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

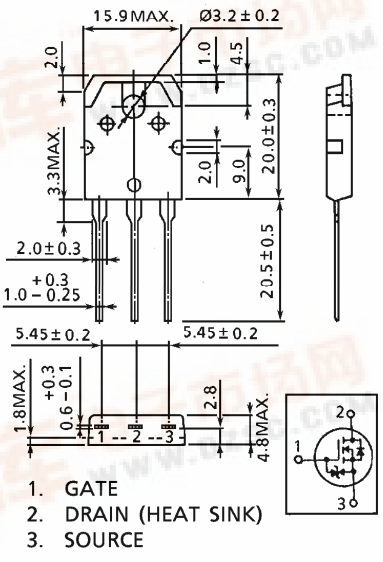
# 2SK3176

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS

SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

INDUSTRIAL APPLICATIONS

Unit in mm




| | |
|---|---|
| JEDEC | — |
| EIAJ | SC-65 |
| TOSHIBA | 2-16C1B |

- Low Drain-Source ON Resistance : $R_{DS\,(ON)}$ = 38 mΩ (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}|$ = 28 S (Typ.)
- Low Leakage Current : $I_{DSS}$ = 100 μA (Max.) ($V_{DS}$ = 200 V)
- Enhancement-Model : $V_{th}$ = 1.5~3.5 V ($V_{DS}$ = 10 V, $I_D$ = 1 mA)

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 200 | V |
| Drain-Gate Voltage ($R_{GS}$ = 20 kΩ) | | $V_{DGR}$ | 200 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Drain Current | DC | $I_D$ | 30 | A |
| | Pulse | $I_{DP}$ | 120 | A |
| Drain Power Dissipation (Ta = 25°C) | | $P_D$ | 150 | W |
| Single Pulse Avalanche Energy* | | $E_{AS}$ | 925 | mJ |
| Avalanche Current | | $I_{AR}$ | 30 | A |
| Repetitive Avalanche Energy** | | $E_{AR}$ | 15 | mJ |
| Channel Temperature | | $T_{ch}$ | 150 | °C |
| Storage Temperature Range | | $T_{stg}$ | −55~150 | °C |

THERMAL CHARACTERISTICS

| CHARACTERISTIC | SYMBOL | MAX. | UNIT |
|---|---|---|---|
| Thermal Resistance, Channel to Case | $R_{th\,(ch-c)}$ | 0.833 | °C / W |
| Thermal Resistance, Channel to Ambient | $R_{th\,(ch-a)}$ | 50.0 | °C / W |

Note ;

* $V_{DD}$ = 50 V, $T_{ch}$ = 25°C, L = 1.66 mH, $I_{AR}$ = 30 A, $R_G$ = 25 Ω

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

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

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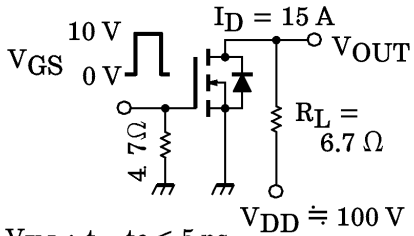
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Gate Leakage Current | | $I_{GSS}$ | $V_{GS}$ = ±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 | | $R_{DS\,(ON)}$ | $V_{GS}$ = 10 V, $I_D$ = 15 A | — | 38 | 52 | mΩ |
| 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<br>f = 1 MHz | — | 5400 | — | pF |
| Reverse Transfer Capacitance | | $C_{rss}$ | | — | 580 | — | |
| Output Capacitance | | $C_{oss}$ | | — | 1900 | — | |
| Switching Time | Rise Time | $t_r$ |  <br>$V_{IN}$ : $t_r$, $t_f$ < 5 ns,<br>Duty ≦ 1%, $t_w$ = 10 μs | — | 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) | | $Q_g$ | $V_{DD}$ ≒ 160 V, $V_{GS}$ = 10 V<br>$I_D$ = 30 A | — | 125 | — | nC |
| Gate-Source Charge | | $Q_{gs}$ | | — | 80 | — | |
| Gate-Drain ("Miller") Charge | | $Q_{gd}$ | | — | 45 | — | |

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Continuous Drain Reverse Current | $I_{DR}$ | — | — | — | 30 | A |
| Pulse Drain Reverse Current | $I_{DRP}$ | — | — | — | 90 | A |
| Diode Forward Voltage | $V_{DSF}$ | $I_{DR}$ = 30 A, $V_{GS}$ = 0 V | — | — | −2.0 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_{DR}$ = 30 A, $V_{GS}$ = 0 V<br>$dI_{DR}$ / dt = 100 A / μs | — | 270 | — | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | — | 3.0 | — | μC |

MARKING