

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

## TPC8128

Lithium Ion Battery Applications

Power Management Switch Applications

- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 3.9 \text{ m}\Omega$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -30 \text{ V}$ )
- Enhancement mode:  $V_{th} = -0.8 \text{ to } -2.0 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -0.5 \text{ mA}$ )

### Absolute 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		$V_{GSS}$	-25/+20	V
Drain current	DC (Note 1)	$I_D$	-16	A
	Pulse (Note 1)	$I_{DP}$	-64	
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)		$E_{AS}$	166	mJ
Avalanche current (Note 1)		$I_{AR}$	-16	A
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

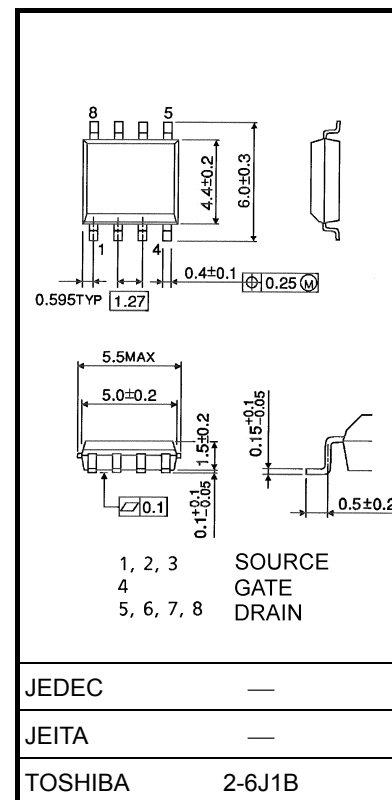
Note 1, Note 2, Note 3 : See the next page.

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.).

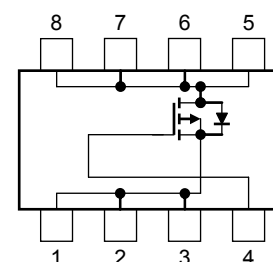
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.080 g (typ.)

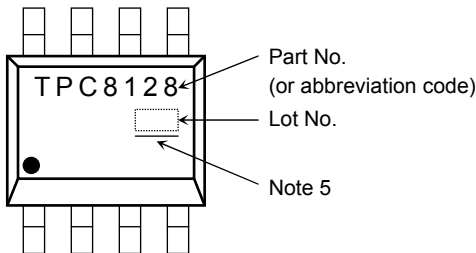
### Circuit Configuration



## Thermal Characteristics

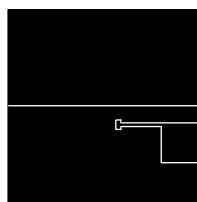
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th(ch-a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th(ch-a)}$	125	°C/W

## Marking (Note 4)

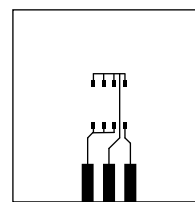


Note 1: Ensure that the channel temperature does not exceed 150°C.

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



(a)



(b)

Note 3:  $V_{DD} = -24\text{ V}$ ,  $T_{ch} = 25\text{ °C}$  (initial),  $L = 500\text{ }\mu\text{H}$ ,  $R_G = 25\text{ }\Omega$ ,  $I_{AR} = -16\text{ A}$

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

※ Weekly code: (Three digits)



Week of manufacture

(01 for the first week of a year: sequential number up to 52 or 53)

Year of manufacture

(The last digit of a year)

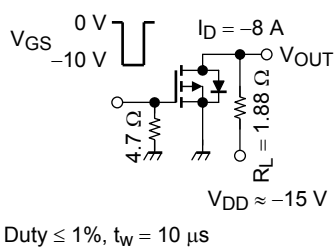
Note 5: A line under a Lot No. identifies the indication of product Labels.

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 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

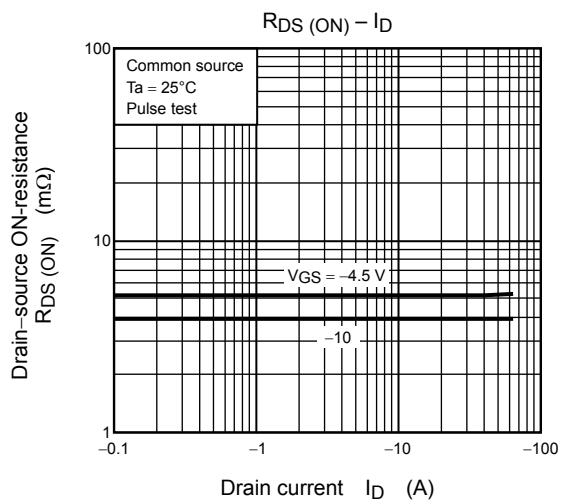
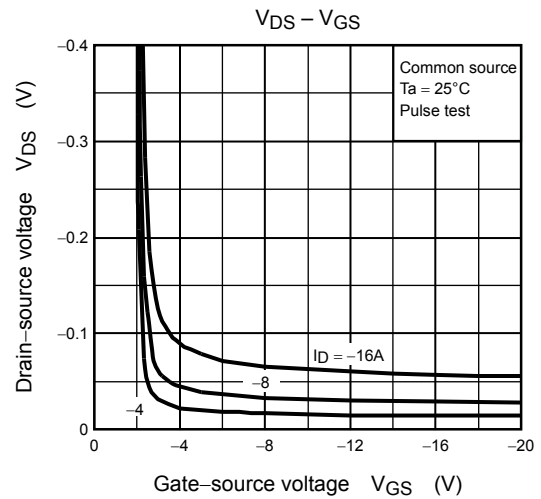
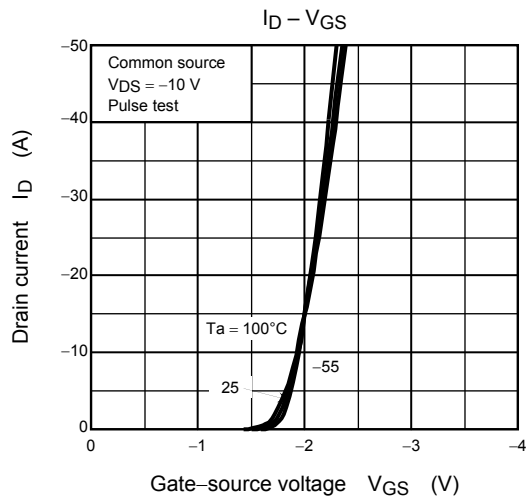
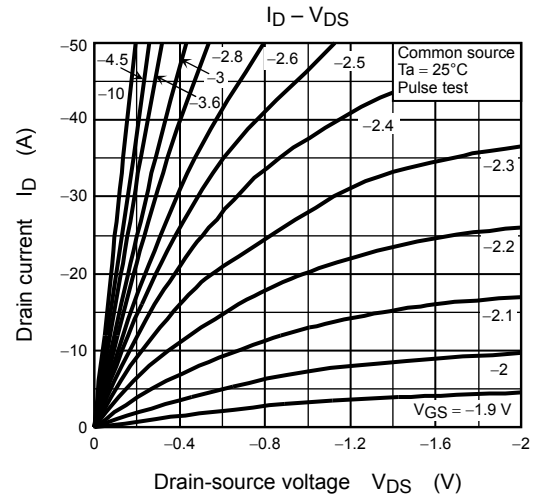
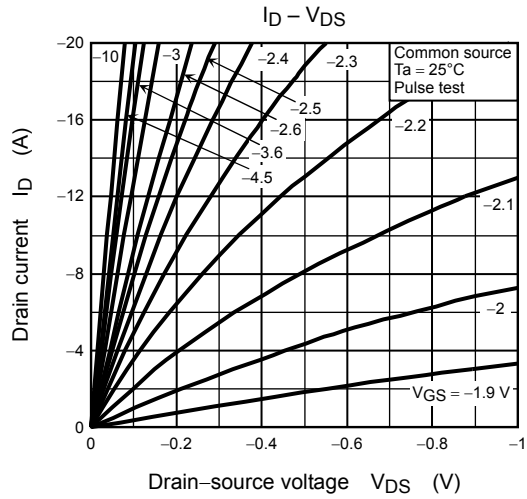
## Electrical Characteristics (Ta = 25°C)

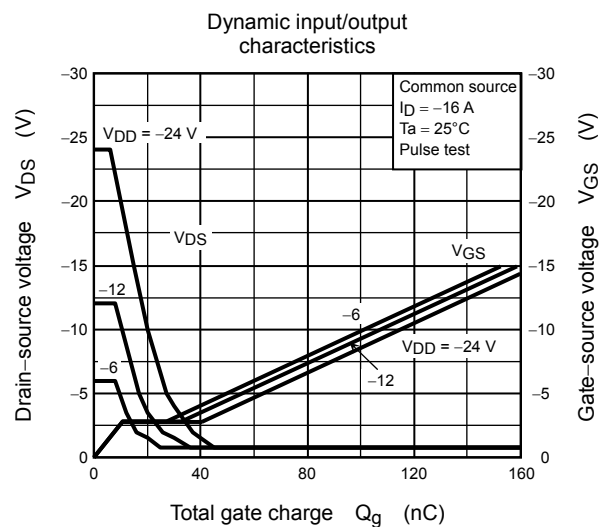
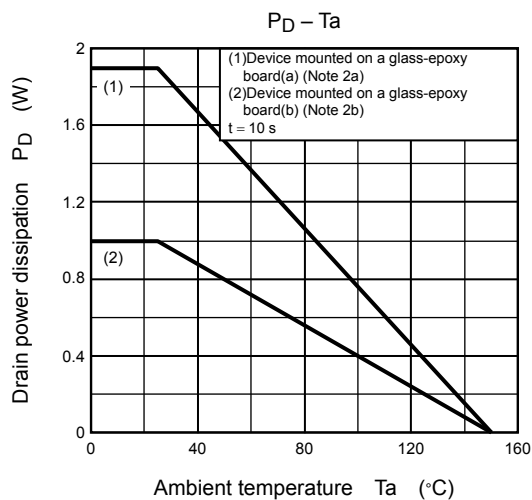
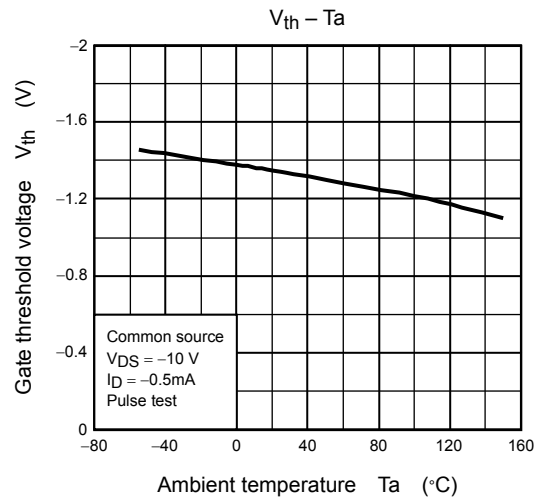
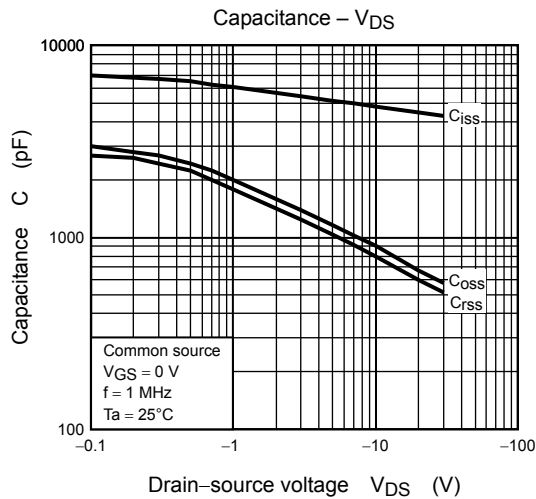
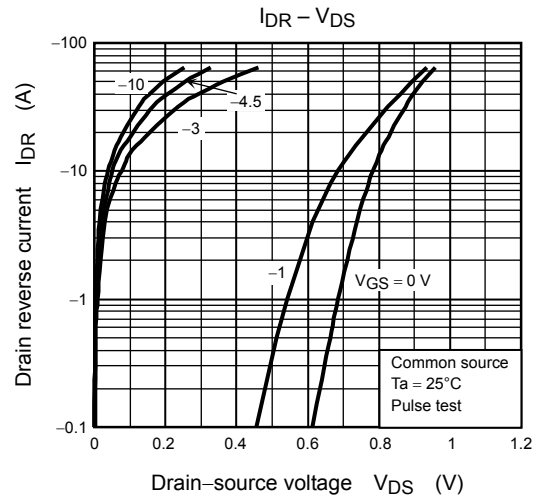
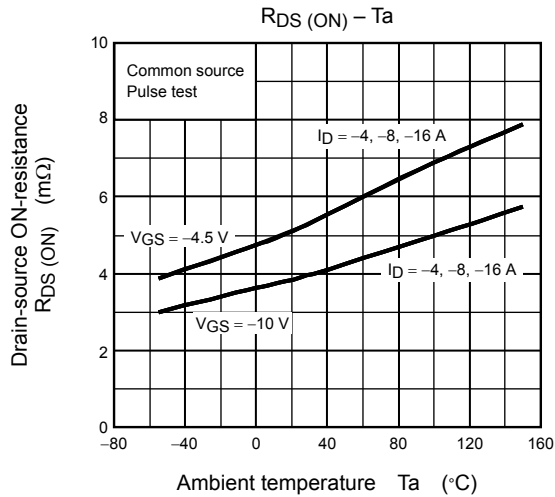
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V	—	—	±100	nA
Drain cut-OFF current		I <sub>DSS</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V	—	—	-10	μA
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 0 V	-30	—	—	V	
	V <sub>(BR) DSX</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 10 V (Note 6)	-21	—	—		
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.5 mA	-0.8	—	-2.0	V
Drain-source ON-resistance	R <sub>DS (ON)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -8 A	—	5.3	6.9	mΩ	
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -8 A	—	3.9	5		
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	4800	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	800	—	
Output capacitance		C <sub>oss</sub>		—	900	—	
Switching time	Rise time	t <sub>r</sub>	 <p>Duty ≤ 1%, t<sub>w</sub> = 10 μs</p>	—	10	—	ns
	Turn-ON time	t <sub>on</sub>		—	19	—	
	Fall time	t <sub>f</sub>		—	140	—	
	Turn-OFF time	t <sub>off</sub>		—	420	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ -24 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -16 A	—	115	—	nC
Gate-source charge 1		Q <sub>gs1</sub>		—	11	—	
Gate-drain ("miller") charge		Q <sub>gd</sub>		—	30	—	

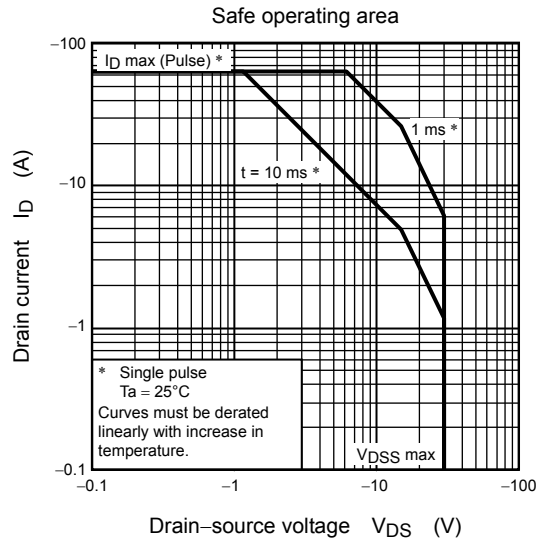
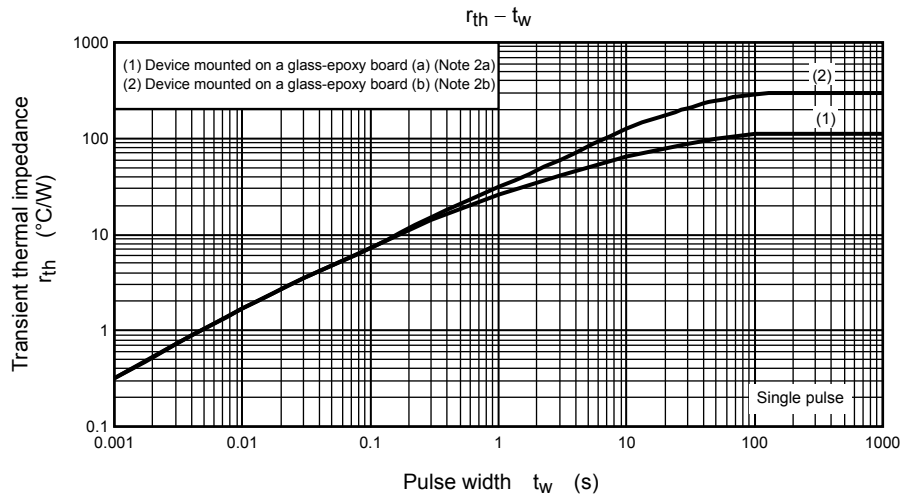
## Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	-64	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = -16 \text{ A}$ , $V_{GS} = 0 \text{ V}$	—	—	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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