



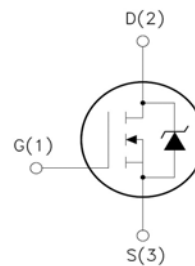
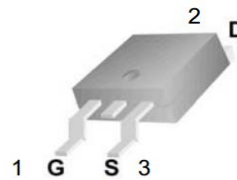
## WGD20N06S

60V N-Channel MOSFET

### Features:

- Low Intrinsic Capacitances.
- Excellent Switching Characteristics.
- Extended Safe Operating Area.
- Unrivalled Gate Charge :Qg= 50nC (Typ.).
- BV<sub>DSS</sub>=60V, I<sub>D</sub>=20A
- R<sub>DS(on)</sub> : 0.024Ω (Max) @V<sub>G</sub>=10V
- 100% Avalanche Tested

TO-252



1. Gate (G)
2. Drain (D)
3. Source (S)

### Absolute Maximum Ratings\* (T<sub>c</sub>=25°C Unless otherwise noted)

| Symbol              | PARAMETER  | Value                 | Unit |
|---------------------|--|-----------------------|------|
| V <sub>DSS</sub>    | Drain-Source Voltage   | 60                    | V    |
| I <sub>D</sub>      | Drain Current  | T <sub>C</sub> =25°C  | 20   |
|                     |  | T <sub>C</sub> =100°C | 17   |
| V <sub>GS(TH)</sub> | Gate Threshold Voltage   | ±20                   | V    |
| E <sub>AS</sub>     | Single Pulse Avalanche Energy (note1)  | 72                    | mJ   |
| I <sub>AR</sub>     | Avalanche Current (note2)  | 60                    | A    |
| P <sub>D</sub>      | Power Dissipation (T <sub>c</sub> =25°C)                                     | 45                    | W    |
| T <sub>j</sub>      | Junction Temperature(MAX)  | 175                   | °C   |
| T <sub>stg</sub>    | Storage Temperature  | -55~+175              | °C   |
| TL                  | Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds | 300                   | °C   |

### Thermal Characteristics

| Symbol           | PARAMETER                               | Typ. | MAX. | Unit |
|------------------|---|------|------|------|
| R <sub>θJC</sub> | Thermal Resistance, Junction to Case    | -    | 3.3  | °C/W |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient | -    | -    | °C/W |
| R <sub>θCS</sub> | Thermal Resistance, Case to Sink        | -    | 110  | °C/W |

Electrical Characteristics ( $T_C=25^\circ\text{C}$  unless otherwise noted)

| Parameter                                 | Symbol       | Condition  | Min | Typ  | Max       | Unit       |
|---|--------------|--|-----|------|-----------|------------|
| <b>Off Characteristics</b>                |              |  |     |      |           |            |
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$  | 60  | -    | -         | V          |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS}=60V, V_{GS}=0V$  | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$  | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> (Note 3)        |              |  |     |      |           |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$  | 1.2 | 1.6  | 2.5       | V          |
| Drain-Source On-State Resistance          | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=10A$  | -   | 24   | 35        | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=5V, I_D=5A$  | 11  | -    | -         | S          |
| <b>Dynamic Characteristics</b> (Note 4)   |              |  |     |      |           |            |
| Input Capacitance                         | $C_{ISS}$    | $V_{DS}=15V, V_{GS}=0V,$<br>$F=1.0MHz$                               | -   | 590  | -         | PF         |
| Output Capacitance                        | $C_{OSS}$    |  | -   | 70   | -         | PF         |
| Reverse Transfer Capacitance              | $C_{RSS}$    |  | -   | 64   | -         | PF         |
| <b>Switching Characteristics</b> (Note 4) |              |  |     |      |           |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=30V, I_D=2A,$<br>$V_{GS}=10V, R_G=3\Omega$                   | -   | 6.0  | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |  | -   | 6.1  | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |  | -   | 17   | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |  | -   | 3.0  | -         | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=30V, I_D=10A,$<br>$V_{GS}=10V$                               | -   | 25.3 | -         | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |  | -   | 4.7  | -         | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |  | -   | 6.1  | -         | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |  |     |      |           |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=20A$   | -   | -    | 1.2       | V          |
| Diode Forward Current (Note 2)            | $I_S$        |  | -   | -    | 20        | A          |
| Reverse Recovery Time                     | $t_{rr}$     | $T_J = 25^\circ\text{C}, I_F = 20A$                                  | -   | 29.5 | -         | nS         |
| Reverse Recovery Charge                   | $Q_{rr}$     | $di/dt = 100A/\mu s$ (Note 3)  | -   | 50   | -         | nC         |
| Forward Turn-On Time                      | $t_{on}$     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) |     |      |           |            |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^\circ\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega$

Typical Characteristics

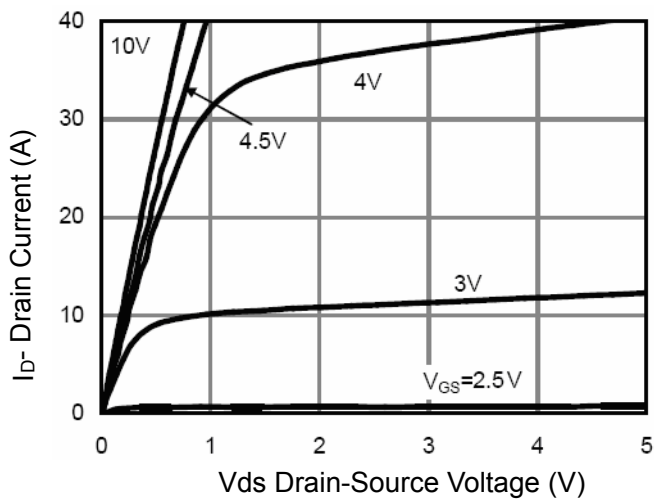


Figure 1 Output Characteristics

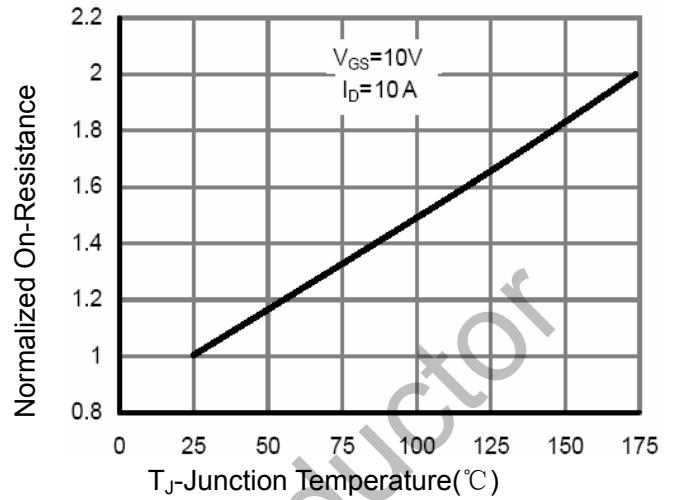


Figure 4  $R_{dson}$ -Junction Temperature

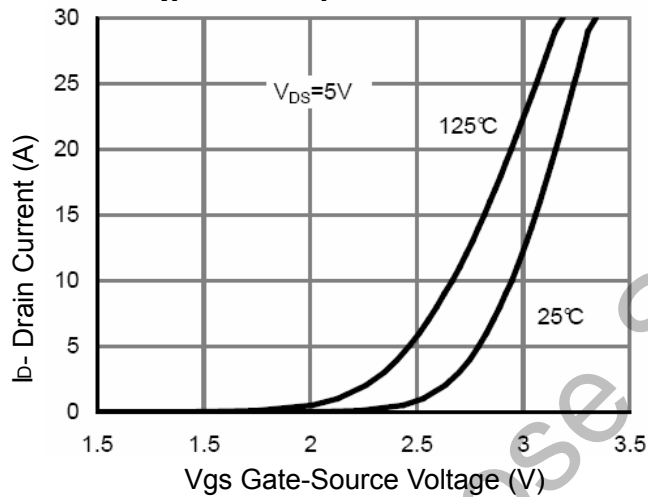


Figure 2 Transfer Characteristics

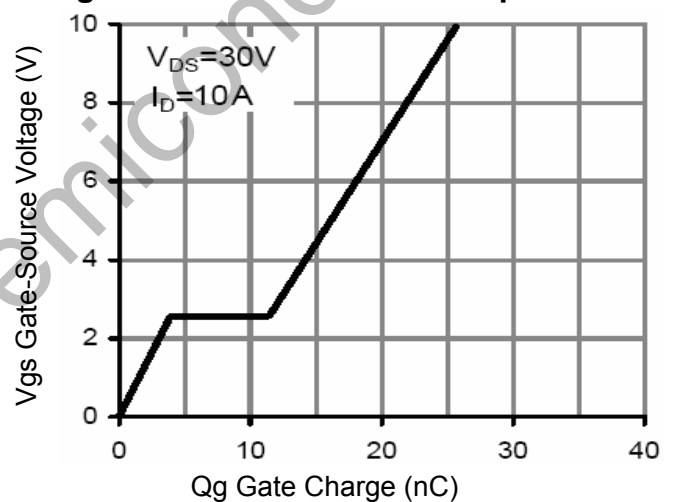


Figure 5 Gate Charge

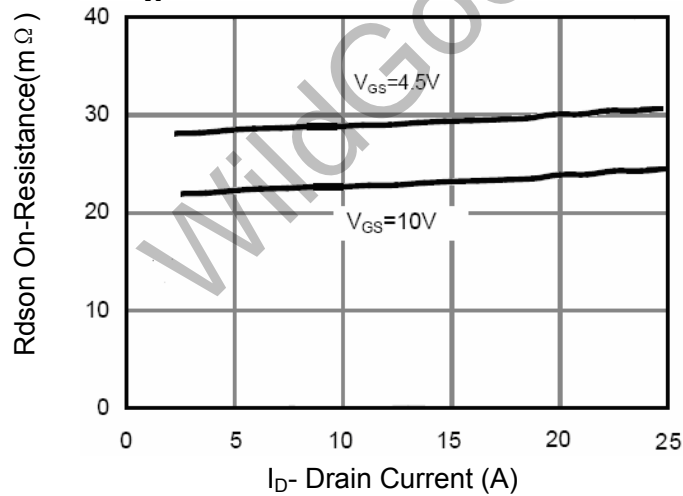


Figure 3  $R_{dson}$ - Drain Current

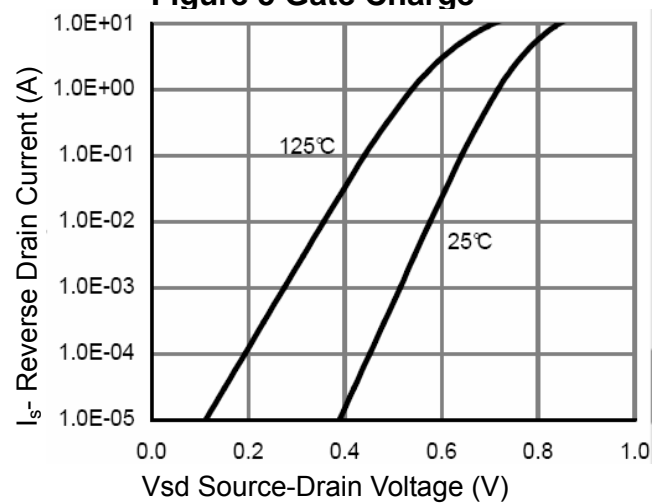


Figure 6 Source- Drain Diode Forward

Typical Characteristics (Continued)

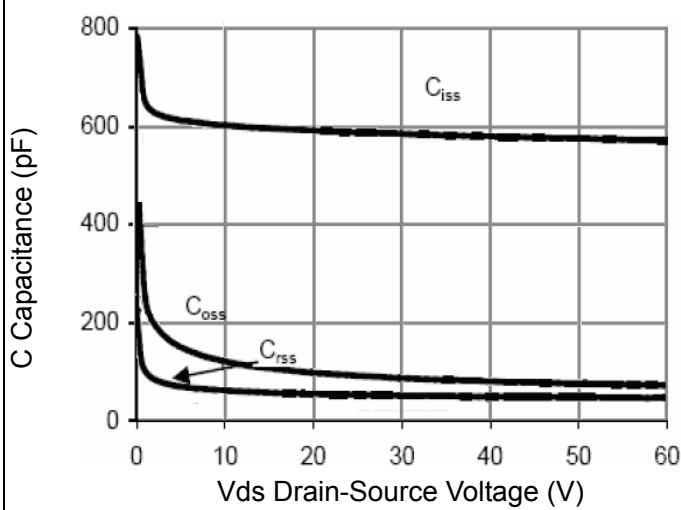


Figure 7 Capacitance vs Vds

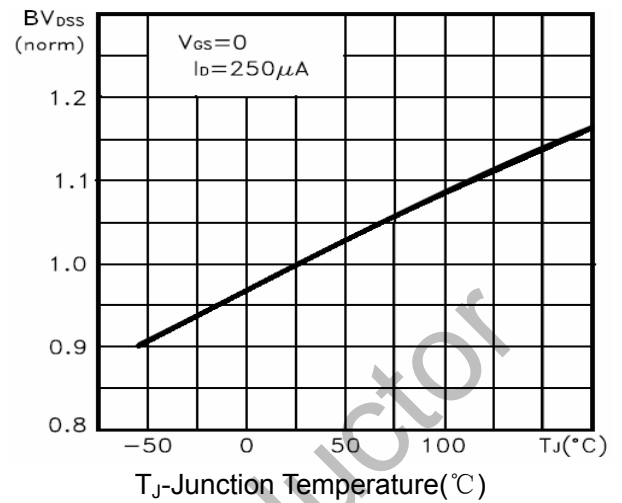


Figure 9  $BV_{DSS}$  vs Junction Temperature

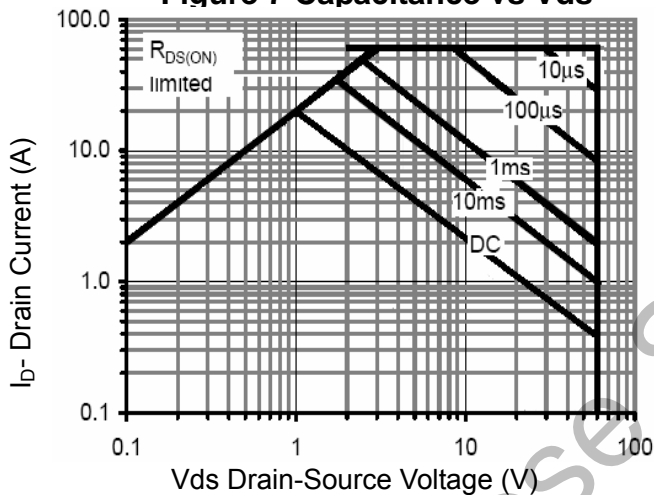


Figure 8 Safe Operation Area

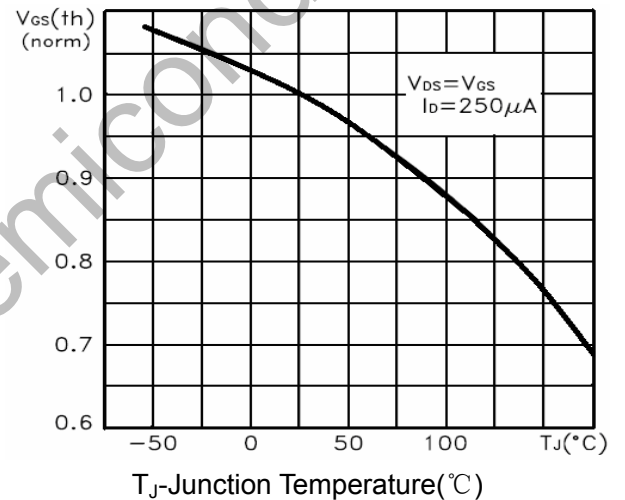


Figure 10  $V_{GS(th)}$  vs Junction Temperature

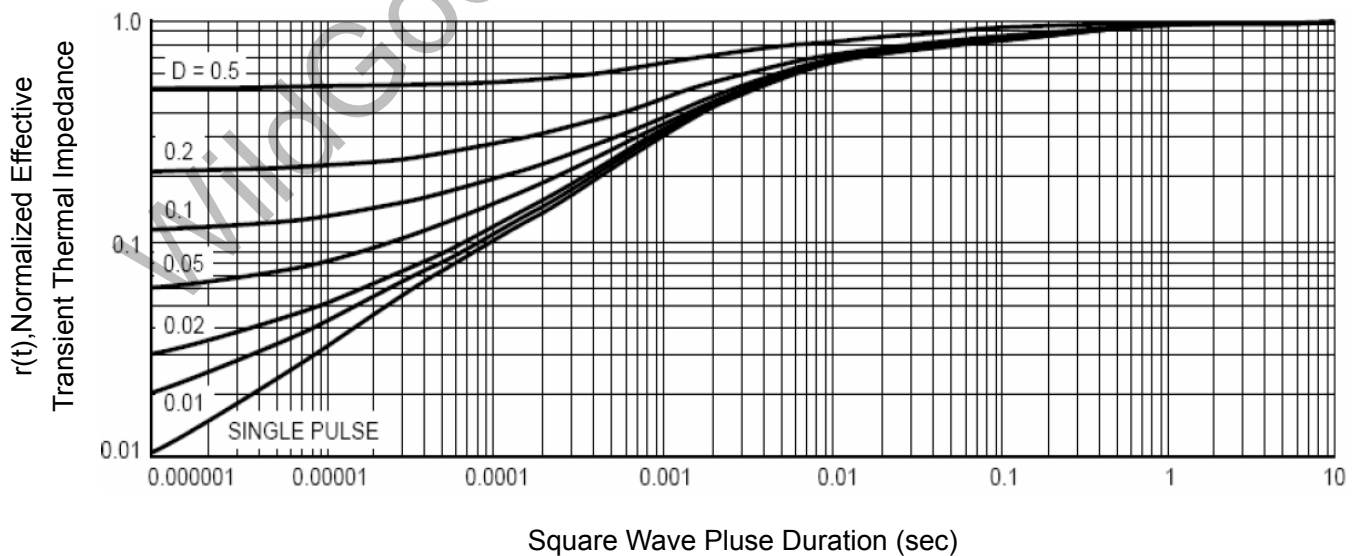
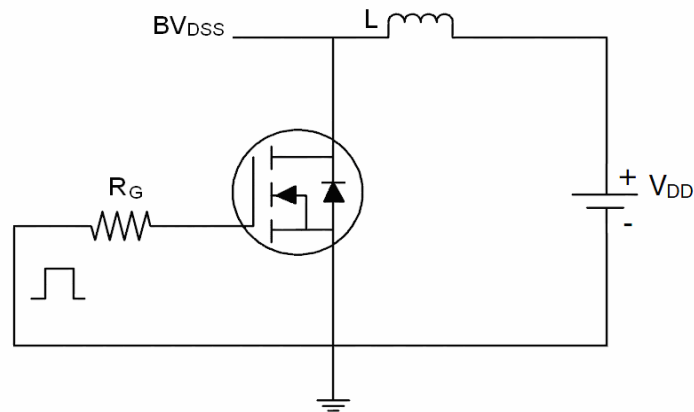


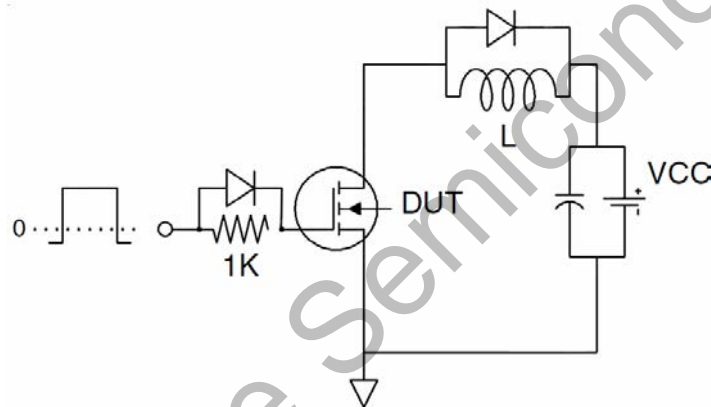
Figure 11 Normalized Maximum Transient Thermal Impedance

**Test Circuit**

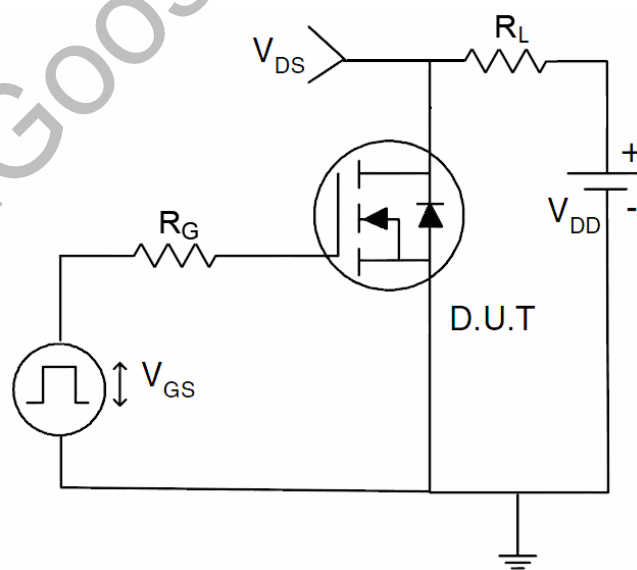
**1)  $E_{AS}$  test Circuit**



**2) Gate charge test Circuit**



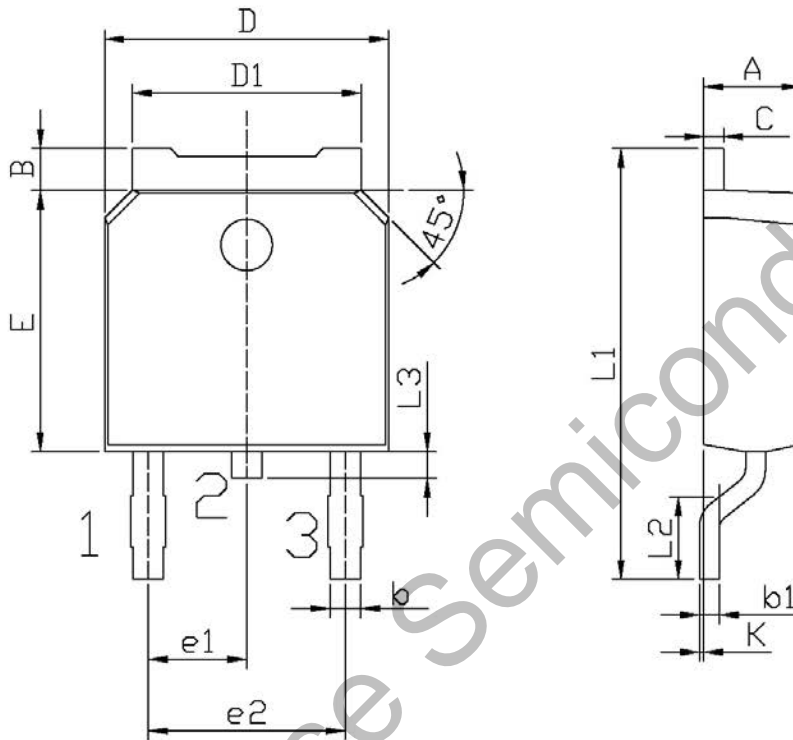
**3) Switch Time Test Circuit**



**Package Dimension**

TO-252

Unit:mm



| Symbol | Dimensions In Millimeters |      | Symbol | Dimensions In Millimeters |       |
|--------|---------------------------|------|--------|---------------------------|-------|
|        | Min                       | Max  |        | Min                       | Max   |
| A      | 2.20                      | 2.40 | E      | 5.95                      | 6.25  |
| B      | 0.95                      | 1.25 | e1     | 2.24                      | 2.34  |
| b      | 0.70                      | 0.90 | e2     | 4.43                      | 4.73  |
| b1     | 0.45                      | 0.55 | L1     | 9.85                      | 10.35 |
| C      | 0.45                      | 0.55 | L2     | 1.25                      | 1.75  |
| D      | 6.45                      | 6.75 | L3     | 0.60                      | 0.90  |
| D1     | 5.20                      | 5.40 | K      | 0.00                      | 0.10  |

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