

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

## 2SK2844

Chopper Regulator, DC-DC Converter and Motor Drive Applications

Unit: mm

- 4-V gate drive
- Low drain-source ON resistance :  $R_{DS(ON)} = 16 \text{ m}\Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 26 \text{ S}$  (typ.)
- Low leakage current :  $I_{DSS} = 100 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement mode :  $V_{th} = 0.8 \text{ to } 2.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

| Characteristics                                      | Symbol         | Rating     | Unit             |
|------------------------------------------------------|----------------|------------|------------------|
| Drain-source voltage                                 | $V_{DSS}$      | 30         | V                |
| Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ ) | $V_{DGR}$      | 30         | V                |
| Gate-source voltage                                  | $V_{GSS}$      | $\pm 20$   | V                |
| Drain current                                        | DC (Note 1)    | $I_D$      | A                |
|                                                      | Pulse (Note 1) | $I_{DP}$   | A                |
| Drain power dissipation ( $T_c = 25^\circ\text{C}$ ) | $P_D$          | 60         | W                |
| Single pulse avalanche energy (Note 2)               | $E_{AS}$       | 259        | mJ               |
| Avalanche current                                    | $I_{AR}$       | 35         | A                |
| Repetitive avalanche energy (Note 3)                 | $E_{AR}$       | 6          | mJ               |
| Channel temperature                                  | $T_{ch}$       | 150        | $^\circ\text{C}$ |
| Storage temperature range                            | $T_{stg}$      | -55 to 150 | $^\circ\text{C}$ |

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    | $R_{th(ch-c)}$ | 2.08 | $^\circ\text{C/W}$ |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 83.3 | $^\circ\text{C/W}$ |

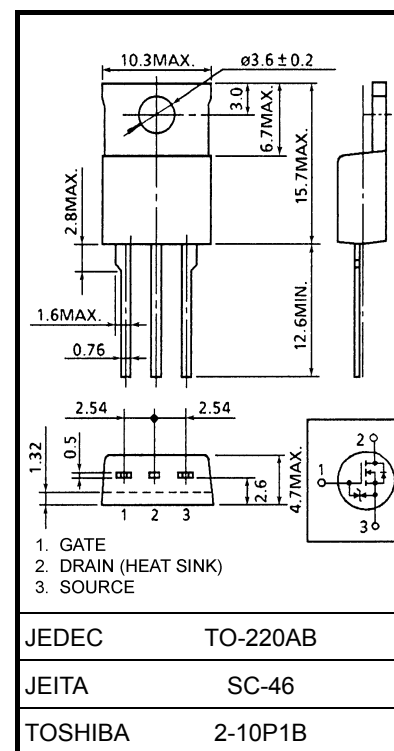
Note 1: Ensure that the channel temperature does not exceed  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 152 \text{ }\mu\text{H}$ ,  $R_G = 25 \text{ }\Omega$ ,  $I_{AR} = 35 \text{ A}$

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

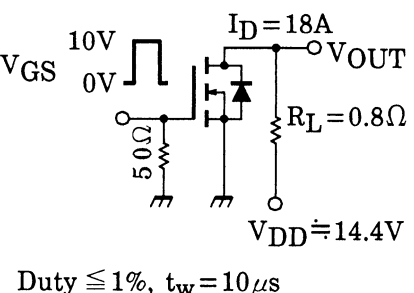
This transistor is an electrostatic-sensitive device.

Please handle with caution.



Weight: 2.0 g (typ.)

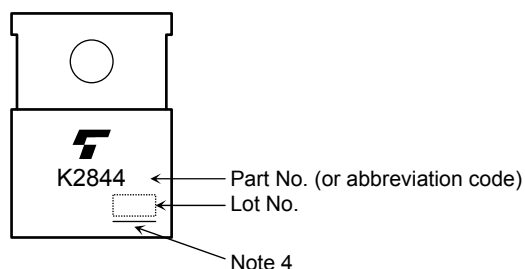
## Electrical Characteristics (Ta = 25°C)

| 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                           |               | $I_{DSS}$      | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$                                      | —   | —    | 100      | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR) DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$                                        | 30  | —    | —        | 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                      |               | $R_{DS(ON)}$   | $V_{GS} = 4 \text{ V}, I_D = 18 \text{ A}$                                         | —   | 26   | 35       | m $\Omega$    |
|                                                 |               |                | $V_{GS} = 10 \text{ V}, I_D = 18 \text{ A}$                                        | —   | 16   | 20       |               |
| Forward transfer admittance                     |               | $ Y_{fs} $     | $V_{DS} = 10 \text{ V}, I_D = 18 \text{ A}$                                        | 13  | 26   | —        | S             |
| Input capacitance                               |               | $C_{iss}$      | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                   | —   | 980  | —        | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$      |                                                                                    | —   | 270  | —        |               |
| Output capacitance                              |               | $C_{oss}$      |                                                                                    | —   | 580  | —        |               |
| Switching time                                  | Rise time     | $t_r$          |  | —   | 14   | —        | ns            |
|                                                 | Turn-on time  | $t_{on}$       |                                                                                    | —   | 23   | —        |               |
|                                                 | Fall time     | $t_f$          |                                                                                    | —   | 64   | —        |               |
|                                                 | Turn-off time | $t_{off}$      |                                                                                    | —   | 190  | —        |               |
| Total gate charge (gate-source plus gate-drain) |               | $Q_g$          | $V_{DD} \approx 24 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 35 \text{ A}$           | —   | 40   | —        | nC            |
| Gate-source charge                              |               | $Q_{gs}$       |                                                                                    | —   | 32   | —        |               |
| Gate-drain ("miller") Charge                    |               | $Q_{gd}$       |                                                                                    | —   | 8    | —        |               |

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

| Characteristics                           | Symbol    | Test Condition                                                                           | Min | Typ. | Max  | Unit |
|-------------------------------------------|-----------|------------------------------------------------------------------------------------------|-----|------|------|------|
| Continuous drain reverse current (Note 1) | $I_{DR}$  | —                                                                                        | —   | —    | 50   | A    |
| Pulse drain reverse current (Note 1)      | $I_{DRP}$ | —                                                                                        | —   | —    | 200  | A    |
| Forward voltage (diode)                   | $V_{DSF}$ | $I_{DR} = 35 \text{ A}, V_{GS} = 0 \text{ V}$                                            | —   | —    | -1.7 | V    |
| Reverse recovery time                     | $t_{rr}$  | $I_{DR} = 35 \text{ A}, V_{GS} = 0 \text{ V}, dI_{DR} / dt = 50 \text{ A} / \mu\text{s}$ | —   | 120  | —    | ns   |
| Reverse recovery charge                   | $Q_{rr}$  |                                                                                          | —   | 180  | —    | nC   |

## Marking

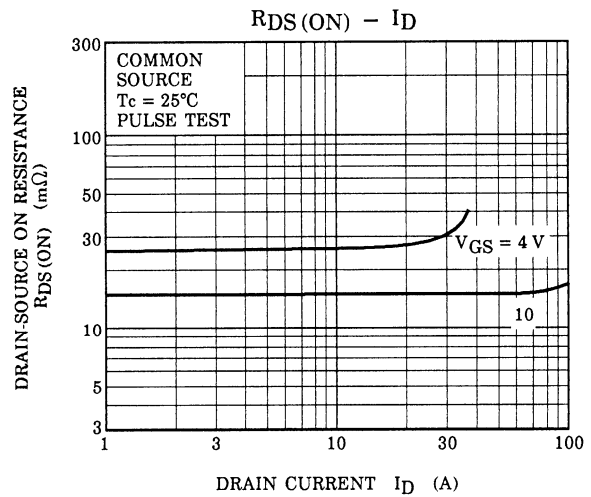
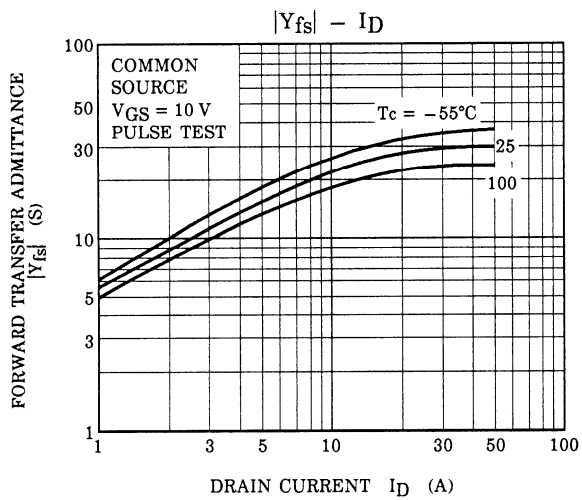
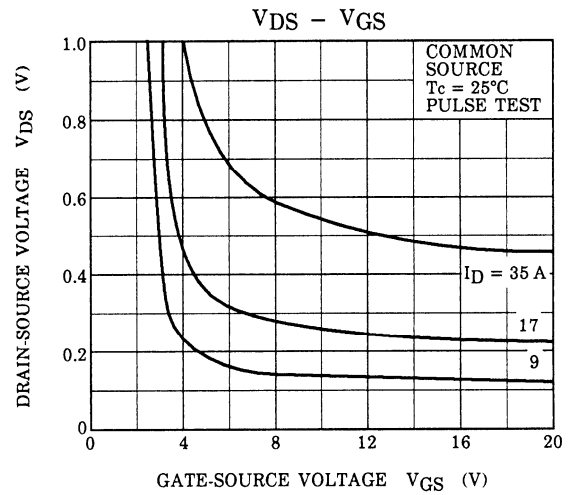
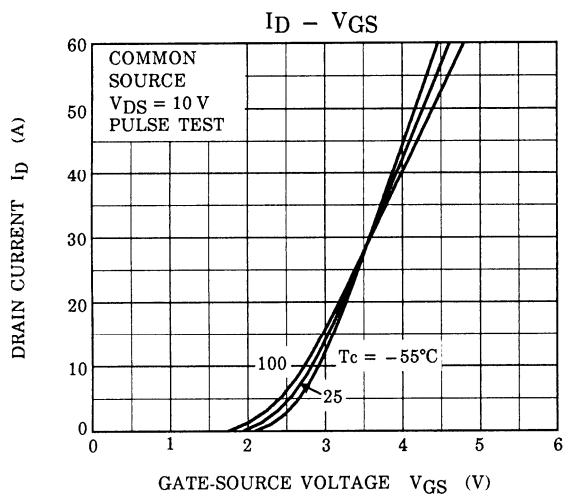
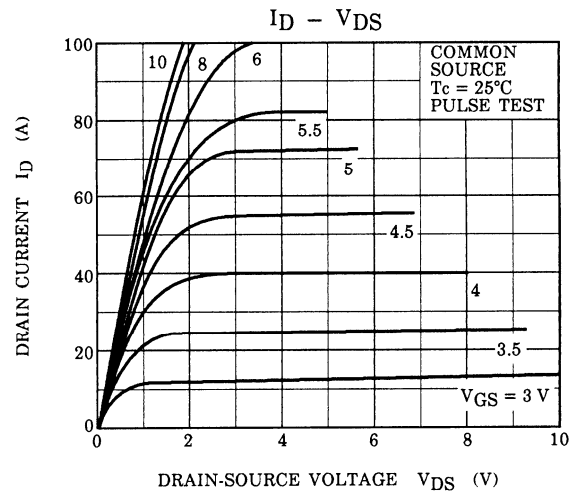
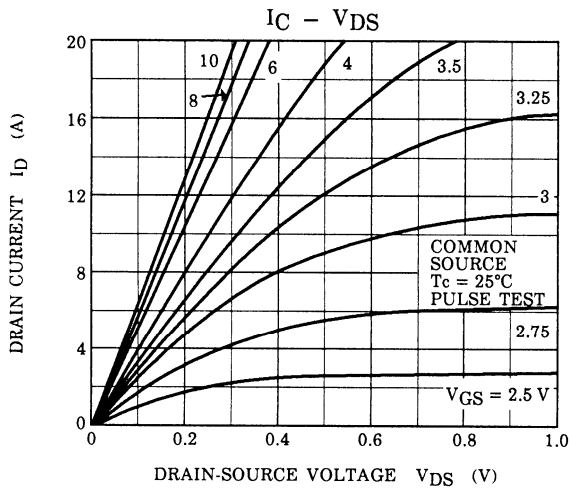


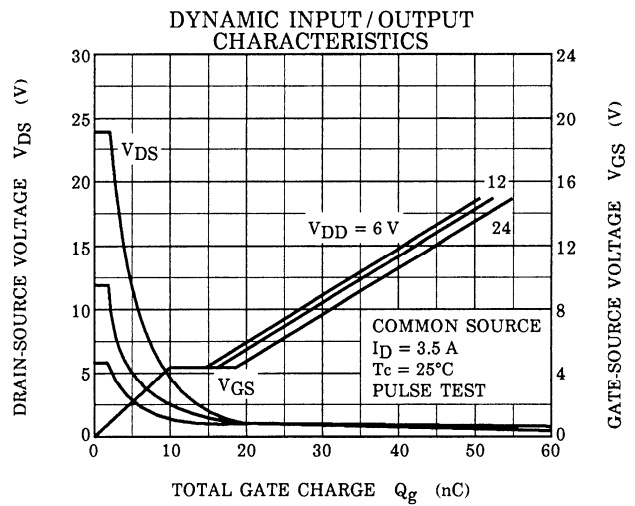
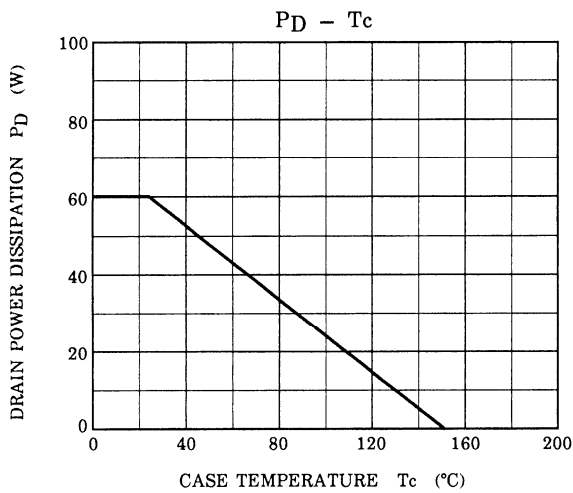
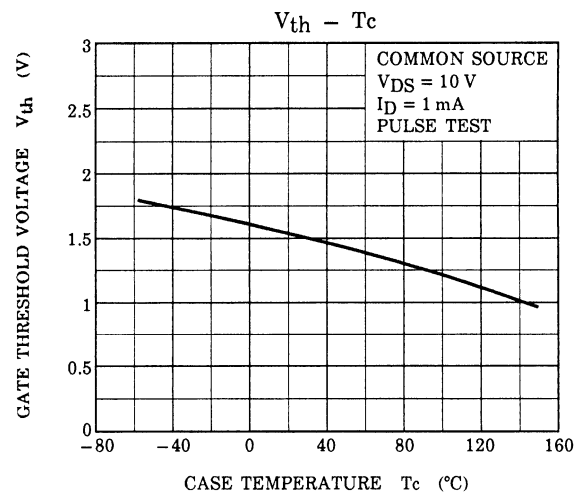
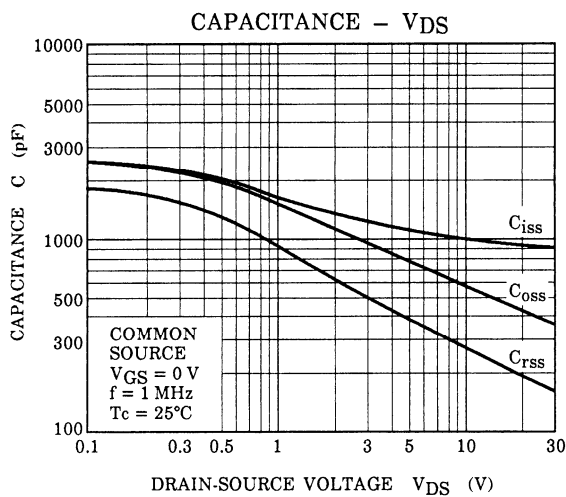
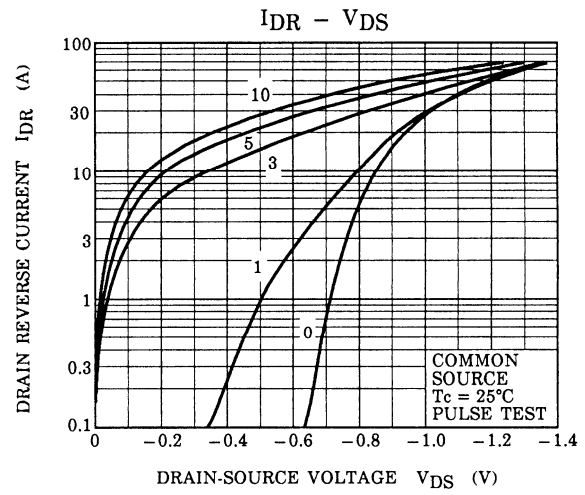
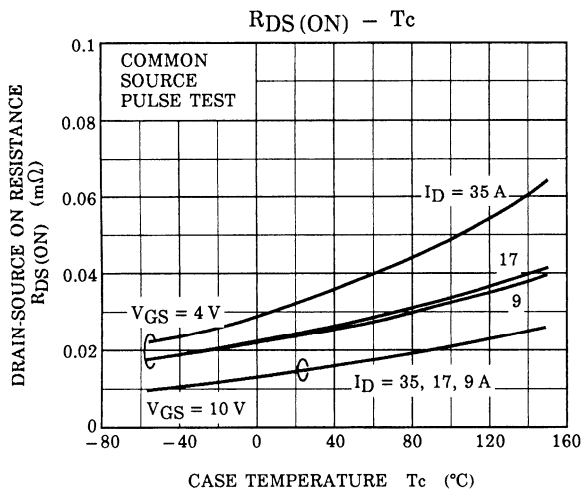
Note 4: A line under a Lot No. identifies the indication of product Labels.

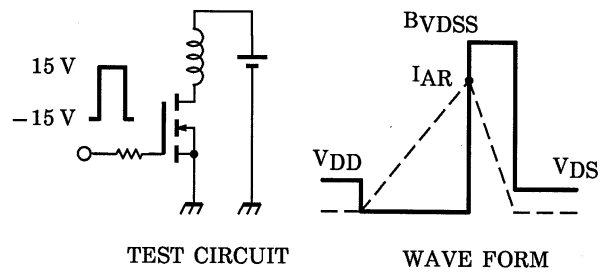
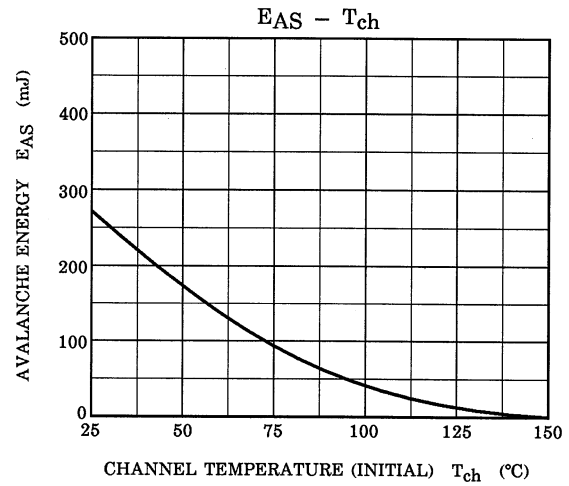
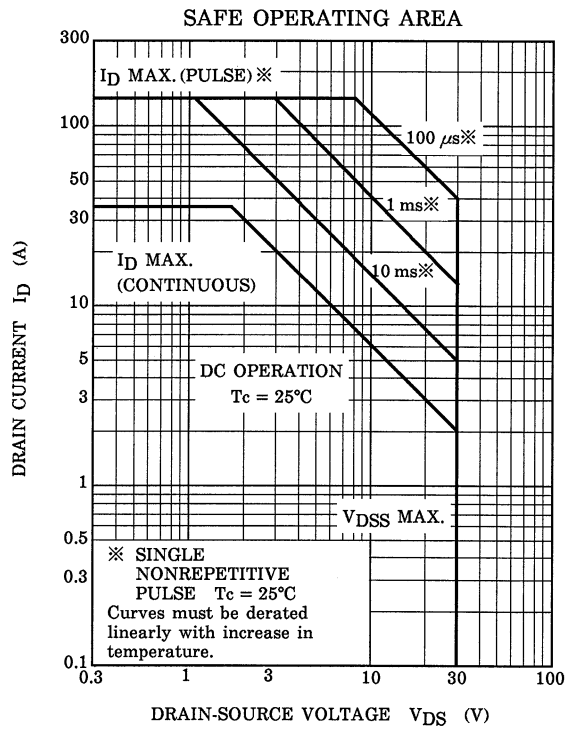
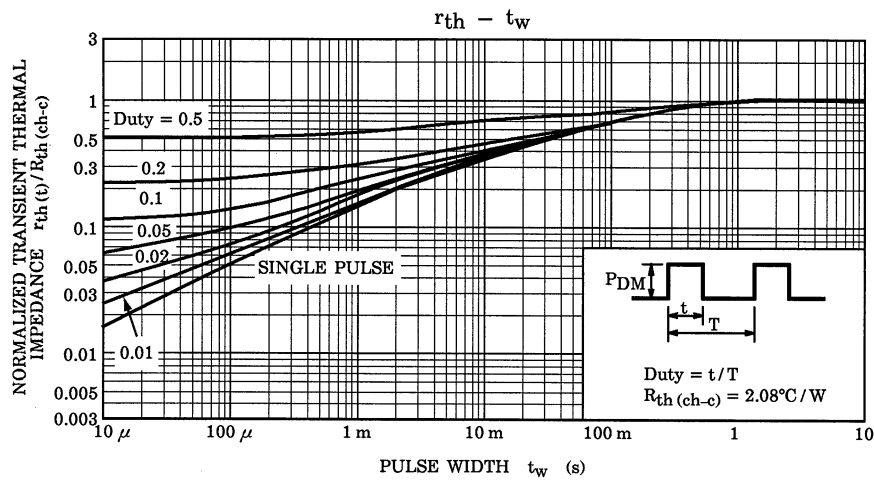
Not underlined:  $[[Pb]]/INCLUDES > MCV$

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

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$$R_G = 25 \, \Omega$$

$$V_{DD} = 25 \, \text{V}, L = 152 \, \mu\text{H}$$

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

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