

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

TPCS8102

LITHIUM ION BATTERY APPLICATIONS

NOTE BOOK PC, PORTABLE EQUIPMENTS APPLICATIONS

HIGH SPEED AND HIGH EFFICIENCY DC-DC CONVERTERS

- High Speed Switching
- Small Gate Charge : $Q_g = 37 \text{ nC}$ (Typ.)
- Low Drain-Source ON Resistance : $R_{DS(ON)} = 16 \text{ m}\Omega$ (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}| = 17 \text{ S}$ (Typ.)
- Low Leakage Current : $I_{DSS} = -10 \mu\text{A}$ (Max.) ($V_{DS} = -20 \text{ V}$)
- Enhancement-Mode : $V_{th} = -0.5 \sim -1.2 \text{ V}$
($V_{DS} = -10 \text{ V}$, $I_D = -200 \mu\text{A}$)

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}	± 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^{***}	1.5	W
Single Pulse Avalanche Energy*		E_{AS}	46.8	mJ
Avalanche Current		I_{AR}	-6	A
Repetitive Avalanche Energy**		E_{AR}	0.15	mJ
Channel Temperature		T_{ch}	150	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	-55~150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}^{***}$	83.3	$^\circ\text{C/W}$

Note ;

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

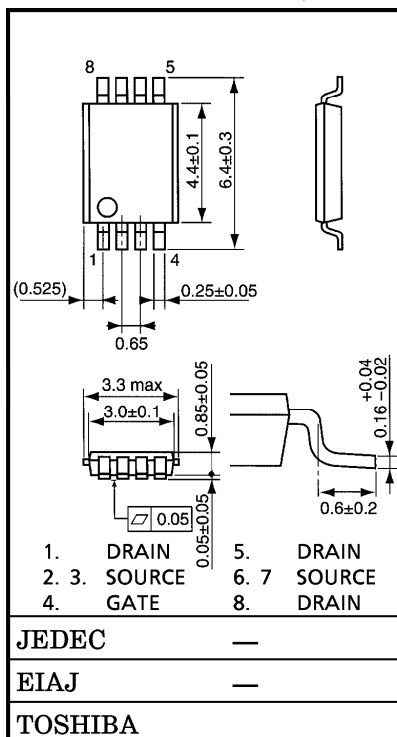
** Repetitive rating ; Pulse Width Limited by Max. Junction temperature.

*** Drive operation ; Mount on glass epoxy board [$1 \text{ inch}^2 \times 0.8 \text{ t}$]
 ($t = 10 \text{ s}$)

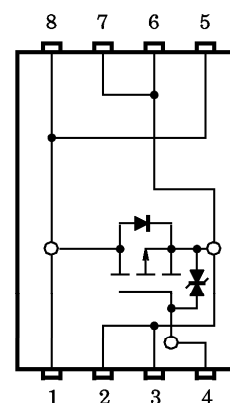
**This transistor is an electrostatic sensitive device.
 Please handle with caution.**

INDUSTRIAL APPLICATIONS

Unit in mm



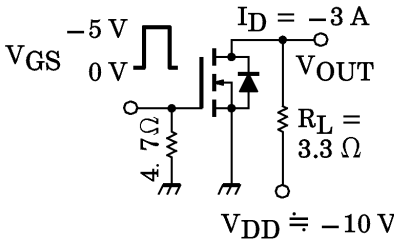
CIRCUIT CONFIGURATION



961001EAA2

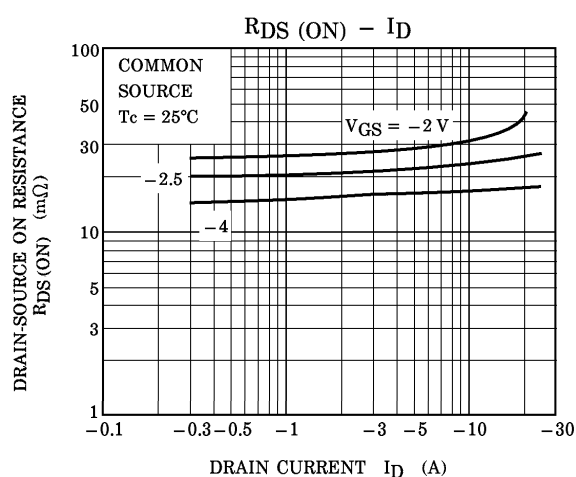
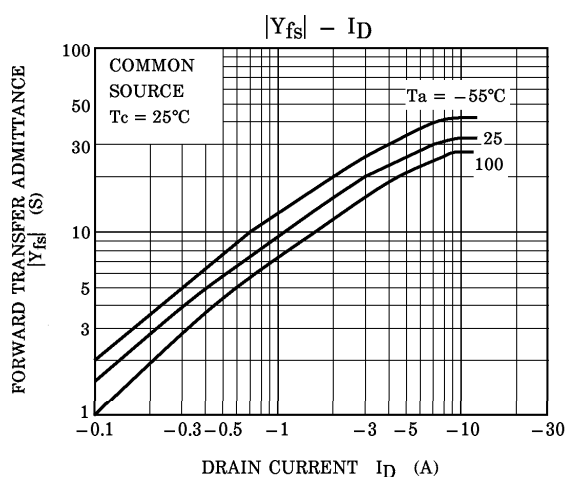
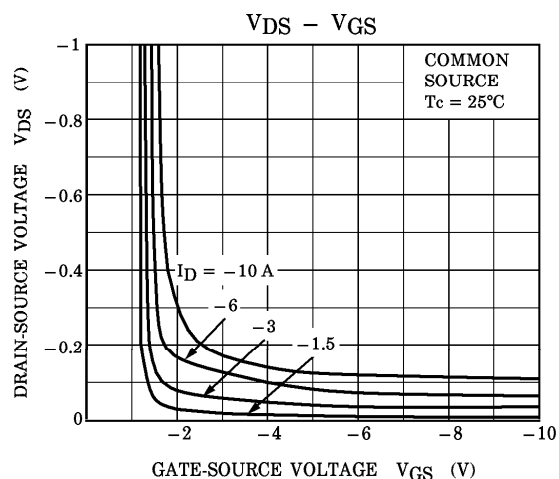
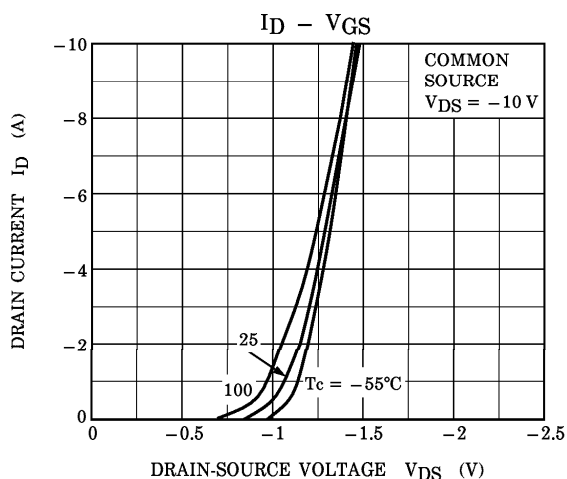
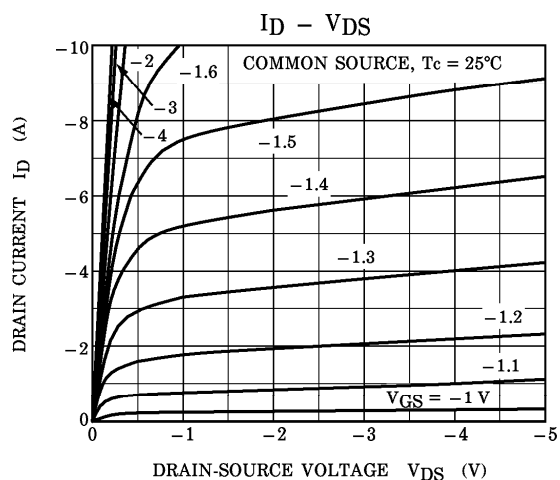
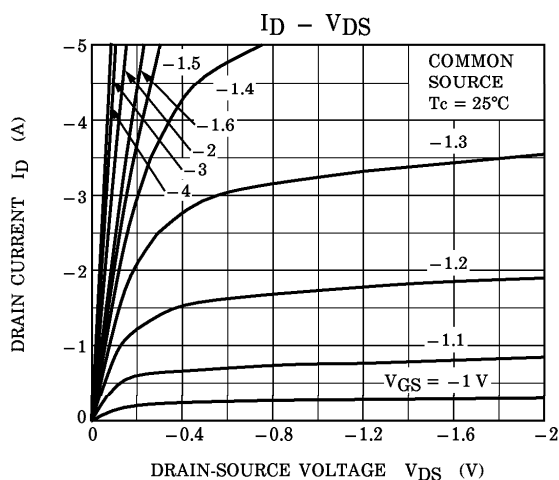
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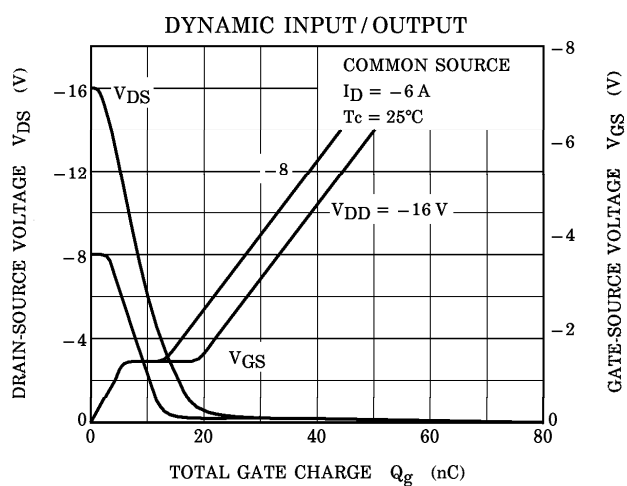
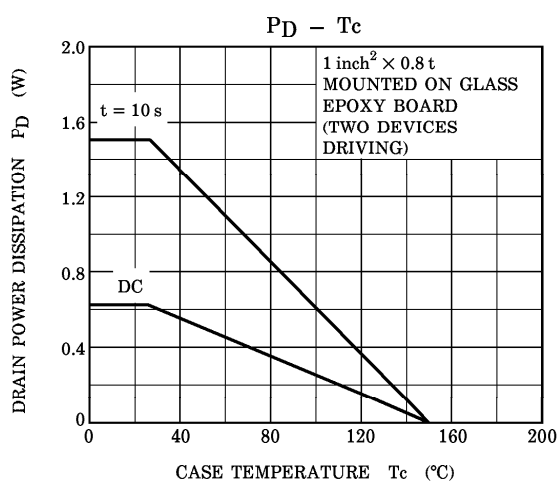
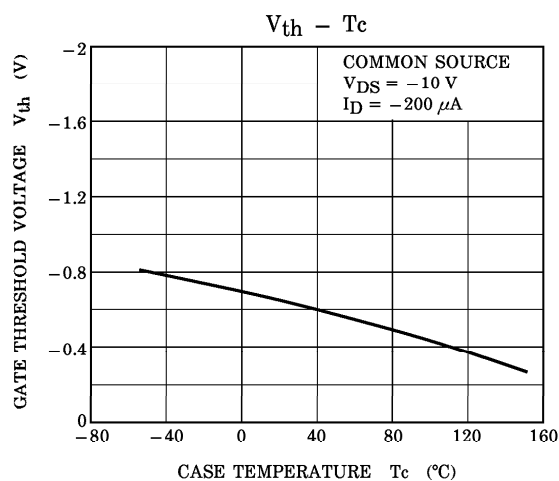
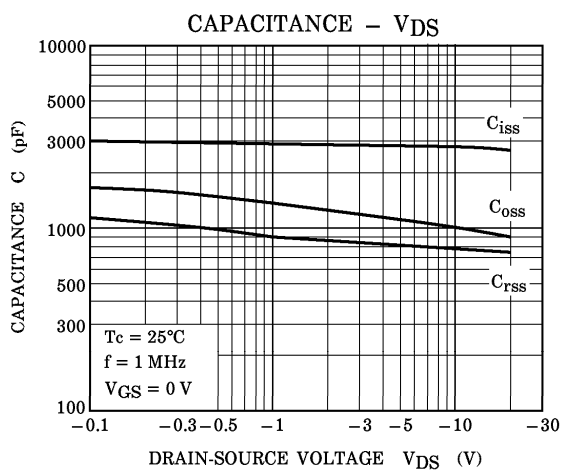
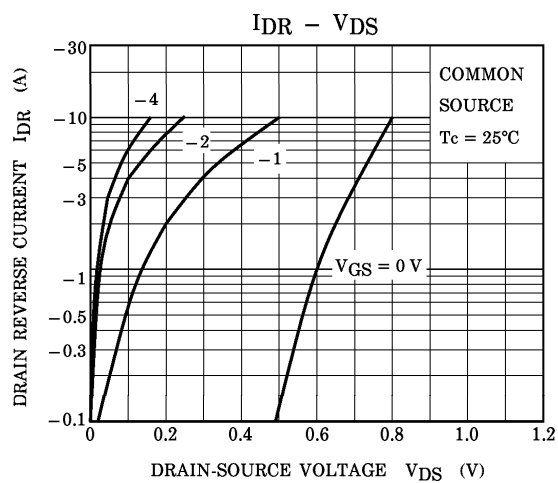
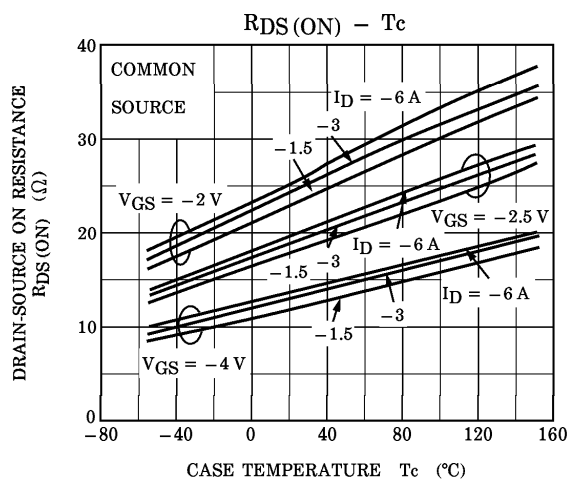
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

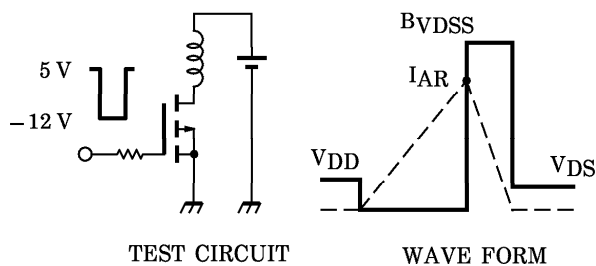
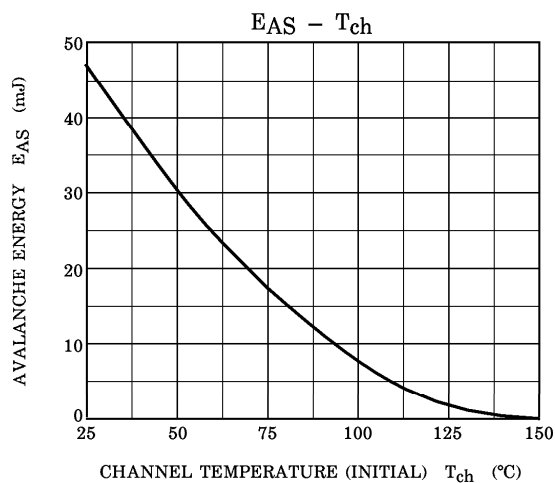
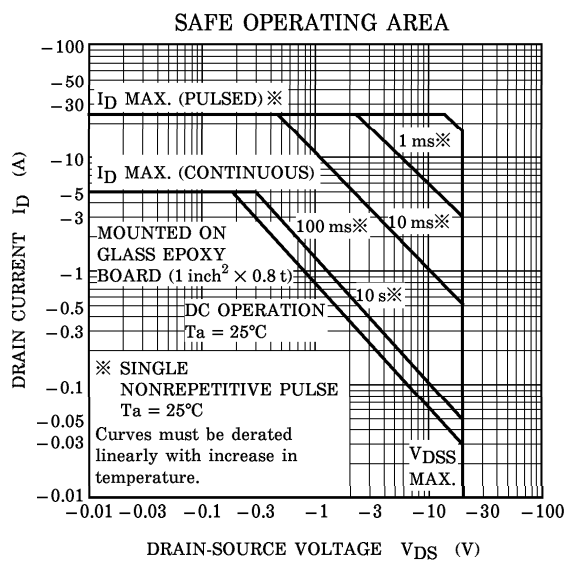
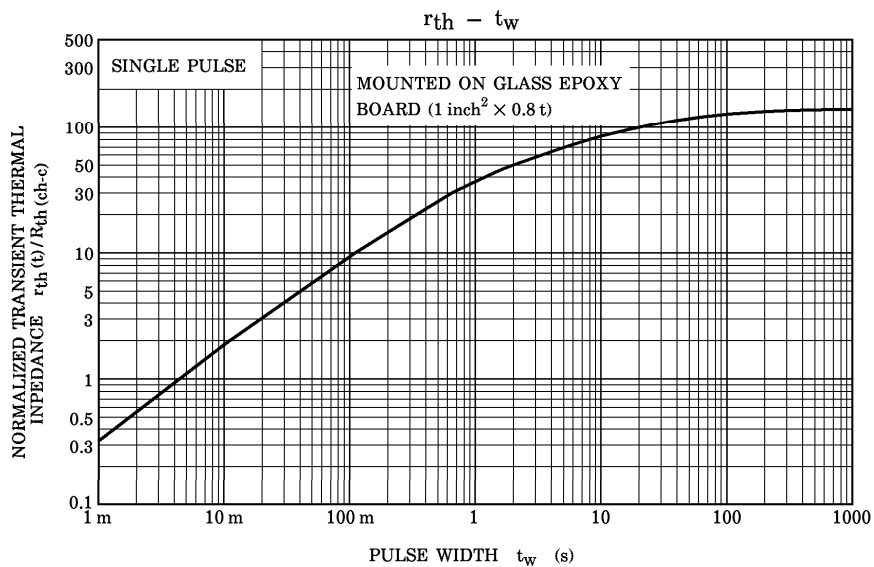
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I _{GSS}	V _{GS} = ±10 V, V _{DS} = 0 V	—	—	±10	μA
Drain Cut-Off Current		I _{DSS}	V _{DS} = −20 V, V _{GS} = 0 V	—	—	−10	μA
Drain-Source Breakdown Voltage		V _(BR) DSS	I _D = −10 mA, V _{GS} = 0 V	−20	—	—	V
		V _(BR) DSX	I _D = −10 mA, V _{GS} = 12 V	−8	—	—	
Gate Threshold Voltage		V _{th}	V _{DS} = −10 V, I _D = −200 μA	−0.5	—	−1.2	V
Drain-Source ON Resistance		R _{DS (ON)}	V _{GS} = −2.0 V, I _D = −3 A	—	30	60	mΩ
			V _{GS} = −2.5 V, I _D = −3 A	—	23	30	
			V _{GS} = −4 V, I _D = −3 A	—	16	20	
Forward Transfer Admittance		Y _{fs}	V _{DS} = −10 V, I _D = −3 A	8.5	17	—	S
Input Capacitance		C _{iss}	V _{DS} = −10 V, V _{GS} = 0 V, f = 1 MHz	—	2740	—	pF
Reverse Transfer Capacitance		C _{rss}		—	780	—	
Output Capacitance		C _{oss}		—	1030	—	
Switching Time	Rise Time	t _r	 V_{GS} −5 V 0 V I_D = −3 A V_{OUT} R_L = 3.3 Ω V_{DD} ≐ −10 V V_{IN} : t_r, t_f < 5 ns Duty ≤ 1%, t_w = 10 μs	—	7.6	—	ns
	Turn-On Time	t _{on}		—	16	—	
	Fall Time	t _f		—	110	—	
	Turn-Off Time	t _{off}		—	230	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q _g	V _{DD} ≐ −16 V, V _{GS} = −5 V I _D = −6 A	—	37	—	nC
Gate-Source Charge		Q _{gs}		—	27	—	
Gate-Drain (“Miller”) Charge		Q _{gd}		—	10	—	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	-6	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	-24	A
Diode Forward Voltage	V_{DSF}	$I_{DR} = -6 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.2	V







$$\text{Peak } I_{AR} = -6 \text{ A, } R_G = 25 \, \Omega \quad E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

$$V_{DD} = -16 \text{ V, } L = 1.0 \text{ mH}$$