# TOSHIBA

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

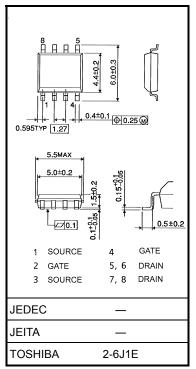
# **TPC8210**

Lithium Ion Battery Applications Portable Equipment Applications Notebook PC Applications

- Low drain-source ON resistance: RDS (ON) =  $11 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 13 \text{ S} (typ.)$
- Low leakage current:  $I_{DSS} = 10 \ \mu A \ (max) \ (V_{DS} = 30 \ V)$
- Enhancement mode:  $V_{th}$  = 1.3 to 2.5 V ( $V_{DS}$  = 10 V,  $I_D$  = 1 mA)

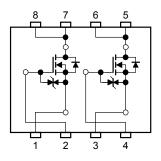
#### Absolute Maximum Ratings (Ta = 25°C)

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Cha	racteristics	Symbol	Rating	Unit	
Drain-source vo	Itage	V <sub>DSS</sub>	30	V	
Drain-gate volta	ge (R <sub>GS</sub> = 20 kΩ)	V <sub>DGR</sub>	30	V	
Gate-source vol	tage	V <sub>GSS</sub>	±20	V	
Drain current	D C (Note 1)	Ι <sub>D</sub>	8	А	
Dialificulterit	Pulse (Note 1)	I <sub>DP</sub>	32	Ą	
Drain power dissipation	Single-device operation (Note 3a)	P <sub>D (1)</sub>	1.5	W	
(t = 10 s) (Note 2a)	Single-device value at dual operation (Note 3b)	P <sub>D(2)</sub>	1.1		
Drain power dissipation (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	P <sub>D (1)</sub>	0.75	W	
	Single-device value at dual operation (Note 3b)	P <sub>D (2)</sub>	0.45		
Single pulse ava	alanche energy (Note 4)	E <sub>AS</sub>	83.2	mJ	
Avalanche curre	ent	I <sub>AR</sub>	8	А	
Repetitive avala Single-device va	nche energy alue at dual operation (Note 2a, 3b, 5)	E <sub>AR</sub>	0.1	mJ	
Channel temper	ature	T <sub>ch</sub>	150	°C	
Storage tempera	ature range	T <sub>stg</sub>	-55 to 150	°C	



Weight: 0.08 g (typ.)

## **Circuit Configuration**



Note: (Note 1), (Note 2), (Note 3), (Note 4) and (Note 5): 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.).

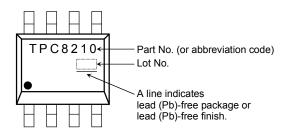
This transistor is an electrostatic-sensitive device. Please handle with caution.

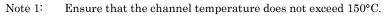
Unit: mm

#### **Thermal Characteristics**

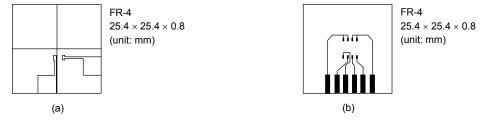
Characteristics	Symbol	Max	Unit		
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	R <sub>th (ch-a) (1)</sub>	83.3		
	Single-device value at dual operation (Note 3b)	R <sub>th (ch-a) (2)</sub>	114	°C/W	
Thermal resistance, channel to ambient	Single-device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

### Marking (Note 6)





Note 2:



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

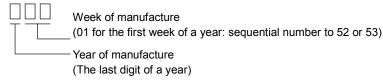
b) Device mounted on a glass-epoxy board (b)

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:  $V_{DD} = 24 \text{ V}, \text{ T}_{ch} = 25^{\circ}\text{C}$  (initial), L = 1.0 mH, R<sub>G</sub> = 25  $\Omega$ , I<sub>AR</sub> = 8 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)



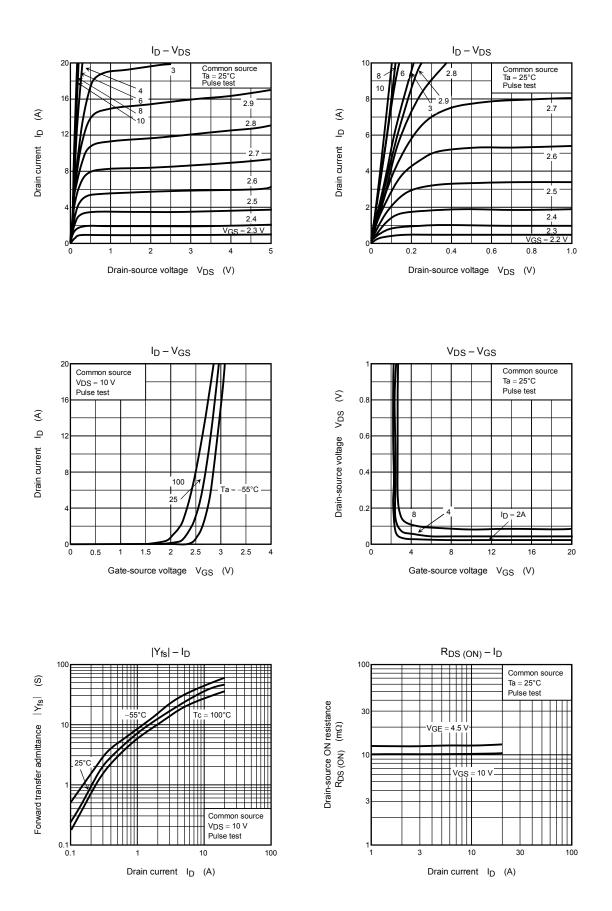
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage cu	urrent	I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V		—	±10	μA
Drain cut-OFF	current			10	μA		
Drain-source breakdown voltage		V (BR) DSS	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	30		-	v
Dialit Source Di	reakdown voltage	V (BR) DSS	$I_D$ = 10 mA, $V_{GS}$ = -20 V	15	_		v
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.3	_	2.5	V
Drain-source O	Nresistance	R <sub>DS (ON)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 4 A		13	20	mΩ
Drain-source ON resistance		R <sub>DS (ON)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4 A	1	11	15	mc2
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4 A	6.5	13	_	S
Input capacitan	ce	C <sub>iss</sub>		_	3530	_	
Reverse transfer capacitance		C <sub>rss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	_	495	_	pF
Output capacitance		C <sub>oss</sub>		-	580	_	
Switching time	Rise time	tr	$V_{GS} \stackrel{10 \text{ V}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} \stackrel{V_{OUT}}{_{0 \text{ V}}} \stackrel{I_{D} = 4 \text{ A}}{_{0 \text{ V}}} $	_	26	_	
	Turn-ON time	t <sub>on</sub>			39		ns
	Fall time	t <sub>f</sub>			32		115
	Turn-OFF time	t <sub>off</sub>	Duty $\leq$ 1%, $t_w$ = 10 $\mu s$		115		
Total gate charge (Gate-source plus gate-drain)		Qg	V <sub>DD</sub> ≈ 24 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 8 A		75	_	
Gate-source charge		Q <sub>gs</sub>		_	6	_	nC
Gate-drain ("miller") charge		Q <sub>gd</sub>		_	19	_	

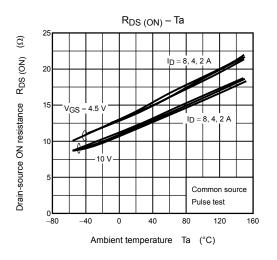
## Source-Drain Ratings and Characteristics (Ta = 25°C)

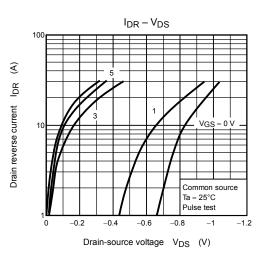
Charact	eristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Drain reverse current	Pulse (Note 1)	I <sub>DRP</sub>	—	_	_	32	А
Forward voltage (	orward voltage (diode) V <sub>DSF</sub>		I <sub>DR</sub> = 8 A, V <sub>GS</sub> = 0 V	_	_	-1.2	V

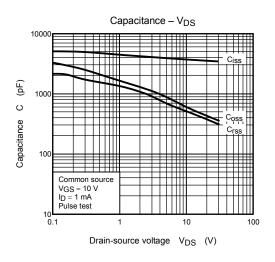
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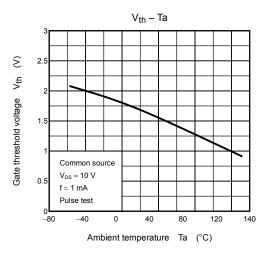


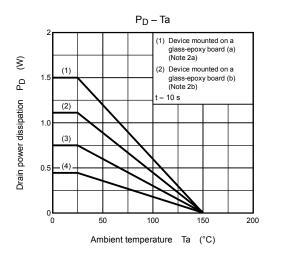
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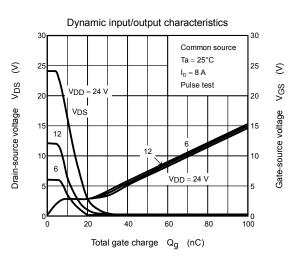


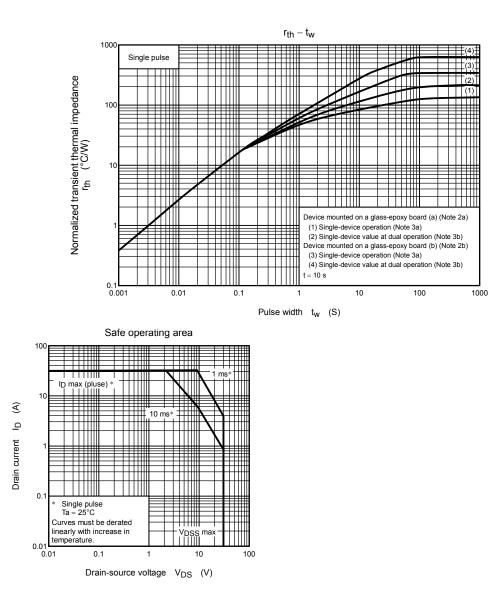












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