

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSIII)

# TPC8208

Lithium Ion Battery Applications  
 Notebook PC Applications  
 Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance:  $R_{DS(ON)} = 38 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 6.3 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 20 \text{ V}$ )
- Enhancement mode:  $V_{th} = 0.5 \text{ to } 1.2 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 200 \text{ }\mu\text{A}$ )

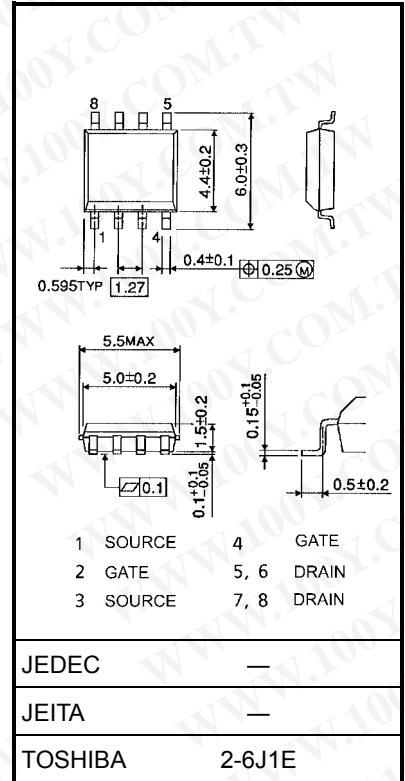
## Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	20	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	20	V
Gate-source voltage		$V_{GSS}$	$\pm 12$	V
Drain current	DC (Note 1)	$I_D$	5	A
	Pulse (Note 1)	$I_{DP}$	20	
Drain power dissipation (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	$P_D$ (1)	1.5	W
	Single-device value at dual operation (Note 3b)	$P_D$ (2)	1.1	
Drain power dissipation (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	$P_D$ (1)	0.75	W
	Single-device value at dual operation (Note 3b)	$P_D$ (2)	0.45	
Single pulse avalanche energy (Note 4)		$E_{AS}$	16.3	mJ
Avalanche current		$I_{AR}$	5	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		$E_{AR}$	0.1	mJ
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55 to 150	°C

Note: For (Note 1), (Note 2), (Note 3), (Note 4) and (Note 5), please refer to the next page.

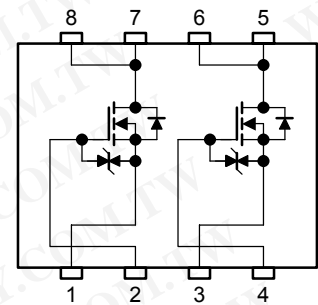
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

## Circuit Configuration

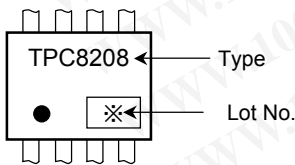


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## Thermal Characteristics

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s)	Single-device operation (Note 3a)	R <sub>th</sub> (ch-a) (1)	83.3	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	114	
Thermal resistance, channel to ambient (t = 10 s)	Single-device operation (Note 3a)	R <sub>th</sub> (ch-a) (1)	167	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	278	

## Marking (Note 6)

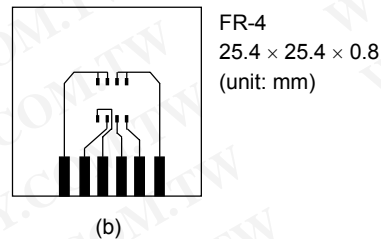
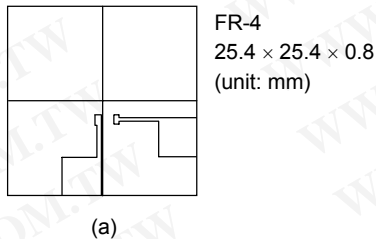


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Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:

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



Note 3:

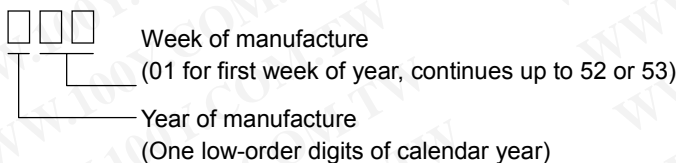
- a) The power dissipation and thermal resistance values are shown for a single device. (During single-device operation, power is only applied to one device.)
- b) The power dissipation and thermal resistance values are shown for a single device. (During dual operation, power is evenly applied to both devices.)

Note 4: V<sub>DD</sub> = 16 V, T<sub>ch</sub> = 25°C (initial), L = 0.5 mH, R<sub>G</sub> = 25 Ω, I<sub>AR</sub> = 5 A

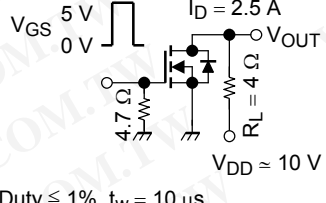
Note 5: Repetitive rating; pulse width limited by maximum channel temperature

Note 6: • on lower left of the marking indicates Pin 1.

※ Weekly code: (Three digits)



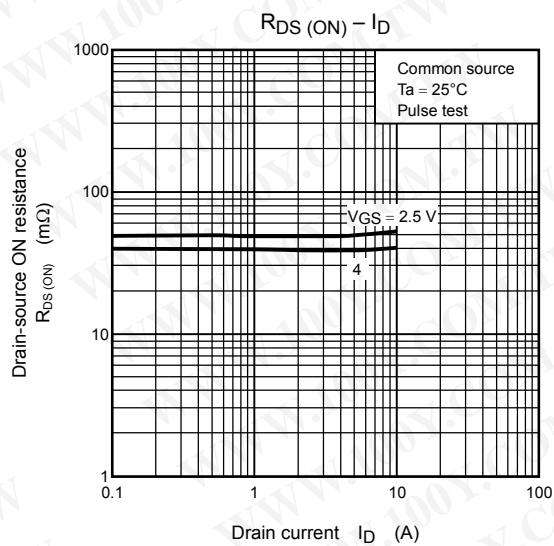
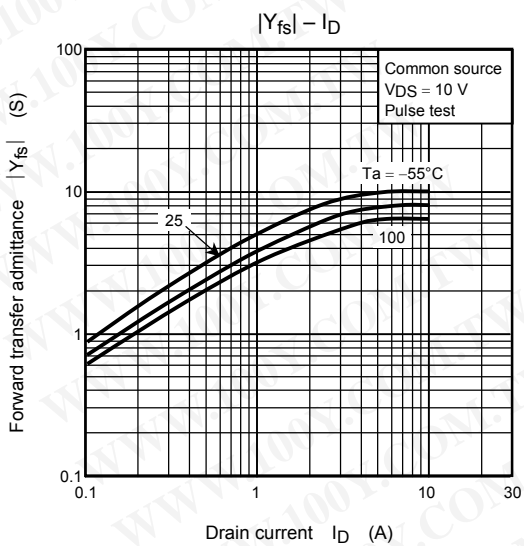
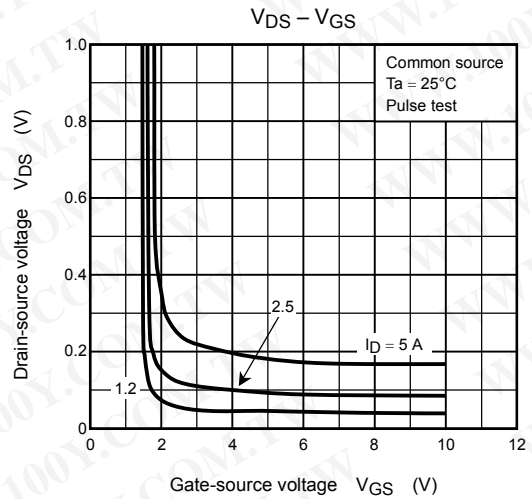
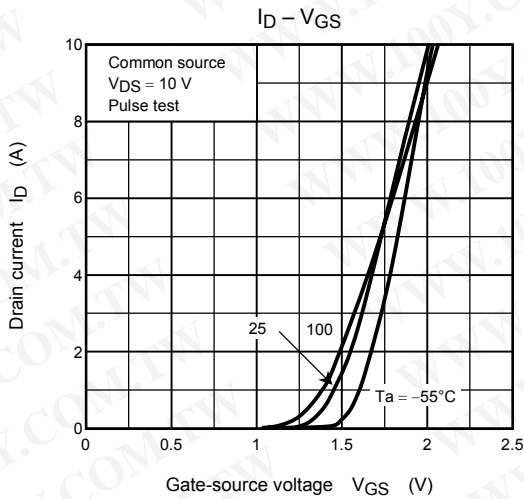
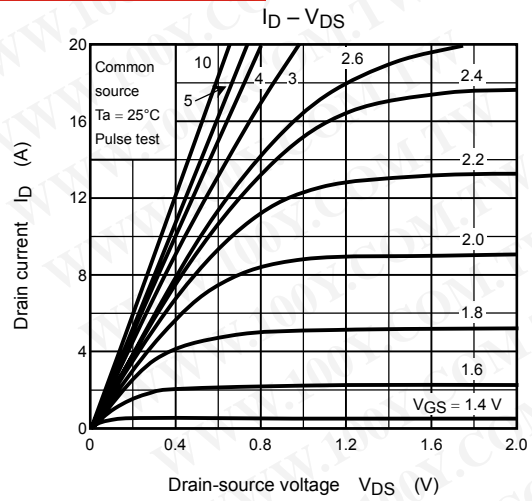
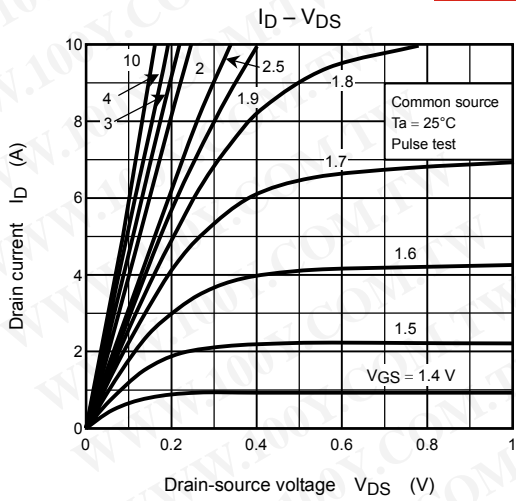
## Electrical Characteristics (Ta = 25°C)

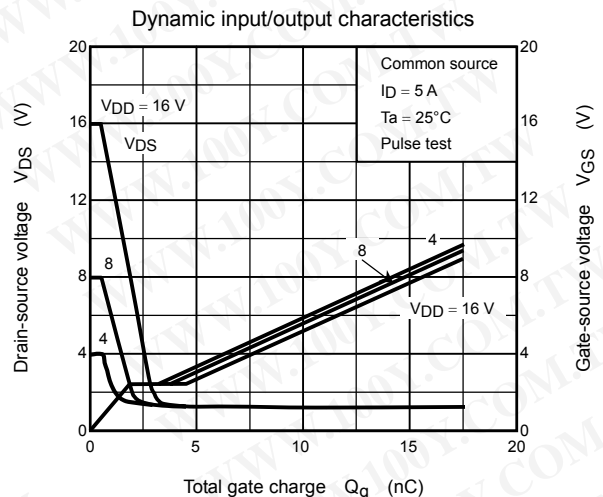
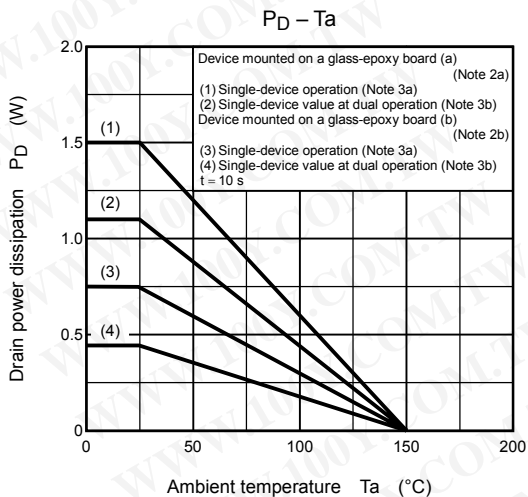
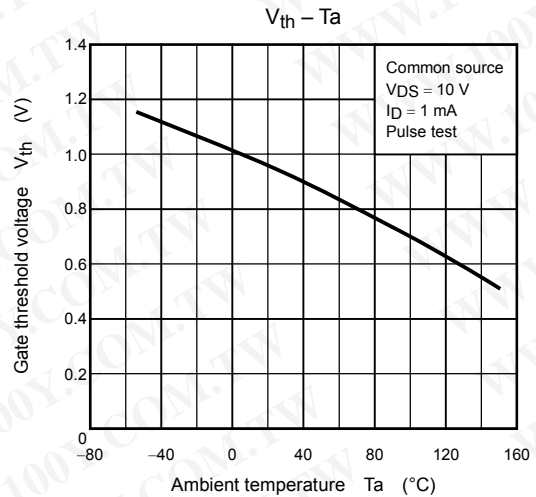
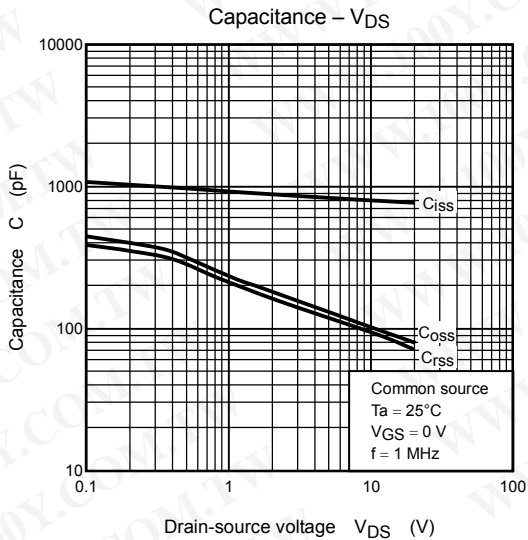
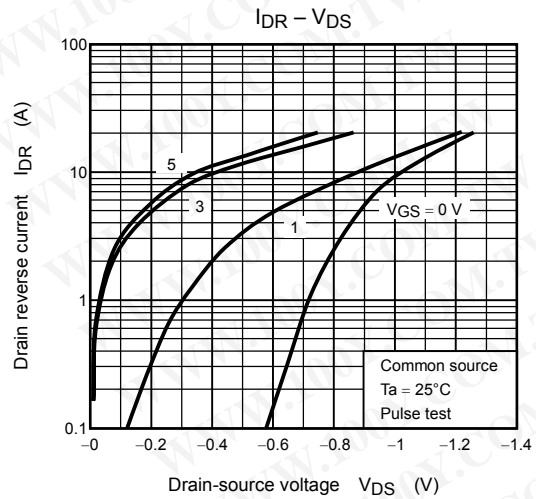
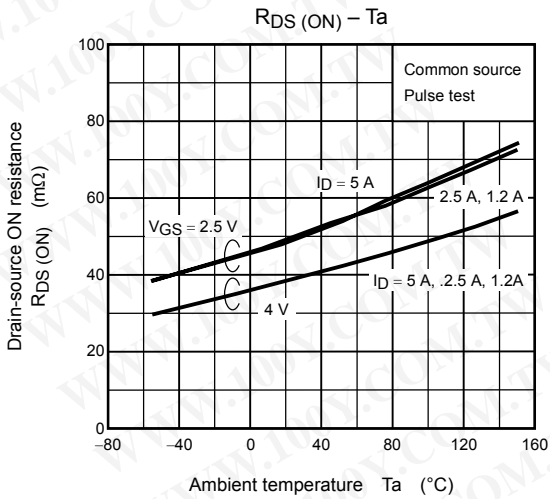
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-OFF current		$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	20	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -12\text{ V}$	8	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 200\text{ }\mu\text{A}$	0.5	—	1.2	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 2.0\text{ V}, I_D = 2.5\text{ A}$	—	57	100	m $\Omega$
			$V_{GS} = 2.5\text{ V}, I_D = 2.5\text{ A}$	—	46	70	
			$V_{GS} = 4.0\text{ V}, I_D = 2.5\text{ A}$	—	38	50	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 2.5\text{ A}$	3.2	6.3	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	780	—	pF
Reverse transfer capacitance		$C_{rss}$		—	90	—	
Output capacitance		$C_{oss}$		—	100	—	
Switching time	Rise time	$t_r$		—	5.0	—	ns
	Turn-ON time	$t_{on}$		—	12	—	
	Fall time	$t_f$		—	2.7	—	
	Turn-OFF time	$t_{off}$		—	21	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 16\text{ V}, V_{GS} = 5\text{ V}, I_D = 5\text{ A}$	—	9.5	—	nC
Gate-source charge 1		$Q_{gs1}$		—	2.0	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	2.2	—	

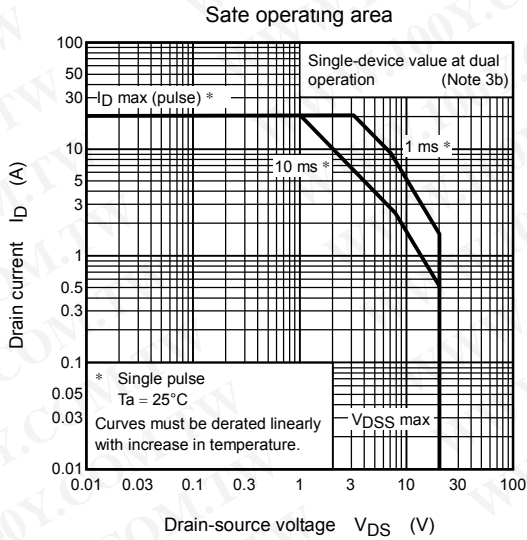
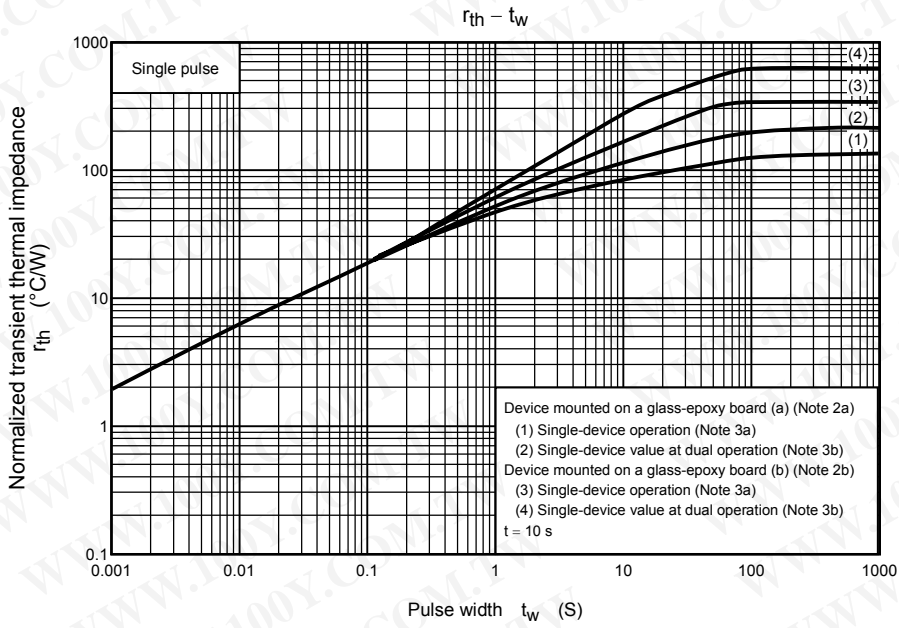
## Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	20	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 5\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	V

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