

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (p-MOSVI)

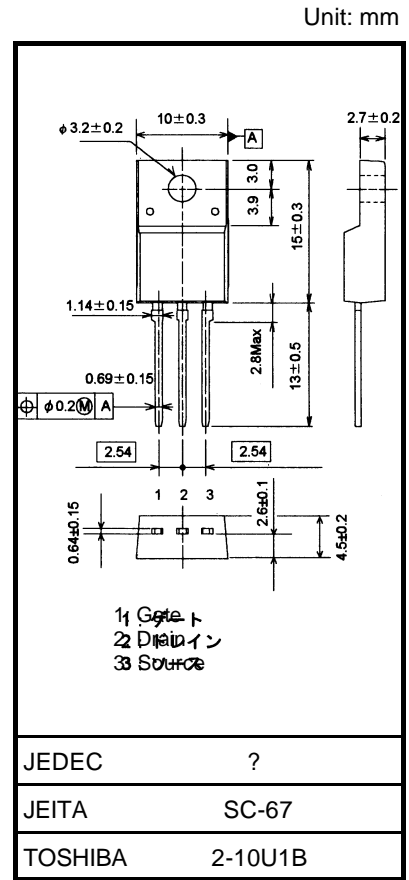
2SK3868

Switching Regulator Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 1.3$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 3S$ (typ.)
- Low leakage current: $I_{DSS} = 100 \mu A$ ($V_{DS} = 500 V$)
- Enhancement-mode: $V_{th} = 2.0 \sim 4.0 V$ ($V_{DS} = 10 V, I_D = 1 mA$)

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

| Characteristics | | Symbol | Rating | Unit |
|--|-------------------------------|-----------|----------|------------|
| Drain-source voltage | | V_{DSS} | 500 | V |
| Drain-gate voltage ($R_{GS} = 20 k\Omega$) | | V_{DGR} | 500 | V |
| Gate-source voltage | | V_{GSS} | ± 30 | V |
| Drain current | DC (Note 1) | I_D | 5 | A |
| | Pulse ($t = 1 ms$) (Note 1) | I_{DP} | 20 | |
| Drain power dissipation ($T_c = 25^\circ C$) | | P_D | 35 | W |
| Single pulse avalanche energy (Note 2) | | E_{AS} | 180 | mJ |
| Avalanche current | | I_{AR} | 5 | A |
| Repetitive avalanche energy (Note 3) | | E_{AR} | 3.5 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ C$ |
| Storage temperature range | | T_{stg} | -55~150 | $^\circ C$ |



Weight : 1.7 g (typ.)

Thermal Characteristics

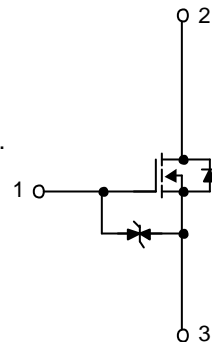
| Characteristics | Symbol | Max | Unit |
|--|----------------|------|--------------|
| Thermal resistance, channel to case | $R_{th(ch-c)}$ | 3.57 | $^\circ C/W$ |
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 62.5 | $^\circ C/W$ |

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

Note 2: $V_{DD} = 90 V, T_{ch} = 25^\circ C$ (initial), $L = 12.2 mH, I_{AR} = 5 A, R_G = 25 \Omega$

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

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



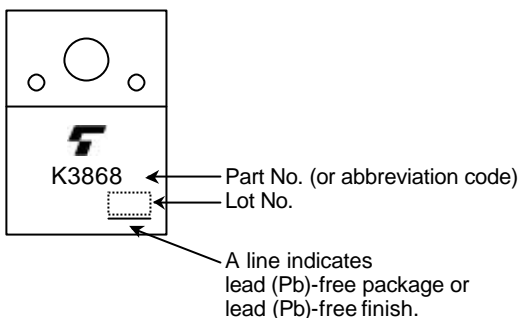
Electrical Characteristics (Ta = 25°C)

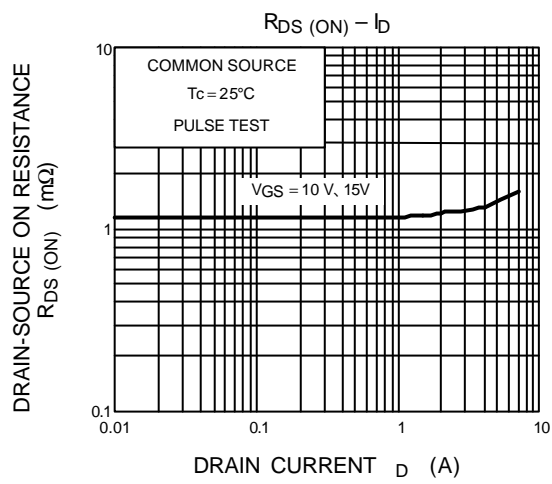
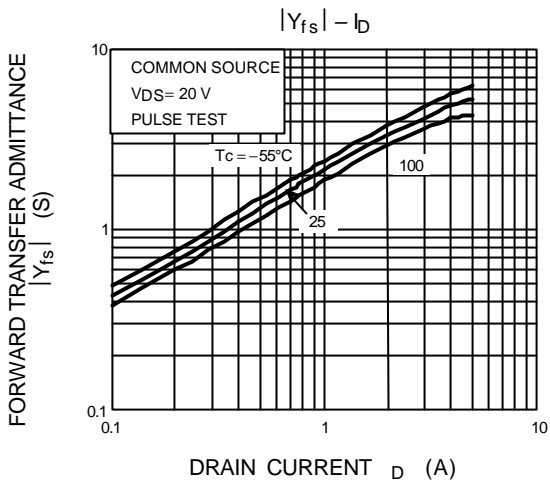
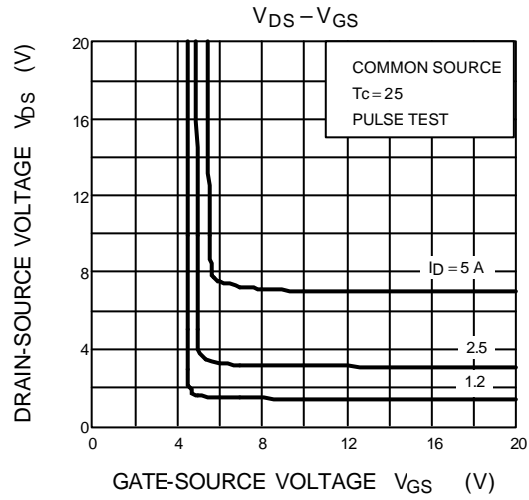
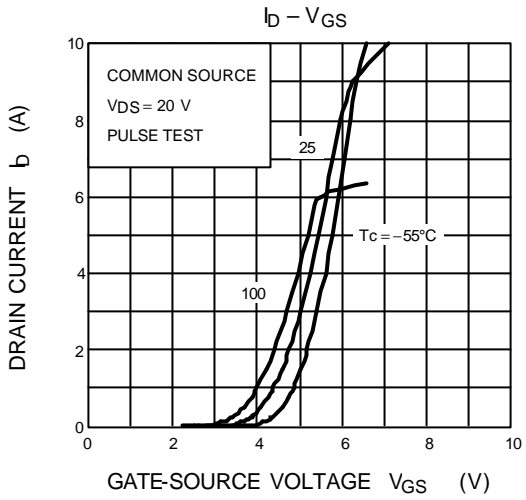
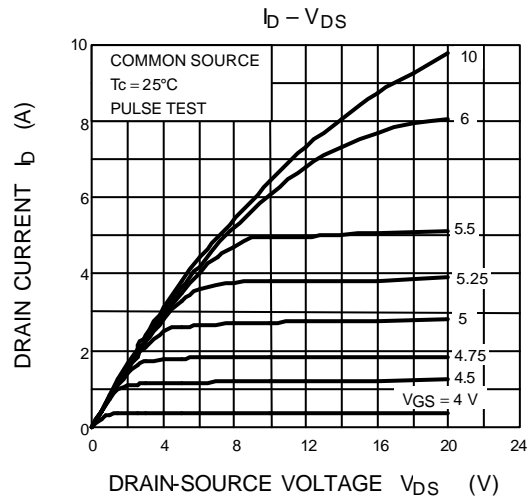
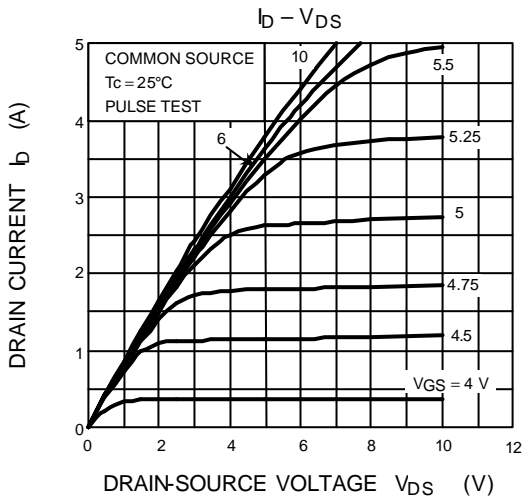
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------|---------------|---------------|---|----------|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Gate-source breakdown voltage | | $V_{(BR)GSS}$ | $I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$ | ± 30 | — | — | V |
| Drain cut-off current | | I_{DSS} | $V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$ | — | — | 100 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$ | 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 | | $R_{DS(ON)}$ | $V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$ | — | 1.3 | 1.7 | Ω |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 2.5\text{ A}$ | 1.5 | 3.0 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 550 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 7 | — | |
| Output capacitance | | C_{oss} | | — | 70 | — | |
| Switching time | Rise time | t_r | <p>$V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}, V_{OUT}$ $15\ \Omega, R_L = 90\ \Omega$ $V_{DD} = 225\text{ V}$ Duty $\leq 1\%, t_w = 10\ \mu\text{s}$</p> | — | 10 | — | ns |
| | Turn-on time | t_{on} | | — | 20 | — | |
| | Fall time | t_f | | — | 10 | — | |
| | Turn-off time | t_{off} | | — | 50 | — | |
| Total gate charge | | Q_g | $V_{DD} = 400\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$ | — | 16 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 10 | — | |
| Gate-drain charge | | Q_{gd} | | — | 6 | — | |

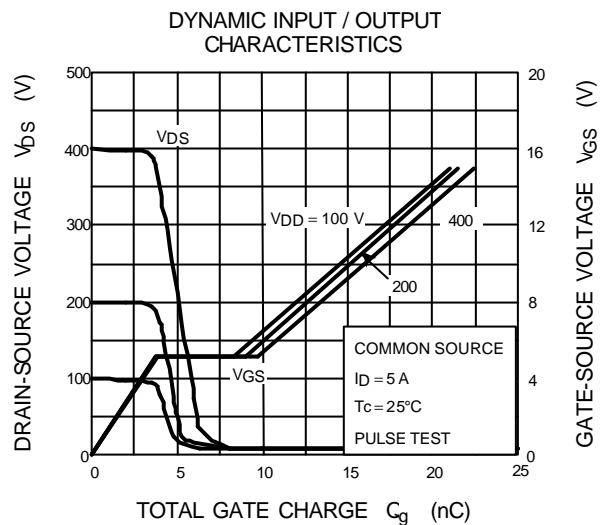
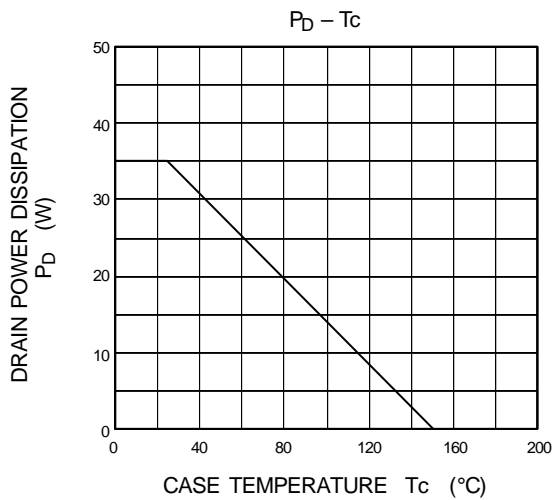
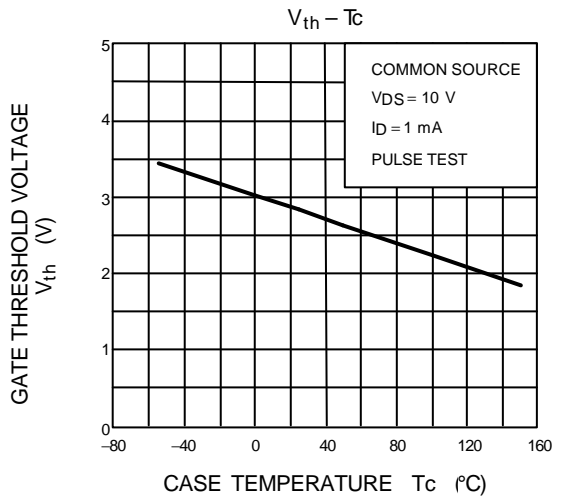
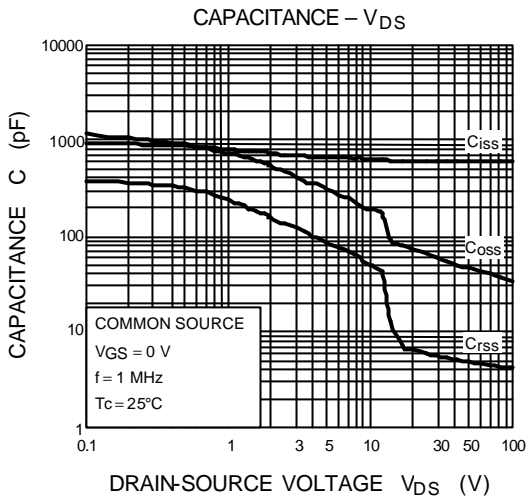
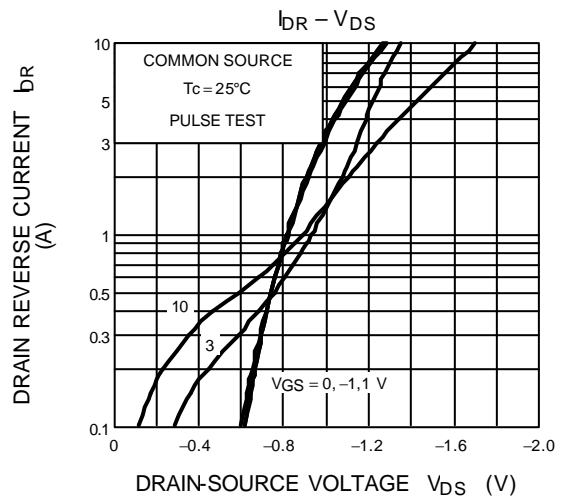
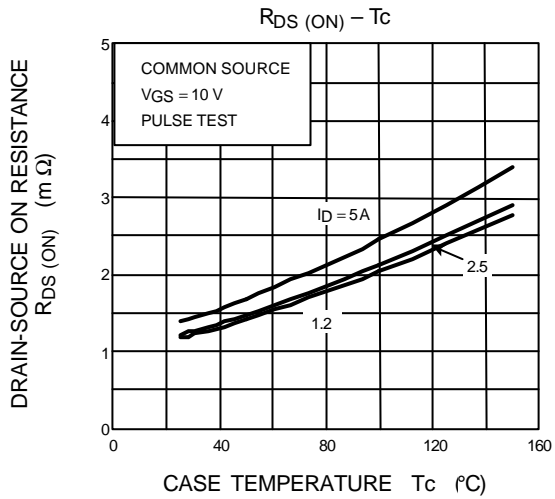
Source-Drain Ratings and Characteristics (Ta = 25°C)

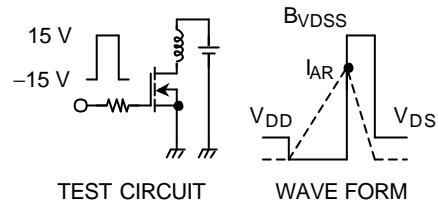
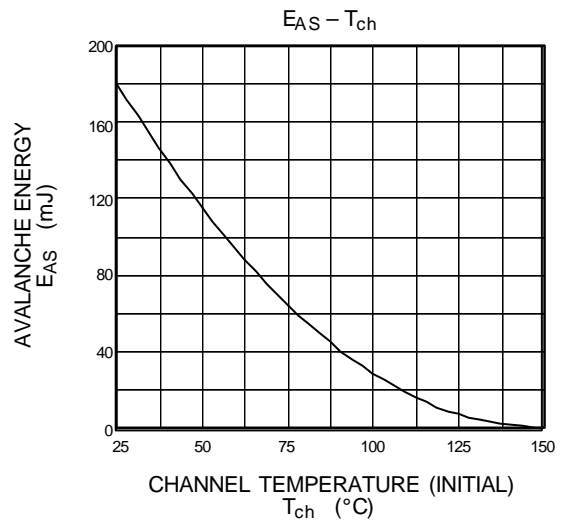
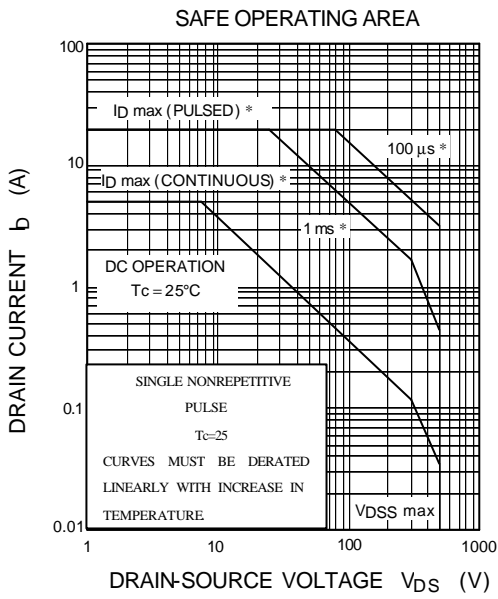
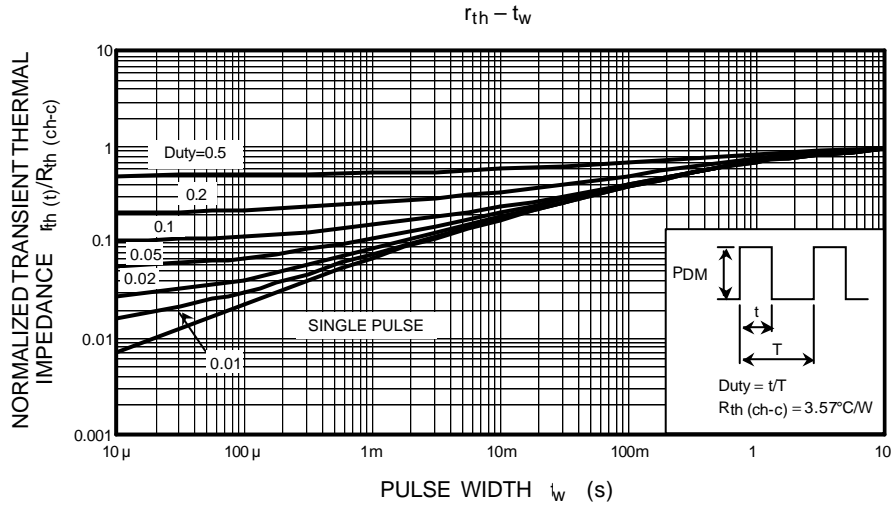
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|-----------|---|-----|------|------|---------------|
| Continuous drain reverse current (Note 1) | I_{DR} | — | — | — | 5 | A |
| Pulse drain reverse current (Note 1) | I_{DRP} | — | — | — | 20 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = 5\text{ A}, V_{GS} = 0\text{ V}$ | — | — | -1.7 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = 5\text{ A}, V_{GS} = 0\text{ V},$ | — | 150 | — | ns |
| Reverse recovery charge | Q_{rr} | $dI_{DR}/dt = 100\text{ A}/\mu\text{s}$ | — | 0.3 | — | μC |

Marking









$R_G = 25 \Omega$
 $V_{DD} = 90 \text{ V}, L = 12.2 \text{ mH}$

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

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