

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type ( $L^2$ - $\pi$ -MOSV)

## 2SJ380

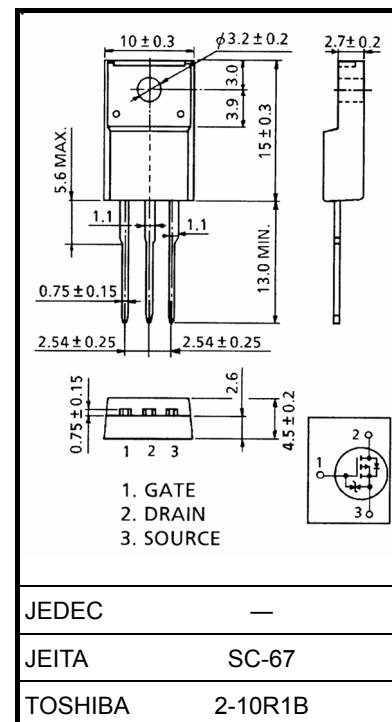
Relay Drive, DC-DC Converter and Motor Drive Applications

Unit: mm

- 4-V gate drive
- Low drain-source ON resistance:  $R_{DS(ON)} = 0.15 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 7.7 S$  (typ.)
- Low leakage current:  $I_{DSS} = -100 \mu A$  (max) ( $V_{DS} = -100 V$ )
- Enhancement mode:  $V_{th} = -0.8$  to  $-2.0 V$  ( $V_{DS} = -10 V$ ,  $I_D = -1 mA$ )

### Absolute Maximum Ratings ( $T_a = 25^\circ C$ )

| Characteristics                                | Symbol         | Rating     | Unit       |
|------------------------------------------------|----------------|------------|------------|
| Drain-source voltage                           | $V_{DSS}$      | -100       | V          |
| Drain-gate voltage ( $R_{GS} = 20 k\Omega$ )   | $V_{DGR}$      | -100       | V          |
| Gate-source voltage                            | $V_{GSS}$      | $\pm 20$   | V          |
| Drain current                                  | DC (Note 1)    | $I_D$      | A          |
|                                                | Pulse (Note 1) | $I_{DP}$   |            |
| Drain power dissipation ( $T_c = 25^\circ C$ ) | $P_D$          | 35         | W          |
| Single pulse avalanche energy (Note 2)         | $E_{AS}$       | 312        | mJ         |
| Avalanche current                              | $I_{AR}$       | -12        | A          |
| Repetitive avalanche energy (Note 3)           | $E_{AR}$       | 3.5        | mJ         |
| Channel temperature                            | $T_{ch}$       | 150        | $^\circ C$ |
| Storage temperature range                      | $T_{stg}$      | -55 to 150 | $^\circ C$ |



Weight: 1.9 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    | $R_{th(ch-c)}$ | 3.57 | $^\circ C/W$ |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 62.5 | $^\circ C/W$ |

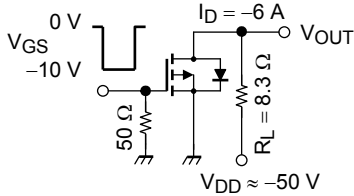
Note1: Ensure that the channel temperature does not exceed  $150^\circ C$ .

Note 2:  $V_{DD} = -25 V$ ,  $T_{ch} = 25^\circ C$  (initial),  $L = 2.94 mH$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = -12 A$

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

This transistor is an electrostatic-sensitive device. Handle with care.

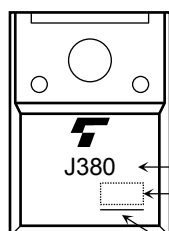
## Electrical Characteristics (Ta = 25°C)

| Characteristics                                 |               | Symbol         | Test Condition                                                                     | Min  | Typ. | Max      | Unit          |
|-------------------------------------------------|---------------|----------------|------------------------------------------------------------------------------------|------|------|----------|---------------|
| Gate leakage current                            |               | $I_{GSS}$      | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$                                  | —    | —    | $\pm 10$ | $\mu\text{A}$ |
| Drain cut-off current                           |               | $I_{DSS}$      | $V_{DS} = -100 \text{ V}, V_{GS} = 0 \text{ V}$                                    | —    | —    | -100     | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR) DSS}$ | $I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$                                       | -100 | —    | —        | 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                      |               | $R_{DS(ON)}$   | $V_{GS} = -4 \text{ V}, I_D = -6 \text{ A}$                                        | —    | 0.25 | 0.32     | $\Omega$      |
|                                                 |               |                | $V_{GS} = -10 \text{ V}, I_D = -6 \text{ A}$                                       | —    | 0.15 | 0.21     |               |
| Forward transfer admittance                     |               | $ Y_{fs} $     | $V_{DS} = -10 \text{ V}, I_D = -6 \text{ A}$                                       | 4.5  | 7.7  | —        | S             |
| Input capacitance                               |               | $C_{iss}$      | $V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                  | —    | 1100 | —        | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$      |                                                                                    | —    | 200  | —        | pF            |
| Output capacitance                              |               | $C_{oss}$      |                                                                                    | —    | 440  | —        | pF            |
| Switching time                                  | Rise time     | $t_r$          |  | —    | 18   | —        | ns            |
|                                                 | Turn-on time  | $t_{on}$       |                                                                                    | —    | 30   | —        |               |
|                                                 | Fall time     | $t_f$          |                                                                                    | —    | 18   | —        |               |
|                                                 | Turn-off time | $t_{off}$      |                                                                                    | —    | 65   | —        |               |
| Total gate charge (gate-source plus gate-drain) |               | $Q_g$          | $V_{DD} \approx -80 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -12 \text{ A}$        | —    | 48   | —        | nC            |
| Gate-source charge                              |               | $Q_{gs}$       |                                                                                    | —    | 29   | —        | nC            |
| Gate-drain ("miller") charge                    |               | $Q_{gd}$       |                                                                                    | —    | 19   | —        | nC            |

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

| Characteristics                              | Symbol    | Test Condition                                 | Min | Typ. | Max | Unit          |
|----------------------------------------------|-----------|------------------------------------------------|-----|------|-----|---------------|
| Continuous drain reverse current<br>(Note 1) | $I_{DR}$  | —                                              | —   | —    | -12 | A             |
| Pulse drain reverse current<br>(Note 1)      | $I_{DRP}$ | —                                              | —   | —    | -48 | A             |
| Forward voltage (diode)                      | $V_{DSF}$ | $I_{DR} = -12 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | —    | 1.7 | V             |
| Reverse recovery time                        | $t_{rr}$  | $I_{DR} = -12 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | 160  | —   | ns            |
| Reverse recovery charge                      | $Q_{rr}$  | $dI_{DR}/dt = 50 \text{ A}/\mu\text{s}$        | —   | 0.5  | —   | $\mu\text{C}$ |

## Marking



Part No. (or abbreviation code)  
Lot No.

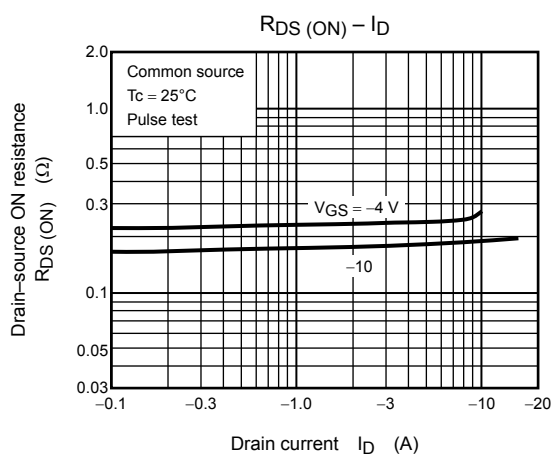
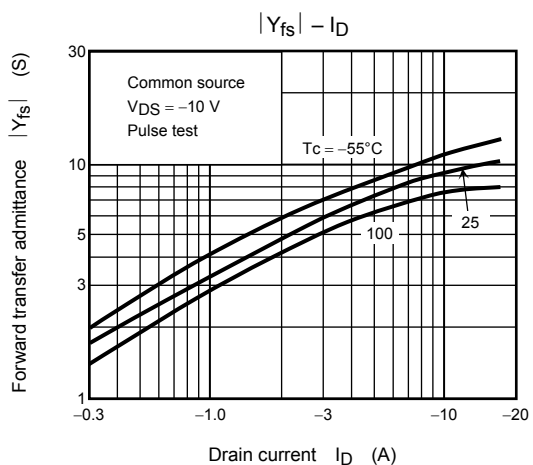
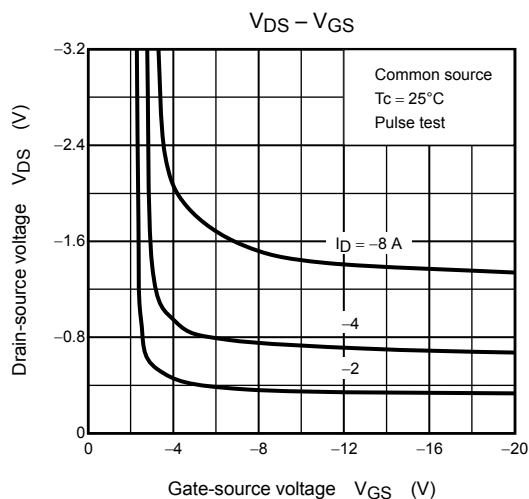
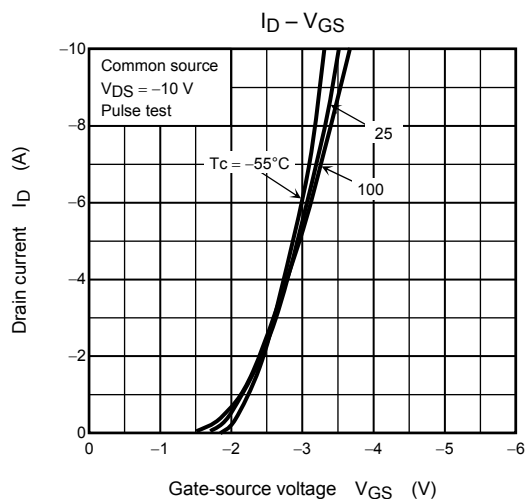
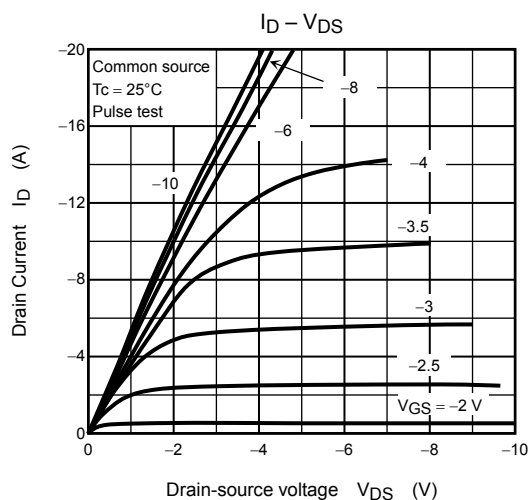
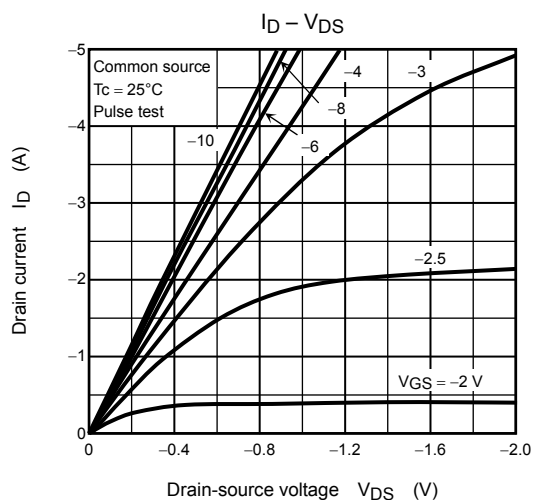
Note 4

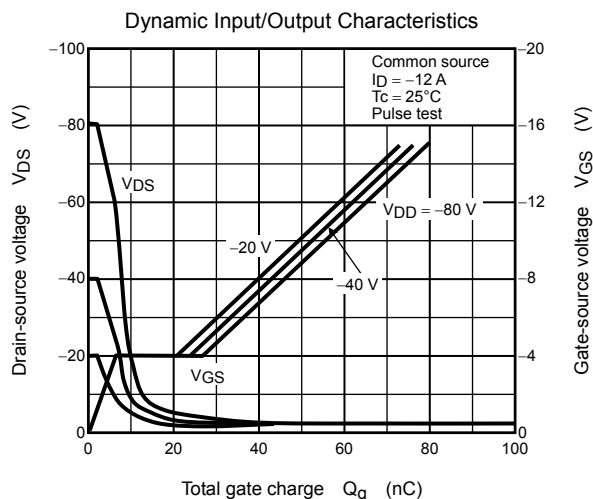
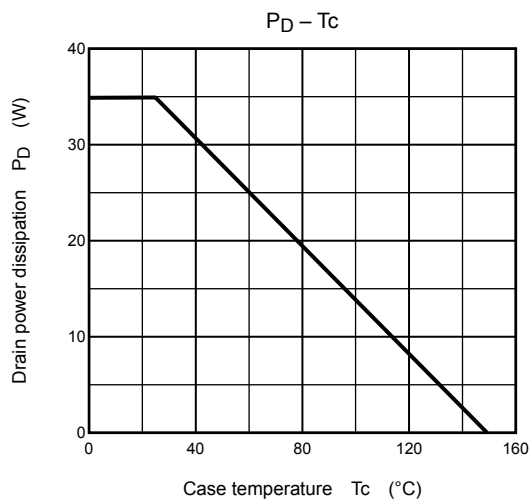
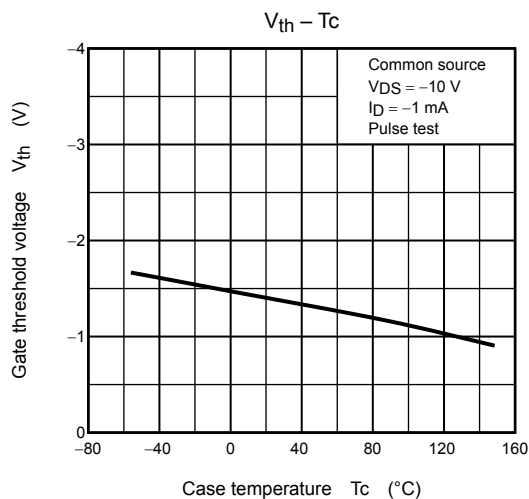
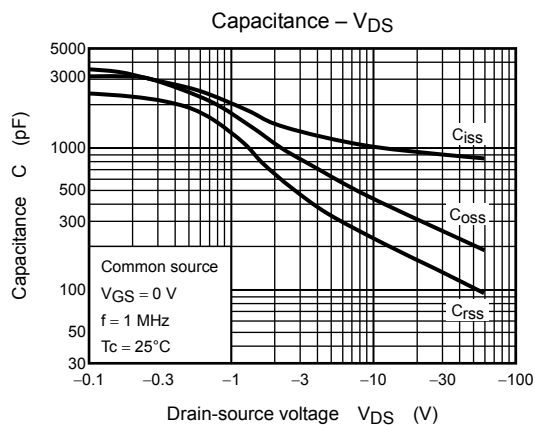
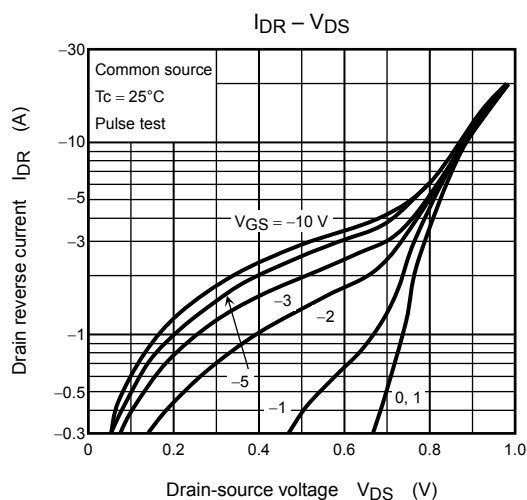
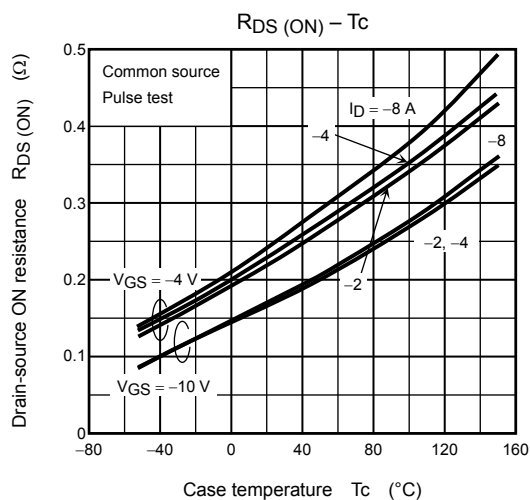
Note 4: A line under a Lot No. identifies the indication of product Labels.

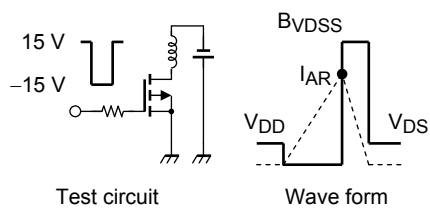
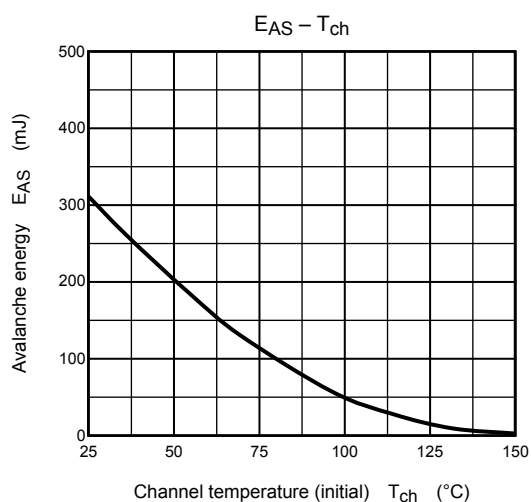
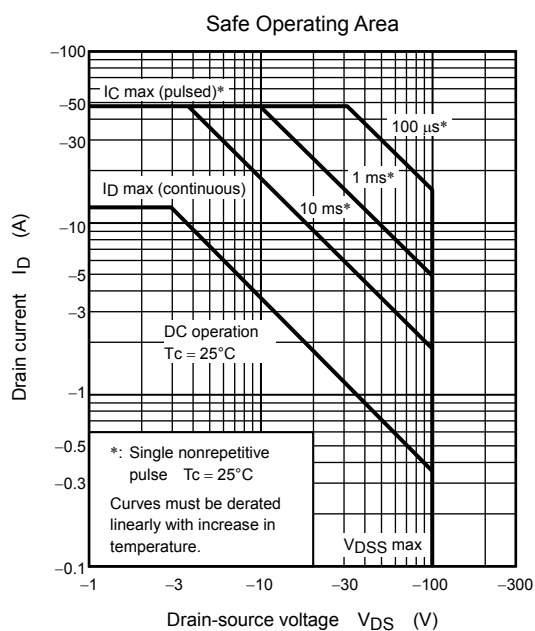
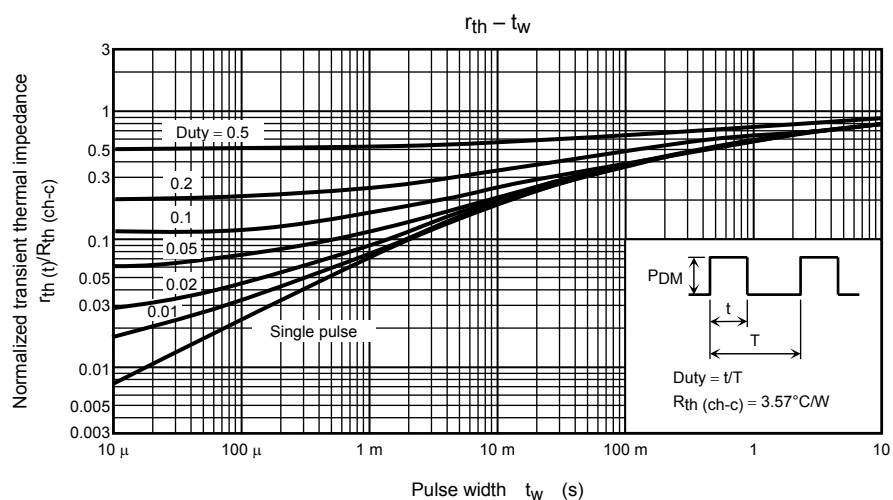
Not underlined:  $[[Pb]]/INCLUDES > MCV$

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

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$$R_G = 25 \, \Omega$$

$$V_{DD} = -25 \, V, L = 2.94 \, mH$$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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