

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOSVI)

TPC6110

Power Management Switch Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS(ON)} = 43 \text{ m}\Omega$ (typ.)
- Low leakage current: $I_{DSS} = -10 \text{ }\mu\text{A}$ (max) ($V_{DS} = -30 \text{ V}$)
- Enhancement mode: $V_{th} = -0.8$ to -2.0 V
($V_{DS} = -10 \text{ V}$, $I_D = -0.1 \text{ mA}$)

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} | -25/+20 | V |
| Drain current | DC (Note 1) | I_D | -4.5 | A |
| | Pulse (Note 1) | I_{DP} | -18 | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2a) | | P_D | 2.2 | W |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2b) | | P_D | 0.7 | W |
| Single pulse avalanche energy (Note 3) | | E_{AS} | 3.4 | mJ |
| Avalanche current | | I_{AR} | -2.3 | A |
| Repetitive avalanche energy (Note 4) | | E_{AR} | 0.025 | 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).

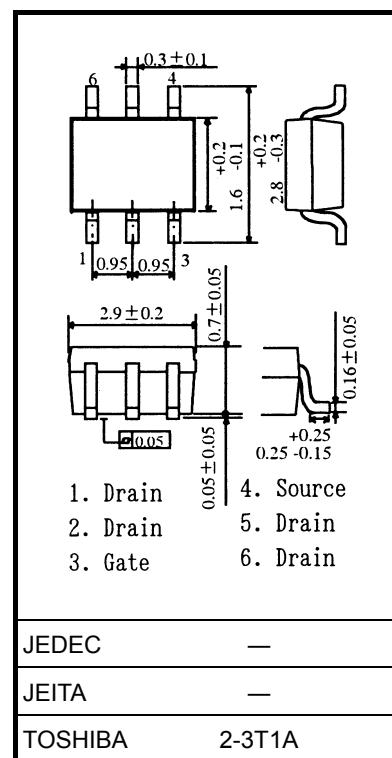
Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|--|----------------|-------|--------------------|
| Thermal resistance, channel to ambient ($t = 5 \text{ s}$) (Note 2a) | $R_{th(ch-a)}$ | 56.8 | $^\circ\text{C/W}$ |
| Thermal resistance, channel to ambient ($t = 5 \text{ s}$) (Note 2b) | $R_{th(ch-a)}$ | 178.5 | $^\circ\text{C/W}$ |

Note: (Note 1), (Note 2), (Note 3), (Note 4) and (Note 5): See other pages.

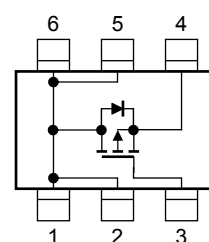
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



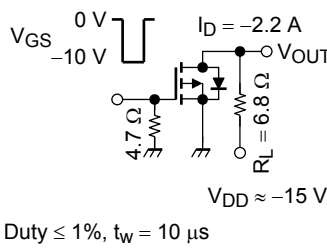
Weight: 0.011 g (typ.)

Circuit Configuration



Start of commercial production
2009-08

Electrical Characteristics (Ta = 25°C)

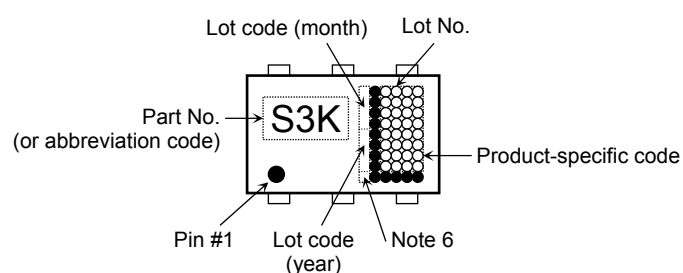
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|-----------------------|--|------|------|------|------|
| Gate leakage current | | I _{GSS} | V _{GS} = ± 20 V, V _{DS} = 0 V | — | — | ±100 | nA |
| Drain cut-off current | | I _{DSS} | V _{DS} = -30 V, V _{GS} = 0 V | — | — | -10 | μA |
| Drain-source breakdown voltage | | V _(BR) DSS | I _D = -10 mA, V _{GS} = 0 V | -30 | — | — | V |
| | | V _(BR) DSX | I _D = -10 mA, V _{GS} = 10 V (Note 7) | -21 | — | — | |
| Gate threshold voltage | | V _{th} | V _{DS} = -10 V, I _D = -0.1 mA | -0.8 | — | -2.0 | V |
| Drain-source ON resistance | | R _{DS} (ON) | V _{GS} = -4.5 V, I _D = -2.2 A | — | 59 | 77 | mΩ |
| | | | V _{GS} = -10 V, I _D = -2.2 A | — | 43 | 56 | |
| Forward transfer admittance | | Y _{fs} | V _{DS} = -10 V, I _D = -2.2 A | 4.2 | 8.4 | — | S |
| Input capacitance | | C _{iss} | V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz | — | 510 | — | pF |
| Reverse transfer capacitance | | C _{rss} | | — | 85 | — | |
| Output capacitance | | C _{oss} | | — | 110 | — | |
| Switching time | Rise time | t _r |  <p>V_{GS} 0 V -10 V</p> <p>I_D = -2.2 A</p> <p>V_{OUT}</p> <p>4.7 Ω</p> <p>R_L = 6.8 Ω</p> <p>V_{DD} ≈ -15 V</p> <p>Duty ≤ 1%, t_w = 10 μs</p> | — | 6 | — | ns |
| | Turn-on time | t _{on} | | — | 12 | — | |
| | Fall time | t _f | | — | 21 | — | |
| | Turn-off time | t _{off} | | — | 70 | — | |
| Total gate charge (gate-source plus gate-drain) | | Q _g | V _{DD} ≈ -24 V, V _{GS} = -10 V, I _D = -4.5 A | — | 14 | — | nC |
| Gate-source charge 1 | | Q _{gs1} | | — | 1.6 | — | |
| Gate-drain ("miller") charge | | Q _{gd} | | — | 3.8 | — | |

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

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|---|-----|------|-----|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | -18 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = -4.5 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | 1.2 | V |

Note 7: VDSX mode (the application of a plus voltage between gate and source) may cause decrease in maximum rating of drain-source voltage.

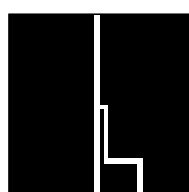
Marking (Note 5)



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

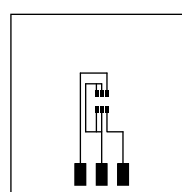
Note 2: (a) Device mounted on a glass-epoxy board (a) (t = 5 s)

(b) Device mounted on a glass-epoxy board (b) (t = 5 s)



(a)

FR-4
25.4 × 25.4 × 0.8
Unit: (mm)



(b)

FR-4
25.4 × 25.4 × 0.8
Unit: (mm)

Note 3: $V_{DD} = -24\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.5\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = -2.3\text{ A}$

Note 4: Repetitive rating : pulse width limited by maximum channel temperature

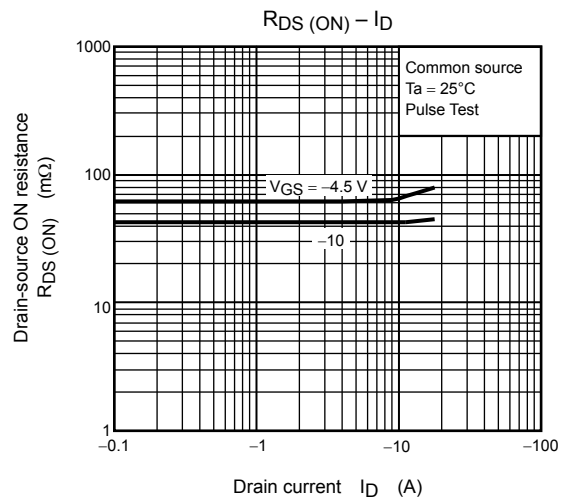
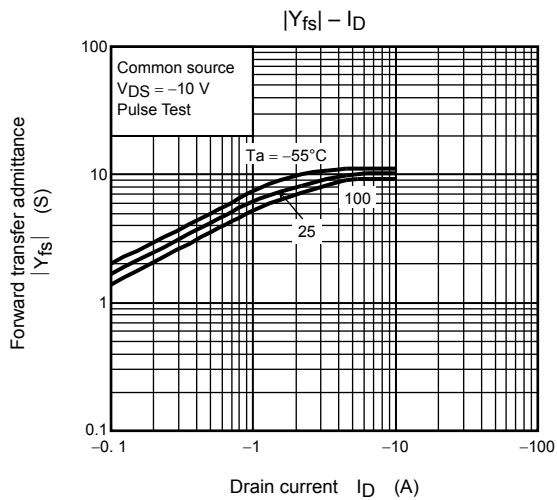
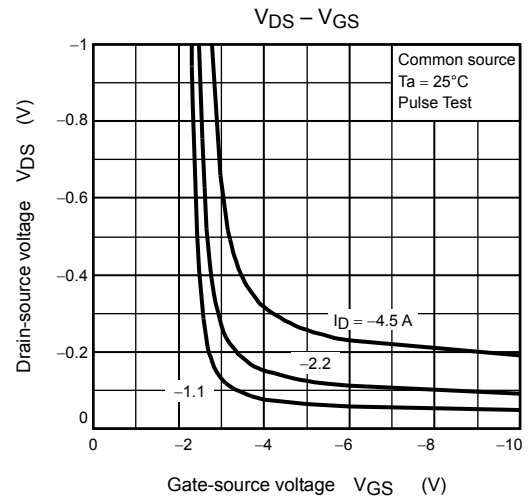
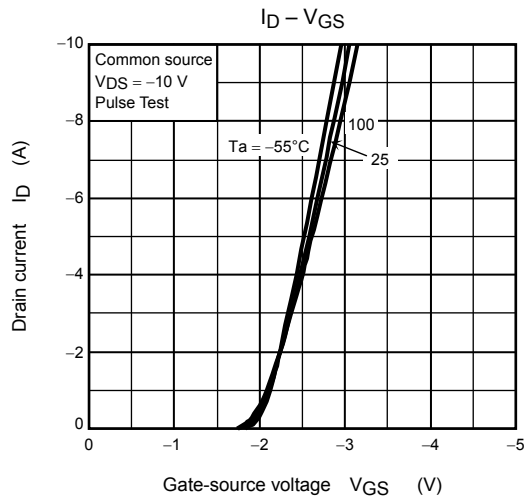
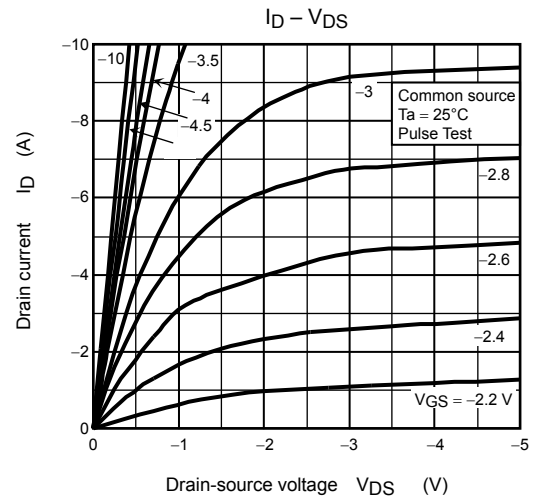
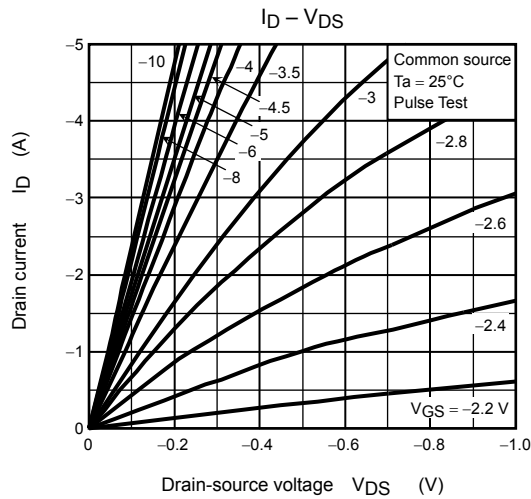
Note 5: • on lower left of the marking indicates Pin 1.

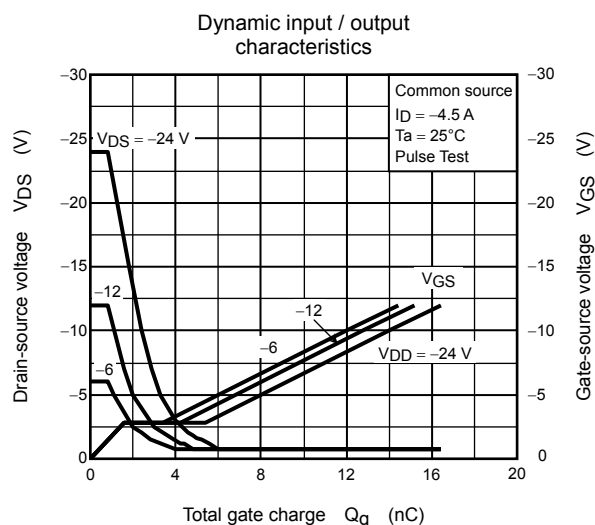
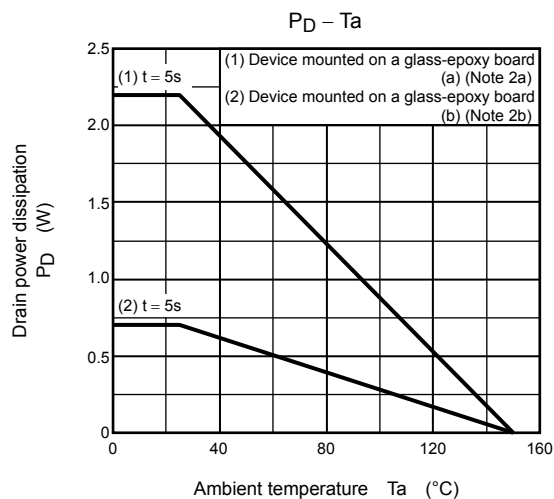
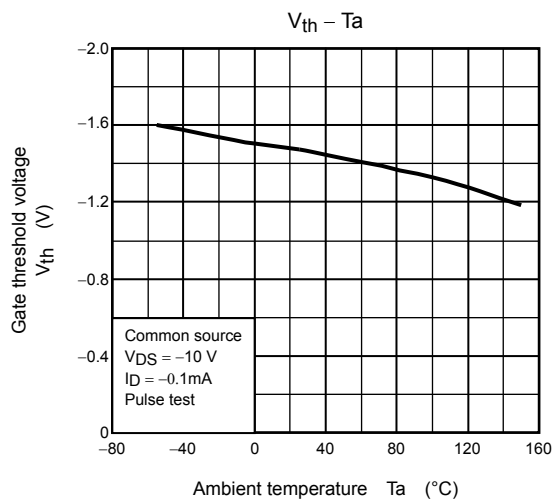
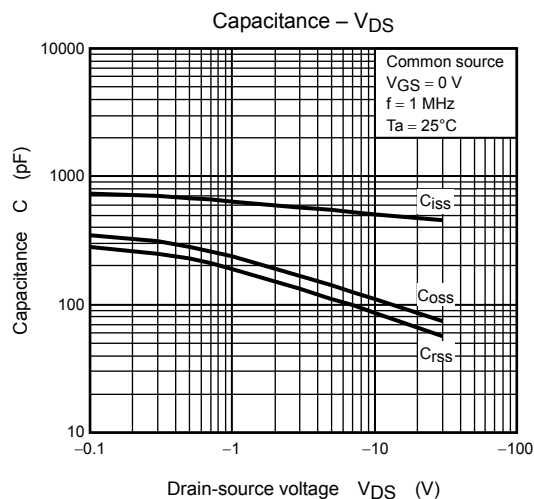
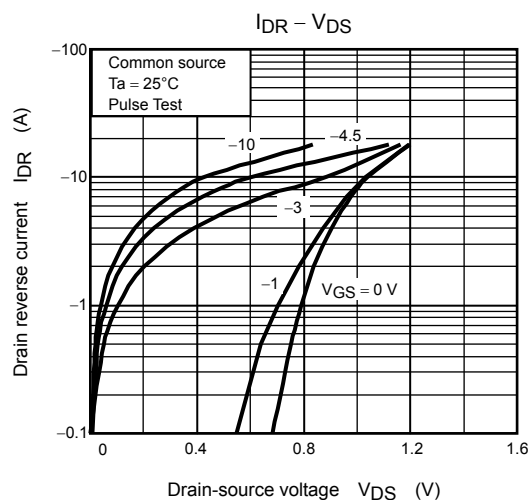
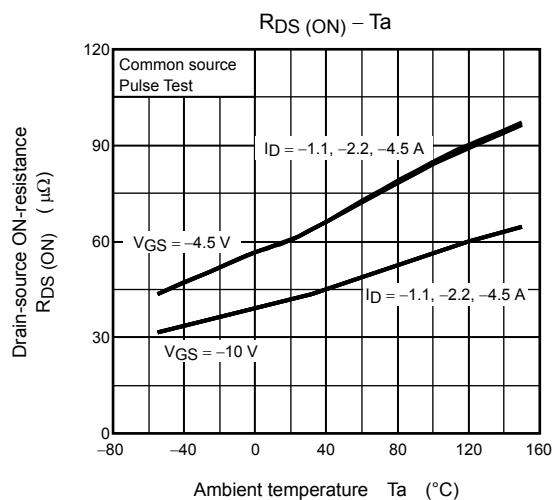
Note 6: A dot marking for identifying the indication of product Labels.

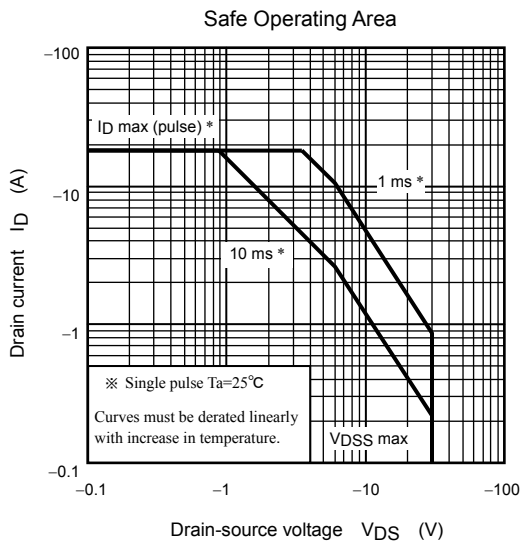
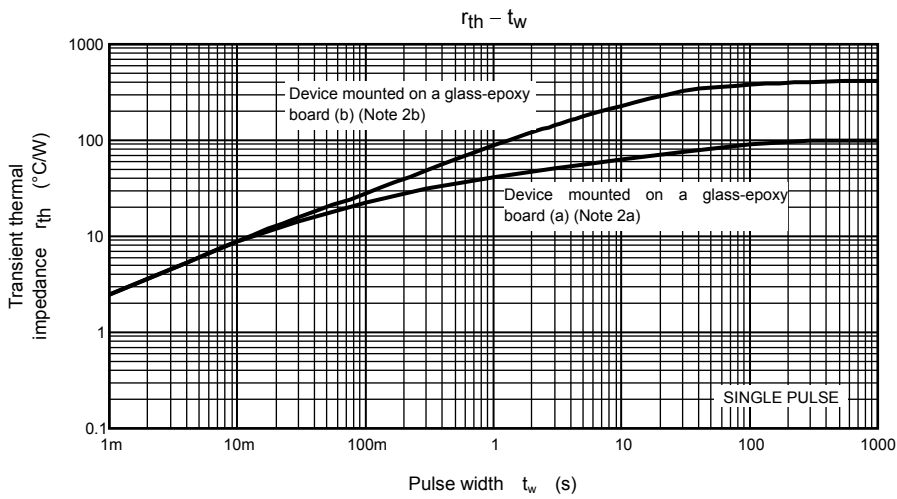
Without a dot: [[Pb]]/INCLUDES > MCV

With a dot: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







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