

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

2SK2173

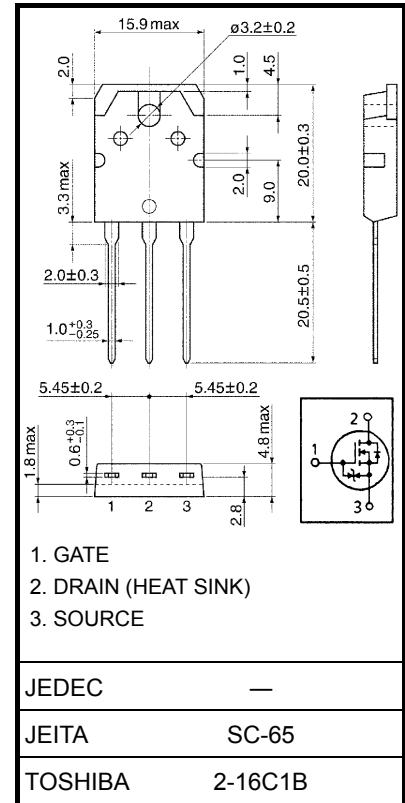
Chopper Regulator, DC-DC Converter and Motor Drive Applications

Unit: mm

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

Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit |
|--|----------------|------------|------------------|
| Drain-source voltage | V_{DSS} | 60 | V |
| Drain-gate voltage ($R_{GS} = 20\text{ k}\Omega$) | V_{DGR} | 60 | V |
| Gate-source voltage | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | 50 |
| | Pulse (Note 1) | I_{DP} | 200 |
| Drain power dissipation ($T_c = 25^\circ\text{C}$) | P_D | 125 | W |
| Single pulse avalanche energy (Note 2) | E_{AS} | 683 | mJ |
| Avalanche current | I_{AR} | 50 | A |
| Repetitive avalanche energy (Note 3) | E_{AR} | 12.5 | mJ |
| Channel temperature | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -55 to 150 | $^\circ\text{C}$ |



Weight: 4.6 g (typ.)

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).

Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|--|----------------|-----|--------------------|
| Thermal resistance, channel to case | $R_{th(ch-c)}$ | 1.0 | $^\circ\text{C/W}$ |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 50 | $^\circ\text{C/W}$ |

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

Note 2: $V_{DD} = 25\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 371\text{ }\mu\text{H}$, $R_G = 25\text{ }\Omega$, $I_{AR} = 50\text{ A}$

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

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

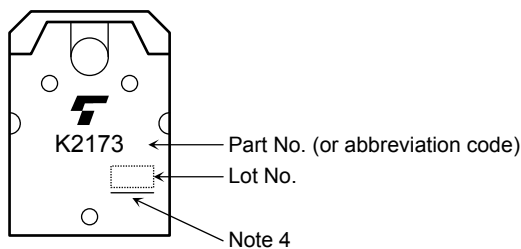
Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|---|-----|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Drain cut-off current | | I_{DSS} | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$ | — | — | 100 | μA |
| 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 | | $R_{DS(ON)}$ | $V_{GS} = 4\text{ V}, I_D = 25\text{ A}$ | — | 19 | 25 | m Ω |
| | | | $V_{GS} = 10\text{ V}, I_D = 25\text{ A}$ | — | 13 | 17 | |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 25\text{ A}$ | 28 | 40 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 3350 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 550 | — | |
| Output capacitance | | C_{oss} | | — | 1600 | — | |
| Switching time | Rise time | t_r | <p>$I_D = 25\text{ A}$ $V_{GS} = 10\text{ V}$ $V_{DS} = 10\text{ V}$ $R_L = 1.2\ \Omega$ $V_{DD} \approx 30\text{ V}$ Duty $\leq 1\%$, $t_w = 10\ \mu\text{s}$</p> | — | 25 | — | ns |
| | 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 | $V_{DD} \approx 48\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$ | — | 110 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 70 | — | |
| Gate-drain ("miller") charge | | Q_{gd} | | — | 40 | — | |

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

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|-----------|---|-----|------|------|---------------|
| Continuous drain reverse current (Note 1) | I_{DR} | — | — | — | 50 | A |
| Pulse drain reverse current (Note 1) | I_{DRP} | — | — | — | 200 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = 50\text{ A}, V_{GS} = 0\text{ V}$ | — | — | -1.7 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = 50\text{ A}, V_{GS} = 0\text{ V}$ | — | 120 | — | ns |
| Reverse recovered charge | Q_{rr} | $dI_{DR} / dt = 50\text{ A} / \mu\text{s}$ | — | 0.2 | — | μC |

Marking

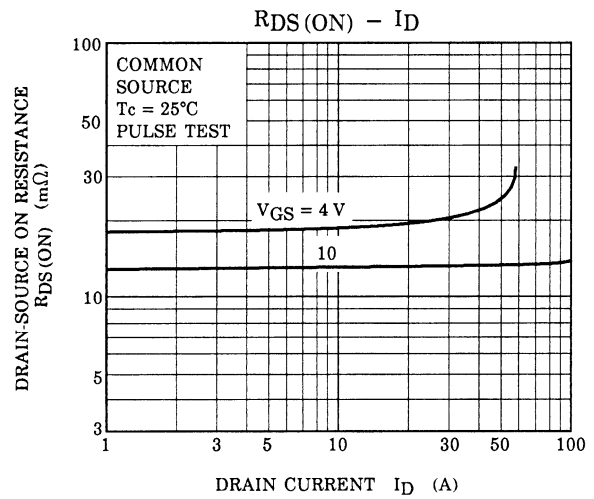
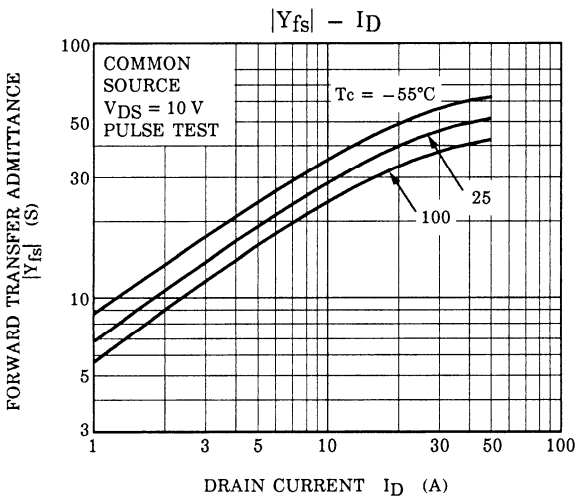
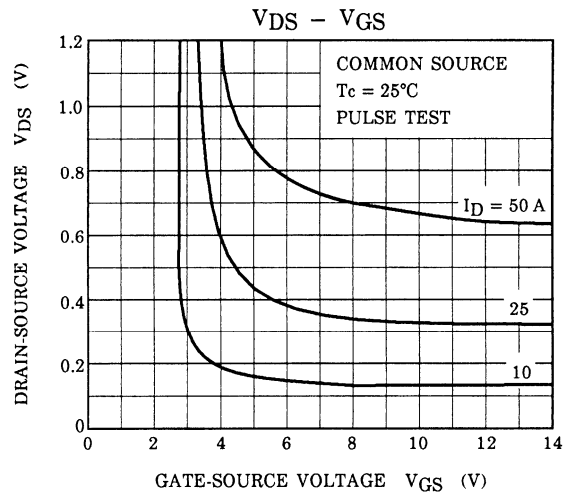
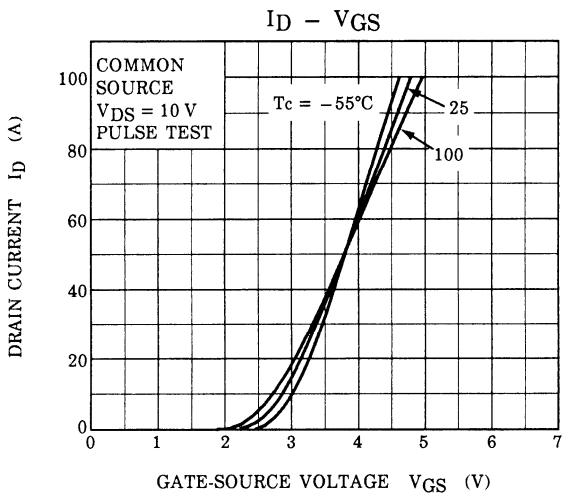
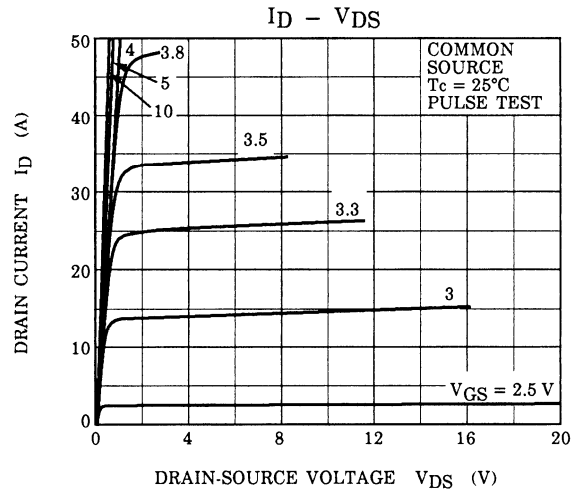
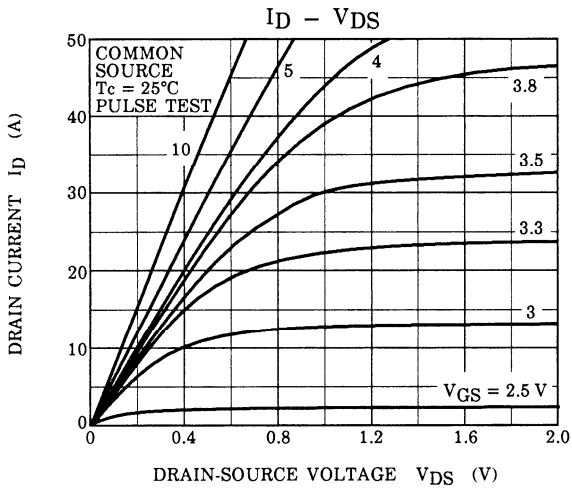


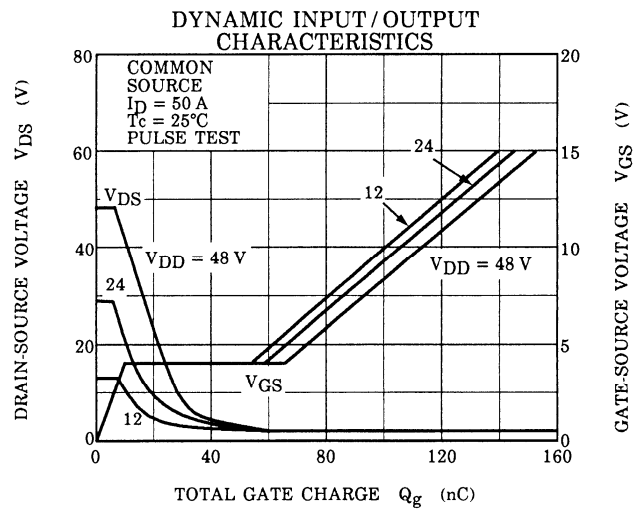
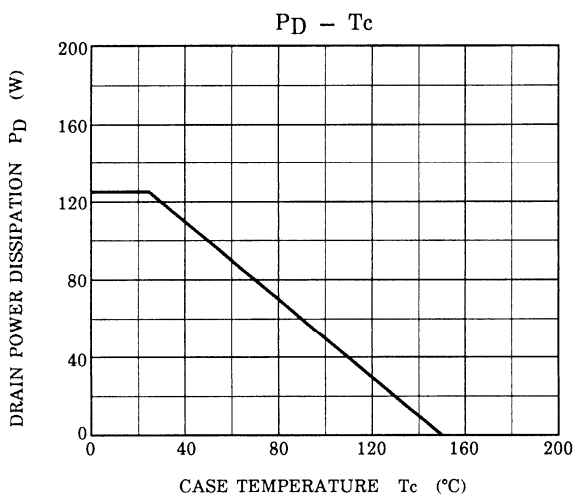
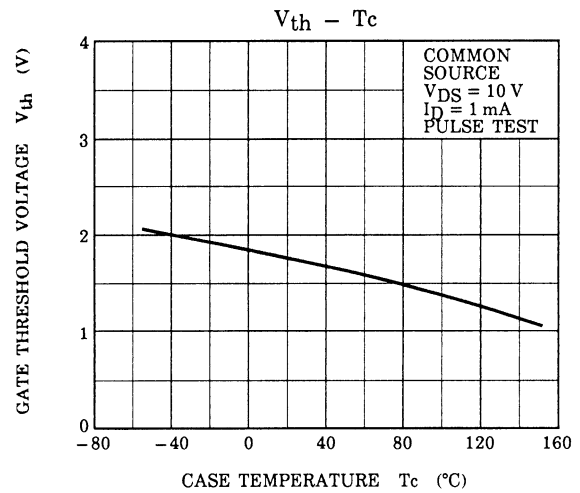
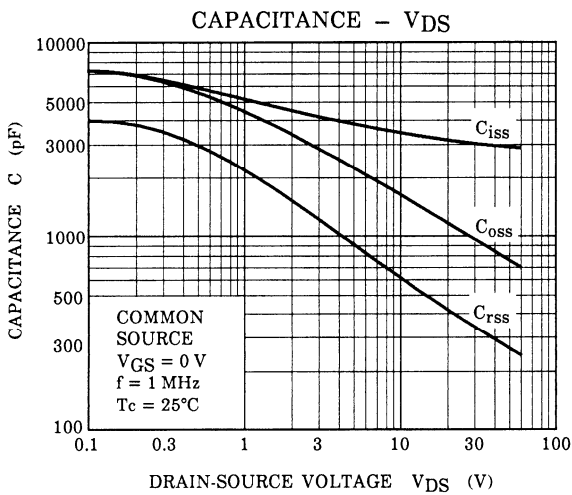
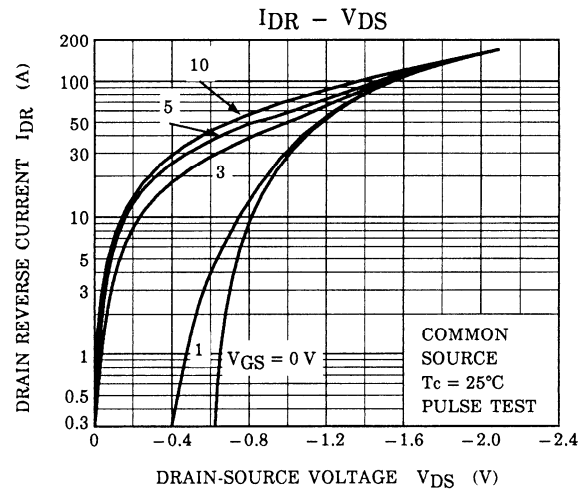
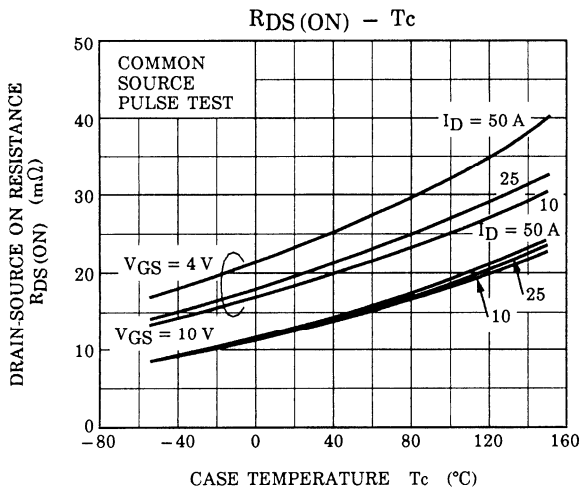
Note 4: A line under a Lot No. identifies the indication of product Labels.

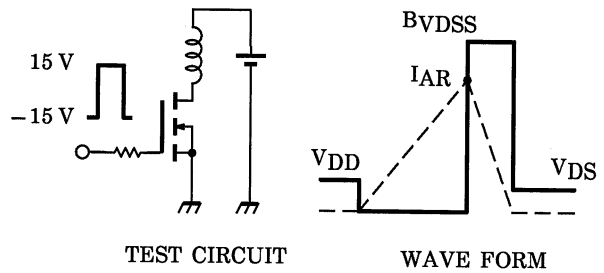
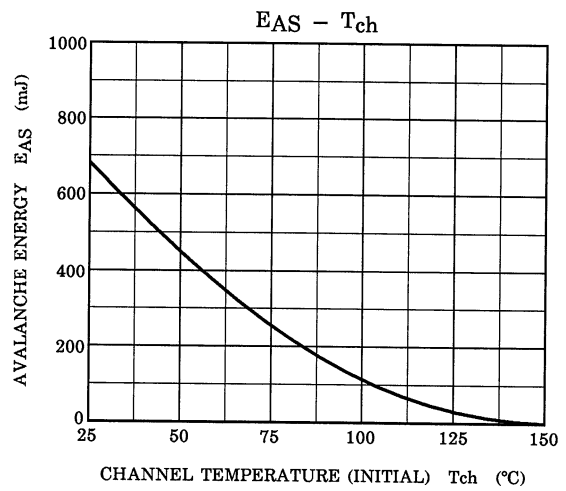
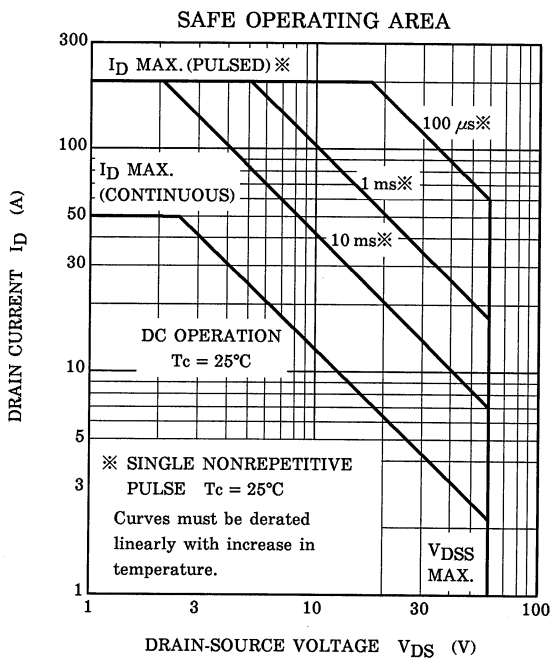
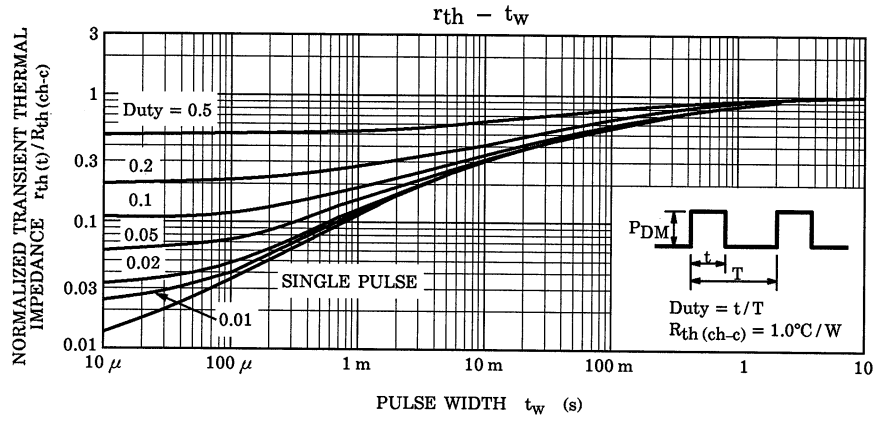
Not underlined: $[[Pb]]/INCLUDES > MCV$

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

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$R_G = 25 \Omega$
 $V_{DD} = 25 \text{ V}, L = 371 \mu\text{H}$

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

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