

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (L²-π-MOSV)

2SK2376

Chopper Regulator, DC-DC Converter and Motor Drive Applications

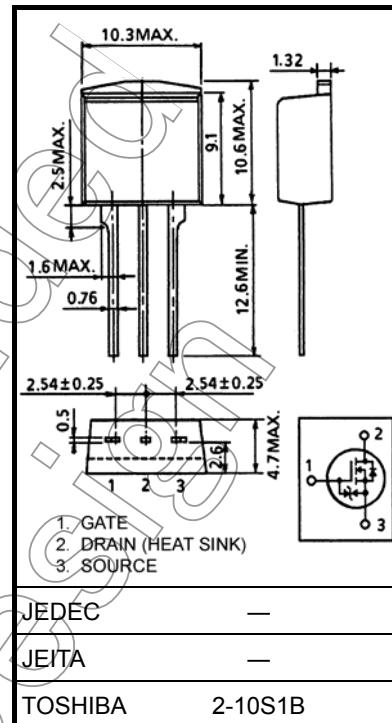
Unit: mm

- 4-V gate drive
- Low drain-source ON resistance : $R_{DS\ (ON)} = 13\ m\Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 40\ S$ (typ.)
- Low leakage current : $I_{DSS} = 100\ \mu A$ (max) ($V_{DS} = 60\ V$)
- Enhancement mode : $V_{th} = 0.8$ to $2.0\ V$ ($V_{DS} = 10\ V$, $I_D = 1\ mA$)

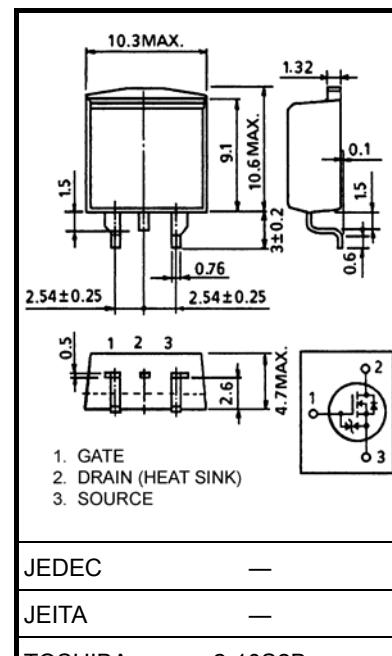
Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | 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} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | A |
| | Pulse (Note 1) | I_{DP} | A |
| Drain power dissipation ($T_c = 25^\circ C$) | P_D | 100 | W |
| Single pulse avalanche energy (Note 2) | E_{AS} | 701 | mJ |
| Avalanche current | I_{AR} | 45 | A |
| Repetitive avalanche energy (Note 3) | E_{AR} | 10 | mJ |
| Channel temperature | T_{ch} | 150 | °C |
| Storage temperature range | T_{stg} | -55 to 150 | °C |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).



Weight: 1.5 g (typ.)



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Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|--|------------------|------|--------|
| Thermal resistance, channel to case | $R_{th\ (ch-c)}$ | 1.25 | °C / W |
| Thermal resistance, channel to ambient | $R_{th\ (ch-a)}$ | 83.3 | °C / W |

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: $V_{DD} = 25\ V$, $T_{ch} = 25^\circ C$ (initial), $L = 471\ \mu H$, $R_G = 25\ \Omega$, $I_{AR} = 45\ A$

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

This transistor is an electrostatic-sensitive device.

Please handle with caution.

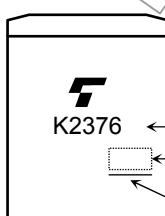
Electrical Characteristics ($T_a = 25^\circ C$)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|----------------|--|-----|------|----------|-----------|
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 16 V, V_{DS} = 0 V$ | — | — | ± 10 | μA |
| Drain cut-off current | I_{DSS} | $V_{DS} = 60 V, V_{GS} = 0 V$ | — | — | 100 | μA |
| Drain-source breakdown voltage | $V_{(BR) DSS}$ | $I_D = 10 mA, V_{GS} = 0 V$ | 60 | — | — | V |
| Gate threshold voltage | V_{th} | $V_{DS} = 10 V, I_D = 1 mA$ | 0.8 | — | 2.0 | V |
| Drain-source ON resistance | $R_{DS (ON)}$ | $V_{GS} = 4 V, I_D = 25 A$ | — | 19 | 25 | $m\Omega$ |
| | | $V_{GS} = 10 V, I_D = 25 A$ | — | 13 | 17 | |
| Forward transfer admittance | $ Y_{fsl} $ | $V_{DS} = 10 V, I_D = 25 A$ | 28 | 40 | — | S |
| Input capacitance | C_{iss} | $V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$ | — | 3350 | — | pF |
| Reverse transfer capacitance | C_{rss} | | — | 550 | — | |
| Output capacitance | C_{oss} | | — | 1600 | — | |
| Switching time | Rise time | t_r | | — | 25 | — |
| | Turn-on time | t_{on} | | — | 55 | — |
| | Fall time | t_f | | — | 60 | — |
| | Turn-off time | t_{off} | | — | 180 | — |
| Total gate charge (Gate-source plus gate-drain) | Q_g | $V_{DD} \approx 48 V, V_{GS} = 10 V, I_D = 45 A$ | — | 110 | — | nC |
| Gate-source charge | Q_{gs} | | — | 70 | — | |
| Gate-drain ("miller") charge | Q_{gd} | | — | 40 | — | |

Source-Drain Ratings and Characteristics ($T_a = 25^\circ C$)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|-----------|-------------------------------|-----|------|------|---------|
| Continuous drain reverse current (Note 1) | I_{DR} | — | — | — | 45 | A |
| Pulse drain reverse current (Note 1) | I_{DRP} | — | — | — | 180 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = 45 A, V_{GS} = 0 V$ | — | — | -1.7 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = 45 A, V_{GS} = 0 V$ | — | 120 | — | ns |
| Reverse recovery charge | Q_{rr} | $dI_{DR} / dt = 50 A / \mu s$ | — | 0.2 | — | μC |

Marking



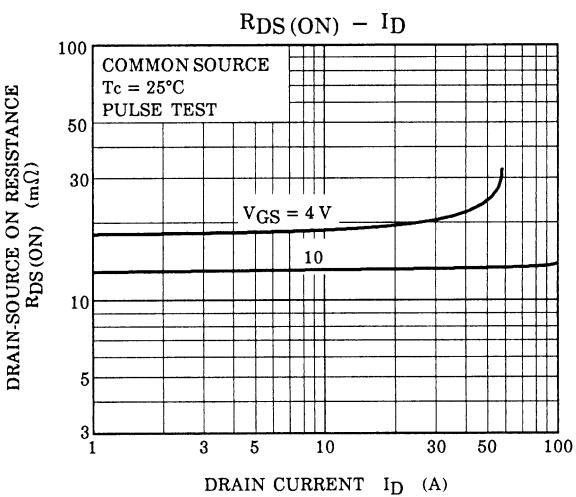
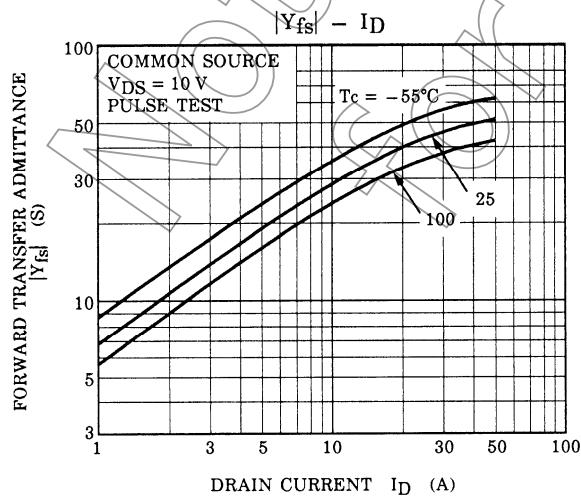
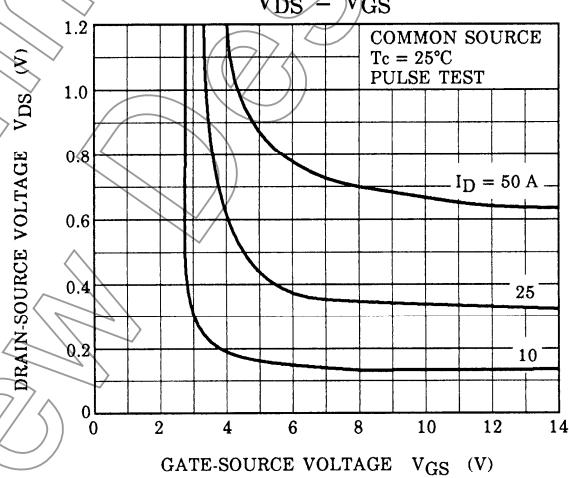
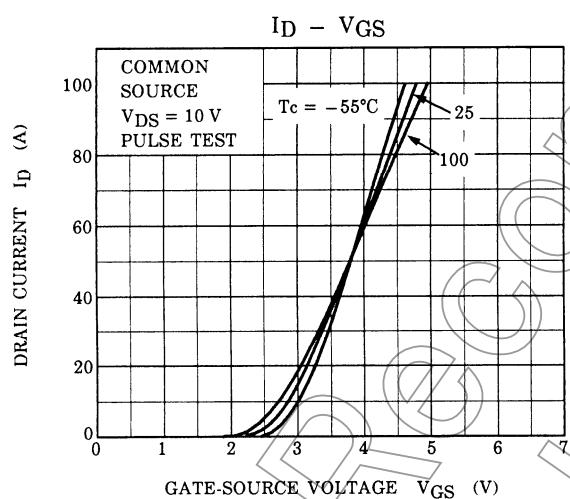
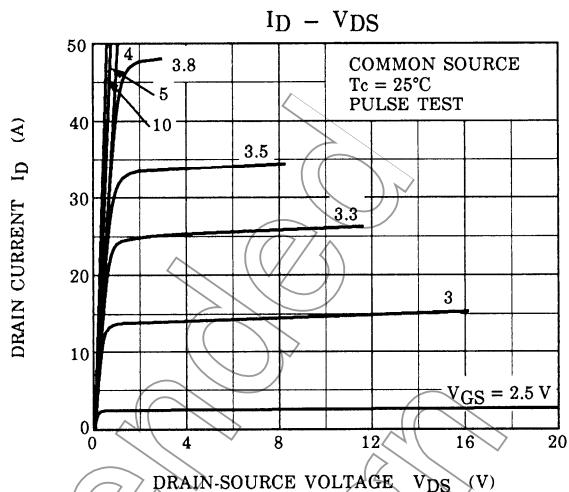
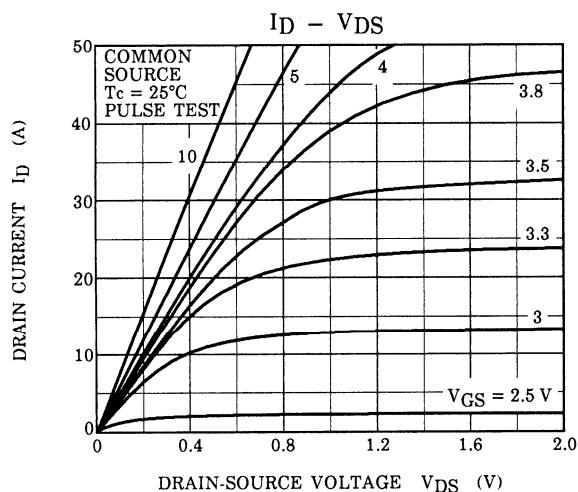
Part No. (or abbreviation code)
Lot No.
Note 4

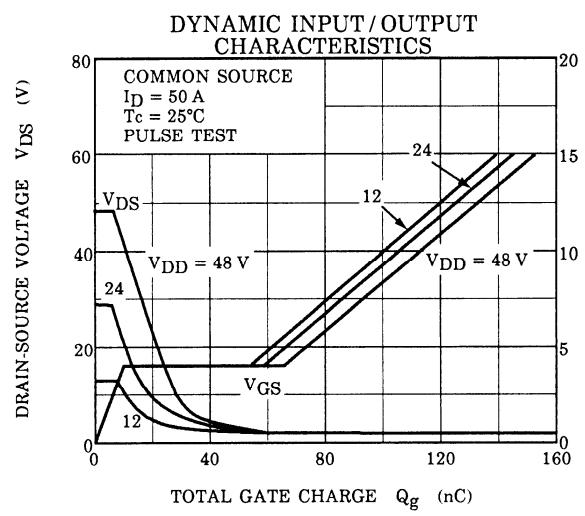
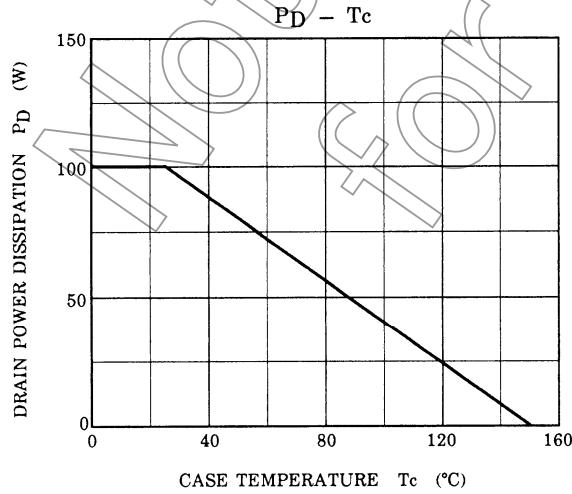
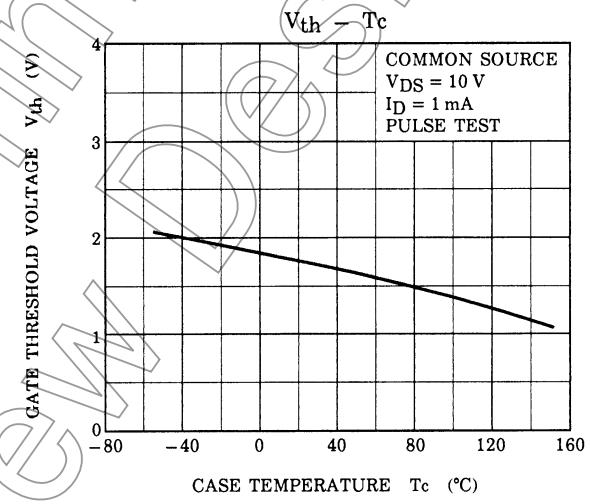
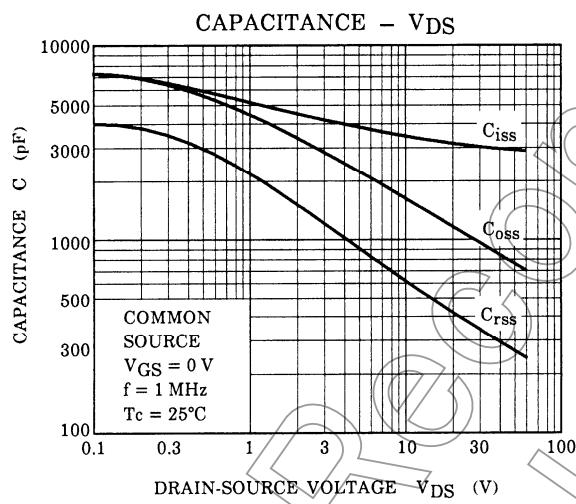
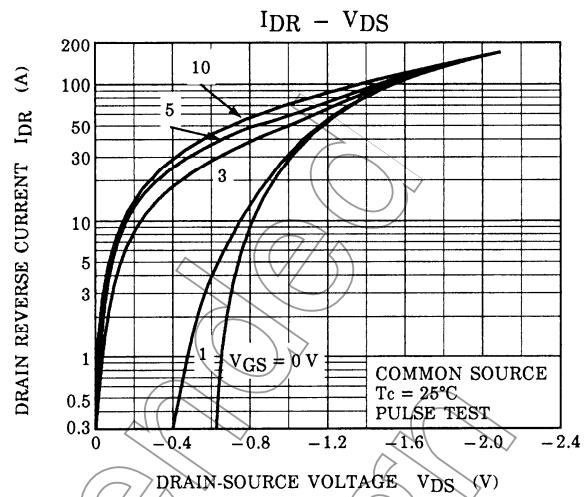
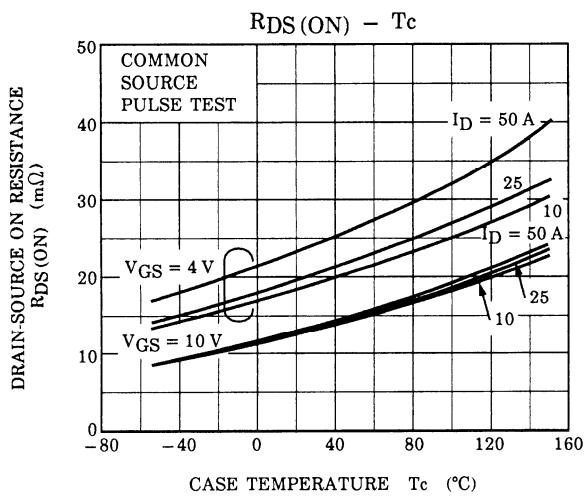
Note 4: A line under a Lot No. identifies the indication of product Labels.

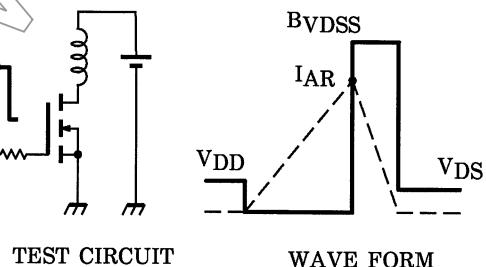
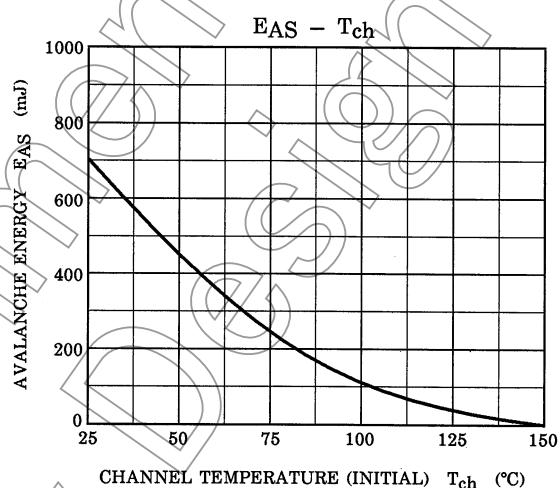
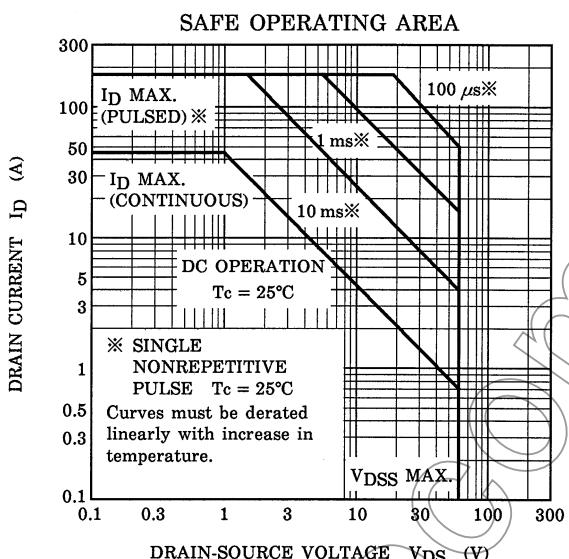
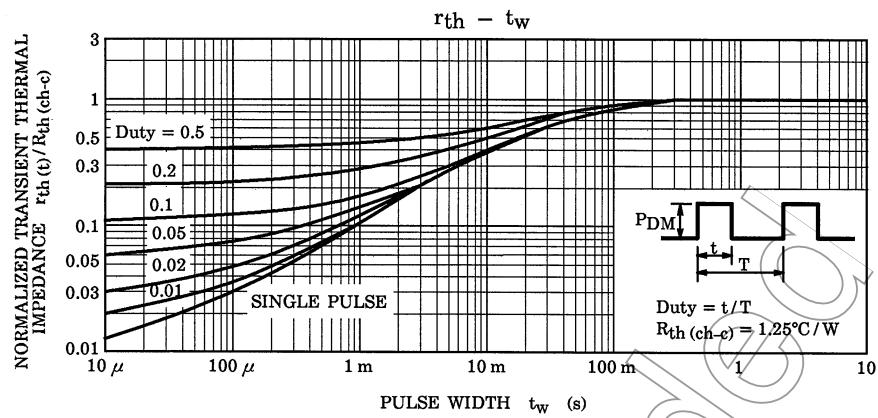
Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$R_G = 25 \Omega$
 $V_{DD} = 25 \text{ V}$, $L = 471 \mu\text{H}$

$$EAS = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{BVDSS}{BVDSS - VDD} \right)$$

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