

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

# TPC8104-H

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

- Small footprint due to small and thin package
- High speed switching
- Small gate charge :  $Q_g = 17 \text{ nC (typ.)}$
- Low drain-source ON resistance :  $R_{DS(ON)} = 38 \text{ m}\Omega \text{ (typ.)}$
- High forward transfer admittance :  $|Y_{fs}| = 7.0 \text{ S (typ.)}$
- Low leakage current :  $I_{DSS} = -10 \text{ }\mu\text{A (max) (}V_{DS} = -30 \text{ V)}$
- Enhancement-mode :  $V_{th} = -0.8 \sim -2.0 \text{ V (}V_{DS} = -10 \text{ V, }I_D = -1 \text{ mA)}$

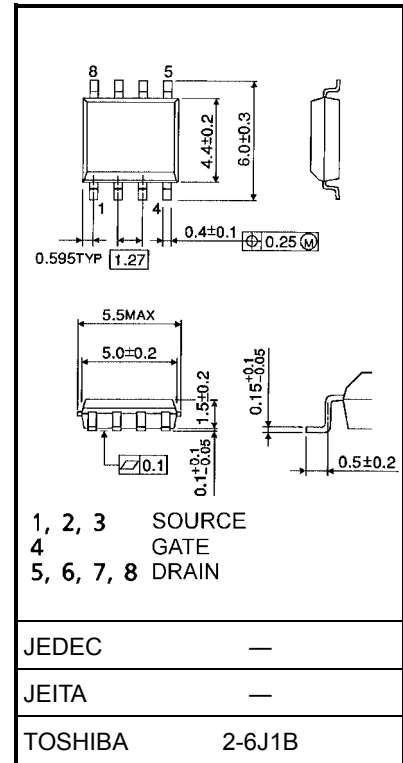
## Maximum Ratings (Ta = 25°C)

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		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	-5	A
	Pulse (Note 1)	$I_{DP}$	-20	
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)		$E_{AS}$	32.5	mJ
Avalanche current		$I_{AR}$	-5	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.

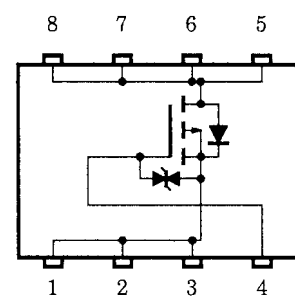
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

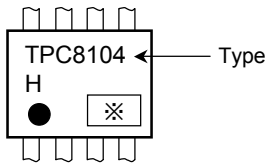
## Circuit Configuration



## 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

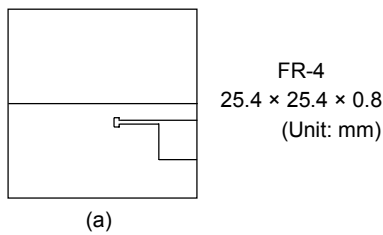
## Marking (Note 5)



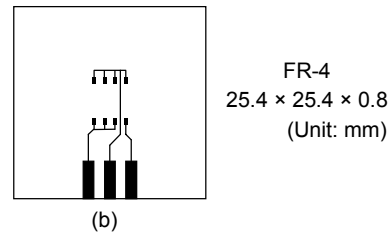
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:

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



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



Note 3:  $V_{DD} = -24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -5\text{ A}$

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

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

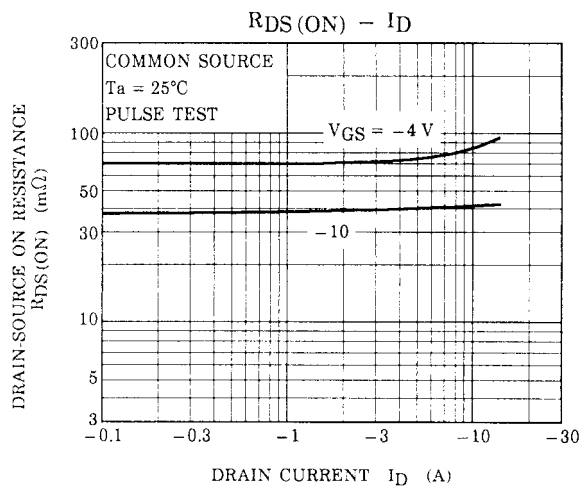
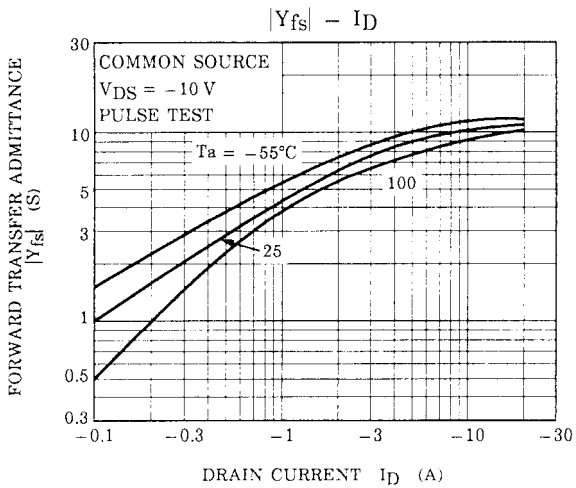
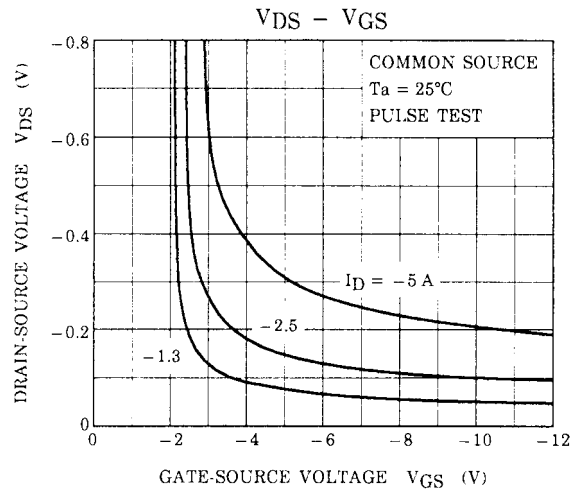
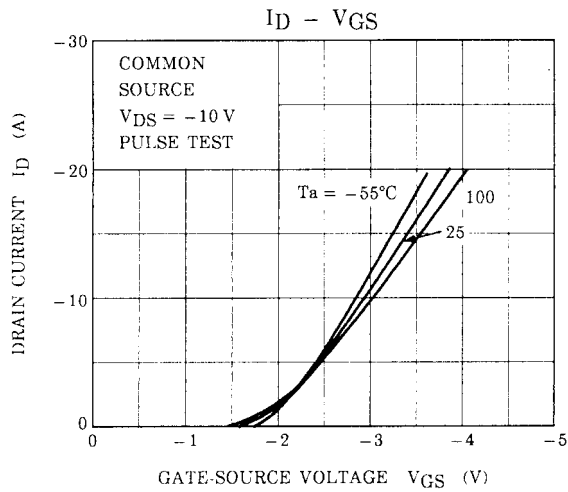
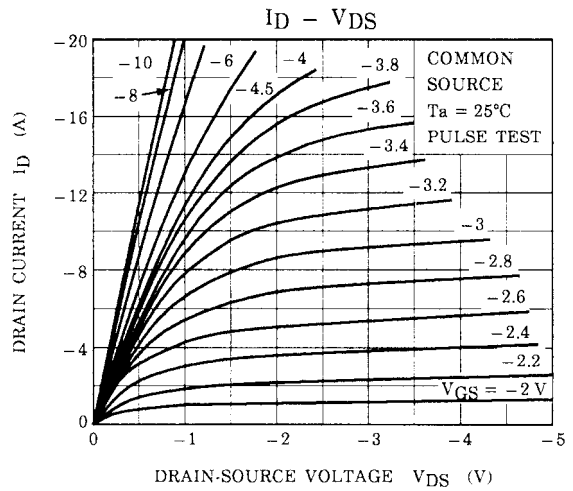
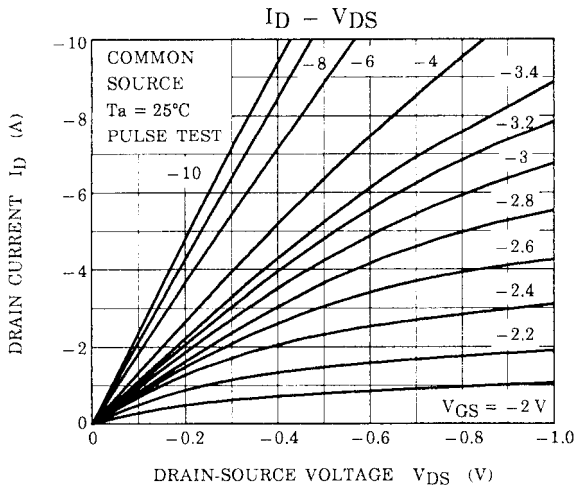
※ shows Lot number. (year of manufacture: last decimal digit of the year of manufacture, month of manufacture: january to december are denoted by letters A to L respectively)

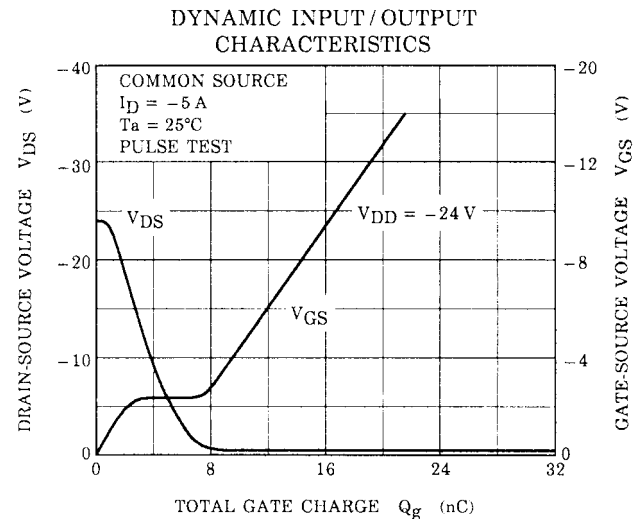
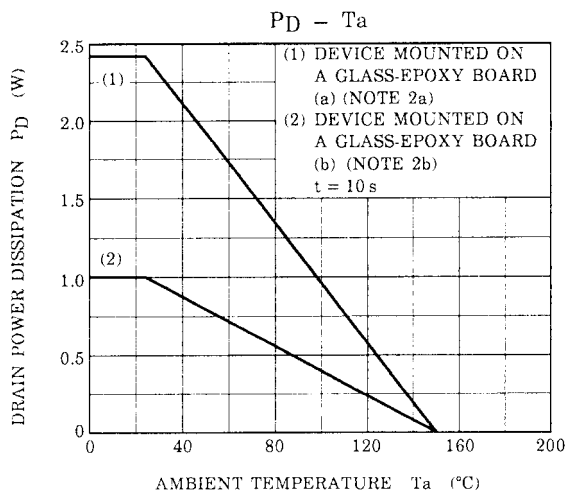
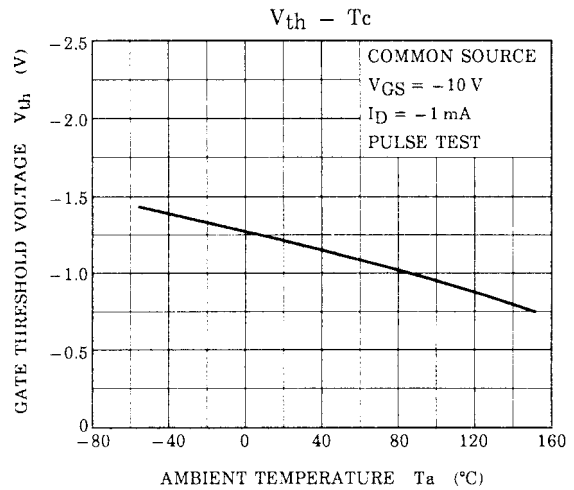
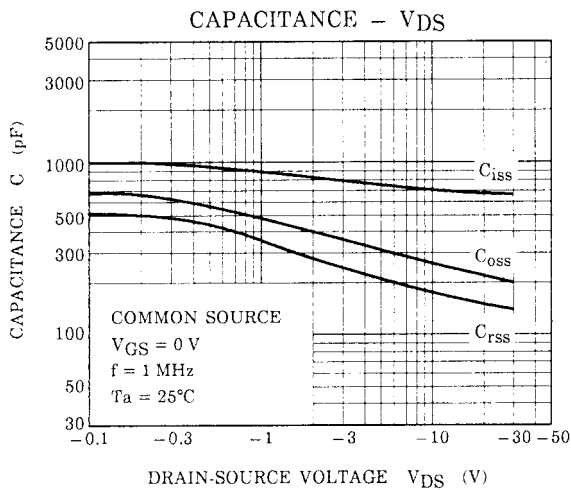
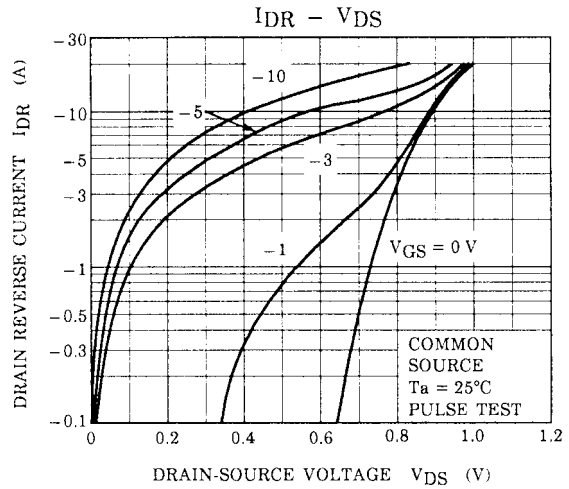
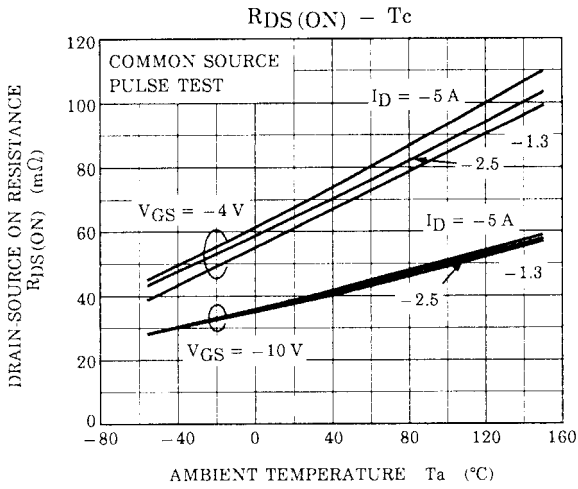
## Electrical Characteristics (Ta = 25°C)

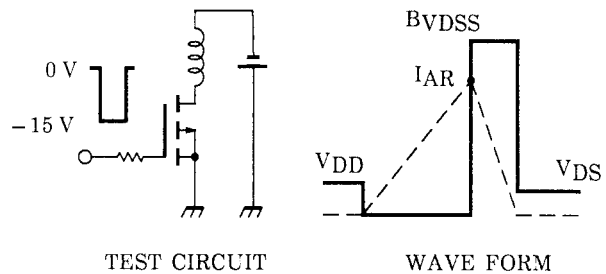
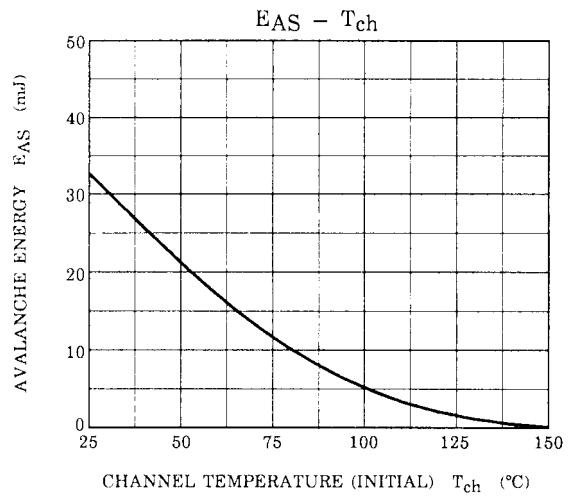
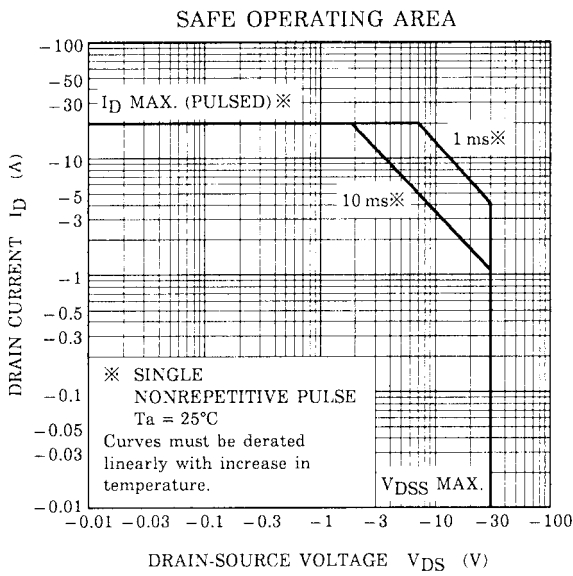
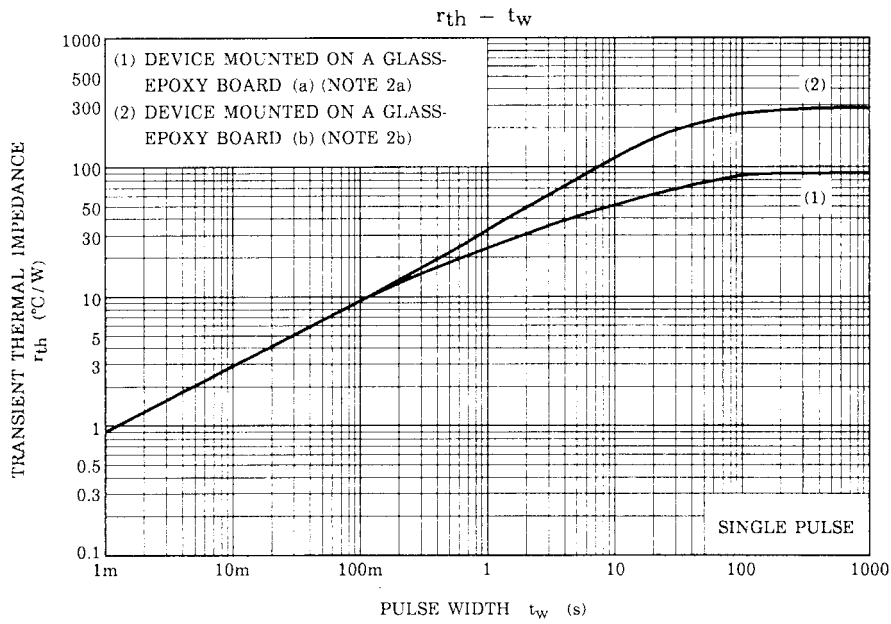
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-30	—	—	V
		$V_{(BR)DSX}$	$I_D = -10\text{ mA}, V_{GS} = 20\text{ V}$	-15	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-0.8	—	-2.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -4\text{ V}, I_D = -2.5\text{ A}$	—	68	120	m $\Omega$
		$R_{DS(ON)}$	$V_{GS} = -10\text{ V}, I_D = -2.5\text{ A}$	—	38	65	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -2.5\text{ A}$	3.5	7.0	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	730	—	pF
Reverse transfer capacitance		$C_{rss}$		—	190	—	
Output capacitance		$C_{oss}$		—	270	—	
Switching time	Rise time	$t_r$		—	8	—	ns
	Turn-on time	$t_{on}$		—	15	—	
	Fall time	$t_f$		—	26	—	
	Turn-off time	$t_{off}$		—	76	—	
Total gate charge (Gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -24\text{ V}, V_{GS} = -10\text{ V}, I_D = -5\text{ A}$	—	17	—	nC
Gate-source charge		$Q_{gs}$		—	13	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	4	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	-2.0	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.2	V







$T_{ch} = 25^\circ\text{C}$  (Initial)  
 Peak  $I_{AR} = -5\text{ A}$ ,  $R_G = 25\ \Omega$   
 $V_{DD} = -24\text{ V}$ ,  $L = 1.0\text{ mH}$

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

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