

## SWITCHING REGULATOR APPLICATIONS

### Features

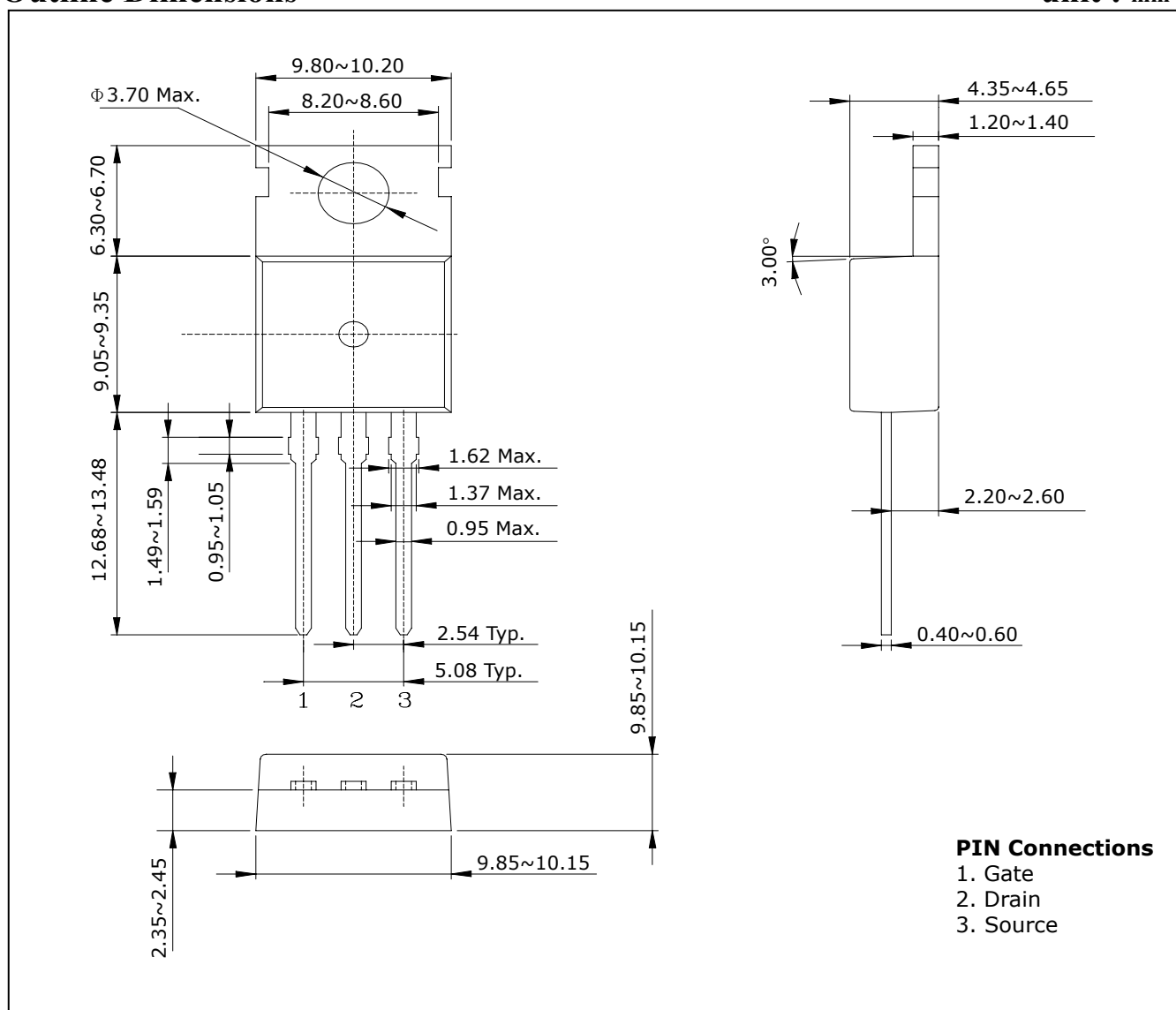
- High Voltage:  $BV_{DSS}=650V(\text{Min.})$
- Low  $C_{rss}$  :  $C_{rss}=19pF(\text{Typ.})$
- Low gate charge :  $Q_g=49nc(\text{Typ.})$
- Low  $R_{DS(on)}$  :  $R_{DS(on)}=1.2\Omega(\text{Max.})$

### Ordering Information

| Type NO. | Marking | Package Code |
|----------|---------|--------------|
| STK0765P | STK0765 | TO-220AB-3L  |

### Outline Dimensions

unit : mm



#### PIN Connections

1. Gate
2. Drain
3. Source

**Absolute maximum ratings**
**(Tc=25°C)**

| Characteristic                   | Symbol    | Rating     | Unit |
|----------------------------------|-----------|------------|------|
| Drain-source voltage             | $V_{DSS}$ | 650        | V    |
| Gate-source voltage              | $V_{GSS}$ | ±30        | V    |
| Drain current (DC)               | $I_D$     | (Tc=25°C)  | 7    |
|                                  |           | (Tc=100°C) | 4.4  |
| Drain current (Pulsed) *         | $I_{DM}$  | 28         | A    |
| Drain power dissipation          | $P_D$     | 100        | W    |
| Avalanche current (Single) ②     | $I_{AS}$  | 7          | A    |
| Single pulsed avalanche energy ② | $E_{AS}$  | 420        | mJ   |
| Avalanche current (Repetitive) ① | $I_{AR}$  | 7          | A    |
| Repetitive avalanche energy ①    | $E_{AR}$  | 14.7       | mJ   |
| Junction temperature             | $T_J$     | 150        | °C   |
| Storage temperature range        | $T_{stg}$ | -55~150    |      |

\* Limited by maximum junction temperature

| Characteristic     |                  | Symbol        | Typ. | Max  | Unit |
|--------------------|------------------|---------------|------|------|------|
| Thermal resistance | Junction-case    | $R_{th(J-C)}$ | -    | 1.25 | °C/W |
|                    | Junction-ambient | $R_{th(J-a)}$ | -    | 83.3 |      |

**Electrical Characteristics**

(Tc=25°C)

| Characteristic                 | Symbol       | Test Condition                             | Min. | Typ. | Max.      | Unit     |
|--------------------------------|--------------|--------------------------------------------|------|------|-----------|----------|
| Drain-source breakdown voltage | $BV_{DSS}$   | $I_D=250\mu A, V_{GS}=0$                   | 650  | -    | -         | V        |
| Gate threshold voltage         | $V_{GS(th)}$ | $I_D=250\mu A, V_{DS}=V_{GS}$              | 2.0  | -    | 4.0       | V        |
| Drain-source cut-off current   | $I_{DSS}$    | $V_{DS}=650V, V_{GS}=0V$                   | -    | -    | 1         | $\mu A$  |
| Gate leakage current           | $I_{GSS}$    | $V_{DS}=0V, V_{GS}=\pm 30V$                | -    | -    | $\pm 100$ | nA       |
| Drain-source on-resistance ④   | $R_{DS(on)}$ | $V_{GS}=10V, I_D=3.5A$                     | -    | -    | 1.2       | $\Omega$ |
| Forward transfer conductance ④ | $g_{fs}$     | $V_{DS}=10V, I_D=5.0A$                     | 3.9  | 6.4  | -         | S        |
| Input capacitance              | $C_{iss}$    | $V_{GS}=0V, V_{DS}=25V$<br>$f=1MHz$        | -    | 881  | 1321      | pF       |
| Output capacitance             | $C_{oss}$    |                                            | -    | 123  | 184       |          |
| Reverse transfer capacitance   | $C_{rss}$    |                                            | -    | 19   | 28        |          |
| Turn-on delay time             | $t_{d(on)}$  | $V_{DD}=325V, I_D=7A$<br>$R_G=25\Omega$ ③④ | -    | 18   | -         | ns       |
| Rise time                      | $t_r$        |                                            | -    | 19   | -         |          |
| Turn-off delay time            | $t_{d(off)}$ |                                            | -    | 72   | -         |          |
| Fall time                      | $t_f$        |                                            | -    | 28   | -         |          |
| Total gate charge              | $Q_g$        | $V_{DS}=325V, V_{GS}=10V$<br>$I_D=7A$ ③④   | -    | 49   | 73        | nC       |
| Gate-source charge             | $Q_{gs}$     |                                            | -    | 8.4  | 13        |          |
| Gate-drain charge              | $Q_{gd}$     |                                            | -    | 22   | 33        |          |

**Source-Drain Diode Ratings and Characteristics**

(Tc=25°C)

| Characteristic            | Symbol   | Test Condition                              | Min | Typ | Max | Unit    |
|---------------------------|----------|---------------------------------------------|-----|-----|-----|---------|
| Source current (DC)       | $I_S$    | Integral reverse diode<br>in the MOSFET     | -   | -   | 7   | A       |
| Source current (Pulsed) ① | $I_{SM}$ |                                             | -   | -   | 28  |         |
| Forward voltage ④         | $V_{SD}$ | $V_{GS}=0V, I_S=7A$                         | -   | -   | 1.4 | V       |
| Reverse recovery time     | $t_{rr}$ | $I_S=7A, V_{GS}=0,$<br>$di_S/dt=100A/\mu s$ | -   | 320 | -   | ns      |
| Reverse recovery charge   | $Q_{rr}$ |                                             | -   | 2.4 | -   | $\mu C$ |

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ②  $L=15.7mH, I_{AS}=7A, V_{DD}=50V, R_G=27\Omega$
- ③ Pulse Test : Pulse Width < 300 $\mu s$ , Duty cycle  $\leq 2\%$
- ④ Essentially independent of operating temperature

# Electrical Characteristic Curves

Fig. 1  $I_D - V_{DS}$

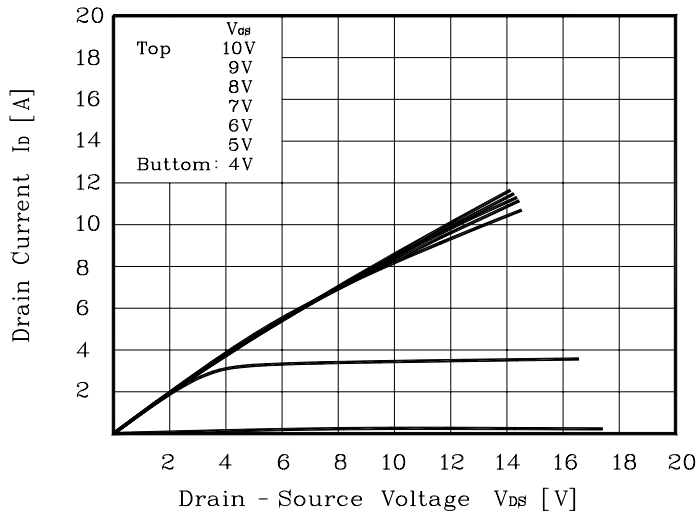


Fig. 2  $I_D - V_{GS}$

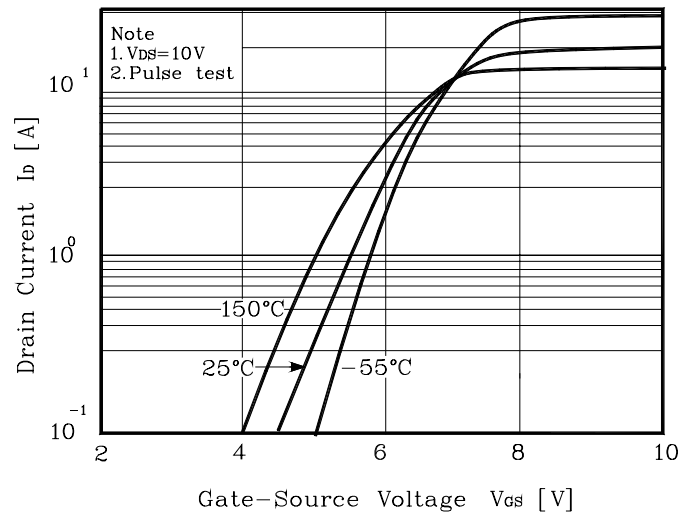


Fig. 3  $R_{DS(on)} - I_D$

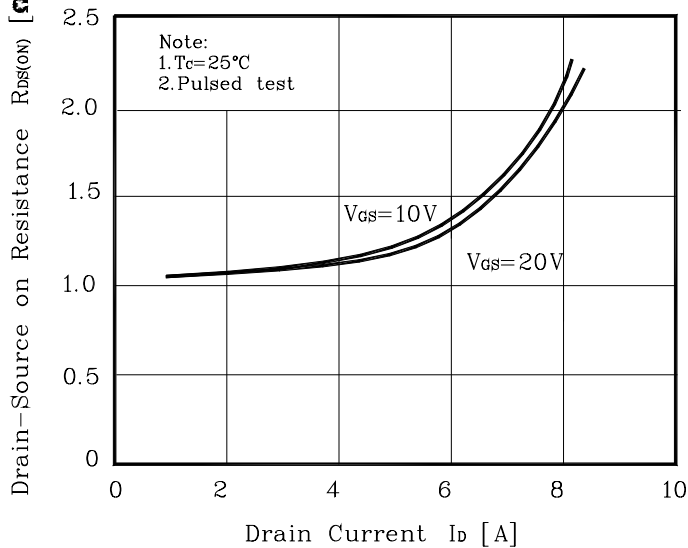


Fig. 4  $I_S - V_{SD}$

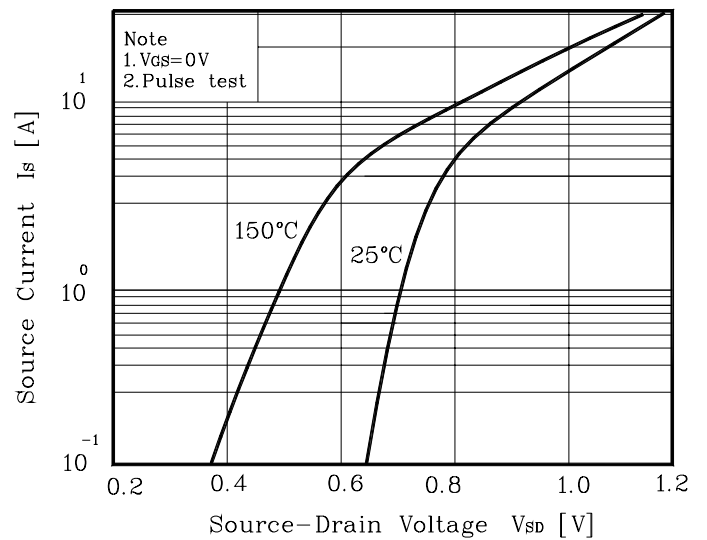


Fig. 5 Capacitance -  $V_{DS}$

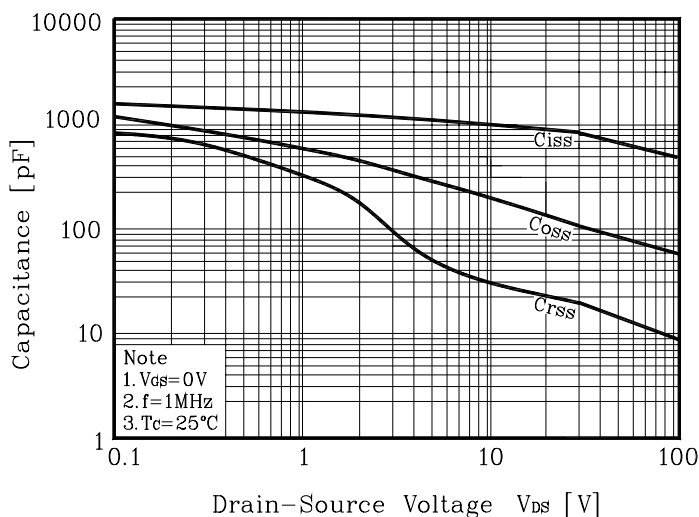


Fig. 6  $V_{GS} - Q_G$

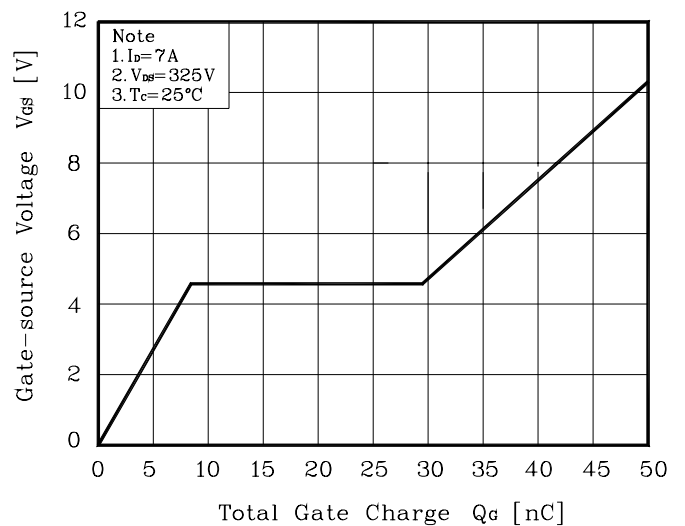


Fig. 7  $V_{DSS} - T_J$

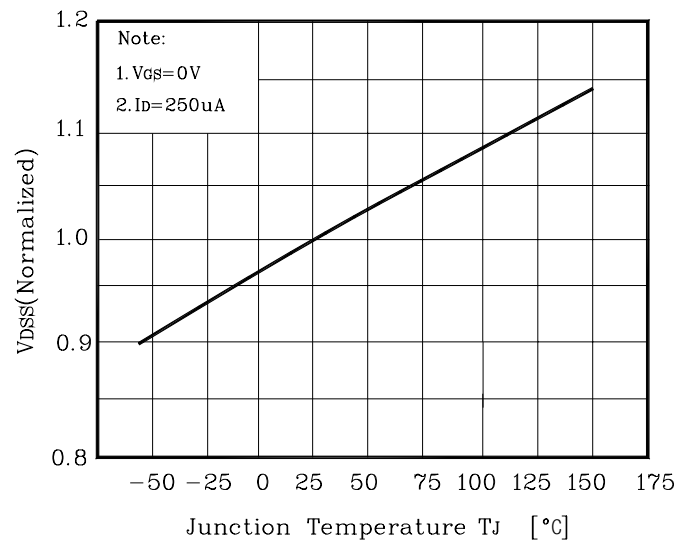


Fig. 8  $R_{DS(on)} - T_J$

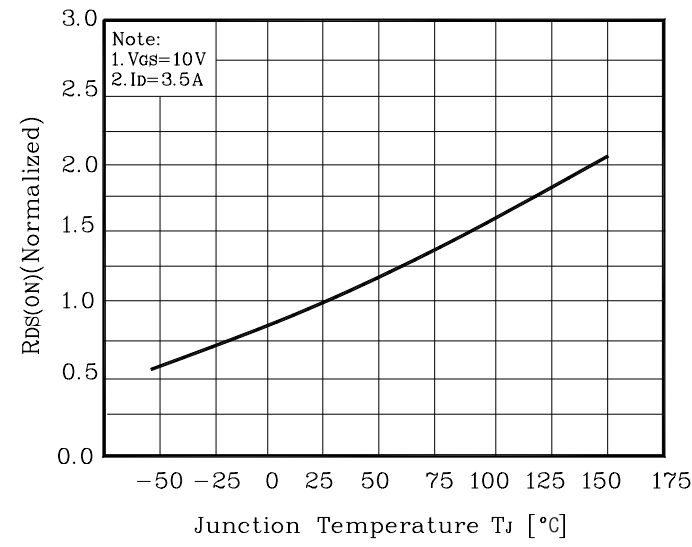


Fig. 9  $I_D - T_C$

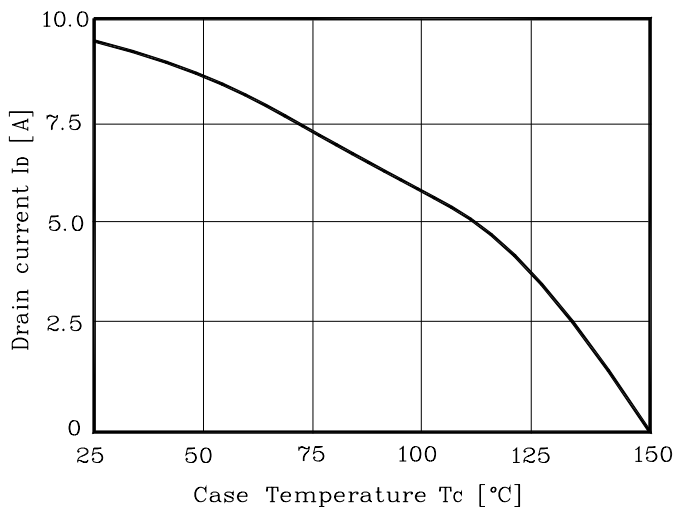
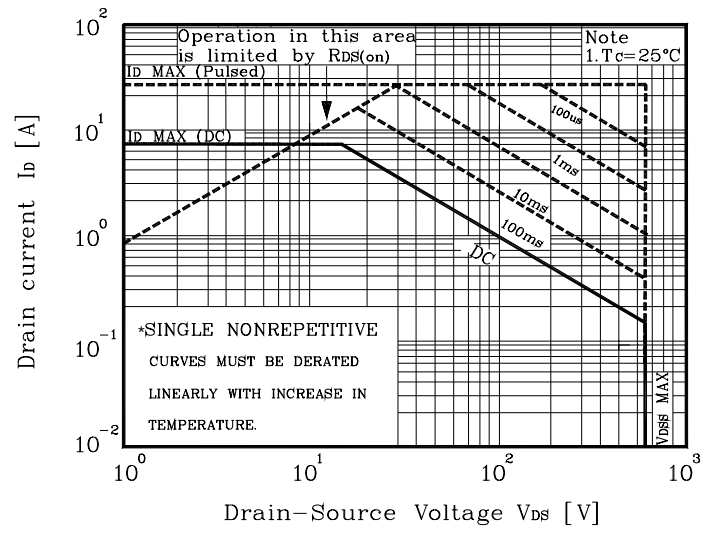
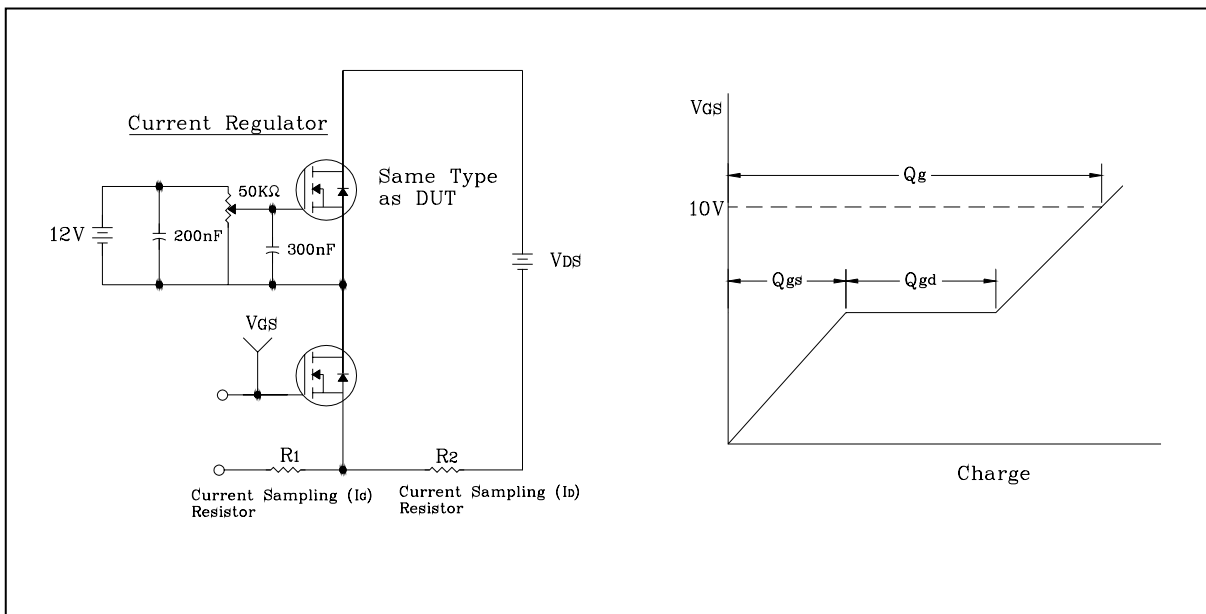


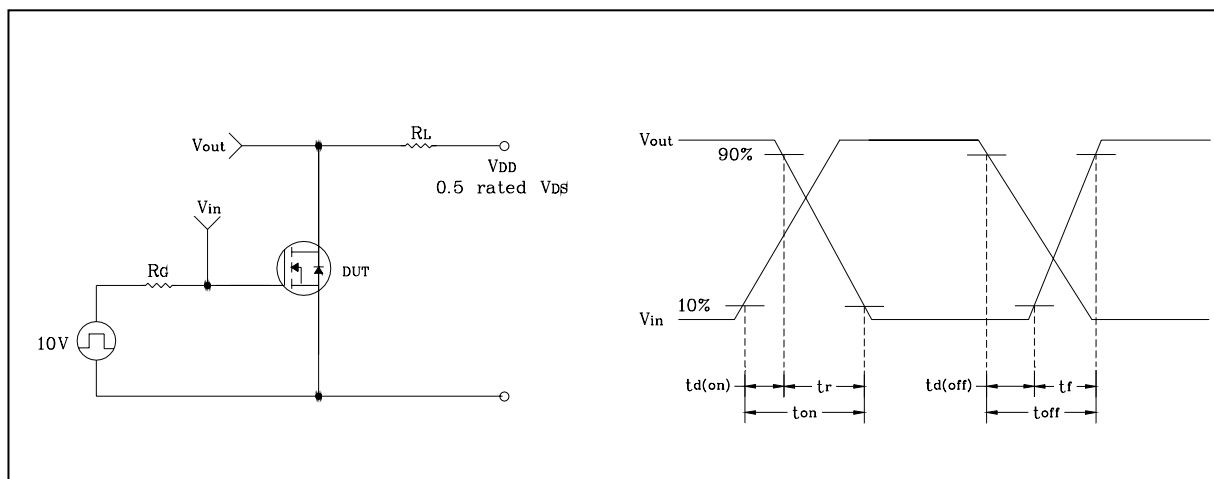
Fig. 10 Safe Operating Area



### Fig. 11 Gate Charge Test Circuit & Waveform



**Fig. 12 Resistive Switching Test Circuit & Waveform**



**Fig. 13 E<sub>AS</sub> Test Circuit & Waveform**

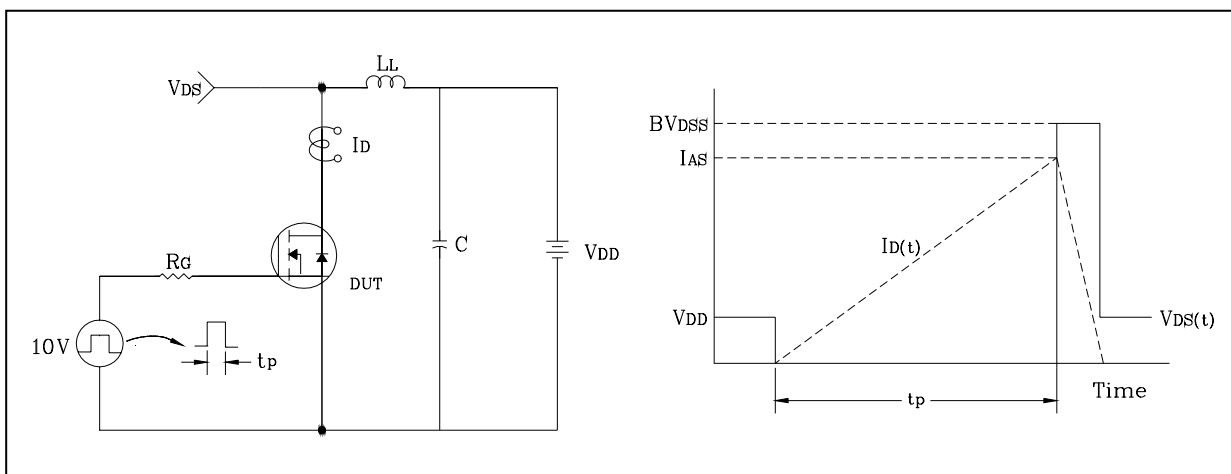
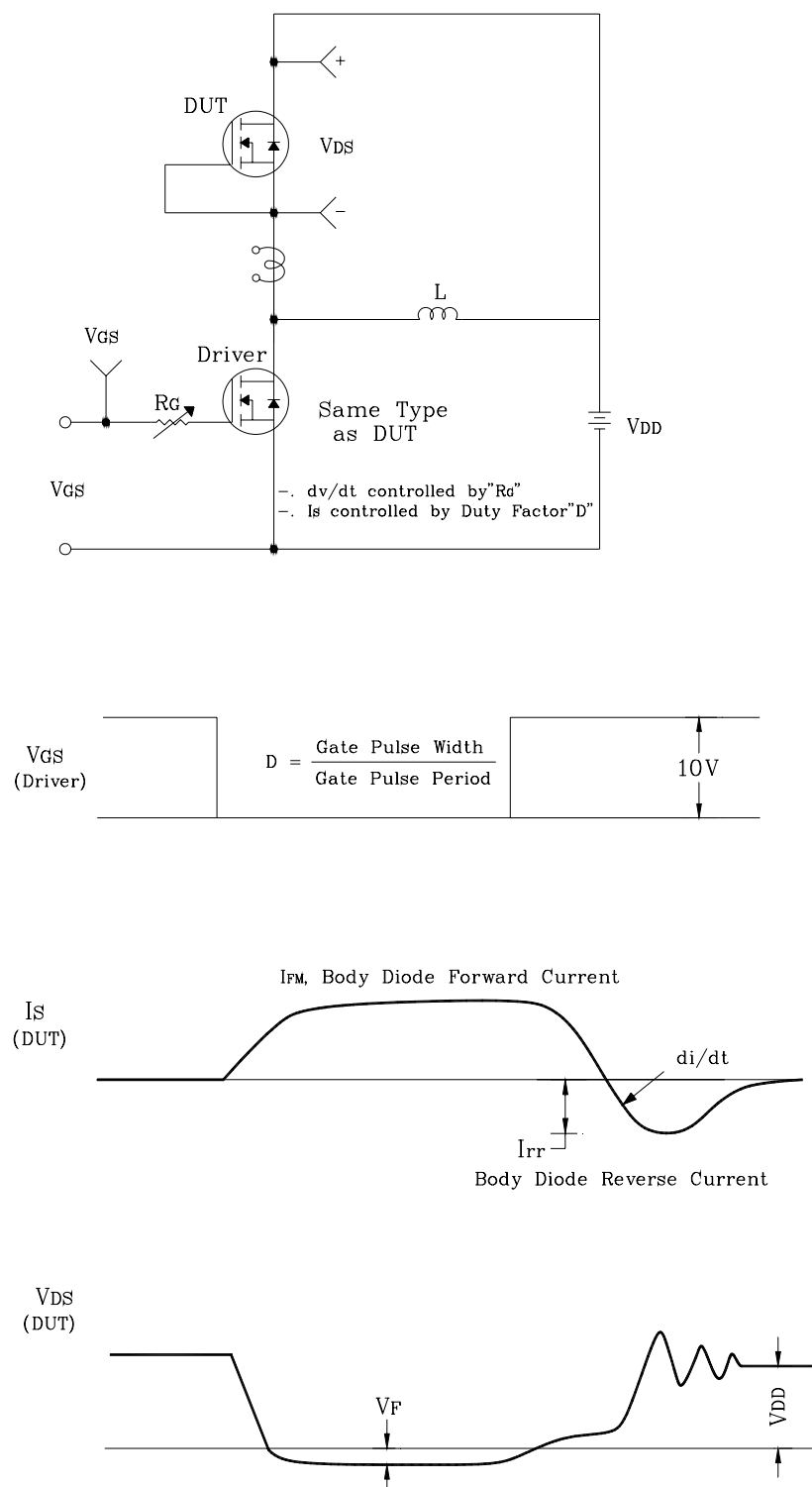


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



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