

# TPCP8203

Portable Equipment Applications

Motor Drive Applications

DC/DC Converters

- Lead (Pb)-free
- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 31 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 8.6 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \mu\text{A}$  (max) ( $V_{DS} = 40 \text{ V}$ )
- Enhancement model:  $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$

( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

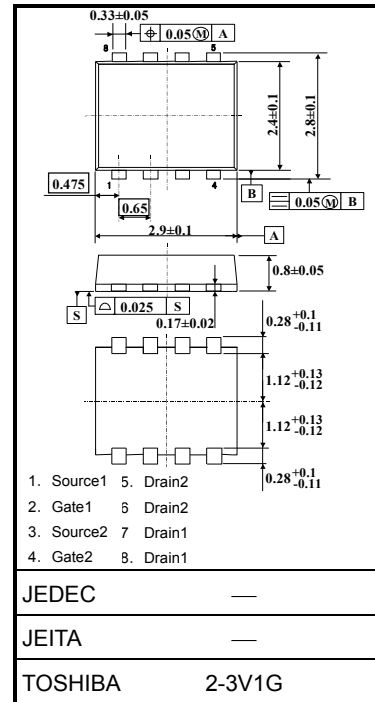
## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	40	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	40	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	4.7	A
	Pulse (Note 1)	$I_{DP}$	18.8	
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2a)	Single-device operation (Note 3a)	$P_D$ (1)	1.48	W
	Single-device value at dual operation (Note 3b)	$P_D$ (2)	1.23	
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2b)	Single-device operation (Note 3a)	$P_D$ (1)	0.58	
	Single-device value at dual operation (Note 3b)	$P_D$ (2)	0.36	
Single-pulse avalanche energy (Note 4)		$E_{AS}$	10.6	mJ
Avalanche current		$I_{AR}$	4.7	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		$E_{AR}$	0.12	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

Note: For Notes 1 to 6, see the next page.

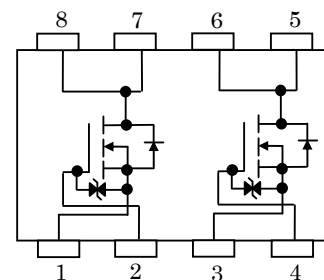
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm

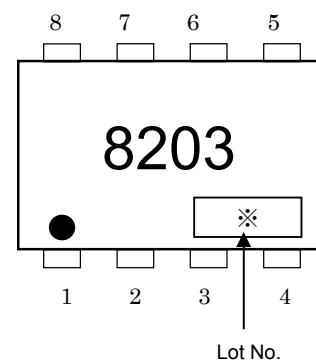


Weight: 0.017 g (typ.)

## Circuit Configuration



## Marking (Note 6)

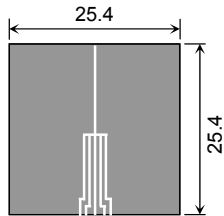


Thermal Characteristics

Characteristic		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	R <sub>th</sub> (ch-a) (1)	84.5	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	101.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	R <sub>th</sub> (ch-a) (1)	215.5	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	347.2	

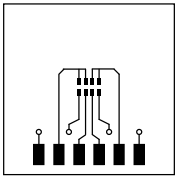
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



(a)

FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)



(b)

FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

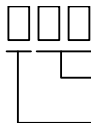
Note 3: a) The power dissipation and thermal resistance values shown are for a single device. (During single-device operation, power is applied to one device only.)  
b) The power dissipation and thermal resistance values shown are for a single device. (During dual operation, power is applied to both devices evenly.).

Note 4: V<sub>DD</sub> = 25 V, T<sub>ch</sub> = 25°C (initial), L = 0.5 mH, R<sub>G</sub> = 25 Ω, I<sub>AR</sub> = 4.7 A

Note 5: Repetitive rating: Pulse width limited by Max. Channel temperature.

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

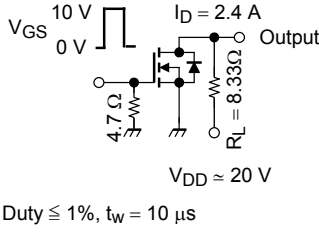
\* Weekly code (3 digits):



Week of manufacture  
(01 for the first week of the year, continuing up to 52 or 53)  
Year of manufacture  
(The last digit of the calendar year)

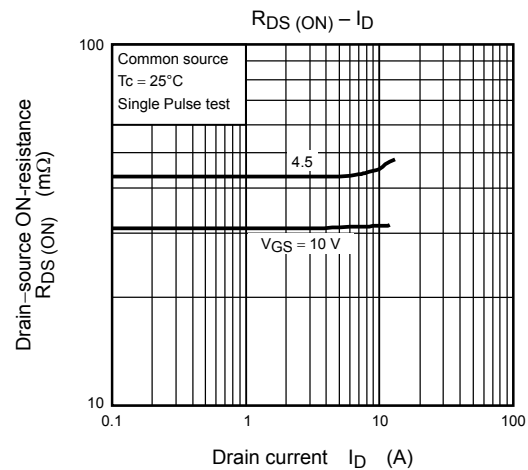
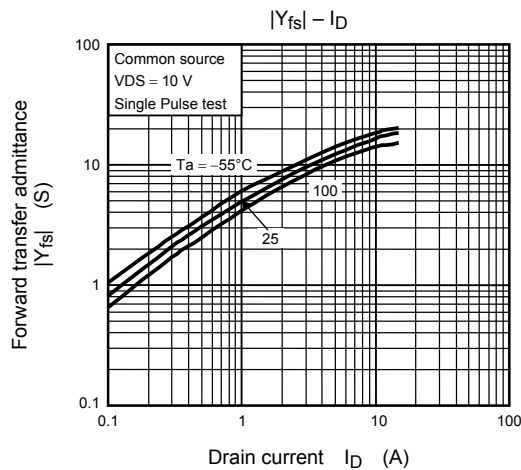
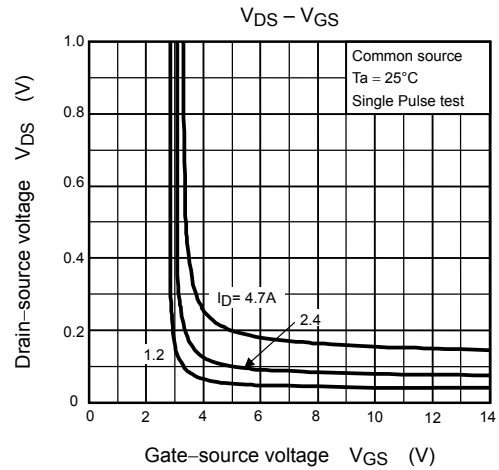
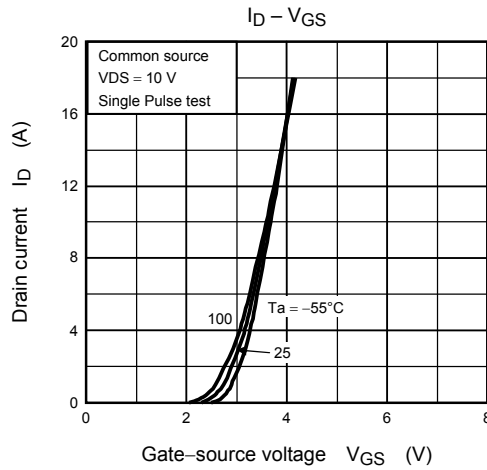
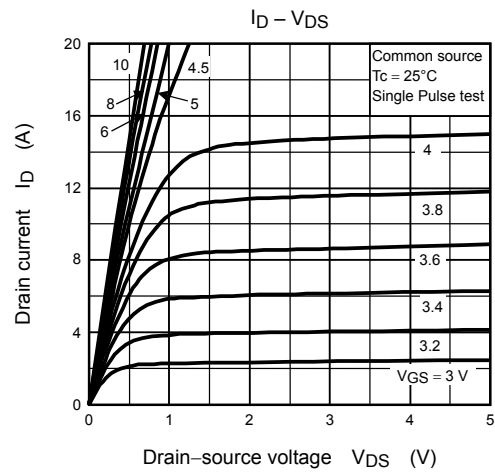
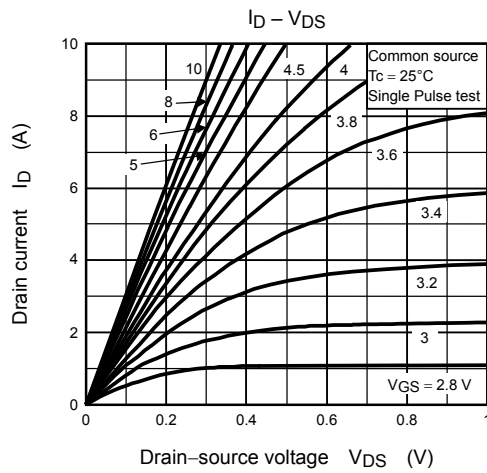
Note 7: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

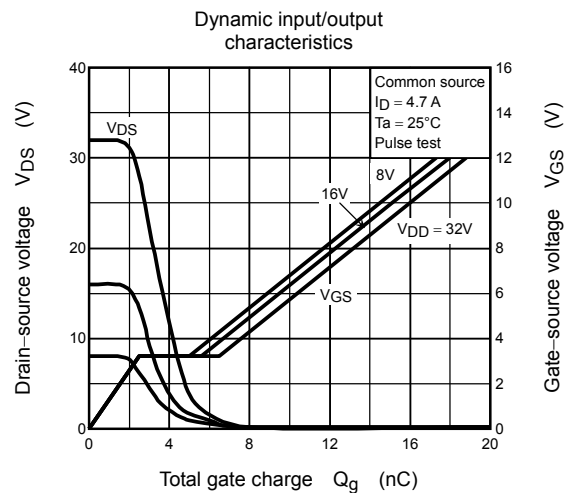
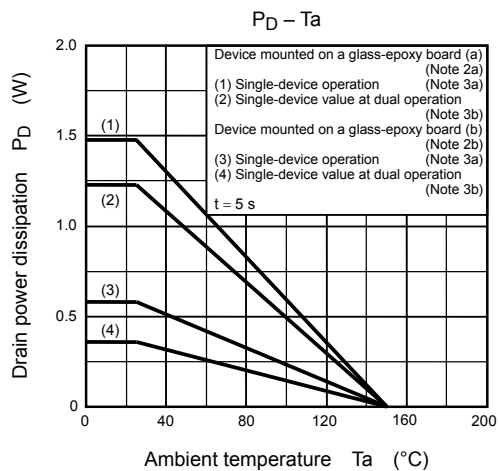
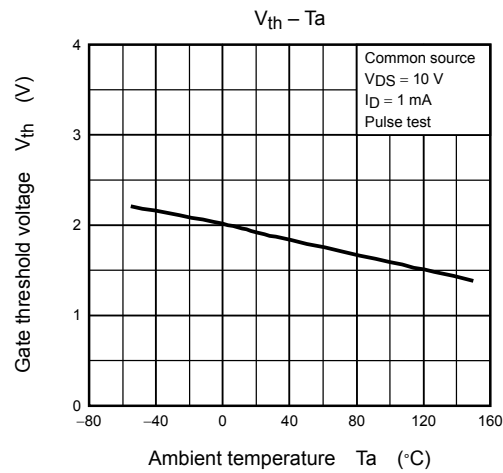
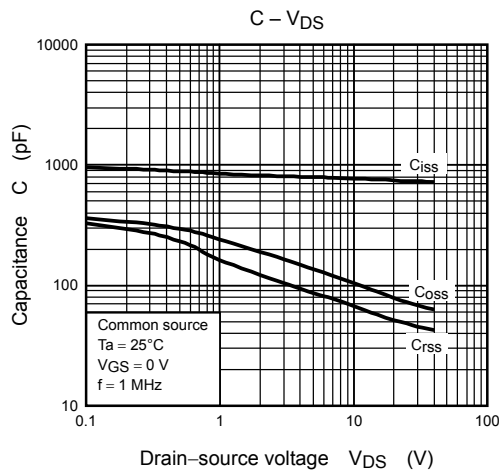
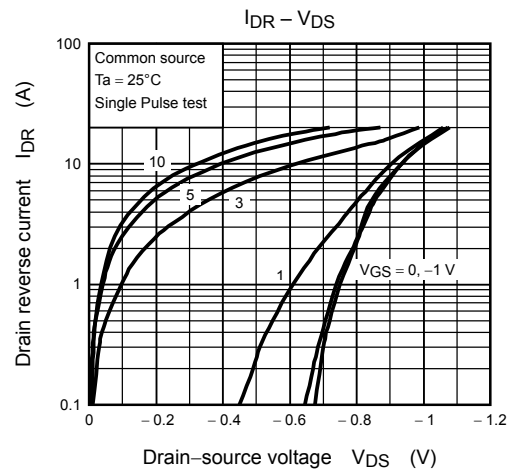
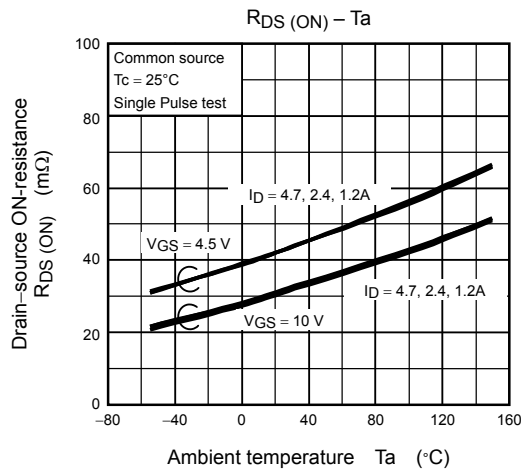
## Electrical Characteristics (Ta = 25°C)

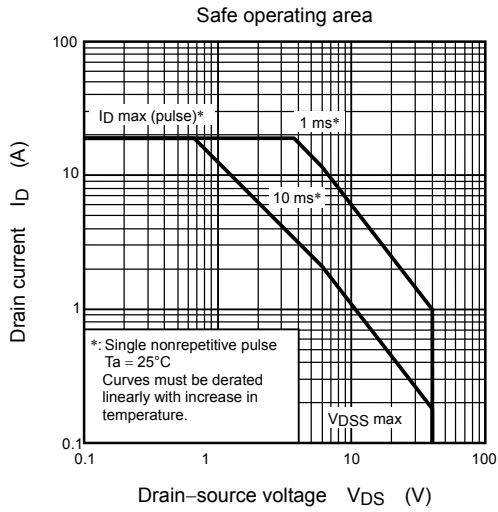
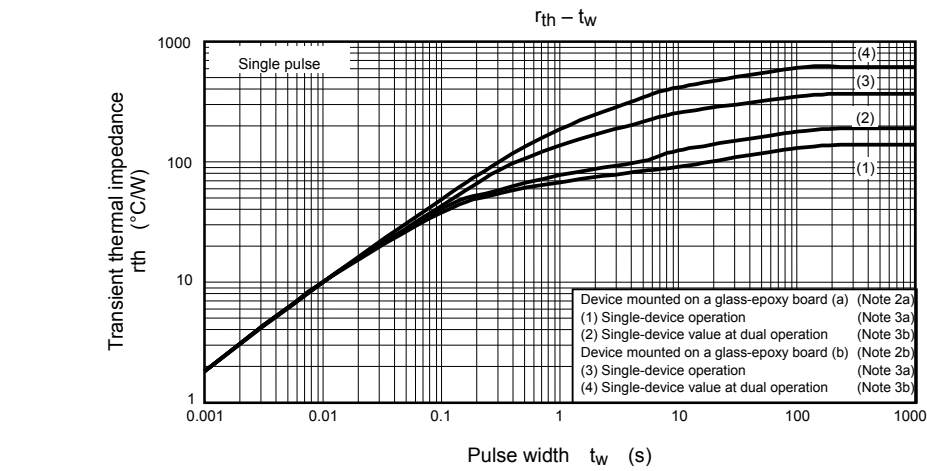
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cutoff current		$I_{DSS}$	$V_{DS} = 40 \text{ V}$ , $V_{GS} = 0 \text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}$ , $V_{GS} = 0 \text{ V}$	40	—	—	V
		$V_{(BR)DSX}$	$I_D = 10 \text{ mA}$ , $V_{GS} = -20 \text{ V}$	15	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$	1.3	—	2.5	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = 4.5 \text{ V}$ , $I_D = 2.4 \text{ A}$	—	43	60	$\text{m}\Omega$
		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}$ , $I_D = 2.4 \text{ A}$	—	31	40	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}$ , $I_D = 2.4 \text{ A}$	4.3	8.6	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	—	770	—	pF
Reverse transfer capacitance		$C_{rss}$		—	70	—	
Output capacitance		$C_{oss}$		—	105	—	
Switching time	Rise time	$t_r$	 <p><math>V_{DD} \approx 20 \text{ V}</math> Duty <math>\leq 1\%</math>, <math>t_w = 10 \mu\text{s}</math></p>	—	8	—	ns
	Turn-on time	$t_{on}$		—	15	—	
	Fall time	$t_f$		—	9	—	
	Turn-off time	$t_{off}$		—	70	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 32 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 4.7 \text{ A}$	—	16	—	nC
Gate-source charge <sup>1</sup>		$Q_{gs1}$		—	2.5	—	
Gate-drain ("Miller") charge		$Q_{gd}$		—	4	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	18.8	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 4.7 \text{ A}$ , $V_{GS} = 0 \text{ V}$	—	—	-1.2	V







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20070701-EN GENERAL

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