

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (L<sup>2</sup>-π-MOSV)

# 2SJ401

DC-DC Converter, Relay Drive and Motor Drive Applications

- 4 V gate drive
- Low drain-source ON resistance :  $R_{DS(ON)} = 33\text{ m}\Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 20\text{ S}$  (typ.)
- Low leakage current :  $I_{DSS} = -100\text{ }\mu\text{A}$  (max) ( $V_{DS} = -60\text{ V}$ )
- Enhancement-mode :  $V_{th} = -0.8\sim -2.0\text{ V}$  ( $V_{DS} = -10\text{ V}$ ,  $I_D = -1\text{ mA}$ )

### Maximum Ratings (Ta = 25°C)

| Characteristics                                      | Symbol         | Rating   | Unit |
|--|----------------|----------|------|
| Drain-source voltage                                 | $V_{DSS}$      | -60      | V    |
| Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )  | $V_{DGR}$      | -60      | V    |
| Gate-source voltage                                  | $V_{GSS}$      | $\pm 20$ | V    |
| Drain current  | DC (Note 1)    | $I_D$    | -20  |
|  | Pulse (Note 1) | $I_{DP}$ | -80  |
| Drain power dissipation ( $T_c = 25^\circ\text{C}$ ) | $P_D$          | 100      | W    |
| Single pulse avalanche energy (Note 2)               | $E_{AS}$       | 800      | mJ   |
| Avalanche current                                    | $I_{AR}$       | -20      | A    |
| Repetitive avalanche energy (Note 3)                 | $E_{AR}$       | 10       | mJ   |
| Channel temperature                                  | $T_{ch}$       | 150      | °C   |
| Storage temperature range                            | $T_{stg}$      | -55~150  | °C   |

### Thermal Characteristics

| Characteristics                        | Symbol         | Max  | Unit   |
|--|----------------|------|--------|
| Thermal resistance, channel to case    | $R_{th(ch-c)}$ | 1.25 | °C / W |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 83.3 | °C / W |

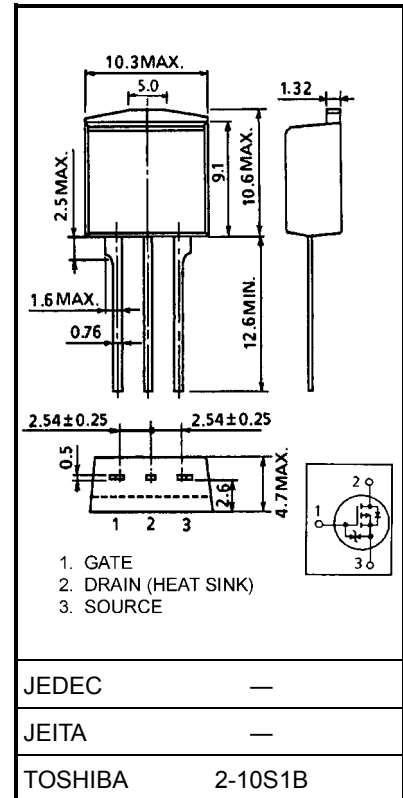
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:  $V_{DD} = -50\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.44\text{ mH}$ ,  $R_G = 25\text{ }\Omega$ ,  $I_{AR} = -20\text{ A}$

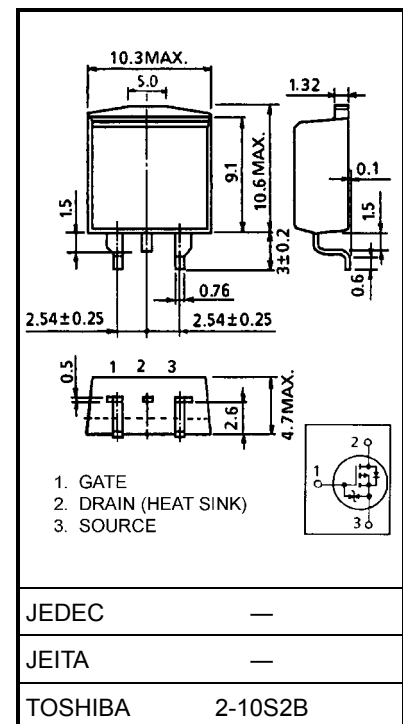
Note 3: Repetitive rating: Pulse width limited by maximum channel temperature

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

Unit: mm



Weight: 1.5 g (typ.)



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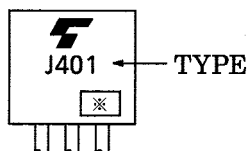
## Electrical Characteristics (Ta = 25°C)

| 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                           |               | $I_{DSS}$     | $V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$                             | —    | —    | -100     | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR)DSS}$ | $I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$                               | -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                      |               | $R_{DS(ON)}$  | $V_{GS} = -4\text{ V}, I_D = -10\text{ A}$                               | —    | 50   | 90       | m $\Omega$    |
|   |               |               | $V_{GS} = -10\text{ V}, I_D = -10\text{ A}$                              | —    | 33   | 45       |               |
| Forward transfer admittance                     |               | $ Y_{fs} $    | $V_{DS} = -10\text{ V}, I_D = -10\text{ A}$                              | 10   | 20   | —        | S             |
| Input capacitance                               |               | $C_{iss}$     | $V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$           | —    | 2800 | —        | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$     |  | —    | 450  | —        |               |
| Output capacitance                              |               | $C_{oss}$     |  | —    | 1300 | —        |               |
| Switching time                                  | Rise time     | $t_r$         |  | —    | 15   | —        | ns            |
|   | Turn-on time  | $t_{on}$      |  | —    | 35   | —        |               |
|   | Fall time     | $t_f$         |  | —    | 25   | —        |               |
|   | Turn-off time | $t_{off}$     |  | —    | 120  | —        |               |
| Total gate charge (Gate-source plus gate-drain) |               | $Q_g$         | $V_{DD} \approx -48\text{ V}, V_{GS} = -10\text{ V}, I_D = -20\text{ A}$ | —    | 90   | —        | nC            |
| Gate-source charge                              |               | $Q_{gs}$      |  | —    | 65   | —        |               |
| Gate-drain ("miller") charge                    |               | $Q_{gd}$      |  | —    | 25   | —        |               |

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

| Characteristics                           | Symbol    | Test Condition                               | Min | Typ. | Max | Unit |
|---|-----------|--|-----|------|-----|------|
| Continuous drain reverse current (Note 1) | $I_{DR}$  | —  | —   | —    | -20 | A    |
| Pulse drain reverse current (Note 1)      | $I_{DRP}$ | —  | —   | —    | -80 | A    |
| Forward voltage (diode)                   | $V_{DSF}$ | $I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V}$ | —   | —    | 1.7 | V    |
| Reverse recovery time                     | $t_{rr}$  | $I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V}$ | —   | 75   | —   | ns   |
| Reverse recovery charge                   | $Q_{rr}$  | $dI_{DR} / dt = 50\text{ A} / \mu\text{s}$   | —   | 83   | —   | nC   |

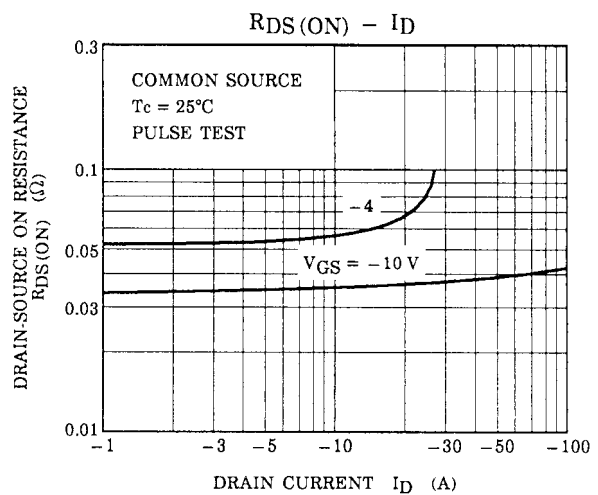
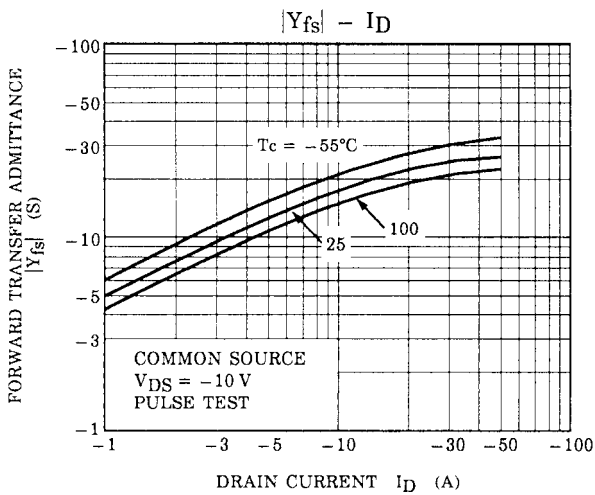
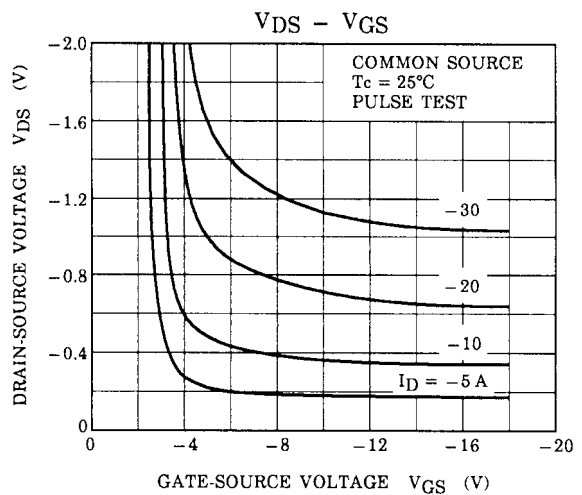
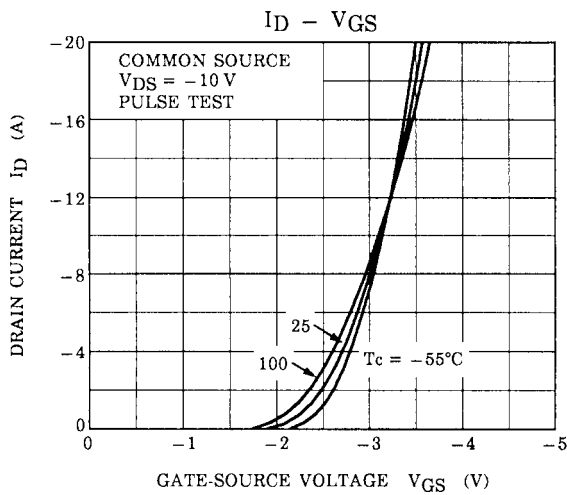
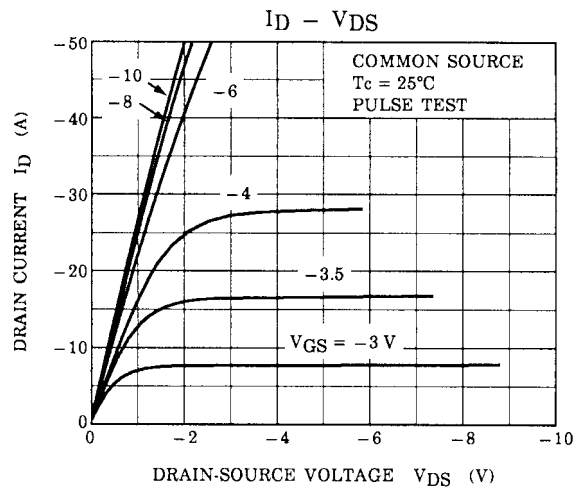
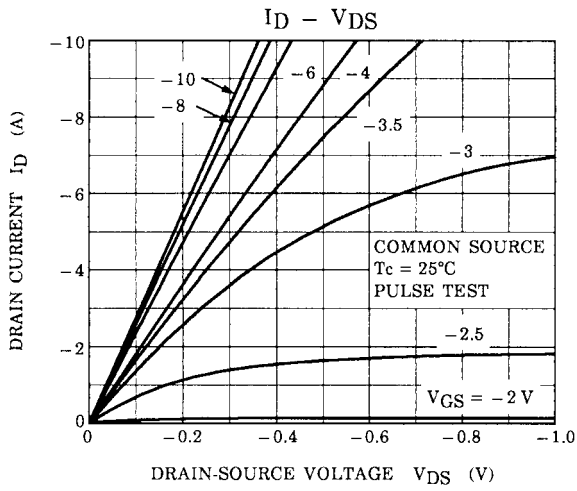
## Marking

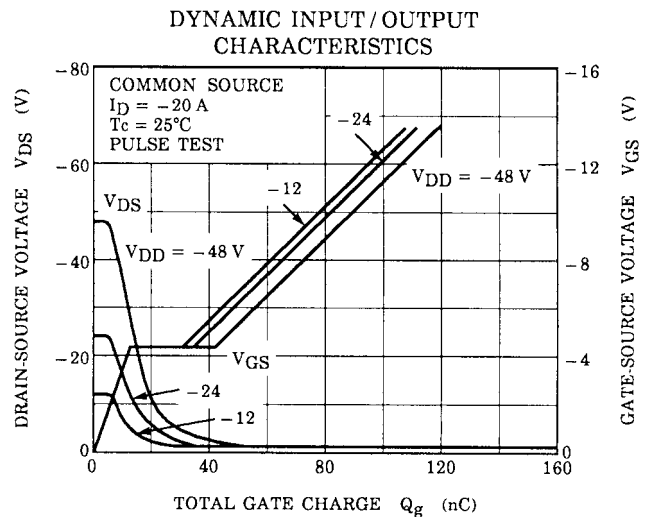
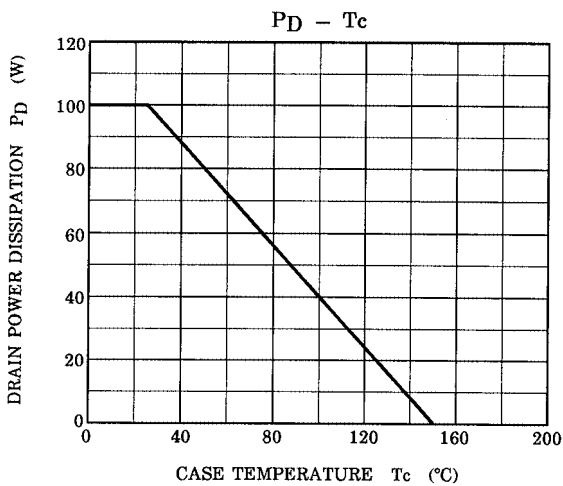
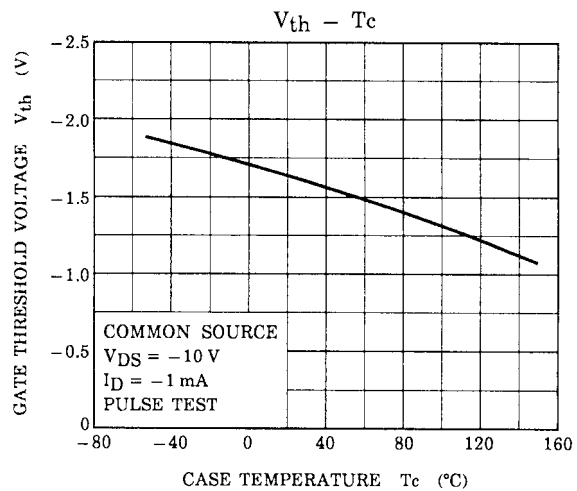
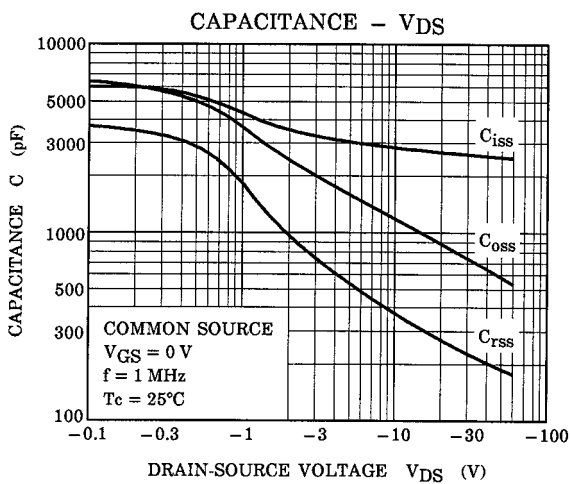
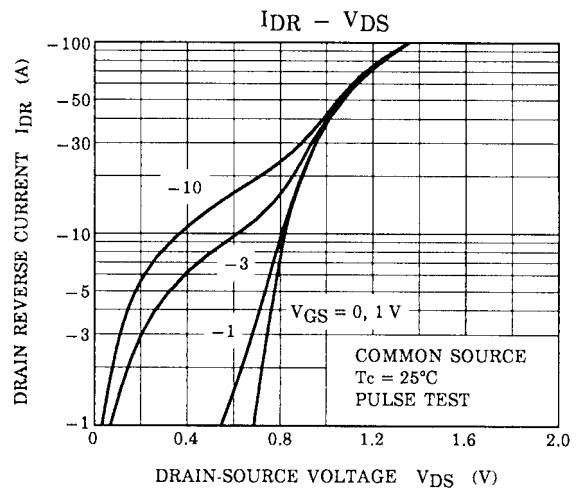
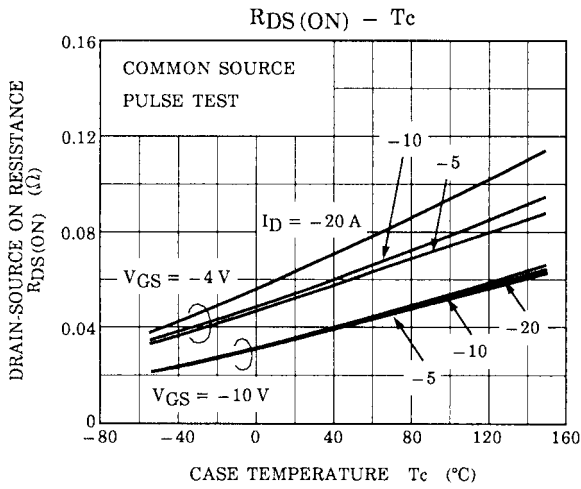


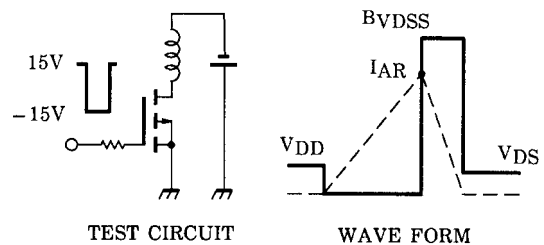
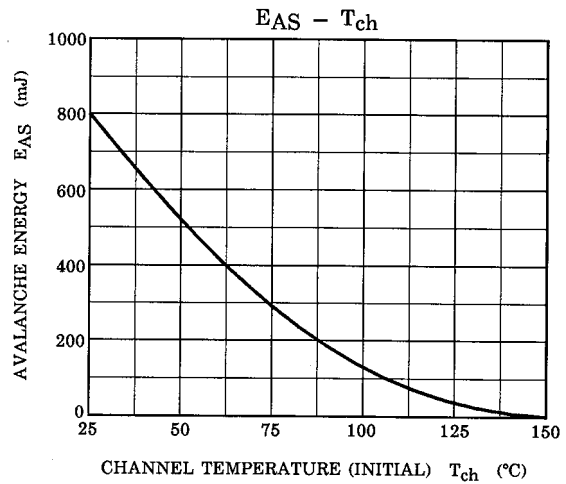
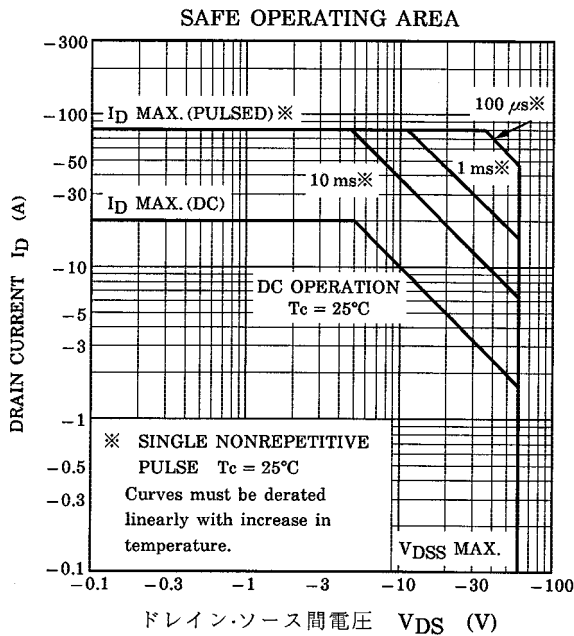
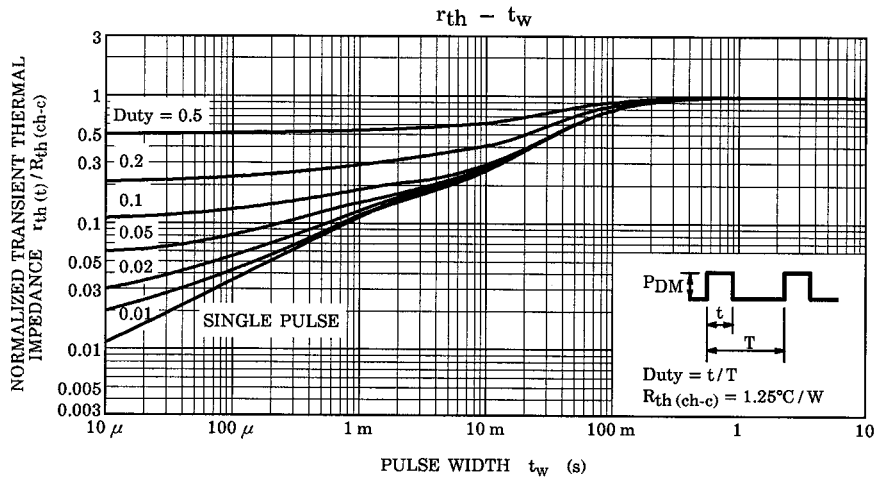
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







$R_G = 25\Omega$   
 $V_{DD} = -50V, L = 1.44mH$

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

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