

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

# TPCS8101

LITHIUM ION BATTERY APPLICATIONS

NOTE BOOK PC, PORTABLE EQUIPMENTS APPLICATIONS

HIGH SPEED AND HIGH EFFICIENCY DC-DC CONVERTERS

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 15 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 12 \text{ S}$  (Typ.)
- Low Leakage Current :  $I_{DSS} = -10 \mu\text{A}$  (Max) ( $V_{DS} = -30 \text{ V}$ )
- Enhancement-Mode :  $V_{th} = -0.8 \sim -2.0 \text{ V}$   
( $V_{DS} = -10 \text{ V}$ ,  $I_D = -1 \text{ mA}$ )

MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSS}$	-30	V
Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-30	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	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	$^\circ\text{C}/\text{W}$

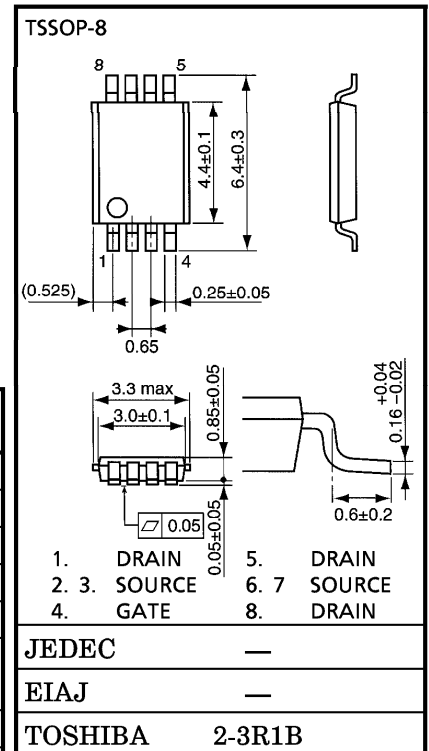
Note ;

- \* Repetitive rating ; Pulse Width Limited by Max. Junction temperature.
- \*\*  $V_{DD} = -24 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0 \text{ mH}$ ,  
 $I_{AR} = -6 \text{ A}$ ,  $R_G = 25 \Omega$
- \*\*\* Drive operation ; Mount on glass epoxy board [ $1 \text{ inch}^2 \times 0.8 \text{ t}$ ]  
( $t = 10 \text{ s}$ )

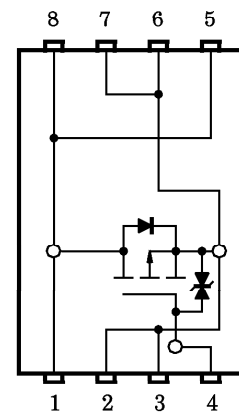
**This transistor is an electrostatic sensitive device.  
Please handle with caution.**

INDUSTRIAL APPLICATIONS

Unit in mm



CIRCUIT CONFIGURATION



961001EAA1

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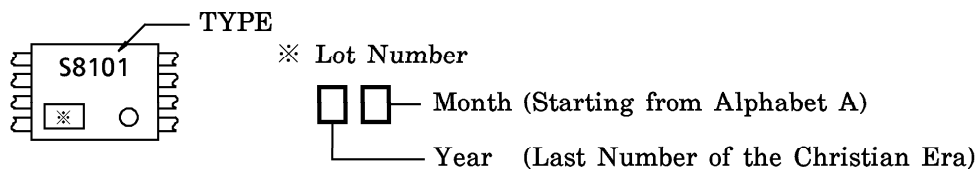
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

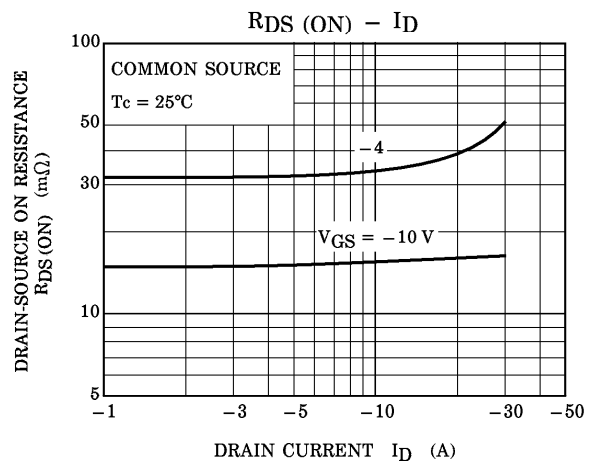
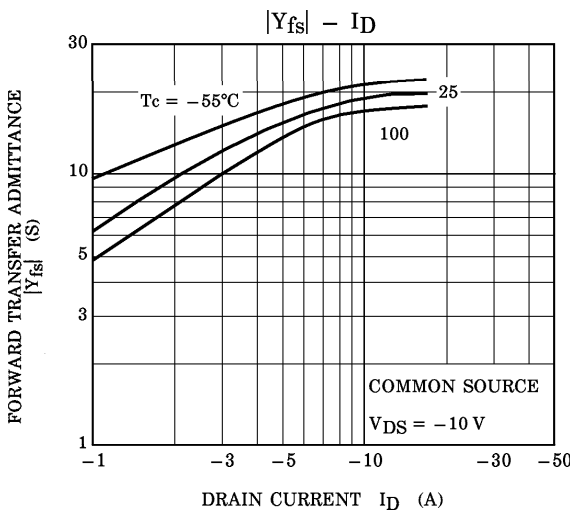
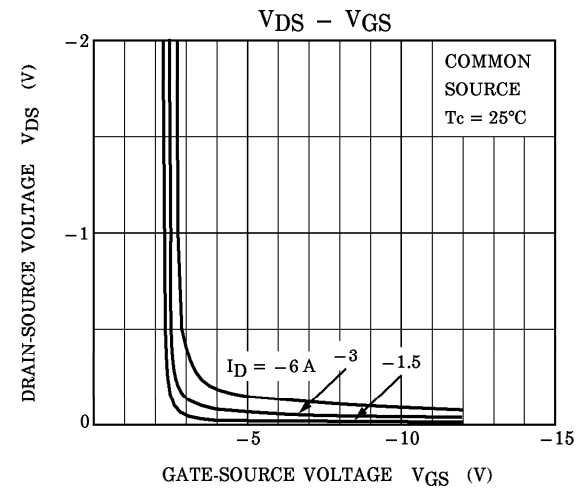
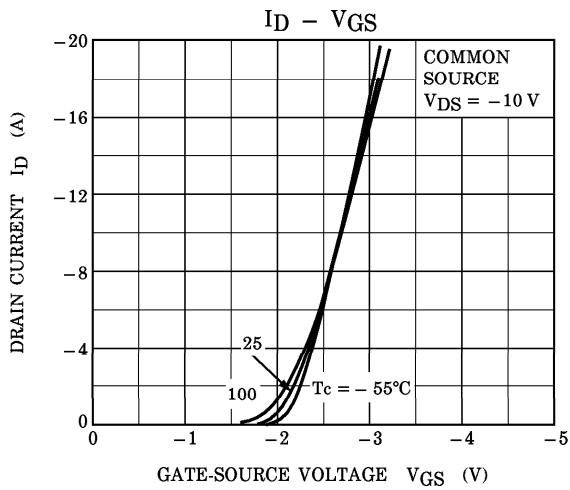
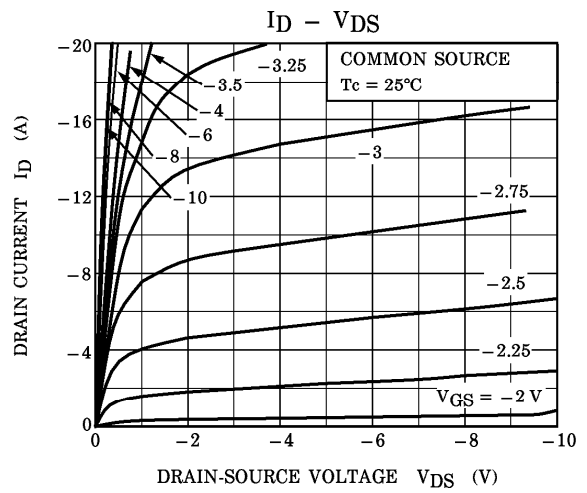
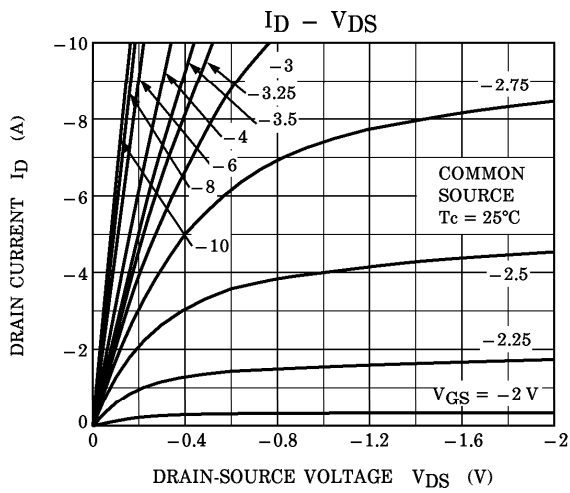
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain Cut-Off Current		$I_{DSS}$	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	$\mu\text{A}$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-30	—	—	V
		$V_{(BR)DSX}$	$I_D = -10\text{ mA}, V_{GS} = 20\text{ V}$	-15	—	—	
Gate Threshold Voltage		$V_{th}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-0.8	—	-2.0	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = -4\text{ V}, I_D = -3\text{ A}$	—	32	40	m $\Omega$
			$V_{GS} = -10\text{ V}, I_D = -3\text{ A}$	—	15	25	
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -3\text{ A}$	6	12	—	S
Input Capacitance		$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	1810	—	pF
Reverse Transfer Capacitance		$C_{rss}$		—	350	—	
Output Capacitance		$C_{oss}$		—	610	—	
Switching Time	Rise Time	$t_r$		—	9	—	ns
	Turn-On Time	$t_{on}$		—	15	—	
	Fall Time	$t_f$		—	49	—	
	Turn-Off Time	$t_{off}$		$V_{IN} : t_r, t_f < 5\text{ ns}$ $Duty \leq 1\%, t_w = 10\ \mu\text{s}$	—	135	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{DD} \doteq -24\text{ V}, V_{GS} = -10\text{ V}$	—	37	—	nC
Gate-Source Charge		$Q_{gs}$	$I_D = -6\text{ A}$	—	30	—	
Gate-Drain ("Miller") Charge		$Q_{gd}$		—	7	—	

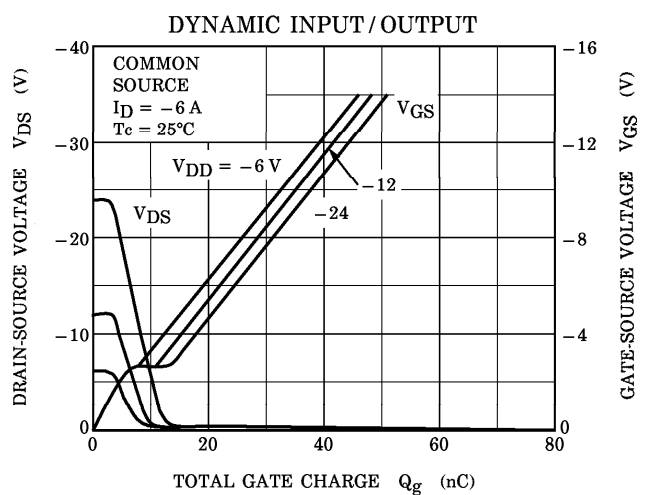
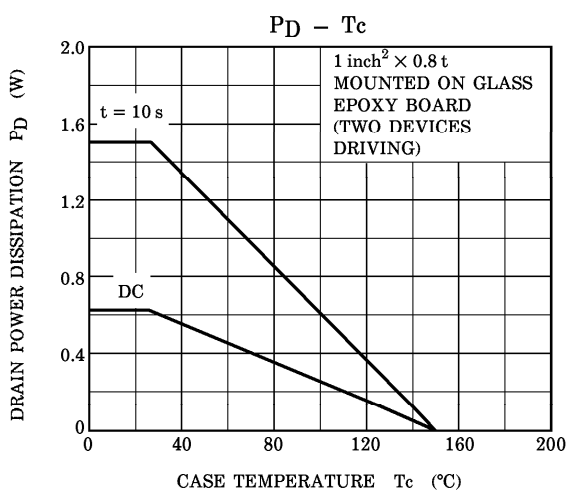
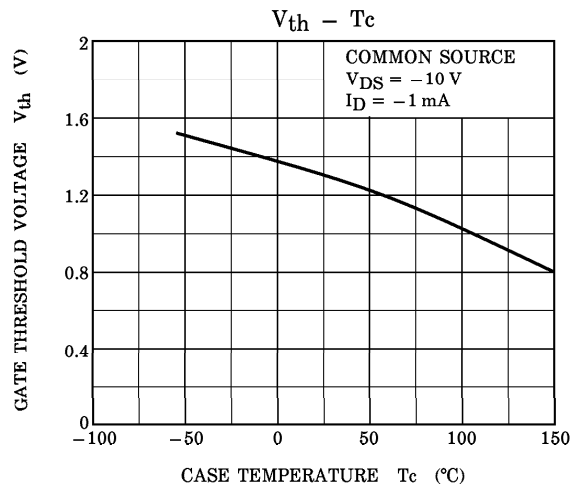
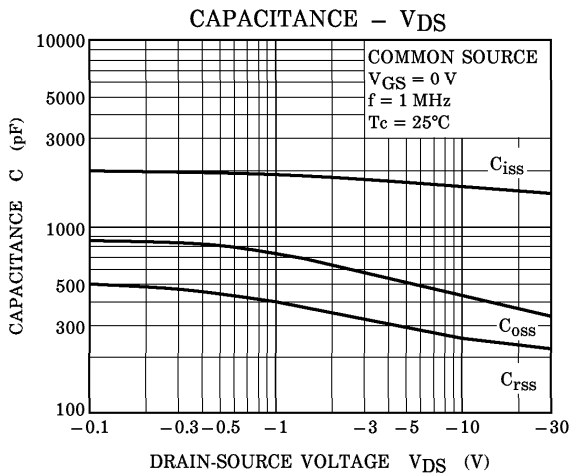
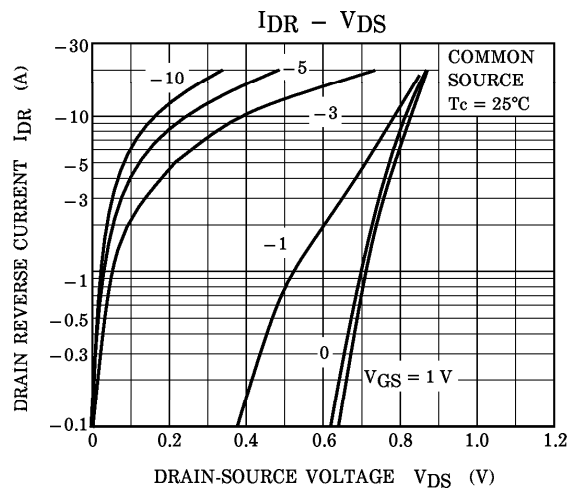
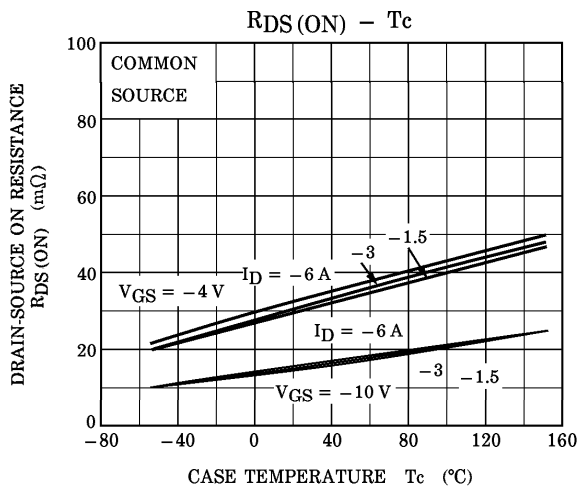
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

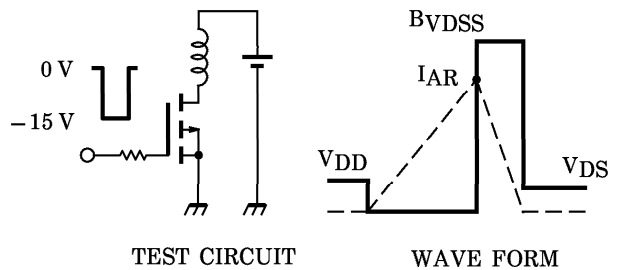
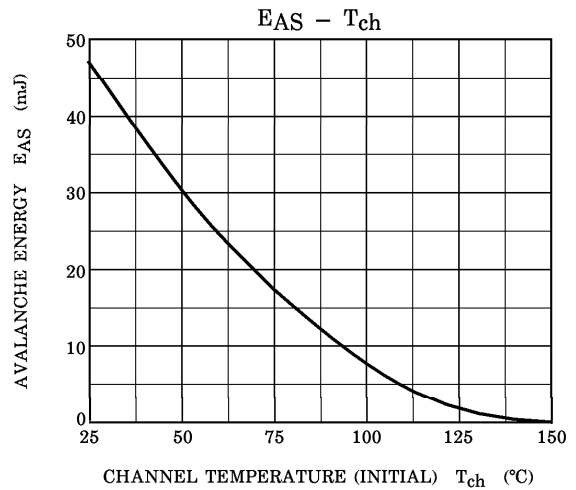
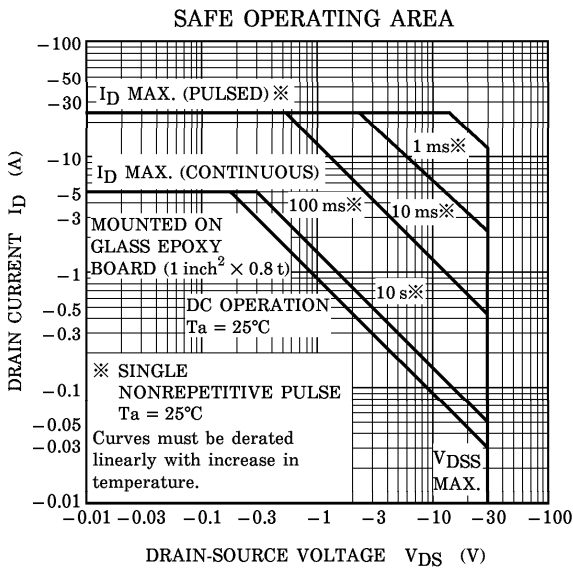
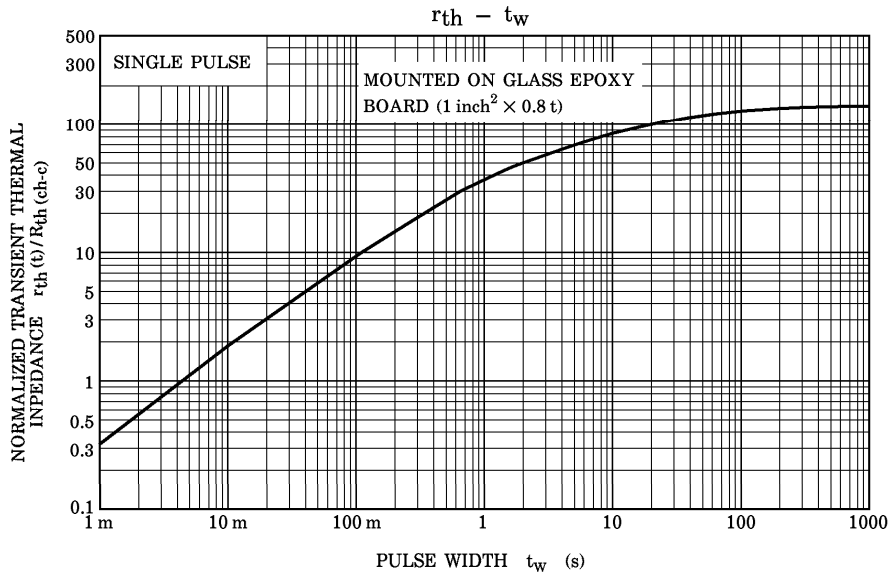
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	-6	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	-24	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = -6\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.2	V

MARKING









Peak  $I_{AR} = -6 \text{ A}$ ,  $R_G = 25 \Omega$ ,  $E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$   
 $V_{DD} = -16 \text{ V}$ ,  $L = 1.0 \text{ mH}$