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

TPCS8101

LITHIUM ION BATTERY APPLICATIONS

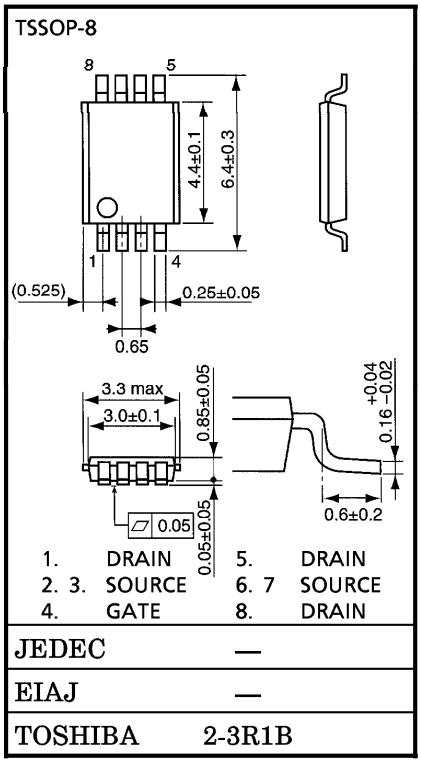
NOTE BOOK PC, PORTABLE EQUIPMENTS APPLICATIONS

HIGH SPEED AND HIGH EFFICIENCY DC-DC CONVERTERS

INDUSTRIAL APPLICATIONS

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

Unit in mm

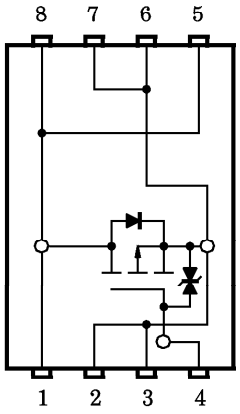


JEDEC	—
EIAJ	—
TOSHIBA	2-3R1B

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	−30	V
Drain-Gate Voltage ($R_{GS} = 20\,k\Omega$)		V_{DGR}	−30	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	DC	I_D	−6	A
	Pulse	I_{DP}	−24	A
Drain Power Dissipation*** (Ta = 25°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	°C
Storage Temperature Range		T_{stg}	−55~150	°C

CIRCUIT CONFIGURATION



THERMAL CHARACTERISTICS

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

Note ;

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

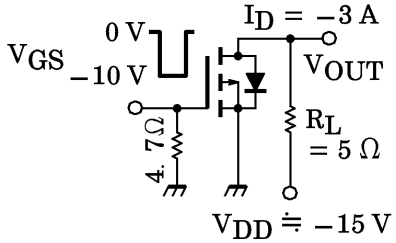
** $V_{DD} = -24\,V$, $T_{ch} = 25°C$ (initial), $L = 1.0\,mH$, $I_{AR} = -6\,A$, $R_G = 25\,\Omega$

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

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

961001EAA1

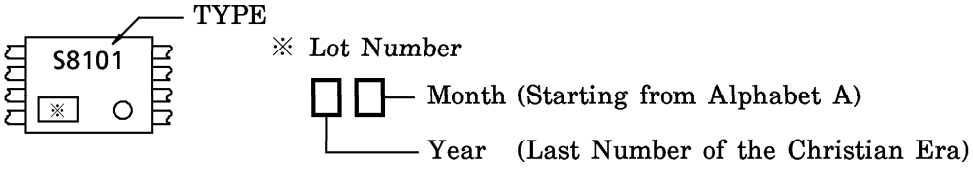
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

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

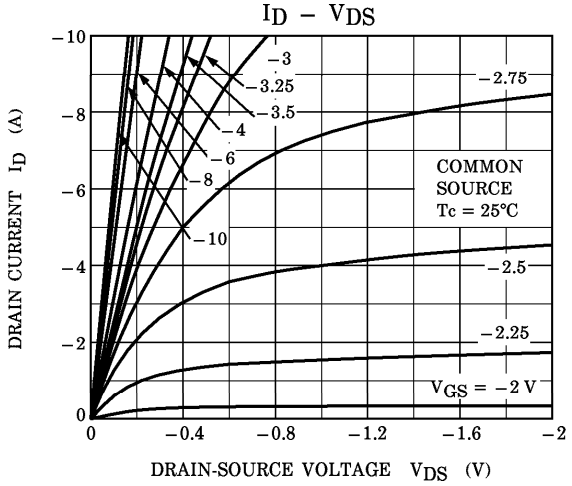
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

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}	$I_{DR} = -6$ A, $V_{GS} = 0$ V	—	—	1.2	V

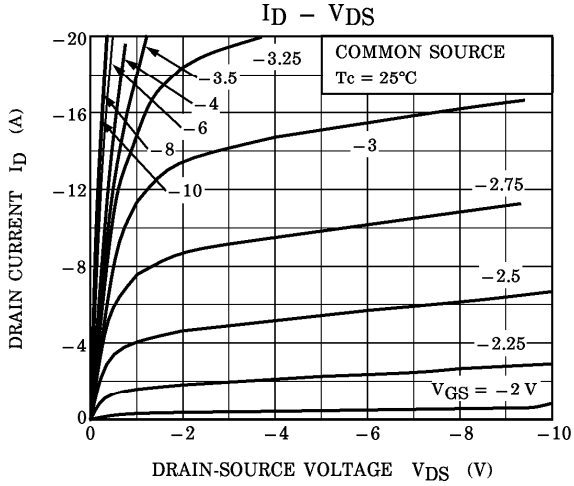
MARKING



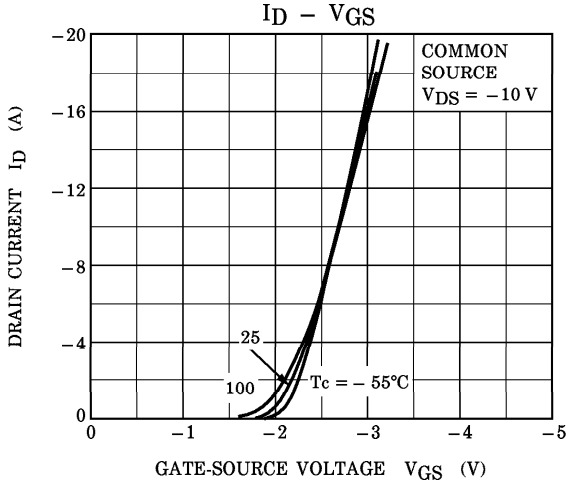
$I_D - V_{DS}$



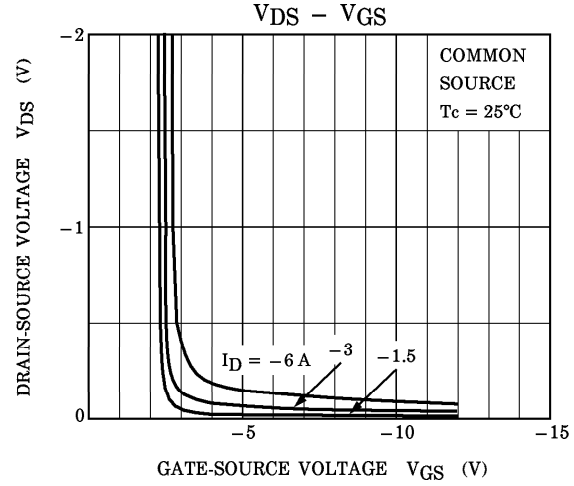
$I_D - V_{DS}$



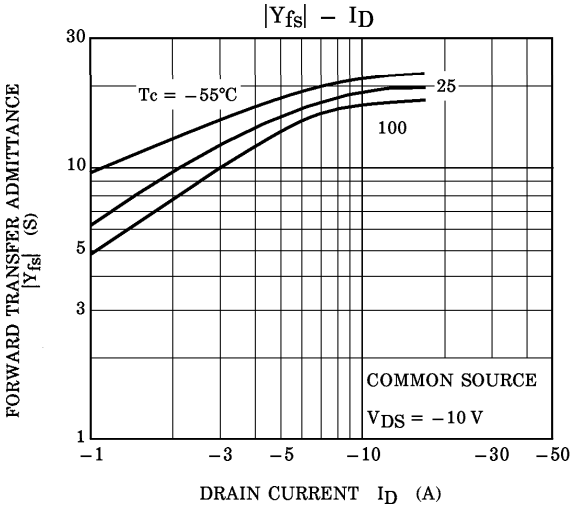
$I_D - V_{GS}$



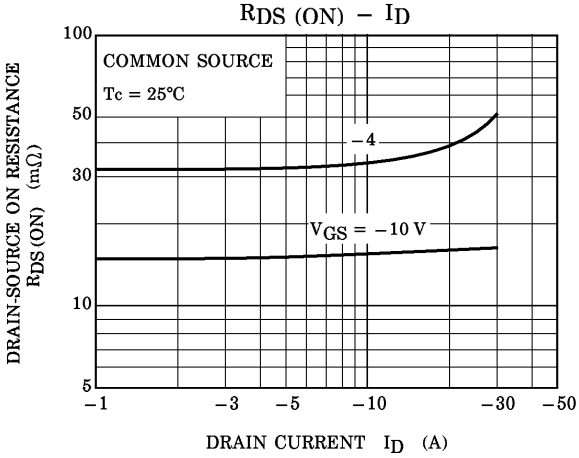
$V_{DS} - V_{GS}$



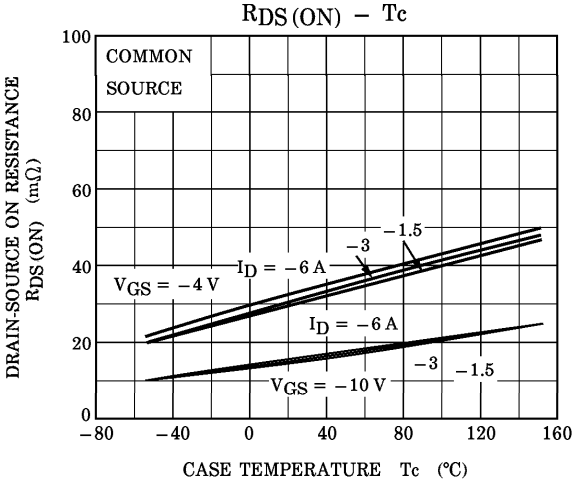
$|Y_{fs}| - I_D$



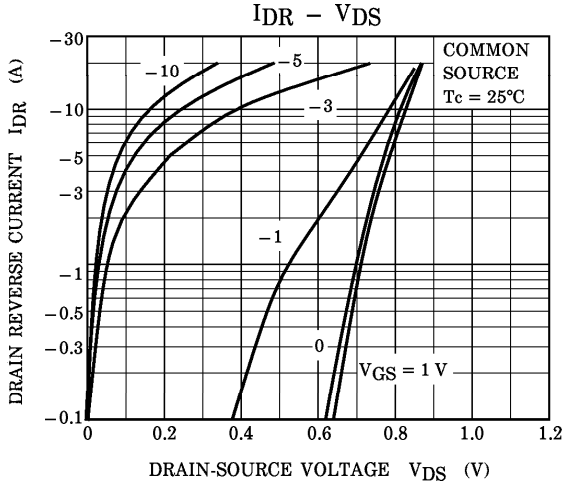
$R_{DS\ (ON)} - I_D$



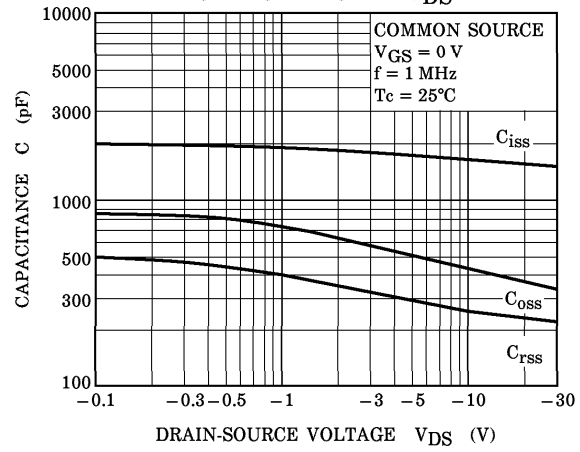
$R_{DS\,(ON)}$ – Tc



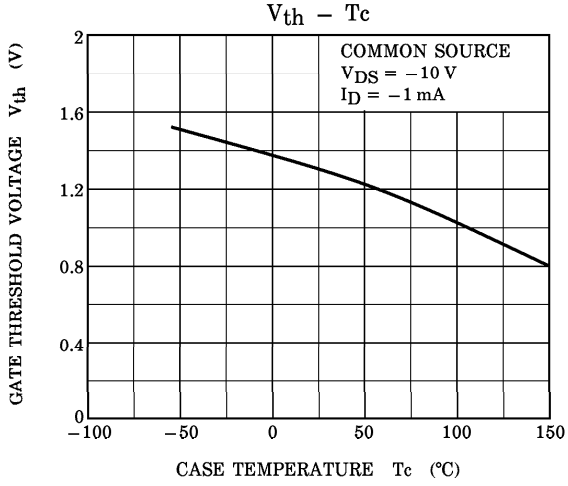
I_{DR} – V_{DS}



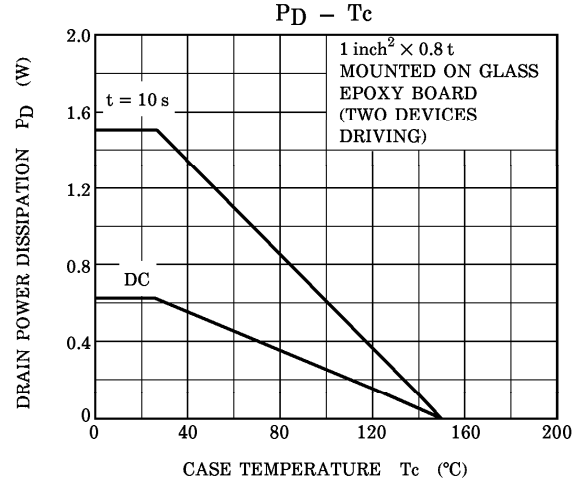
CAPACITANCE – V_{DS}



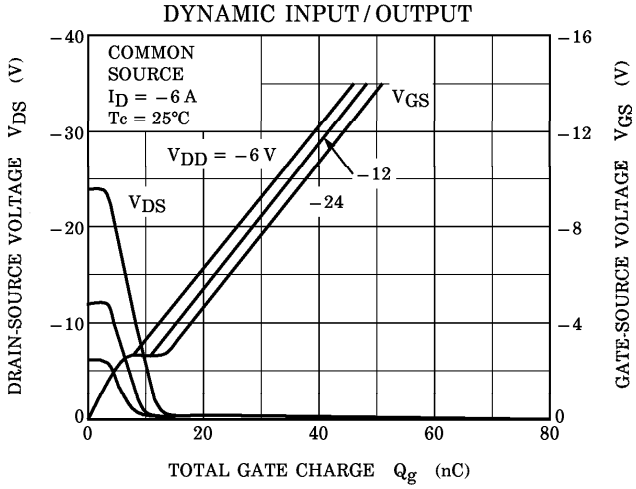
V_{th} – Tc



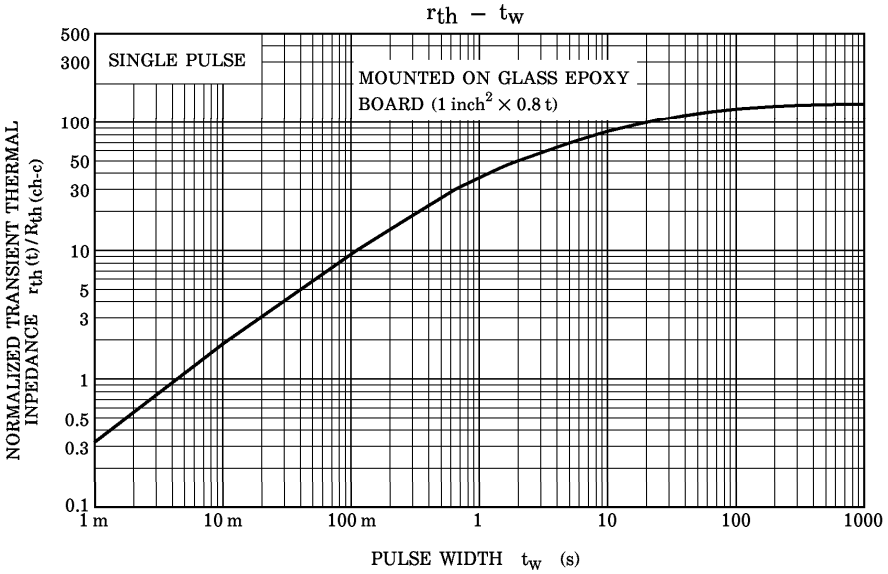
P_D – Tc



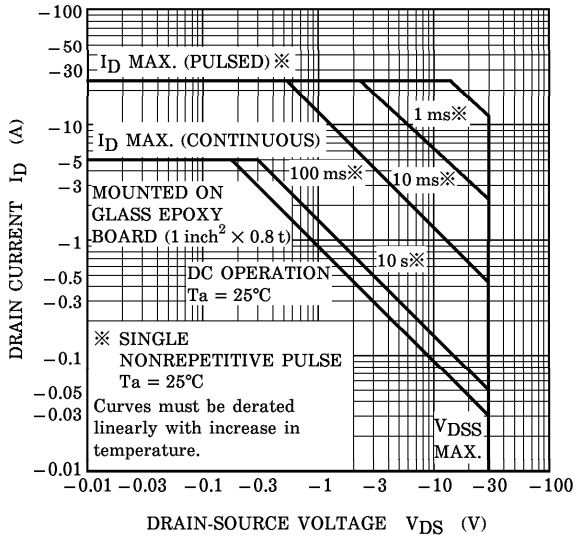
DYNAMIC INPUT / OUTPUT



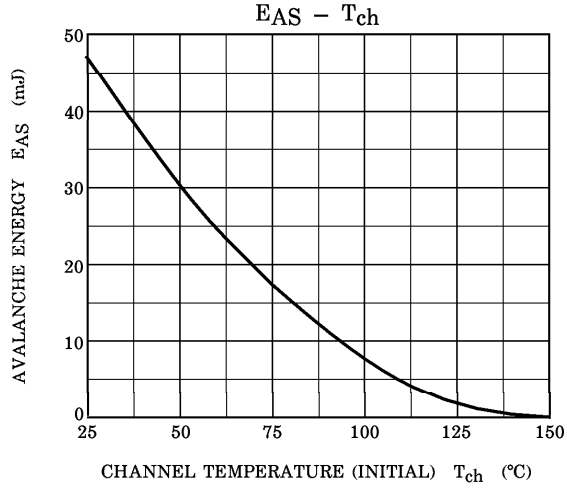
r_{th} – t_w

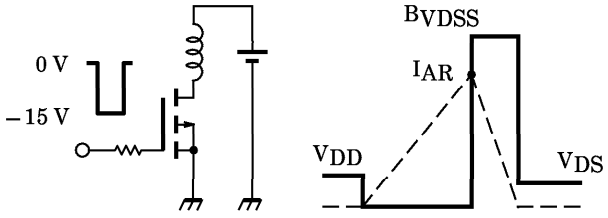


SAFE OPERATING AREA



E_{AS} – T_{ch}





TEST CIRCUIT WAVE FORM

Peak I_{AR} = −6 A, R_G = 25 Ω
V_{DD} = −16 V, L = 1.0 mH

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