

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

## TPC8120

Lithium Ion Battery Applications  
Power Management Switch Applications

- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 2.6 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 80 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -30 \text{ V}$ )
- Enhancement mode:  $V_{th} = -0.8$  to  $-2.0 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -1 \text{ mA}$ )

### 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)	$I_D$	-18	A
	Pulse (Note 1)	$I_{DP}$	-72	
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)		$E_{AS}$	211	mJ
Avalanche current		$I_{AR}$	-18	A
Repetitive avalanche energy (Note 2a) (Note 4)		$E_{AR}$	0.03	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

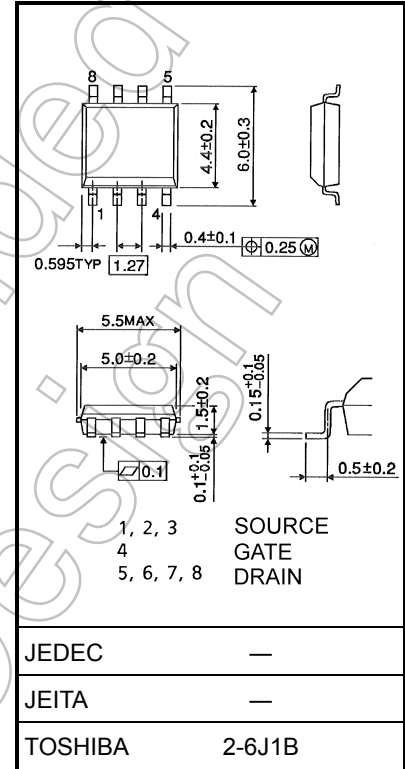
Note 1, Note 2, Note 3 and Note 4: See the next page.

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).

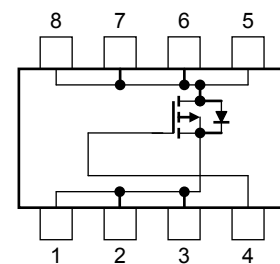
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.080 g (typ.)

### Circuit Configuration

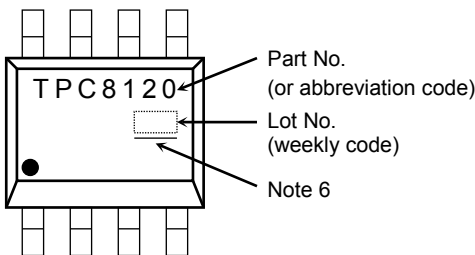


Start of commercial production  
2009-02

## 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 5)

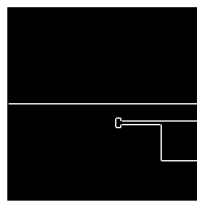


Note 6: A line under a Lot No. identifies the indication of product Labels [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is 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

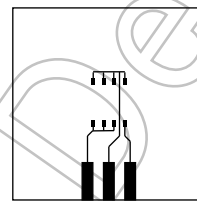
Note 1: Ensure that the channel temperature does not exceed 150°C.

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:  $V_{DD} = -24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 500\ \mu\text{H}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -18\ \text{A}$

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

Note 5: • 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)

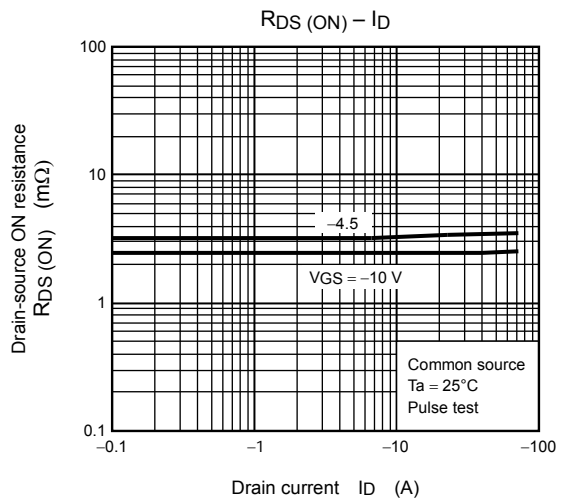
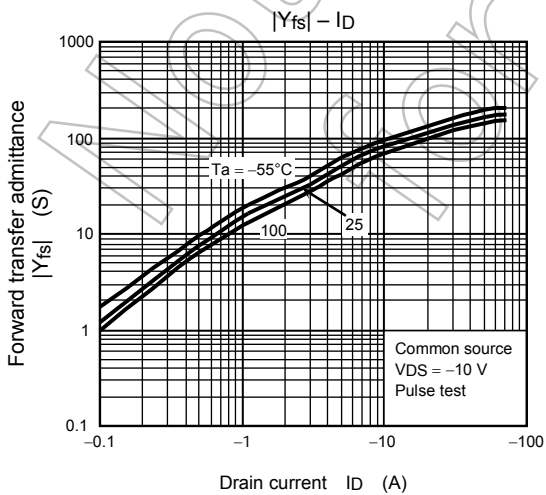
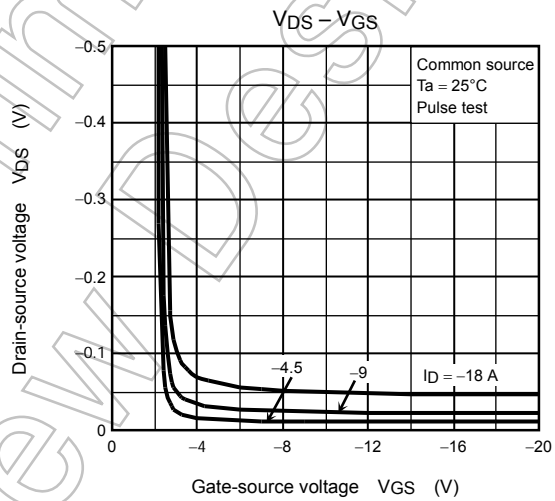
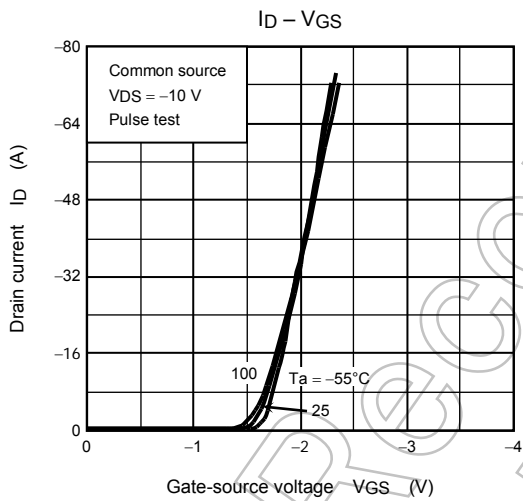
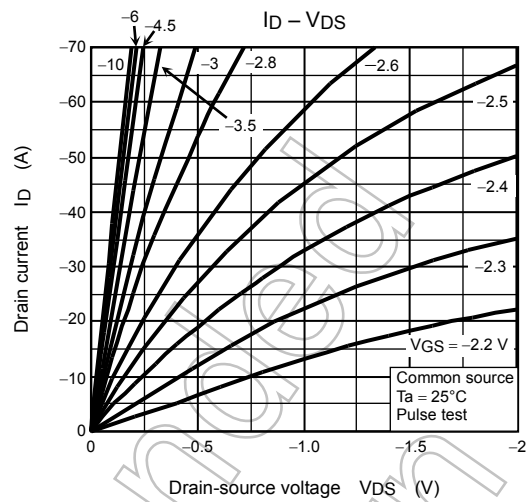
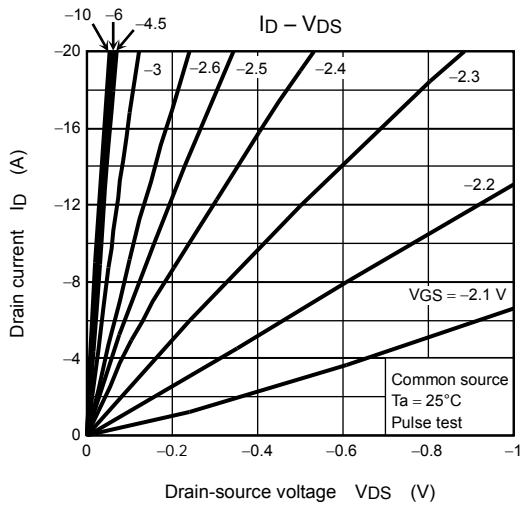
## Electrical Characteristics (Ta = 25°C)

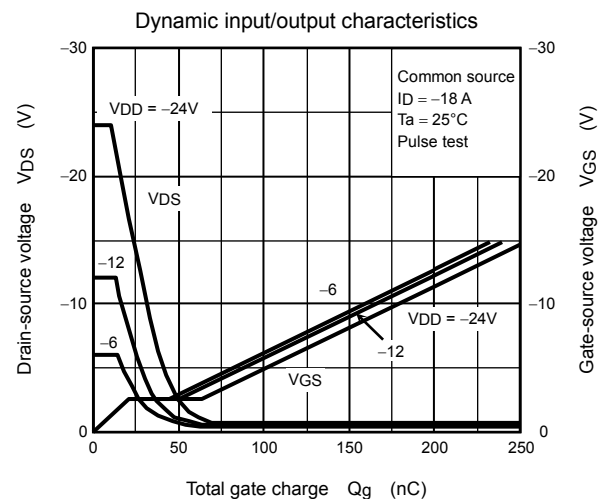
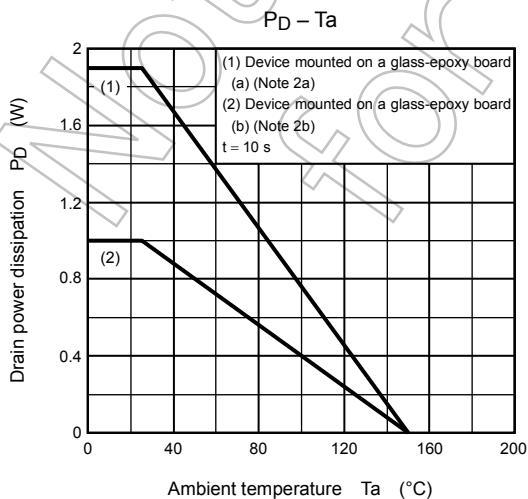
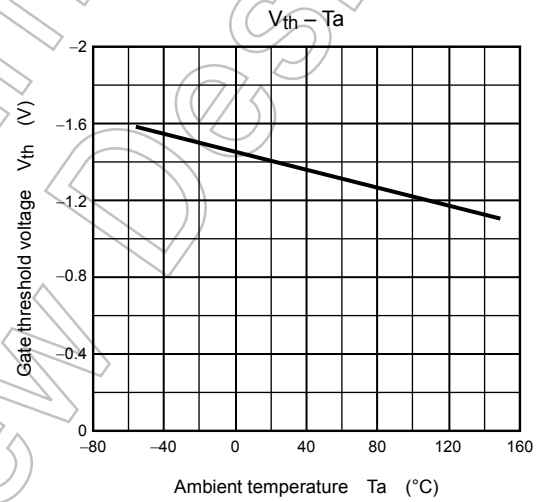
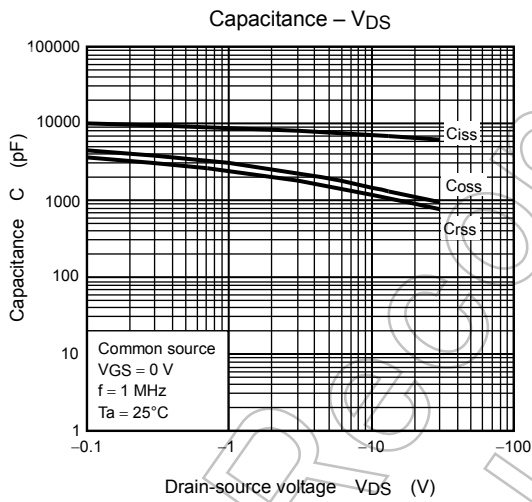
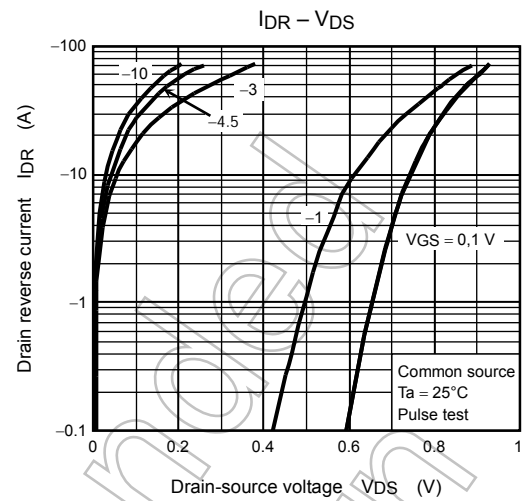
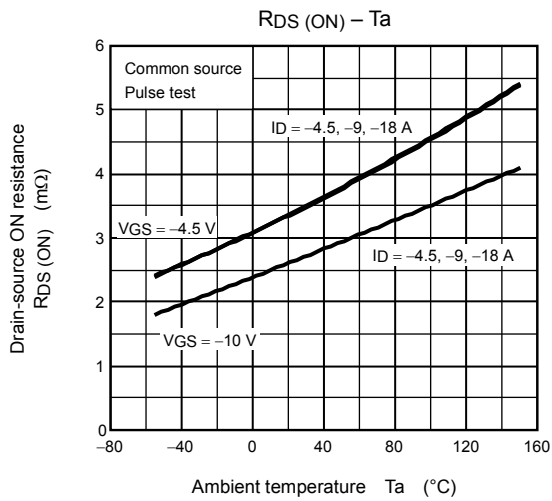
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		IGSS	VGS = ±20 V, VDS = 0 V	—	—	±100	nA
Drain cut-OFF current		IDSS	VDS = -30 V, VGS = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V(BR)DSS	ID = -10 mA, VGS = 0 V	-30	—	—	V
		V(BR)DSX	ID = -10 mA, VGS = 10V (Note 7)	-21	—	—	
Gate threshold voltage		Vth	VDS = -10 V, ID = -1 mA	-0.8	—	-2.0	V
Drain-source ON-resistance		RDS(ON)	VGS = -4.5 V, ID = -9 A	—	3.3	4.2	mΩ
			VGS = -10 V, ID = -9 A	—	2.6	3.2	
Forward transfer admittance		Yfs	VDS = -10 V, ID = -9 A	40	80	—	S
Input capacitance		Ciss	VDS = -10 V, VGS = 0 V, f = 1 MHz	—	7420	—	pF
Reverse transfer capacitance		Crss		—	1180	—	
Output capacitance		Coss		—	1440	—	
Switching time	Rise time	tr		—	10	—	ns
	Turn-ON time	ton		—	18	—	
	Fall time	tf		—	275	—	
	Turn-OFF time	toff		Duty ≤ 1%, tw = 10 μs	—	790	
Total gate charge (gate-source plus gate-drain)		Qg	VDD ≈ -24 V, VGS = -10 V, ID = -18 A	—	180	—	nC
Gate-source charge 1		Qgs1		—	20	—	
Gate-drain ("miller") charge		Qgd		—	40	—	

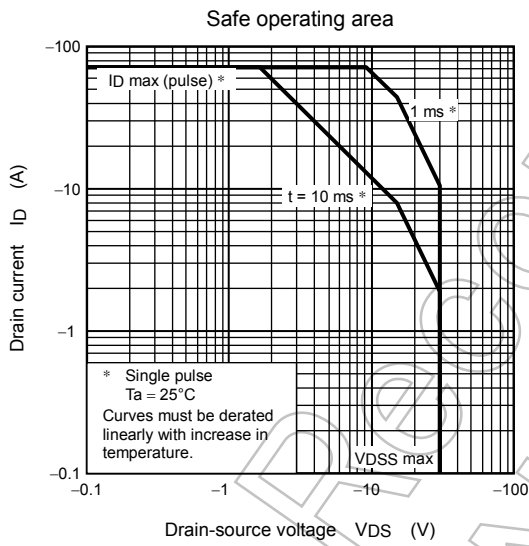
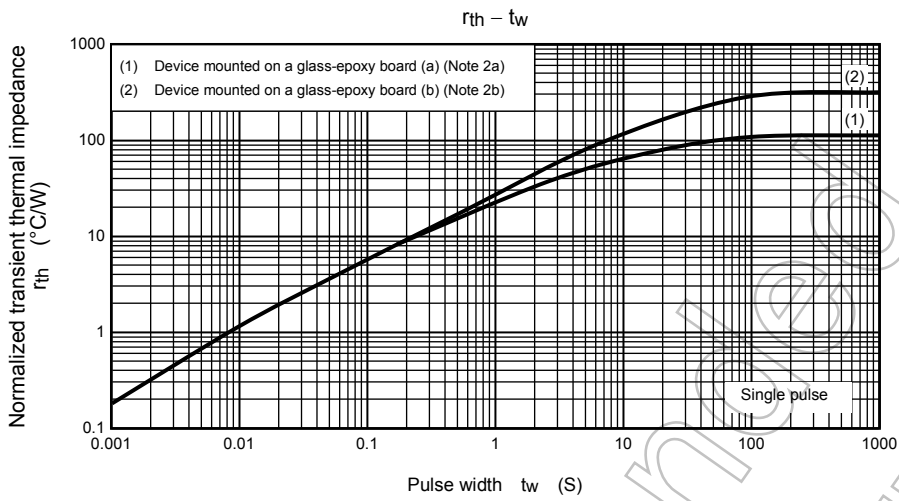
## Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	IDRP	—	—	—	-72	A
Forward voltage (diode)		VDSF	IDR = -18 A, VGS = 0 V	—	—	1.2	V

Note 7: 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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