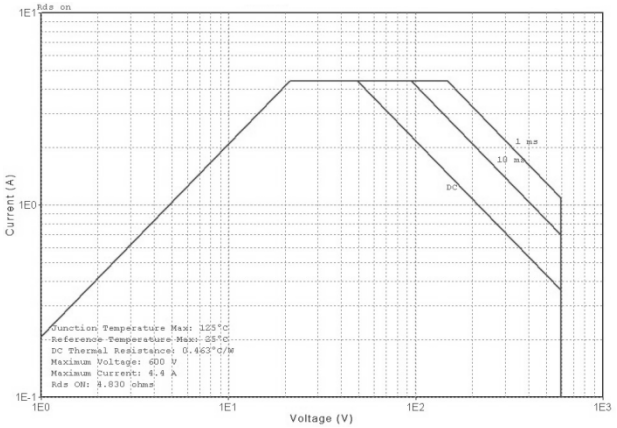



**Fig. 8. Transient thermal response curve**

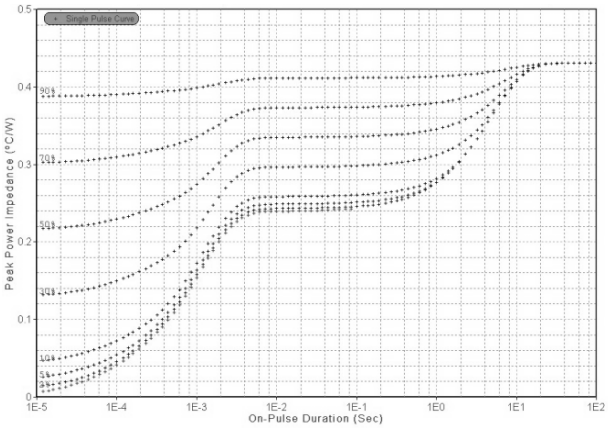



**Fig. 9. Gate charge test circuit & waveform**

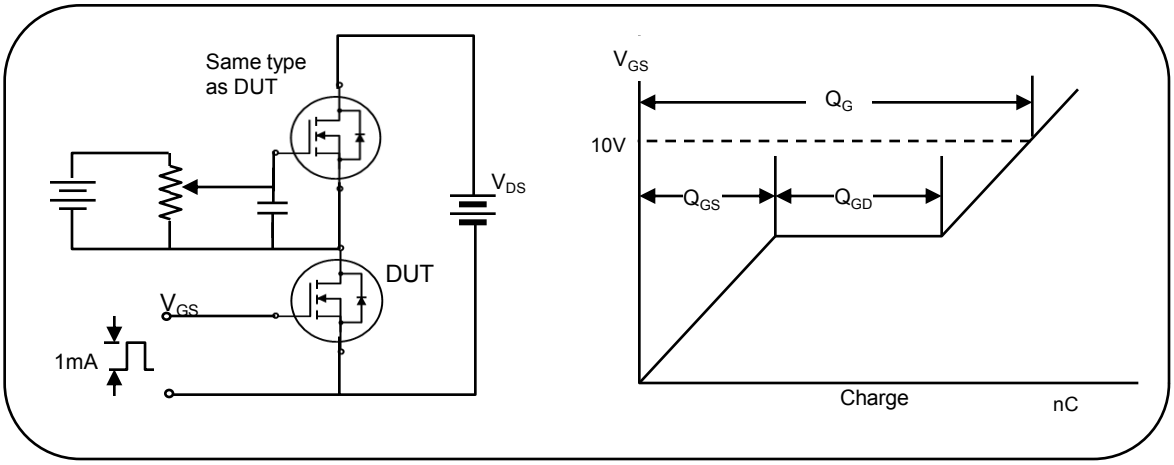



**Fig. 10. Switching time test circuit & waveform**

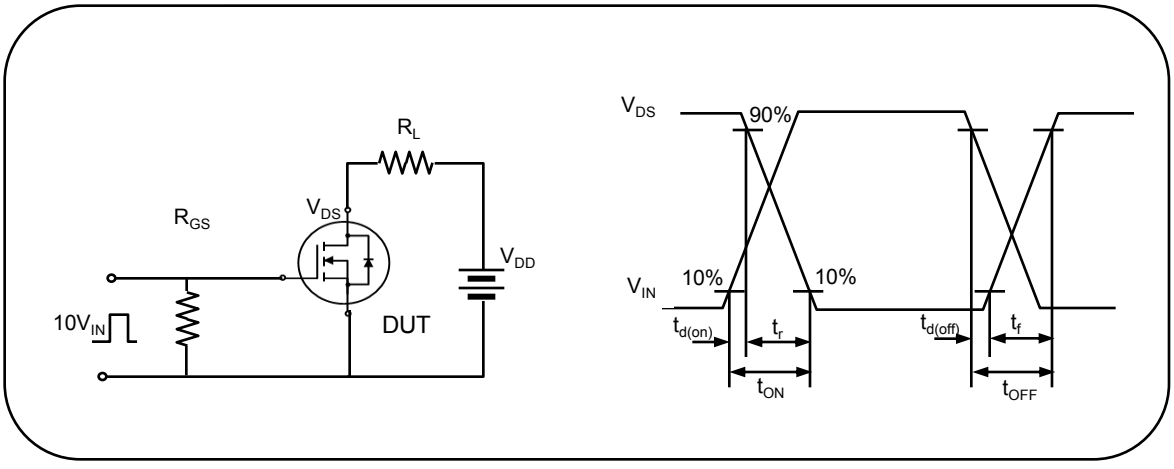


**Fig. 11. Unclamped Inductive switching test circuit & waveform**

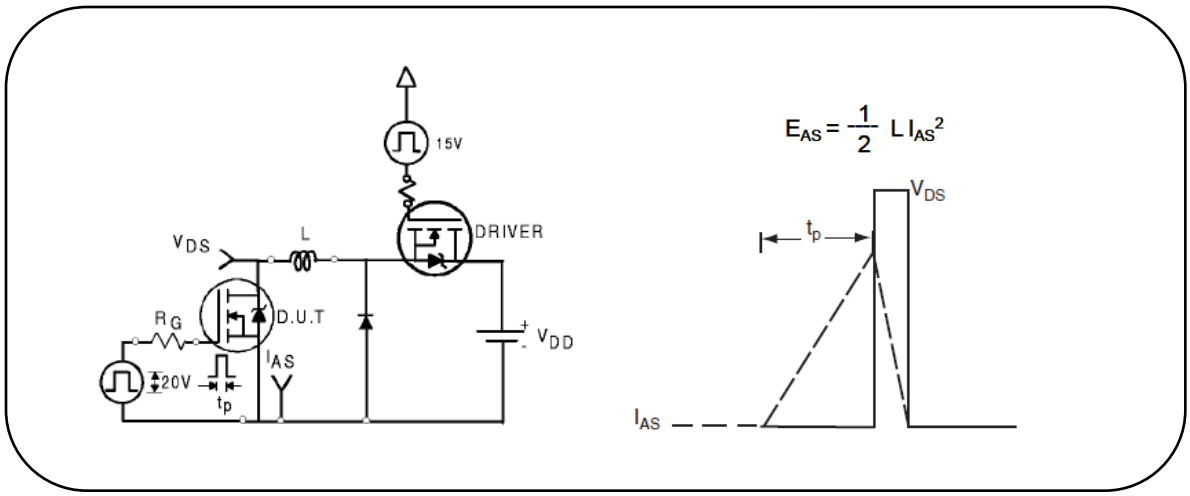



**Fig. 12. Peak diode recovery dv/dt test circuit & waveform**