

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (L<sup>2</sup>-π-MOSV)

# 2SK2233

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

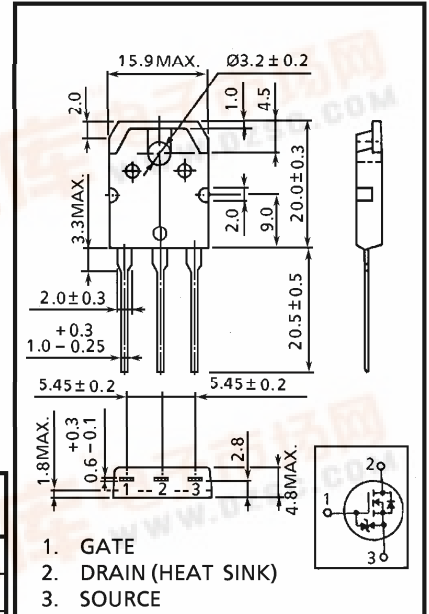
INDUSTRIAL APPLICATIONS

Unit in mm

- 4 V Gate Drive
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.022 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 27 S$  (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    | $I_D$     | 45             | A          |
|  | Pulse | $I_{DP}$  | 180            | A          |
| Drain Power Dissipation ( $T_c = 25^\circ C$ ) |       | $P_D$     | 100            | W          |
| Single Pulse Avalanche Energy**                |       | $E_{AS}$  | 246            | mJ         |
| Avalanche Current                              |       | $I_{AR}$  | 45             | A          |
| Repetitive Avalanche Energy*                   |       | $E_{AR}$  | 10             | mJ         |
| Channel Temperature                            |       | $T_{ch}$  | 150            | $^\circ C$ |
| Storage Temperature Range                      |       | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |



|         |         |
|---------|---------|
| JEDEC   | —       |
| EIAJ    | SC-65   |
| TOSHIBA | 2-16C1B |

Weight : 4.6 g

THERMAL CHARACTERISTICS

| CHARACTERISTIC                         | SYMBOL         | MAX. | UNIT         |
|--|----------------|------|--------------|
| Thermal Resistance, Channel To Case    | $R_{th(ch-c)}$ | 1.25 | $^\circ C/W$ |
| 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),  $L = 165 \mu H, R_G = 25 \Omega, I_{AR} = 45 A$

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

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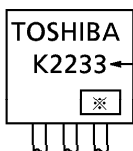
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                                  |               | SYMBOL        | TEST CONDITION   | MIN. | TYP. | MAX.     | UNIT          |
|---|---------------|---------------|--|------|------|----------|---------------|
| Gate Leakage Current                            |               | $I_{GSS}$     | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$  | —    | —    | $\pm 10$ | $\mu\text{A}$ |
| 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                      |               | $R_{DS(ON)}$  | $V_{GS} = 4\text{ V}, I_D = 15\text{ A}$   | —    | 40   | 55       | m $\Omega$    |
|   |               |               | $V_{GS} = 10\text{ V}, I_D = 25\text{ A}$  | —    | 22   | 30       |               |
| Forward Transfer Admittance                     |               | $ Y_{fs} $    | $V_{DS} = 10\text{ V}, I_D = 25\text{ A}$  | 15   | 27   | —        | S             |
| Input Capacitance                               |               | $C_{iss}$     | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$  | —    | 1800 | —        | pF            |
| Reverse Transfer Capacitance                    |               | $C_{rss}$     |  | —    | 350  | —        |               |
| Output Capacitance                              |               | $C_{oss}$     |  | —    | 900  | —        |               |
| Switching Time                                  | Rise Time     | $t_r$         | <p><math>I_D = 25\text{ A}</math><br/><math>V_{GS} = 10\text{ V}</math><br/><math>V_{DD} \cong 30\text{ V}</math><br/><math>R_L = 1.2\ \Omega</math><br/><math>V_{IN} : t_r, t_f &lt; 5\text{ ns},</math><br/><math>\text{Duty} \leq 1\%, t_w = 10\ \mu\text{s}</math></p> | —    | 20   | —        | ns            |
|   | Turn-on Time  | $t_{on}$      |  | —    | 30   | —        |               |
|   | Fall Time     | $t_f$         |  | —    | 40   | —        |               |
|   | Turn-off Time | $t_{off}$     |  | —    | 130  | —        |               |
| Total Gate Charge (Gate-Source Plus Gate-Drain) |               | $Q_g$         | $V_{DD} \cong 48\text{ V}, V_{GS} = 10\text{ V}$   | —    | 60   | —        | nC            |
| Gate-Source Charge                              |               | $Q_{gs}$      | $I_D = 45\text{ A}$  | —    | 40   | —        |               |
| Gate-Drain (“Miller”) Charge                    |               | $Q_{gd}$      |  | —    | 20   | —        |               |

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

| CHARACTERISTIC                   | SYMBOL    | TEST CONDITION                              | MIN. | TYP. | MAX. | UNIT          |
|----------------------------------|-----------|---|------|------|------|---------------|
| Continuous Drain Reverse Current | $I_{DR}$  | —   | —    | —    | 45   | A             |
| Pulse Drain Reverse Current      | $I_{DRP}$ | —   | —    | —    | 180  | A             |
| Diode Forward Voltage            | $V_{DSF}$ | $I_{DR} = 45\text{ A}, V_{GS} = 0\text{ V}$ | —    | —    | -1.8 | V             |
| Reverse Recovery Time            | $t_{rr}$  | $I_{DR} = 45\text{ A}, V_{GS} = 0\text{ V}$ | —    | 90   | —    | ns            |
| Reverse Recovery Charge          | $Q_{rr}$  | $dI_{DR} / dt = 100\text{ A} / \mu\text{s}$ | —    | 0.1  | —    | $\mu\text{C}$ |

MARKING



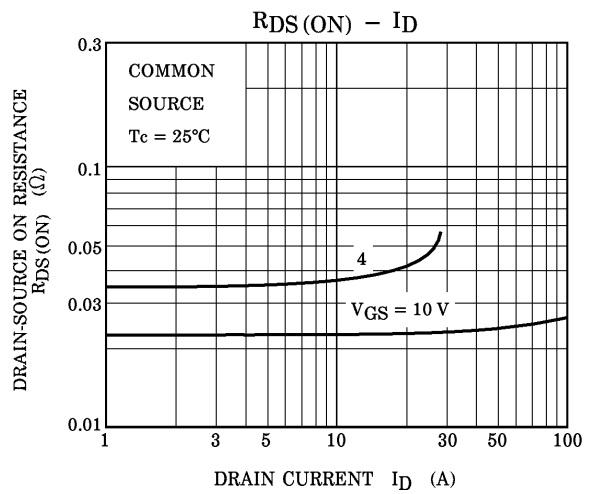
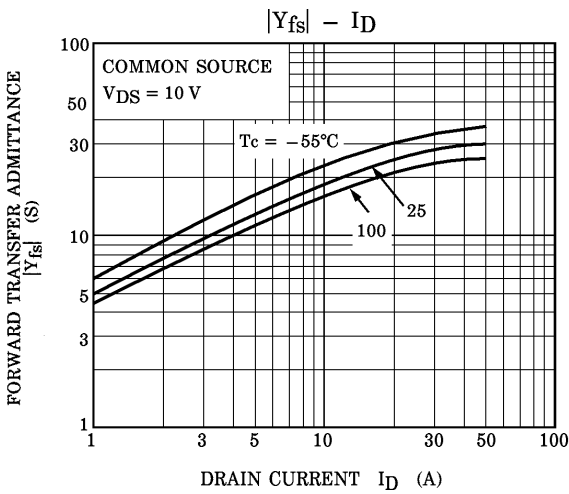
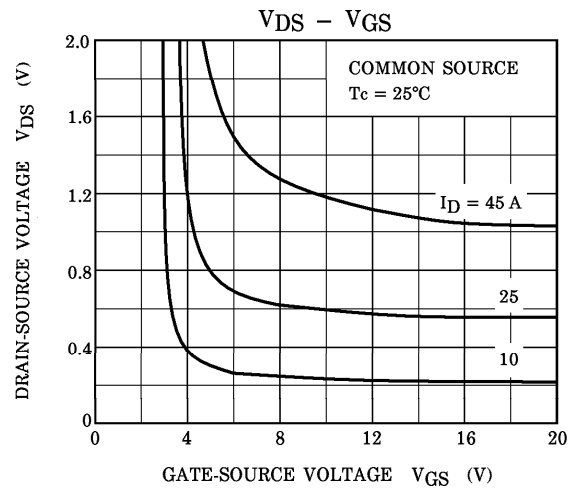
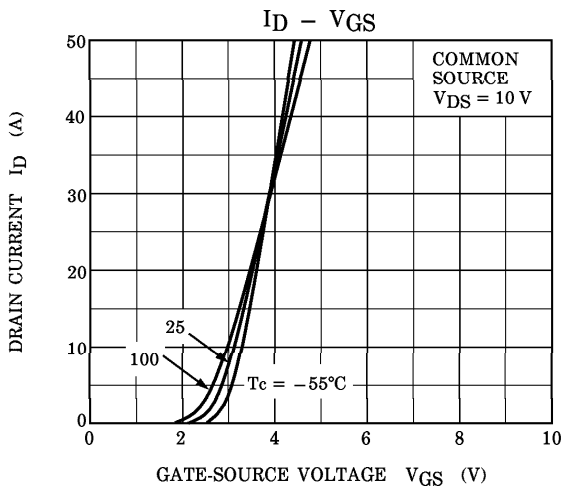
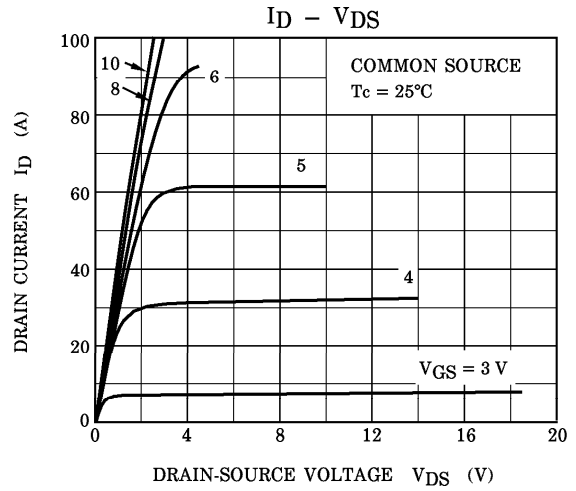
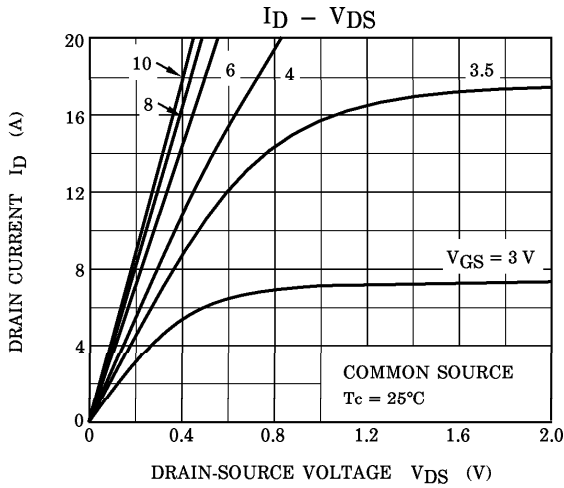
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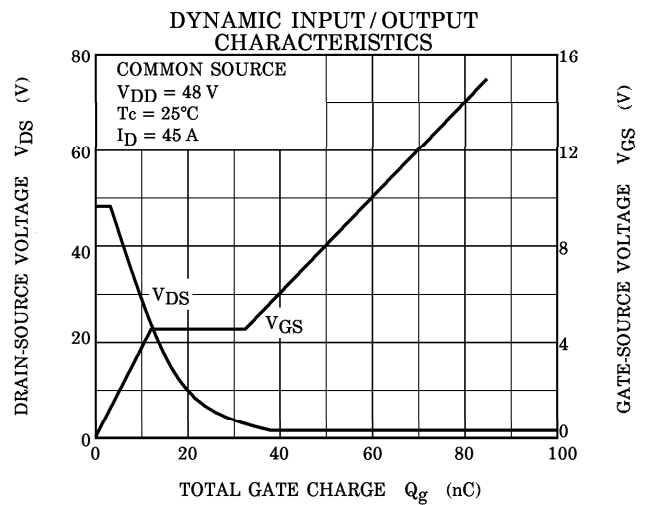
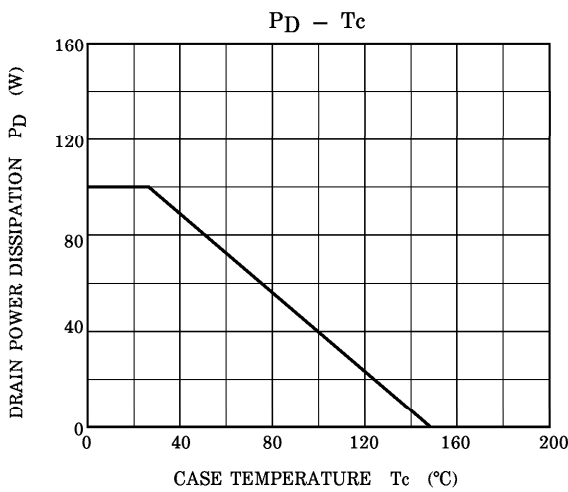
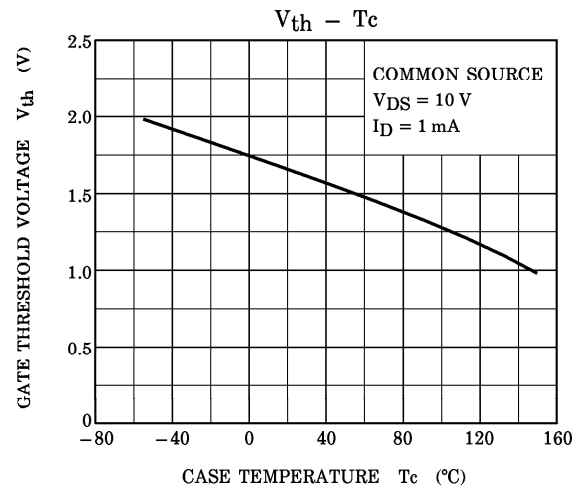
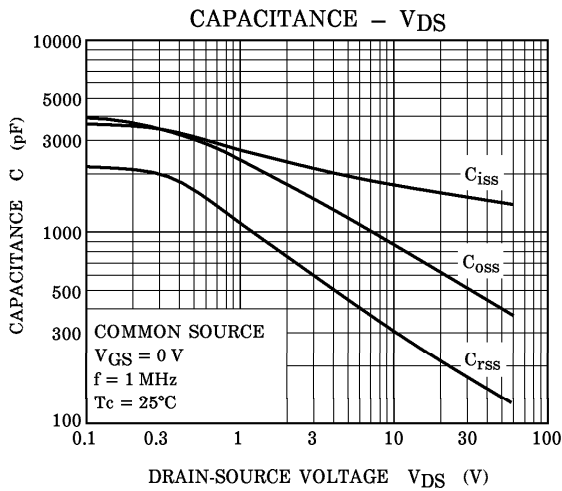
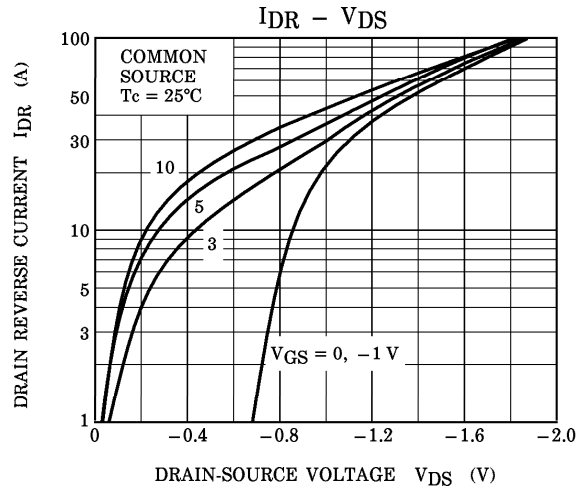
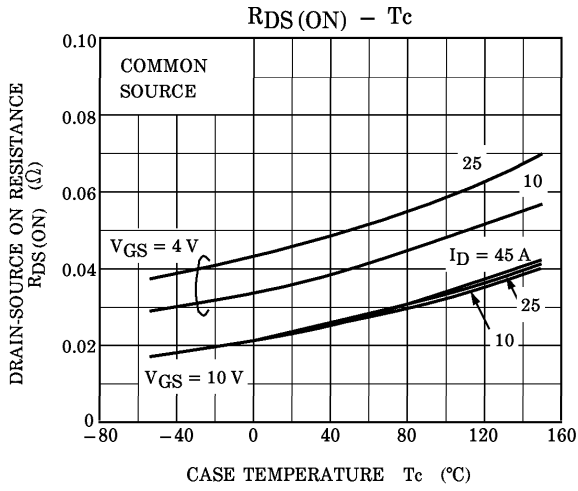
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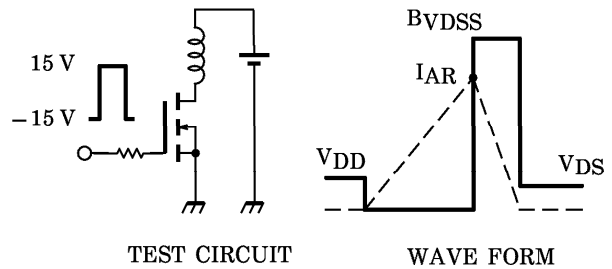
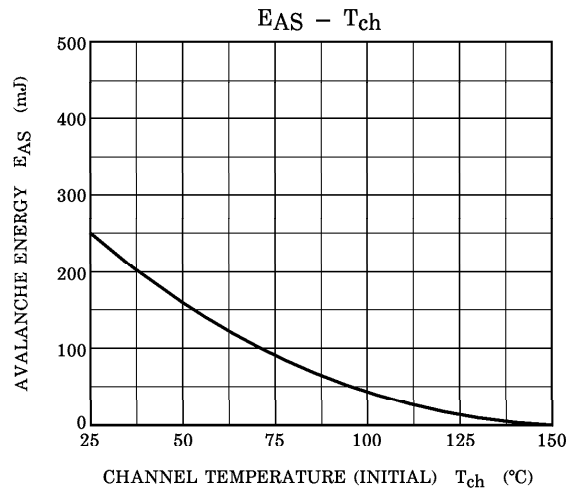
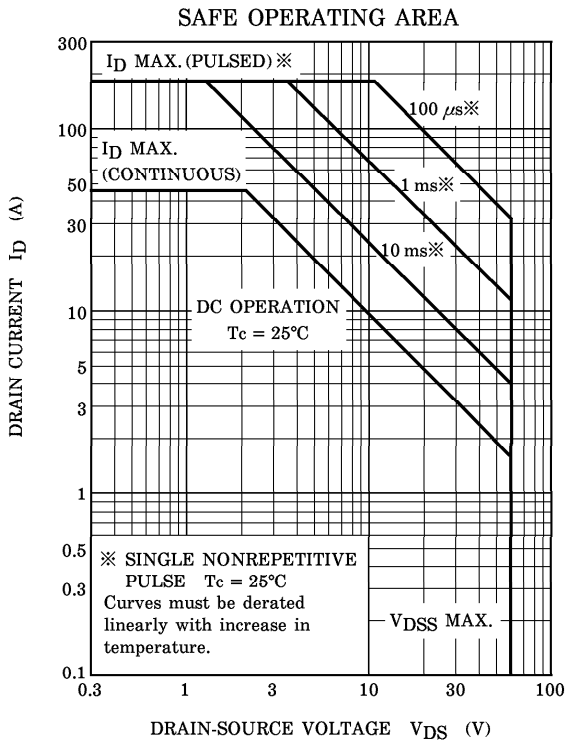
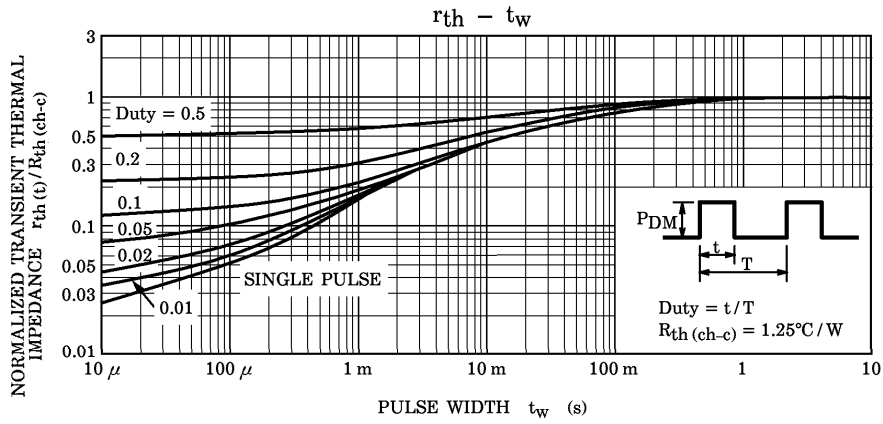


Month (Starting from Alphabet A)

Year (Last Number of the Christian Era)







Peak  $I_{AR} = 45 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 25 \text{ V}$ ,  $L = 165 \mu\text{H}$

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