

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $\pi$ -MOSV)

## 2SK2401

Chopper Regulator, DC-DC Converter and Motor Drive Applications

Unit: mm

- Low drain-source ON resistance :  $R_{DS(ON)} = 0.13 \Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 17 S$  (typ.)
- Low leakage current :  $I_{DSS} = 100 \mu A$  (max) ( $V_{DS} = 200 V$ )
- Enhancement-mode :  $V_{th} = 1.5 \sim 3.5 V$  ( $V_{DS} = 10 V$ ,  $I_D = 1 mA$ )

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

| Characteristics                                |                | Symbol    | Rating         | Unit       |
|------------------------------------------------|----------------|-----------|----------------|------------|
| Drain-source voltage                           |                | $V_{DSS}$ | 200            | V          |
| Drain-gate voltage ( $R_{GS} = 20 k\Omega$ )   |                | $V_{DGR}$ | 200            | V          |
| Gate-source voltage                            |                | $V_{GSS}$ | $\pm 20$       | V          |
| Drain current                                  | DC (Note 1)    | $I_D$     | 15             | A          |
|                                                | Pulse (Note 1) | $I_{DP}$  | 45             | A          |
| Drain power dissipation ( $T_c = 25^\circ C$ ) |                | $P_D$     | 75             | W          |
| Single pulse avalanche energy (Note 2)         |                | $E_{AS}$  | 166            | mJ         |
| Avalanche current                              |                | $I_{AR}$  | 15             | A          |
| Repetitive avalanche energy (Note 3)           |                | $E_{AR}$  | 7.5            | mJ         |
| Channel temperature                            |                | $T_{ch}$  | 150            | $^\circ C$ |
| Storage temperature range                      |                | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |

### Thermal Characteristics

| Characteristics                        | Symbol         | Max  | Unit           |
|----------------------------------------|----------------|------|----------------|
| Thermal resistance, channel to case    | $R_{th(ch-c)}$ | 1.67 | $^\circ C / W$ |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 83.3 | $^\circ C / W$ |

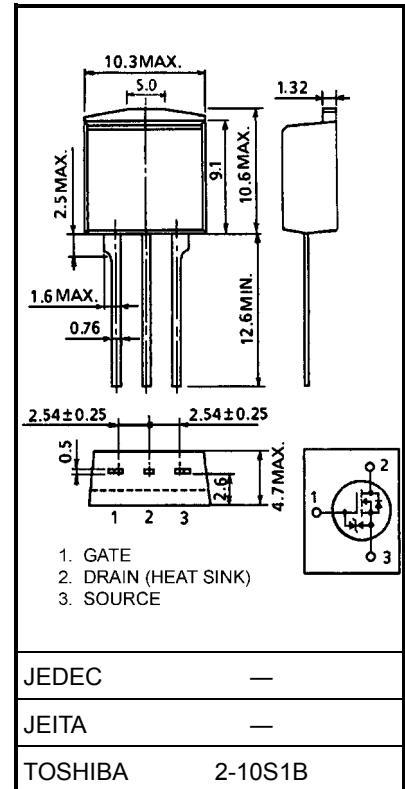
Note 1: Please use devices on condition that the channel temperature is below  $150^\circ C$ .

Note 2:  $V_{DD} = 50 V$ ,  $T_{ch} = 25^\circ C$  (initial),  $L = 1.2 mH$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 15 A$

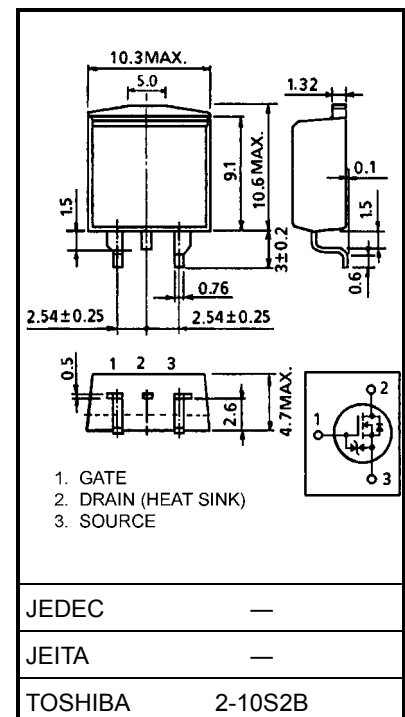
Note 3: Repetitive rating: Pulse width limited by maximum channel temperature

This transistor is an electrostatic sensitive device.

Please handle with caution.

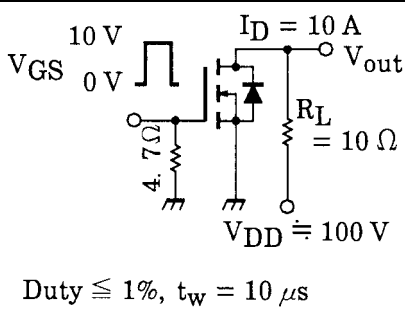


Weight: 1.5 g (typ.)



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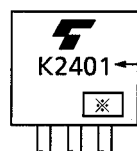
## Electrical Characteristics (Ta = 25°C)

| 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                           |               | $I_{DSS}$     | $V_{DS} = 200 \text{ V}, V_{GS} = 0 \text{ V}$                                     | —   | —    | 100      | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR)DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$                                        | 200 | —    | —        | V             |
| Gate threshold voltage                          |               | $V_{th}$      | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$                                        | 1.5 | —    | 3.5      | V             |
| Drain-source ON resistance                      |               | $R_{DS(ON)}$  | $V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$                                        | —   | 0.13 | 0.18     | $\Omega$      |
| Forward transfer admittance                     |               | $ Y_{fs} $    | $V_{DS} = 10 \text{ V}, I_D = 10 \text{ A}$                                        | 10  | 17   | —        | S             |
| Input capacitance                               |               | $C_{iss}$     | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                   | —   | 2000 | —        | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$     |                                                                                    | —   | 200  | —        |               |
| Output capacitance                              |               | $C_{oss}$     |                                                                                    | —   | 600  | —        |               |
| Switching time                                  | Rise time     | $t_r$         |  | —   | 35   | —        | ns            |
|                                                 | Turn-on time  | $t_{on}$      |                                                                                    | —   | 50   | —        |               |
|                                                 | Fall time     | $t_f$         |                                                                                    | —   | 10   | —        |               |
|                                                 | Turn-off time | $t_{off}$     |                                                                                    | —   | 66   | —        |               |
| Total gate charge (Gate-source plus gate-drain) |               | $Q_g$         | $V_{DD} \approx 100 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 15 \text{ A}$          | —   | 40   | —        | nC            |
| Gate-source charge                              |               | $Q_{gs}$      |                                                                                    | —   | 25   | —        |               |
| Gate-drain ("miller") charge                    |               | $Q_{gd}$      |                                                                                    | —   | 15   | —        |               |

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

| Characteristics                           | Symbol    | Test Condition                                | Min | Typ. | Max  | Unit          |
|-------------------------------------------|-----------|-----------------------------------------------|-----|------|------|---------------|
| Continuous drain reverse current (Note 1) | $I_{DR}$  | —                                             | —   | —    | 15   | A             |
| Pulse drain reverse current (Note 1)      | $I_{DRP}$ | —                                             | —   | —    | 45   | A             |
| Forward voltage (diode)                   | $V_{DSF}$ | $I_{DR} = 15 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | —    | -2.0 | V             |
| Reverse recovery time                     | $t_{rr}$  | $I_{DR} = 15 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | 180  | —    | ns            |
| Reverse recovery charge                   | $Q_{rr}$  | $di_{DR} / dt = 100 \text{ A} / \mu\text{s}$  | —   | 1.13 | —    | $\mu\text{C}$ |

## Marking



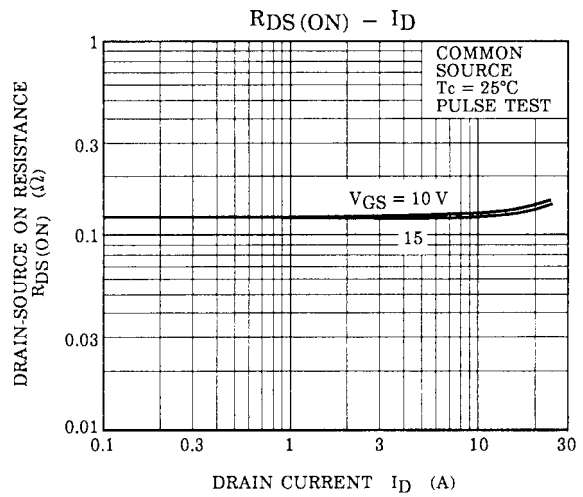
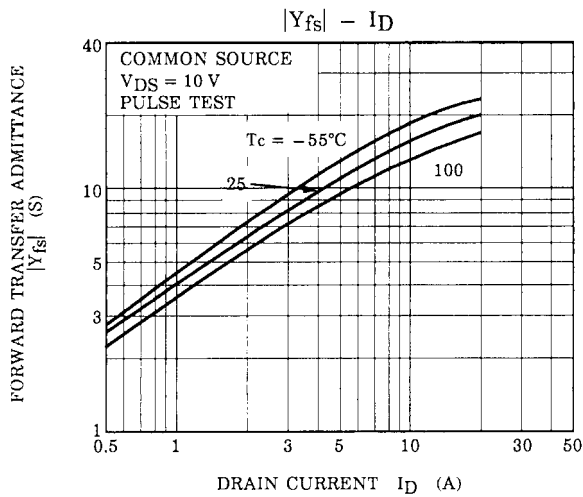
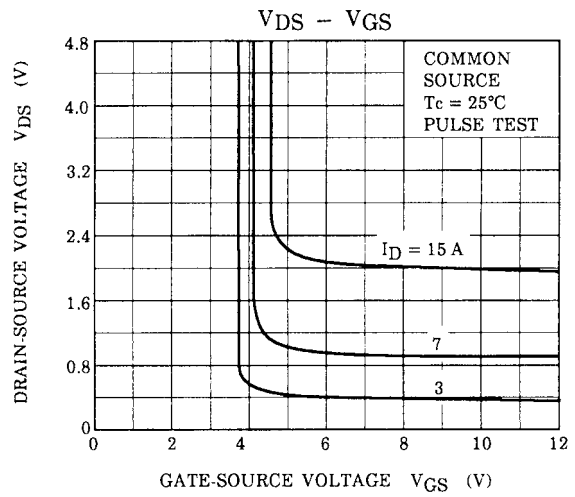
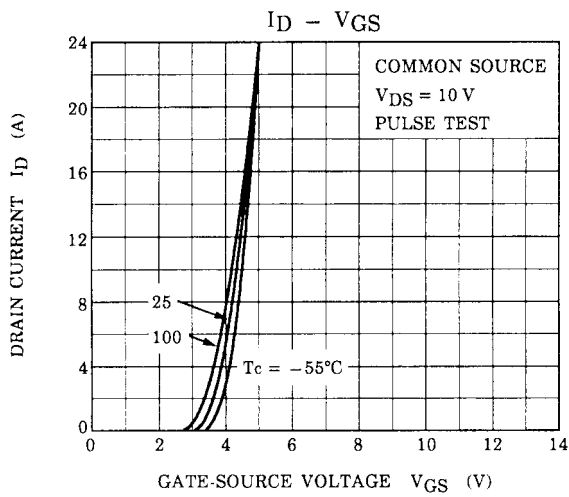
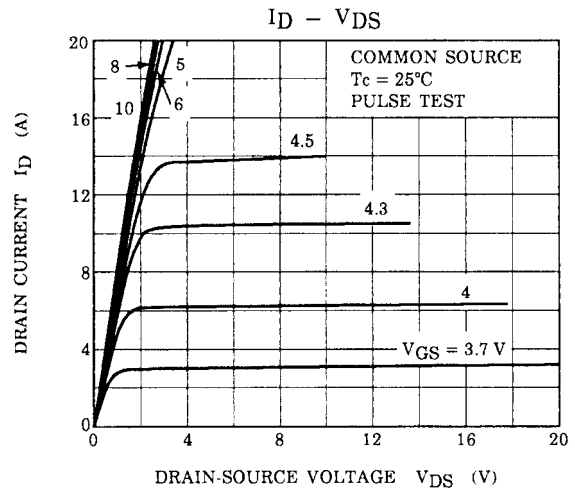
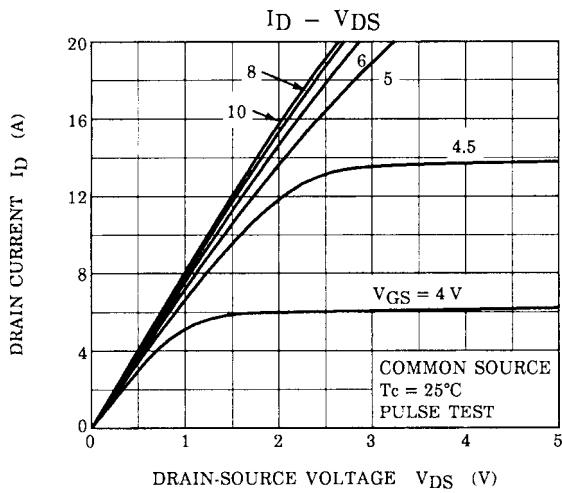
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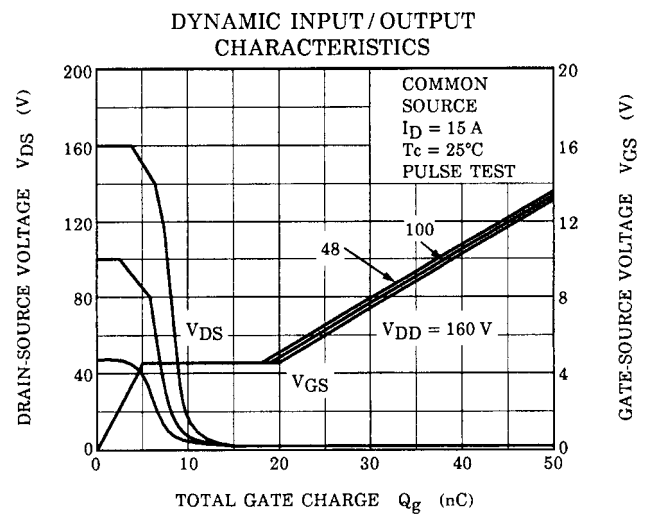
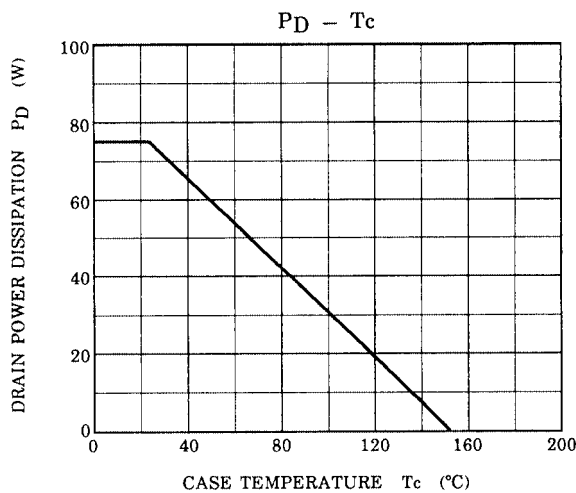
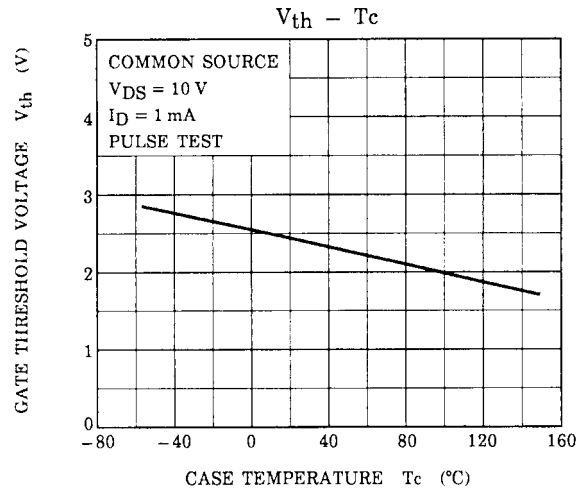
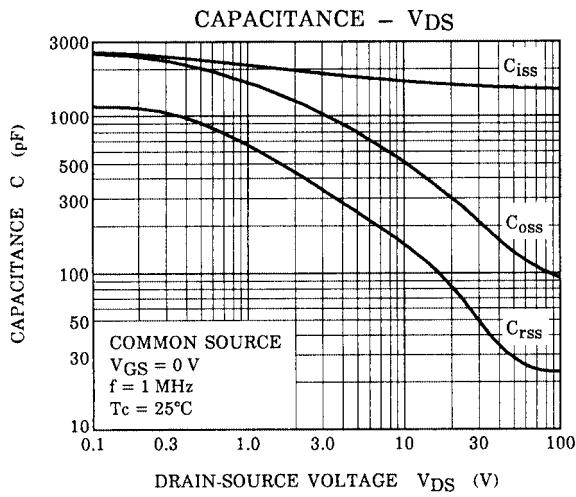
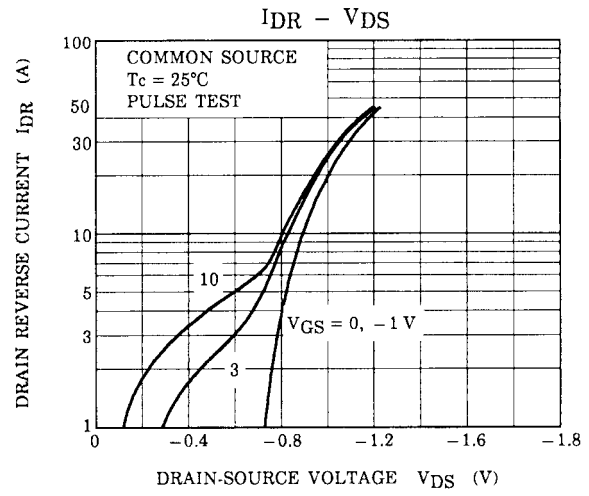
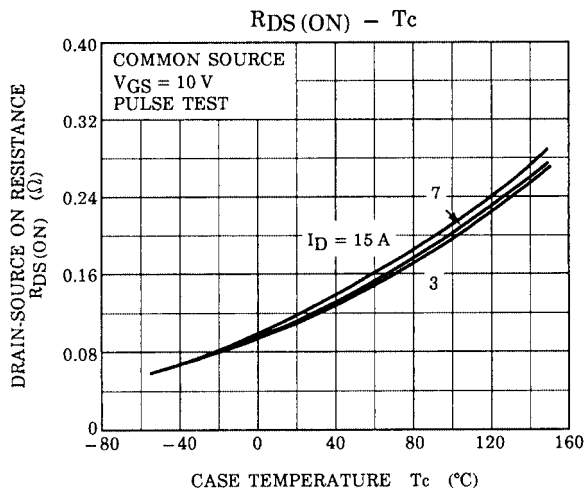
※ Lot Number

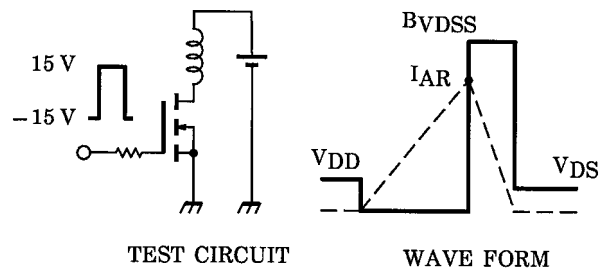
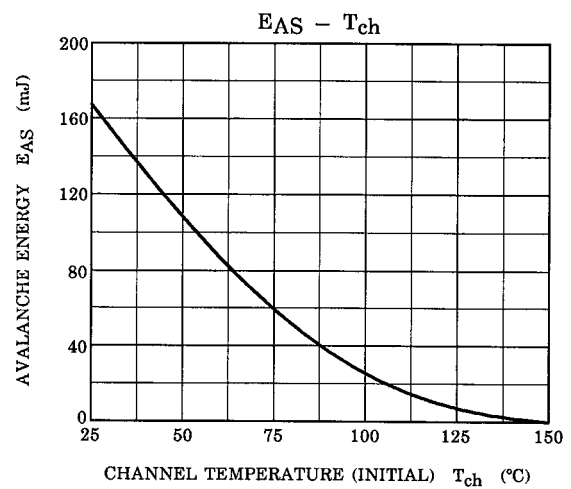
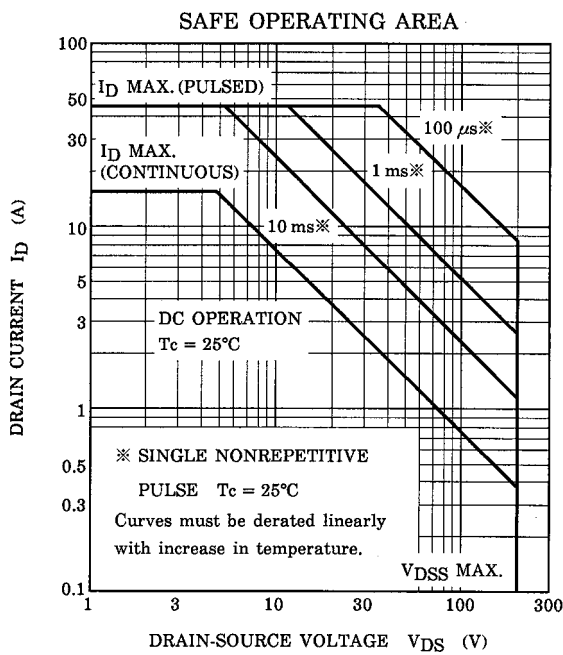
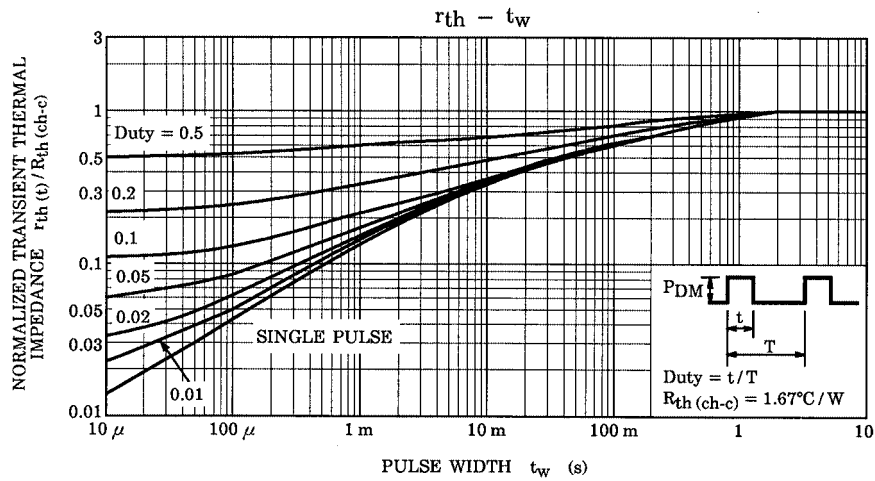


Month (Starting from Alphabet A)

Year (Last Number of the Christian Era)







$$R_G = 25 \, \Omega$$

$$V_{DD} = 50 \, V, L = 1.2 \, mH$$

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

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