

TENTATIVE TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE ( $L^2$ - $\pi$ -MOS V)

## 2SK2741

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

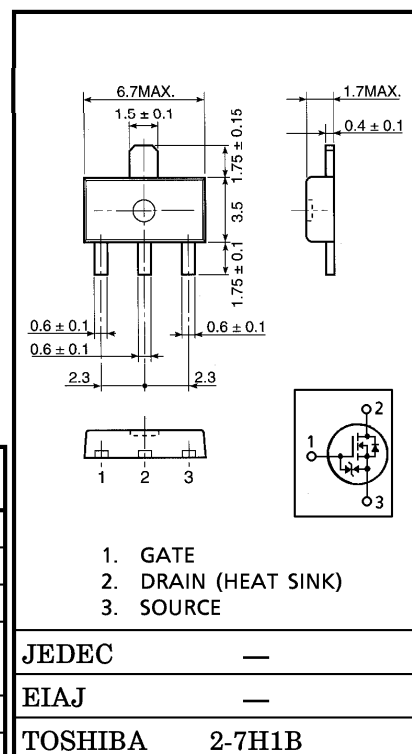
INDUSTRIAL APPLICATIONS

Unit in mm

- 4 V Gate Drive
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.12 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 5.0 S$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu A$  (Max.) ( $V_{DS} = 60 V$ )
- Enhancement-Mode :  $V_{th} = 0.8 \sim 2.0 V$  ( $V_{DS} = 10 V$ ,  $I_D = 1 mA$ )

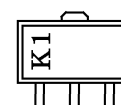
MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

| CHARACTERISTIC                               | SYMBOL    | RATING         | UNIT       |
|----------------------------------------------|-----------|----------------|------------|
| Drain-Source Voltage                         | $V_{DSS}$ | 60             | V          |
| Drain-Gate Voltage ( $R_{GS} = 20 k\Omega$ ) | $V_{DGR}$ | 60             | V          |
| Gate-Source Voltage                          | $V_{GSS}$ | $\pm 20$       | V          |
| Drain Current                                | DC        | $I_D$          | A          |
|                                              | Pulse     | $I_{DP}$       |            |
| Drain Power Dissipation***                   | $P_D$     | 2.5            | W          |
| Single Pulse Avalanche Energy**              | $E_{AS}$  | 129            | mJ         |
| Avalanche Current                            | $I_{AR}$  | 5              | A          |
| Repetitive Avalanche Energy*                 | $E_{AR}$  | 0.25           | mJ         |
| Channel Temperature                          | $T_{ch}$  | 150            | $^\circ C$ |
| Storage Temperature Range                    | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |



Weight : 0.12 g (Typ.)

MARKING



## THERMAL CHARACTERISTICS

| CHARACTERISTIC                         | SYMBOL         | MAX. | UNIT         |
|----------------------------------------|----------------|------|--------------|
| Thermal Resistance, Channel to Ambient | $R_{th(ch-a)}$ | 50   | $^\circ C/W$ |

Note ;

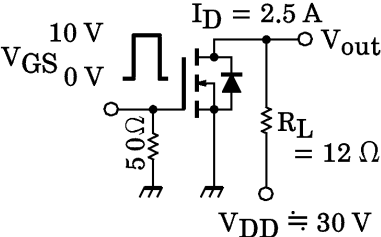
\* Repetitive rating ; Pulse Width Limited by Max. junction temperature.

\*\*  $V_{DD} = 25 V$ ,  $T_{ch} = 25^\circ C$  (initial),  $L = 7 mH$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 5 A$ \*\*\* Mounted on ceramic substrate ( $1 \text{ inch}^2 \times 0.8 t$ )**This transistor is an electrostatic sensitive device.****Please handle with caution.**

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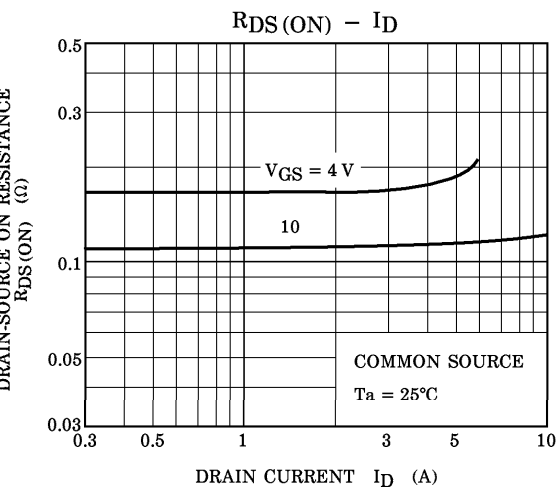
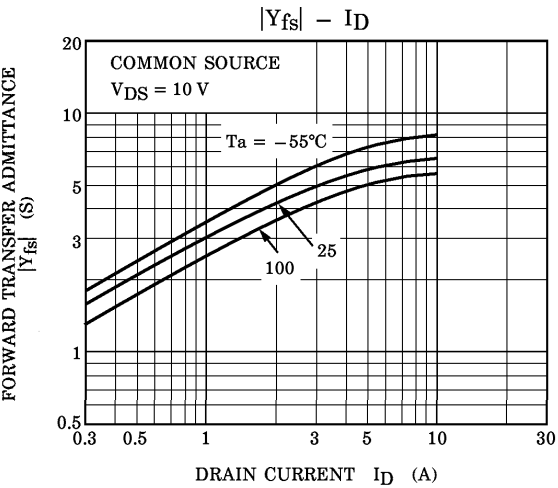
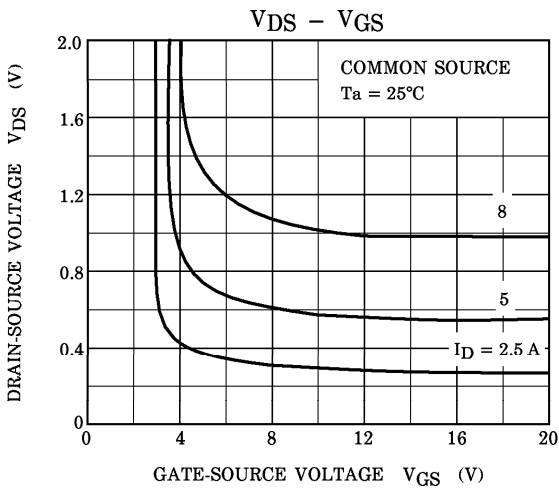
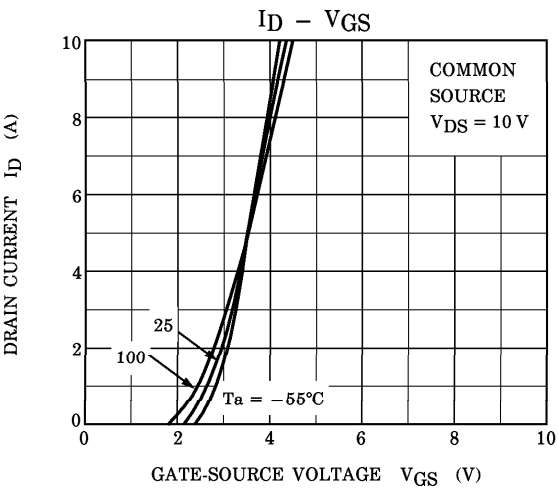
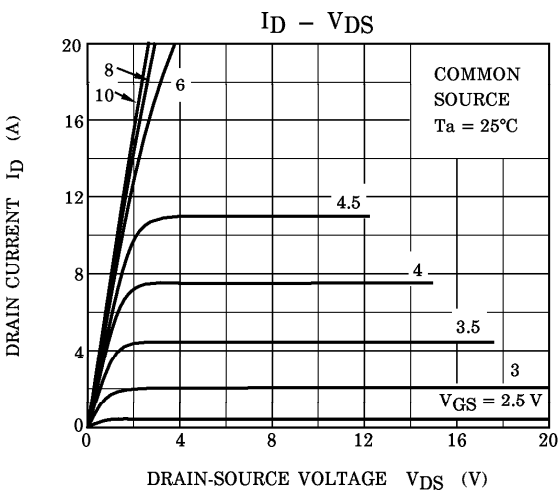
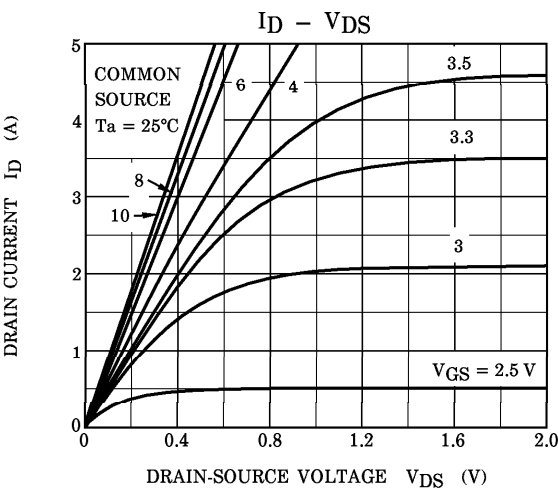
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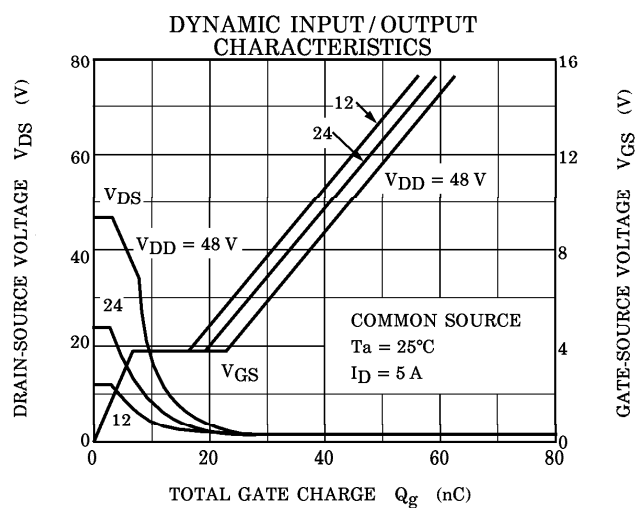
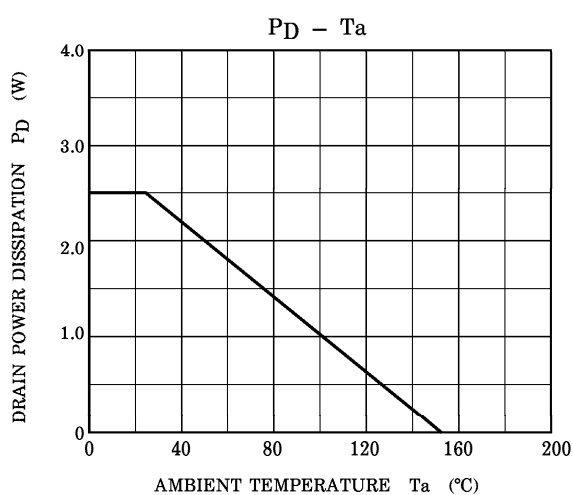
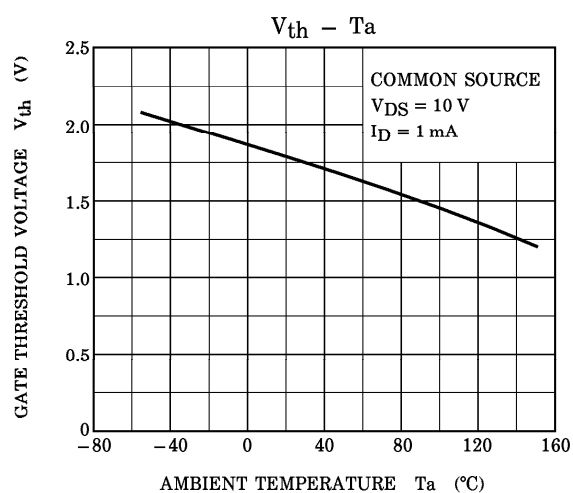
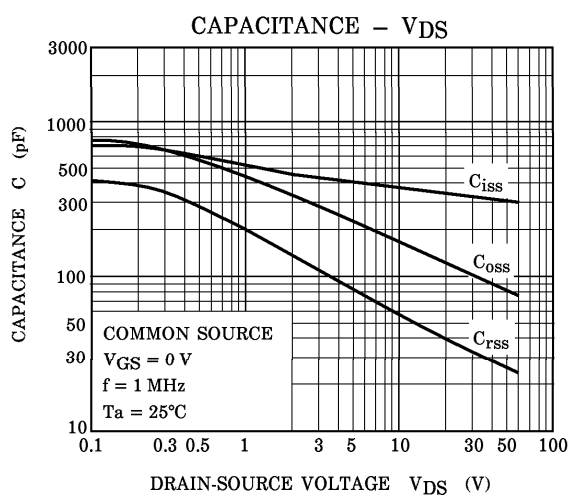
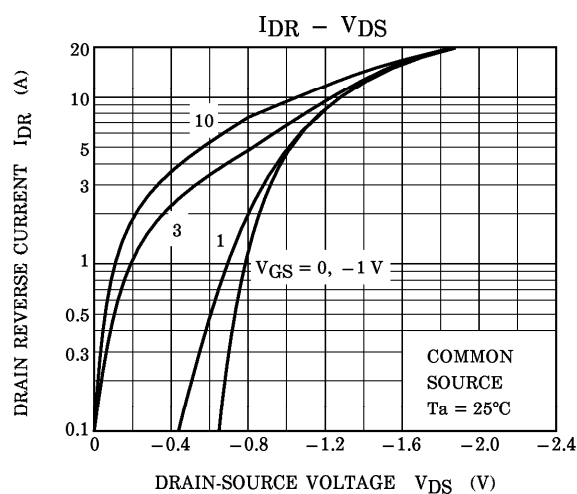
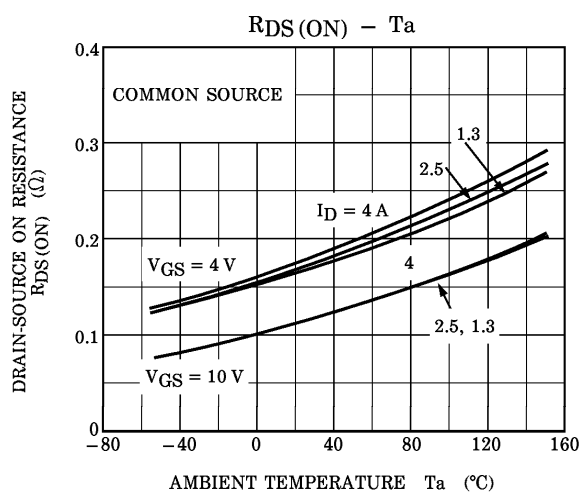
## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

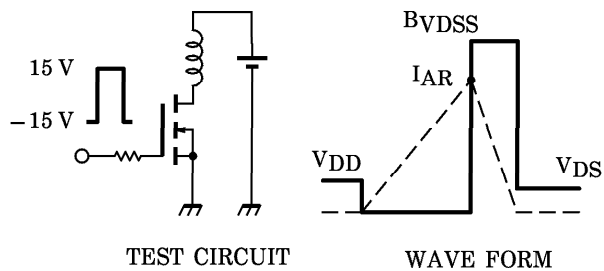
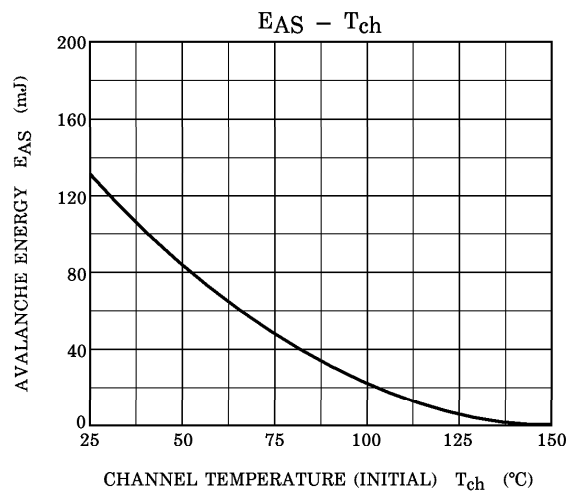
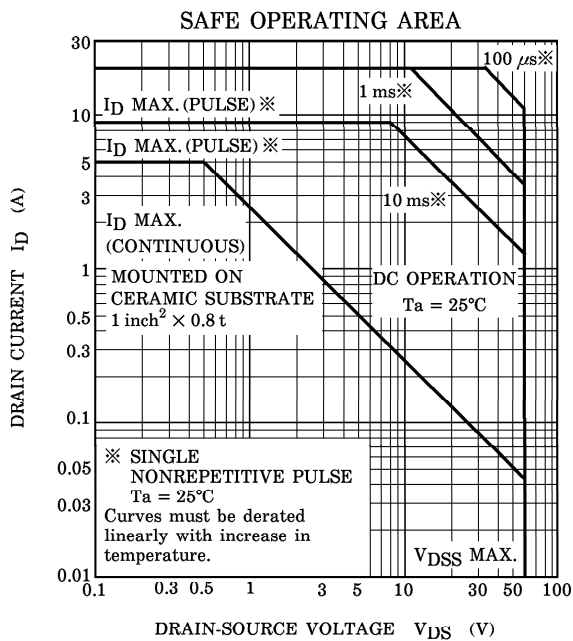
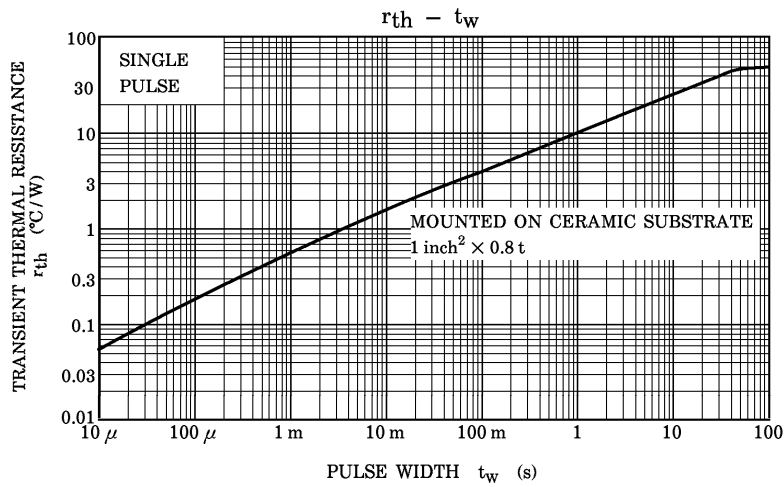
| CHARACTERISTIC                                  |               | SYMBOL        | TEST CONDITION                                                                                                                                                                                                                                          | MIN. | TYP. | MAX.     | UNIT          |
|-------------------------------------------------|---------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|----------|---------------|
| Gate Leakage Current                            |               | $I_{GSS}$     | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$                                                                                                                                                                                                       | —    | —    | $\pm 10$ | $\mu\text{A}$ |
| Drain Cut-off Current                           |               | $I_{DSS}$     | $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$                                                                                                                                                                                                           | —    | —    | 100      | $\mu\text{A}$ |
| Drain-Source Breakdown Voltage                  |               | $V_{(BR)DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$                                                                                                                                                                                                             | 60   | —    | —        | V             |
| Gate Threshold Voltage                          |               | $V_{th}$      | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$                                                                                                                                                                                                             | 0.8  | —    | 2.0      | V             |
| Drain-Source ON Resistance                      |               | $R_{DS(ON)}$  | $V_{GS} = 4 \text{ V}, I_D = 1.3 \text{ A}$                                                                                                                                                                                                             | —    | 0.20 | 0.30     | $\Omega$      |
|                                                 |               |               | $V_{GS} = 10 \text{ V}, I_D = 2.5 \text{ A}$                                                                                                                                                                                                            | —    | 0.12 | 0.16     |               |
| Forward Transfer Admittance                     |               | $ Y_{fs} $    | $V_{DS} = 10 \text{ V}, I_D = 2.5 \text{ A}$                                                                                                                                                                                                            | 3.0  | 5.0  | —        | S             |
| Input Capacitance                               |               | $C_{iss}$     | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V},$<br>$f = 1 \text{ MHz}$                                                                                                                                                                                   | —    | 370  | —        | pF            |
| Reverse Transfer Capacitance                    |               | $C_{rss}$     |                                                                                                                                                                                                                                                         | —    | 60   | —        |               |
| Output Capacitance                              |               | $C_{oss}$     |                                                                                                                                                                                                                                                         | —    | 180  | —        |               |
| Switching Time                                  | Rise Time     | $t_r$         |  <p><math>V_{GS} = 10 \text{ V}, 0 \text{ V}</math><br/><math>I_D = 2.5 \text{ A}</math><br/><math>R_L = 12 \Omega</math><br/><math>V_{DD} = 30 \text{ V}</math></p> | —    | 18   | —        | ns            |
|                                                 | Turn-on Time  | $t_{on}$      |                                                                                                                                                                                                                                                         | —    | 25   | —        |               |
|                                                 | Fall Time     | $t_f$         |                                                                                                                                                                                                                                                         | —    | 55   | —        |               |
|                                                 | Turn-off Time | $t_{off}$     |                                                                                                                                                                                                                                                         | —    | 170  | —        |               |
| Total Gate Charge (Gate-Source Plus Gate-Drain) |               | $Q_g$         | $V_{DD} = 48 \text{ V}, V_{GS} = 10 \text{ V},$<br>$I_D = 5 \text{ A}$                                                                                                                                                                                  | —    | 12   | —        | nC            |
| Gate-Source Charge                              |               | $Q_{gs}$      |                                                                                                                                                                                                                                                         | —    | 8    | —        |               |
| Gate-Drain ("Miller") Charge                    |               | $Q_{gd}$      |                                                                                                                                                                                                                                                         | —    | 4    | —        |               |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                   | SYMBOL    | TEST CONDITION                               | MIN. | TYP. | MAX. | UNIT          |
|----------------------------------|-----------|----------------------------------------------|------|------|------|---------------|
| Continuous Drain Reverse Current | $I_{DR}$  | —                                            | —    | —    | 5    | A             |
| Pulse Drain Reverse Current      | $I_{DRP}$ | —                                            | —    | —    | 20   | A             |
| Diode Forward Voltage            | $V_{DSF}$ | $I_{DR} = 5 \text{ A}, V_{GS} = 0 \text{ V}$ | —    | —    | −1.7 | V             |
| Reverse Recovery Time            | $t_{rr}$  | $I_{DR} = 5 \text{ A}, V_{GS} = 0 \text{ V}$ | —    | 70   | —    | ns            |
| Reverse Recovered Charge         | $Q_{rr}$  | $dI_{DR}/dt = 50 \text{ A}/\mu\text{s}$      | —    | 0.1  | —    | $\mu\text{C}$ |







Peak  $I_{AR} = 5 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 25 \text{ V}$ ,  $L = 7 \text{ mH}$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$