

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π-MOSV)

TPCS8004

High-Speed Switching Applications

Switching Regulator Applications

DC-DC Converter Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS(ON)} = 0.56 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 1.8 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 100 \mu\text{A}$ (max) ($V_{DS} = 200 \text{ V}$)
- Enhancement model: $V_{th} = 1.5 \text{ to } 3.5 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

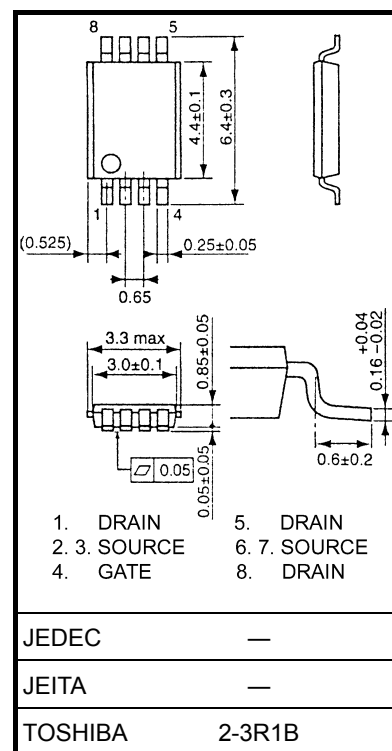
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

| Characteristics | Symbol | Rating | Unit |
|----------------------------------------------------------|----------------|------------|------------------|
| Drain-source voltage | V_{DSS} | 200 | V |
| Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$) | V_{DGR} | 200 | V |
| Gate-source voltage | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | A |
| | Pulse (Note 1) | I_{DP} | |
| Drain power dissipation ($t = 10 \text{ s}$) (Note 2a) | P_D | 1.5 | W |
| Drain power dissipation ($t = 10 \text{ s}$) (Note 2b) | P_D | 0.6 | |
| Single pulse avalanche energy (Note 3) | E_{AS} | 1.05 | mJ |
| Avalanche current | I_{AR} | 1.3 | A |
| Repetitive avalanche energy (Note 2a, Note 4) | E_{AR} | 0.15 | mJ |
| Channel temperature | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -55 to 150 | $^\circ\text{C}$ |

Note 1, Note 2, Note 3 and Note 4: See the next page.

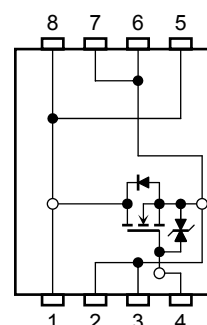
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.035 g (typ.)

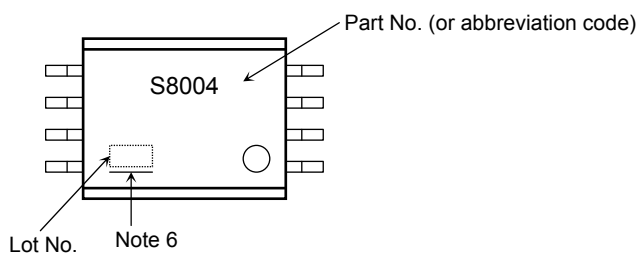
Circuit Configuration



Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|-------------------------------------------------------------------|----------------|------|------|
| Thermal resistance, channel to ambient (t = 10 s) (Note 2a) | $R_{th(ch-a)}$ | 83.3 | °C/W |
| Thermal resistance, channel to ambient (t = 10 s) (Note 2b) | $R_{th(ch-a)}$ | 208 | °C/W |

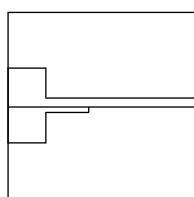
Marking (Note 5)



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

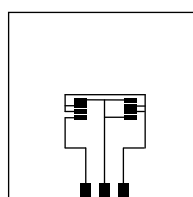
Note 2:

a) Device mounted on a glass-epoxy board (a)



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

b) Device mounted on a glass-epoxy board (b)



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

Note 3: $V_{DD} = 50\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.0\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 1.3\text{ A}$

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

Note 5: ○ on lower right of the marking indicates Pin 1.

※ Weekly code: (Three digits)



Week of manufacture

(01 for the first week of a year: sequential number up to 52 or 53)

Year of manufacture

(The last digit of a year)

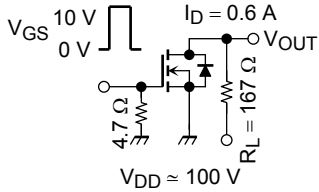
Note 6: A line under a Lot No. identifies the indication of product Labels.

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

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

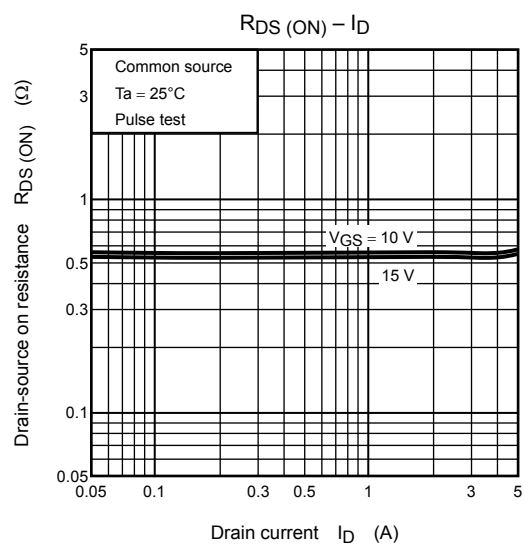
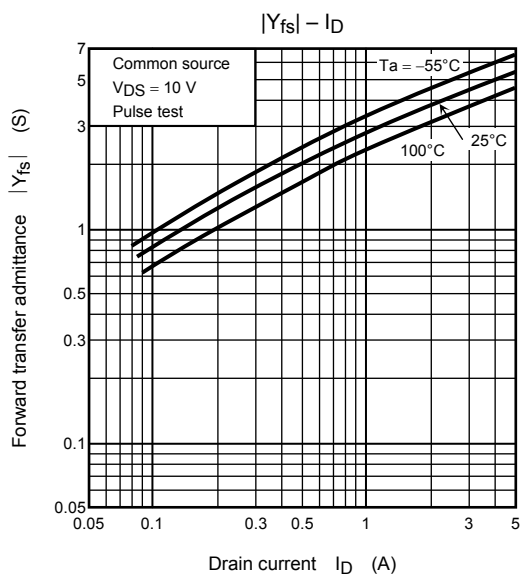
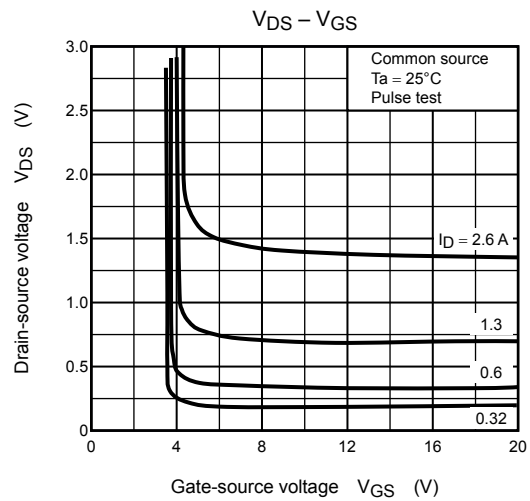
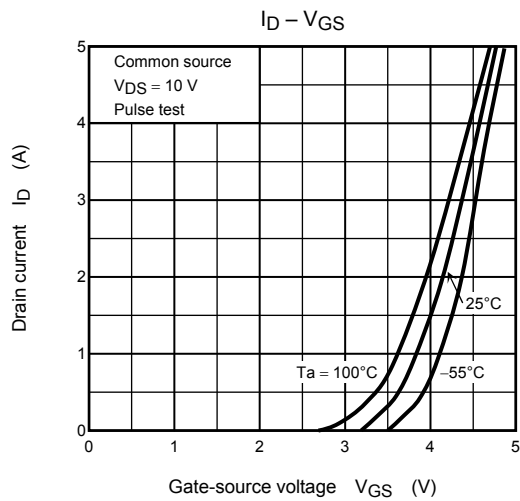
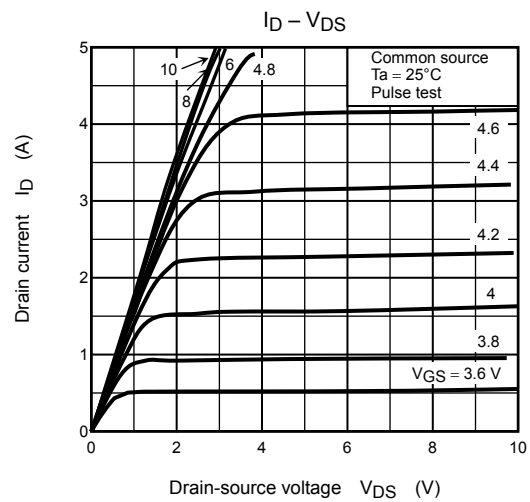
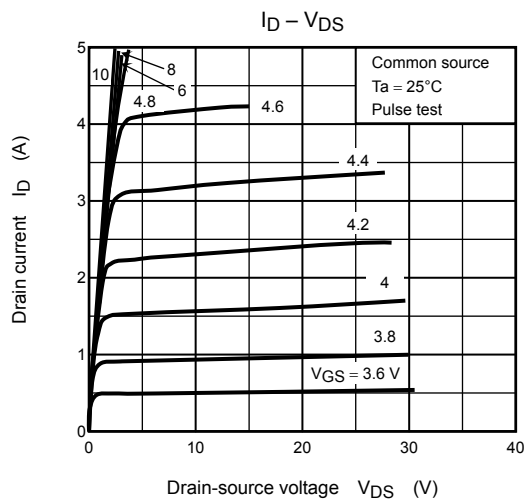
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

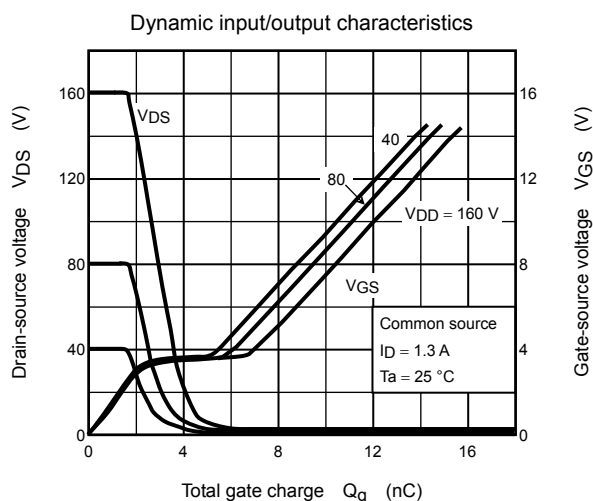
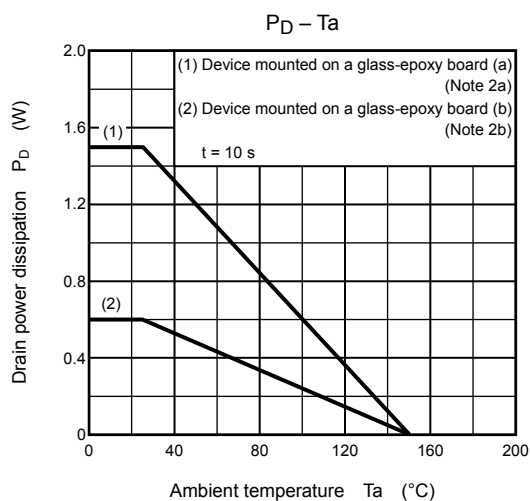
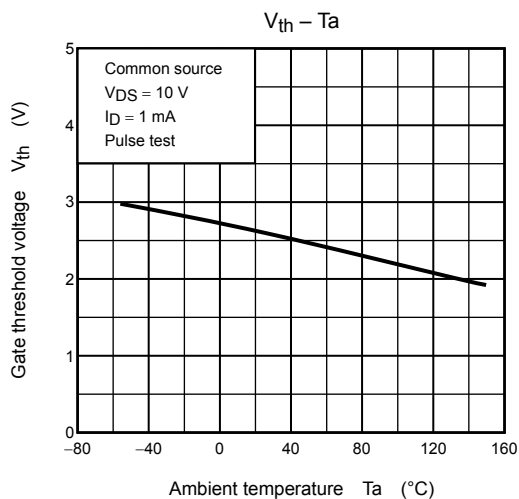
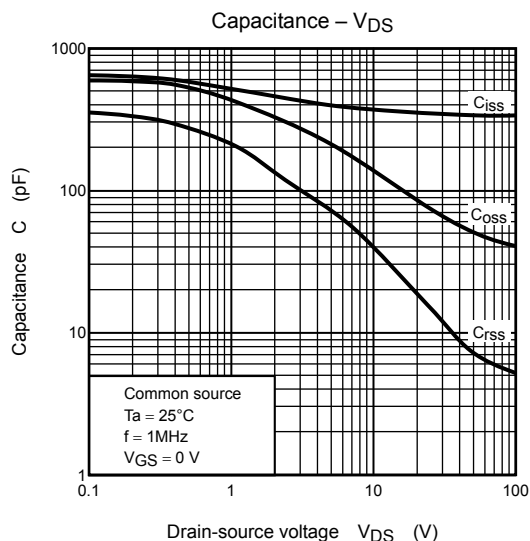
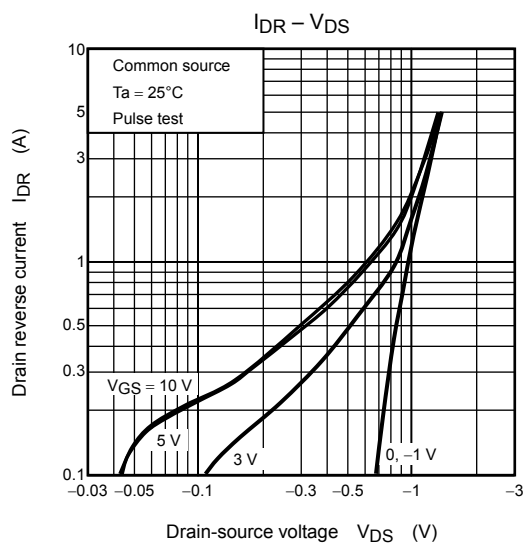
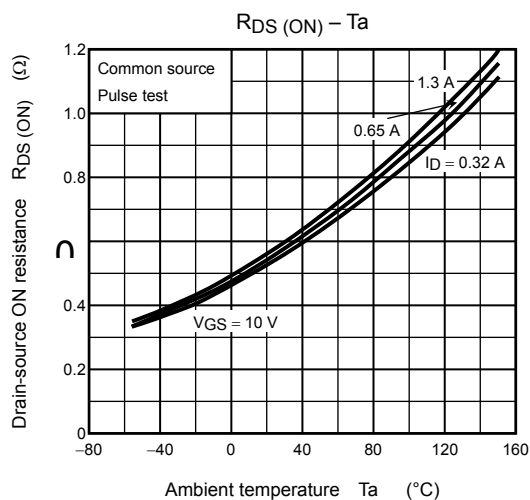
Electrical Characteristics (Ta = 25°C)

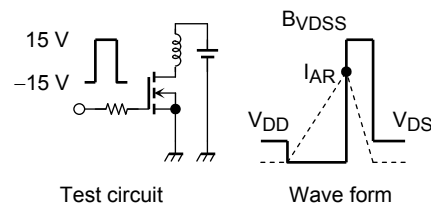
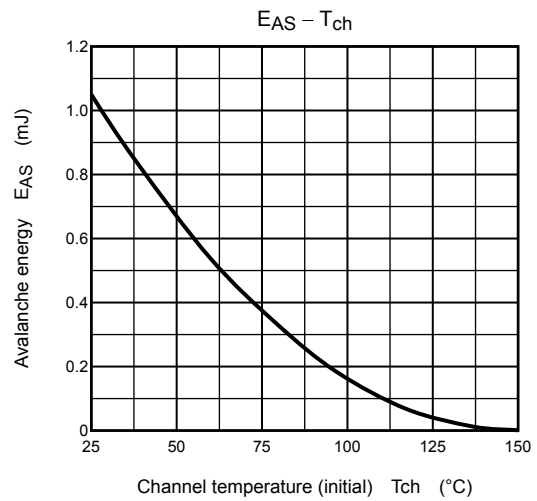
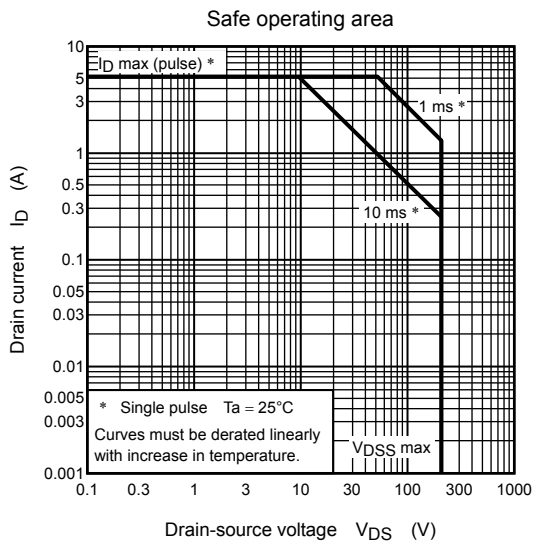
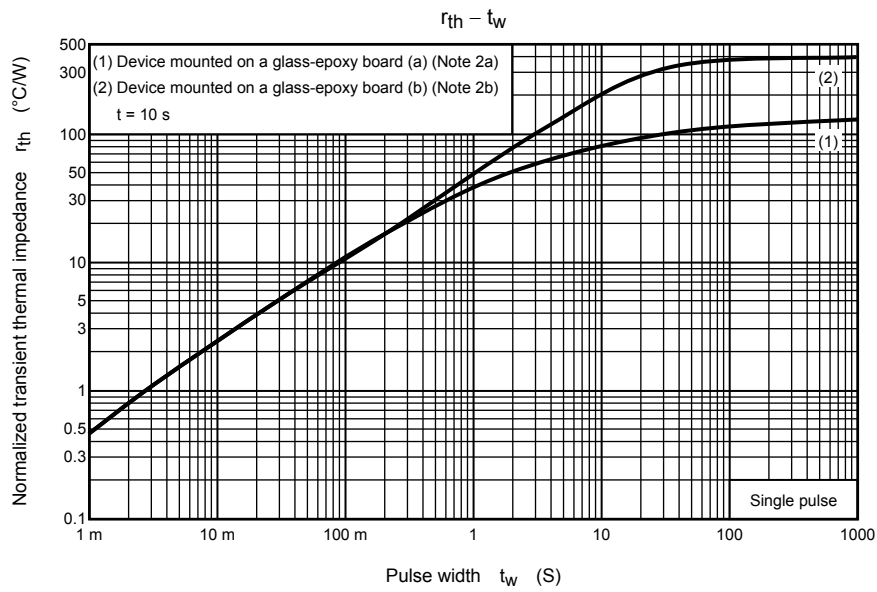
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------------------------|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$ | — | — | ± 10 | μA |
| Drain cut-OFF current | | I_{DSS} | $V_{DS} = 200 \text{ V}, V_{GS} = 0 \text{ V}$ | — | — | 100 | μA |
| Drain-source breakdown voltage | | $V_{(BR) DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$ | 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 | | $R_{DS(ON)}$ | $V_{GS} = 10 \text{ V}, I_D = 0.6 \text{ A}$ | — | 0.56 | 0.8 | Ω |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10 \text{ V}, I_D = 0.6 \text{ A}$ | 0.9 | 1.8 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 380 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 40 | — | pF |
| Output capacitance | | C_{oss} | | — | 140 | — | pF |
| Switching time | Rise time | t_r |  <p>$V_{GS} = 10 \text{ V}$ 0 V $I_D = 0.6 \text{ A}$ V_{OUT} $C_L = 4.7 \text{ nF}$ $R_L = 167 \Omega$ $V_{DD} \approx 100 \text{ V}$ Duty $\leq 1\%$, $t_w = 10 \mu\text{s}$</p> | — | 4.5 | — | ns |
| | Turn-ON time | t_{on} | | — | 12 | — | |
| | Fall time | t_f | | — | 23 | — | |
| | Turn-OFF time | t_{off} | | — | 54 | — | |
| Total gate charge (gate-source plus gate-drain) | | Q_g | $V_{DD} \approx 160 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 1.3 \text{ A}$ | — | 12 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 8 | — | nC |
| Gate-drain ("miller") charge | | Q_{gd} | | — | 4 | — | nC |

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

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------------------------------|-----------|-------------------------------------------------|-----|------|------|------|
| Drain reverse current (pulse) (Note 1) | I_{DRP} | — | — | — | 5.2 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = 1.3 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | -2.0 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = 1.3 \text{ A}, V_{GS} = 0 \text{ V},$ | — | 89 | — | ns |
| Reverse recovery charge | Q_{rr} | $dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$ | — | 230 | — | nC |







$T_{ch} = 25^\circ\text{C}$ (Initial)
 Peak $I_{AR} = 1.3$ A, $R_G = 25 \Omega$ $E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$
 $V_{DD} = 50$ V, $L = 1$ mH

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