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

TPC8103

LITHIUM ION BATTERY

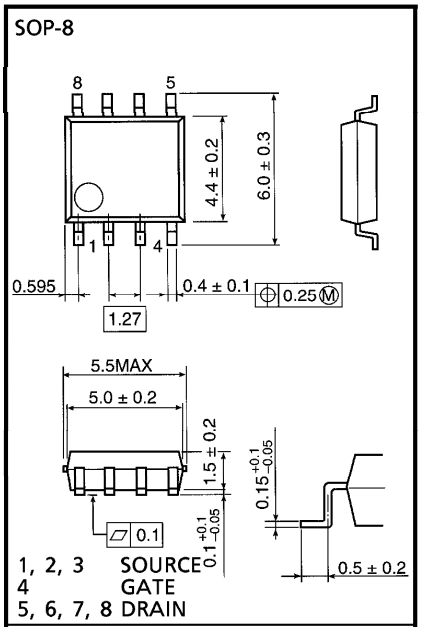
PORTABLE MACHINES AND TOOLS

NOTE BOOK PC

INDUSTRIAL APPLICATIONS

- Low Drain-Source ON Resistance : $R_{DS\,(ON)} = 9.5\,m\Omega$ (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}| = 20\,S$ (Typ.)
- Low Leakage Current
  : $I_{DSS} = -10\,\mu A$ (Max.) ($V_{DS} = -30\,V$)
- Enhancement-Mode
  : $V_{th} = -0.8 \sim -2.0\,V$ ($V_{DS} = -10\,V$, $I_D = -1\,mA$)

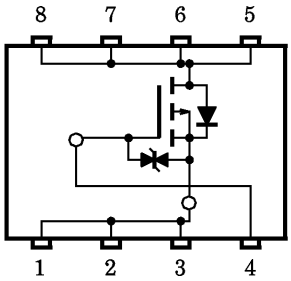
Unit in mm



JEDEC	—
EIAJ	—
TOSHIBA	2-6J1A

Weight : 0.08 g (Typ.)

CIRCUIT CONFIGURATION



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	−11	A
	Pulse	I_{DP}	−44	A
Drain Power Dissipation*** (Ta = 25°C)		P_D	2.4	W
Single Pulse Avalanche Energy**		E_{AS}	157	mJ
Avalanche Current		I_{AR}	−11	A
Repetitive Avalanche Energy*		E_{AR}	0.24	mJ
Channel Temperature		T_{ch}	150	°C
Storage Temperature Range		T_{stg}	−55~150	°C

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient***	$R_{th\,(ch\text{-}a)}$	52.1	°C / W

Note ;

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

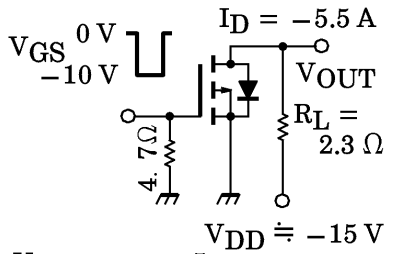
** $V_{DD} = -24\,V$, $T_{ch} = 25°C$ (initial), $L = 1.0\,mH$, $R_G = 25\,\Omega$, $I_{AR} = -11\,A$

*** 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

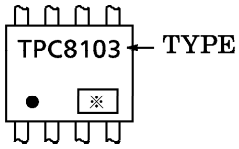
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

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	—	—	V
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, $I_D = -5.5$ A	—	18.5	23	mΩ
		$R_{DS\ (ON)}$	$V_{GS} = -10$ V, $I_D = -5.5$ A	—	9.5	13	mΩ
Forward Transfer Admittance		$\|Y_{fs}\|$	$V_{DS} = -10$ V, $I_D = -5.5$ A	10	20	—	S
Input Capacitance		C_{iss}	$V_{DS} = -10$ V, $V_{GS} = 0$ V, f = 1 MHz	—	2700	—	pF
Reverse Transfer Capacitance		C_{rss}		—	600	—	
Output Capacitance		C_{oss}		—	1000	—	
Switching Time	Rise Time	t_r		—	50	—	ns
	Turn-On Time	t_{on}		—	60	—	
	Fall Time	t_f		—	220	—	
	Turn-Off Time	t_{off}		—	480	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	$V_{DD} \fallingdotseq -24$ V, $V_{GS} = -11$ V, $I_D = -11$ A	—	60	—	nC
Gate-Source Charge		Q_{gs}		—	40	—	
Gate-Drain ("Miller") Charge		Q_{gd}		—	20	—	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	−11	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	−44	A
Diode Forward Voltage	V_{DSF}	$I_{DR} = -11$ A, $V_{GS} = 0$ V	—	—	1.2	V

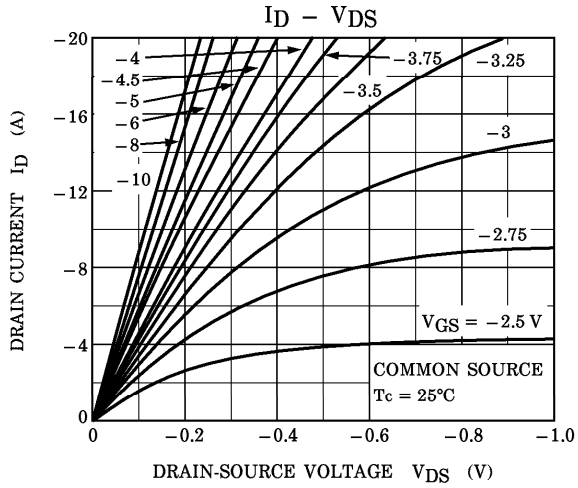
MARKING

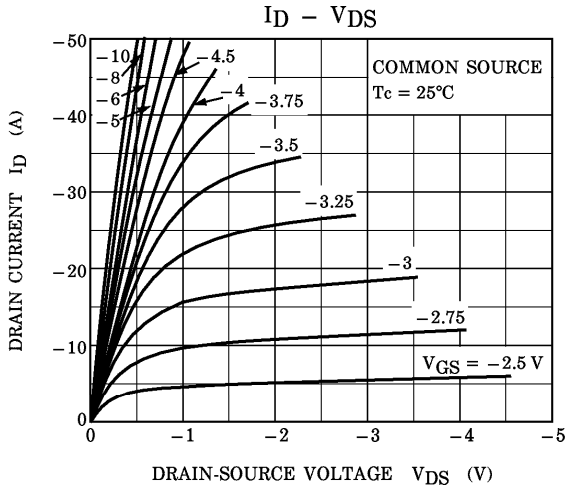


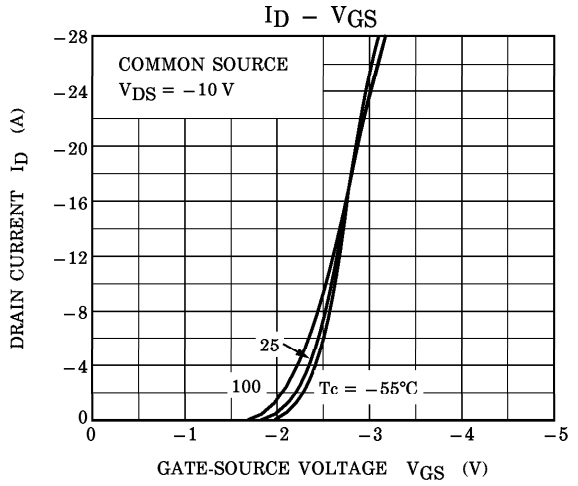
※ Lot Number

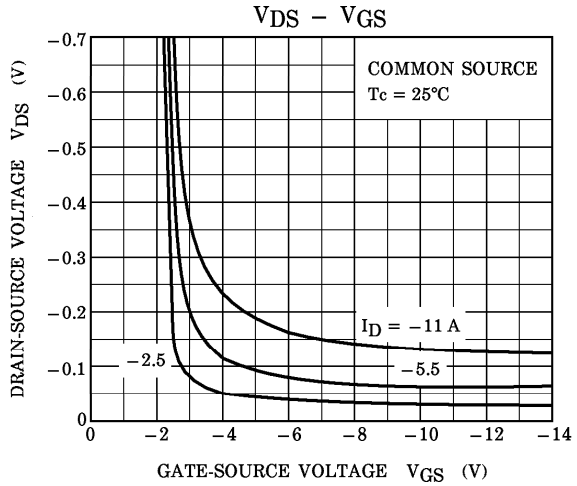
□□ — Month (Starting from Alphabet A)

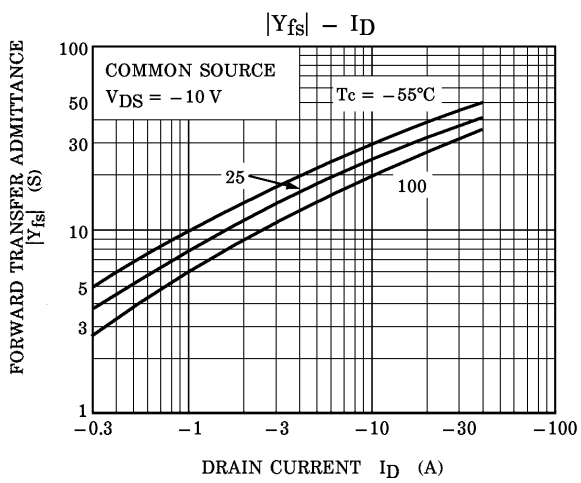
Year (Last Number of the Christian Era)

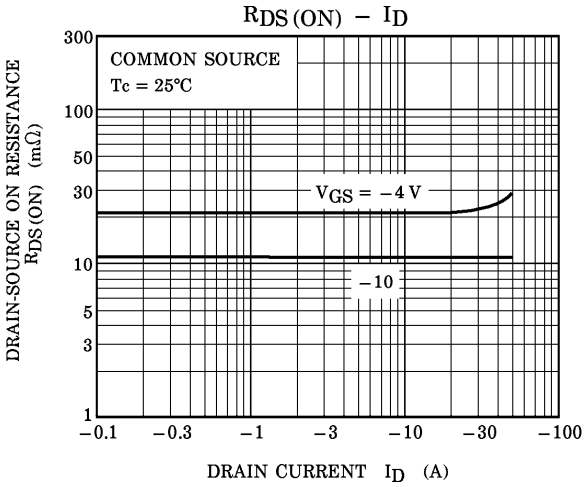

$I_D - V_{DS}$
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)
−4
−4.5
−5
−6
−8
−10
−3.75
−3.25
−3.5
−3
−2.75
V_{GS} = −2.5 V
COMMON SOURCE
Tc = 25°C


$I_D - V_{DS}$
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)
COMMON SOURCE
Tc = 25°C
−10
−8
−6
−5
−4.5
−4
−3.75
−3.5
−3.25
−3
−2.75
V_{GS} = −2.5 V

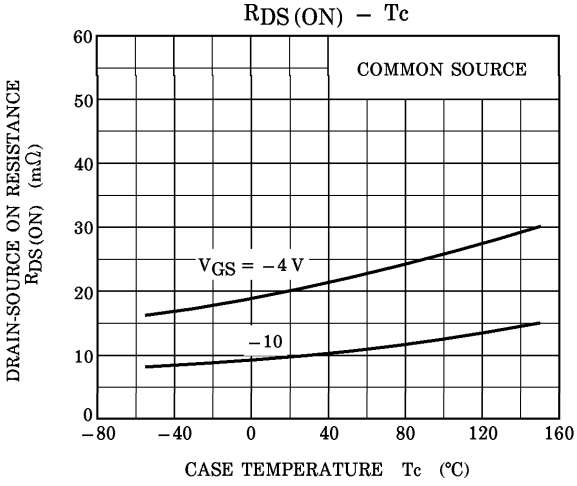

$I_D - V_{GS}$
DRAIN CURRENT I_D (A)
GATE-SOURCE VOLTAGE V_{GS} (V)
COMMON SOURCE
V_{DS} = −10 V
25
100
Tc = −55°C


$V_{DS} - V_{GS}$
DRAIN-SOURCE VOLTAGE V_{DS} (V)
GATE-SOURCE VOLTAGE V_{GS} (V)
COMMON SOURCE
Tc = 25°C
I_D = −11 A
−2.5
−5.5

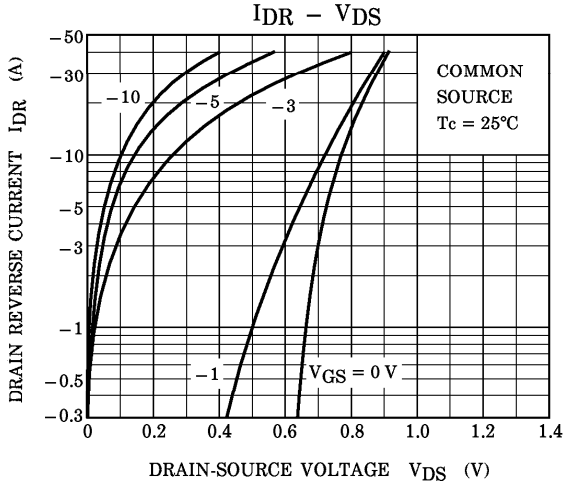

$|Y_{fs}| - I_D$
FORWARD TRANSFER ADMITTANCE $|Y_{fs}|$ (S)
DRAIN CURRENT I_D (A)
COMMON SOURCE
V_{DS} = −10 V
Tc = −55°C
25
100


$R_{DS\,(ON)} - I_D$
DRAIN-SOURCE ON RESISTANCE $R_{DS\,(ON)}$ (mΩ)
DRAIN CURRENT I_D (A)
COMMON SOURCE
Tc = 25°C
V_{GS} = −4 V
−10

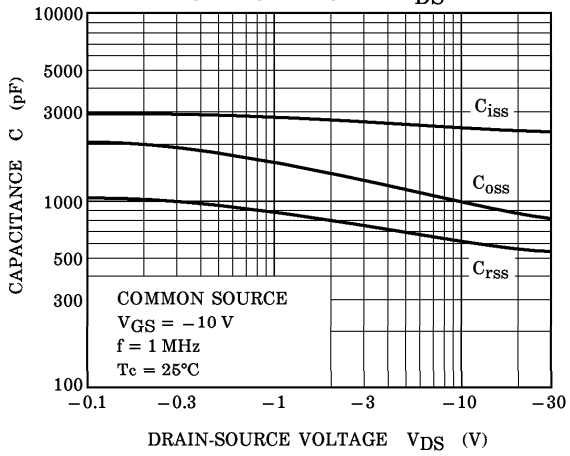
$R_{DS\,(ON)}$ – Tc



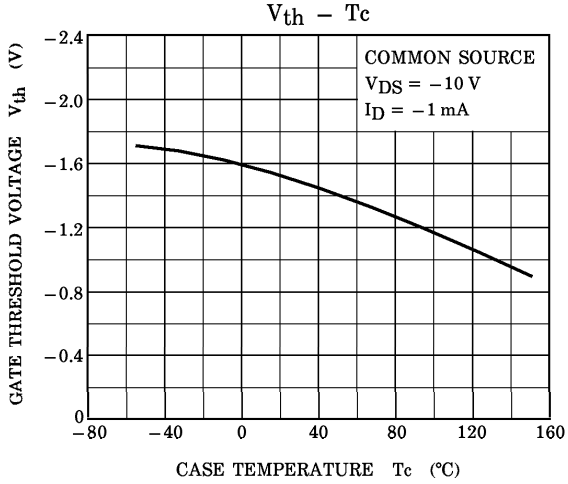
I_{DR} – V_{DS}



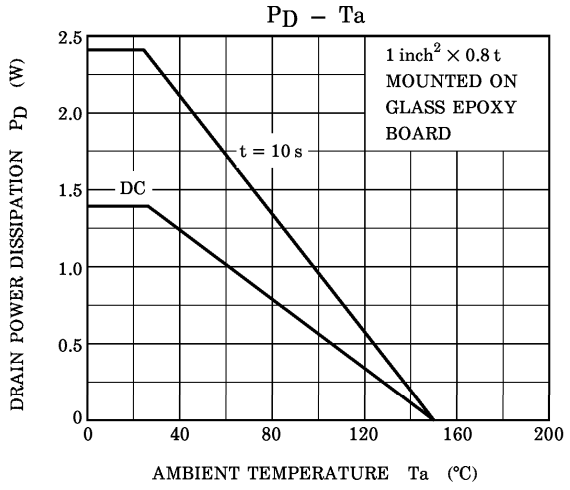
CAPACITANCE – V_{DS}



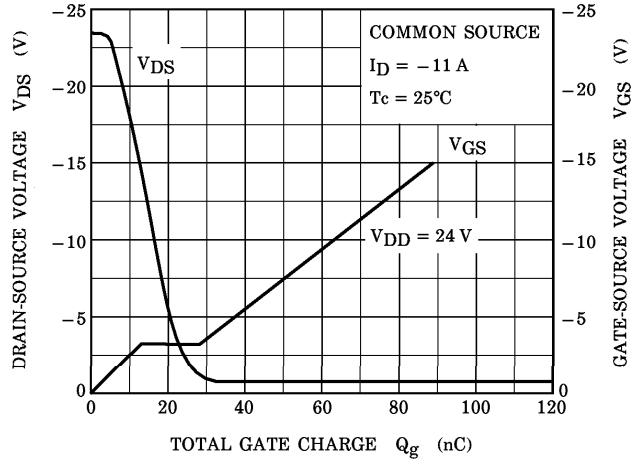
V_{th} – Tc



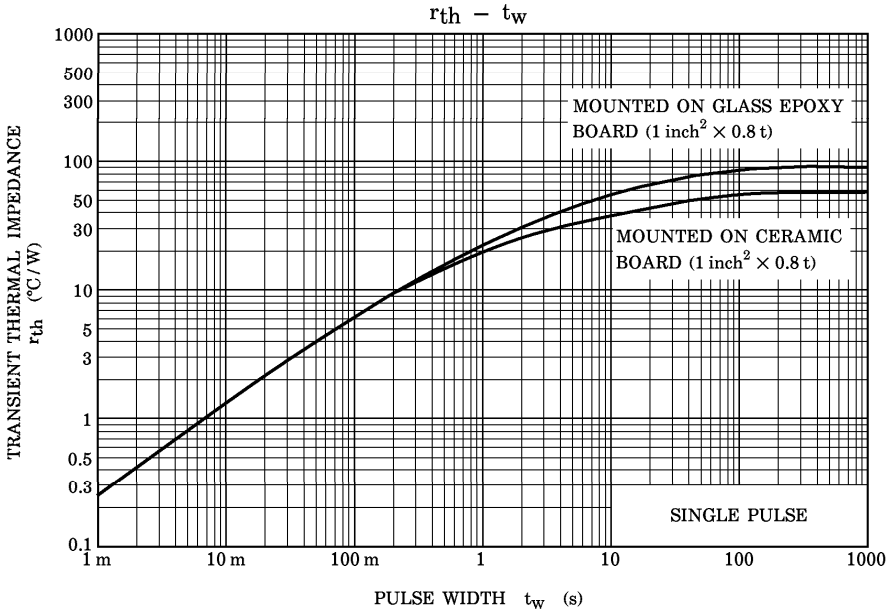
P_D – Ta



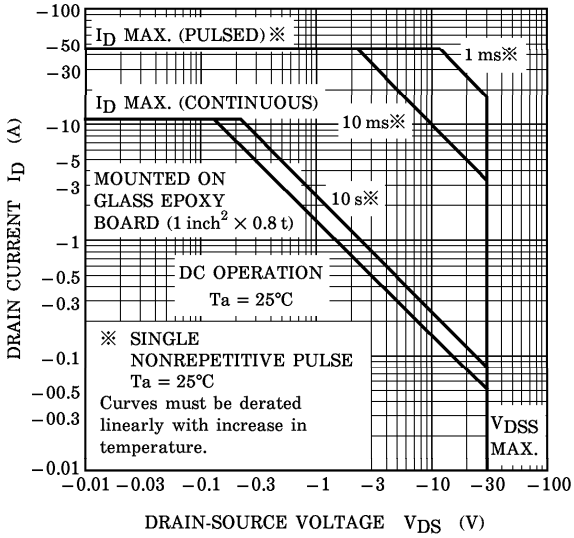
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



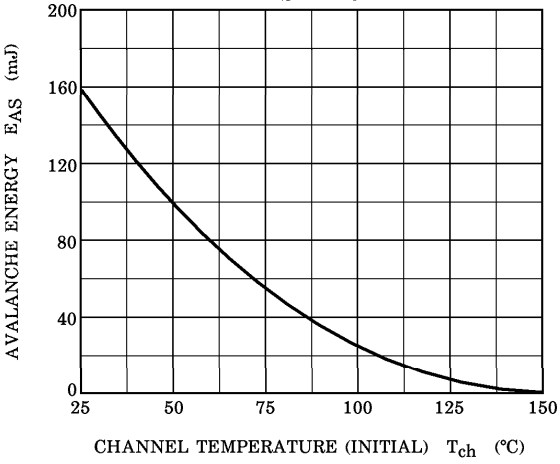
r_{th} – t_w

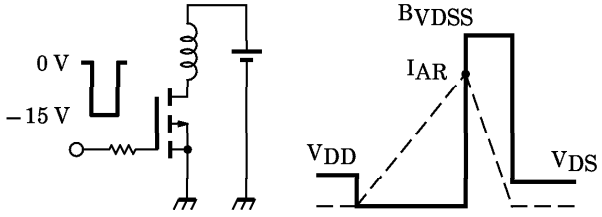


SAFE OPERATING AREA



E_{AS} – T_{ch}





TEST CIRCUIT WAVE FORM

Peak I_{AR} = −11 A, R_G = 25 Ω
V_{DD} = −24 V, L = 1.0 mH

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