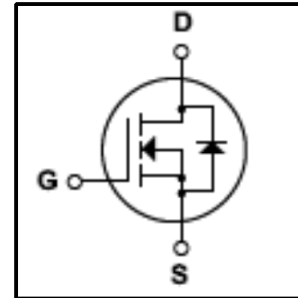


## Silicon N-Channel MOSFET

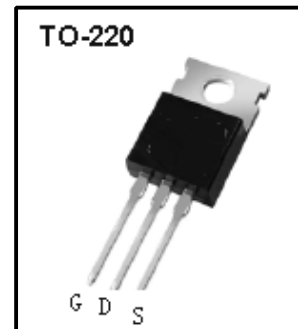
### Features

- 12A, 650V,  $R_{DS(on)}$  (Max 0.78 $\Omega$ ) @  $V_{GS}=10V$
- Ultra-low Gate Charge (Typical 30nC)
- Fast Switching Capability
- 100% Avalanche Tested
- Maximum Junction Temperature Range (150°C)



### General Description

This Power MOSFET is produced using Winsemi's advanced planar stripe, VDMOS technology. This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics. This devices is specially well suited for AC-DC switching power supplies, DC-DC power converters, high voltage H-bridge motor drive PMW



### Absolute Maximum Ratings

| Symbol         | Parameter                                       | Value    | Units         |
|----------------|-------------------------------------------------|----------|---------------|
| $V_{DSS}$      | Drain Source Voltage                            | 650      | V             |
| $I_D$          | Continuous Drain Current (@ $T_c=25^\circ C$ )  | 12       | A             |
|                | Continuous Drain Current (@ $T_c=100^\circ C$ ) |          | A             |
| $I_{DM}$       | Drain Current Pulsed (Note1)                    |          | A             |
| $V_{GS}$       | Gate to Source Voltage                          | $\pm 30$ | V             |
| $E_{AS}$       | Single Pulsed Avalanche Energy (Note 2)         | 990      | mJ            |
| $E_{AR}$       | Repetitive Avalanche Energy (Note 1)            | 22       | mJ            |
| $dv/dt$        | Peak Diode Recovery $dv/dt$ (Note 3)            | 4.5      | V/ns          |
| $P_D$          | Total Power Dissipation (@ $T_c=25^\circ C$ )   | 178      | W             |
|                | Derating Factor above $25^\circ C$              | 1.43     | W/ $^\circ C$ |
| $T_J, T_{stg}$ | Junction and Storage Temperature                | -55~150  | $^\circ C$    |
| $T_L$          | Channel Temperature                             | 300      | $^\circ C$    |

### Thermal Characteristics

| Symbol    | Parameter                               | Value |     |      | Units      |
|-----------|-----------------------------------------|-------|-----|------|------------|
|           |                                         | Min   | Typ | Max  |            |
| $R_{QJC}$ | Thermal Resistance, Junction-to-Case    | -     | -   | 0.70 | $^\circ C$ |
| $R_{QCS}$ | Thermal Resistance, Case-to-Sink        | -     | -   | -    | $^\circ C$ |
| $R_{QJA}$ | Thermal Resistance, Junction-to-Ambient | -     | -   | 62.5 | W          |

## Electrical Characteristics (Tc = 25°C)

| Characteristics                                 |               | Symbol               | Test Condition                                                                                 | Min | Type | Max  | Unit |
|-------------------------------------------------|---------------|----------------------|------------------------------------------------------------------------------------------------|-----|------|------|------|
| Gate leakage current                            |               | I <sub>GSS</sub>     | V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V                                                 | -   | -    | ±100 | nA   |
| Gate-source breakdown voltage                   |               | V <sub>(BR)GSS</sub> | I <sub>G</sub> = ±10 μA, V <sub>DS</sub> = 0 V                                                 | ±30 | -    | -    | V    |
| Drain cut-off current                           |               | I <sub>DSS</sub>     | V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V                                                 | -   | -    | 10   | μA   |
|                                                 |               |                      | V <sub>DS</sub> = 480 V, T <sub>C</sub> = 125°C                                                | -   | -    | 100  | μA   |
| Drain-source breakdown voltage                  |               | V <sub>(BR)DSS</sub> | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V                                                 | 650 | -    | -    | V    |
| Gate threshold voltage                          |               | V <sub>GS(th)</sub>  | V <sub>DS</sub> = 10 V, I <sub>D</sub> =250 μA                                                 | 3   | -    | 4.5  | V    |
| Drain-source ON resistance                      |               | R <sub>DS(ON)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6A                                                    | -   | 0.64 | 0.78 | Ω    |
| Forward Transconductance                        |               | g <sub>fs</sub>      | V <sub>DS</sub> = 50 V, I <sub>D</sub> =6A                                                     | -   | 6.4  | -    | S    |
| Input capacitance                               |               | C <sub>iss</sub>     | V <sub>DS</sub> = 25 V,<br><br>V <sub>GS</sub> = 0 V,<br><br>f = 1 MHz                         | -   | 1830 | -    | pF   |
| Reverse transfer capacitance                    |               | C <sub>rss</sub>     |                                                                                                | -   | 155  | -    |      |
| Output capacitance                              |               | C <sub>oss</sub>     |                                                                                                | -   | 2.0  | -    |      |
| Switching time                                  | Rise time     | t <sub>r</sub>       | V <sub>DD</sub> =325V,<br><br>I <sub>D</sub> = 12A<br><br>R <sub>G</sub> =25Ω<br><br>(Note4,5) | -   | 50   | -    | ns   |
|                                                 | Turn-on time  | t <sub>on</sub>      |                                                                                                | -   | 49   | -    |      |
|                                                 | Fall time     | t <sub>f</sub>       |                                                                                                | -   | 310  | -    |      |
|                                                 | Turn-off time | t <sub>off</sub>     |                                                                                                | -   | 54   | -    |      |
| Total gate charge (gate-source plus gate-drain) |               | Q <sub>g</sub>       | V <sub>DD</sub> =520 V,<br>V <sub>GS</sub> = 10 V,<br>I <sub>D</sub> = 12A<br><br>(Note4,5)    | -   | 51.7 | -    | nC   |
| Gate-source charge                              |               | Q <sub>gs</sub>      |                                                                                                | -   | 9.6  | -    |      |
| Gate-drain (“miller”) Charge                    |               | Q <sub>gd</sub>      |                                                                                                | -   | 18.6 | -    |      |

## Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristics                  | Symbol    | Test Condition                                                                                 | Min | Type | Max | Unit          |
|----------------------------------|-----------|------------------------------------------------------------------------------------------------|-----|------|-----|---------------|
| Continuous drain reverse current | $I_{DR}$  | -                                                                                              | -   | -    | 12  | A             |
| Pulse drain reverse current      | $I_{DRP}$ | -                                                                                              | -   | -    | 48  | A             |
| Forward voltage (diode)          | $V_{DSF}$ | $I_{DR} = 10\text{A}, V_{GS} = 0 \text{ V}$                                                    | -   | -    | 1.4 | V             |
| Reverse recovery time            | $t_{rr}$  | $I_{DR} = 10 \text{ A}, V_{GS} = 0 \text{ V},$<br>$dI_{DR} / dt = 100 \text{ A} / \mu\text{s}$ | -   | 450  | -   | ns            |
| Reverse recovery charge          | $Q_{rr}$  |                                                                                                | -   | 5.0  | -   | $\mu\text{C}$ |

Note 1.Repeativity rating :pulse width limited by junction temperature

2.L=14mH,I<sub>AS</sub>=12A,V<sub>DD</sub>=95V,R<sub>G</sub>=25Ω,Starting T<sub>J</sub>=25°C

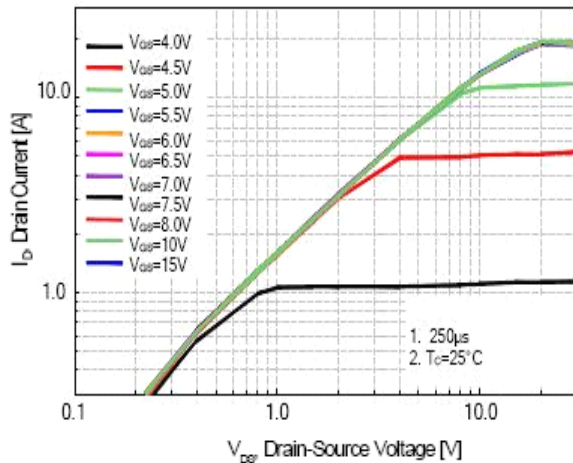
3.I<sub>SD</sub>≤10A,di/dt≤200A/μs, V<sub>DD</sub><BV<sub>DSS</sub>,STARTING T<sub>J</sub>=25°C

4.Pulse Test: Pulse Width≤300μs,Duty Cycle≤2%

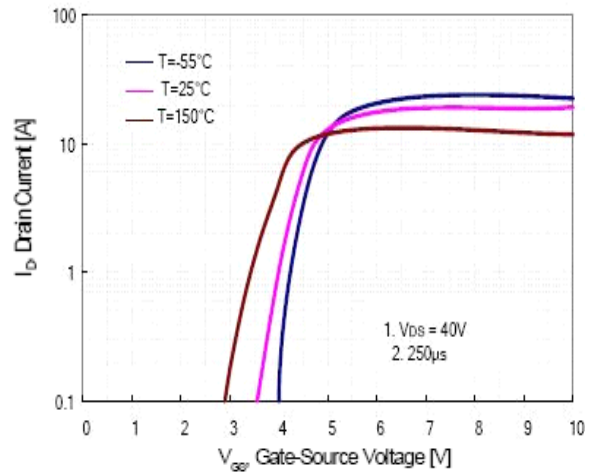
5.Essentially independent of operating temperature.

This transistor is an electrostatic sensitive device

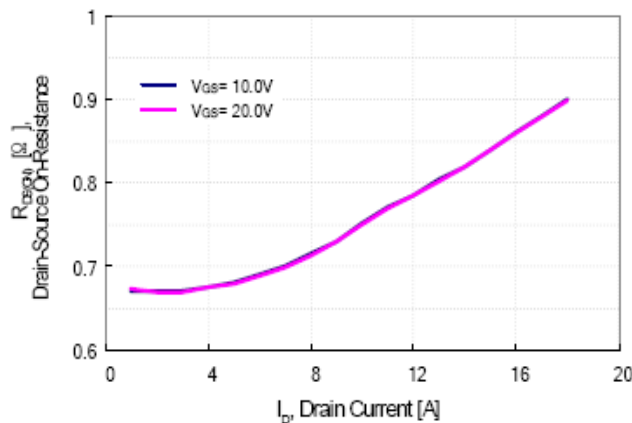
Please handle with caution



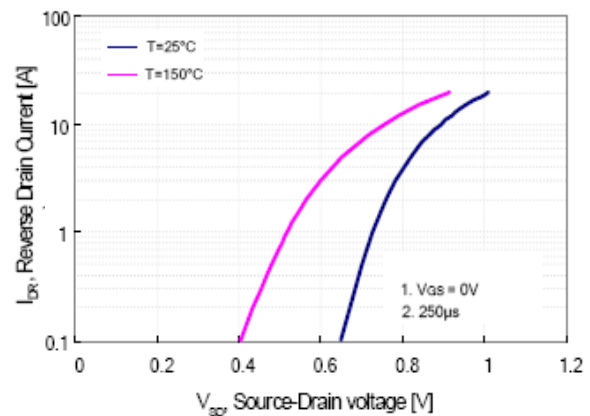
**Fig. 1 On-State Characteristics**



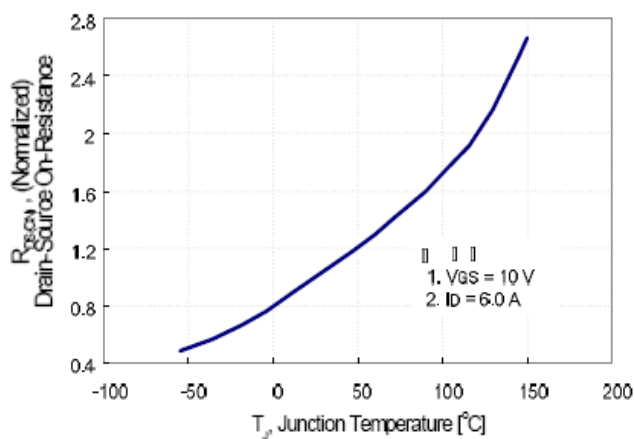
**Fig.2 Transfer Current Characteristics**



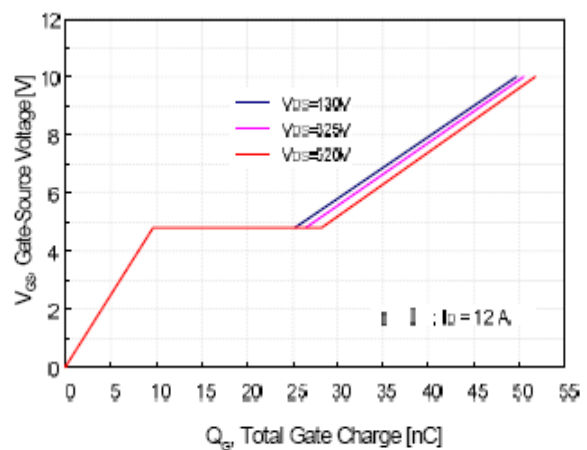
**Fig.3 On-Resistance Variation vs Drain Current**



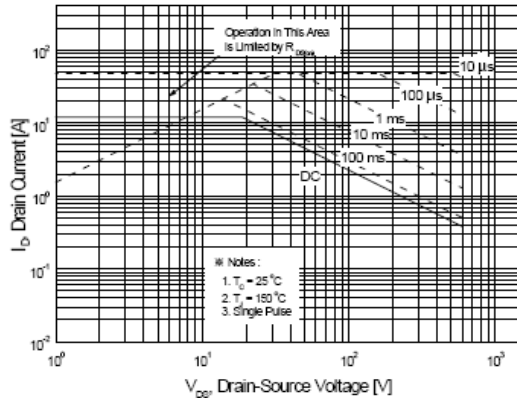
**Fig.4 Body Diode Forward Voltage Variation with Source Current And Temperature**



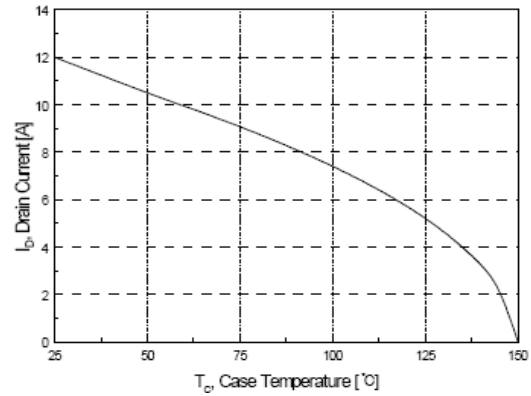
**Fig.5 On-Resistance Variation vs Junction Temperature**



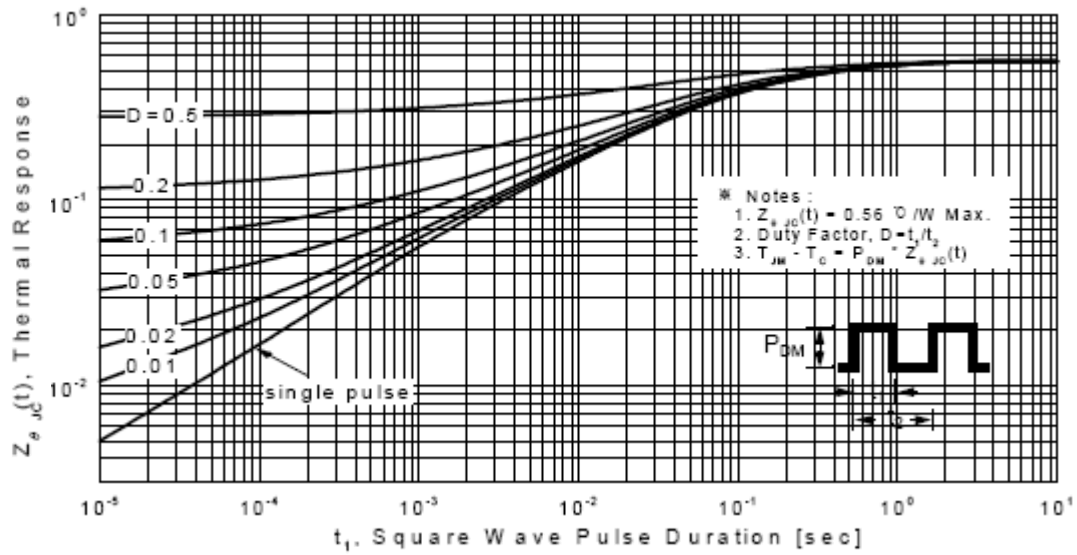
**Fig.6 Gate Charge Characteristics**



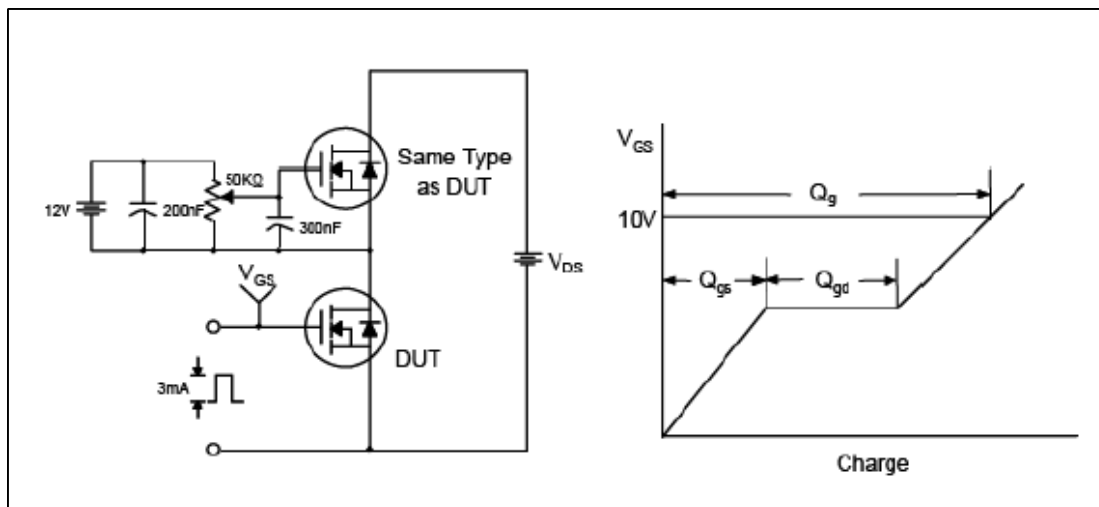
**Fig.7 Maximum Safe Operation Area**



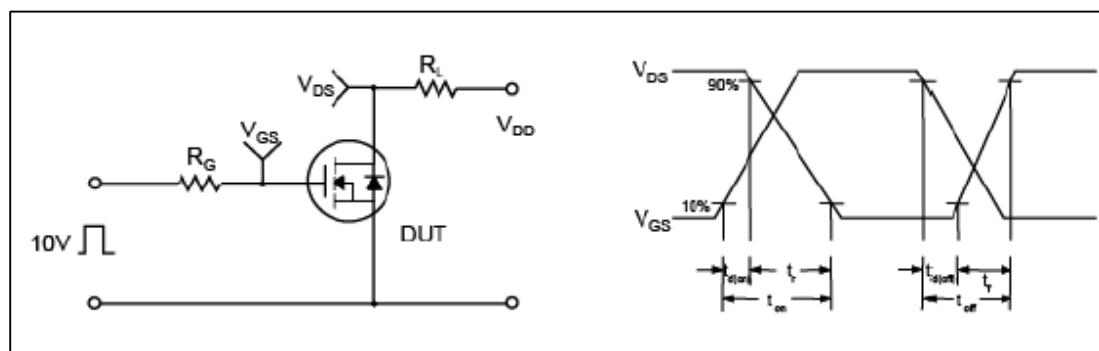
**Fig.8 Maximum Drain Current vs Case Temperature**



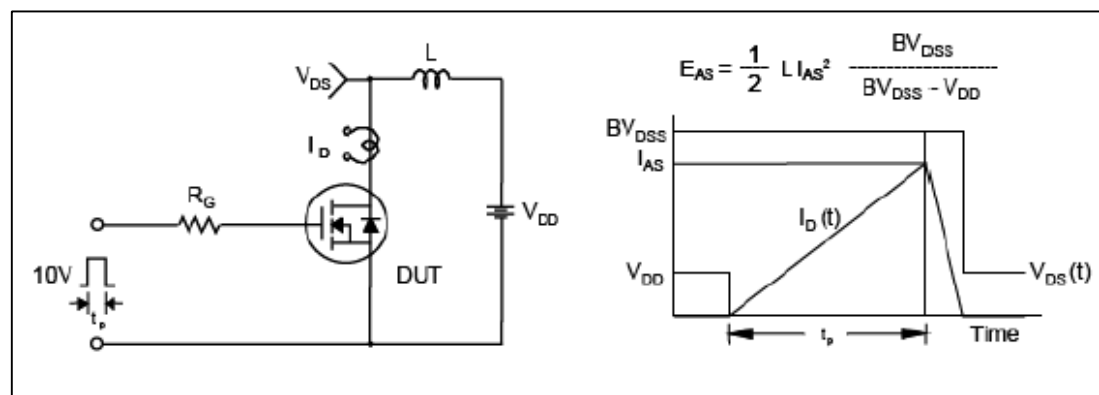
**Fig.9 Transient Thermal Response Curve**



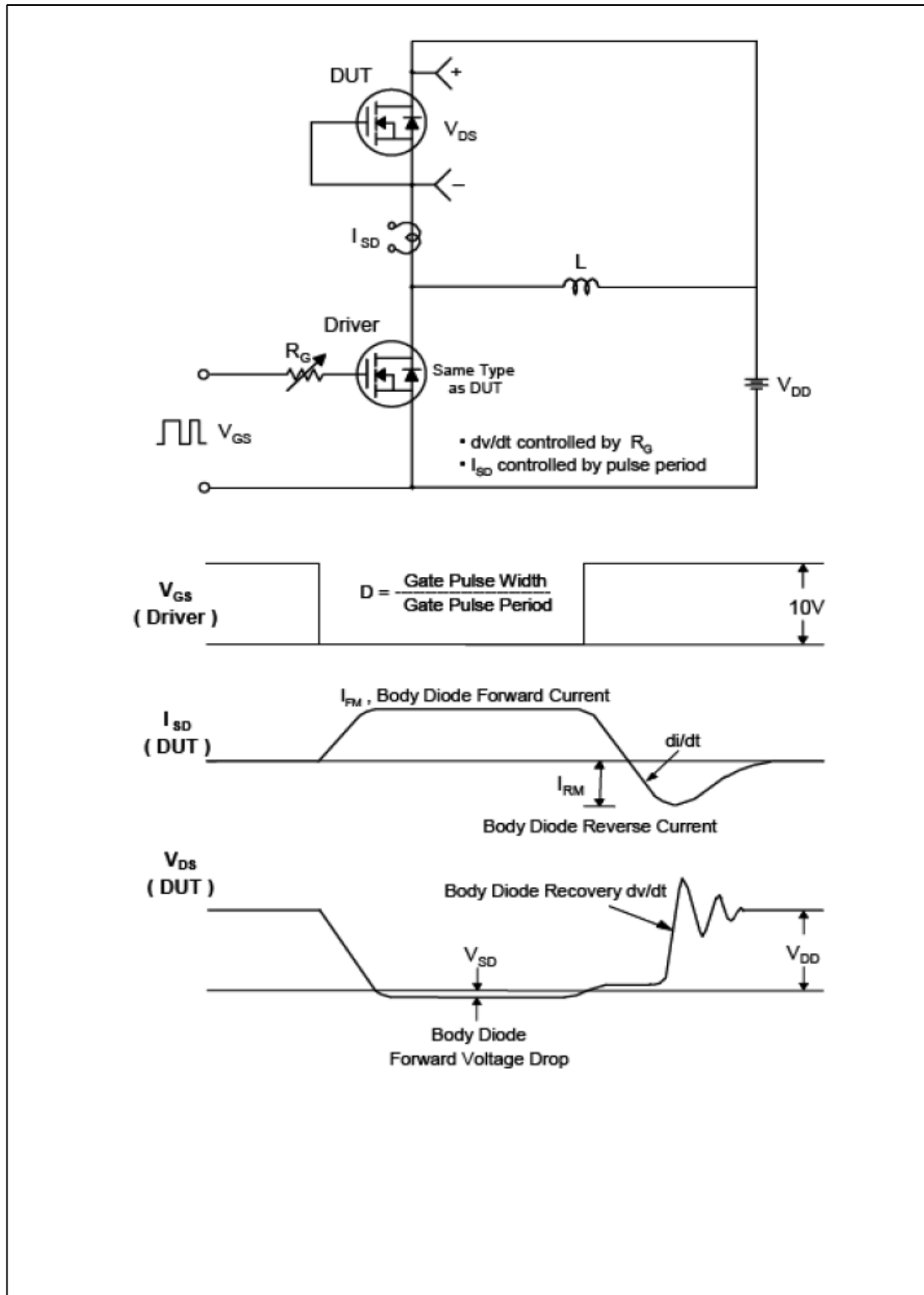
**Fig.10 Gate Test circuit & Waveform**



**Fig.11 Resistive Switching Test Circuit & Waveform**



**Fig.12 Uncamped Inductive Switching Test Circuit & Waveform**



**Fig.13 Peak Diode Recovery dv/dt Test Circuit & Waveform**

**TO-220 Package Dimension**

