

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

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: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 40 \text{ V}$)
- Enhancement model: $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$
($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

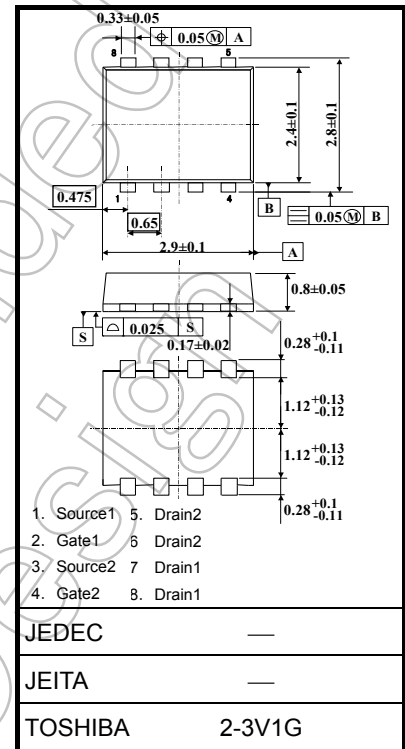
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

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}	± 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	W
	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.

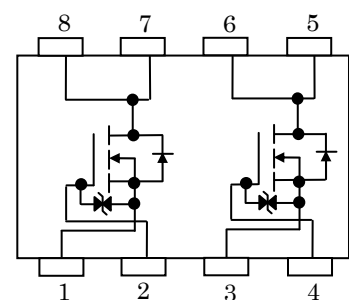
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm

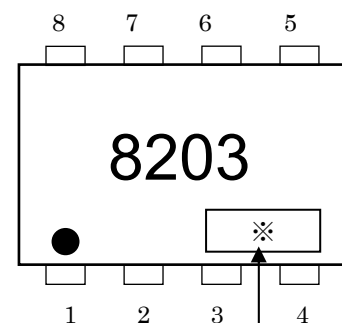


Weight: 0.017 g (typ.)

Circuit Configuration



Marking (Note 6)



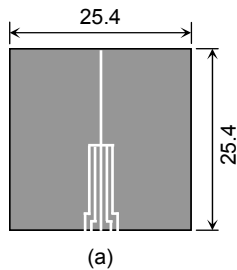
Lot No.

Thermal Characteristics

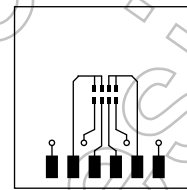
Characteristic		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th(ch-a)}(1)$	84.5	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th(ch-a)}(2)$	101.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation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



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)



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.)

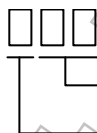
b) The power dissipation and thermal resistance values shown are for a single device. (During dual operation, power is applied to both devices evenly.)

Note 4: $V_{DD} = 25\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.5\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 4.7\text{ A}$

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.

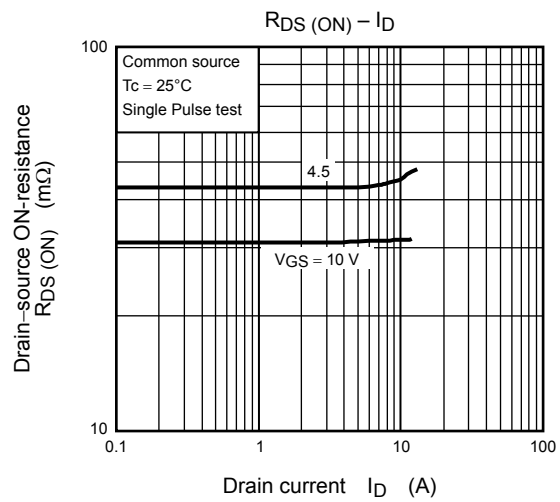
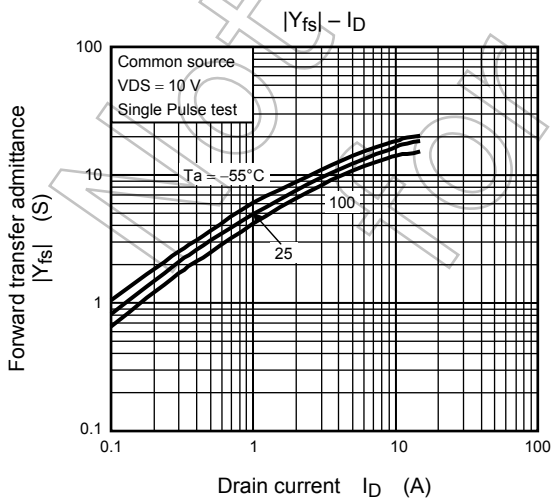
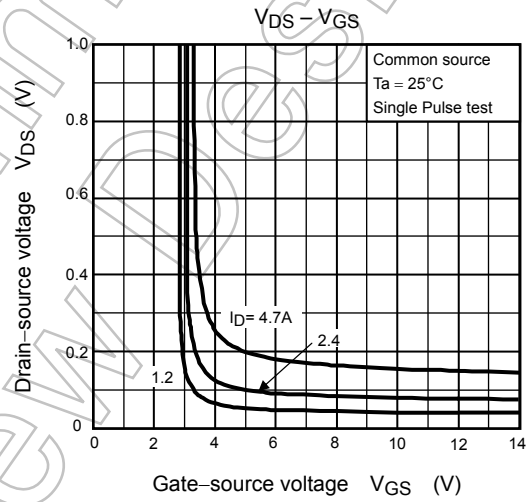
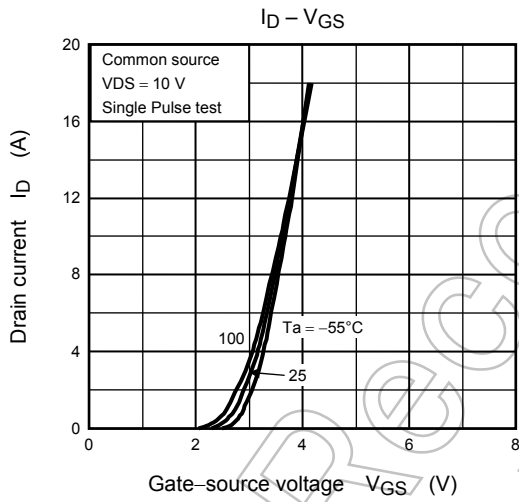
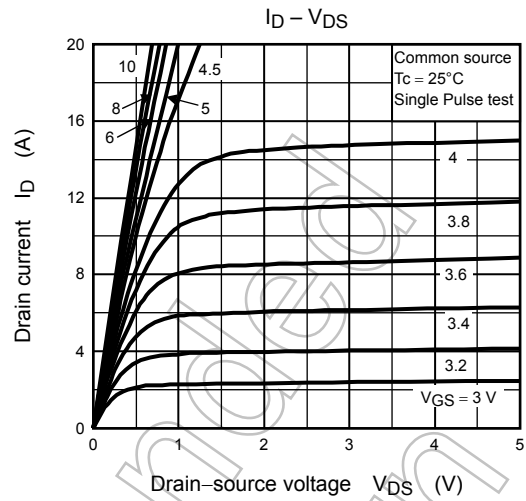
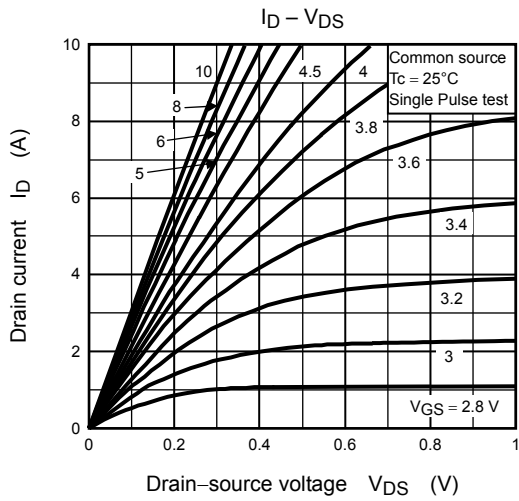
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

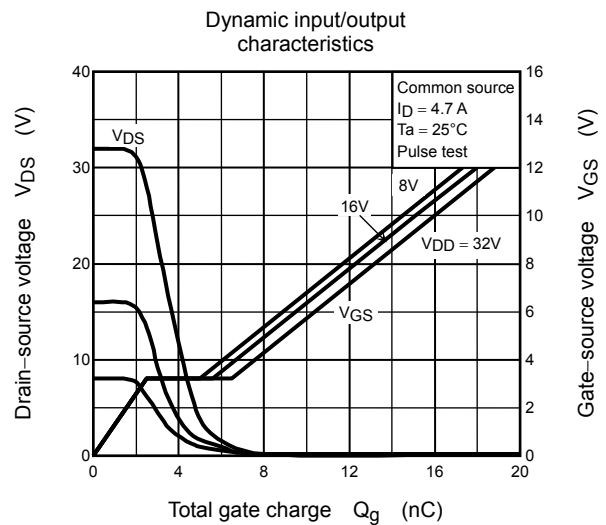
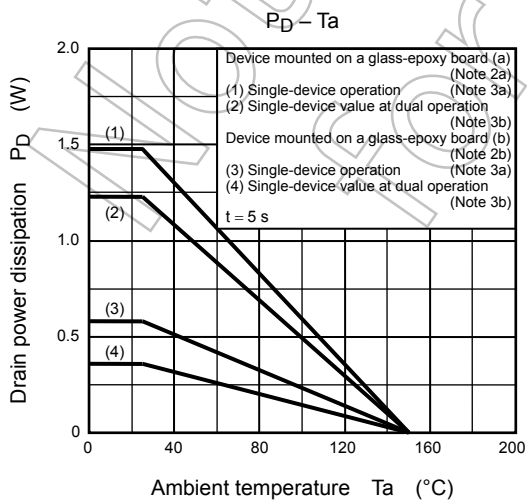
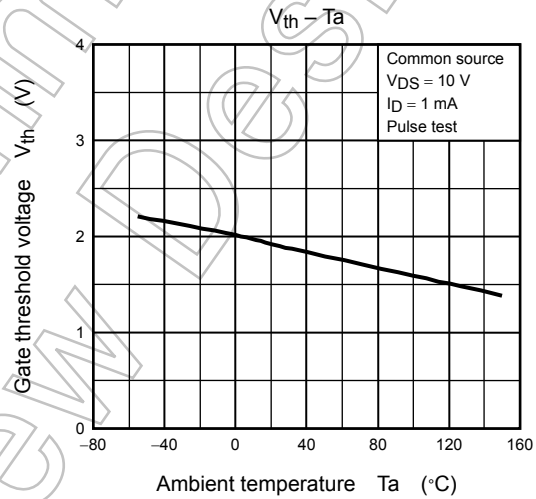
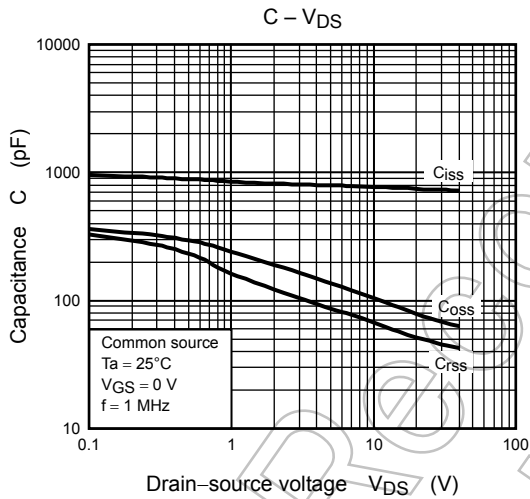
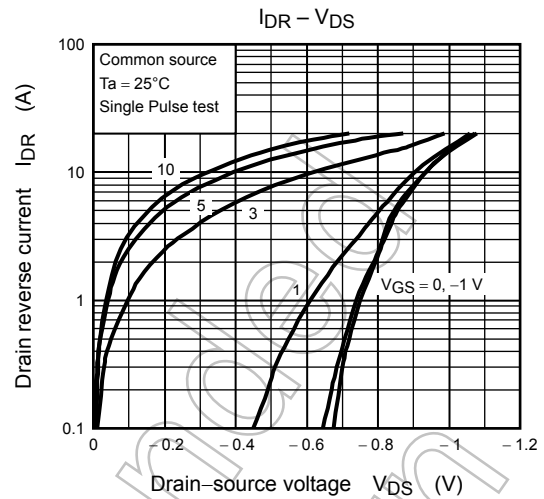
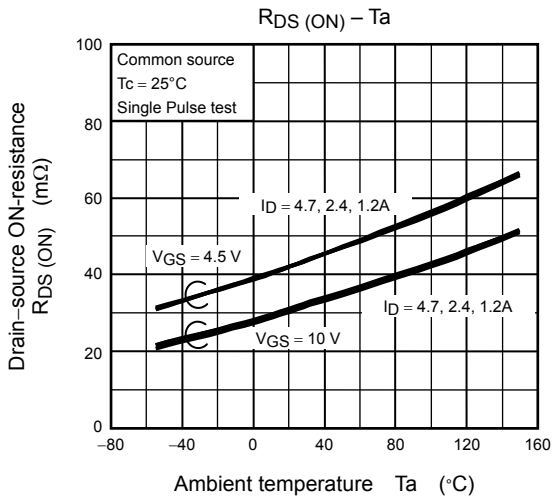
Electrical Characteristics (Ta = 25°C)

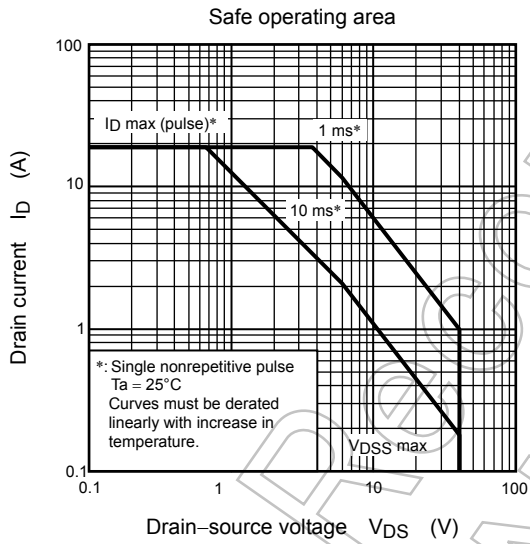
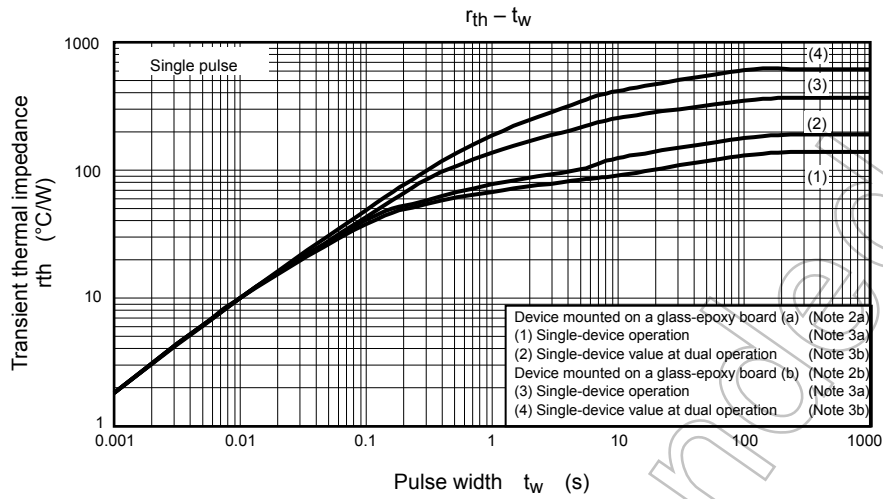
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cutoff current		I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	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	m Ω
		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 2.4\text{ A}$	—	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>$V_{GS} = 10\text{ V}$ 0 V $I_D = 2.4\text{ A}$ $R_L = 8.33\Omega$ $V_{DD} \approx 20\text{ V}$ Output</p>	—	8	—	ns
	Turn-on time	t_{on}		—	15	—	
	Fall time	t_f		—	9	—	
	Turn-off time	t_{off}		Duty $\leq 1\%$, $t_w = 10\text{ }\mu\text{s}$	—	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 charge1		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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