

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE ( $\pi$ -MOSV)

# 2SK2996

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

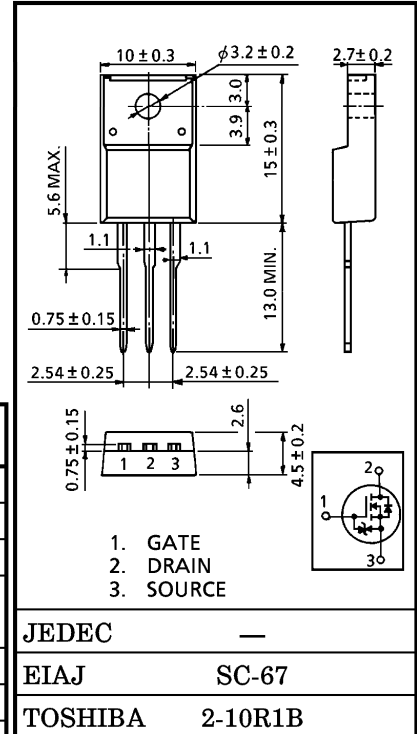
INDUSTRIAL APPLICATIONS

Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.74 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 6.8 S$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu A$  (Max.) ( $V_{DS} = 600 V$ )
- Enhancement-Mode :  $V_{th} = 2.0 \sim 4.0 V$   
 ( $V_{DS} = 10 V, I_D = 1 mA$ )

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

| CHARACTERISTIC                                 |       | SYMBOL    | RATING         | UNIT       |
|--|-------|-----------|----------------|------------|
| Drain-Source Voltage                           |       | $V_{DSS}$ | 600            | V          |
| Drain-Gate Voltage ( $R_{GS} = 20 k\Omega$ )   |       | $V_{DGR}$ | 600            | V          |
| Gate-Source Voltage                            |       | $V_{GSS}$ | $\pm 30$       | V          |
| Drain Current                                  | DC    | $I_D$     | 10             | A          |
|  | Pulse | $I_{DP}$  | 30             |            |
| Drain Power Dissipation ( $T_c = 25^\circ C$ ) |       | $P_D$     | 45             | W          |
| Single Pulse Avalanche Energy**                |       | $E_{AS}$  | 252            | mJ         |
| Avalanche Current                              |       | $I_{AR}$  | 10             | A          |
| Repetitive Avalanche Energy*                   |       | $E_{AR}$  | 4.5            | mJ         |
| Channel Temperature                            |       | $T_{ch}$  | 150            | $^\circ C$ |
| Storage Temperature Range                      |       | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |



Weight : 1.9 g

Thermal Characteristics

| CHARACTERISTIC                         | SYMBOL         | MAX. | UNIT           |
|--|----------------|------|----------------|
| Thermal Resistance, Channel to Case    | $R_{th(ch-c)}$ | 2.78 | $^\circ C / W$ |
| Thermal Resistance, Channel to Ambient | $R_{th(ch-a)}$ | 62.5 | $^\circ C / W$ |

Note ;

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

\*\*  $V_{DD} = 90 V$ , Starting  $T_{ch} = 25^\circ C$ ,  $L = 4.41 mH$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 10 A$

**This transistor is an electrostatic sensitive device.  
 Please handle with caution.**

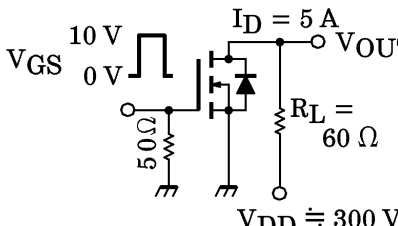
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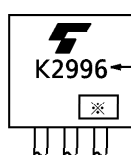
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                                  | SYMBOL               | TEST CONDITION  | MIN.  | TYP.   | MAX. | UNIT |    |
|---|----------------------|---|---|--|------|------|----|
| Gate Leakage Current                            | I <sub>GSS</sub>     | V <sub>GS</sub> = ±25 V, V <sub>DS</sub> = 0 V                            | —   | —  | ±10  | μA   |    |
| Gate-Source Breakdown Voltage                   | V <sub>(BR)GSS</sub> | I <sub>G</sub> = ±10 μA, V <sub>DS</sub> = 0 V                            | ±30   | —  | —    | V    |    |
| Drain Cut-off Current                           | I <sub>DSS</sub>     | V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V                            | —   | —  | 100  | μA   |    |
| Drain-Source Breakdown Voltage                  | V <sub>(BR)DSS</sub> | I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V                             | 600   | —  | —    | V    |    |
| Gate Threshold Voltage                          | V <sub>th</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA                             | 2.0   | —  | 4.0  | V    |    |
| Drain-Source ON Resistance                      | R <sub>DS(ON)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5 A                              | —   | 0.74   | 1.0  | Ω    |    |
| Forward Transfer Admittance                     | Y <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 5 A                              | 3.4   | 6.8  | —    | S    |    |
| Input Capacitance                               | C <sub>iss</sub>     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V,<br>f = 1 MHz               | —   | 1500   | —    | pF   |    |
| Reverse Transfer Capacitance                    | C <sub>rss</sub>     |   | —   | 13   | —    |      |    |
| Output Capacitance                              | C <sub>oss</sub>     |   | —   | 140  | —    |      |    |
| Switching Time                                  | Rise Time            | t <sub>r</sub>  |  | —  | 15   | —    | ns |
|   | Turn-on Time         | t <sub>on</sub>   |   | —  | 55   | —    |    |
|   | Fall Time            | t <sub>f</sub>  |   | —  | 27   | —    |    |
|   | Turn-off Time        | t <sub>off</sub>  |   | V <sub>IN</sub> : t <sub>r</sub> , t <sub>f</sub> < 5 ns,<br>Duty ≤ 1%, t <sub>w</sub> = 10 μs | —    | 145  |    |
| Total Gate Charge (Gate-Source Plus Gate-Drain) | Q <sub>g</sub>       | V <sub>DD</sub> ≐ 400 V, V <sub>GS</sub> = 10 V,<br>I <sub>D</sub> = 10 A | —   | 38   | —    | nC   |    |
| Gate-Source Charge                              | Q <sub>gs</sub>      |   | —   | 21   | —    |      |    |
| Gate-Drain ("Miller") Charge                    | Q <sub>gd</sub>      |   | —   | 17   | —    |      |    |

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

| CHARACTERISTIC                   | SYMBOL           | TEST CONDITION   | MIN. | TYP. | MAX. | UNIT |
|----------------------------------|------------------|--|------|------|------|------|
| Continuous Drain Reverse Current | I <sub>DR</sub>  | —  | —    | —    | 10   | A    |
| Pulse Drain Reverse Current      | I <sub>DRP</sub> | —  | —    | —    | 30   | A    |
| Diode Forward Voltage            | V <sub>DSF</sub> | I <sub>DR</sub> = 10 A, V <sub>GS</sub> = 0 V                                    | —    | —    | -1.7 | V    |
| Reverse Recovery Time            | t <sub>rr</sub>  | I <sub>DR</sub> = 10 A, V <sub>GS</sub> = 0 V<br>dI <sub>DR</sub> /dt = 100 A/μs | —    | 1600 | —    | ns   |
| Reverse Recovery Charge          | Q <sub>rr</sub>  |  | —    | 17   | —    | μC   |

MARKING

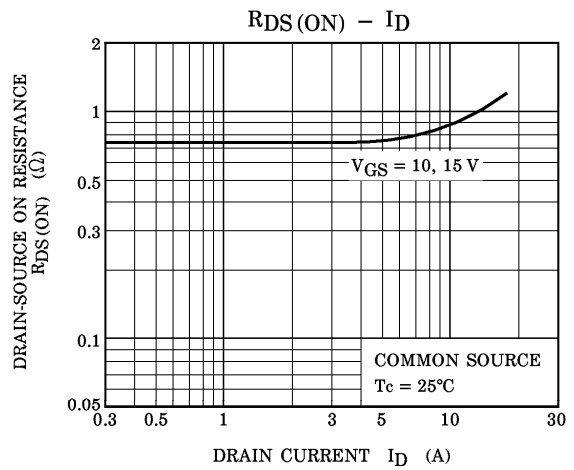
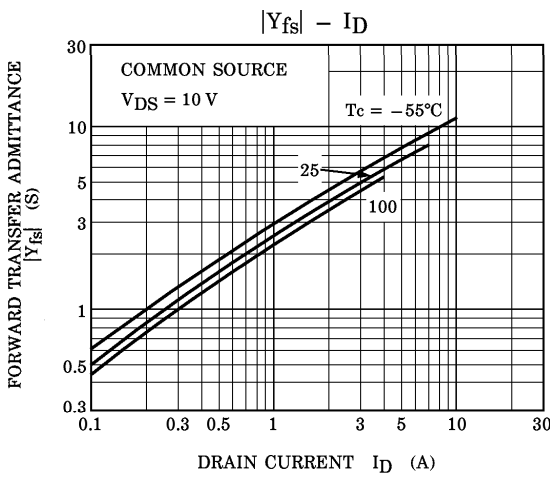
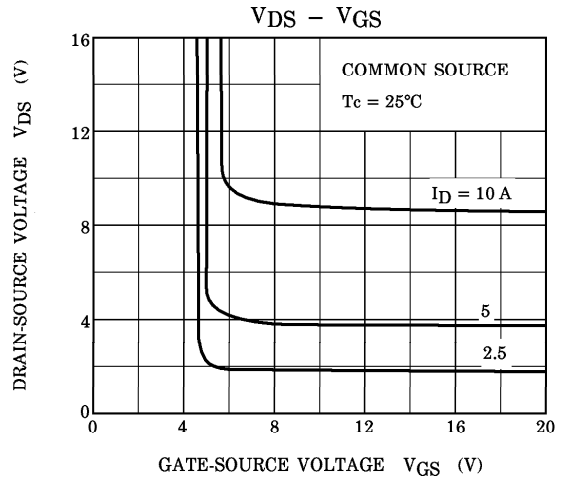
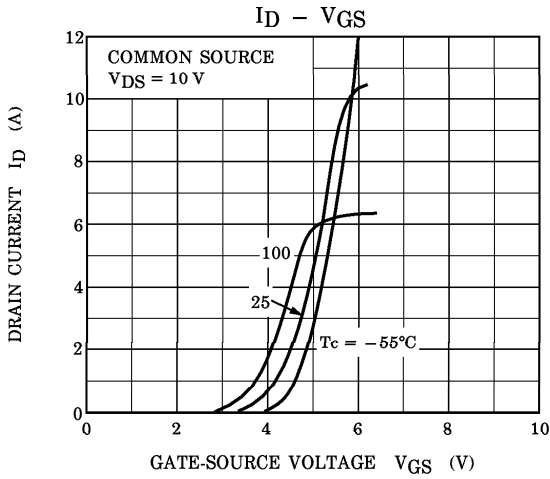
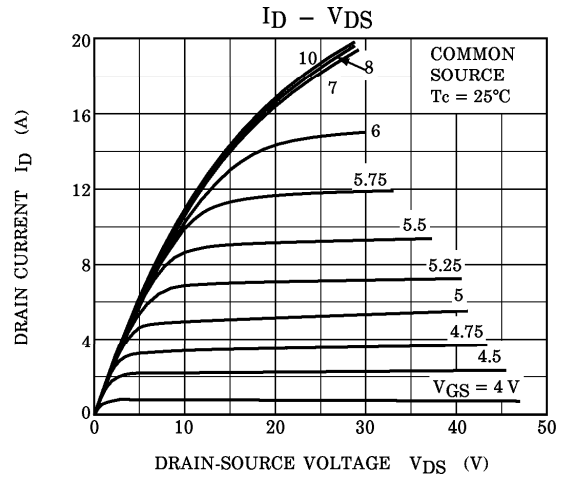
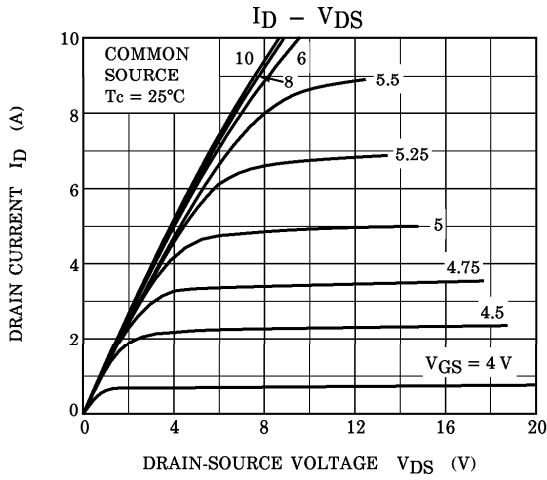


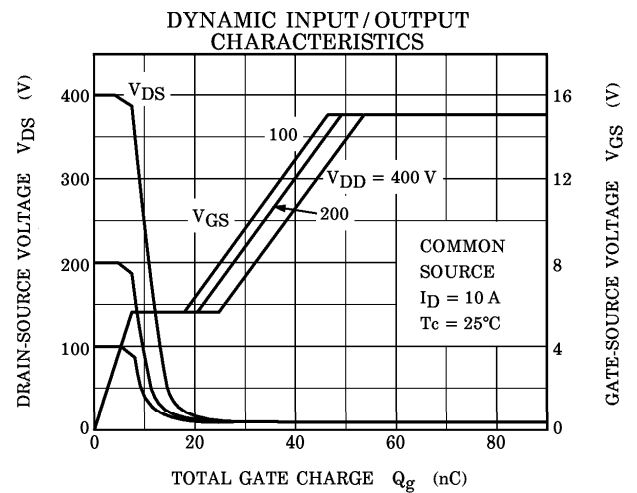
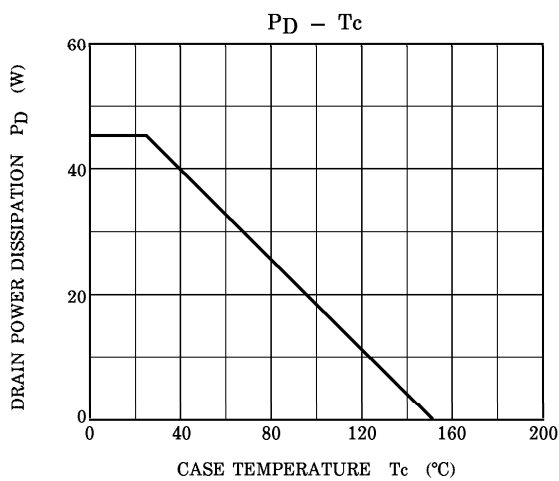
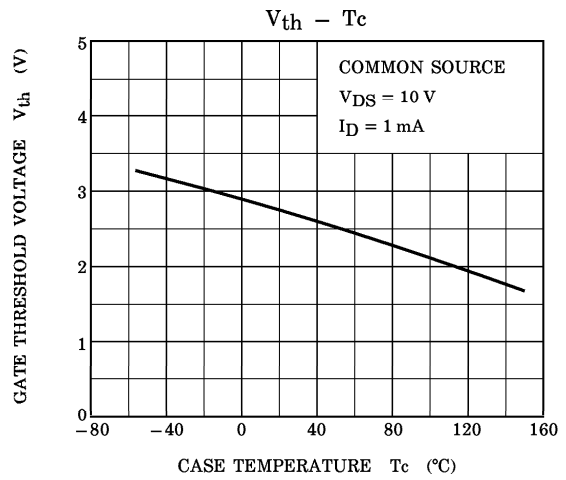
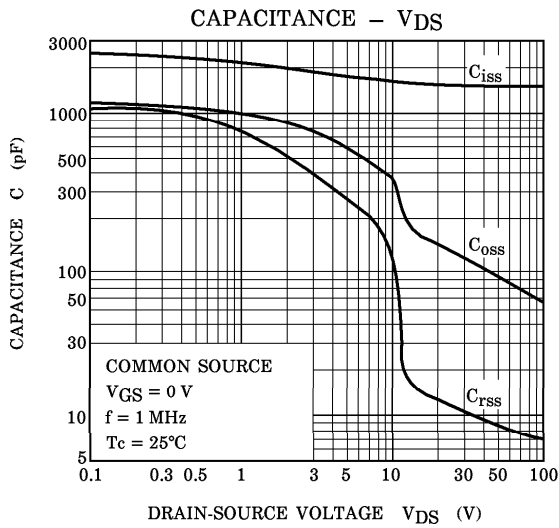
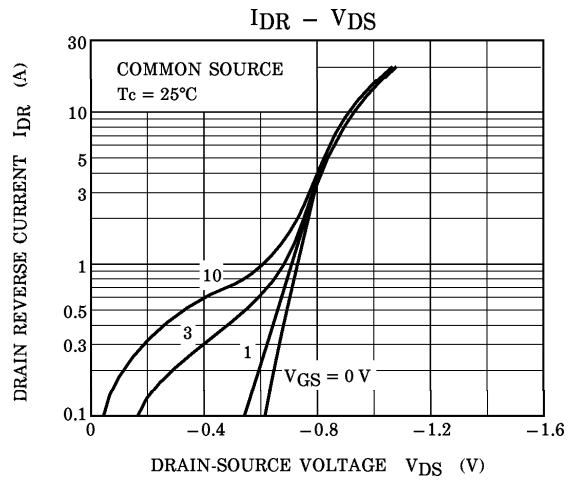
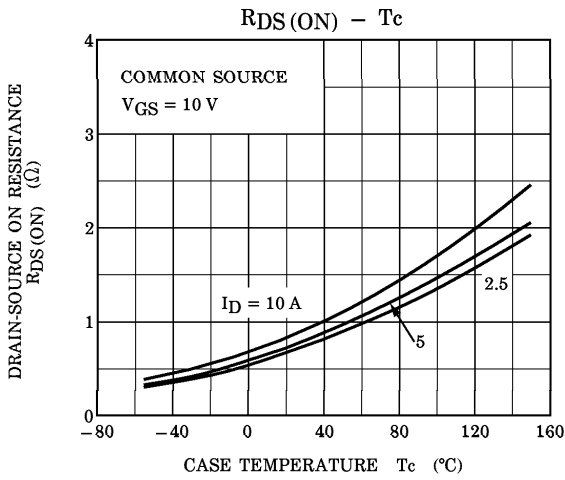
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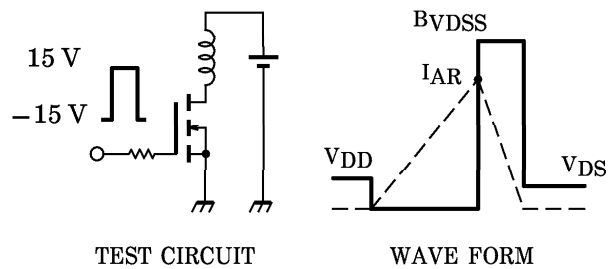
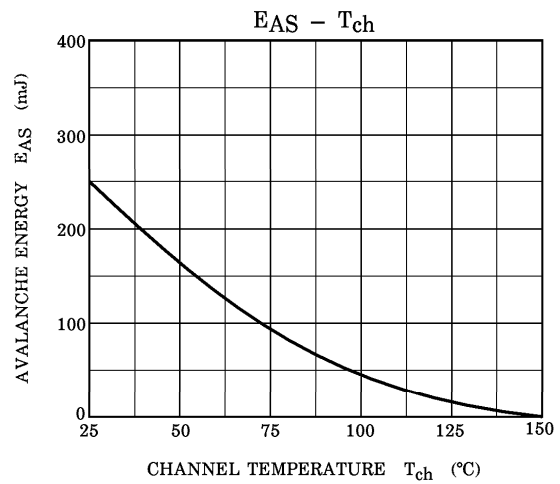
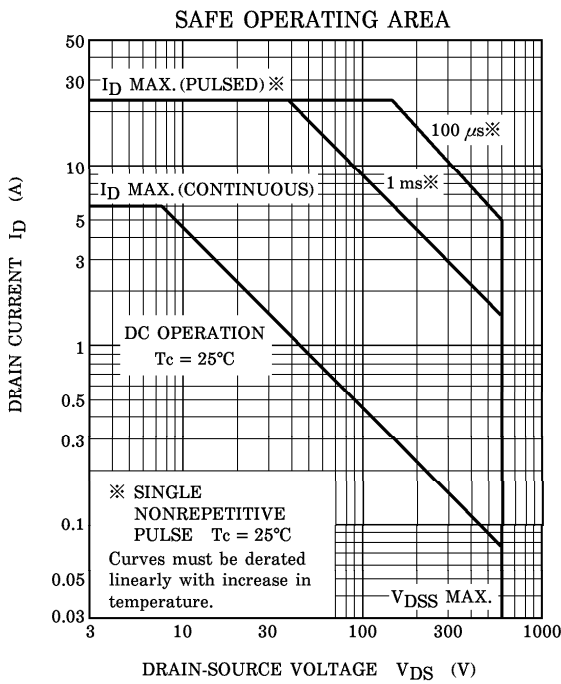
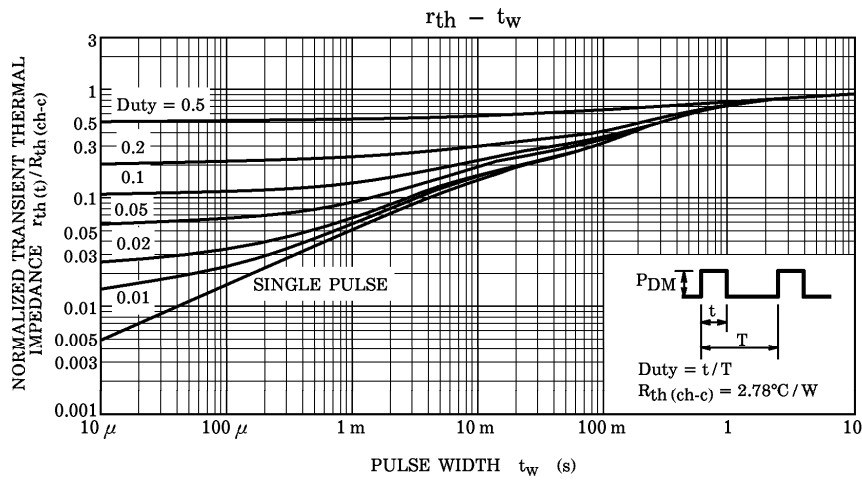
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







Peak  $I_{AR} = 10 \text{ A}$ ,  $R_G = 25 \Omega$      $E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$   
 $V_{DD} = 90 \text{ V}$ ,  $L = 4.41 \text{ mH}$

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