

## TO-92 High Speed Switching Application

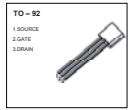
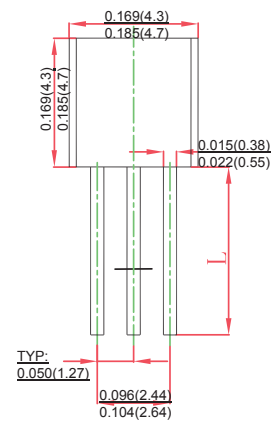
### Features

- ESD rating: 1000V (HBM)
- Low On-Resistance:  $R_{DS(on)} < 3\Omega$  @  $V_{GS} = 10V$
- High power and current handling capability
- Very fast switching
- N-Channel Enhancement Mode MOSFET
- High speed line driver

### MECHANICAL DATA

- Case style: TO-92 molded plastic
- Mounting position: any

### TO-92



## MAXIMUM RATINGS AND CHARACTERISTICS

@ 25°C Ambient Temperature (unless otherwise noted)

| Characteristic                                     | Symbol        | Ratings   | Unit |
|--|---------------|-----------|------|
| Drain-Source voltage                               | $V_{DS}$      | 60        | V    |
| Gate-Source voltage                                | $V_{GS}$      | $\pm 20$  | V    |
| Maximum drain current<br>(Note 1)                  | $I_D$         | 500       | mA   |
| Pulsed drain current<br>(Note 1)                   | $I_{DP}$      | 2         | A    |
| Power dissipation<br>(Note 2)                      | $P_D$         | 625       | mW   |
| Operating junction temperature                     | $T_j$         | 150       | °C   |
| Storage temperature range                          | $T_{stg}$     | -55 ~ 150 | °C   |
| Thermal resistance junction to ambient<br>(Note 2) | $R_{th(j-a)}$ | 400       | °C/W |

Note 1) Limited only maximum junction temperature

Note 2) Device mounted on FR-4 board with recommended pad layout.

## Electrical Specification (@ $T_A=25$ unless otherwise specified)

| Characteristic                         | Symbol       | Test Condition                                   | Min.     | Typ. | Max.     | Unit     |
|--|--------------|--|----------|------|----------|----------|
| Drain-Source breakdown voltage         | $BV_{DSS}$   | $I_D=250\mu A, V_{GS}=0$                         | 60       | -    | -        | V        |
| Gate-Source breakdown voltage          | $BV_{GSS}$   | $I_G=250\mu A, V_{DS}=0$                         | $\pm 20$ | -    | -        | V        |
| Gate-Threshold voltage                 | $V_{GS(th)}$ | $I_D=250\mu A, V_{DS}=V_{GS}$                    | 1        | -    | 2.5      | V        |
| Zero Gate voltage drain current        | $I_{DSS}$    | $V_{DS}=60V, V_{GS}=0$                           | -        | -    | 1        | $\mu A$  |
| Gate-body leakage                      | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                      | -        | -    | $\pm 10$ | $\mu A$  |
| Drain-Source on-resistance<br>(Note 3) | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=0.5A$                           | -        | -    | 3        | $\Omega$ |
|  |              | $V_{GS}=5V, I_D=0.05A$                           | -        | -    | 3.5      |          |
| Forward trans-conductance<br>(Note 3)  | $g_{fs}$     | $V_{DS}=10V, I_D=0.2A$                           | 0.08     | -    | -        | S        |
| Input capacitance                      | $C_{iss}$    |  | -        | 30   | 50       | pF       |
| Output capacitance                     | $C_{oss}$    | $V_{DS}=25V, V_{GS}=0, f=1MHz$                   | -        | 7    | -        |          |
| Reverse Transfer capacitance           | $C_{rss}$    |  | -        | 4    | -        |          |
| Turn-on delay time<br>(Note 3, 4)      | $t_{d(on)}$  |  | -        | 2    | -        | ns       |
| Rise time<br>(Note 3, 4)               | $t_r$        | $V_{DD}=30V, I_D=0.2A, V_{GS}=10V, R_G=10\Omega$ | -        | 15   | -        |          |
| Turn-off delay time<br>(Note 3, 4)     | $t_{d(off)}$ |  | --       | 8    | -        |          |
| Fall time<br>(Note 3, 4)               | $t_f$        |  | -        | 11   | -        | nC       |
| Total gate charge<br>(Note 3, 4)       | $Q_g$        |  | -        | 0.6  | 0.8      |          |
| Gate-Source charge<br>(Note 3, 4)      | $Q_{gs}$     | $V_{DS}=10V, I_D=0.25A, V_{GS}=4.5V$             | -        | 0.2  | -        |          |
| Gate-Drain charge<br>(Note 3, 4)       | $Q_{gd}$     |  | -        | 0.2  | -        | V        |
| Diode forward voltage<br>(Note 3)      | $V_{SD}$     | $V_{GS}=0V, I_S=0.2A$                            | -        | -    | 1.3      |          |

Note 3) Pulse test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

Note 4) Essentially independent of operating temperature typical characteristics.

# RATINGS AND CHARACTERISTIC CURVES

Fig. 1  $I_D - V_{DS}$

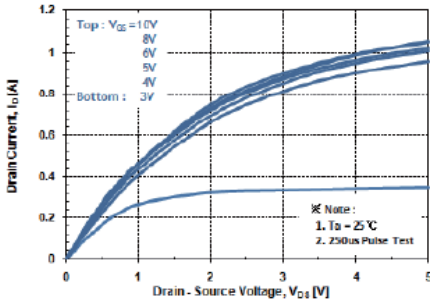


Fig. 2  $I_D - V_{GS}$

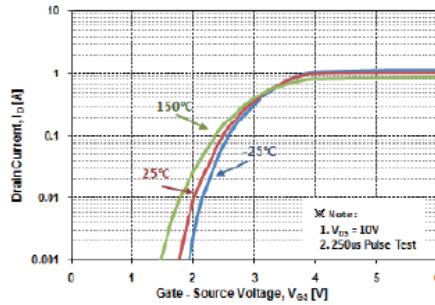


Fig. 3  $R_{DS(on)} - I_D$

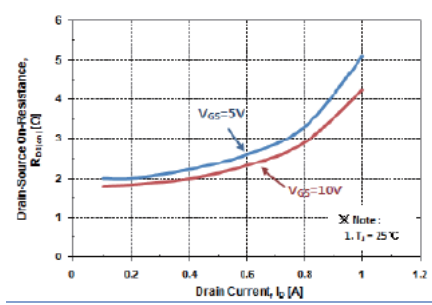


Fig. 4  $I_S - V_{SD}$

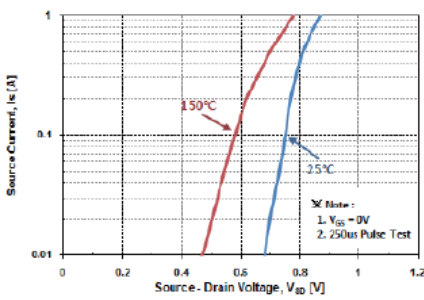


Fig. 5 Capacitance -  $V_{DS}$

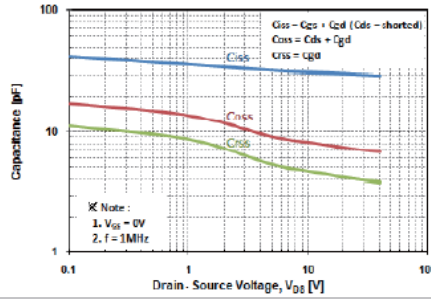


Fig. 6  $V_{GS} - Q_g$

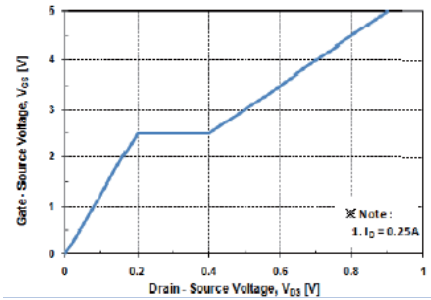


Fig. 7  $V_{DS(s)} - T_J$

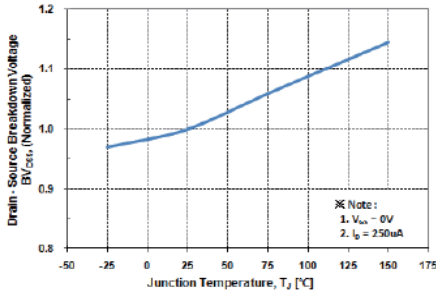


Fig. 8  $R_{DS(on)} - T_J$

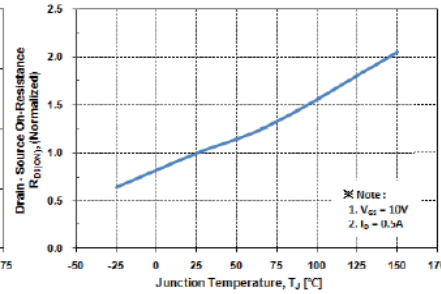


Fig. 9  $I_D - T_C$

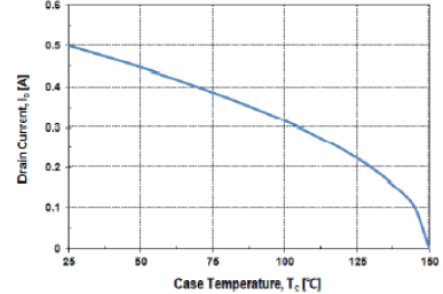


Fig. 10 Safe Operating Area

