

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (High speed U-MOSIII)

TPC8009-H

High Speed and High Efficiency DC-DC Converters

Notebook PC Applications

Portable Equipment Applications

- Small footprint due to small and thin package
- High speed switching
- Small gate charge: $Q_g = 29 \text{ nC}$ (typ.)
- Low drain-source ON resistance: $R_{DS(ON)} = 8 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 16 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 30 \text{ V}$)
- Enhancement mode: $V_{th} = 1.1 \text{ to } 2.3 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

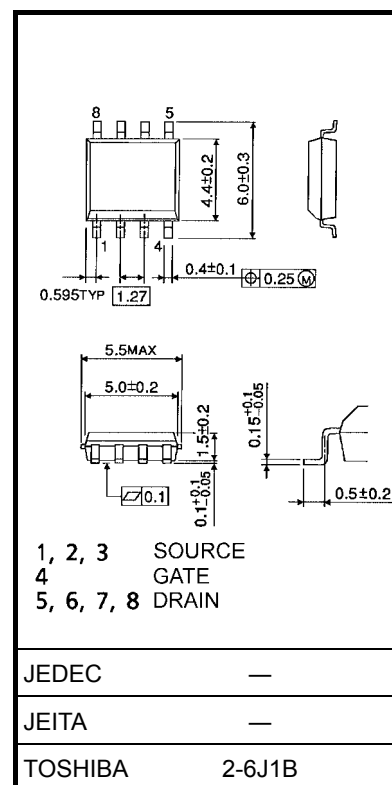
Maximum Ratings ($T_a = 25^\circ\text{C}$)

| 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} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | 13 | A |
| | Pulse (Note 1) | I_{DP} | 52 | |
| Drain power dissipation ($t = 10 \text{ s}$) (Note 2a) | | P_D | 1.9 | W |
| Drain power dissipation ($t = 10 \text{ s}$) (Note 2b) | | P_D | 1.0 | W |
| Single pulse avalanche energy (Note 3) | | E_{AS} | 219 | mJ |
| Avalanche current | | I_{AR} | 13 | A |
| Repetitive avalanche energy (Note 2a) (Note 4) | | E_{AR} | 0.19 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55 to 150 | $^\circ\text{C}$ |

Note: (Note 1), (Note 2), (Note 3), (Note 4) Please see next page.

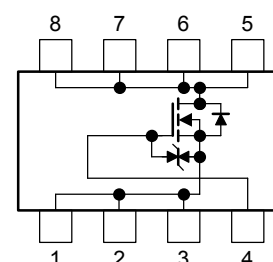
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

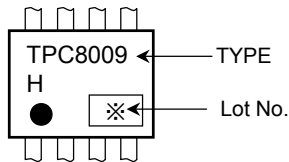
Circuit Configuration



Thermal Characteristics

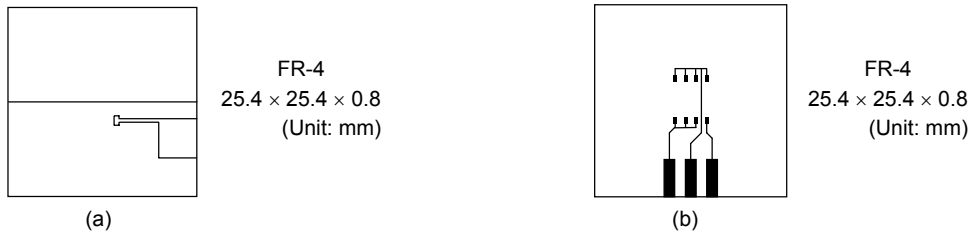
| Characteristics | Symbol | Max | Unit |
|--|-----------------|------|------|
| Thermal resistance, channel to ambient (t = 10 s) (Note 2a) | $R_{th (ch-a)}$ | 65.8 | °C/W |
| Thermal resistance, channel to ambient (t = 10 s) (Note 2b) | $R_{th (ch-a)}$ | 125 | °C/W |

Marking (Note 5)



Note 1: Please use devices on condition that the channel temperature is below 150°C.

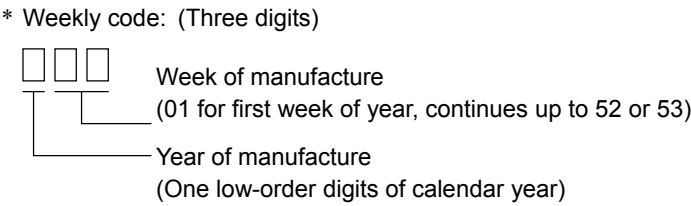
Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



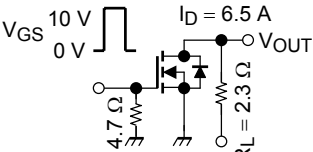
Note 3: $V_{DD} = 24\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.0\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 13\text{ A}$

Note 4: Repetitive rating; pulse width limited by max channel temperature.

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

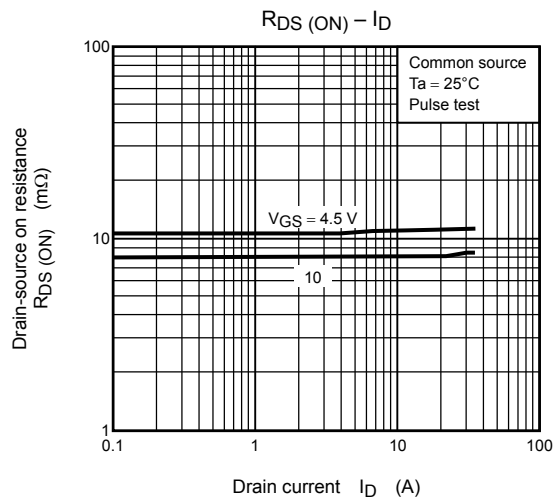
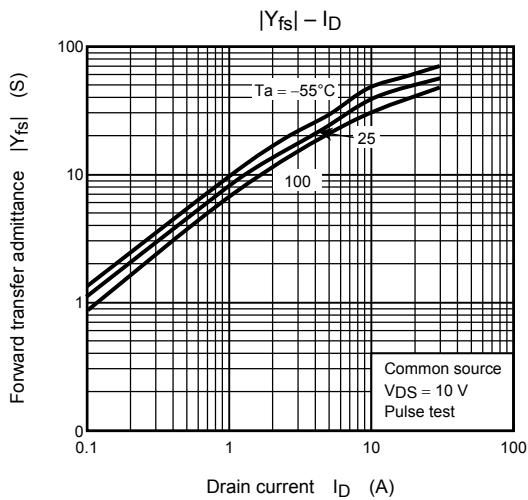
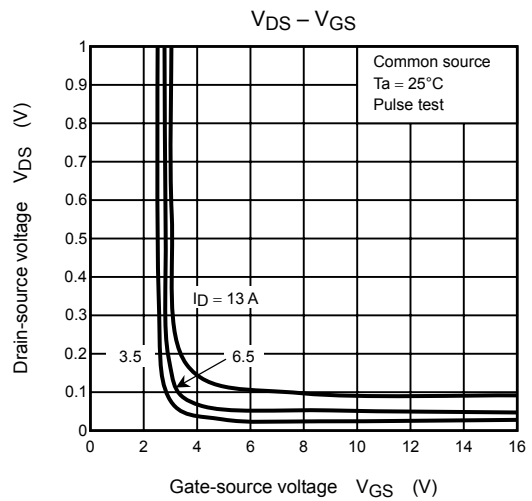
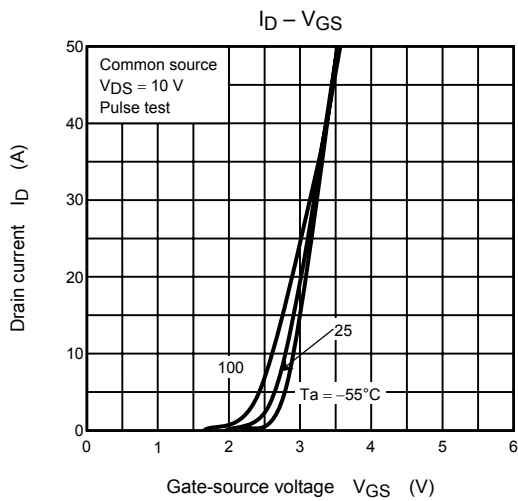
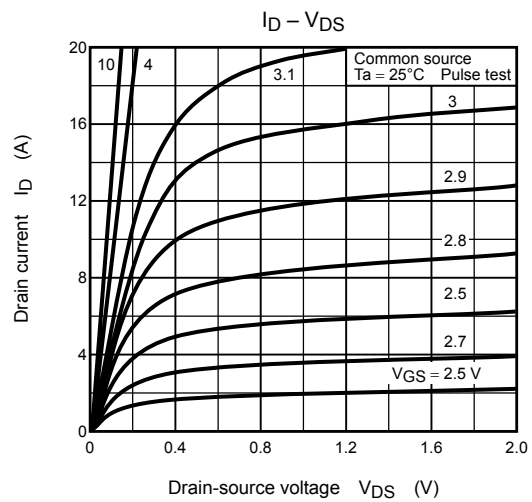
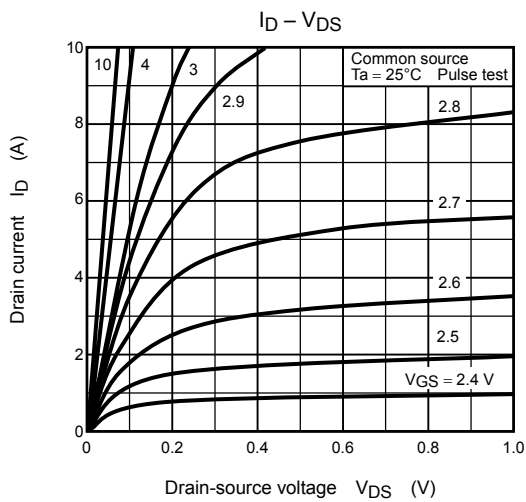


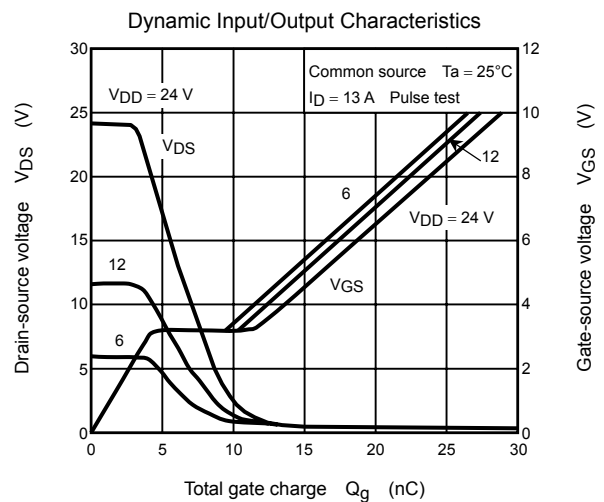
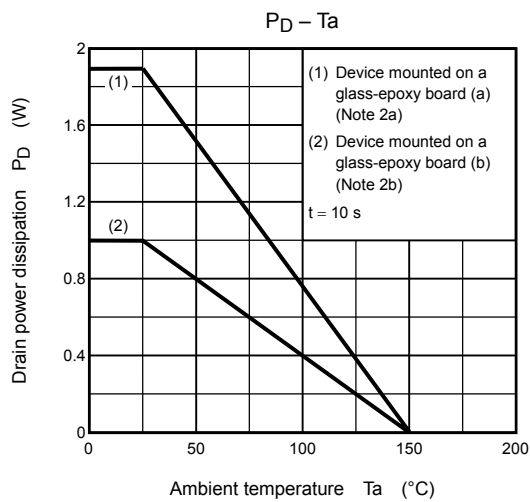
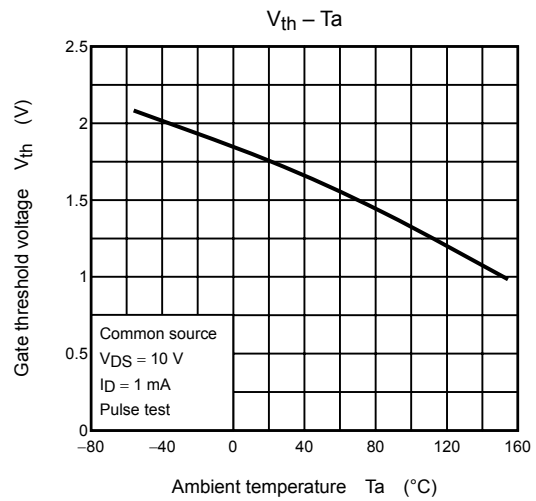
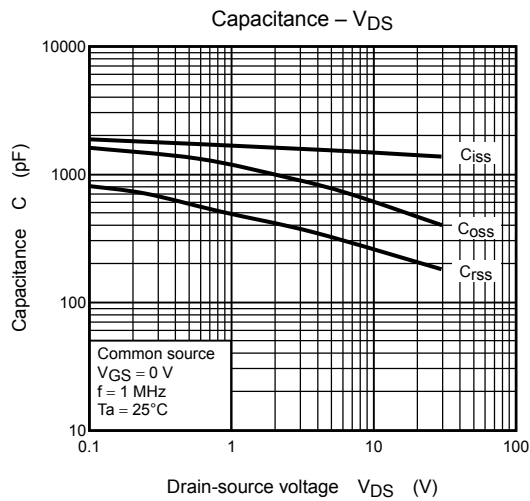
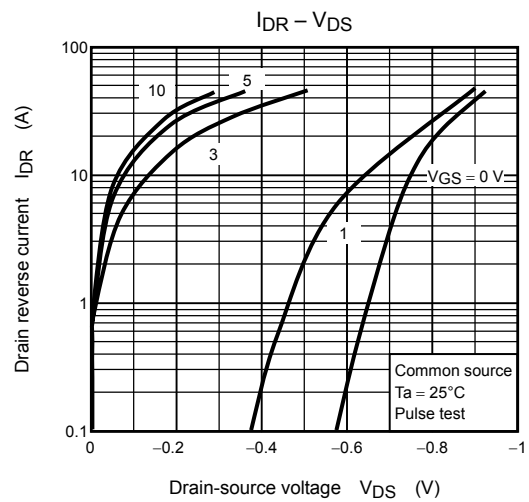
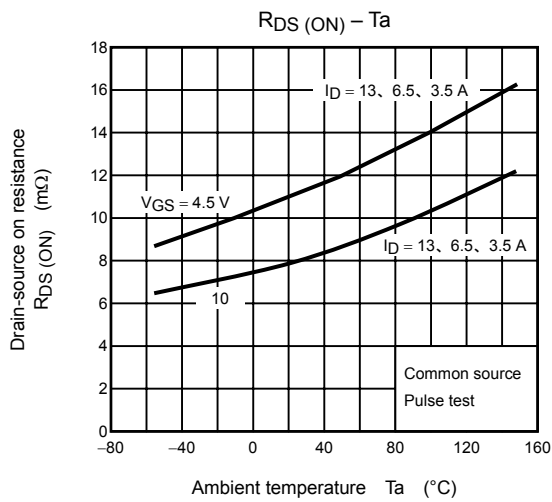
Electrical Characteristics (Ta = 25°C)

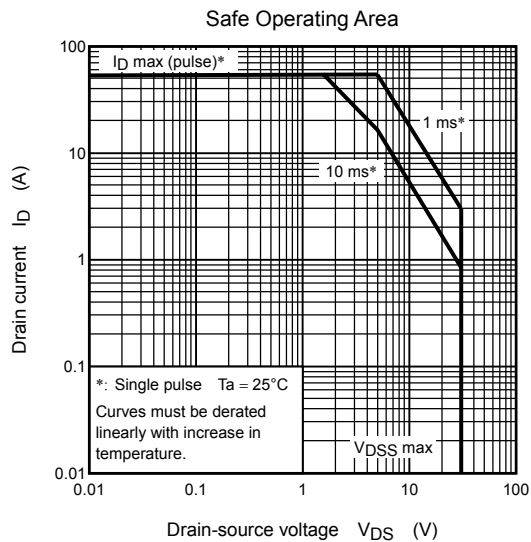
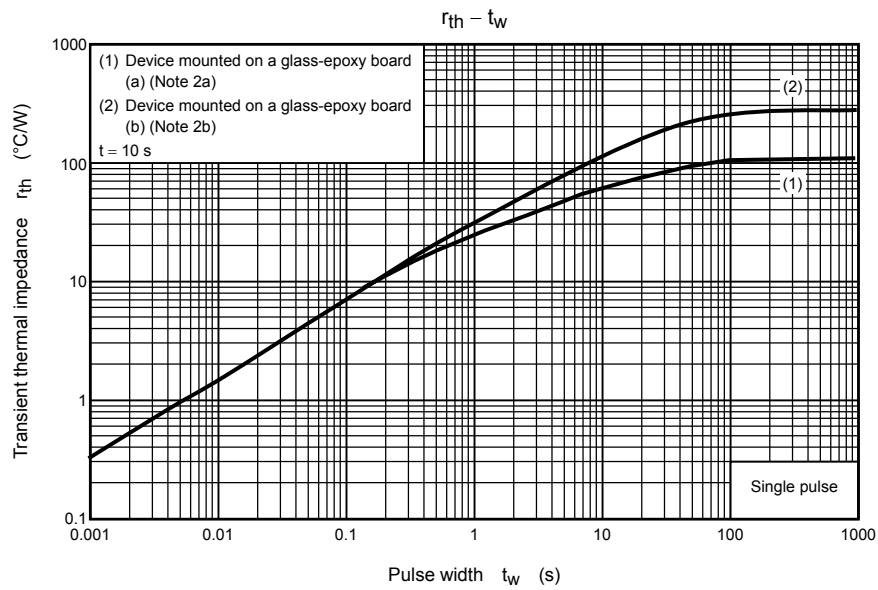
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|-----------------------|--|-----|------|-----|------|
| Gate leakage current | | I _{GSS} | V _{GS} = ±16 V, V _{DS} = 0 V | — | — | ±10 | μA |
| Drain cut-OFF current | | I _{DSS} | V _{DS} = 30 V, V _{GS} = 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} = −20 V | 15 | — | — | |
| Gate threshold voltage | | V _{th} | V _{DS} = 10 V, I _D = 1 mA | 1.1 | — | 2.3 | V |
| Drain-source ON resistance | | R _{DS} (ON) | V _{GS} = 4.5 V, I _D = 6.5 A | — | 11 | 15 | mΩ |
| | | | V _{GS} = 10 V, I _D = 6.5 A | — | 8 | 10 | |
| Forward transfer admittance | | Y _{fs} | V _{DS} = 10 V, I _D = 6.5 A | 8 | 16 | — | S |
| Input capacitance | | C _{iss} | V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz | — | 1460 | — | pF |
| Reverse transfer capacitance | | C _{rss} | | — | 250 | — | |
| Output capacitance | | C _{oss} | | — | 600 | — | |
| Switching time | Rise time | t _r |  <p>V_{GS} 10 V 0 V</p> <p>I_D = 6.5 A</p> <p>V_{OUT}</p> <p>4.7 Ω</p> <p>R_L = 2.3 Ω</p> <p>V_{DD} ≈ 15 V</p> <p>Duty ≤ 1%, t_W = 10 μs</p> | — | 5 | — | ns |
| | Turn-ON time | t _{on} | | — | 13 | — | |
| | Fall time | t _f | | — | 12 | — | |
| | Turn-OFF time | t _{off} | | — | 37 | — | |
| Total gate charge (gate-source plus gate-drain) | | Q _g | V _{DD} ≈ 24 V, V _{GS} = 10 V, I _D = 13 A | — | 29 | — | nC |
| | | | V _{DD} ≈ 24 V, V _{GS} = 5 V, I _D = 13 A | — | 16 | — | |
| Gate-source charge 1 | | Q _{gs1} | V _{DD} ≈ 24 V, V _{GS} = 10 V, I _D = 13 A | — | 4.2 | — | |
| Gate-drain (“miller”) charge | | Q _{gd} | | — | 7.3 | — | |
| Gate switch charge | | Q _{SW} | | — | 9.1 | — | |

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

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|---|-----|------|------|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | 52 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = 13 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | -1.2 | V |







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