

## Field Effect Transistor

### Silicon P Channel MOS Type ( $L^2$ - $\pi$ -MOS IV)

## High Speed, High Current DC-DC Converter,

## Relay Drive and Motor Drive Applications

## Features

- 4-Volt Gate Drive
- Low Drain-Source ON Resistance
  - $R_{DS(ON)} = 0.04\Omega$  (Typ.)
- High Forward Transfer Admittance
  - $|Y_{fs}| = 20S$  (Typ.)
- Low Leakage Current
  - $I_{DSS} = -100\mu A$  (Max.) @  $V_{DS} = -60V$
- Enhancement-Mode
  - $V_{th} = -0.8 \sim -2.0V$  @  $V_{DS} = -10V, I_D = -1mA$

### Absolute Maximum Ratings (Ta = 25°C)

| CHARACTERISTIC                                    |       | SYMBOL    | RATING    | UNIT       |
|---------------------------------------------------|-------|-----------|-----------|------------|
| Drain-Source Voltage                              |       | $V_{DSS}$ | -60       | V          |
| Drain-Gate Voltage ( $R_{GS} = 20k\Omega$ )       |       | $V_{DGR}$ | -60       | V          |
| Gate-Source Voltage                               |       | $V_{GSS}$ | $\pm 20$  | V          |
| Drain Current                                     | DC    | $I_D$     | -20       | A          |
|                                                   | Pulse | $I_{DP}$  | -80       |            |
| Drain Power Dissipation<br>( $T_c = 25^\circ C$ ) |       | $P_D$     | 45        | W          |
| Channel Temperature                               |       | $T_{ch}$  | 150       | $^\circ C$ |
| Storage Temperature Range                         |       | $T_{stg}$ | -55 ~ 150 | $^\circ C$ |

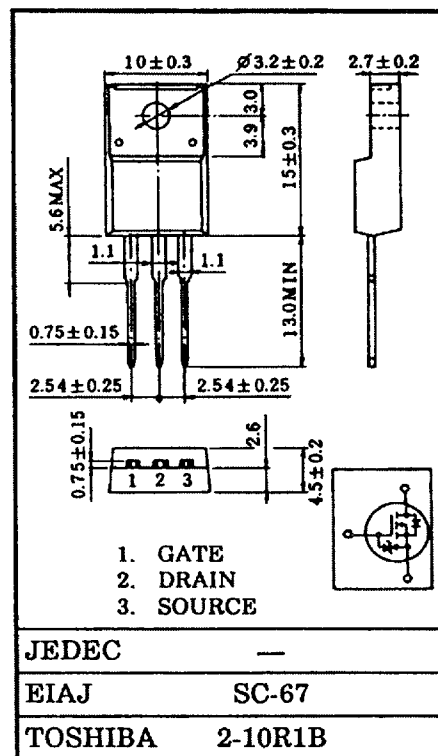
## Thermal Characteristics

| CHARACTERISTIC                         | SYMBOL         | MAX. | UNIT |
|----------------------------------------|----------------|------|------|
| Thermal Resistance, Channel to Case    | $R_{th(ch-c)}$ | 2.77 | °C/W |
| Thermal Resistance, Channel to Ambient | $R_{th(ch-a)}$ | 62.5 | °C/W |

This transistor is an electrostatic sensitive device. Please handle with care.

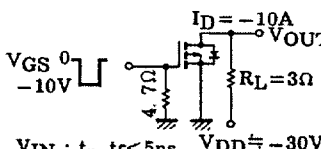
## Industrial Applications

Unit in mm



Weight : 1.9g

## Electrical Characteristics (Ta = 25°C)

| CHARACTERISTIC                                  |               | SYMBOL         | TEST CONDITION                                                                                                                                                                                                                                                                                    | MIN. | TYP. | MAX.     | UNIT     |
|-------------------------------------------------|---------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|----------|----------|
| Gate Leakage Current                            |               | $I_{GSS}$      | $V_{GS} = \pm 16V, V_{DS} = 0V$                                                                                                                                                                                                                                                                   | —    | —    | $\pm 10$ | $\mu A$  |
| Drain Cut-off Current                           |               | $I_{DSS}$      | $V_{DS} = -60V, V_{GS} = 0V$                                                                                                                                                                                                                                                                      | —    | —    | -100     | $\mu A$  |
| Drain-Source Breakdown Voltage                  |               | $V_{(BR) DSS}$ | $I_D = -10mA, V_{GS} = 0V$                                                                                                                                                                                                                                                                        | -60  | —    | —        | V        |
| Gate Threshold Voltage                          |               | $V_{th}$       | $V_{DS} = -10V, I_D = -1mA$                                                                                                                                                                                                                                                                       | -0.8 | —    | -2.0     | V        |
| Drain-Source ON Resistance                      |               | $R_{DS(ON)}$   | $V_{GS} = -4V, I_{DS} = -10A$                                                                                                                                                                                                                                                                     | —    | 58   | 90       | $\Omega$ |
|                                                 |               |                | $V_{GS} = -10V, I_{DS} = -10A$                                                                                                                                                                                                                                                                    | —    | 35   | 45       |          |
| Forward Transfer Admittance                     |               | $ Y_{fs} $     | $V_{DS} = -10V, I_{DS} = -10A$                                                                                                                                                                                                                                                                    | 12   | 20   | —        | S        |
| Input Capacitance                               |               | $C_{iss}$      | $V_{DS} = -10V, V_{GS} = 0V,$<br>$f = 1MHz$                                                                                                                                                                                                                                                       | —    | 3000 | 3800     | pF       |
| Reverse Transfer Capacitance                    |               | $C_{rss}$      |                                                                                                                                                                                                                                                                                                   | —    | 500  | 900      |          |
| Output Capacitance                              |               | $C_{oss}$      |                                                                                                                                                                                                                                                                                                   | —    | 1500 | 2200     |          |
| Switching Time                                  | Rise Time     | $t_r$          |  <p> <math>V_{GS} = 0V, -10V</math><br/> <math>I_D = -10A</math><br/> <math>V_{DD} = -30V</math><br/> <math>R_L = 3\Omega</math><br/> <math>V_{IN} : t_r, t_f &lt; 5ns, Duty \leq 1\%, t_w = 10\mu s</math> </p> | —    | 20   | 40       | ns       |
|                                                 | Turn-on Time  | $t_{on}$       |                                                                                                                                                                                                                                                                                                   | —    | 50   | 100      |          |
|                                                 | Fall Time     | $t_f$          |                                                                                                                                                                                                                                                                                                   | —    | 70   | 140      |          |
|                                                 | Turn-off Time | $t_{off}$      |                                                                                                                                                                                                                                                                                                   | —    | 180  | 360      |          |
| Total Gate Charge (Gate-Source Plus Gate-Drain) |               | $Q_g$          | $V_{DD} = -48V, V_{GS} = -10V,$<br>$I_D = -20A$                                                                                                                                                                                                                                                   | —    | 120  | 240      | nC       |
| Gate-Source Charge                              |               | $Q_{gs}$       |                                                                                                                                                                                                                                                                                                   | —    | 80   | —        |          |
| Gate-Drain ("Miller") Charge                    |               | $Q_{gd}$       |                                                                                                                                                                                                                                                                                                   | —    | 40   | —        |          |

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

| CHARACTERISTICS                  | SYMBOL    | TEST CONDITION               | MIN. | TYP. | MAX. | UNIT    |
|----------------------------------|-----------|------------------------------|------|------|------|---------|
| Continuous Drain Reverse Current | $I_{DR}$  | —                            | —    | —    | -20  | A       |
| Pulse Drain Reverse Current      | $I_{DRP}$ | —                            | —    | —    | -80  | A       |
| Diode Forward Voltage            | $V_{DSF}$ | $I_{DR} = -20A, V_{GS} = 0V$ | —    | —    | 1.7  | V       |
| Reverse Recovery Time            | $t_{rr}$  | $I_{DR} = -20A, V_{GS} = 0V$ | —    | 120  | —    | ns      |
| Reverse Recovered Charge         | $Q_{rr}$  | $dI_{DR}/dt = 100A/\mu s$    | —    | 0.36 | —    | $\mu C$ |

