

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

# TPC8125

Lithium Ion Battery Applications  
Power Management Switch Applications

- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 10 \text{ m}\Omega$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \mu\text{A}$  (max) ( $V_{DS} = -30 \text{ V}$ )
- Enhancement mode:  $V_{th} = -0.8$  to  $-2.0 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -0.5 \text{ mA}$ )

## Absolute 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                                  |                | $V_{GSS}$ | -25/+20    | V    |
| Drain current  | DC (Note 1)    | $I_D$     | -10        | A    |
|  | Pulse (Note 1) | $I_{DP}$  | -40        |      |
| Drain power dissipation (t = 10 s)<br>(Note 2a)      |                | $P_D$     | 1.9        | W    |
| Drain power dissipation (t = 10 s)<br>(Note 2b)      |                | $P_D$     | 1.0        | W    |
| Single pulse avalanche energy<br>(Note 3)            |                | $E_{AS}$  | 65         | mJ   |
| Avalanche current (Note 1)                           |                | $I_{AR}$  | -10        | A    |
| Channel temperature                                  |                | $T_{ch}$  | 150        | °C   |
| Storage temperature range                            |                | $T_{stg}$ | -55 to 150 | °C   |

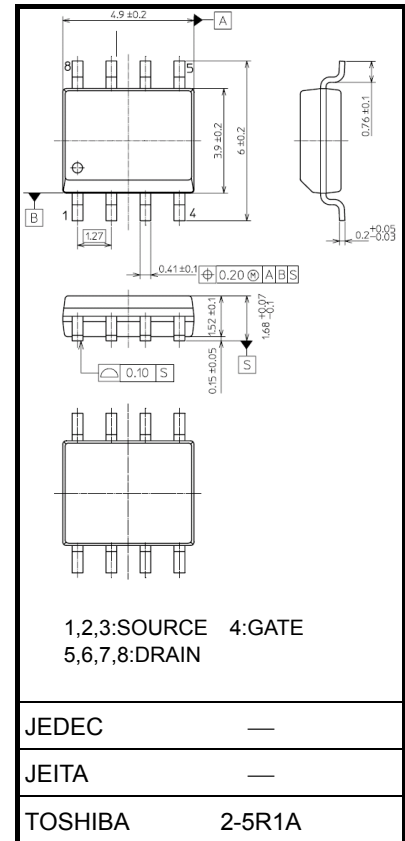
Note 1, Note 2, Note 3 : See the next page.

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).

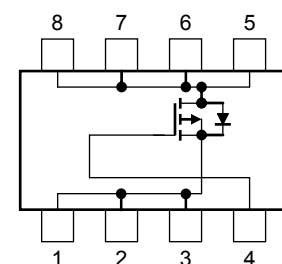
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.085 g (typ.)

## Circuit Configuration

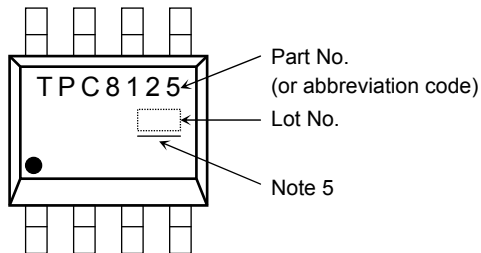


Start of commercial production  
2009-11

## Thermal Characteristics

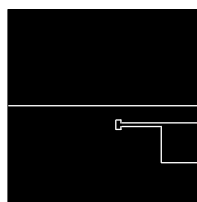
| Characteristics   | Symbol          | Max  | Unit |
|---|-----------------|------|------|
| Thermal resistance, channel to ambient<br>(t = 10 s)<br>(Note 2a) | $R_{th} (ch-a)$ | 65.8 | °C/W |
| Thermal resistance, channel to ambient<br>(t = 10 s)<br>(Note 2b) | $R_{th} (ch-a)$ | 125  | °C/W |

## Marking (Note 4)



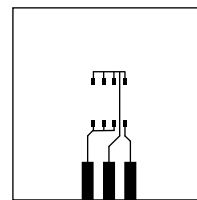
Note 1: Ensure that the channel temperature does not exceed 150°C.

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



(a)

FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)



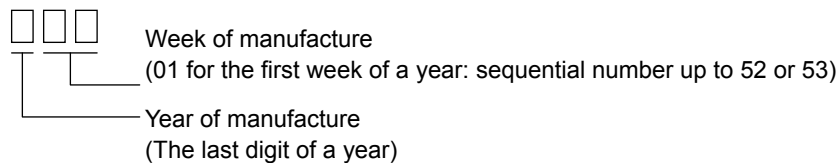
(b)

FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

Note 3:  $V_{DD} = -24\text{ V}$ ,  $T_{ch} = 25\text{ °C}$  (initial),  $L = 500\text{ }\mu\text{H}$ ,  $R_G = 25\text{ }\Omega$ ,  $I_{AR} = -10\text{ A}$

Note 4: • on lower left of the marking indicates Pin 1.

※ Weekly code: (Three digits)



Note 5: 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 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

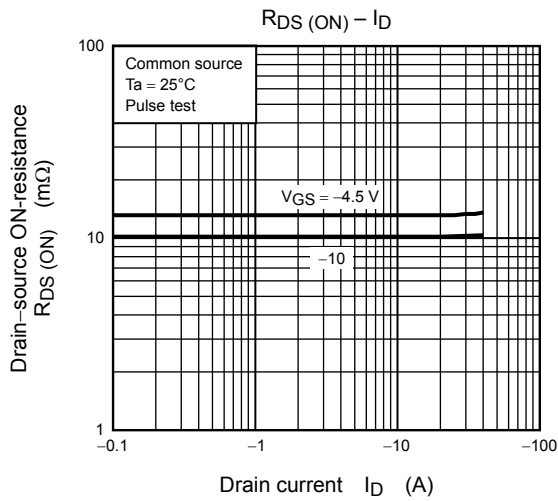
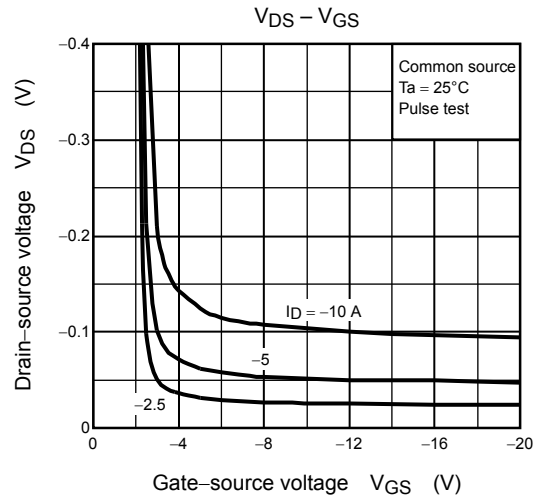
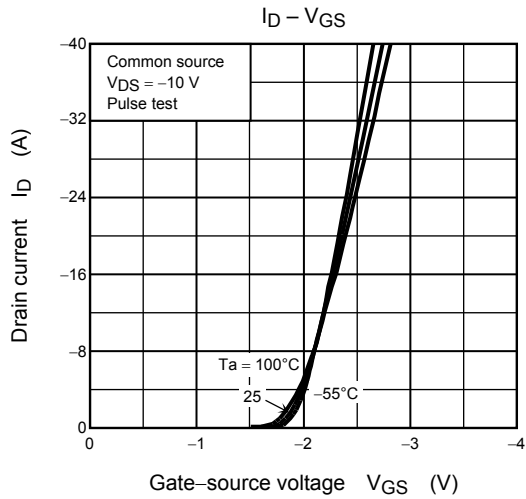
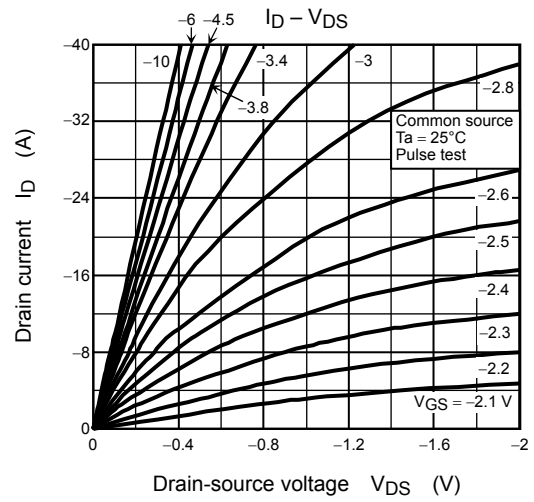
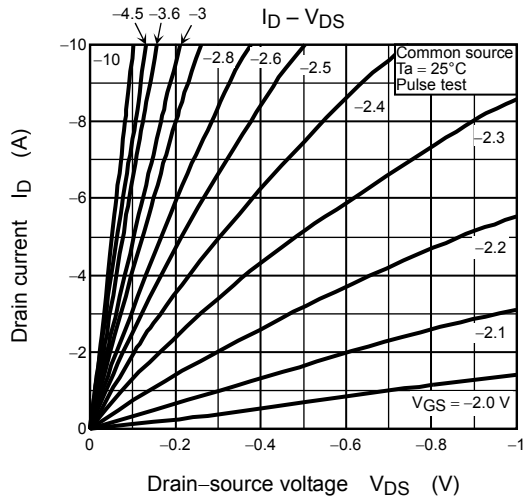
## Electrical Characteristics (Ta = 25°C)

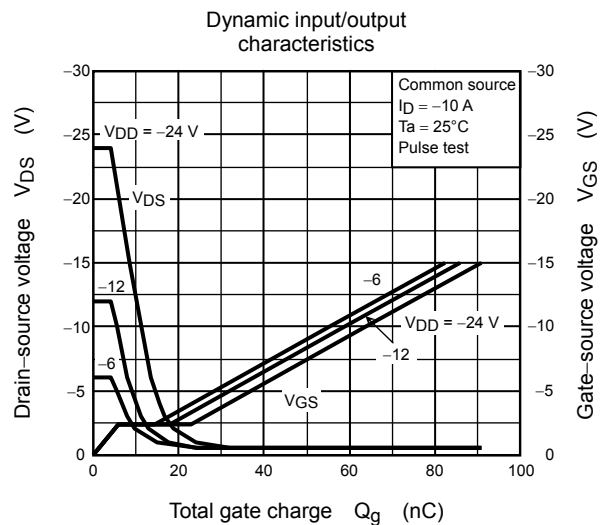
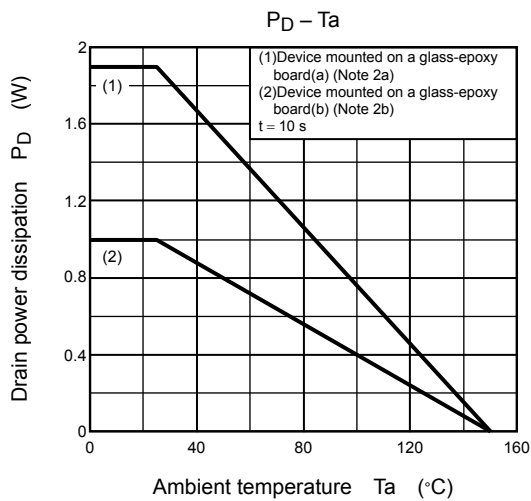
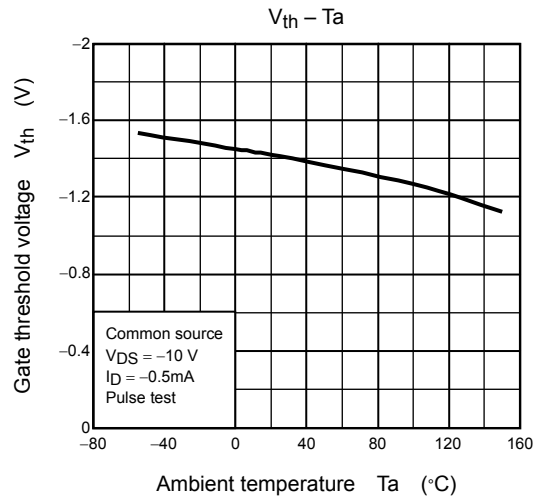
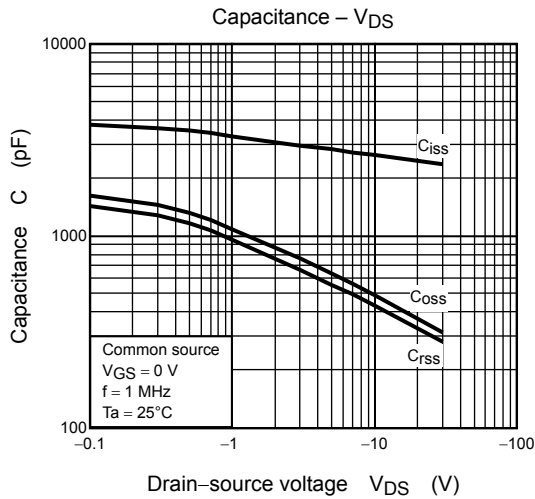
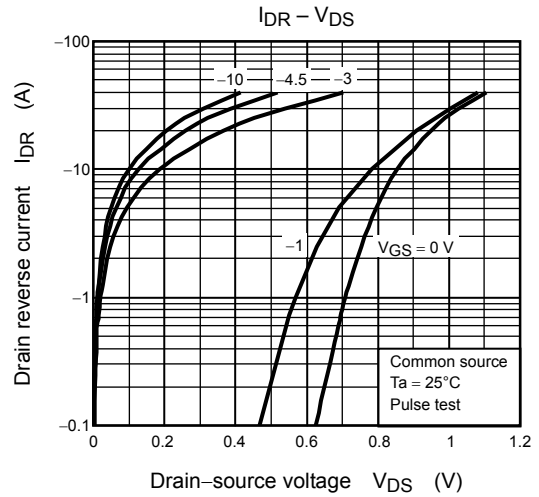
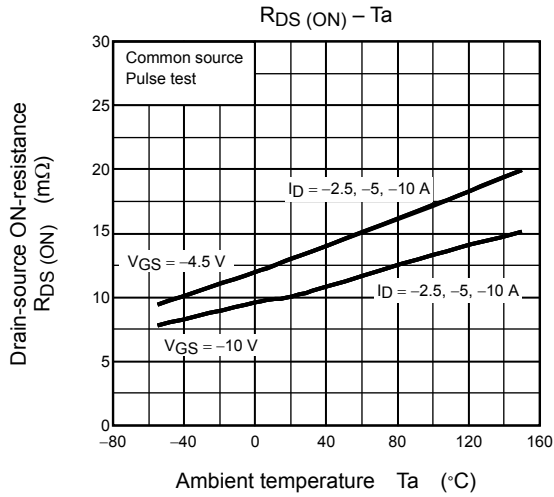
| Characteristics                                 |               | Symbol        | Test Condition   | Min  | Typ. | Max       | Unit          |
|---|---------------|---------------|--|------|------|-----------|---------------|
| Gate leakage current                            |               | $I_{GSS}$     | $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$                          | —    | —    | $\pm 100$ | nA            |
| Drain cut-OFF current                           |               | $I_{DSS}$     | $V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$                             | —    | —    | -10       | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR)DSS}$ | $I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$                               | -30  | —    | —         | V             |
|   |               | $V_{(BR)DSX}$ | $I_D = -10\text{ mA}, V_{GS} = 10\text{ V}$ (Note 6)                     | -21  | —    | —         |               |
| Gate threshold voltage                          |               | $V_{th}$      | $V_{DS} = -10\text{ V}, I_D = -0.5\text{ mA}$                            | -0.8 | —    | -2.0      | V             |
| Drain-source ON-resistance                      |               | $R_{DS(ON)}$  | $V_{GS} = -4.5\text{ V}, I_D = -5\text{ A}$                              | —    | 13   | 17        | m $\Omega$    |
|   |               |               | $V_{GS} = -10\text{ V}, I_D = -5\text{ A}$                               | —    | 10   | 13        |               |
| Input capacitance                               |               | $C_{iss}$     | $V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$           | —    | 2580 | —         | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$     |  | —    | 430  | —         |               |
| Output capacitance                              |               | $C_{oss}$     |  | —    | 490  | —         |               |
| Switching time                                  | Rise time     | $t_r$         |  | —    | 8    | —         | ns            |
|   | Turn-ON time  | $t_{on}$      |  | —    | 16   | —         |               |
|   | Fall time     | $t_f$         |  | —    | 75   | —         |               |
|   | Turn-OFF time | $t_{off}$     |  | —    | 245  | —         |               |
| Total gate charge (gate-source plus gate-drain) |               | $Q_g$         | $V_{DD} \approx -24\text{ V}, V_{GS} = -10\text{ V}, I_D = -10\text{ A}$ | —    | 64   | —         | nC            |
| Gate-source charge 1                            |               | $Q_{gs1}$     |  | —    | 6    | —         |               |
| Gate-drain ("miller") charge                    |               | $Q_{gd}$      |  | —    | 17   | —         |               |

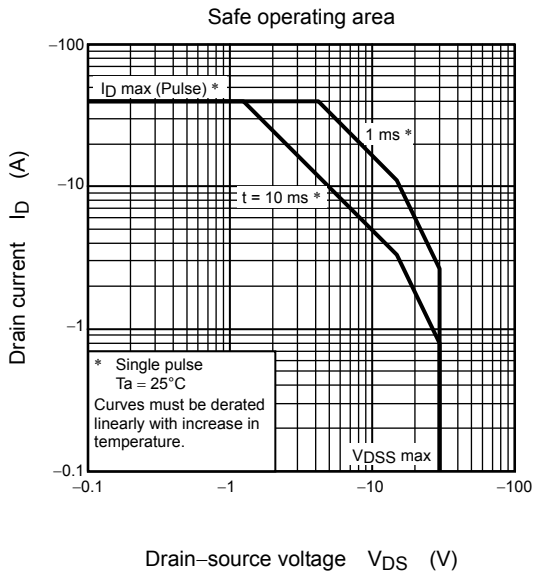
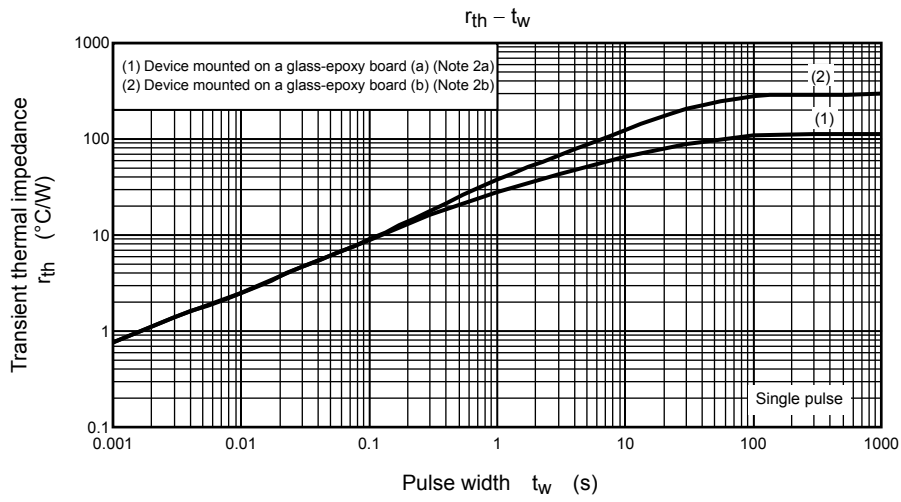
## Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristics         |                | Symbol    | Test Condition                               | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|--|-----|------|-----|------|
| Drain reverse current   | Pulse (Note 1) | $I_{DRP}$ | —  | —   | —    | -40 | A    |
| Forward voltage (diode) |                | $V_{DSF}$ | $I_{DR} = -10\text{ A}, V_{GS} = 0\text{ V}$ | —   | —    | 1.2 | V    |

Note 6: VDSX mode (the application of a plus voltage between gate and source) may cause decrease in maximum rating of drain-source voltage.







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