

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

# 2SK2920

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 :  $R_{DS(ON)} = 0.56 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 4.5 S$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu A$  (Max.) ( $V_{DS} = 200 V$ )
- Enhancement-Mode :  $V_{th} = 1.5 \sim 3.5 V$   
( $V_{DS} = 10 V, I_D = 1 mA$ )

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

| CHARACTERISTIC                                 | SYMBOL    | RATING         | UNIT       |
|--|-----------|----------------|------------|
| Drain-Source Voltage                           | $V_{DSS}$ | 200            | V          |
| Drain-Gate Voltage ( $R_{GS} = 20 k\Omega$ )   | $V_{DGR}$ | 200            | V          |
| Gate-Source Voltage                            | $V_{GSS}$ | $\pm 20$       | V          |
| Drain Current                                  | DC        | $I_D$          | 5 A        |
|  | Pulse     | $I_{DP}$       | 20 A       |
| Drain Power Dissipation ( $T_c = 25^\circ C$ ) | $P_D$     | 20             | W          |
| Single Pulse Avalanche Energy**                | $E_{AS}$  | 65             | mJ         |
| Avalanche Current                              | $I_{AR}$  | 5              | A          |
| Repetitive Avalanche Energy*                   | $E_{AR}$  | 2              | mJ         |
| Channel Temperature                            | $T_{ch}$  | 150            | $^\circ C$ |
| Storage Temperature Range                      | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |

THERMAL CHARACTERISTICS

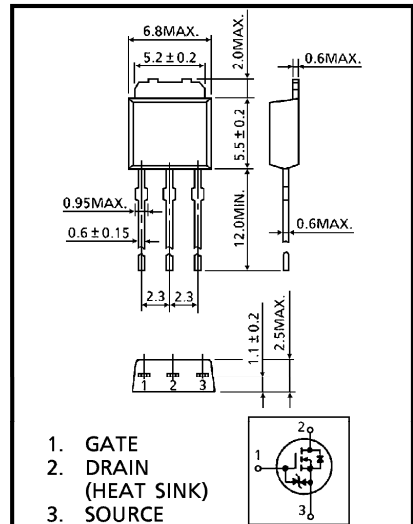
| CHARACTERISTIC                         | SYMBOL         | MAX. | UNIT           |
|--|----------------|------|----------------|
| Thermal Resistance, Channel to Case    | $R_{th(ch-c)}$ | 6.25 | $^\circ C / W$ |
| Thermal Resistance, Channel to Ambient | $R_{th(ch-a)}$ | 125  | $^\circ C / W$ |

Note ;

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

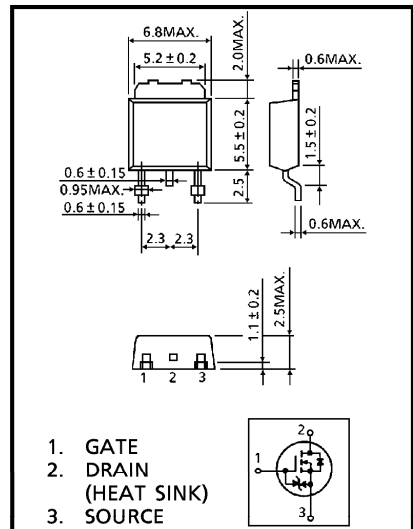
\*\*  $V_{DD} = 50 V$ , Starting  $T_{ch} = 25^\circ C$ ,  $L = 4.2 mH$ ,  
 $R_G = 25 \Omega$ ,  $I_{AR} = 5 A$

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



|         |        |
|---------|--------|
| JEDEC   | —      |
| EIAJ    | SC-64  |
| TOSHIBA | 2-7B1B |

Weight : 0.36 g (Typ.)



|         |        |
|---------|--------|
| JEDEC   | —      |
| EIAJ    | SC-64  |
| TOSHIBA | 2-7B2B |

Weight : 0.36 g (Typ.)

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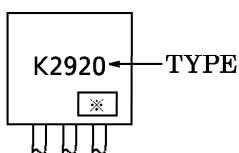
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                                  |               | SYMBOL   | TEST CONDITION   | MIN.   | TYP. | MAX. | UNIT |
|---|---------------|----------|--|--|------|------|------|
| Gate Leakage Current                            |               | IGSS     | VGS = ±16 V, VDS = 0 V   | —  | —    | ±10  | μA   |
| Drain Cut-off Current                           |               | IDSS     | VDS = 200 V, VGS = 0 V   | —  | —    | 100  | μA   |
| Drain-Source Breakdown Voltage                  |               | V(BR)DSS | ID = 10 mA, VGS = 0 V  | 200  | —    | —    | V    |
| Gate Threshold Voltage                          |               | Vth      | VDS = 10 V, ID = 1 mA  | 1.5  | —    | 3.5  | V    |
| Drain-Source ON Resistance                      |               | RDS(ON)  | VGS = 10 V, ID = 2.5 A   | —  | 0.56 | 0.8  | Ω    |
| Forward Transfer Admittance                     |               | Yfs      | VDS = 10 V, ID = 2.5 A   | 2.0  | 4.5  | —    | S    |
| Input Capacitance                               |               | Ciss     | VDS = 10 V, VGS = 0 V<br>f = 1 MHz   | —  | 440  | —    | pF   |
| Reverse Transfer Capacitance                    |               | Crss     |  | —  | 35   | —    |      |
| Output Capacitance                              |               | Coss     |  | —  | 120  | —    |      |
| Switching Time                                  | Rise Time     | tr       | <p> <math>I_D = 2.5 \text{ A}</math><br/> <math>V_{GS} = 10 \text{ V}</math><br/> <math>V_{DD} = 100 \text{ V}</math><br/> <math>R_L = 40 \Omega</math> </p> | —  | 15   | —    | ns   |
|   | Turn-on Time  | ton      |  | —  | 20   | —    |      |
|   | Fall Time     | tf       |  | —  | 15   | —    |      |
|   | Turn-off Time | toff     |  | $V_{IN} : t_r, t_f < 5 \text{ ns}$<br>$\text{Duty} \leq 1\%, t_w = 10 \mu\text{s}$ | —    | 60   |      |
| Total Gate Charge (Gate-Source Plus Gate-Drain) |               | Qg       | VDD = 100 V, VGS = 10 V<br>ID = 5 A  | —  | 10   | —    | nC   |
| Gate-Source Charge                              |               | Qgs      |  | —  | 6    | —    |      |
| Gate-Drain ("Miller") Charge                    |               | Qgd      |  | —  | 4    | —    |      |

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   | —                      | —    | —    | 20   | A    |
| Diode Forward Voltage            | VDSF   | IDR = 5 A, VGS = 0 V   | —    | —    | -2.0 | V    |
| Reverse Recovery Time            | trr    | IDR = 5 A, VGS = 0 V   | —    | 150  | —    | ns   |
| Reverse Recovery Charge          | Qrr    | dIDR / dt = 100 A / μs | —    | 0.45 | —    | μC   |

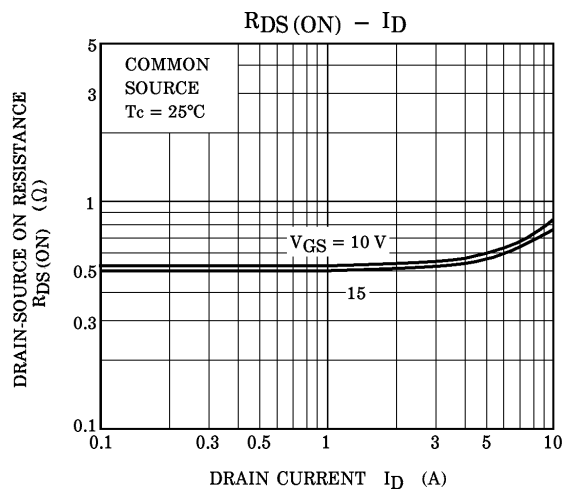
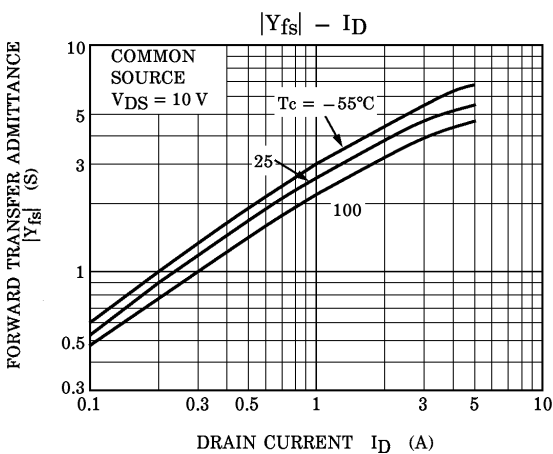
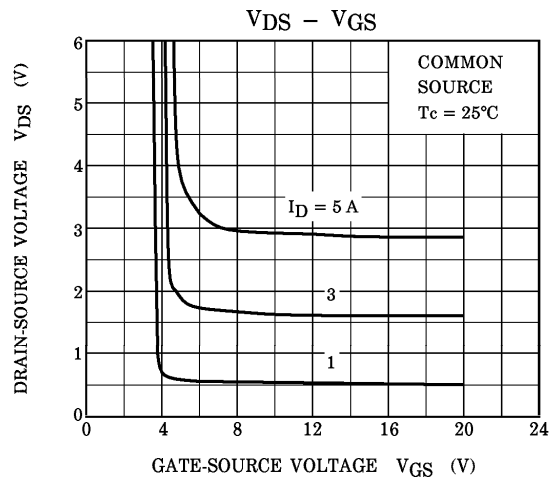
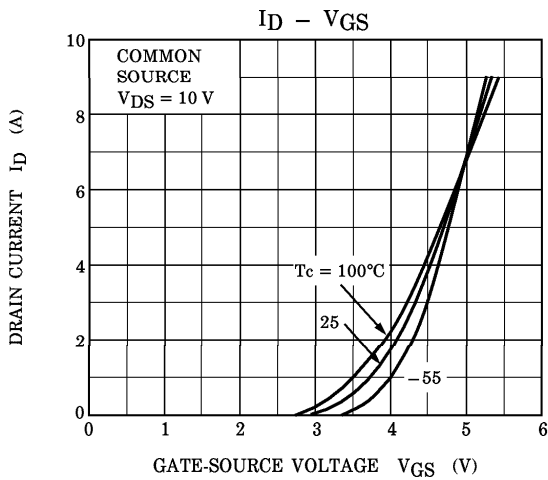
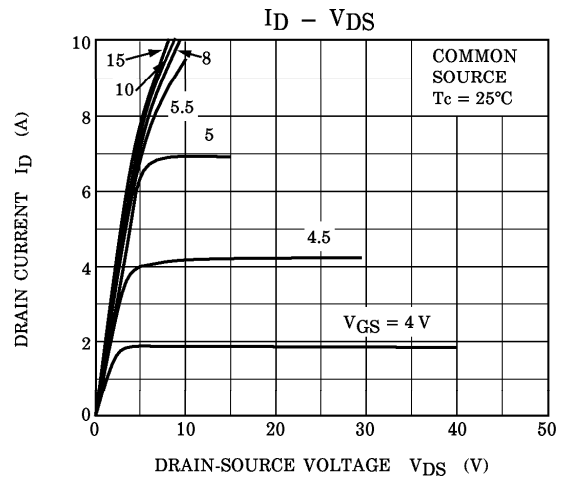
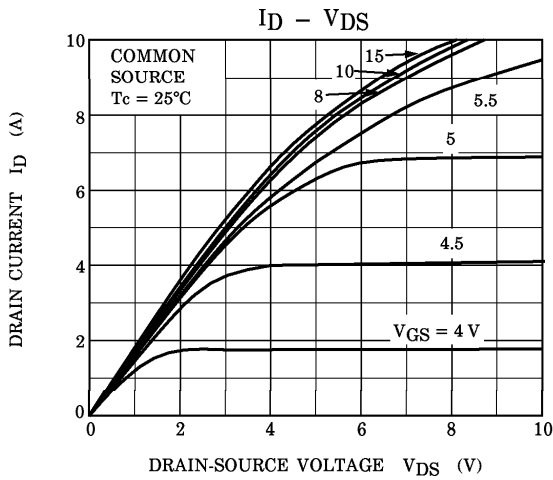
MARKING

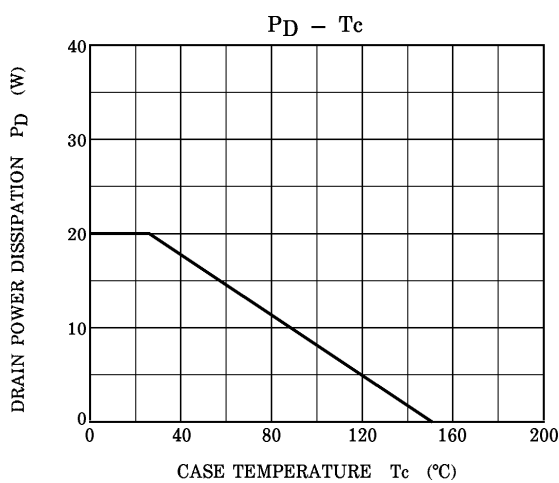
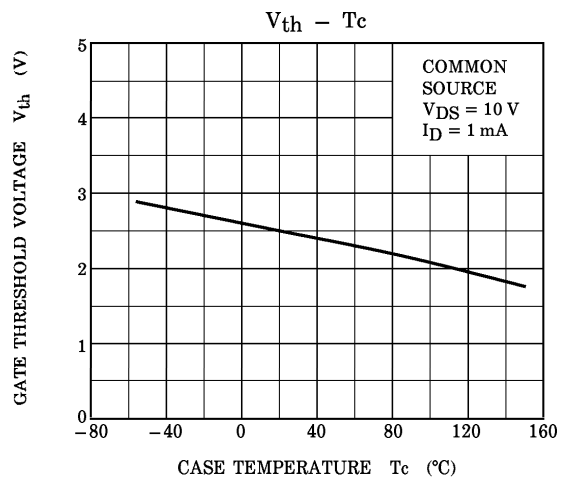
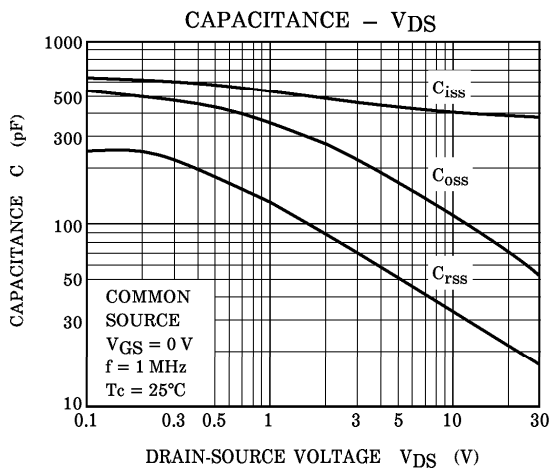
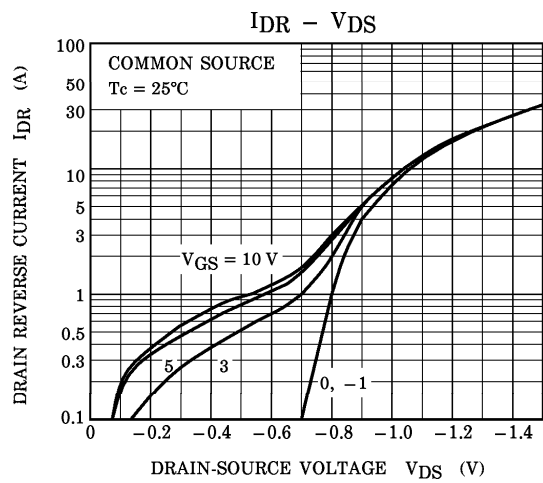
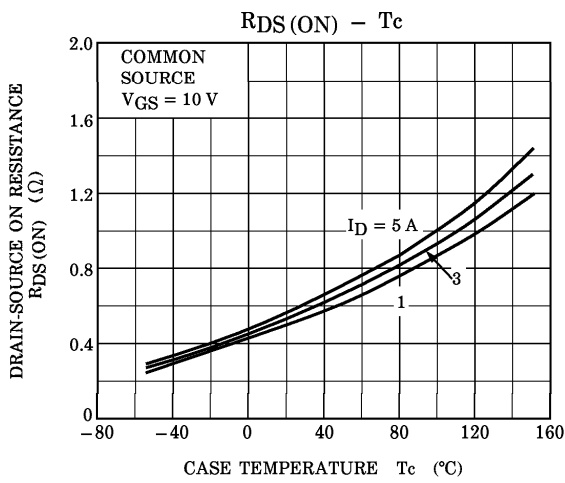


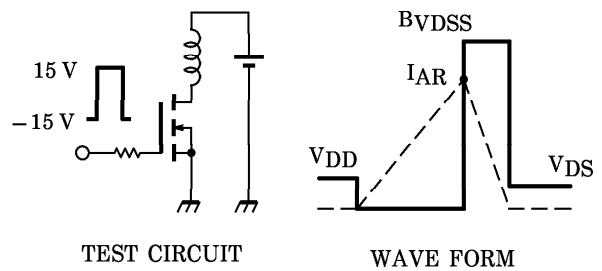
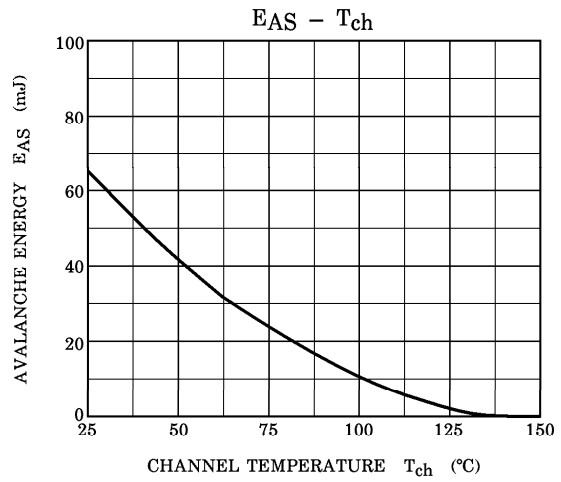
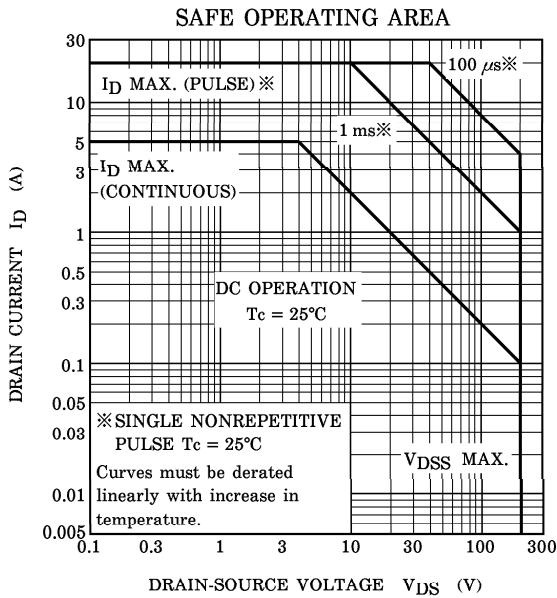
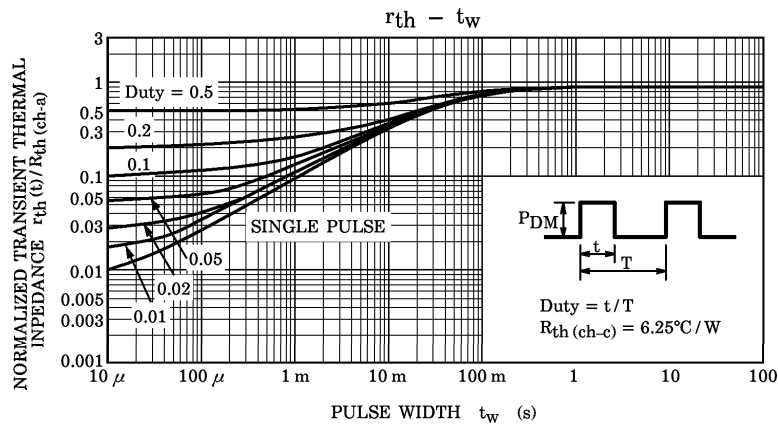
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







Peak  $I_{AR} = 5 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 25 \text{ V}$ ,  $L = 4.2 \text{ mH}$

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