

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π-MOSV)

## 2SK3302

Switching Regulator, DC-DC Converter Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 11.5 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 0.4 S$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \mu A$  (max) ( $V_{DS} = 500 V$ )
- Enhancement-model:  $V_{th} = 2.0 \sim 4.0 V$  ( $V_{DS} = 10 V$ ,  $I_D = 1 mA$ )

### Maximum Ratings ( $T_a = 25^\circ C$ )

| Characteristics                              |                | Symbol    | Rating         | Unit       |
|----------------------------------------------|----------------|-----------|----------------|------------|
| Drain-source voltage                         |                | $V_{DSS}$ | 500            | V          |
| Drain-gate voltage ( $R_{GS} = 20 k\Omega$ ) |                | $V_{DGR}$ | 500            | V          |
| Gate-source voltage                          |                | $V_{GSS}$ | $\pm 30$       | V          |
| Drain current                                | DC (Note 1)    | $I_D$     | 0.5            | A          |
|                                              | Pulse (Note 1) | $I_{DP}$  | 1.5            |            |
| Drain power dissipation                      |                | $P_D$     | 1.3            | W          |
| Single pulse avalanche energy (Note 2)       |                | $E_{AS}$  | 14.3           | mJ         |
| Avalanche current                            |                | $I_{AR}$  | 0.5            | A          |
| Repetitive avalanche energy (Note 3)         |                | $E_{AR}$  | 0.13           | mJ         |
| Channel temperature                          |                | $T_{ch}$  | 150            | $^\circ C$ |
| Storage temperature range                    |                | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |

### Thermal Characteristics

| Characteristics                        | Symbol         | Max  | Unit         |
|----------------------------------------|----------------|------|--------------|
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 96.1 | $^\circ C/W$ |

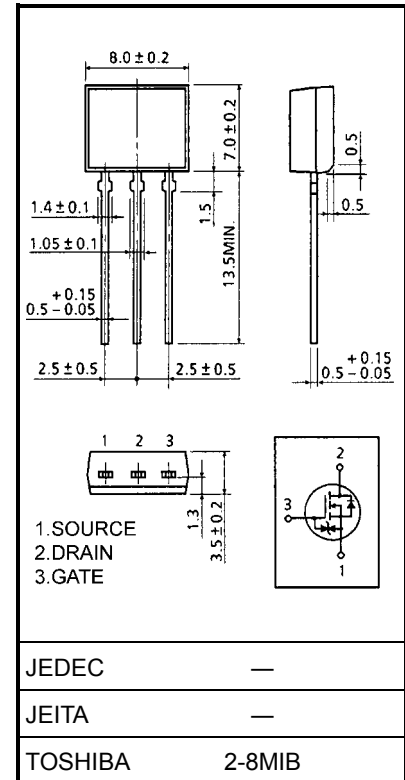
Note 1: Please use device on condition that the channel temperature is below  $150^\circ C$ .

Note 2:  $V_{DD} = 90 V$ ,  $T_{ch} = 25^\circ C$ ,  $L = 100 mH$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 0.5 A$

Note 3: Repetitive rating; pulse width limited by maximum channel temperature.

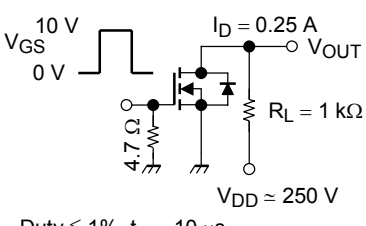
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 1.9 g (typ.)

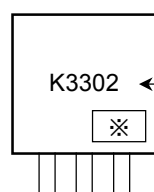
## Electrical Characteristics (Ta = 25°C)

| Characteristics                                 |               | Symbol        | Test Condition                                                                     | Min      | Typ. | Max      | Unit          |
|-------------------------------------------------|---------------|---------------|------------------------------------------------------------------------------------|----------|------|----------|---------------|
| Gate leakage current                            |               | $I_{GSS}$     | $V_{GS} = \pm 25 \text{ V}, V_{DS} = 0 \text{ V}$                                  | —        | —    | $\pm 10$ | $\mu\text{A}$ |
| Gate-source breakdown voltage                   |               | $V_{(BR)GSS}$ | $I_G = \pm 10 \mu\text{A}, V_{GS} = 0 \text{ V}$                                   | $\pm 30$ | —    | —        | V             |
| Drain cut-OFF current                           |               | $I_{DSS}$     | $V_{DS} = 500 \text{ V}, V_{GS} = 0 \text{ V}$                                     | —        | —    | 100      | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR)DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$                                        | 500      | —    | —        | V             |
| Gate threshold voltage                          |               | $V_{th}$      | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$                                        | 2.0      | —    | 4.0      | V             |
| Drain-source ON resistance                      |               | $R_{DS(ON)}$  | $V_{GS} = 10 \text{ V}, I_D = 0.25 \text{ A}$                                      | —        | 10   | 18       | $\Omega$      |
| Forward transfer admittance                     |               | $ Y_{fs} $    | $V_{DS} = 10 \text{ V}, I_D = 0.25 \text{ A}$                                      | 0.2      | 0.4  | —        | S             |
| Input capacitance                               |               | $C_{iss}$     | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                   | —        | 75   | —        | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$     |                                                                                    | —        | 7    | —        |               |
| Output capacitance                              |               | $C_{oss}$     |                                                                                    | —        | 24   | —        |               |
| Switching time                                  | Rise time     | $t_r$         |  | —        | 11   | —        | ns            |
|                                                 | Turn-ON time  | $t_{on}$      |                                                                                    | —        | 18   | —        |               |
|                                                 | Fall time     | $t_f$         |                                                                                    | —        | 54   | —        |               |
|                                                 | Turn-OFF time | $t_{off}$     |                                                                                    | —        | 95   | —        |               |
| Total gate charge (gate-source plus gate-drain) |               | $Q_g$         | $V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.5 \text{ A}$         | —        | 3.8  | —        | nC            |
| Gate-source charge                              |               | $Q_{gs}$      |                                                                                    | —        | 1.9  | —        |               |
| Gate-drain ("miller") charge                    |               | $Q_{gd}$      |                                                                                    | —        | 1.9  | —        |               |

## Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristics                           | Symbol    | Test Condition                                  | Min | Typ. | Max  | Unit |
|-------------------------------------------|-----------|-------------------------------------------------|-----|------|------|------|
| Continuous drain reverse current (Note 1) | $I_{DR}$  | —                                               | —   | —    | 0.5  | A    |
| Pulse drain reverse current (Note 1)      | $I_{DRP}$ | —                                               | —   | —    | 1.5  | A    |
| Forward voltage (diode)                   | $V_{DSF}$ | $I_{DR} = 0.5 \text{ A}, V_{GS} = 0 \text{ V}$  | —   | —    | −1.5 | V    |
| Reverse recovery time                     | $t_{rr}$  | $I_{DR} = 0.5 \text{ A}, V_{GS} = 0 \text{ V},$ | —   | 190  | —    | ns   |
| Reverse recovery charge                   | $Q_{rr}$  | $dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$        | —   | 380  | —    | nC   |

## Marking

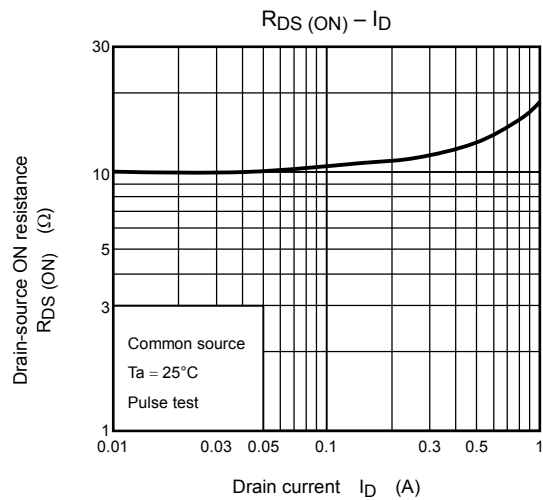
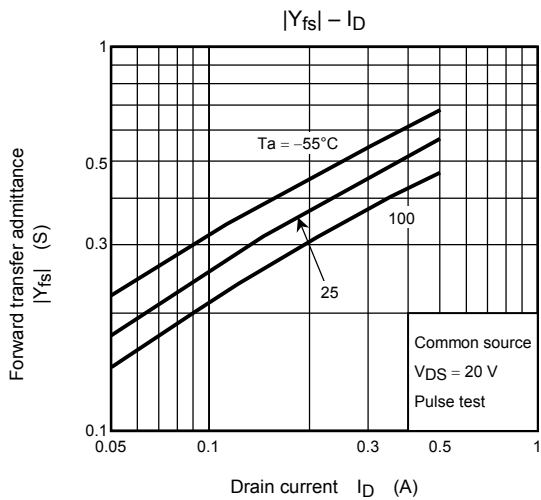
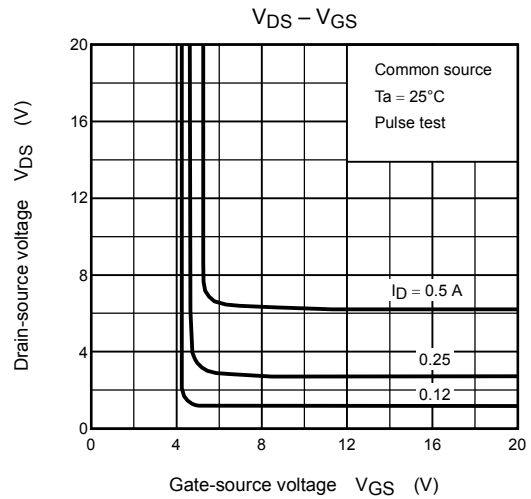
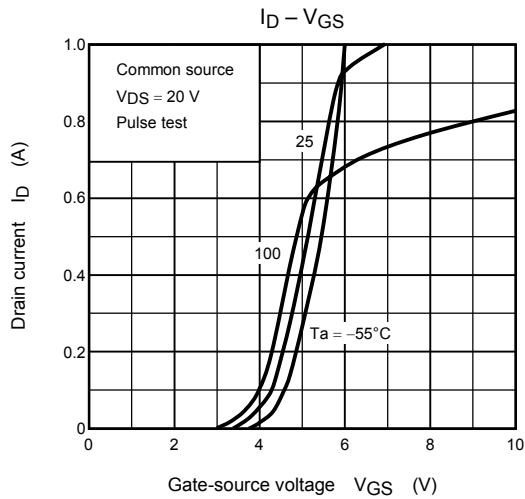
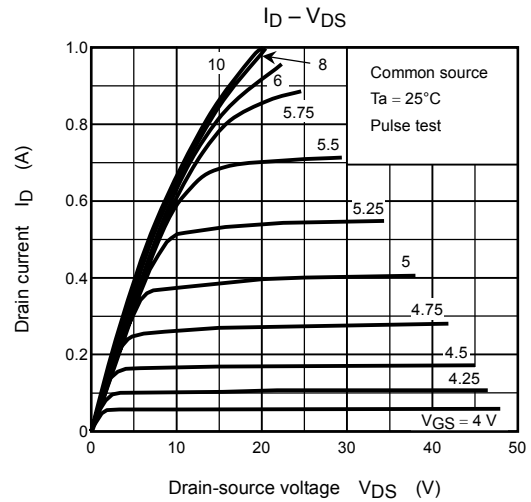
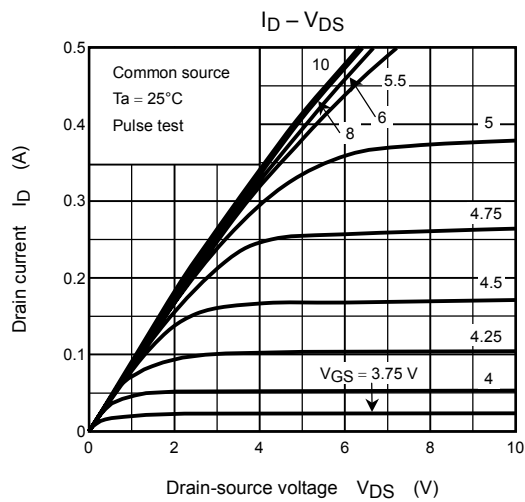


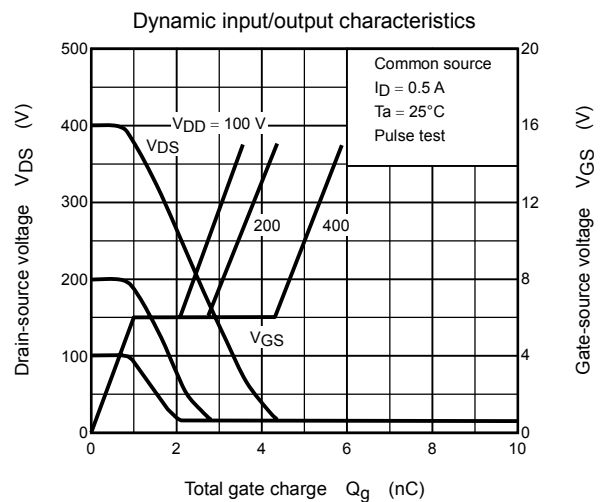
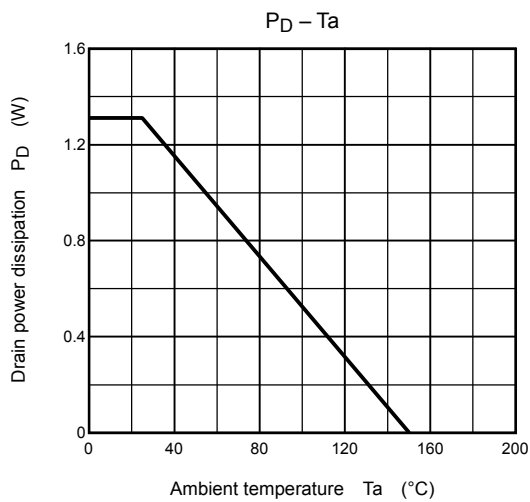
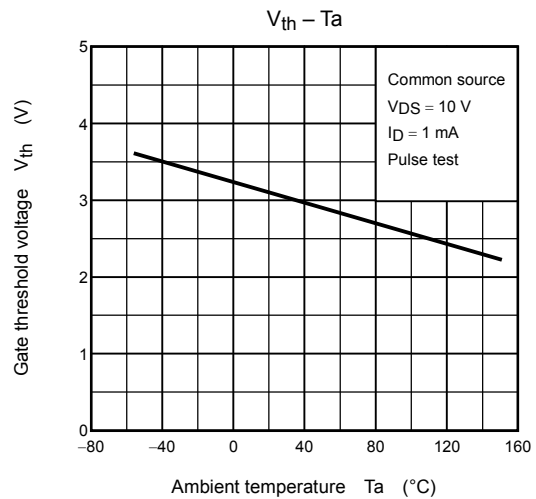
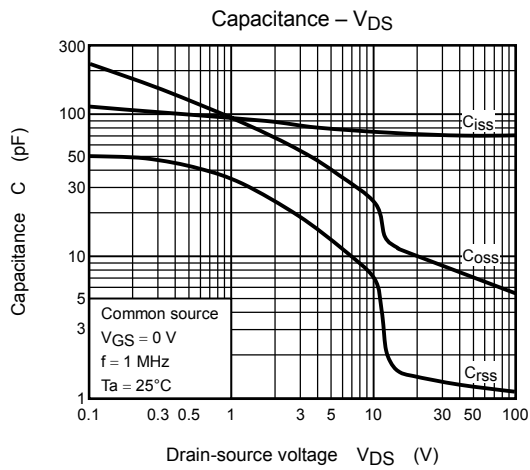
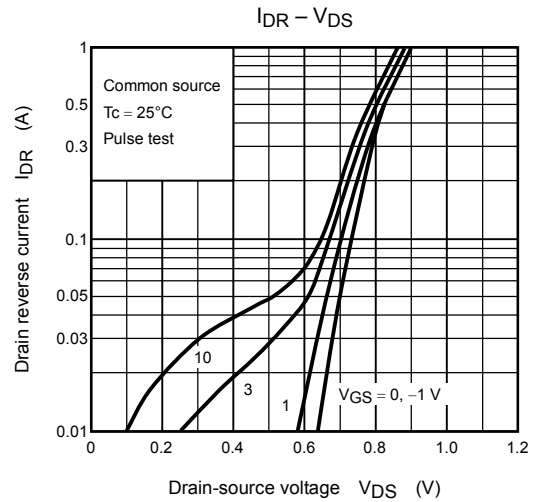
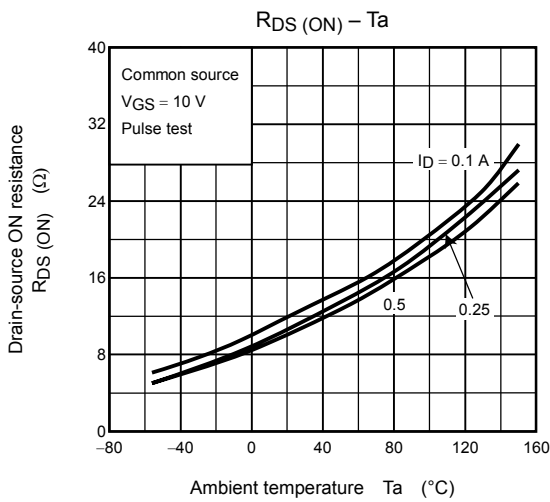
※ Lot Number

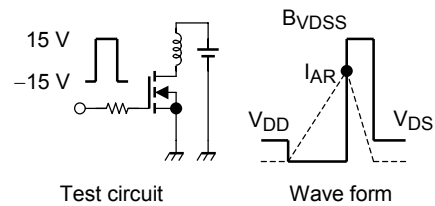
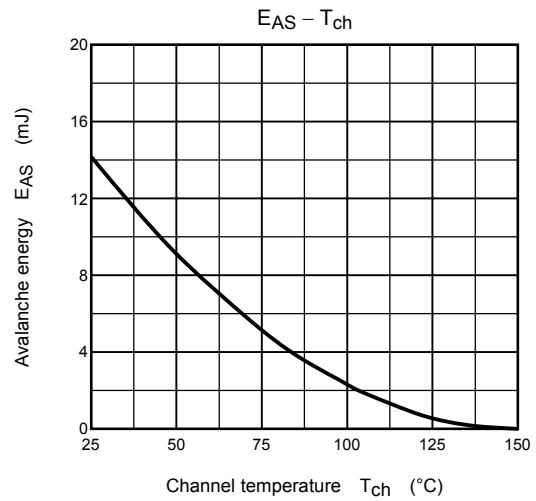
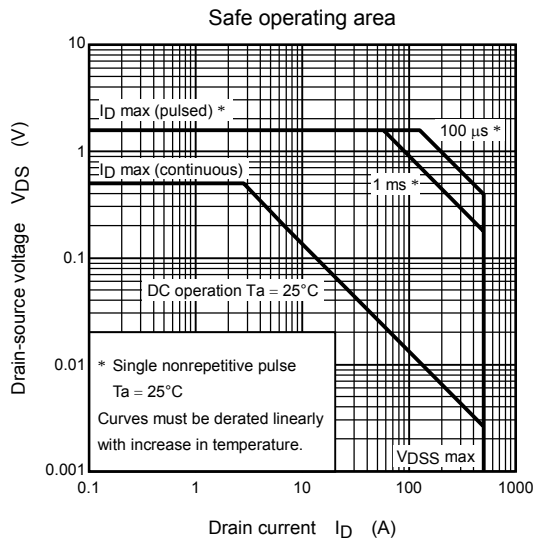
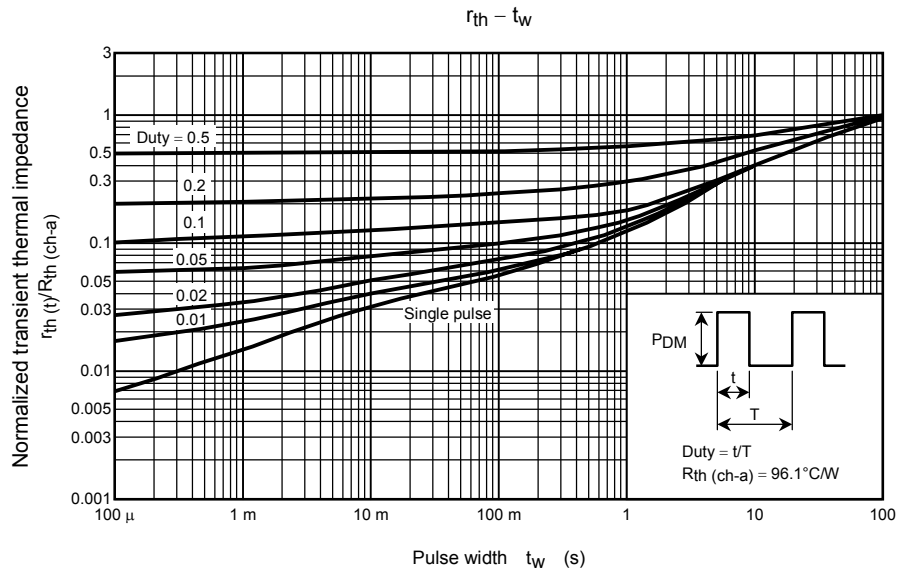


Month (starting from alphabet A)

Year (last number of the christian era)







$$R_G = 25 \, \Omega$$

$$V_{DD} = 90 \, V, L = 100 \, mH$$

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

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