

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

# TPCS8211

Lithium Ion Battery Applications

Notebook PC Applications

Portable Machines and Tools

- Small footprint due to small and thin package
- Low drain-source ON resistance:  $R_{DS(ON)} = 16 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 11 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 20 \text{ V}$ )
- Enhancement-mode:  $V_{th} = 0.5 \sim 1.2 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 200 \text{ }\mu\text{A}$ )

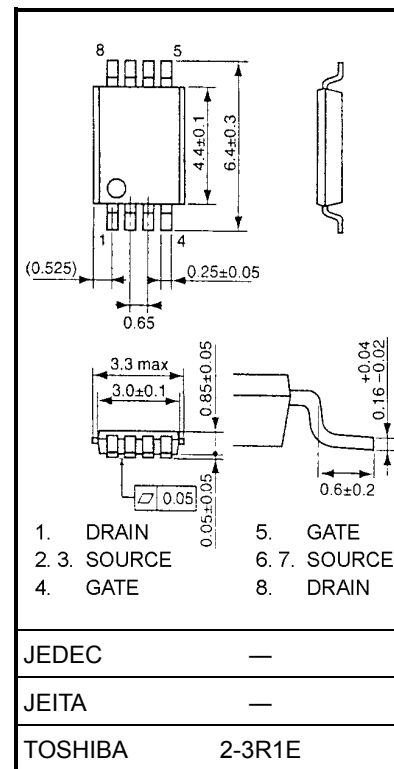
## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

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)	$I_D$	6	A
	Pulse (Note 1)	$I_{DP}$	24	
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2a)	Single-device operation (Note 3a)	$P_D (1)$	1.1	W
	Single-device value at dual operation (Note 3b)	$P_D (2)$	0.75	
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2b)	Single-device operation (Note 3a)	$P_D (1)$	0.6	W
	Single-device value at dual operation (Note 3b)	$P_D (2)$	0.35	
Single pulse avalanche energy (Note 4)		$E_{AS}$	46.8	mJ
Avalanche current		$I_{AR}$	6	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		$E_{AR}$	0.075	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	$-55 \sim 150$	$^\circ\text{C}$

Note: (Note 1), (Note 2), (Note 3), (Note 4), (Note 5) Please see next page.

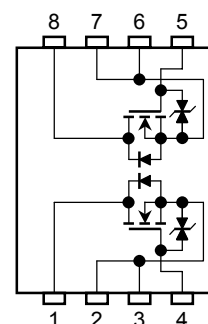
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.035 g (typ.)

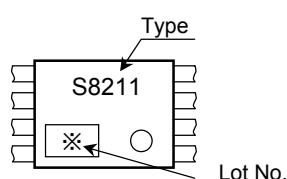
## Circuit Configuration



## Thermal Characteristics

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s)	Single-device operation (Note 3a)	$R_{th(ch-a)}(1)$	114	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th(ch-a)}(2)$	167	
Thermal resistance, channel to ambient (t = 10 s)	Single-device operation (Note 3a)	$R_{th(ch-a)}(1)$	208	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th(ch-a)}(2)$	357	

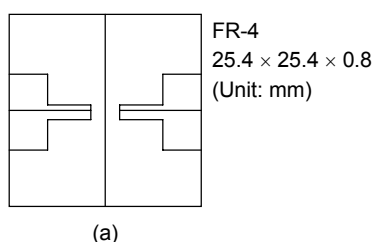
## Marking (Note 6)



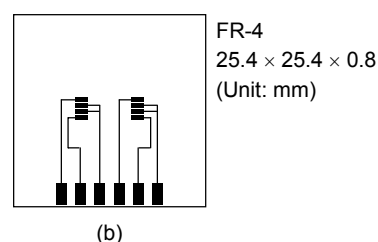
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:

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



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



Note 3:

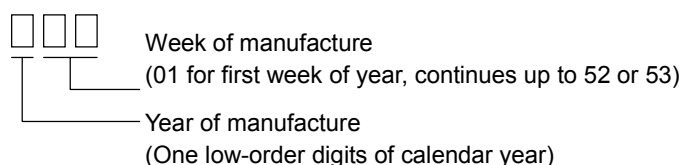
- The power dissipation and thermal resistance values are shown for a single device (During single-device operation, power is only applied to one device.).
- The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.).

Note 4:  $V_{DD} = 16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = 6\text{ A}$

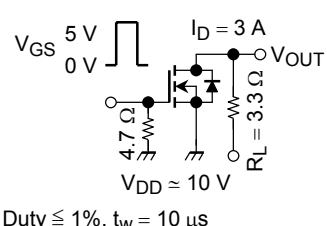
Note 5: Repetitive rating; pulse width limited by max channel temperature.

Note 6:  $\circ$  on lower right of the marking indicates Pin 1.

※ Weekly code: (Three digits)

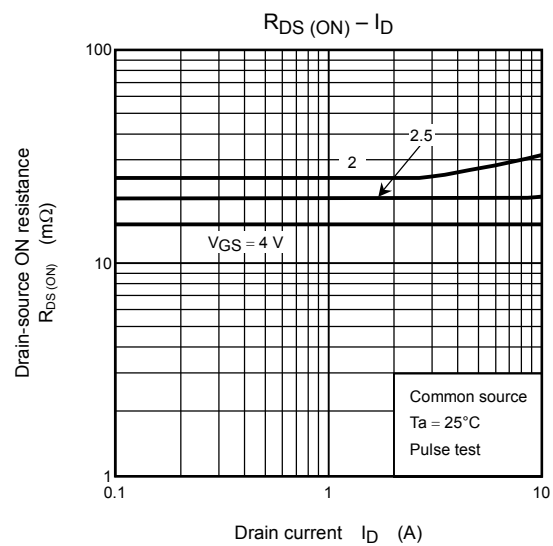
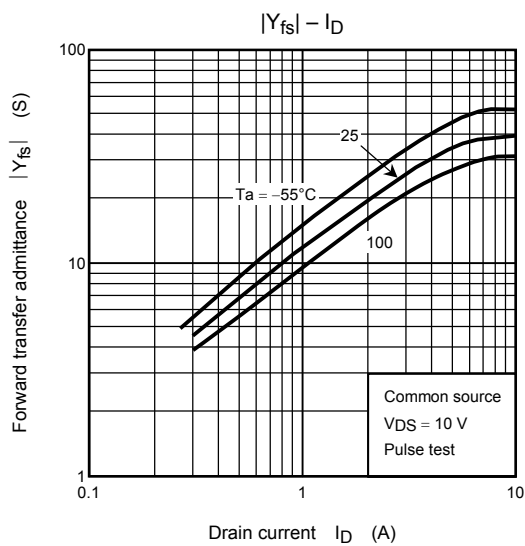
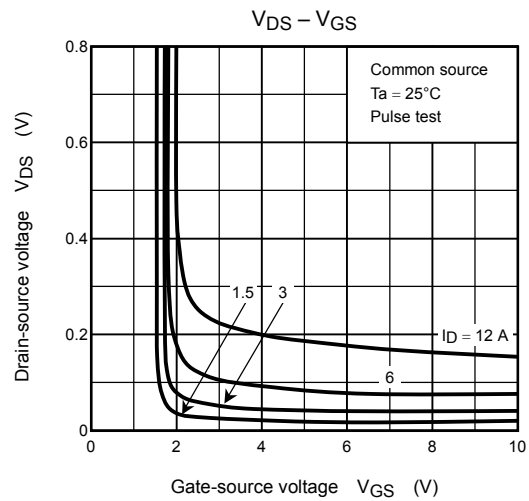
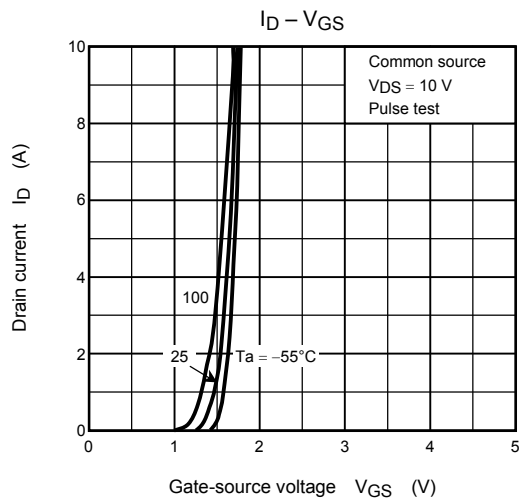
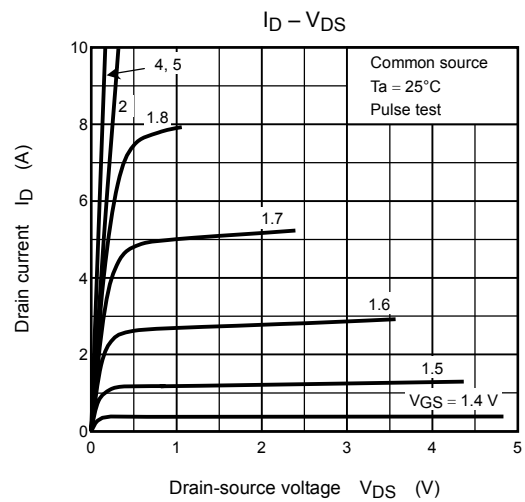
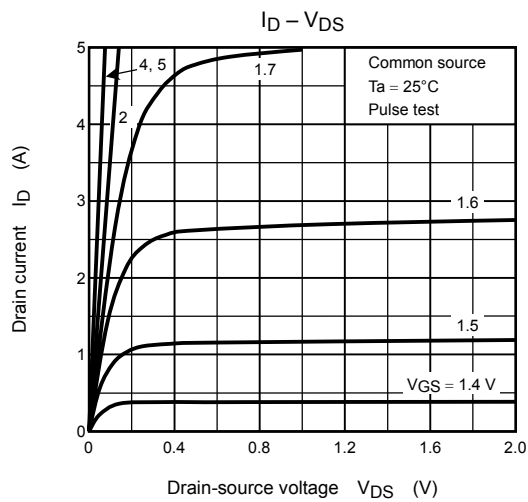


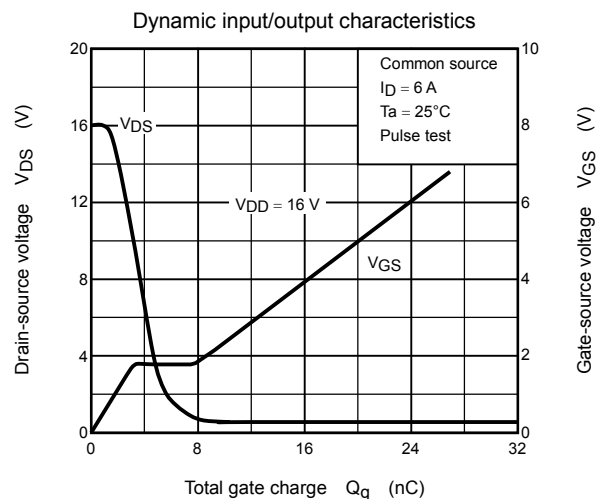
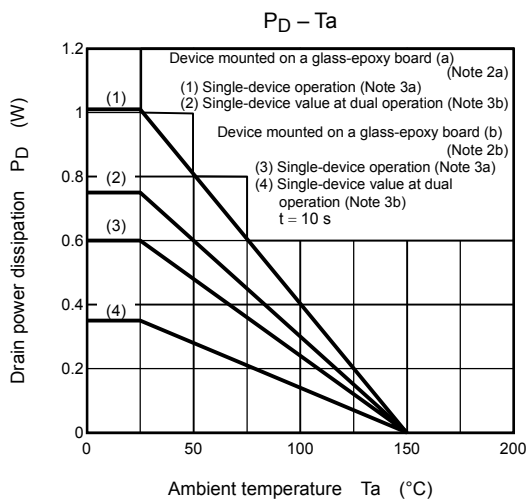
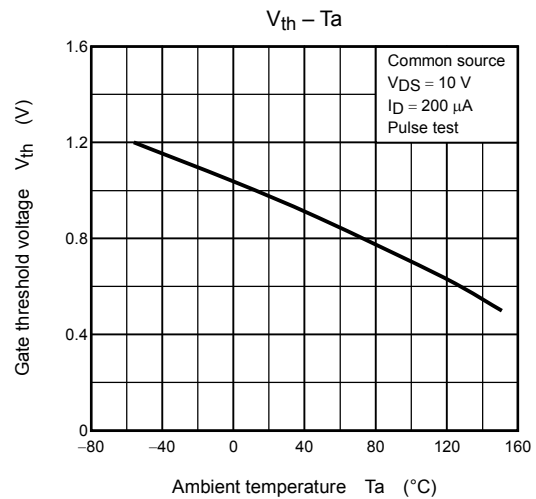
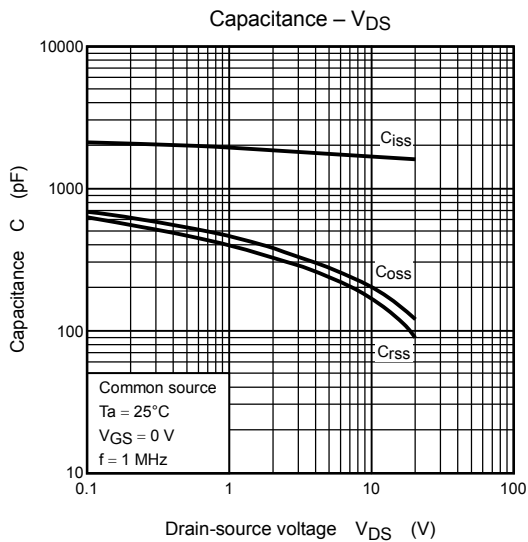
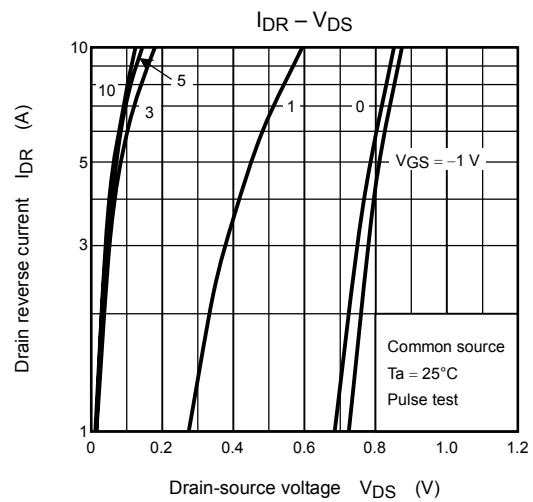
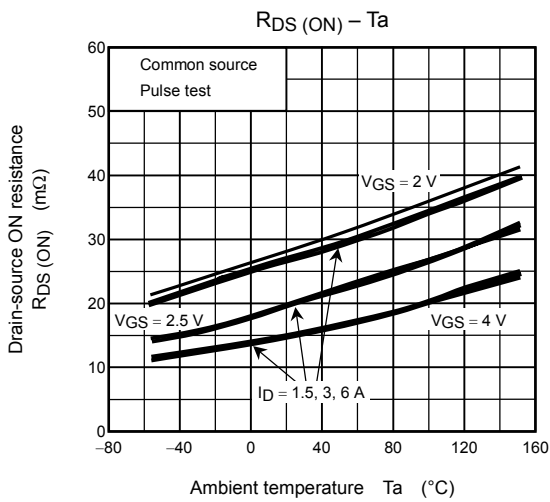
## Electrical Characteristics (Ta = 25°C)

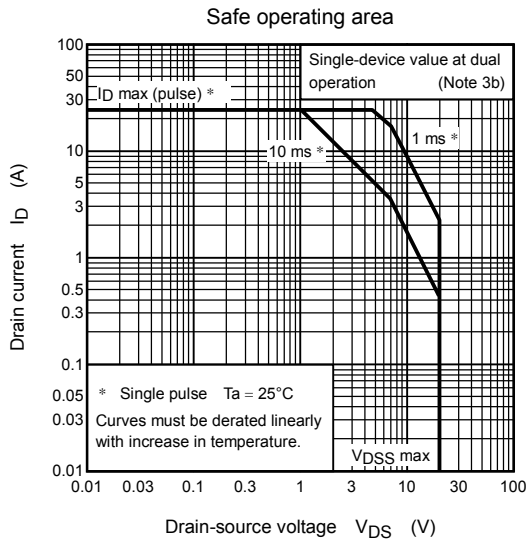
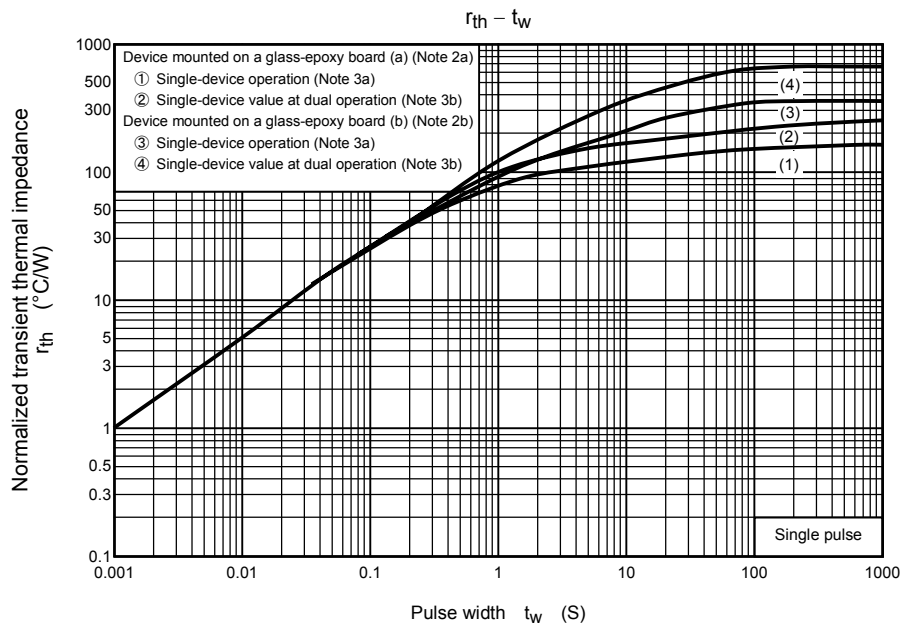
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±10 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain cut-OFF current		I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V	—	—	10	μA
Drain-source breakdown voltage		V <sub>(BR) DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	20	—	—	V
		V <sub>(BR) DSX</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = −12 V	8	—	—	
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 200 μA	0.5	—	1.2	V
Drain-source ON resistance		R <sub>DS (ON)</sub>	V <sub>GS</sub> = 2.0 V, I <sub>D</sub> = 4.2 A	—	26	45	mΩ
			V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 4.2 A	—	21	29	
			V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 4.8 A	—	16	24	
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3.0 A	5.5	11	—	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	1590	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	180	—	
Output capacitance		C <sub>Oss</sub>		—	200	—	
Switching time	Rise time	t <sub>r</sub>		—	6.4	—	ns
	Turn-ON time	t <sub>on</sub>		—	22	—	
	Fall time	t <sub>f</sub>		—	10	—	
	Turn-OFF time	t <sub>off</sub>		—	42	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ 16 V, V <sub>GS</sub> = 5 V, I <sub>D</sub> = 6 A	—	20	—	nC
Gate-source charge 1		Q <sub>gs1</sub>		—	3.5	—	
Gate-drain (“miller”) charge		Q <sub>gd</sub>		—	4.5	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	24	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 6 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V







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