

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 : $V_{th} = -0.8 \sim -2.0 \text{ V (}V_{DS} = -10 \text{ V, }I_D = -1 \text{ mA)}$

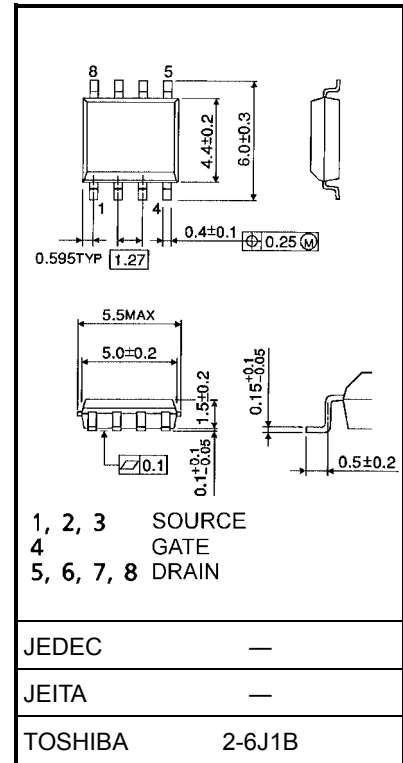
Maximum Ratings (Ta = 25°C)

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}	± 20	V
Drain current	DC (Note 1)	I_D	-5	A
	Pulse (Note 1)	I_{DP}	-20	
Drain power dissipation	($t = 10 \text{ s}$) (Note 2a)	P_D	2.4	W
Drain power dissipation	($t = 10 \text{ s}$) (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.

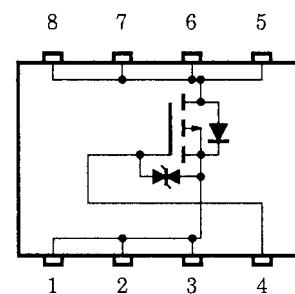
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

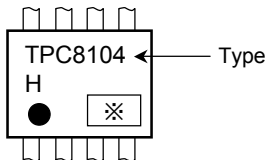
Circuit Configuration



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

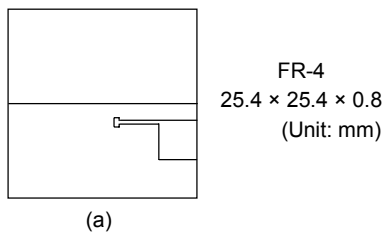
Marking (Note 5)



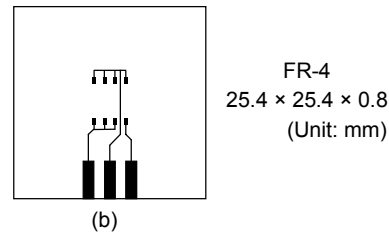
Note 1: Please use devices on condition that the channel temperature is below 150°C.

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.

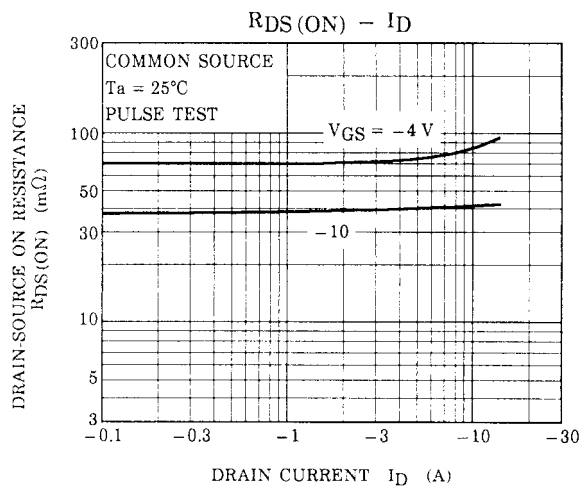
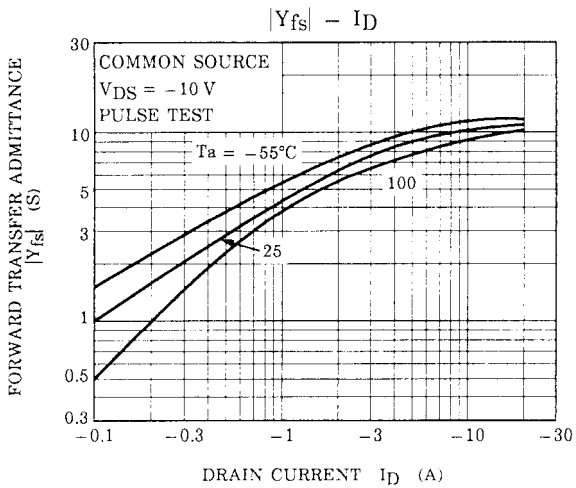
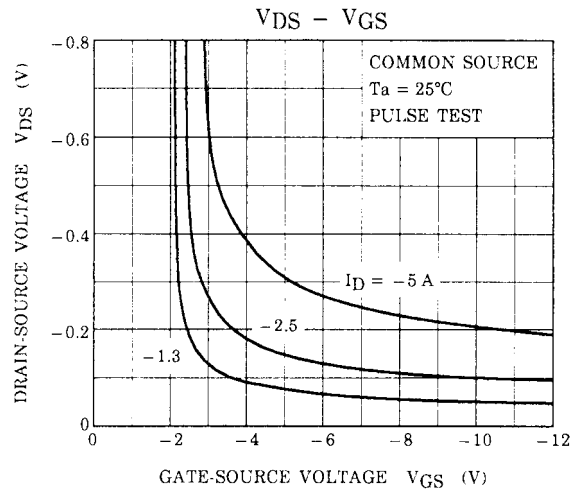
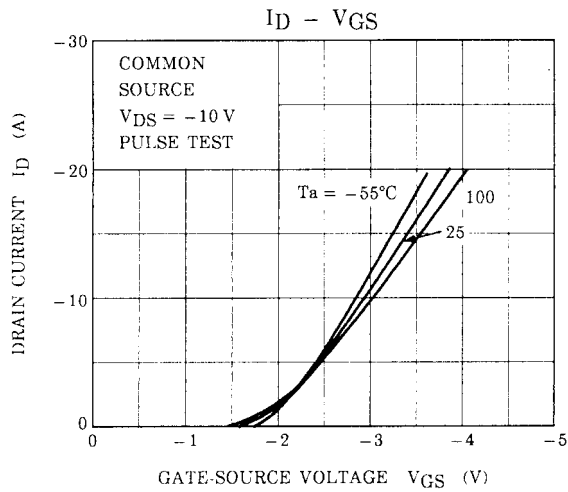
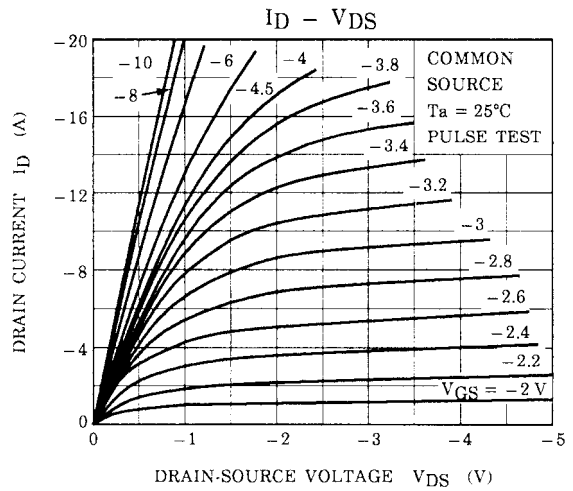
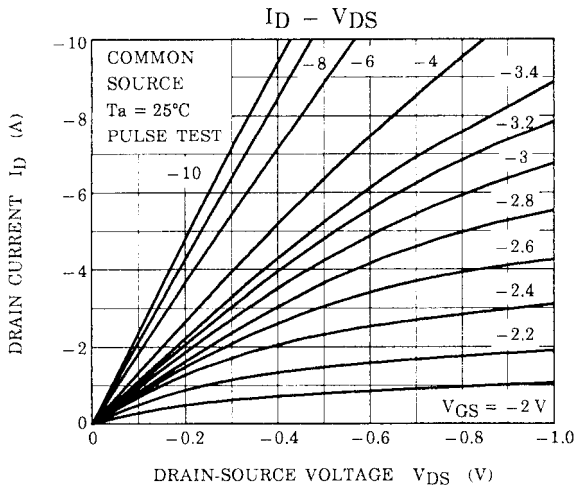
⊛ shows Lot number. (year of manufacture: last decimal digit of the year of manufacture, month of manufacture: january to december are denoted by letters A to L respectively)

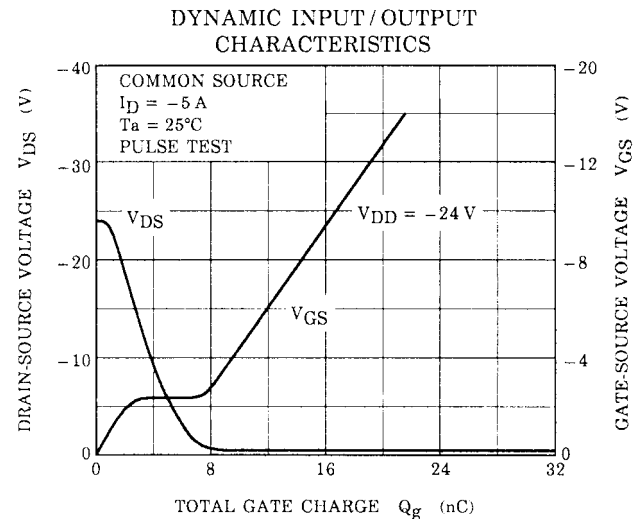
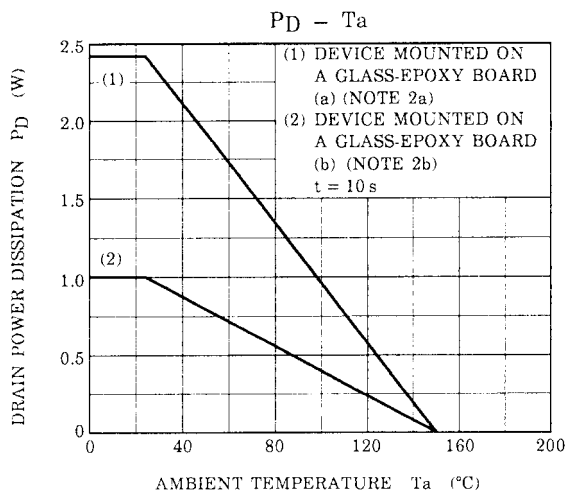
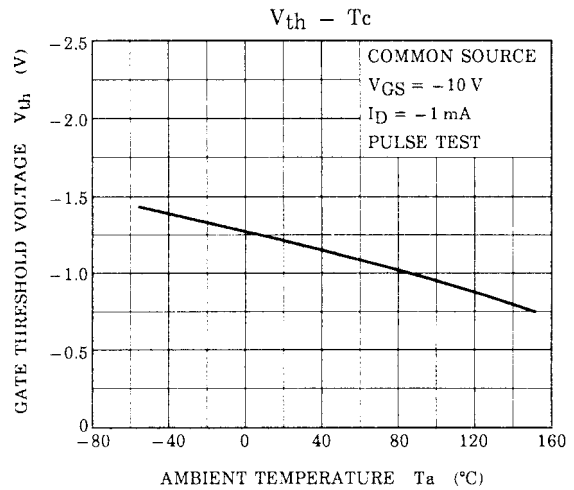
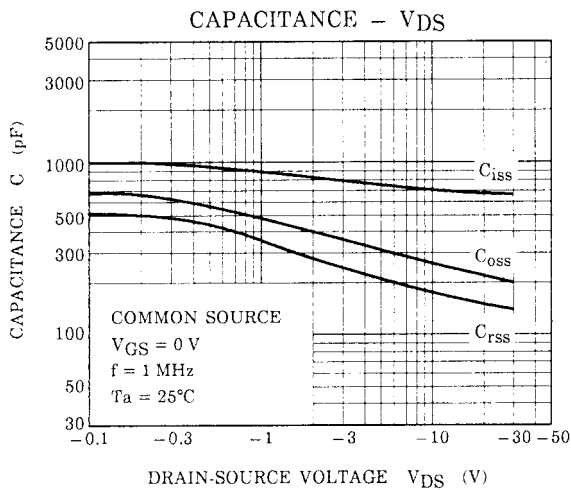
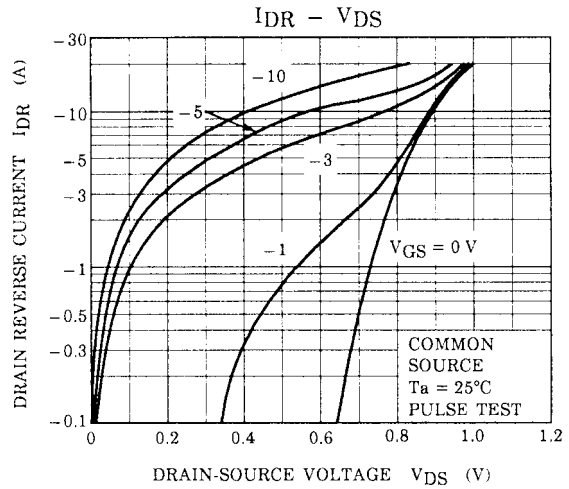
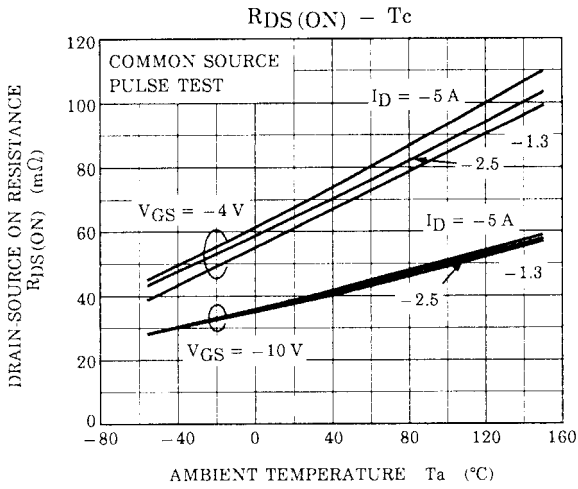
Electrical Characteristics (Ta = 25°C)

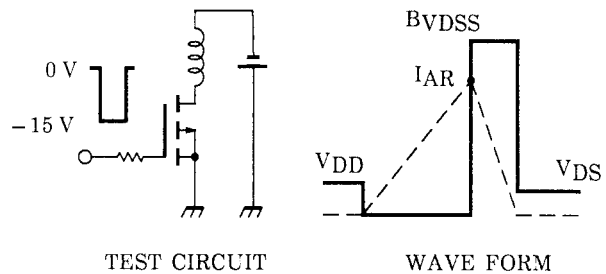
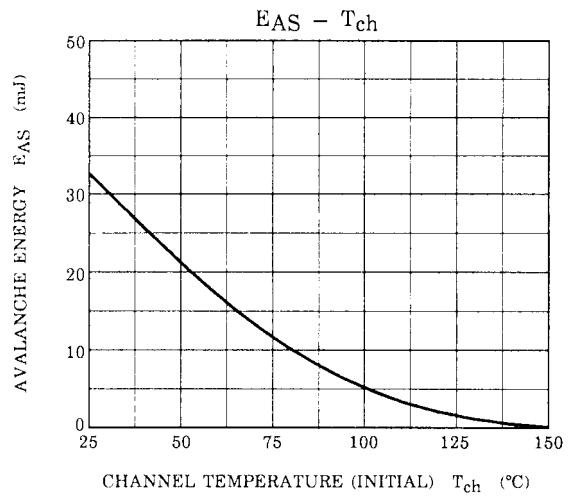
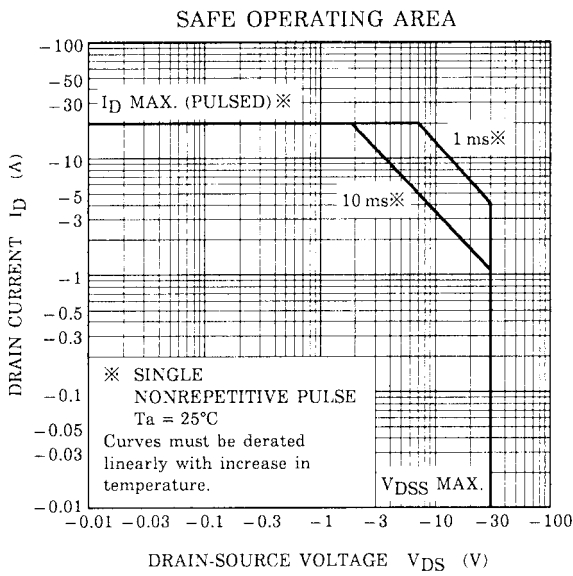
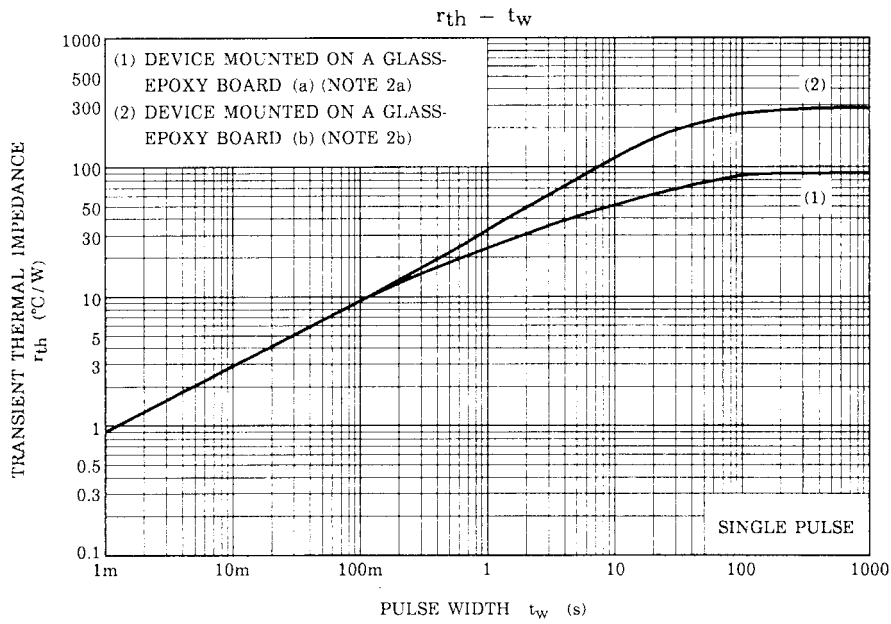
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current		I_{DSS}	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-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 Ω
		$R_{DS(ON)}$	$V_{GS} = -10\text{ V}, I_D = -2.5\text{ A}$	—	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	<p>V_{GS} 0 V -10 V $I_D = -2.5\text{ A}$ V_{OUT} $R_L = 6\ \Omega$ $V_{DD} \approx -15\text{ V}$ 4.7Ω</p> <p>$V_{IN} : t_r, t_f < 5\text{ ns},$ $Duty \leq 1\%, t_w = 10\ \mu\text{s}$</p>	—	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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