

2SJ380

Relay Drive, DC-DC Converter and Motor Drive Applications

- 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 (Ta = 25°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} | ±20 | V |
| Drain current | DC (Note 1) | I_D | -12 |
| | Pulse (Note 1) | I_{DP} | -48 |
| 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 | °C |
| Storage temperature range | T_{stg} | -55 to 150 | °C |

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 | °C/W |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 62.5 | °C/W |

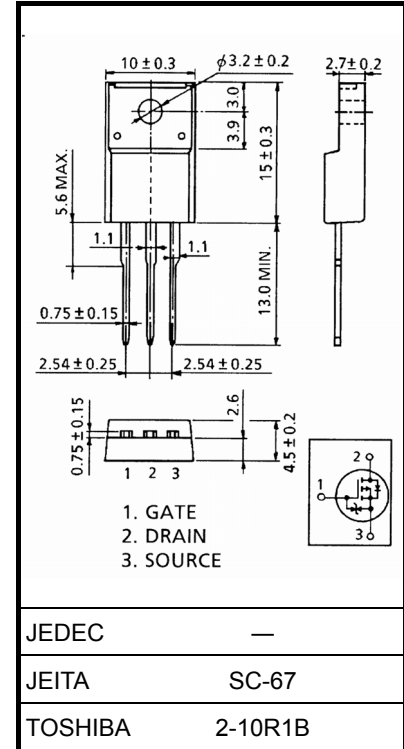
Note1: Ensure that the channel temperature does not exceed 150°C.

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.

Unit: mm



Weight: 1.9 g (typ.)

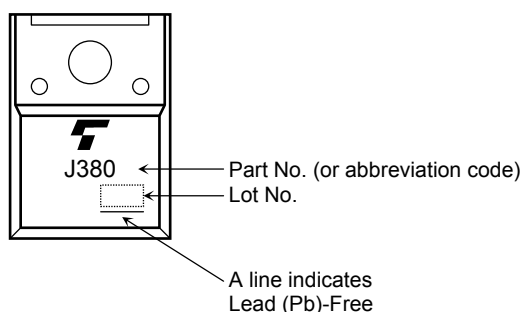
Electrical Characteristics (Tc = 25°C)

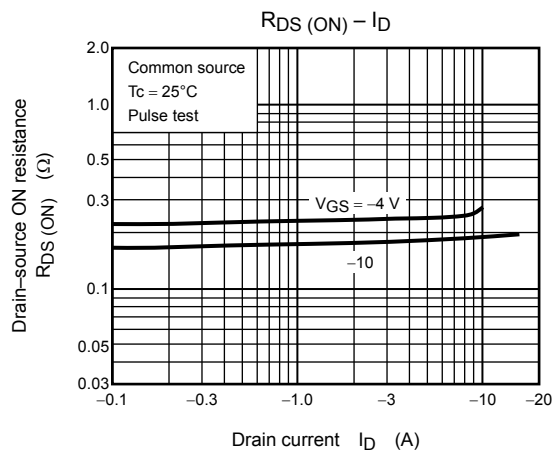
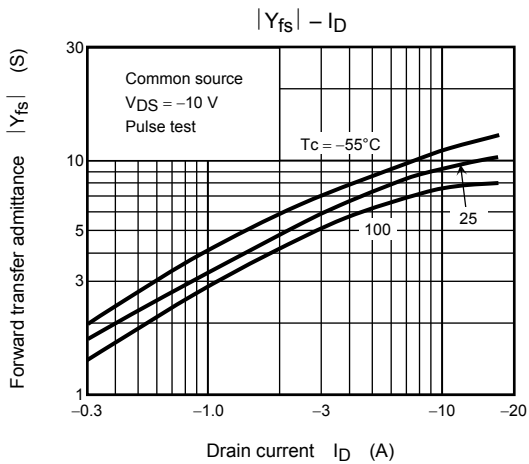
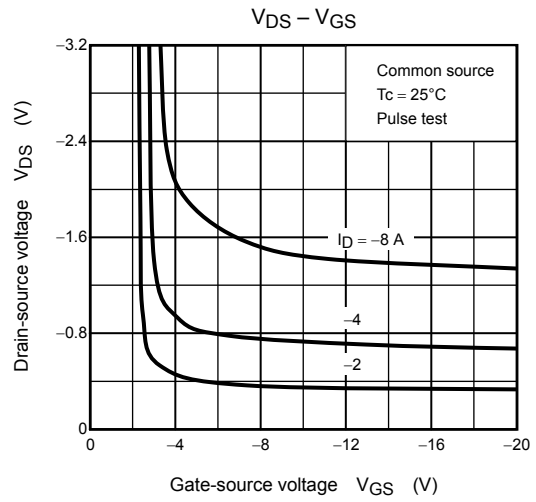
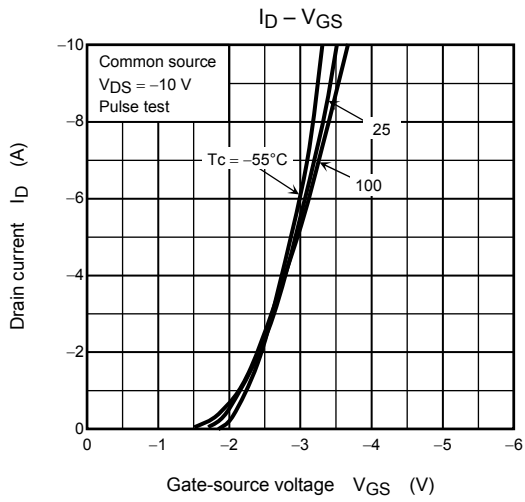
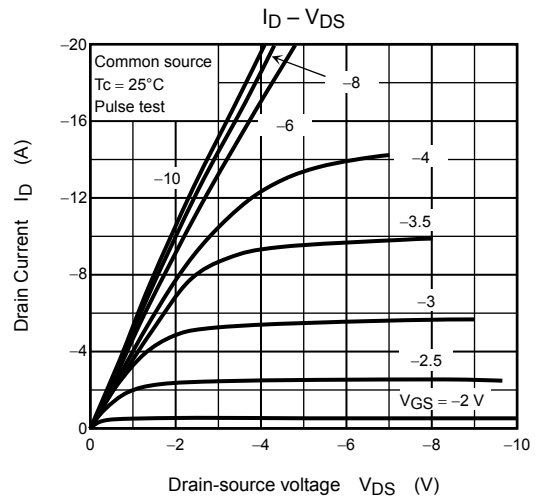
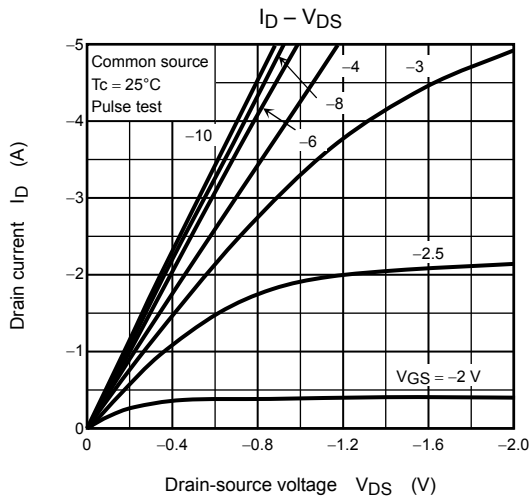
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|--|------|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Drain cut-off current | | I_{DSS} | $V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$ | — | — | -100 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$ | -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 | Ω |
| | | | $V_{GS} = -10\text{ V}, I_D = -6\text{ A}$ | — | 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 |

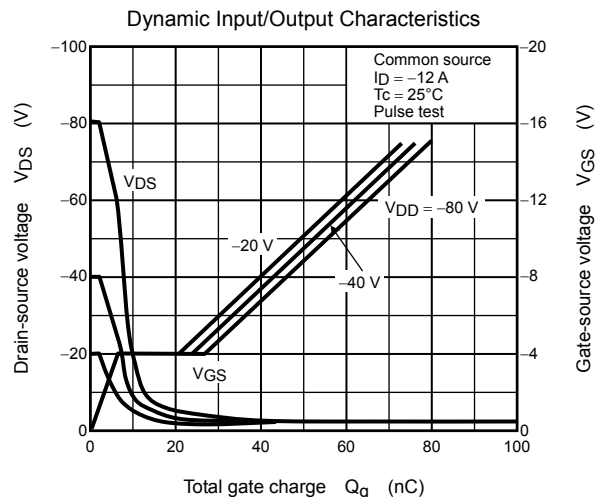
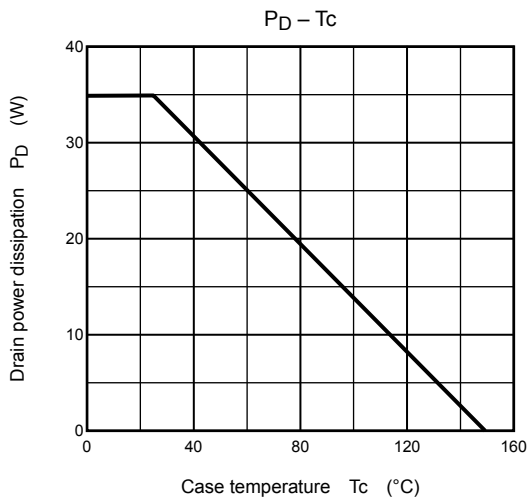
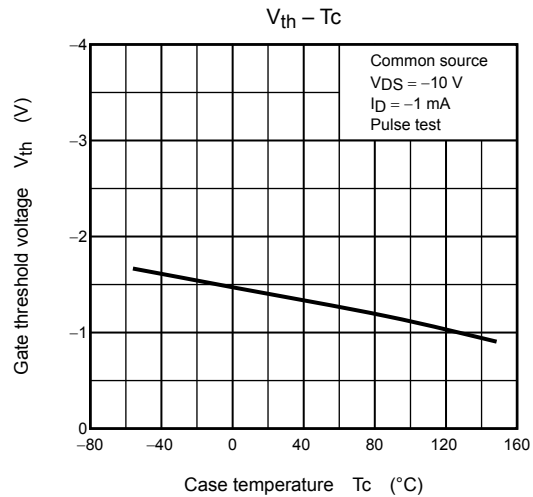
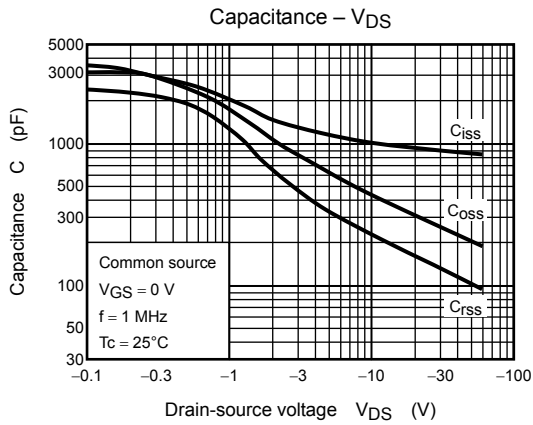
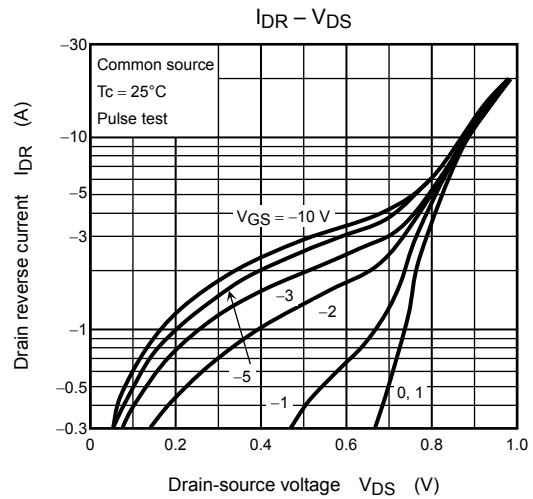
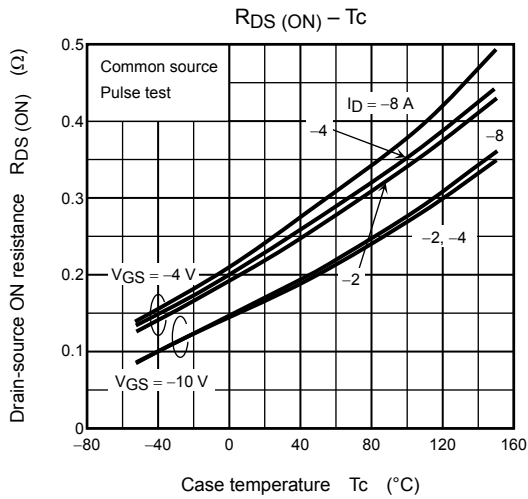
Source-Drain Ratings and Characteristics (Tc = 25°C)

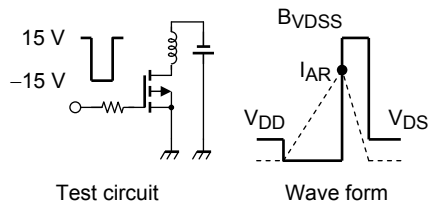
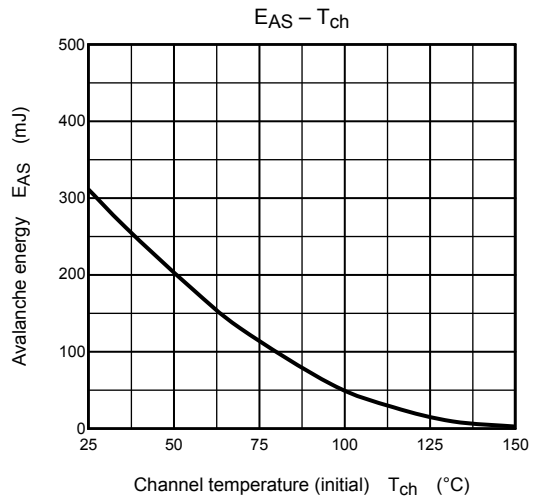
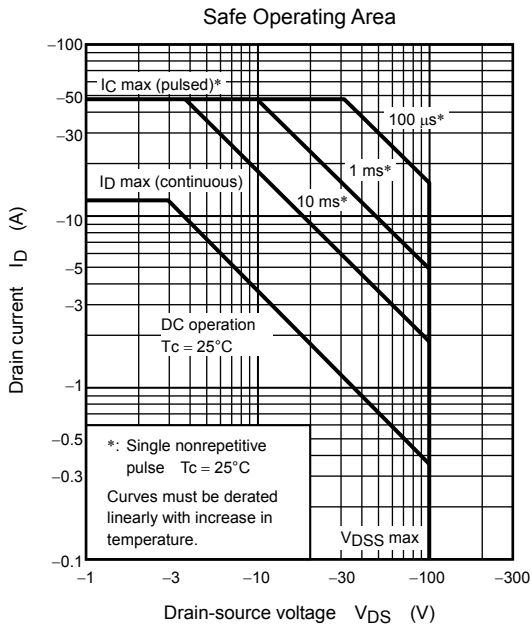
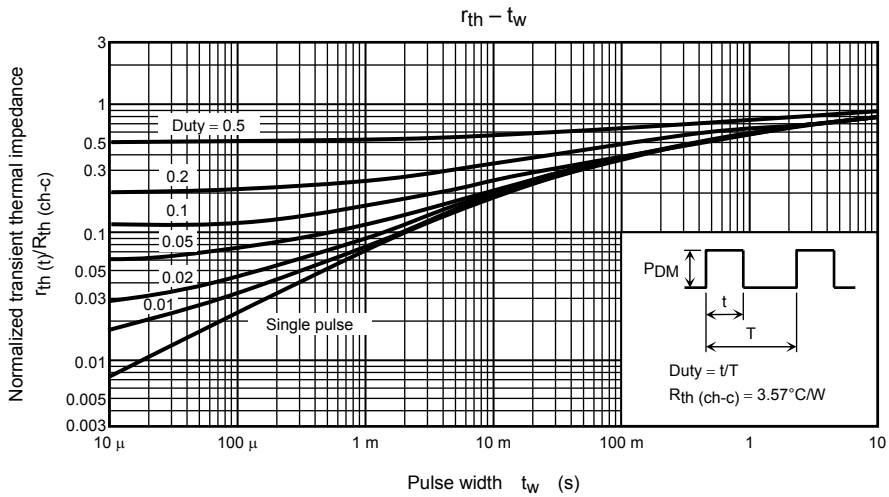
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|--|-----------|--|-----|------|-----|---------------|
| Continuous drain reverse current (Note 1) | | I_{DR} | — | — | — | -12 | A |
| Pulse drain reverse current (Note 1) | | I_{DRP} | — | — | — | -48 | A |
| Forward voltage (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 | — | μC |

Marking









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

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

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20070701-EN GENERAL

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