

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

TPC8005-H

High Speed and High Efficiency DC-DC Converters
 Lithium Ion Battery Applications
 Portable Equipment Applications
 Notebook PC Applications

- Small footprint due to small and thin package
- High speed switching : 60% speed up (compare with current type)
- Small gate charge : $Q_g = 20 \text{ nC}$ (typ.)
- Low drain-source ON resistance : $R_{DS(ON)} = 13 \text{ m}\Omega$ (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 : $V_{th} = 1.3\sim 2.5 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

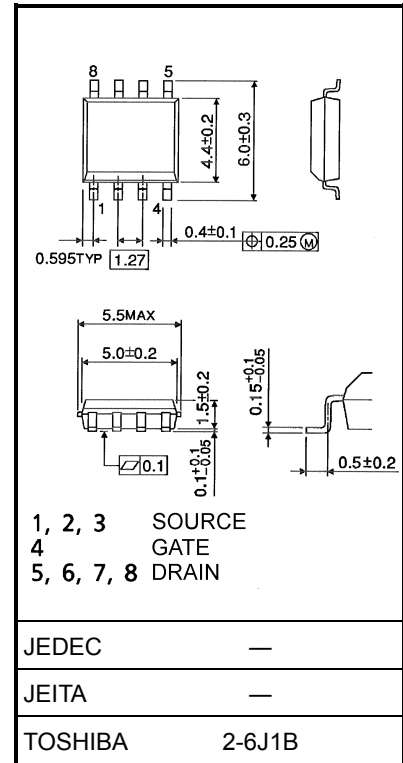
Maximum Ratings (Ta = 25°C)

| 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 | 11 | A |
| | Pulse (Note 1) | I_{DP} | 44 | |
| Drain power dissipation (t = 10 s) (Note 2a) | | P_D | 2.4 | W |
| Drain power dissipation (t = 10 s) (Note 2b) | | P_D | 1.0 | W |
| Single pulse avalanche energy (Note 3) | | E_{AS} | 157 | mJ |
| Avalanche current | | I_{AR} | 11 | A |
| Repetitive avalanche energy (Note 2a) (Note 4) | | E_{AR} | 0.24 | mJ |
| Channel temperature | | T_{ch} | 150 | °C |
| Storage temperature range | | T_{stg} | -55 to 150 | °C |

Note: For (Note 1), (Note 2), (Note 3) and (Note 4), please refer to the next page.

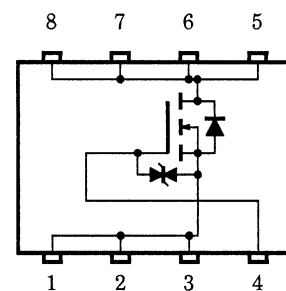
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

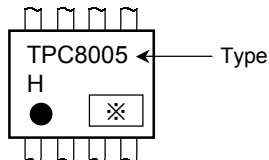
Circuit Configuration



Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|---|----------------|------|------|
| Thermal resistance, channel to ambient (t = 10 s) (Note 2a) | $R_{th(ch-a)}$ | 52.1 | °C/W |
| Thermal resistance, channel to ambient (t = 10 s) (Note 2b) | $R_{th(ch-a)}$ | 125 | °C/W |

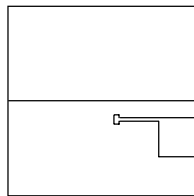
Marking (Note 5)



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

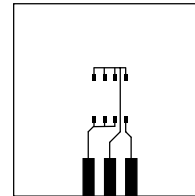
Note 2: (a) Device mounted on a glass-epoxy board (a)

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



(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), $L = 1.0\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 11\text{ A}$

Note 4: Reptitive rating; pulse width limited by maximum channel temperature

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

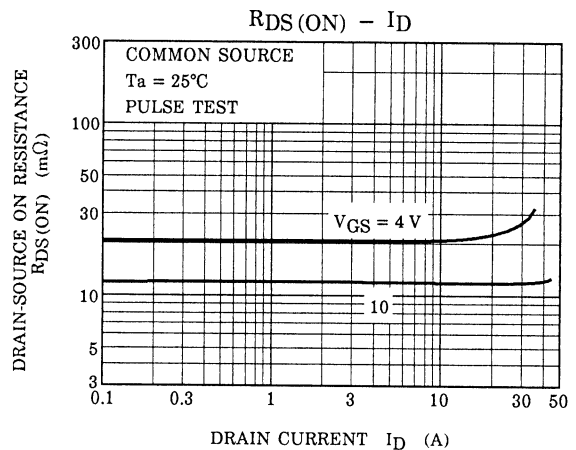
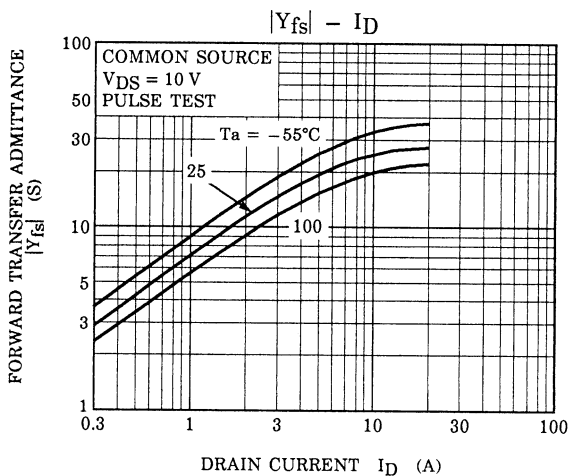
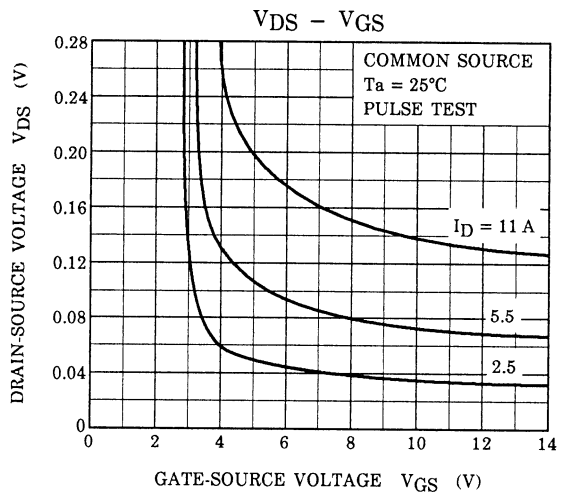
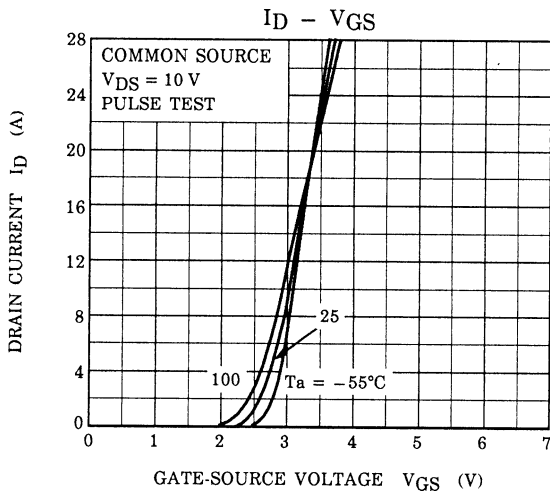
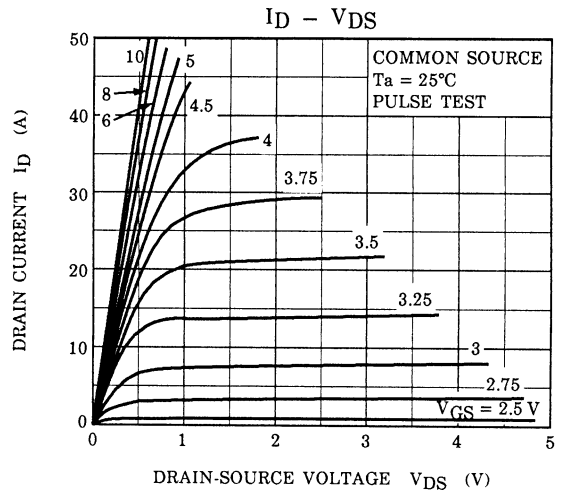
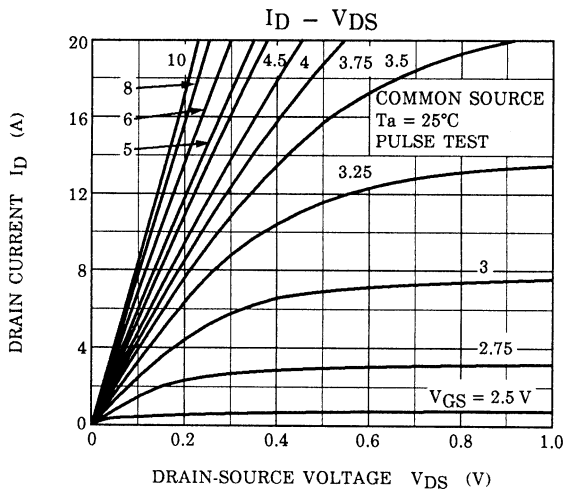
※ shows lot number. (year of manufacture: last decimal digit of the year of manufacture, month of manufacture: January to December are denoted by letters A to L respectively.)

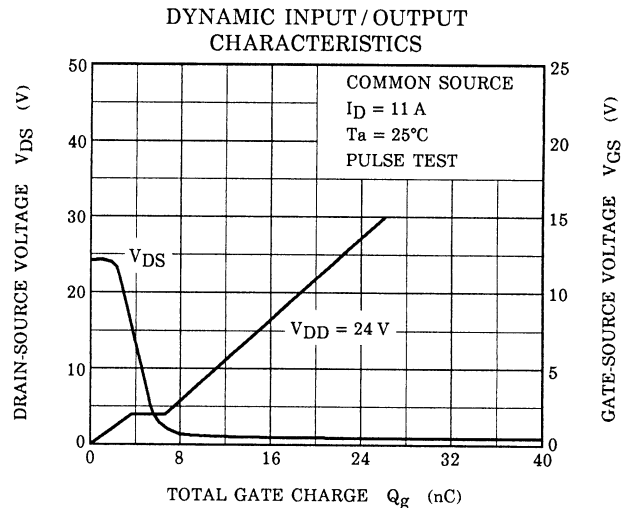
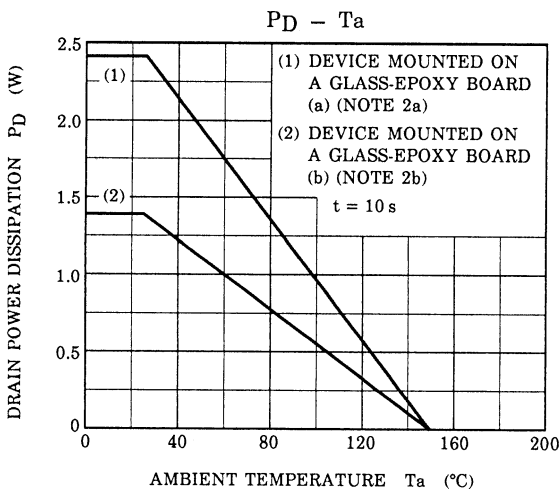
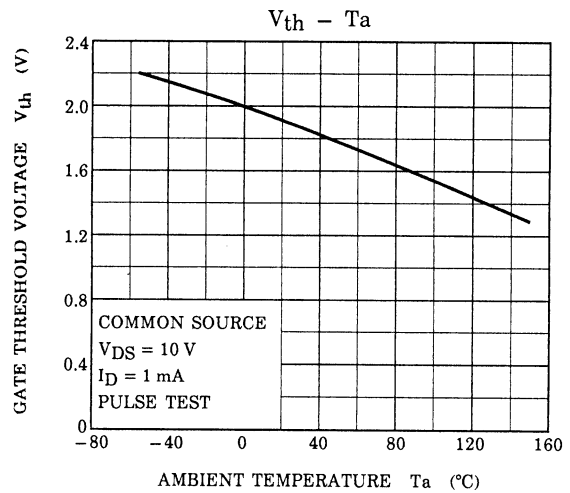
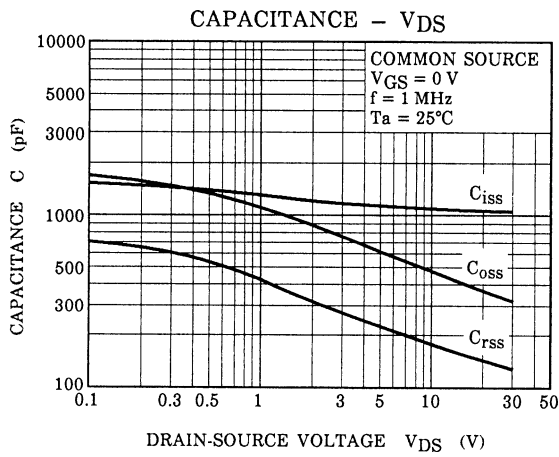
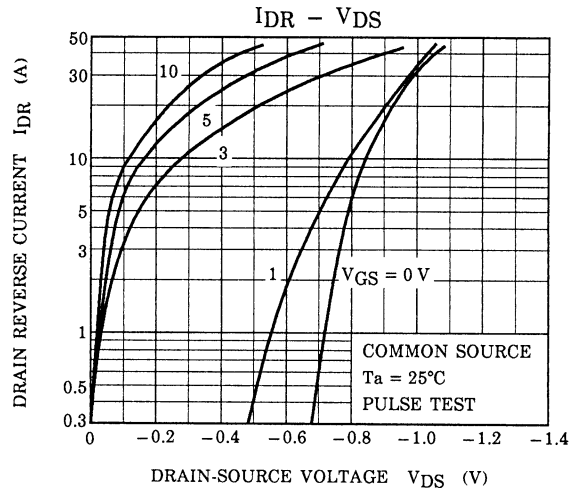
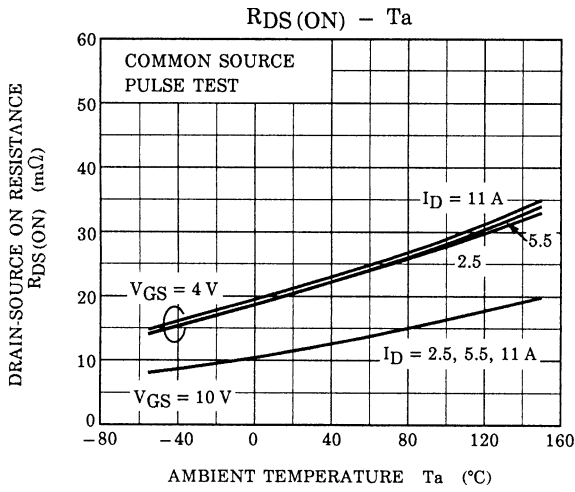
Electrical Characteristics (Ta = 25°C)

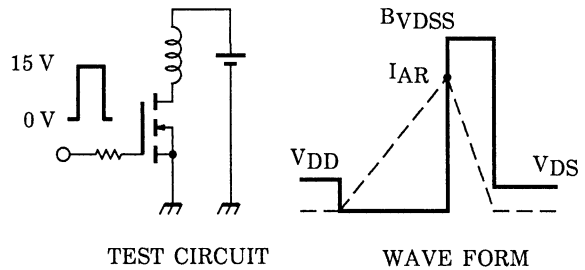
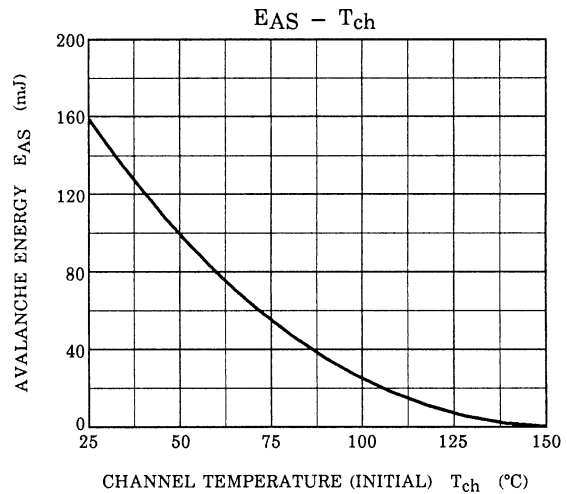
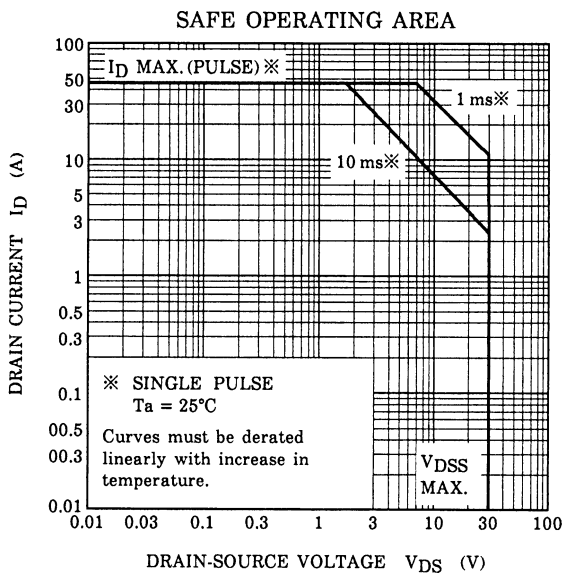
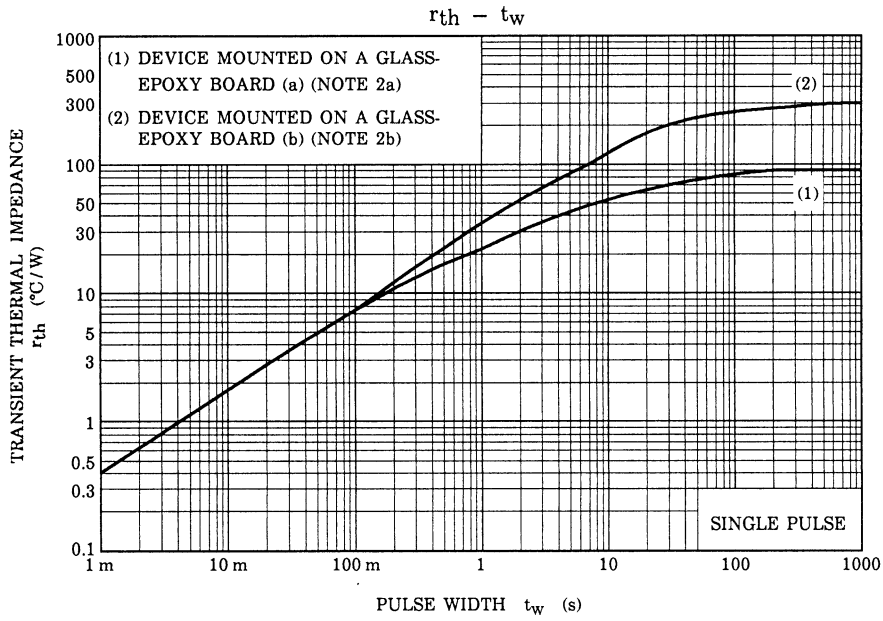
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|--|-----|------|----------|------------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Drain cut-off current | | I_{DSS} | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$ | — | — | 10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$ | 30 | — | — | V |
| | | $V_{(BR)DSX}$ | $I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$ | 15 | — | — | V |
| Gate threshold voltage | | V_{th} | $V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$ | 1.3 | — | 2.5 | V |
| Drain-source ON resistance | | $R_{DS(ON)}$ | $V_{GS} = 4.5\text{ V}, I_D = 5.5\text{ A}$ | — | 23 | 27 | $\text{m}\Omega$ |
| | | $R_{DS(ON)}$ | $V_{GS} = 10\text{ V}, I_D = 5.5\text{ A}$ | — | 13 | 16 | $\text{m}\Omega$ |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 5.5\text{ A}$ | 8 | 16 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 1150 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 140 | — | |
| Output capacitance | | C_{oss} | | — | 400 | — | |
| Switching time | Rise time | t_r | <p> $I_D = 5.5\text{ A}$ $V_{GS} = 10\text{ V}, 0\text{ V}$ V_{OUT} $R_L = 2.7\ \Omega$ $V_{DD} \approx 15\text{ V}$ $\text{Duty} \leq 1\%, t_w = 10\ \mu\text{s}$ </p> | — | 4 | — | ns |
| | Turn-on time | t_{on} | | — | 12 | — | |
| | Fall time | t_f | | — | 8 | — | |
| | Turn-off time | t_{off} | | — | 40 | — | |
| Total gate charge (Gate-source plus gate-drain) | | Q_g | $V_{DD} \approx 24\text{ V}, V_{GS} = 10\text{ V}, I_D = 11\text{ A}$ | — | 20 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 15 | — | |
| Gate-drain ("miller") charge | | Q_{gd} | | — | 5 | — | |

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

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|---|-----|------|------|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | 44 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = 11\text{ A}, V_{GS} = 0\text{ V}$ | — | — | -1.2 | V |







$T_{ch} = 25^\circ\text{C}$ (Initial)
 Peak $I_{AR} = 11\text{ A}$, $R_G = 25\ \Omega$
 $V_{DD} = 24\text{ V}$, $L = 1.0\text{ mH}$

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

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