

2SJ377

Relay Drive, DC/DC Converter and Motor Drive Applications

- 4 V gate drive
- Low drain-source ON-resistance : $R_{DS(ON)} = 0.16 \Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 4.0 \text{ S}$ (typ.)
- Low leakage current : $I_{DSS} = -100 \mu\text{A}$ (max) ($V_{DS} = -60 \text{ V}$)
- Enhancement mode : $V_{th} = -0.8 \sim -2.0 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)

Absolute Maximum Ratings (Ta = 25°C)

| Characteristic | Symbol | Rating | Unit | |
|--|----------------|----------|------|---|
| Drain-source voltage | V_{DSS} | -60 | V | |
| Drain-gate voltage (R _{GS} = 20 kΩ) | V_{DGR} | -60 | V | |
| Gate-source voltage | V_{GSS} | ±20 | V | |
| Drain current | DC (Note 1) | I_D | -5 | A |
| | Pulse (Note 1) | I_{DP} | -20 | A |
| Drain power dissipation (Tc = 25°C) | P_D | 20 | W | |
| Single-pulse avalanche energy (Note 2) | E_{AS} | 273 | mJ | |
| Avalanche current | I_{AR} | -5 | A | |
| Repetitive avalanche energy (Note 3) | E_{AR} | 2 | mJ | |
| Channel temperature | T_{ch} | 150 | °C | |
| Storage temperature range | T_{stg} | -55~150 | °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

| Characteristic | Symbol | Max | Unit |
|--|----------------|------|--------|
| Thermal resistance, channel to case | $R_{th(ch-c)}$ | 6.25 | °C / W |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 125 | °C / W |

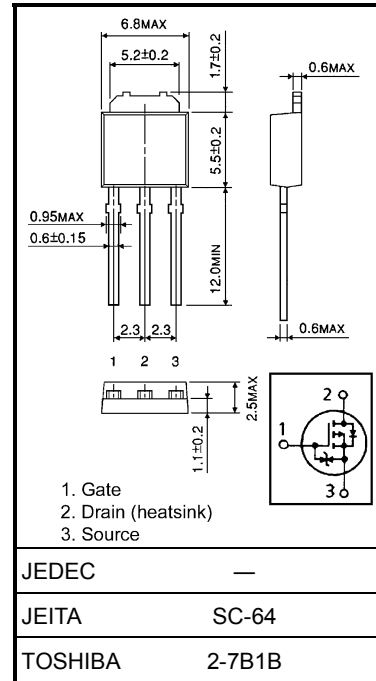
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: $V_{DD} = -25 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 14.84 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = -5 \text{ A}$

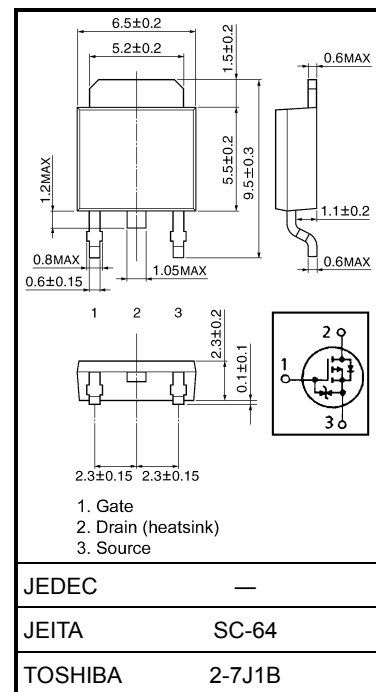
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

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

Unit: mm



Weight: 0.36 g (typ.)



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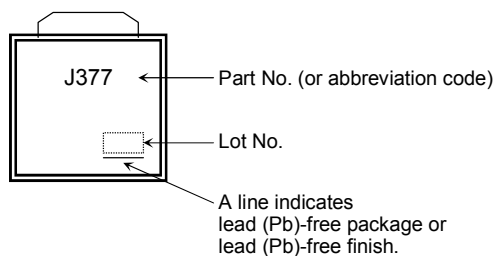
Electrical Characteristics (Ta = 25°C)

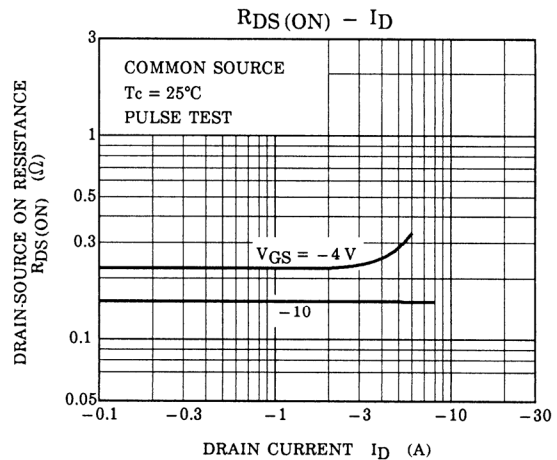
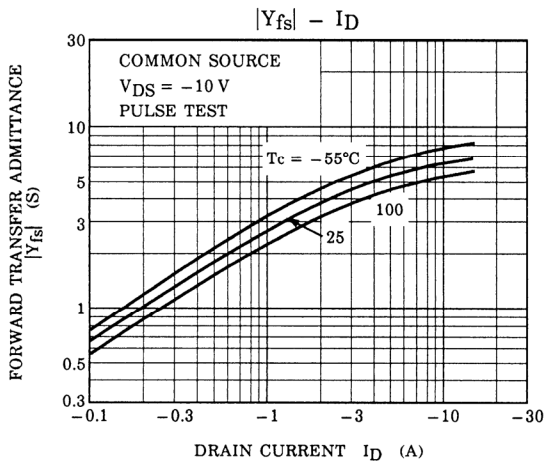
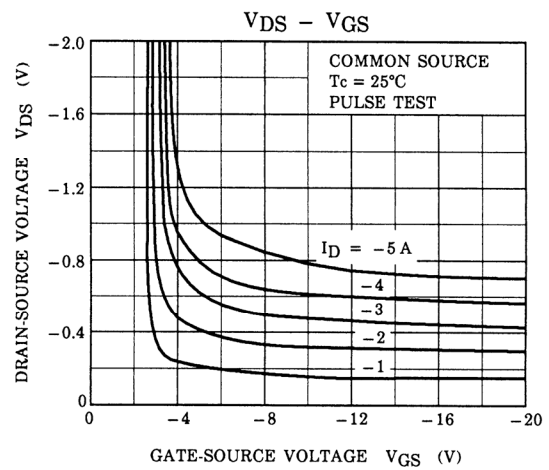
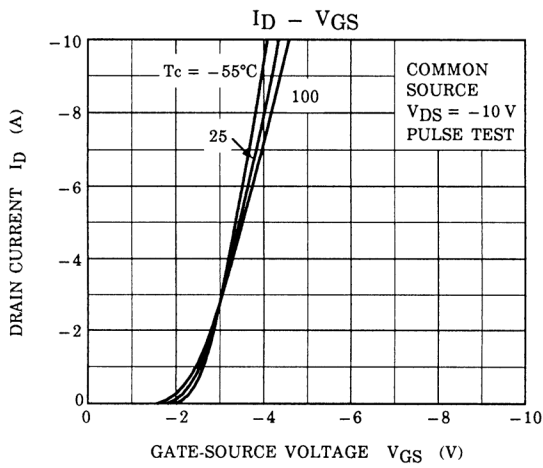
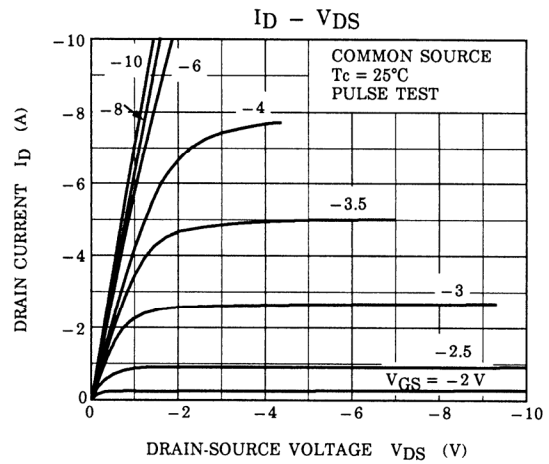
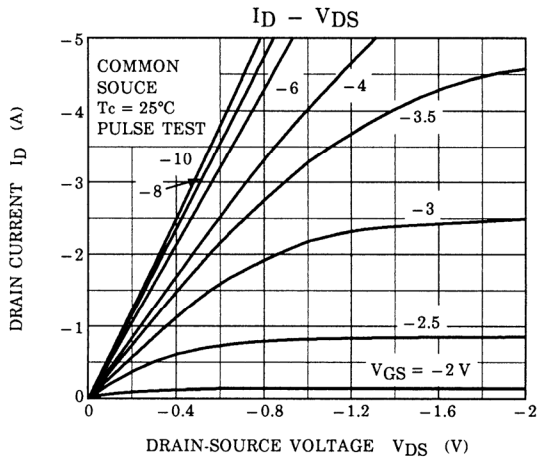
| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|---|---|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Drain cutoff current | | I_{DSS} | $V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$ | — | — | -100 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$ | -60 | — | — | 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 | | $R_{DS(ON)}$ | $V_{GS} = -4\text{ V}, I_D = -2.5\text{ A}$ | — | 0.24 | 0.28 | Ω |
| | | | $V_{GS} = -10\text{ V}, I_D = -2.5\text{ A}$ | — | 0.16 | 0.19 | |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = -10\text{ V}, I_D = -2.5\text{ A}$ | 2.0 | 4.0 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 630 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 95 | — | |
| Output capacitance | | C_{oss} | | — | 290 | — | |
| Switching time | Rise time | t_r | | — | 25 | — | ns |
| | Turn-on time | t_{on} | | — | 45 | — | |
| | Fall time | t_f | | — | 55 | — | |
| | Turn-off time | t_{off} | | Duty $\leq 1\%$, $t_w = 10\mu\text{s}$ | — | 200 | |
| Total gate charge (Gate-source plus gate-drain) | | Q_g | $V_{DD} \approx -48\text{ V}, V_{GS} = -10\text{ V}, I_D = -5\text{ A}$ | — | 22 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 16 | — | |
| Gate-drain ("Miller") charge | | Q_{gd} | | — | 6 | — | |

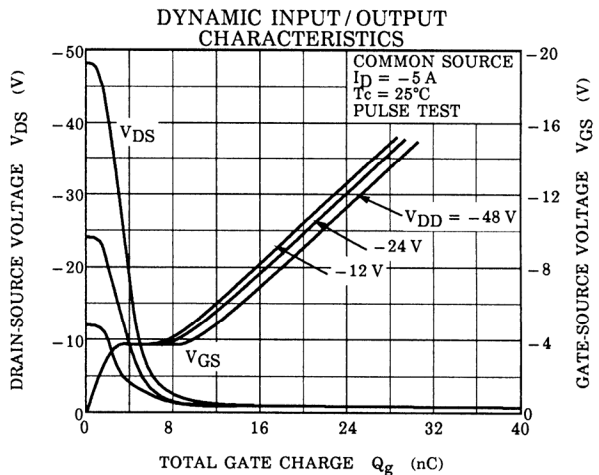
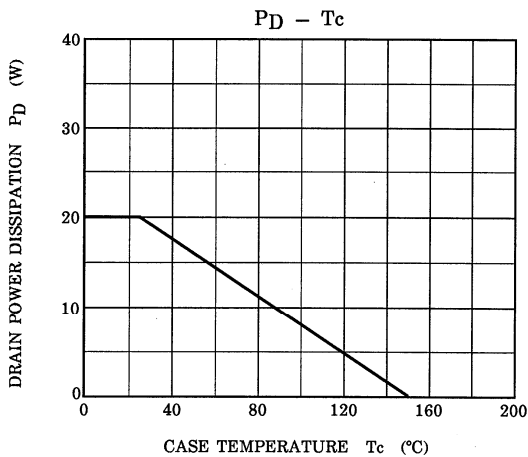
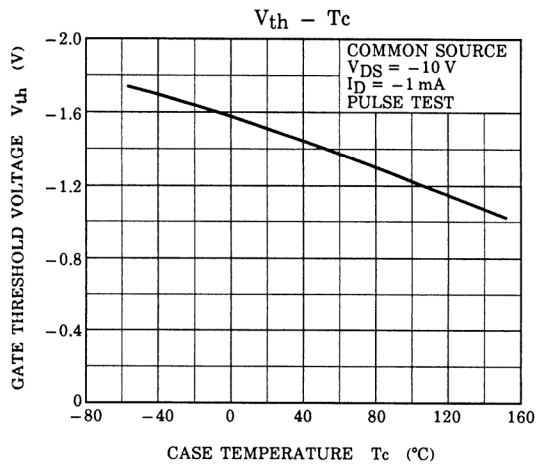
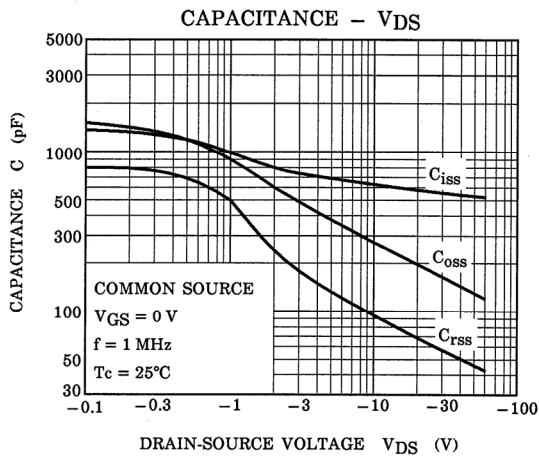
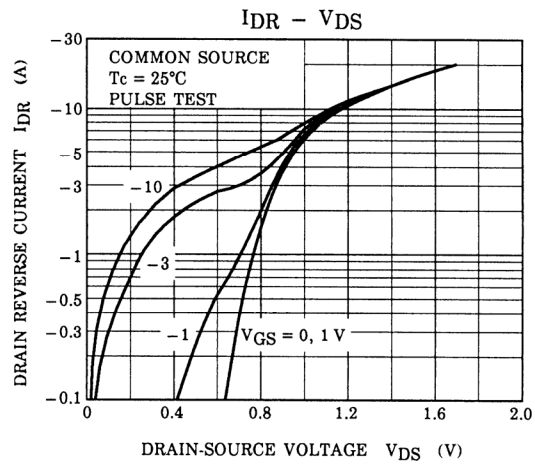
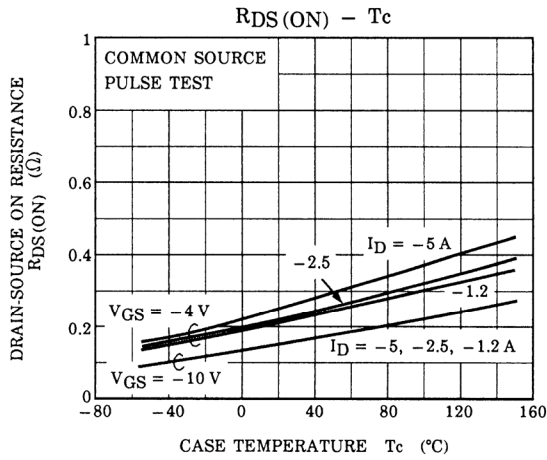
Source-Drain Ratings and Characteristics (Ta = 25°C)

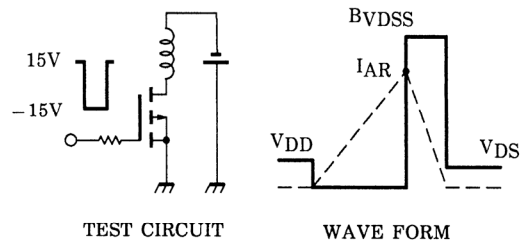
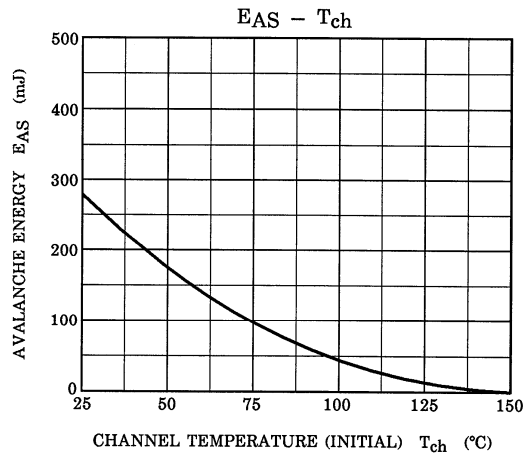
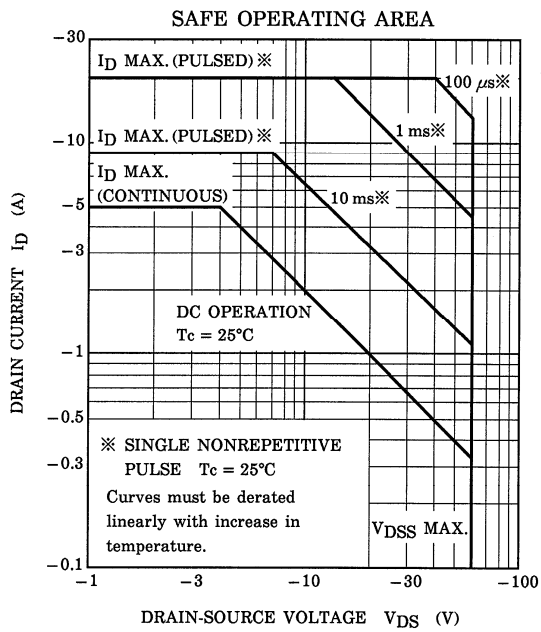
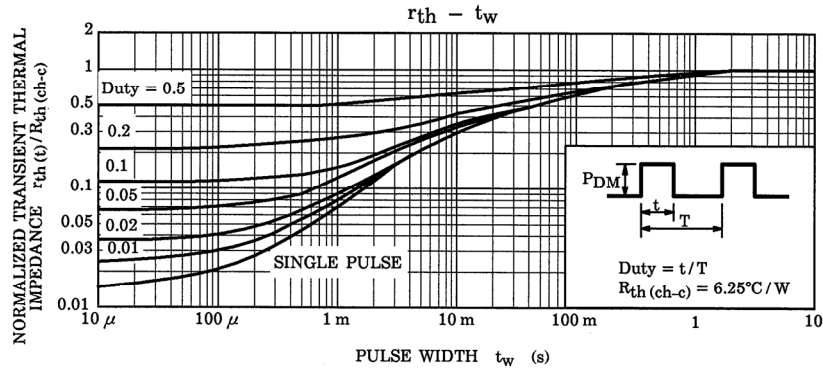
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|-----------|---|-----|------|-----|---------------|
| Continuous drain reverse current (Note 1) | I_{DR} | — | — | — | -5 | A |
| Pulse drain reverse current (Note 1) | I_{DRP} | — | — | — | -20 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$ | — | — | 1.7 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$ | — | 80 | — | ns |
| Reverse recovery charge | Q_{rr} | $dI_{DR} / dt = 50\text{ A} / \mu\text{s}$ | — | 0.1 | — | μC |

Marking









$R_G = 25\Omega$
 $V_{DD} = -25V, L = 14.84mH$

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

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