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

# TPCA8102

Lithium Ion Battery Applications
Notebook PC Applications
Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 4.5mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 60S (typ.)
- Low leakage current: $I_{DSS}$ = −10 μA (max) ($V_{DS}$ = −30 V)
- Enhancement mode: $V_{th}$ = −0.8 to −2.0 V ($V_{DS}$ = −10 V, $I_D$ = −1 mA)

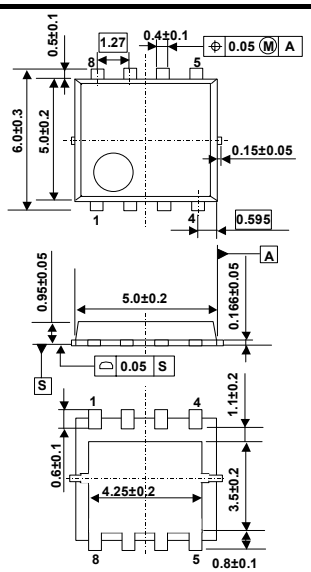
## Maximum Ratings (Ta = 25°C)

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-source voltage | | $V_{DSS}$ | −30 | V |
| Drain-gate voltage ($R_{GS}$ = 20 kΩ) | | $V_{DGR}$ | −30 | V |
| Gate-source voltage | | $V_{GSS}$ | ±20 | V |
| Drain current | DC (Note 1) | $I_D$ | − 40 | A |
| | Pulsed (Note 1) | $I_{DP}$ | −120 | |
| Drain power dissipation (Tc=25°C) | | $P_D$ | 45 | W |
| Drain power dissipation (t = 10 s) (Note 2a) | | $P_D$ | 2.8 | W |
| Drain power dissipation (t = 10 s) (Note 2b) | | $P_D$ | 1.6 | W |
| Single pulse avalanche energy (Note 3) | | $E_{AS}$ | 208 | mJ |
| Avalanche current | | $I_{AR}$ | − 40 | A |
| Repetitive avalanche energy (Tc=25°C) (Note 4) | | $E_{AR}$ | 4.5 | mJ |
| Channel temperature | | $T_{ch}$ | 150 | °C |
| Storage temperature range | | $T_{stg}$ | −55 to 150 | °C |

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

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

Unit: mm

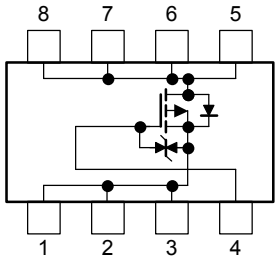



1,2,3 : SOURCE
4 : GATE
5,6,7,8 : DRAIN

| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 2-5Q1A |

Weight: 0.076 g (typ.)

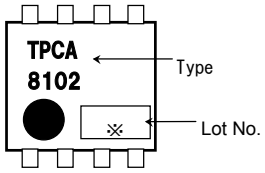
## Circuit Configuration



## Thermal Characteristics

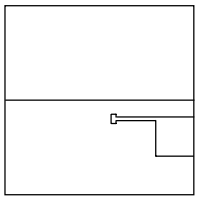
| Characteristics | Symbol | Max | Unit |
|---|---|---|---|
| Thermal resistance, channel to case (Tc=25°C) | $R_{th\ (ch\text{-}c)}$ | 2.78 | °C/W |
| Thermal resistance, channel to ambient (t = 10 s) (Note 2a) | $R_{th\ (ch\text{-}a)}$ | 44.6 | °C/W |
| Thermal resistance, channel to ambient (t = 10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

## Marking (Note 5)



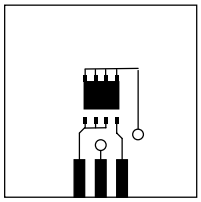

Note 1: Please use devices on condition that the channel temperature is below 150°C.

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



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

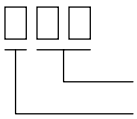
(b)

Note 3: $V_{DD}$ = 24 V, $T_{ch}$ = 25°C (initial), L = 100 μH, $R_G$ = 25 Ω, $I_{AR}$ = − 40 A

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

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

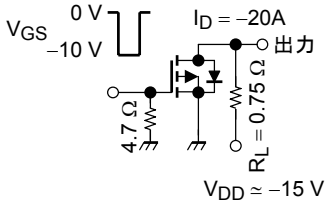
※ Weekly code: (Three digits)



Week of manufacture
(01 for first week of year, continues up to 52 or 53)

Year of manufacture
(One low-order digits of calendar year)

## 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 | −0.8 | — | −2.0 | V |
| Drain-source ON resistance | | $R_{DS\ (ON)}$ | $V_{GS}$ = −4 V, $I_D$ = −20 A | — | 9.0 | 14 | mΩ |
| | | | $V_{GS}$ = −10 V, $I_D$ = −20 A | — | 4.5 | 6.0 | |
| Forward transfer admittance | | $\|Y_{fs}\|$ | $V_{DS}$ = −10 V, $I_D$ = −20 A | 30 | 60 | — | S |
| Input capacitance | | $C_{iss}$ | $V_{DS}$ = −10 V, $V_{GS}$ = 0 V, f = 1 MHz | — | 4600 | — | pF |
| Reverse transfer capacitance | | $C_{rss}$ | | — | 850 | — | |
| Output capacitance | | $C_{oss}$ | | — | 980 | — | |
| Switching time | Rise time | $t_r$ |  Duty ≦ 1%, $t_w$ = 10 μs | — | 10 | — | ns |
| | Turn-ON time | $t_{on}$ | | — | 20 | — | |
| | Fall time | $t_f$ | | — | 78 | — | |
| | Turn-OFF time | $t_{off}$ | | — | 220 | — | |
| Total gate charge (gate-source plus gate-drain) | | $Q_g$ | $V_{DD}$ ≃ −24 V, $V_{GS}$ = 10 V, $I_D$ = −40 A | — | 109 | — | nC |
| Gate-source charge 1 | | $Q_{gs1}$ | | — | 24 | — | |
| Gate-drain (“miller”) charge | | $Q_{gd}$ | | — | 25 | — | |

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

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Drain reverse current | Pulse (Note 1) | $I_{DRP}$ | — | — | — | −120 | A |
| Forward voltage (diode) | | $V_{DSF}$ | $I_{DR}$ = −40 A, $V_{GS}$ = 0 V | — | — | 1.2 | V |

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