

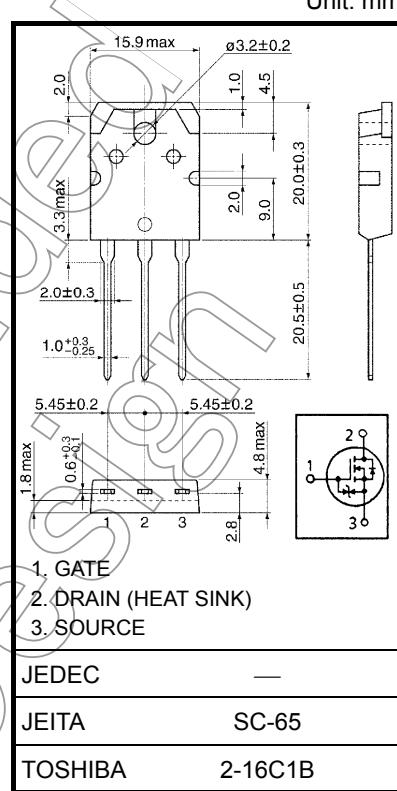
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π -MOS V)**2SK3176**

Switching Regulator, DC-DC Converter and Motor Drive Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 38 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 30 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 100 \text{ mA}$ (max) ($V_{DS} = 200 \text{ V}$)
- Enhancement-mode: $V_{th} = 1.5$ to 3.5 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} | 200 | V |
| Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$) | V_{DGR} | 200 | V |
| Gate-source voltage | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | A |
| | Pulse (Note 1) | I_{DP} | |
| Drain power dissipation ($T_c = 25^\circ\text{C}$) | P_D | 150 | W |
| Single pulse avalanche energy (Note 2) | E_{AS} | 925 | mJ |
| Avalanche current | I_{AR} | 30 | A |
| Repetitive avalanche energy (Note 3) | E_{AR} | 15 | mJ |
| Channel temperature | T_{ch} | 150 | °C |
| Storage temperature range | T_{stg} | -55 to 150 | °C |



Weight: 4.6 g (typ.)

Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: $V_{DD} = 50 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.66 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = 30 \text{ A}$

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

Note 4: 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).

This transistor is an electrostatic sensitive device.

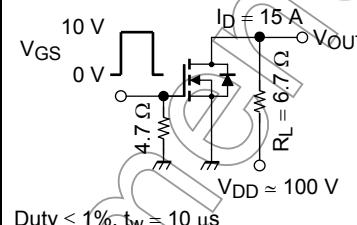
Please handle with caution.

Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|--|-----------------------|-------|------|
| Thermal resistance, channel to case | $R_{th}(\text{ch-c})$ | 0.833 | °C/W |
| Thermal resistance, channel to ambient | $R_{th}(\text{ch-a})$ | 50.0 | °C/W |

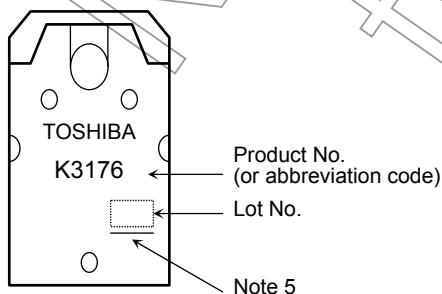
Electrical Characteristics ($T_a = 25^\circ C$)

| 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} | $V_{DS} = 200 V, V_{GS} = 0 V$ | — | — | 100 | μA |
| Drain-source breakdown voltage | $V_{(BR) DSS}$ | $I_D = 10 mA, V_{GS} = 0 V$ | 200 | — | — | V |
| Gate threshold voltage | V_{th} | $V_{DS} = 10 V, I_D = 1 mA$ | 1.5 | — | 3.5 | V |
| Drain-source ON resistance | $R_{DS} (\text{ON})$ | $V_{GS} = 10 V, I_D = 15 A$ | — | 38 | 52 | $m\Omega$ |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = 10 V, I_D = 15 A$ | 15 | 30 | — | S |
| Input capacitance | C_{iss} | $V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$ | — | 5400 | — | pF |
| Reverse transfer capacitance | C_{rss} | $V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$ | — | 580 | — | pF |
| Output capacitance | C_{oss} | $V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$ | — | 1900 | — | pF |
| Switching time | Rise time | t_r | — | 15 | — | ns |
| | Turn-on time | t_{on} | — | 55 | — | |
| | Fall time | t_f | — | 25 | — | |
| | Turn-off time | t_{off} | — | 190 | — | |
| Total gate charge (gate-source plus gate-drain) | Q_g | $V_{DD} \approx 160 V, V_{GS} = 10 V, I_D = 30 A$ | — | 125 | — | nC |
| Gate-source charge | Q_{gs} | $V_{DD} \approx 160 V, V_{GS} = 10 V, I_D = 30 A$ | — | 80 | — | nC |
| Gate-drain ("miller") charge | Q_{gd} | $V_{DD} \approx 160 V, V_{GS} = 10 V, I_D = 30 A$ | — | 45 | — | nC |

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} | — | — | — | 30 | A |
| Pulse drain reverse current (Note 1) | I_{DRP} | — | — | — | 90 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = 30 A, V_{GS} = 0 V$ | — | — | -2.0 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = 30 A, V_{GS} = 0 V, dI_{DR}/dt = 100 A/\mu s$ | — | 270 | — | ns |
| Reverse recovery charge | Q_{rr} | $I_{DR} = 30 A, V_{GS} = 0 V, dI_{DR}/dt = 100 A/\mu s$ | — | 3.0 | — | μC |

Marking

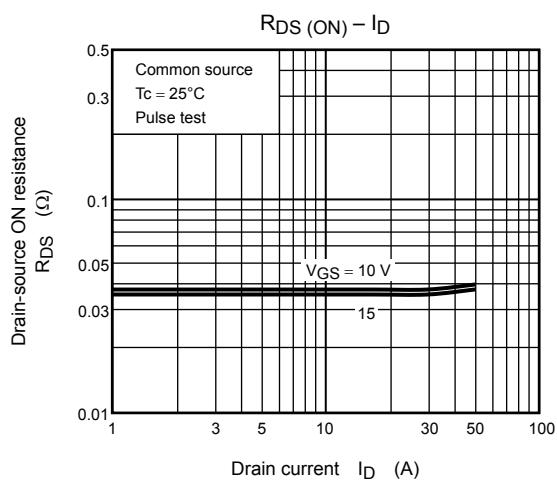
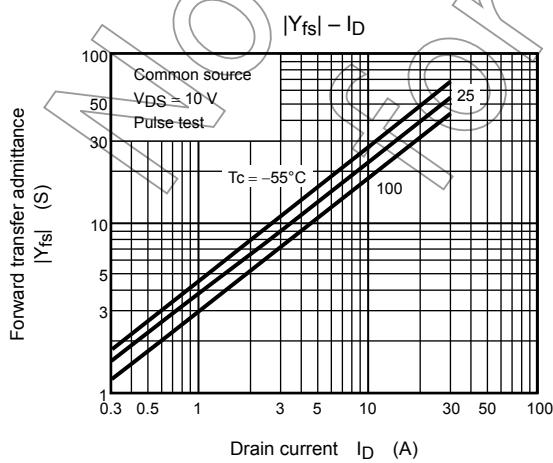
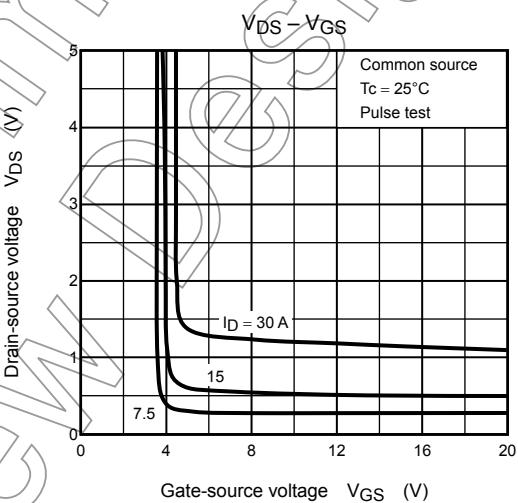
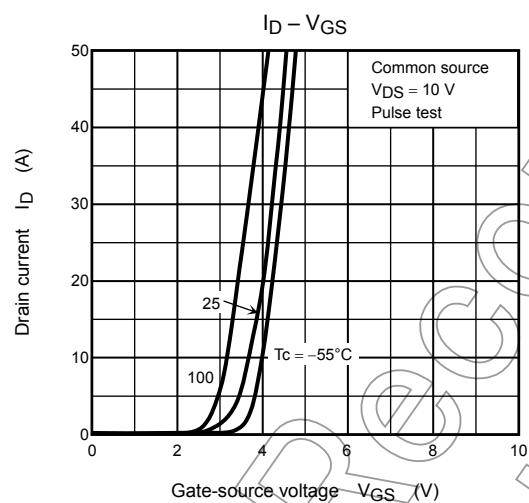
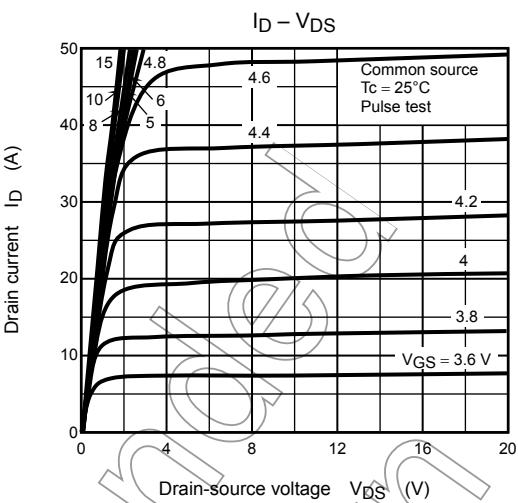
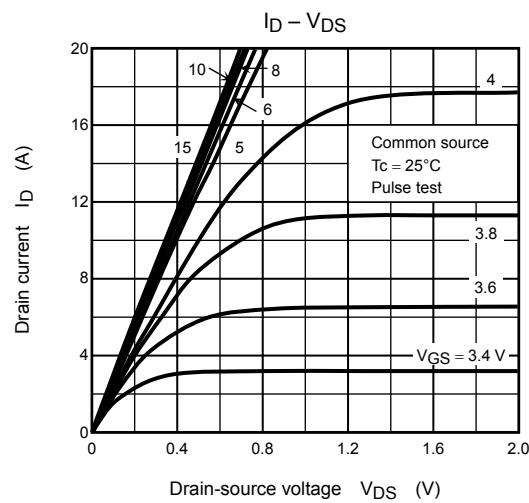


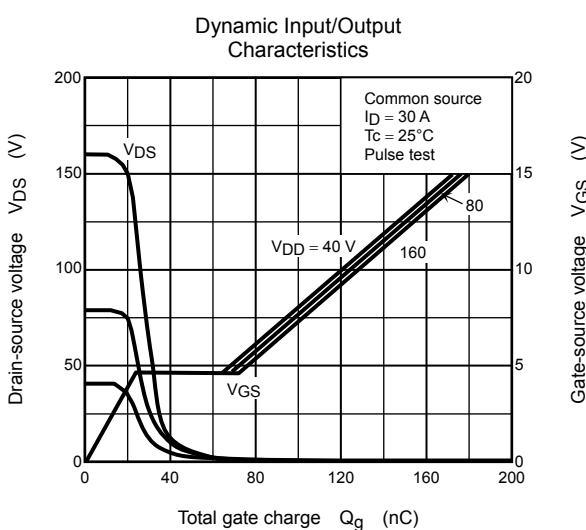
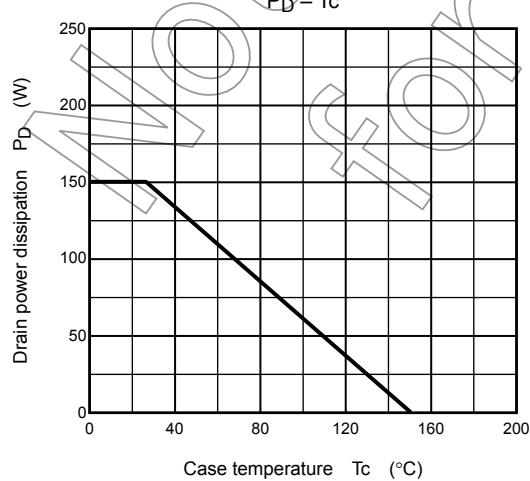
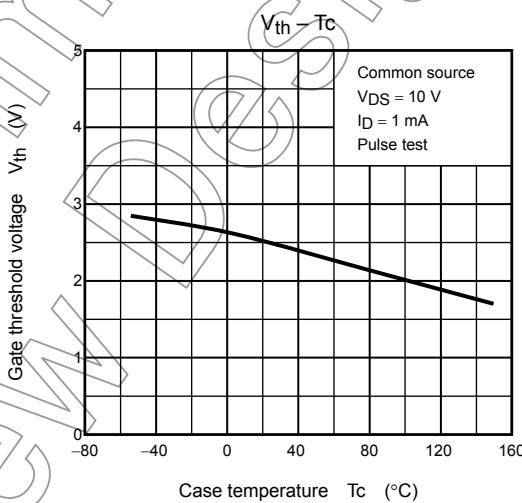
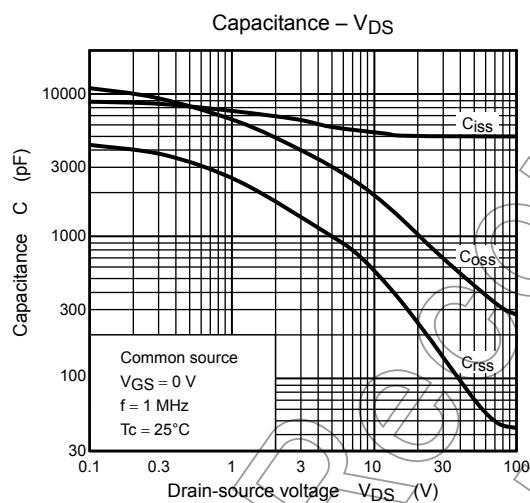
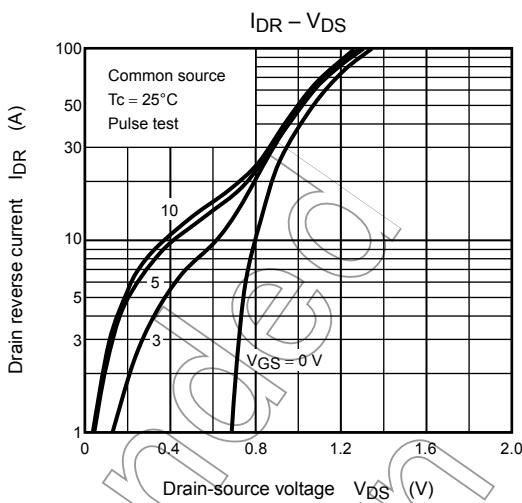
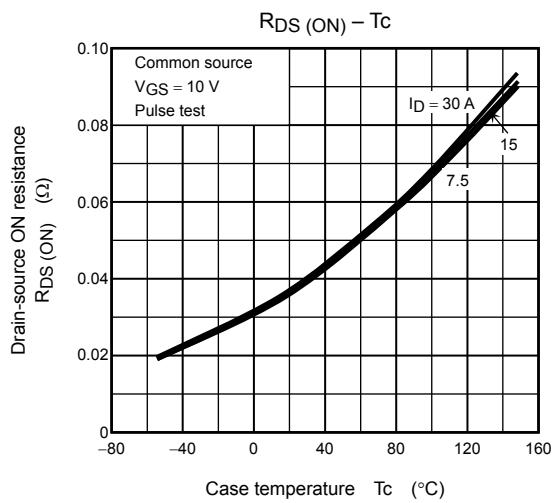
Note 5: A line under a Lot No. identifies the indication of product Labels.

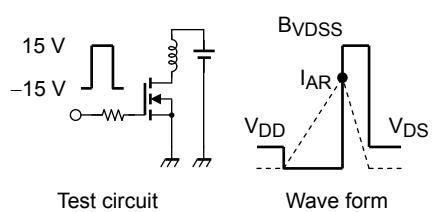
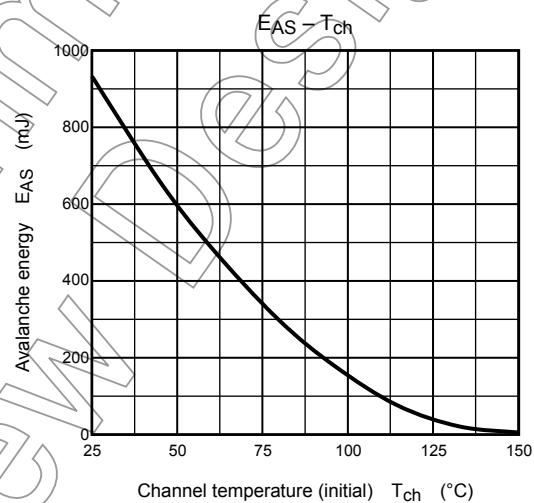
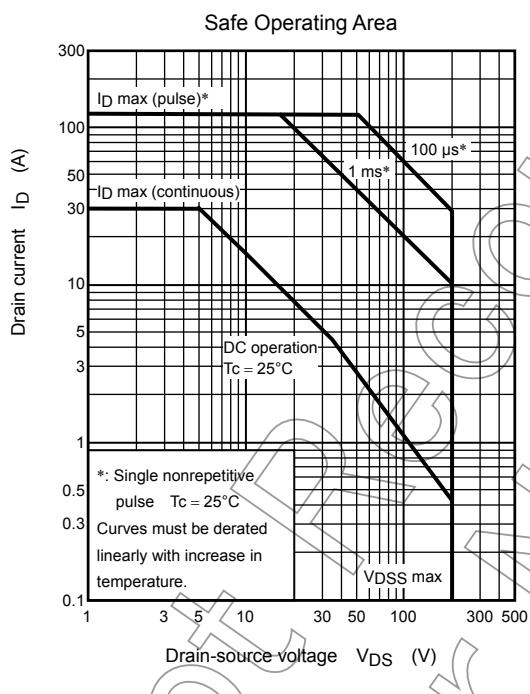
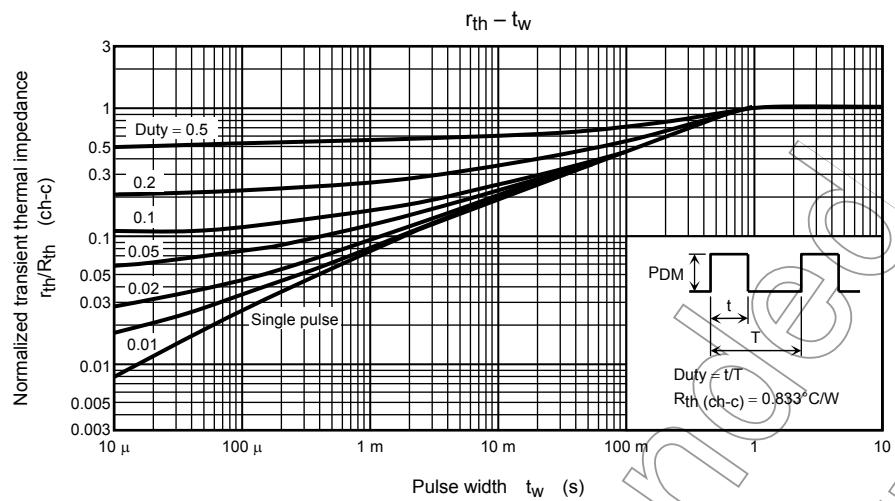
Not underlined: [[Pb]]/INCLUDES > MCV

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