

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

## 2SK3117

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

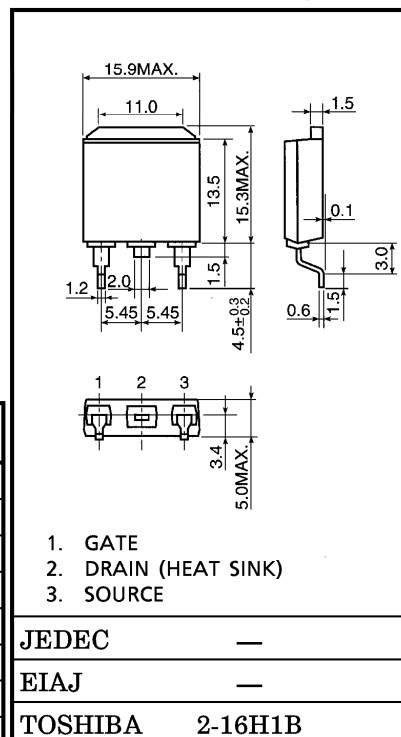
INDUSTRIAL APPLICATIONS

Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.21 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 17 S$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu A$  (Max.) ( $V_{DSS} = 500 V$ )
- Enhancement-Mode :  $V_{th} = 2.0 \sim 4.0 V$   
( $V_{DS} = 10 V, I_D = 1 mA$ )

MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

| CHARACTERISTIC                                 | 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        | $I_D$          | 20         |
|                                                | Pulse     | $I_{DP}$       | 80         |
| Drain Power Dissipation ( $T_c = 25^\circ C$ ) | $P_D$     | 150            | W          |
| Single Pulse Avalanche Energy**                | $E_{AS}$  | 960            | mJ         |
| Avalanche Current                              | $I_{AR}$  | 20             | A          |
| Repetitive Avalanche Energy*                   | $E_{AR}$  | 15             | mJ         |
| Channel Temperature                            | $T_{ch}$  | 150            | $^\circ C$ |
| Storage Temperature Range                      | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |



Weight : 4.6 g

## THERMAL CHARACTERISTICS

| CHARACTERISTIC                         | SYMBOL         | MAX.  | UNIT           |
|----------------------------------------|----------------|-------|----------------|
| Thermal Resistance, Channel to Case    | $R_{th(ch-c)}$ | 0.833 | $^\circ C / W$ |
| Thermal Resistance, Channel to Ambient | $R_{th(ch-a)}$ | 50    | $^\circ C / W$ |

Note ;

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

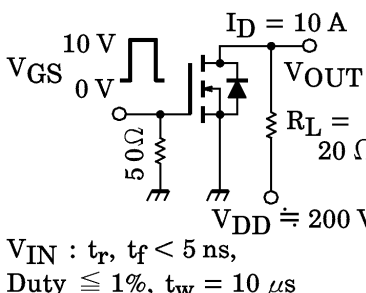
\*\*  $V_{DD} = 90 V, T_{ch} = 25^\circ C$  (initial),  $L = 4.08 mH$   
 $R_G = 25 \Omega, I_{AR} = 20 A$ 

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

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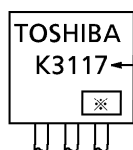
## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                                  | SYMBOL        | TEST CONDITION                                                                | MIN.                                                                                | TYP. | MAX.     | UNIT          |
|-------------------------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|----------|---------------|
| Gate Leakage Current                            | $I_{GSS}$     | $V_{GS} = \pm 25 \text{ V}, V_{DS} = 0 \text{ V}$                             | —                                                                                   | —    | $\pm 10$ | $\mu\text{A}$ |
| Gate-Source Breakdown Voltage                   | $V_{(BR)GSS}$ | $I_G = \pm 10 \mu\text{A}, V_{DS} = 0 \text{ V}$                              | $\pm 30$                                                                            | —    | —        | 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                      | $R_{DS(ON)}$  | $V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$                                   | —                                                                                   | 0.21 | 0.27     | $\Omega$      |
| Forward Transfer Admittance                     | $ Y_{fs} $    | $V_{DS} = 10 \text{ V}, I_D = 10 \text{ A}$                                   | 10                                                                                  | 17   | —        | S             |
| Input Capacitance                               | $C_{iss}$     | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V},$<br>$f = 1 \text{ MHz}$         | —                                                                                   | 3720 | —        | pF            |
| Reverse Transfer Capacitance                    | $C_{rss}$     |                                                                               | —                                                                                   | 340  | —        |               |
| Output Capacitance                              | $C_{oss}$     |                                                                               | —                                                                                   | 1165 | —        |               |
| Switching Time                                  | Rise Time     | $t_r$                                                                         |  |      |          | ns            |
|                                                 | Turn-on Time  | $t_{on}$                                                                      |                                                                                     |      |          |               |
|                                                 | Fall Time     | $t_f$                                                                         |                                                                                     |      |          |               |
|                                                 | Turn-off Time | $t_{off}$                                                                     |                                                                                     |      |          |               |
| Total Gate Charge (Gate-Source Plus Gate-Drain) | $Q_g$         | $V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V},$<br>$I_D = 6 \text{ A}$ | —                                                                                   | 80   | —        | nC            |
| Gate-Source Charge                              | $Q_{gs}$      |                                                                               | —                                                                                   | 48   | —        |               |
| Gate-Drain ("Miller") Charge                    | $Q_{gd}$      |                                                                               | —                                                                                   | 32   | —        |               |

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

| CHARACTERISTIC                   | SYMBOL    | TEST CONDITION                                                                            | MIN. | TYP. | MAX. | UNIT          |
|----------------------------------|-----------|-------------------------------------------------------------------------------------------|------|------|------|---------------|
| Continuous Drain Reverse Current | $I_{DR}$  | —                                                                                         | —    | —    | 20   | A             |
| Pulse Drain Reverse Current      | $I_{DRP}$ | —                                                                                         | —    | —    | 80   | A             |
| Diode Forward Voltage            | $V_{DSF}$ | $I_{DR} = 20 \text{ A}, V_{GS} = 0 \text{ V}$                                             | —    | —    | −1.7 | V             |
| Reverse Recovery Time            | $t_{rr}$  | $I_{DR} = 20 \text{ A}, V_{GS} = 0 \text{ V}$<br>$dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$ | —    | 430  | —    | ns            |
| Reverse Recovery Charge          | $Q_{rr}$  |                                                                                           | —    | 5.8  | —    | $\mu\text{C}$ |

## MARKING



TYPE

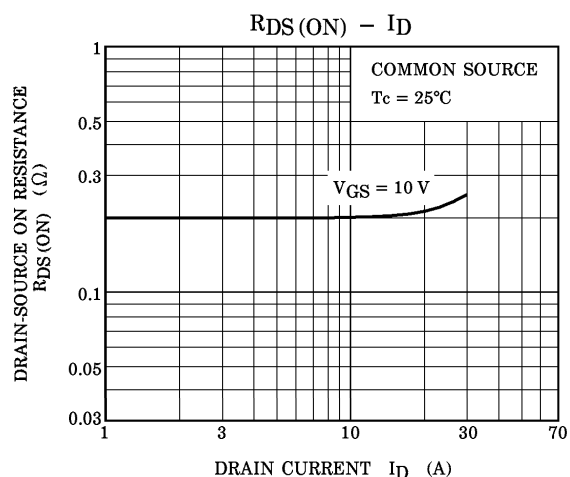
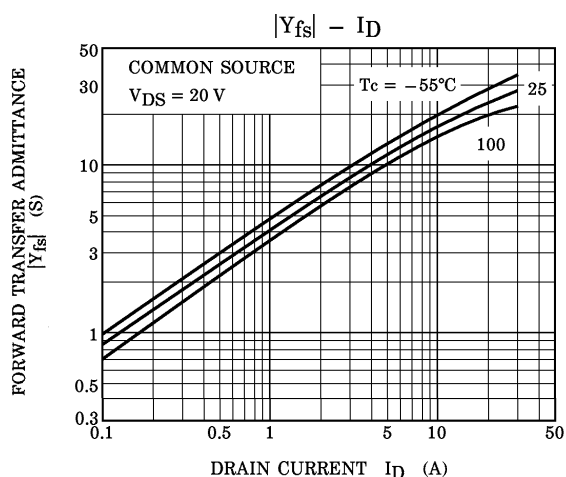
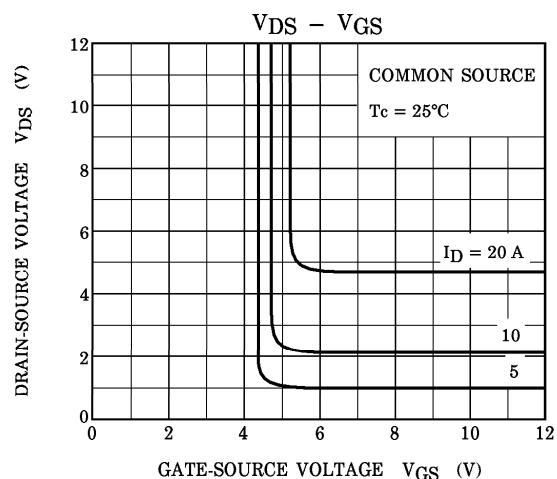
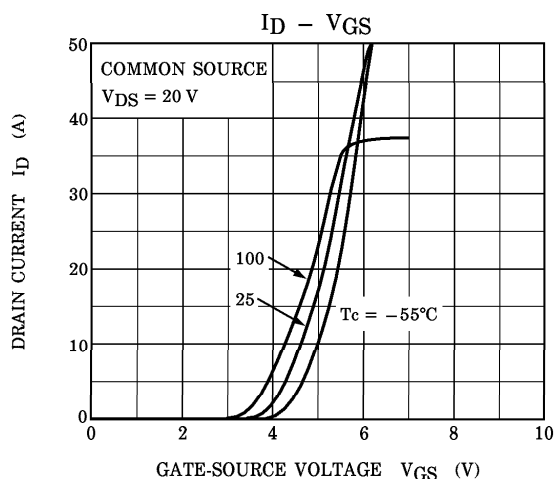
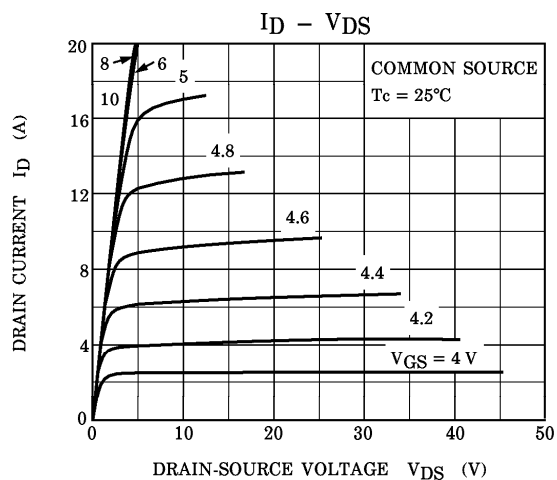
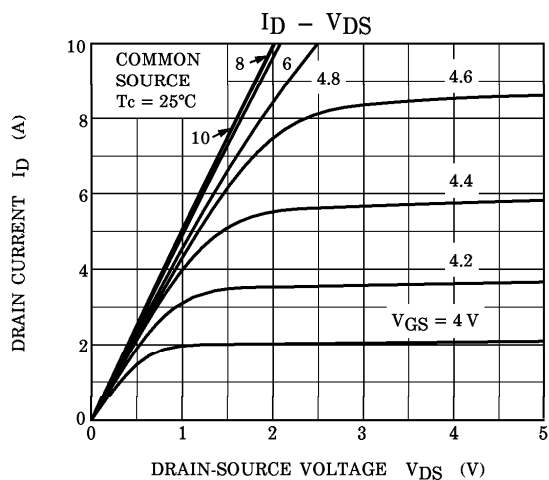
※ Lot Number

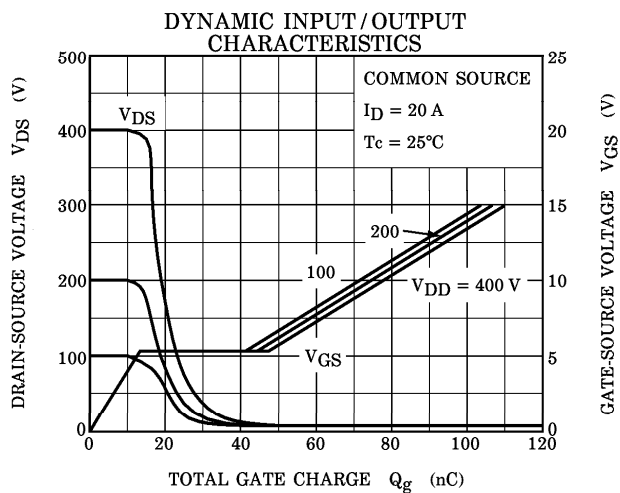
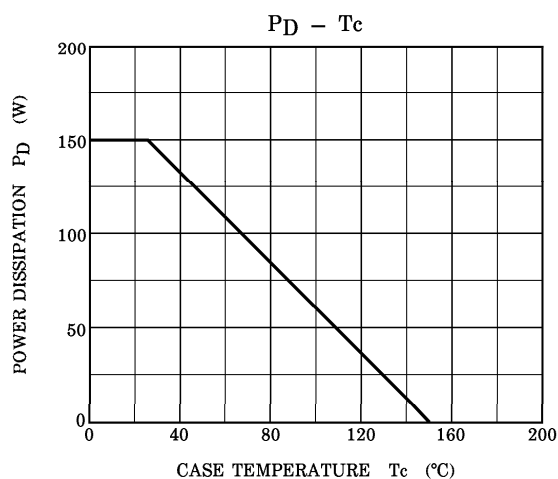
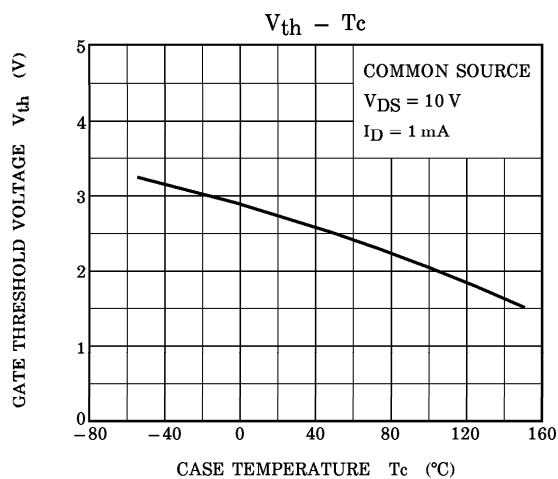
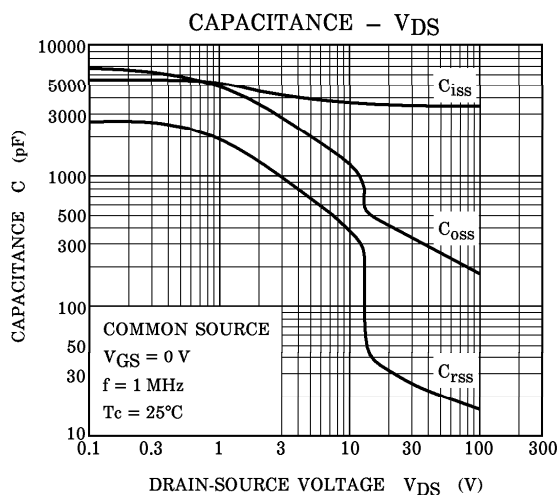
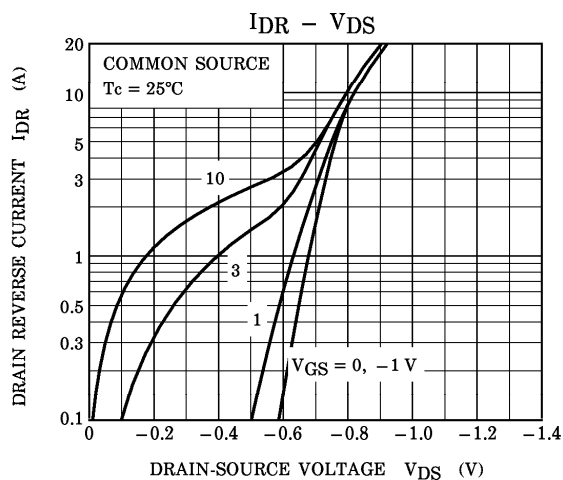
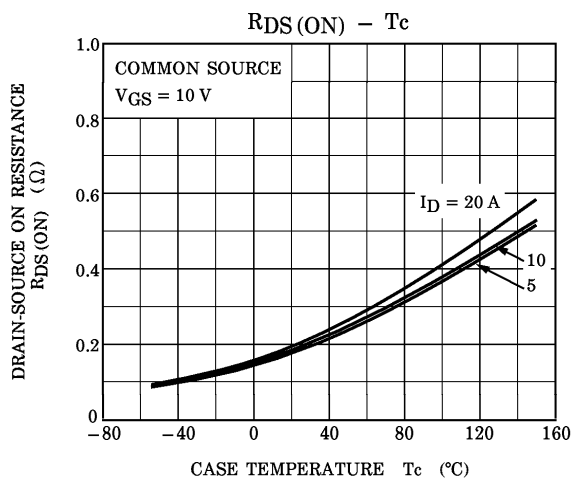


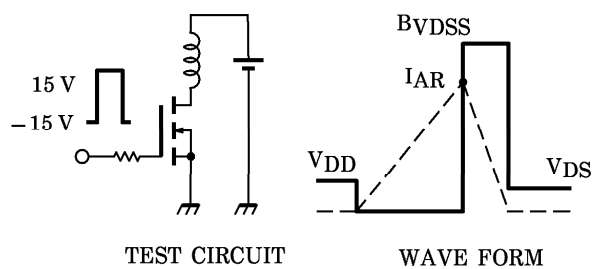
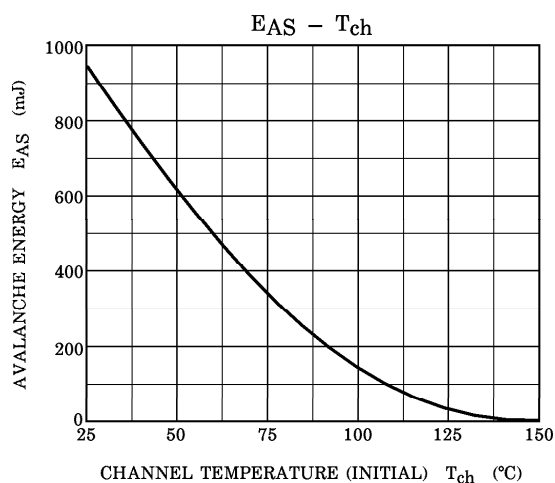
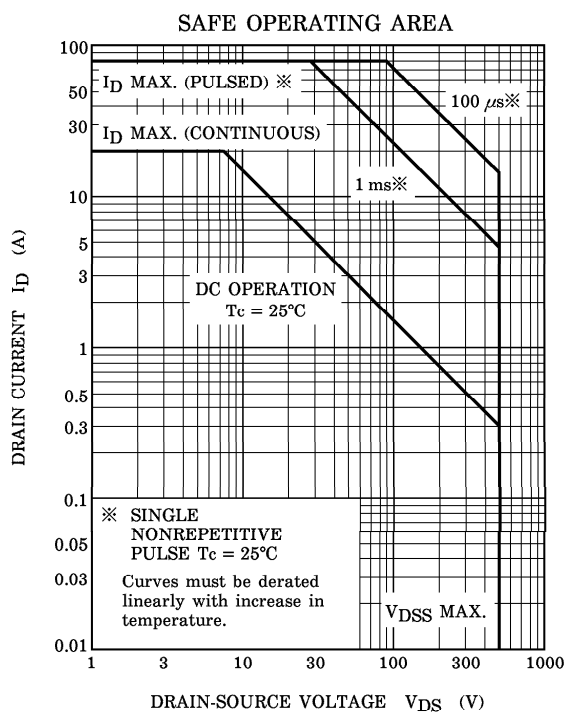
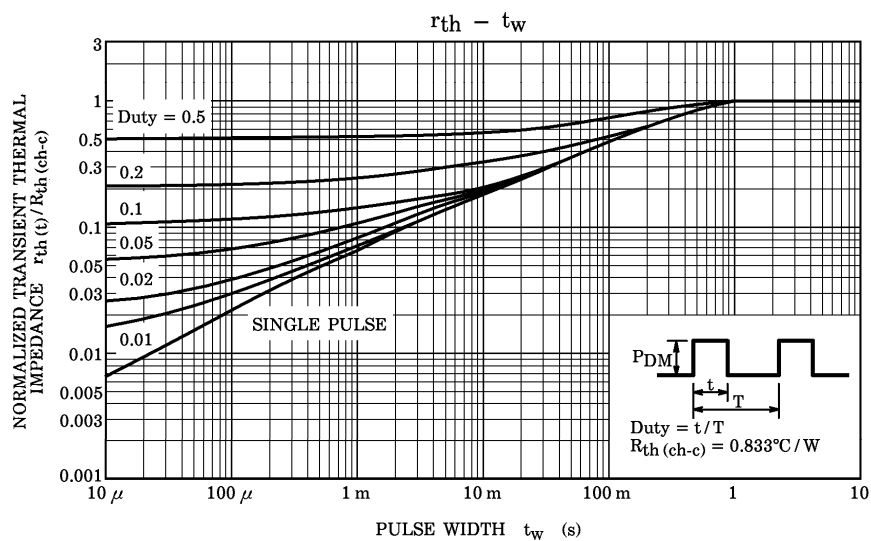
Month (Starting from Alphabet A)



Year (Last Number of the Christian Era)







Peak  $I_{AR} = 20\text{ A}$ ,  $R_G = 25\ \Omega$   $E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$   
 $V_{DD} = 90\text{ V}$ ,  $L = 4.08\text{ mH}$