

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

# 2SK2884

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS  
 CHOPPER REGULATOR, DC-DC CONVERTER APPLICATIONS

INDUSTRIAL APPLICATIONS  
 TO-220FL Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 1.9 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 3.8 S$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu A$  (Max.)  
( $V_{DS} = 640 V$ )
- 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                           | $V_{DSS}$ | 800            | V          |
| Drain-Gate Voltage ( $R_{GS} = 20 k\Omega$ )   | $V_{DGR}$ | 800            | V          |
| Gate-Source Voltage                            | $V_{GSS}$ | $\pm 30$       | V          |
| Drain Current                                  | DC        | $I_D$          | 5 A        |
|  | Pulse     | $I_{DP}$       | 15 A       |
| Drain Power Dissipation ( $T_c = 25^\circ C$ ) | $P_D$     | 100            | W          |
| Single Pulse Avalanche Energy**                | $E_{AS}$  | 370            | mJ         |
| Avalanche Current                              | $I_{AR}$  | 5              | A          |
| Repetitive Avalanche Energy*                   | $E_{AR}$  | 10             | mJ         |
| Channel Temperature                            | $T_{ch}$  | 150            | $^\circ C$ |
| Storage Temperature Range                      | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |

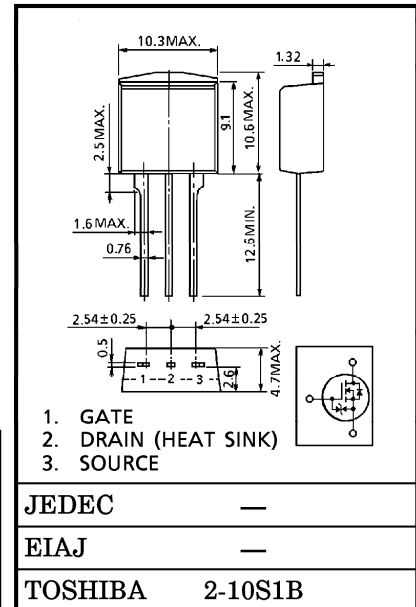
THERMAL CHARACTERISTICS

| CHARACTERISTIC                         | SYMBOL         | MAX. | UNIT           |
|--|----------------|------|----------------|
| Thermal Resistance, Channel to Case    | $R_{th(ch-c)}$ | 1.25 | $^\circ C / W$ |
| Thermal Resistance, Channel to Ambient | $R_{th(ch-a)}$ | 83.3 | $^\circ C / W$ |

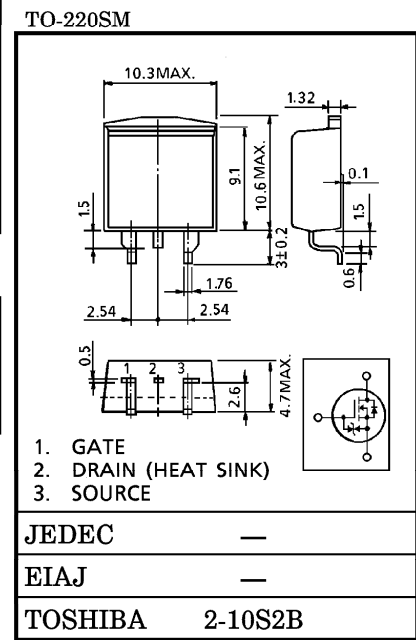
Note ;

- \* Repetitive rating ; Pulse Width Limited by Max. junction temperature.
- \*\*  $V_{DD} = 90 V$ , Starting  $T_{ch} = 25^\circ C$ ,  $L = 27 mH$ ,  
 $R_G = 25 \Omega$ ,  $I_{AR} = 5 A$

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



Weight : 1.5 g (Typ.)



Weight : 1.5 g (Typ.)

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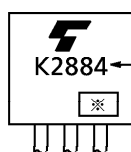
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                                  |               | SYMBOL   | TEST CONDITION   | MIN. | TYP. | MAX. | UNIT |
|---|---------------|----------|--|------|------|------|------|
| Gate Leakage Current                            |               | IGSS     | VGS = ±30 V, VDS = 0 V   | —    | —    | ±10  | μA   |
| Gate-Source Breakdown Voltage                   |               | V(BR)GSS | IG = ±10 μA, VDS = 0 V   | ±30  | —    | —    | V    |
| Drain Cut-Off Current                           |               | IDSS     | VDS = 640 V, VGS = 0 V   | —    | —    | 100  | μA   |
| Drain-Source Breakdown Voltage                  |               | V(BR)DSS | ID = 10 mA, VGS = 0 V  | 800  | —    | —    | V    |
| Gate Threshold Voltage                          |               | Vth      | VDS = 10 V, ID = 1 mA  | 2.0  | —    | 4.0  | V    |
| Drain-Source ON Resistance                      |               | RDS(ON)  | VGS = 10 V, ID = 3 A   | —    | 1.9  | 2.2  | Ω    |
| Forward Transfer Admittance                     |               | Yfs      | VDS = 15 V, ID = 3 A   | 1.0  | 3.8  | —    | S    |
| Input Capacitance                               |               | Ciss     | VDS = 25 V, VGS = 0 V,<br>f = 1 MHz  | —    | 1080 | —    | pF   |
| Reverse Transfer Capacitance                    |               | Crss     |  | —    | 16   | —    |      |
| Output Capacitance                              |               | Coss     |  | —    | 105  | —    |      |
| Switching Time                                  | Rise Time     | tr       | <p>VGS 10 V<br/>0 V</p> <p>ID = 3 A</p> <p>VOUT</p> <p>RL = 66.7 Ω</p> <p>VDD ≅ 200 V</p> <p>VIN : tr, tf &lt; 5 ns,<br/>Duty ≤ 1%, tw = 10 μs</p> | —    | 40   | —    | ns   |
|   | Turn-On Time  | ton      |  | —    | 80   | —    |      |
|   | Fall Time     | tf       |  | —    | 40   | —    |      |
|   | Turn-Off Time | toff     |  | —    | 140  | —    |      |
| Total Gate Charge (Gate-Source Plus Gate-Drain) |               | Qg       | VDD ≅ 400 V, VGS = 10 V,<br>ID = 5 A   | —    | 34   | —    | nC   |
| Gate-Source Charge                              |               | Qgs      |  | —    | 16   | —    |      |
| Gate-Drain (“Miller”) Charge                    |               | Qgd      |  | —    | 18   | —    |      |

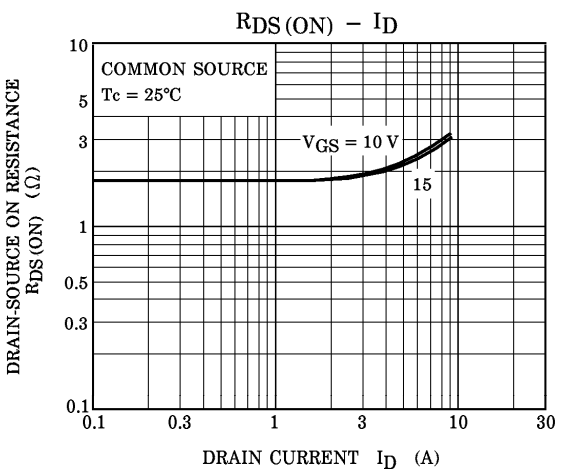
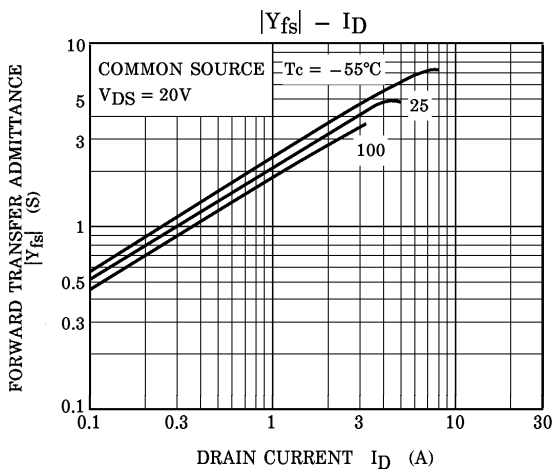
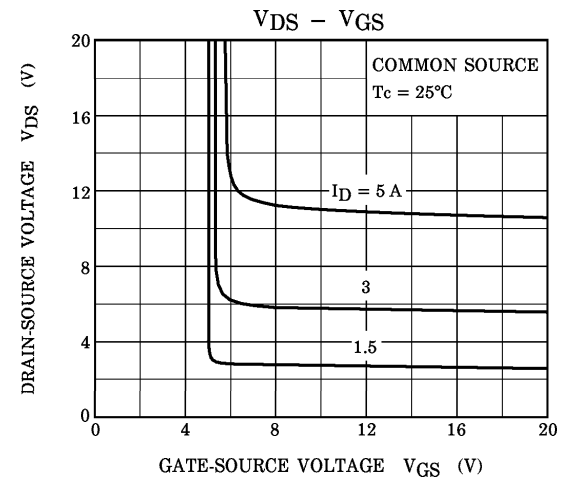
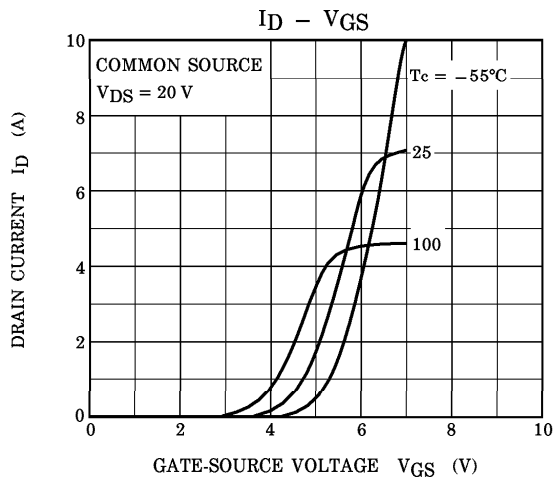
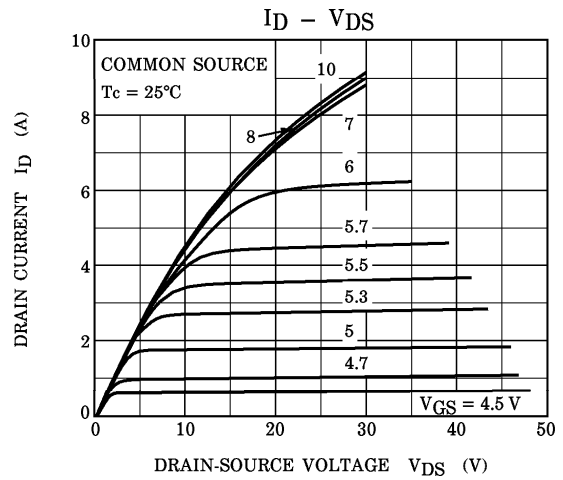
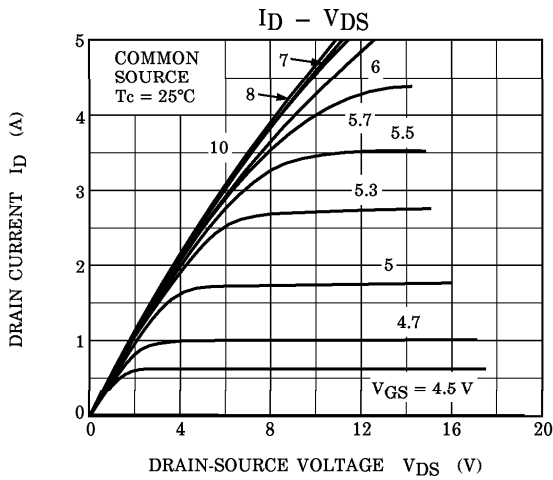
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

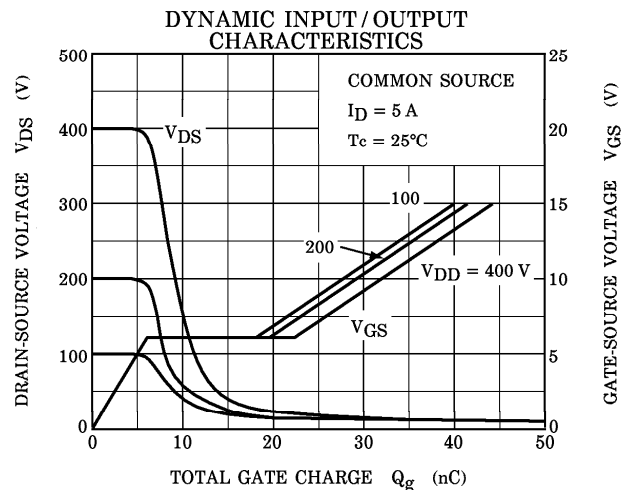
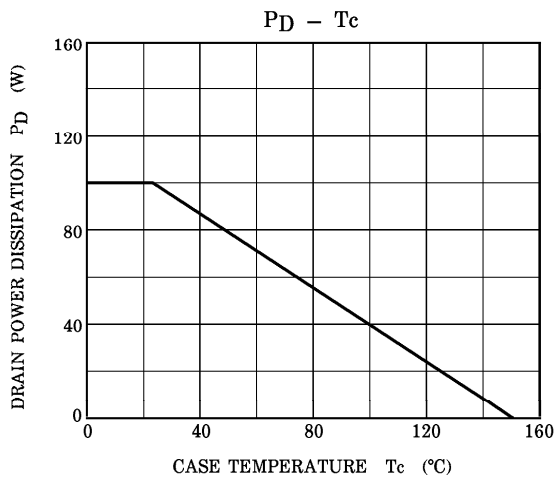
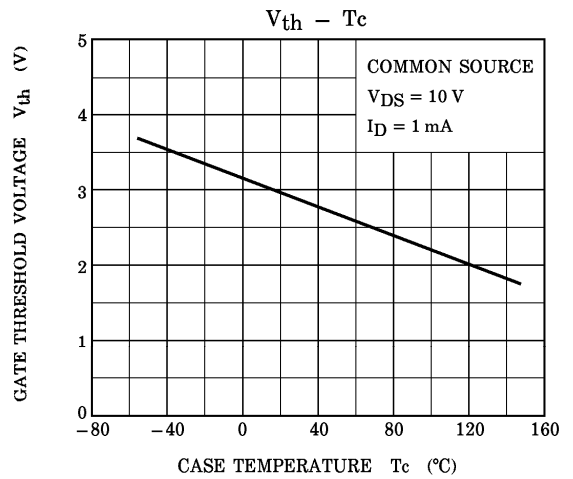
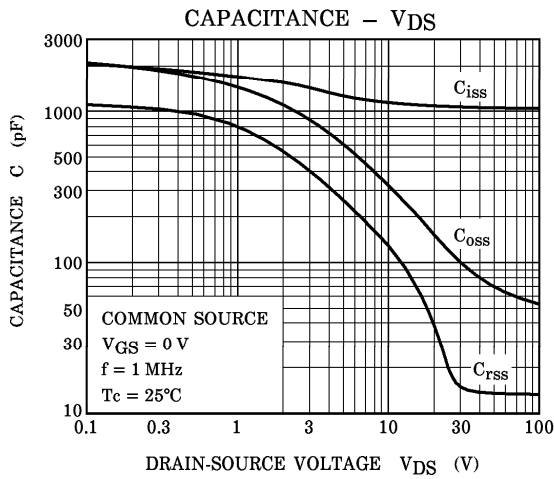
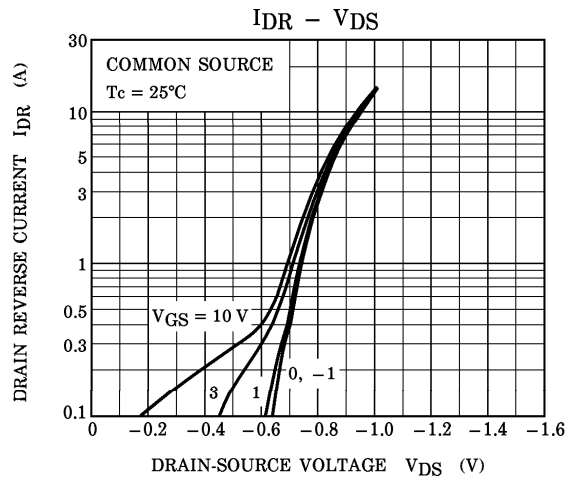
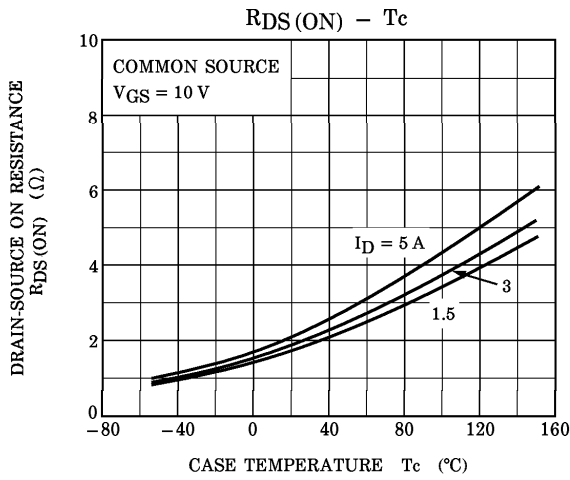
| CHARACTERISTIC                   | SYMBOL | TEST CONDITION       | MIN. | TYP. | MAX. | UNIT |
|----------------------------------|--------|----------------------|------|------|------|------|
| Continuous Drain Reverse Current | IDR    | —                    | —    | —    | 5    | A    |
| Pulse Drain Reverse Current      | IDRP   | —                    | —    | —    | 15   | A    |
| Diode Forward Voltage            | VDSF   | IDR = 5 A, VGS = 0 V | —    | —    | -1.9 | V    |
| Reverse Recovery Time            | trr    | IDR = 5 A, VGS = 0 V | —    | 1000 | —    | ns   |
| Reverse Recovery Charge          | Qrr    | dIDR/dt = 100 A/μs   | —    | 7.5  | —    | μC   |

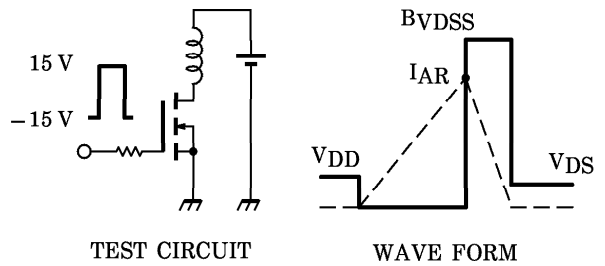
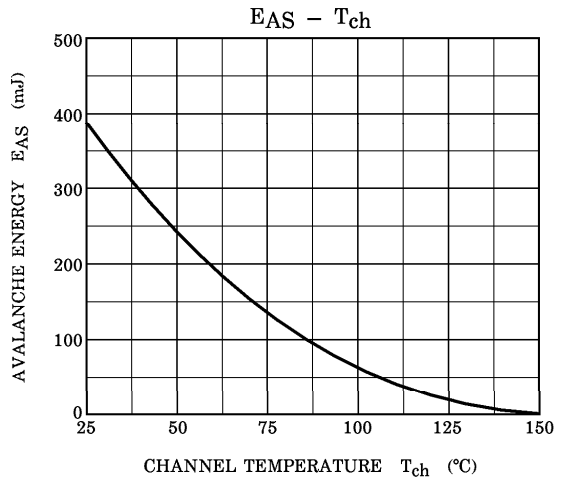
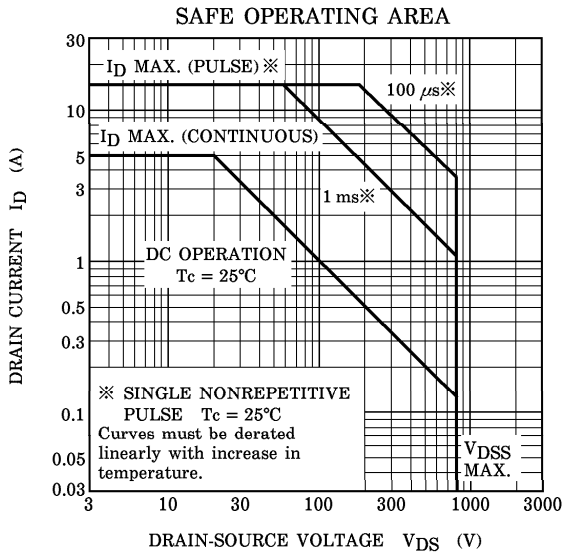
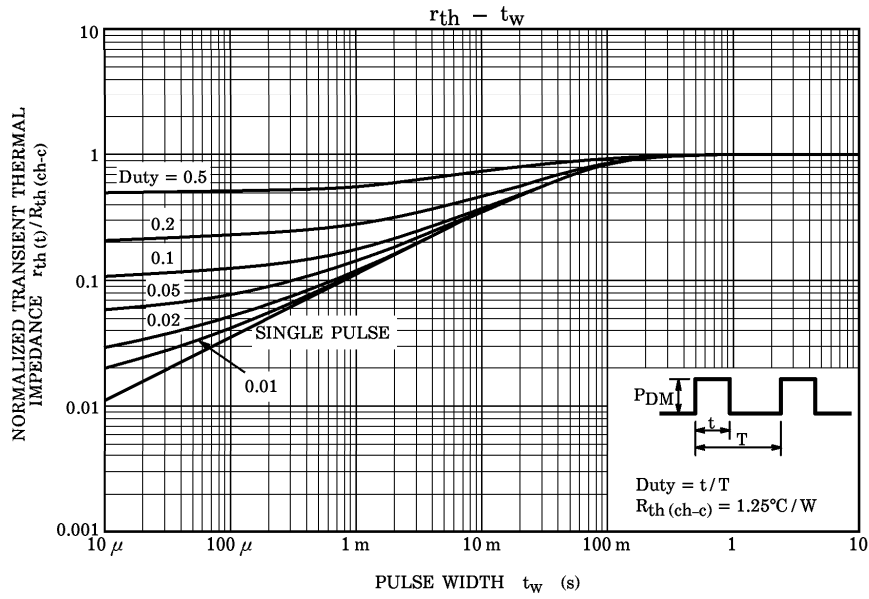
MARKING



TYPE → K2884  
 ※ Lot Number  
 □ □ → Month (Starting from Alphabet A)  
 ———→ Year (Last Number of the Christian Era)







Peak  $I_{AR} = 5 A$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 90 V$ ,  $L = 27 mH$

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