

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (U-MOS II)

# TPCS8203

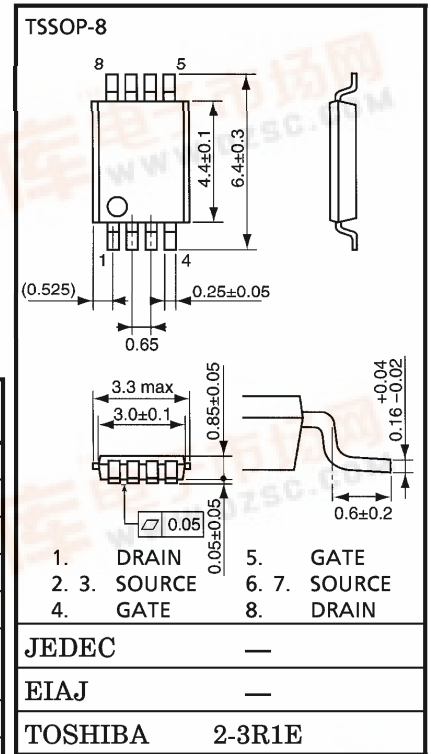
LITHIUM ION BATTERY APPLICATIONS  
NOTE BOOK PC  
PORTABLE MACHINES AND TOOLS

INDUSTRIAL APPLICATIONS  
Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 17\text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 13\text{ S}$  (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 ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC		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	$I_D$	6	A
	Pulse	$I_{DP}$	24	A
Drain Power Dissipation*** ( $T_a = 25^\circ\text{C}$ )		$P_D$	1.0	W
Single Pulse Avalanche Energy**		$E_{AS}$	234	mJ
Avalanche Current		$I_{AR}$	6	A
Repetitive Avalanche Energy*		$E_{AR}$	0.1	mJ
Channel Temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ\text{C}$



THERMAL CHARACTERISTICS

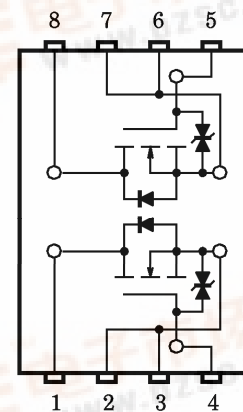
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient***	$R_{th(ch-a)}$	125	$^\circ\text{C/W}$

Note ;

- \* Repetitive rating ; Pulse Width Limited by Max. Junction temperature.
- \*\*  $V_{DD} = 16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 5.0\text{ mH}$ ,  $I_{AR} = 6\text{ A}$ ,  $R_G = 25\text{ }\Omega$
- \*\*\* Drive operation ; Mount on glass epoxy board [ $1\text{ inch}^2 \times 0.8\text{ t}$ ] in the two devices driving ( $t = 10\text{ s}$ )

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

CIRCUIT CONFIGURATION



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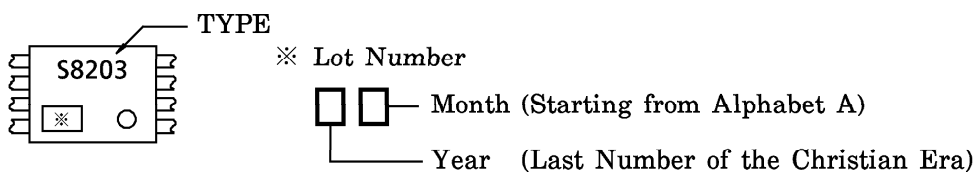
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

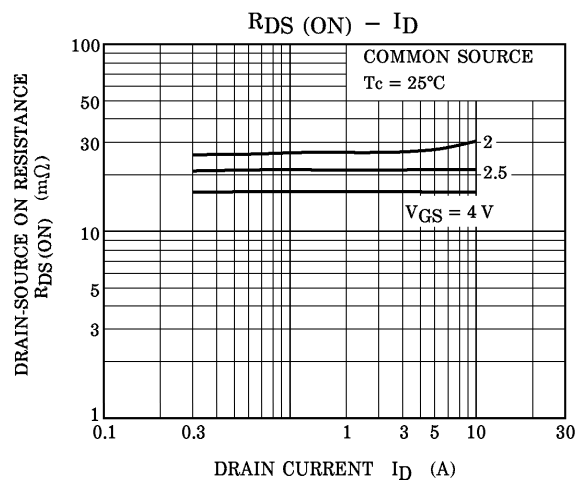
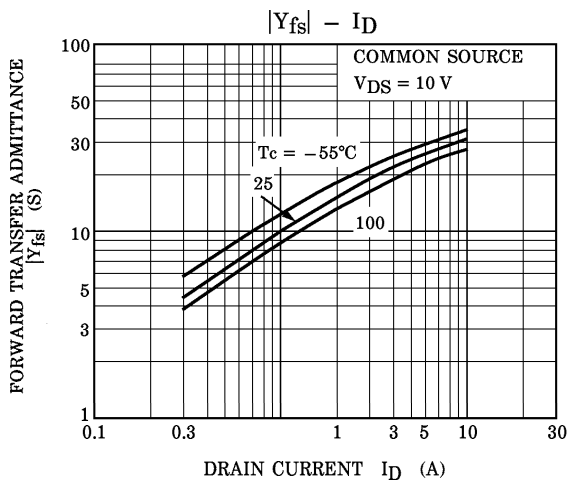
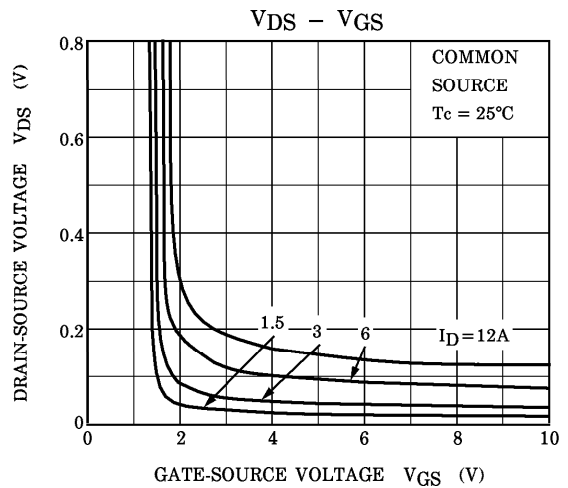
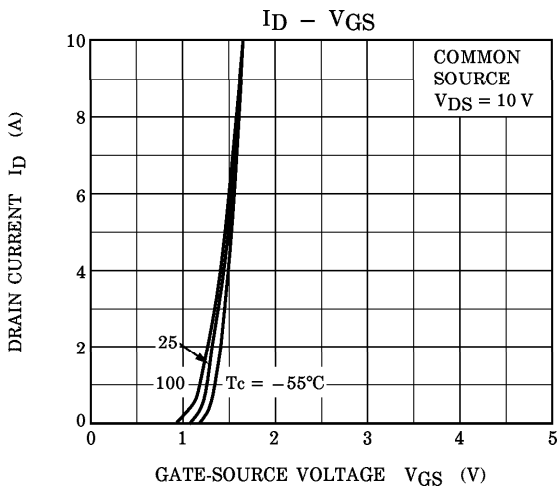
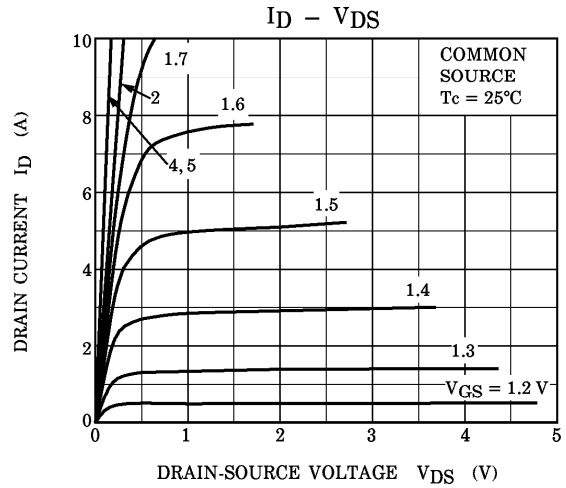
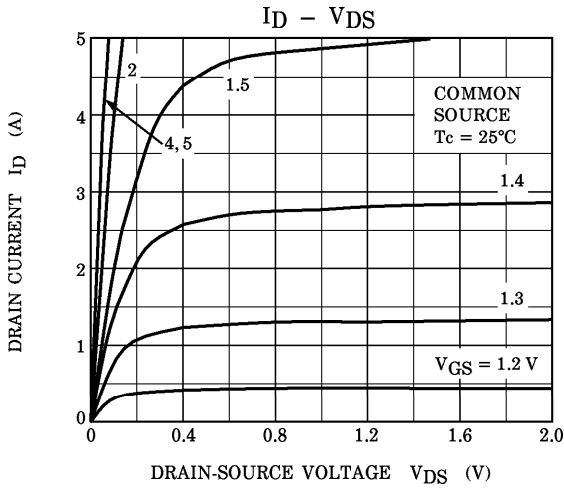
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		IGSS	VGS = ±10 V, VDS = 0 V	—	—	±10	μA
Drain Cut-Off Current		IDSS	VDS = 20 V, VGS = 0 V	—	—	10	μA
Drain-Source Breakdown Voltage		V(BR)DSS	ID = 10 mA, VGS = 0 V	20	—	—	V
		V(BR)DSX	ID = 10 mA, VGS = -12 V	8	—	—	
Gate Threshold Voltage		Vth	VDS = 10 V, ID = 200 μA	0.5	—	1.2	V
Drain-Source ON Resistance		RDS(ON)	VGS = 2.0 V, ID = 4.2 A	—	27	45	mΩ
			VGS = 2.5 V, ID = 4.2 A	—	22	29	
			VGS = 4 V, ID = 4.8 A	—	17	24	
Forward Transfer Admittance		Yfs	VDS = 10 V, ID = 3 A	6.5	13	—	S
Input Capacitance		Ciss	VDS = 10 V, VGS = 0 V, f = 1 MHz	—	1160	—	pF
Reverse Transfer Capacitance		Crss		—	190	—	
Output Capacitance		Coss		—	270	—	
Switching Time	Rise Time	tr	<p>VGS = 5 V, 0 V pulse ID = 3 A VDD ≐ 10 V RL = 3.3 Ω 4.7 Ω gate resistor</p>	—	6.9	—	ns
	Turn-On Time	ton		—	13	—	
	Fall Time	tf		—	18	—	
	Turn-Off Time	toff		VIN : tr, tf < 5 ns Duty ≤ 1%, tw = 10 μs	—	62	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Qg	VDD ≐ 16 V, VGS = 5 V ID = 6 A	—	18	—	nC
Gate-Source Charge		Qgs		—	12	—	
Gate-Drain ("Miller") Charge		Qgd		—	6	—	

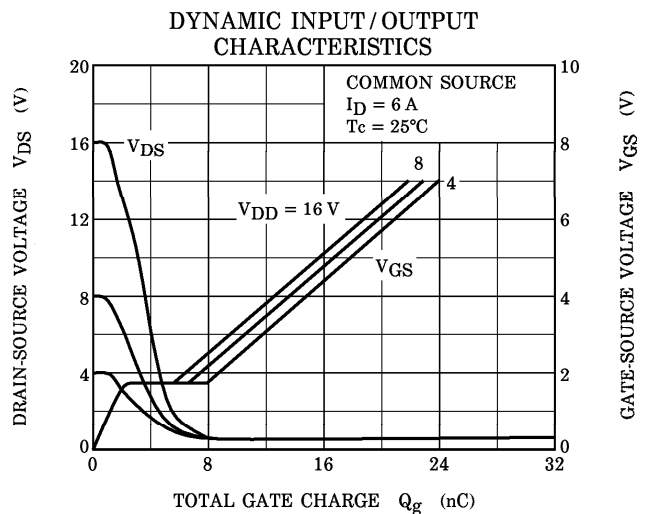
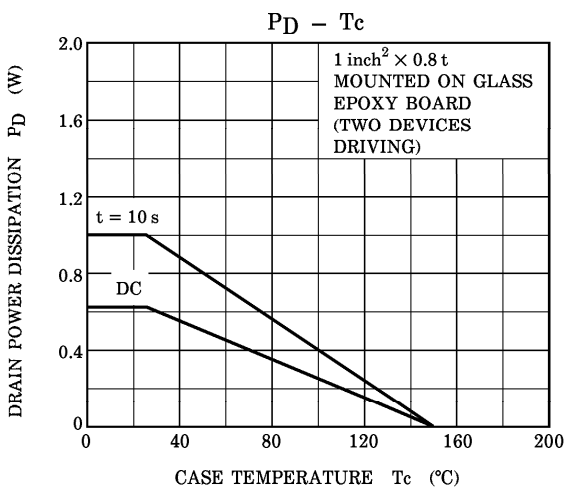
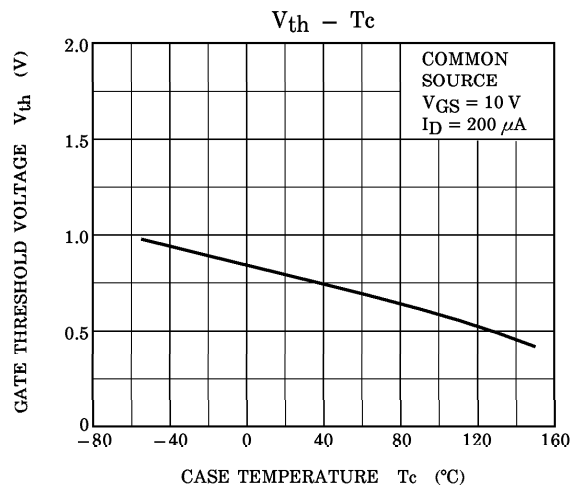
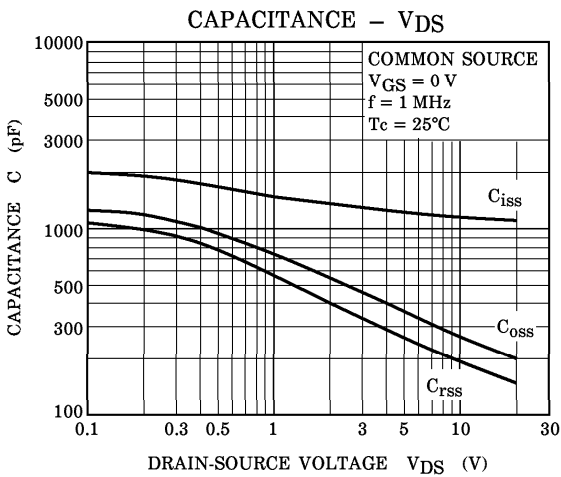
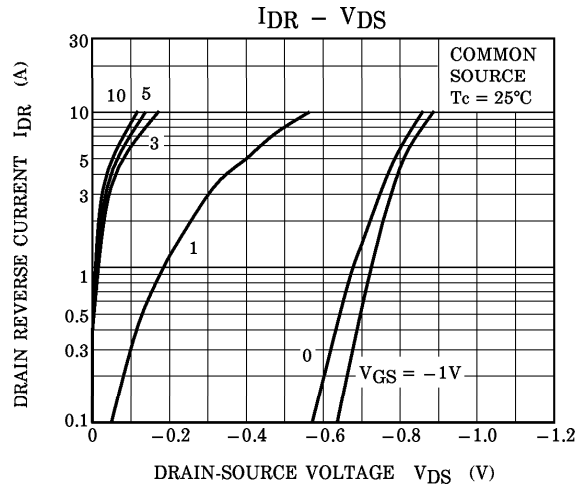
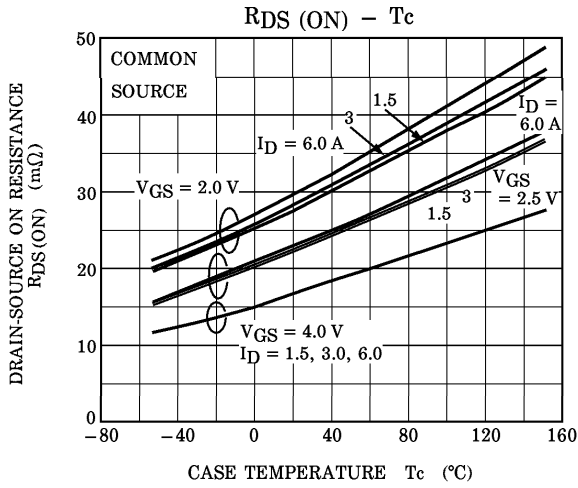
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

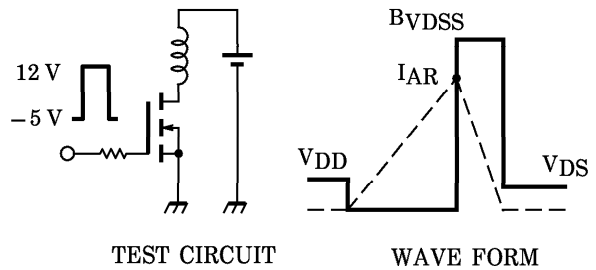
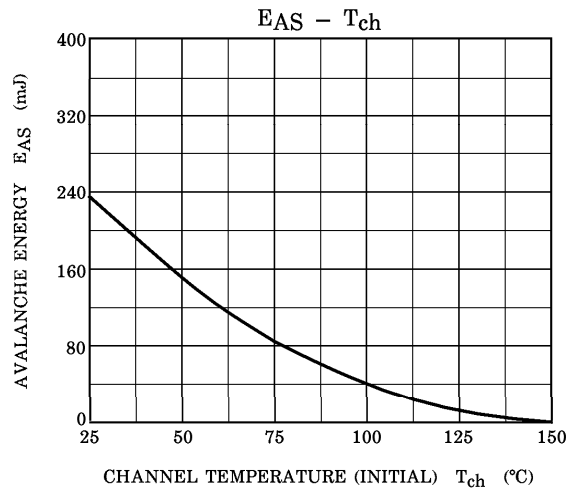
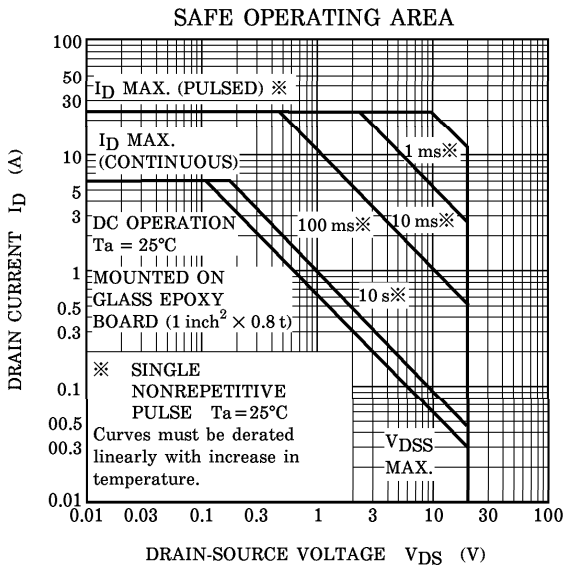
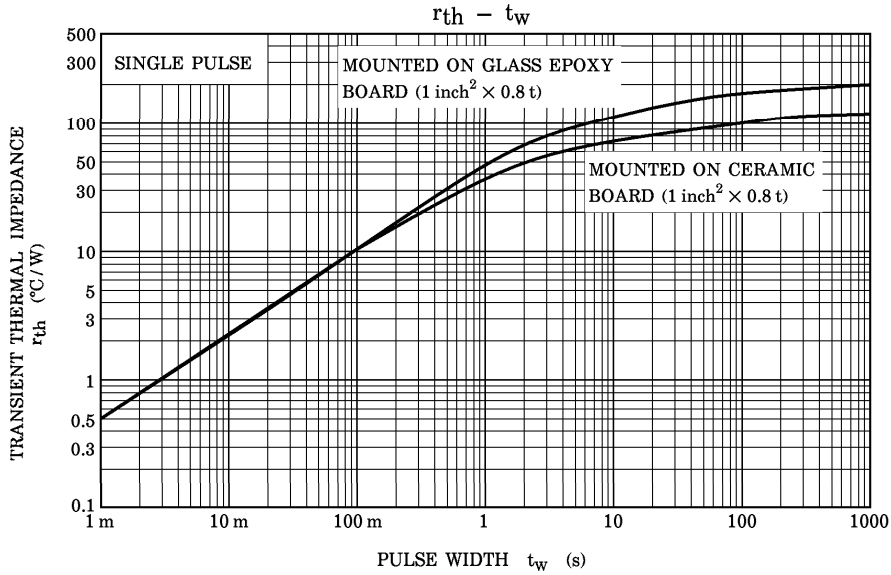
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	IDR	—	—	—	6	A
Pulse Drain Reverse Current	IDRP	—	—	—	24	A
Diode Forward Voltage	VDSF	IDR = 6 A, VGS = 0 V	—	—	-1.2	V

MARKING









Peak  $I_{AR} = 6 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 16 \text{ V}$ ,  $L = 5.0 \text{ mH}$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{BVDSS}{BVDSS - V_{DD}} \right)$$