

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

TPCA8051-H

Switching Regulator Applications

Motor Drive Applications

DC-DC Converter Applications

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge: $Q_{SW} = 18 \text{ nC}$ (typ.)
- Low drain-source ON-resistance: $R_{DS(ON)} = 6.0 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 96 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 80 \text{ V}$)
- Enhancement mode: $V_{th} = 1.3 \text{ to } 2.3 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1.0 \text{ mA}$)

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

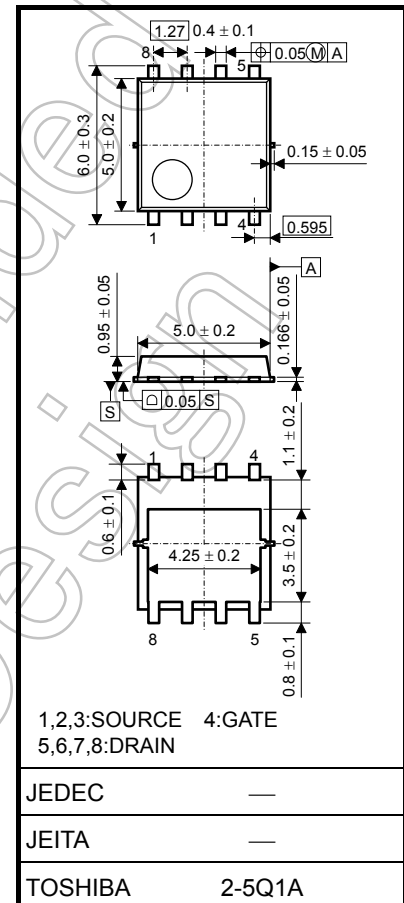
| Characteristic | | Symbol | Rating | Unit |
|---|-----------------|-----------|------------|------------------|
| Drain-source voltage | | V_{DSS} | 80 | V |
| Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$) | | V_{DGR} | 80 | V |
| Gate-source voltage | | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | 28 | A |
| | Pulsed (Note 1) | I_{DP} | 84 | |
| Drain power dissipation ($T_c = 25^\circ\text{C}$) | | P_D | 45 | W |
| Drain power dissipation ($t = 10 \text{ s}$) (Note 2a) | | P_D | 2.8 | W |
| Drain power dissipation ($t = 10 \text{ s}$) (Note 2b) | | P_D | 1.6 | W |
| Single-pulse avalanche energy (Note 3) | | E_{AS} | 255 | mJ |
| Avalanche current | | I_{AR} | 28 | A |
| Repetitive avalanche energy ($T_c = 25^\circ\text{C}$) (Note 4) | | E_{AR} | 2.03 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55 to 150 | $^\circ\text{C}$ |

Note: For Notes 1 to 4, refer to the next page.

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).

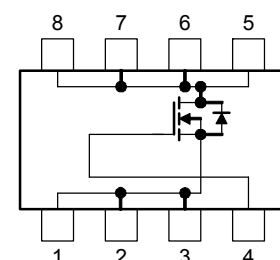
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.069 g (typ.)

Circuit Configuration

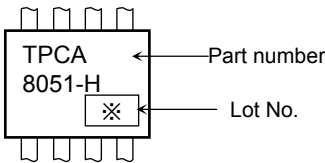


Start of commercial production
2008-10

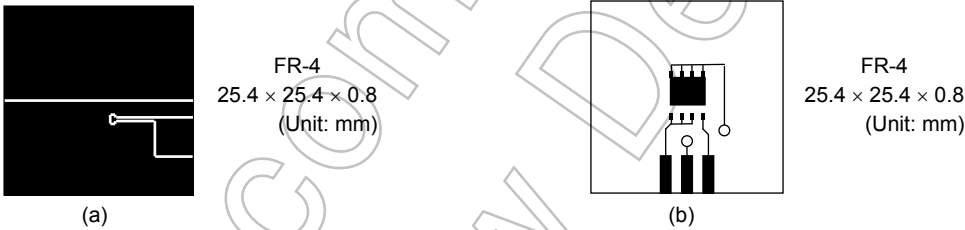
Thermal Characteristics

| Characteristic | Symbol | Max | Unit |
|---|----------------|------|----------------------|
| Thermal resistance, channel to case ($T_c = 25^{\circ}\text{C}$) | $R_{th(ch-c)}$ | 2.78 | $^{\circ}\text{C/W}$ |
| Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2a) | $R_{th(ch-a)}$ | 44.6 | $^{\circ}\text{C/W}$ |
| Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2b) | $R_{th(ch-a)}$ | 78.1 | $^{\circ}\text{C/W}$ |

Marking (Note 5)

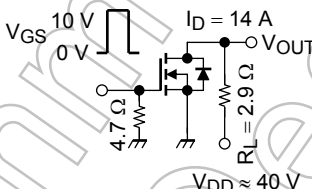


- Note 1: Ensure that the channel temperature does not exceed 150°C .
- Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



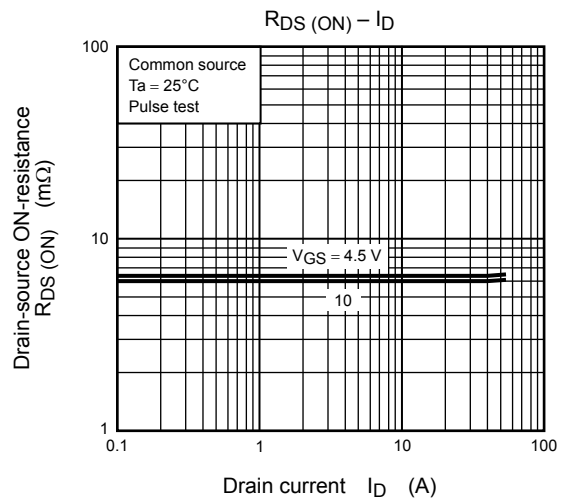
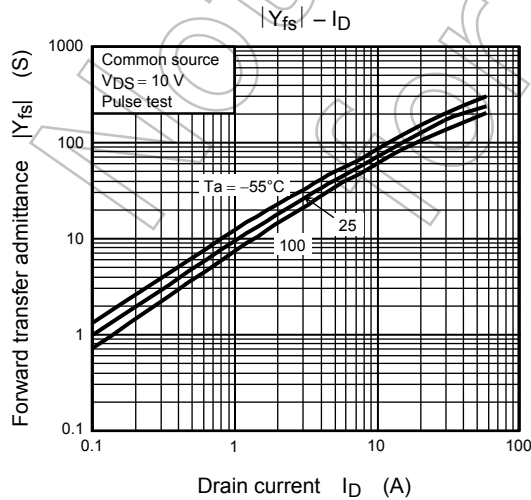
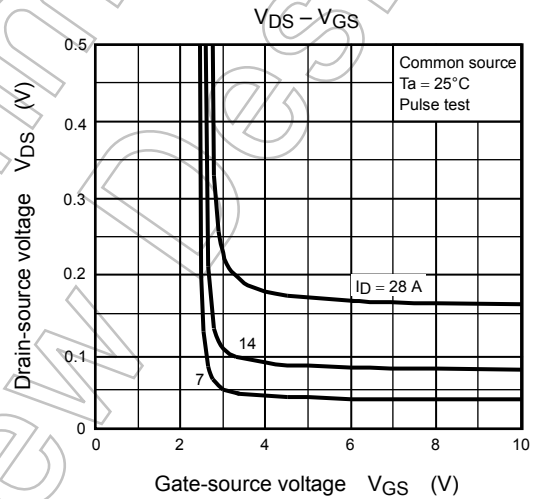
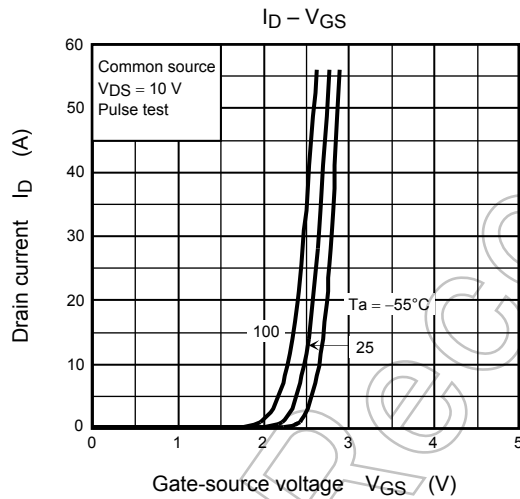
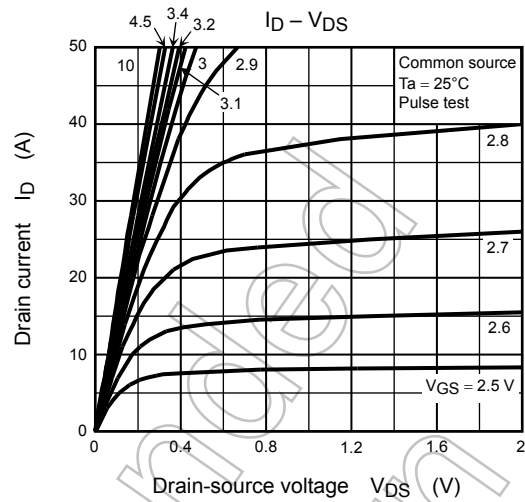
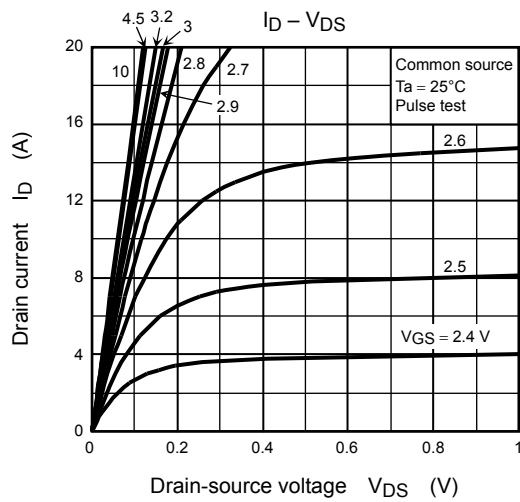
- Note 3: $V_{DD} = 24\text{ V}$, $T_{ch} = 25^{\circ}\text{C}$ (initial), $L = 100\text{ }\mu\text{H}$, $R_G = 25\text{ }\Omega$, $I_{AR} = 28\text{ A}$
- Note 4: Repetitive rating: pulse width limited by maximum channel temperature
- Note 5: * Weekly code: (Three digits)
- □ □ Week of manufacture
(01 for the first week of the year, continuing up to 52 or 53)
- Year of manufacture
(The last digit of the year)

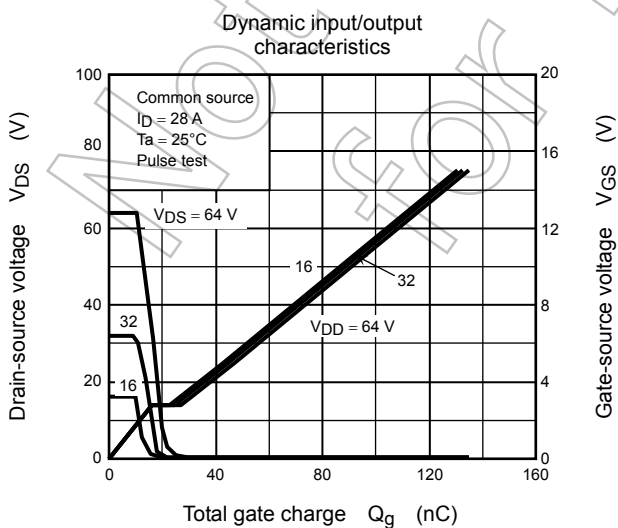
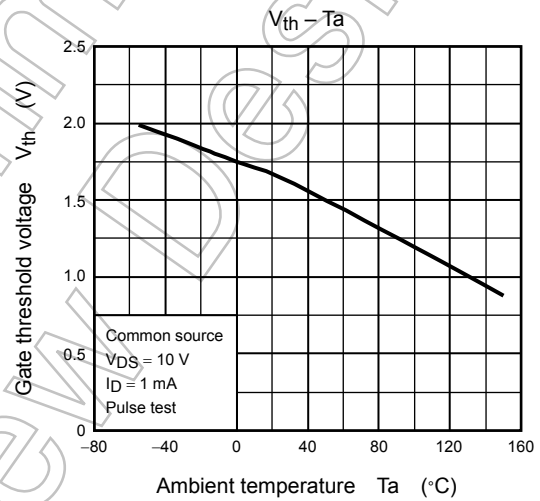
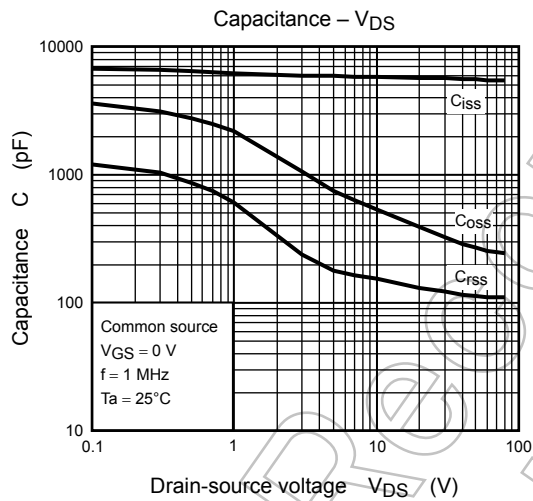
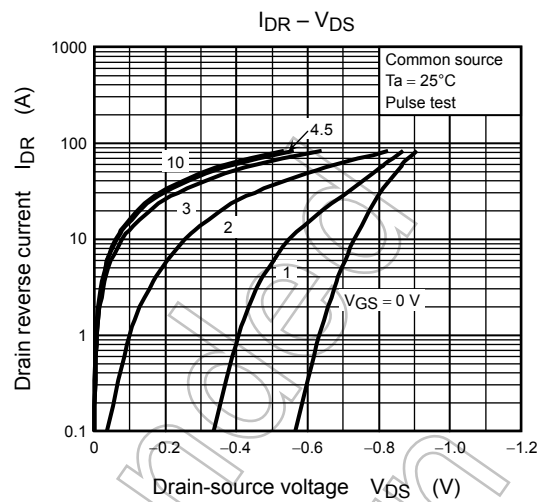
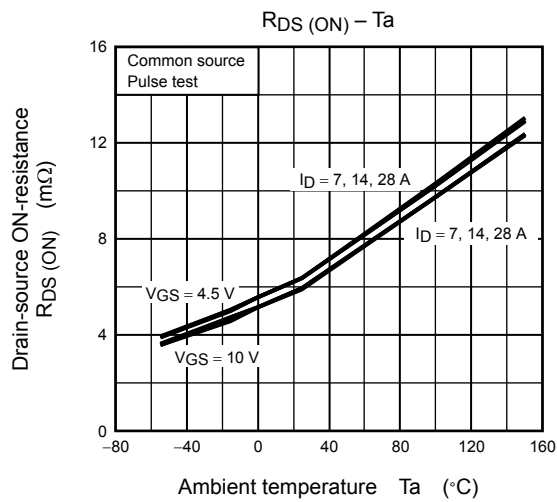
Electrical Characteristics (Ta = 25°C)

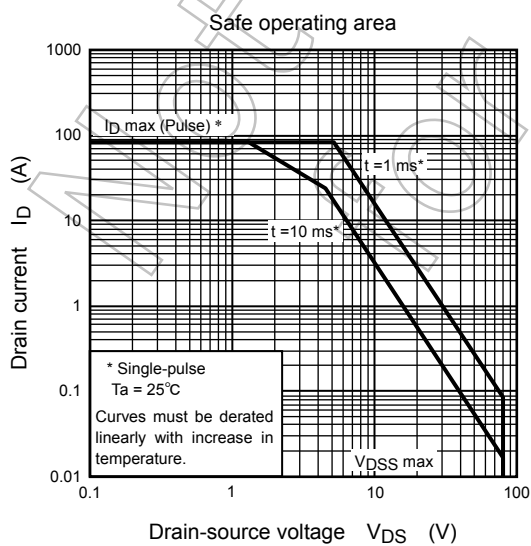
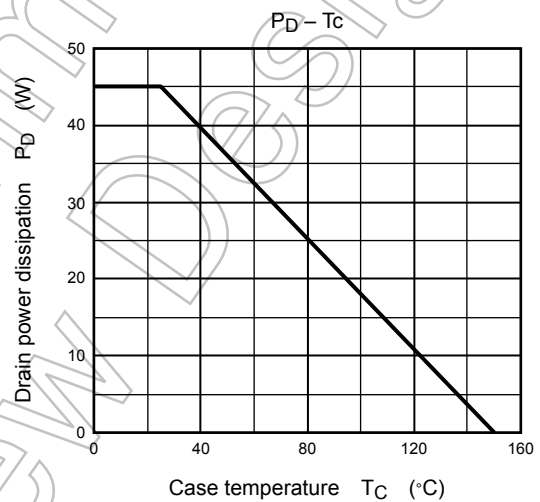
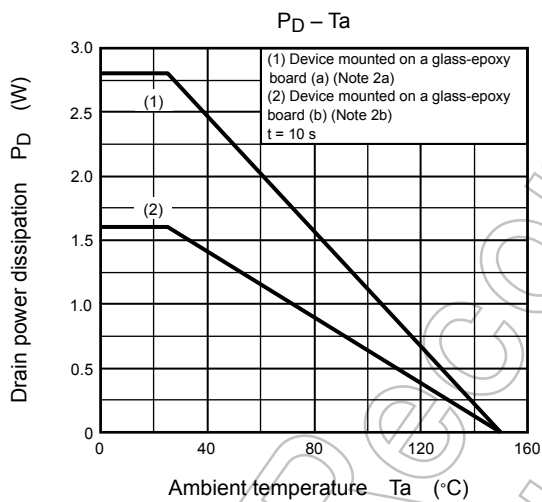
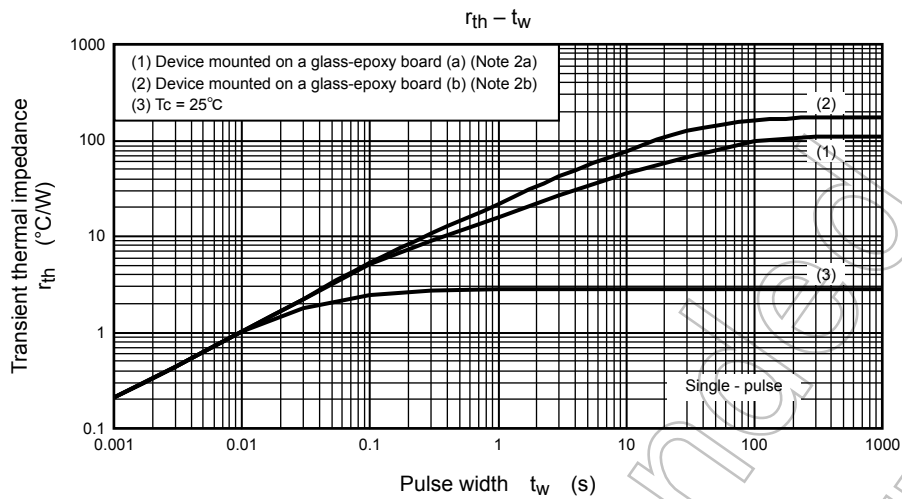
| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|-----------------------|---|-----------------------------------|------|------|------|
| Gate leakage current | | I _{GSS} | V _{GS} = ±20 V, V _{DS} = 0 V | — | — | ±100 | nA |
| Drain cutoff current | | I _{DSS} | V _{DS} = 80 V, V _{GS} = 0 V | — | — | 10 | μA |
| Drain-source breakdown voltage | | V _(BR) DSS | I _D = 10 mA, V _{GS} = 0 V | 80 | — | — | V |
| | | V _(BR) DSX | I _D = 10 mA, V _{GS} = −20 V | 60 | — | — | |
| Gate threshold voltage | | V _{th} | V _{DS} = 10 V, I _D = 1.0 mA | 1.3 | — | 2.3 | V |
| Drain-source ON-resistance | | R _{DS} (ON) | V _{GS} = 4.5 V, I _D = 14 A | — | 6.4 | 9.8 | mΩ |
| | | | V _{GS} = 10 V, I _D = 14 A | — | 6.0 | 9.4 | |
| Forward transfer admittance | | Y _{fs} | V _{DS} = 10 V, I _D = 14 A | 48 | 96 | — | S |
| Input capacitance | | C _{iss} | V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz | — | 5800 | 7540 | pF |
| Reverse transfer capacitance | | C _{rss} | | — | 150 | 210 | |
| Output capacitance | | C _{oss} | | — | 520 | — | |
| Gate resistance | | r _g | V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz | — | 1.0 | 1.5 | Ω |
| Switching time | Rise time | t _r |  | — | 3.4 | — | ns |
| | Turn-on time | t _{on} | | — | 13 | — | |
| | Fall time | t _f | | — | 6.3 | — | |
| | Turn-off time | t _{off} | | Duty ≤ 1%, t _w = 10 μs | — | 66 | |
| Total gate charge (gate-source plus gate-drain) | | Q _g | V _{DD} ≈ 64 V, V _{GS} ≈ 10 V, I _D = 28 A | — | 91 | — | nC |
| | | | V _{DD} ≈ 64 V, V _{GS} = 5 V, I _D = 28 A | — | 47 | — | |
| Gate-source charge 1 | | Q _{gs1} | V _{DD} ≈ 64 V, V _{GS} = 10 V, I _D = 28 A | — | 16 | — | |
| Gate-drain (“Miller”) charge | | Q _{gd} | | — | 11 | — | |
| Gate switch charge | | Q _{sw} | | — | 18 | — | |

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

| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|---|-----|------|------|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | 84 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = 28 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | -1.2 | V |







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