

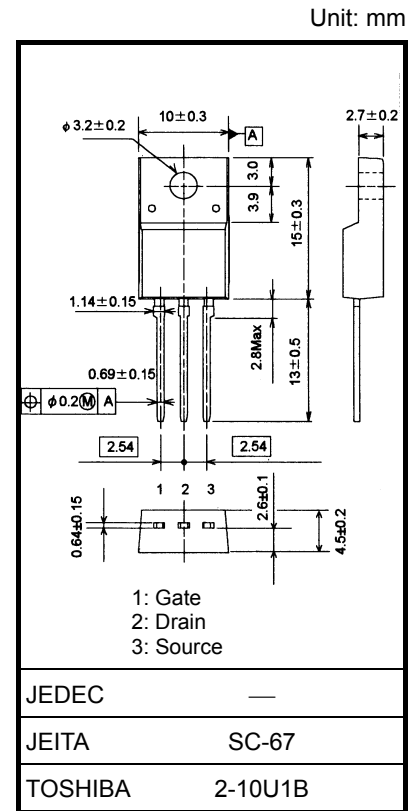
TK13A50DA

Switching Regulator Applications

- Low drain-source ON-resistance: $R_{DS(ON)} = 0.39 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 6.0 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \mu\text{A}$ (max) ($V_{DS} = 500 \text{ V}$)
- Enhancement mode: $V_{th} = 2.0$ to 4.0 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} | 500 | V |
| Gate-source voltage | V_{GSS} | ± 30 | V |
| Drain current | DC (Note 1) | I_D | 12.5 |
| | Pulse (Note 1) | I_{DP} | 50 |
| Drain power dissipation ($T_c = 25^\circ\text{C}$) | P_D | 45 | W |
| Single pulse avalanche energy (Note 2) | E_{AS} | 416 | mJ |
| Avalanche current | I_{AR} | 12.5 | A |
| Repetitive avalanche energy (Note 3) | E_{AR} | 4.5 | mJ |
| Channel temperature | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -55 to 150 | $^\circ\text{C}$ |



Weight: 1.7 g (typ.)

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 | $R_{th(ch-c)}$ | 2.78 | $^\circ\text{C/W}$ |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 62.5 | $^\circ\text{C/W}$ |

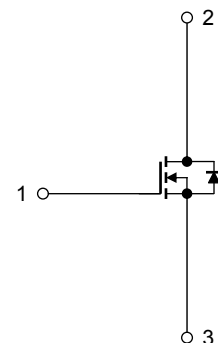
Note 1: Ensure that the channel temperature does not exceed 150°C .

Note 2: $V_{DD} = 90 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 4.53 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = 12.5 \text{ A}$

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

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

Internal Connection



Start of commercial production
2008-09

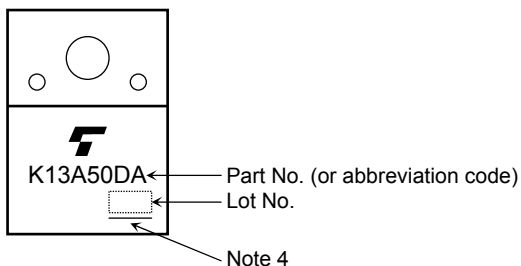
Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------|---------------|---------------|--|---|------|---------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 1 | μA |
| Drain cut-off current | | I_{DSS} | $V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$ | — | — | 10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$ | 500 | — | — | V |
| Gate threshold voltage | | V_{th} | $V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$ | 2.0 | — | 4.0 | V |
| Drain-source ON-resistance | | $R_{DS(ON)}$ | $V_{GS} = 10\text{ V}, I_D = 6.3\text{ A}$ | — | 0.39 | 0.47 | Ω |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 6.3\text{ A}$ | 1.5 | 6.0 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 1550 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 7 | — | |
| Output capacitance | | C_{oss} | | — | 165 | — | |
| Switching time | Rise time | t_r | | — | 25 | — | ns |
| | Turn-on time | t_{on} | | — | 60 | — | |
| | Fall time | t_f | | — | 15 | — | |
| | Turn-off time | t_{off} | | Duty $\leq 1\%$, $t_W = 10\ \mu\text{s}$ | — | 110 | |
| Total gate charge | | Q_g | $V_{DD} \approx 400\text{ V}, V_{GS} = 10\text{ V}, I_D = 12.5\text{ A}$ | — | 28 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 18 | — | |
| Gate-drain charge | | Q_{gd} | | — | 10 | — | |

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

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|-----------|--|-----|------|------|---------------|
| Continuous drain reverse current (Note 1) | I_{DR} | — | — | — | 12.5 | A |
| Pulse drain reverse current (Note 1) | I_{DRP} | — | — | — | 50 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = 12.5\text{ A}, V_{GS} = 0\text{ V}$ | — | — | -1.7 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = 12.5\text{ A}, V_{GS} = 0\text{ V},$ | — | 1300 | — | ns |
| Reverse recovery charge | Q_{rr} | $dI_{DR}/dt = 100\text{ A}/\mu\text{s}$ | — | 13 | — | μC |

Marking

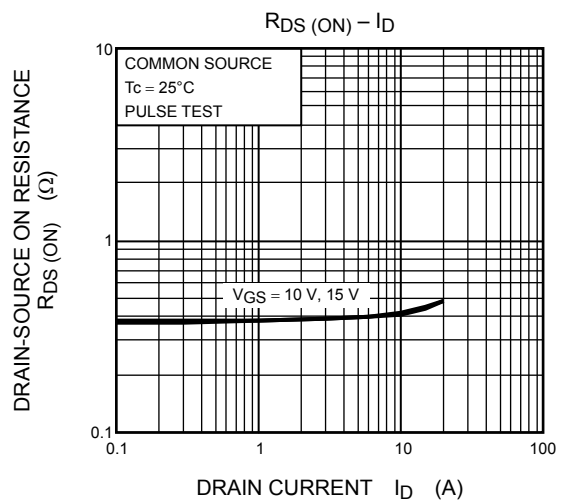
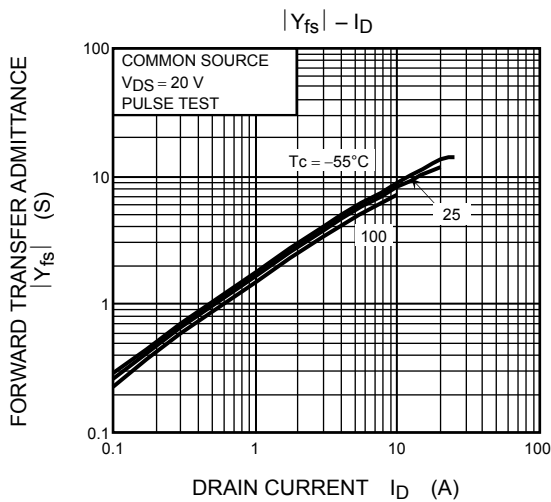
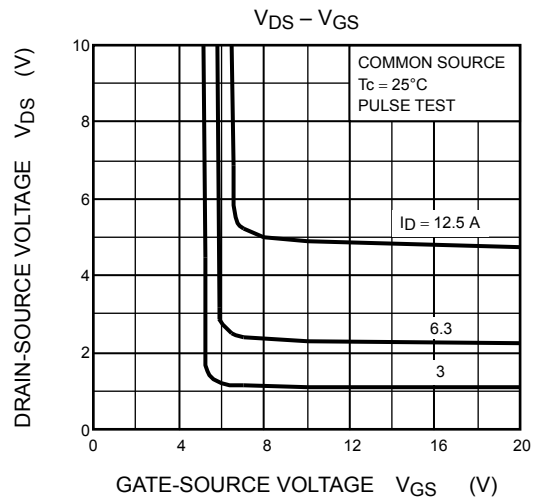
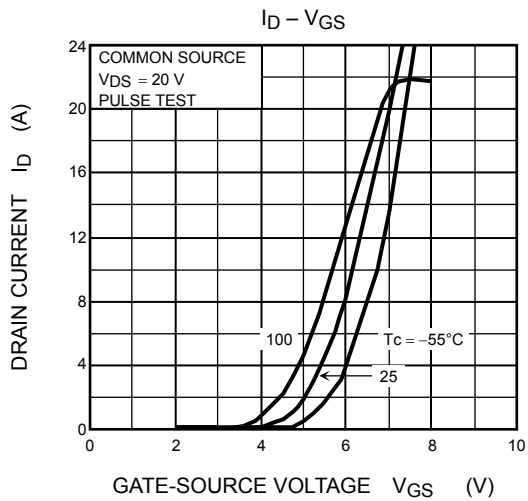
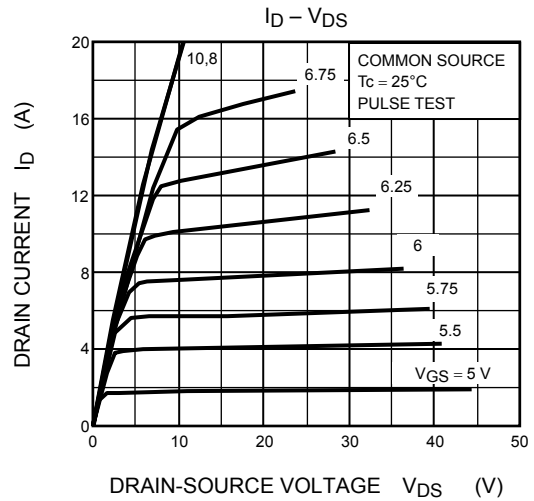
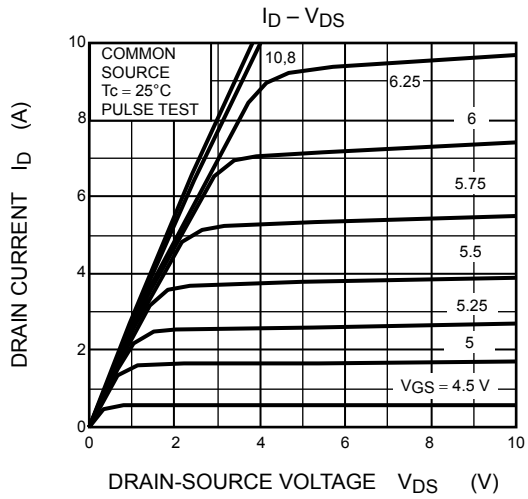


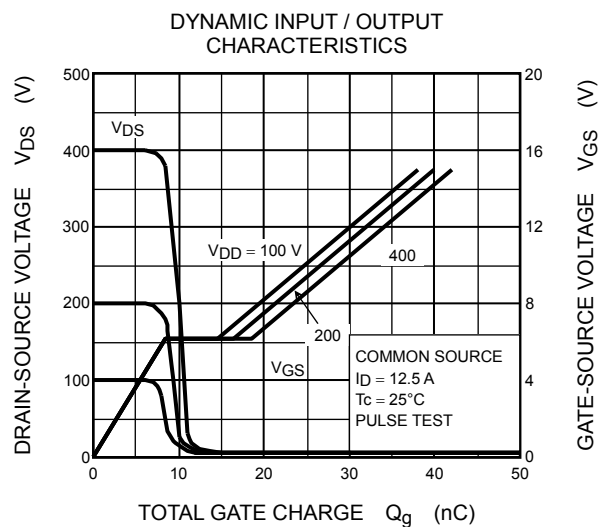
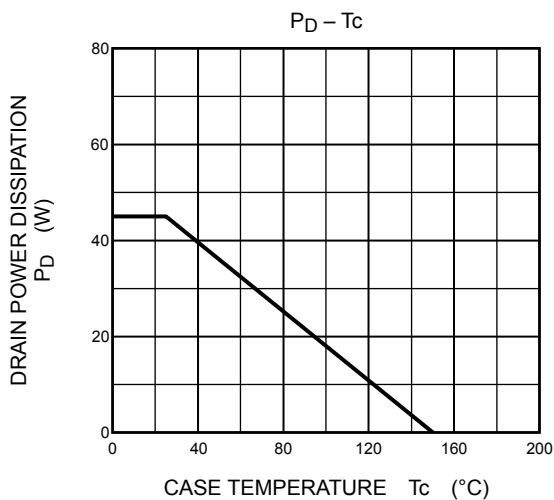
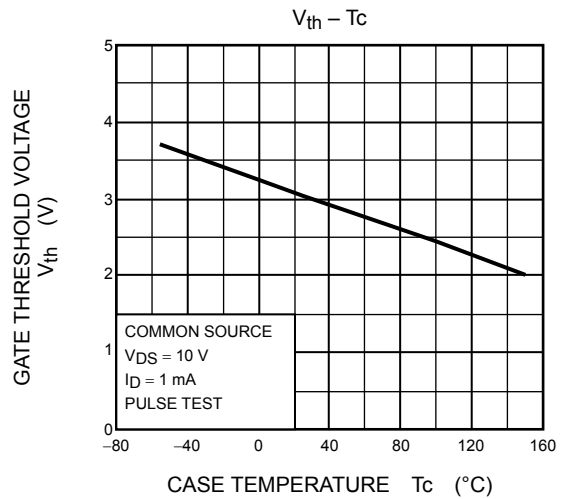
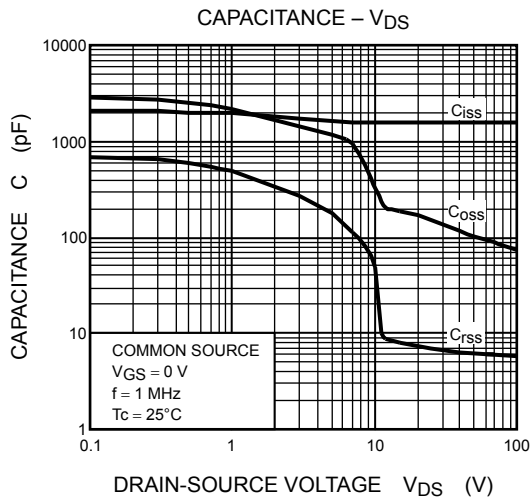
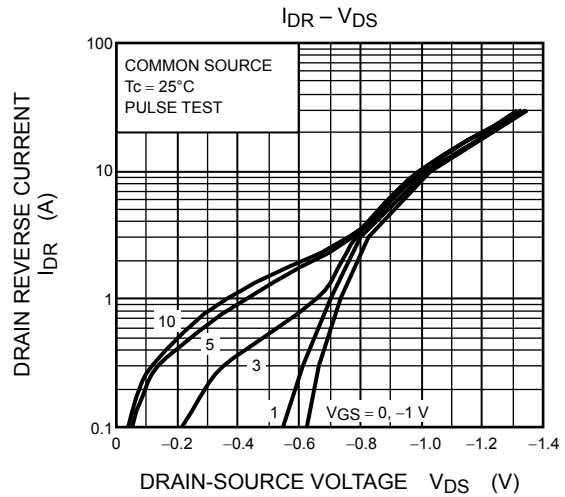
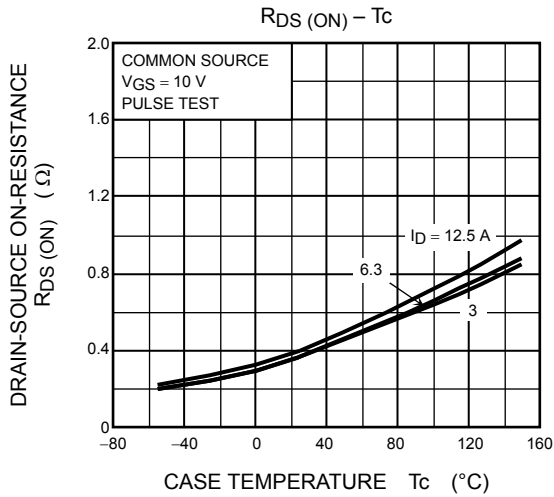
Note 4: A line under a Lot No. identifies the indication of product Labels.

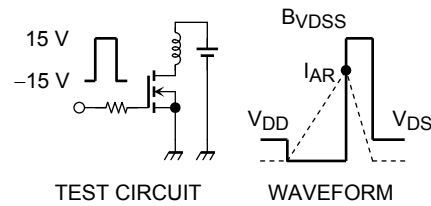
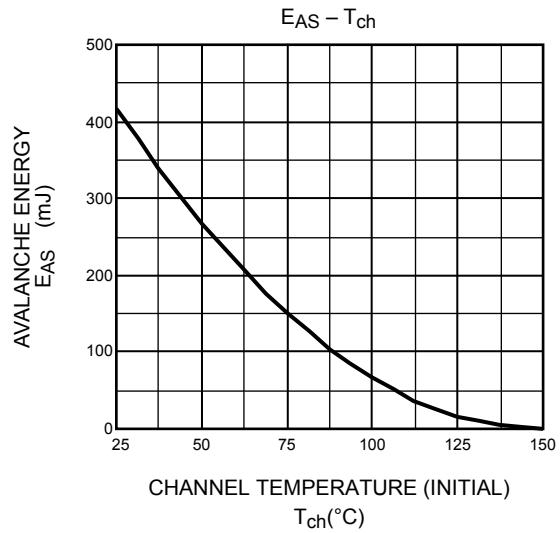
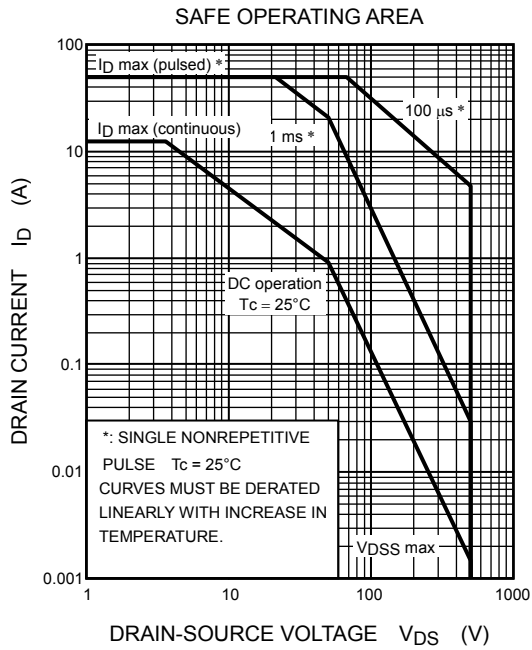
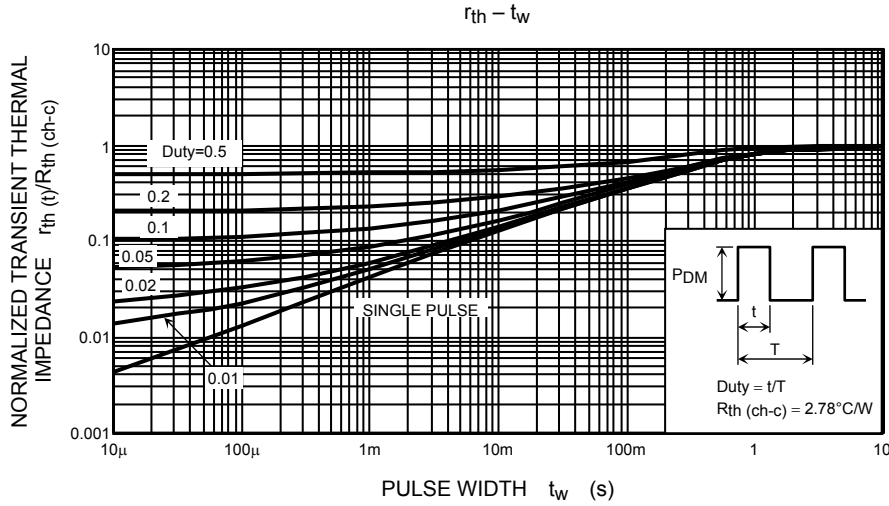
Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$R_G = 25 \Omega$
 $V_{DD} = 90 \text{ V}, L = 4.53 \text{ mH}$

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

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