TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U−MOSII)

TPC8003

Lithium Ion Battery Applications
Portable Equipment Applications
Notebook PC Applications

- Small footprint due to small and thin package
- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 5.4 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 21 S (typ.)
- Low leakage current : I_{DSS} = 10 μA (max) (V_{DS} = 30 V)
- Enhancement mode : V_{th} = 0.8~2.5 V (V_{DS} = 10 V, I_D = 1 mA)

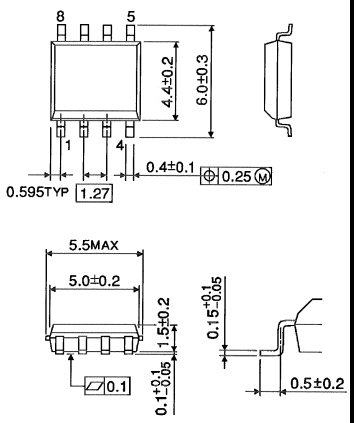
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	30	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	30	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	DC (Note 1)	I_D	13	A
	Pulse (Note 1)	I_{DP}	52	
Drain power dissipation (t = 10 s) (Note 2a)		P_D	2.4	W
Drain power dissipation (t = 10 s) (Note 2b)		P_D	1.0	W
Single pulse avalanche energy (Note 3)		E_{AS}	220	mJ
Avalanche current		I_{AR}	13	A
Repetitive avalanche energy (Note 2a) (Note 4)		E_{AR}	0.24	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Note 1, Note 2, Note 3 and Note 4: See the next page.

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

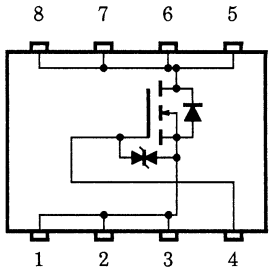
Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-6J1B

Weight: 0.080 g (typ.)

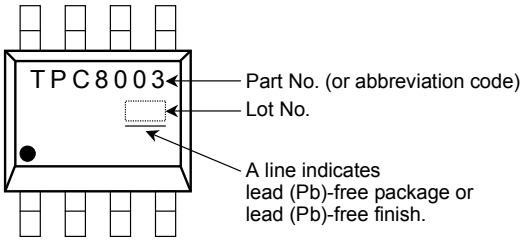
Circuit Configuration



Thermal Characteristics

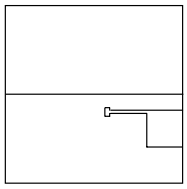
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th\ (ch\text{-}a)}$	52.1	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	125	°C/W

Marking (Note 5)

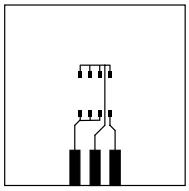


Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



(a)



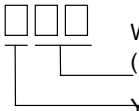
(b)

Note 3: V_{DD} = 24 V, T_{ch} = 25°C (initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = 13 A

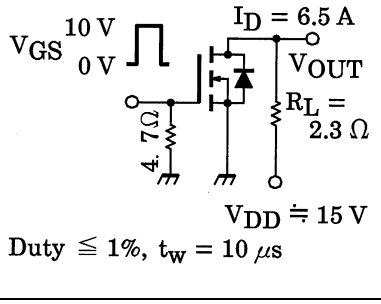
Note 4: Reptitve rating: pulse width limited by maximum channel temperature

Note 5: ● on lower left of the marking indicates Pin 1.

※ Weekly code: (Three digits)



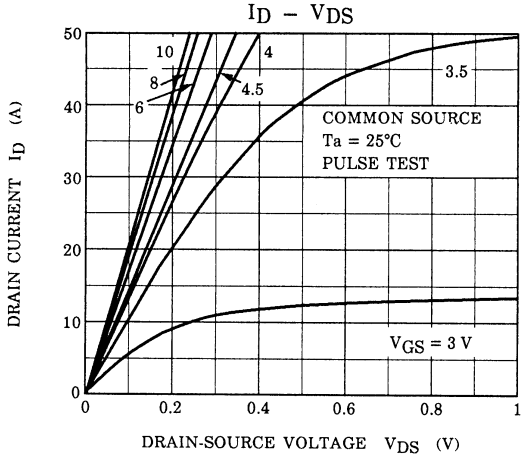
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±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	—	2.5	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 4 V, I_D = 6.5 A	—	8.3	13	mΩ
		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 6.5 A	—	5.4	7	mΩ
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 6.5 A	10.5	21	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	4380	—	pF
Reverse transfer capacitance		C_{rss}		—	500	—	
Output capacitance		C_{oss}		—	890	—	
Switching time	Rise time	tr		—	14	—	ns
	Turn−on time	t_{on}		—	27	—	
	Fall time	t_f		—	72	—	
	Turn−off time	t_{off}		—	235	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ 24 V, V_{GS} = 10 V, I_D = 13 A	—	90	—	nC
Gate−source charge		Q_{gs}		—	60	—	
Gate−drain (“miller”) charge		Q_{gd}		—	30	—	

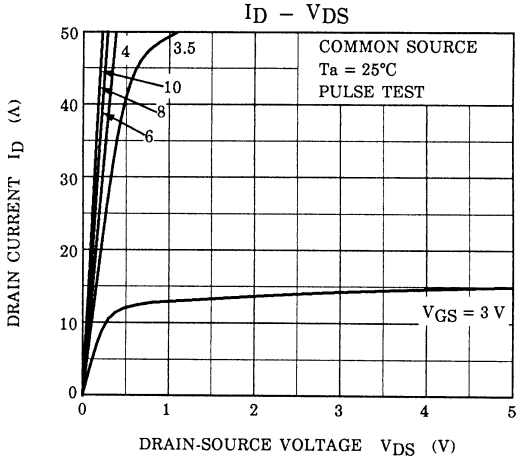
Source−Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	52	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 13 A, V_{GS} = 0 V	—	—	−1.2	V

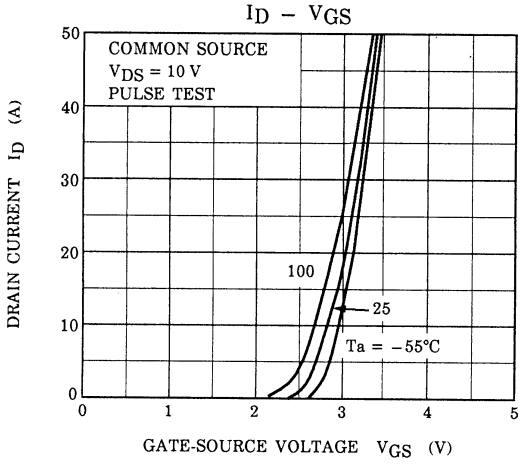
$I_D - V_{DS}$



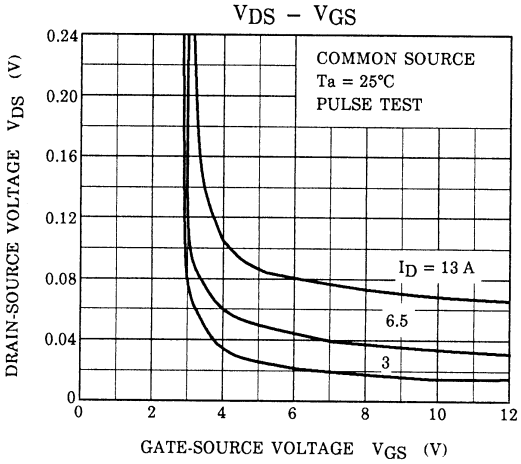
$I_D - V_{DS}$



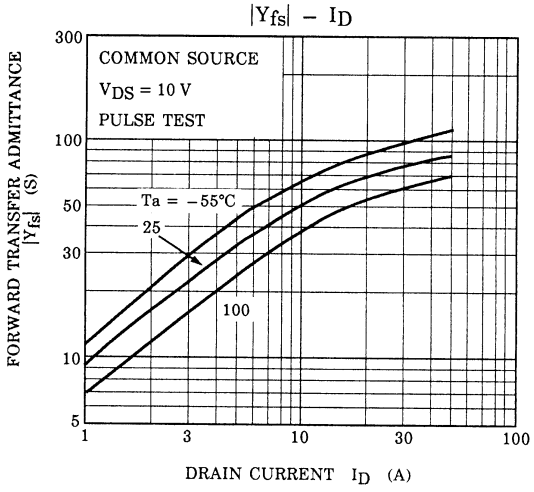
$I_D - V_{GS}$



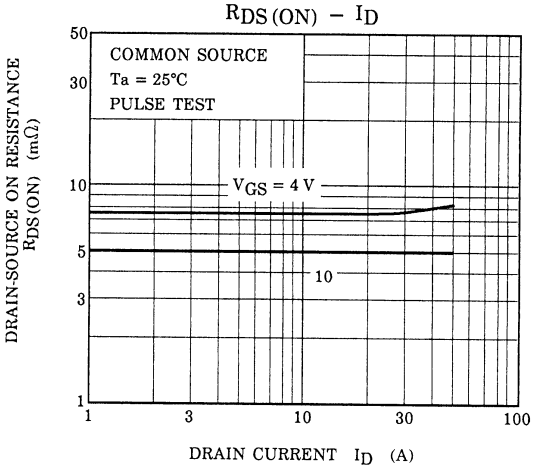
$V_{DS} - V_{GS}$



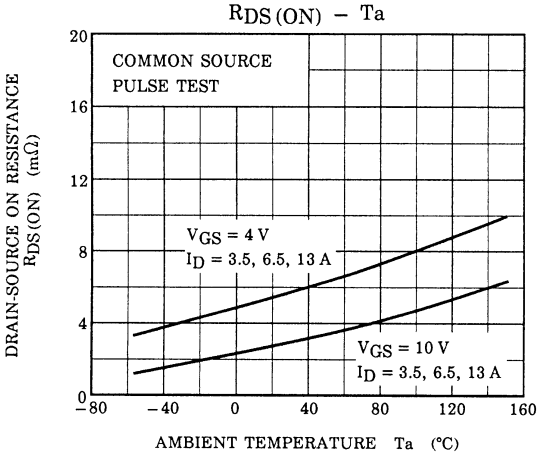
$|Y_{fs}| - I_D$



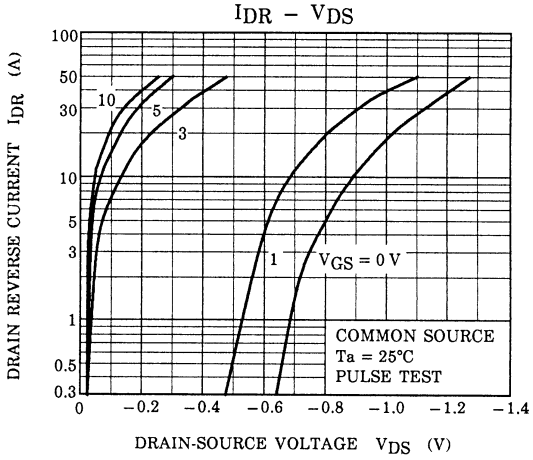
$R_{DS\,(ON)} - I_D$



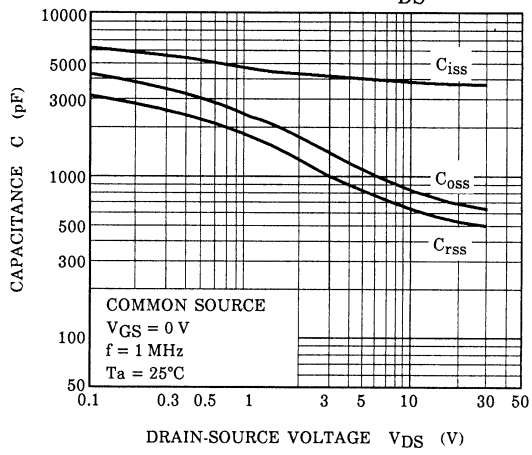
$R_{DS\,(ON)}$ – Ta



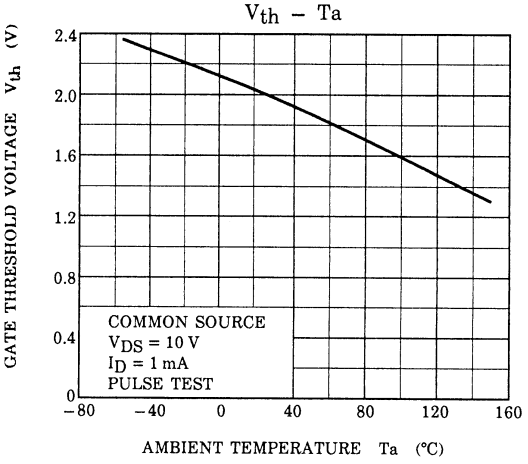
I_{DR} – V_{DS}



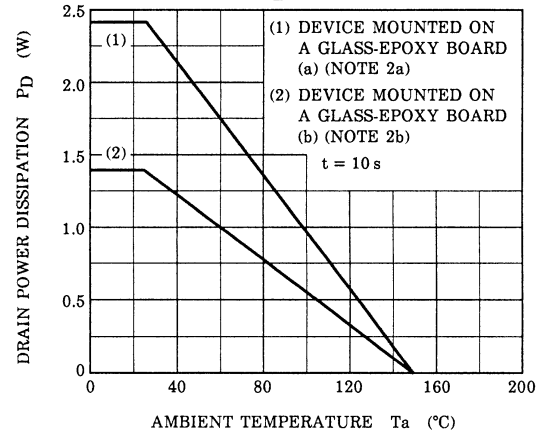
CAPACITANCE – V_{DS}



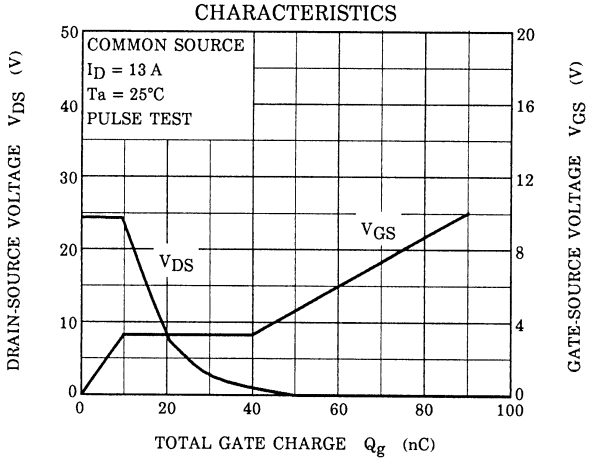
V_{th} – Ta



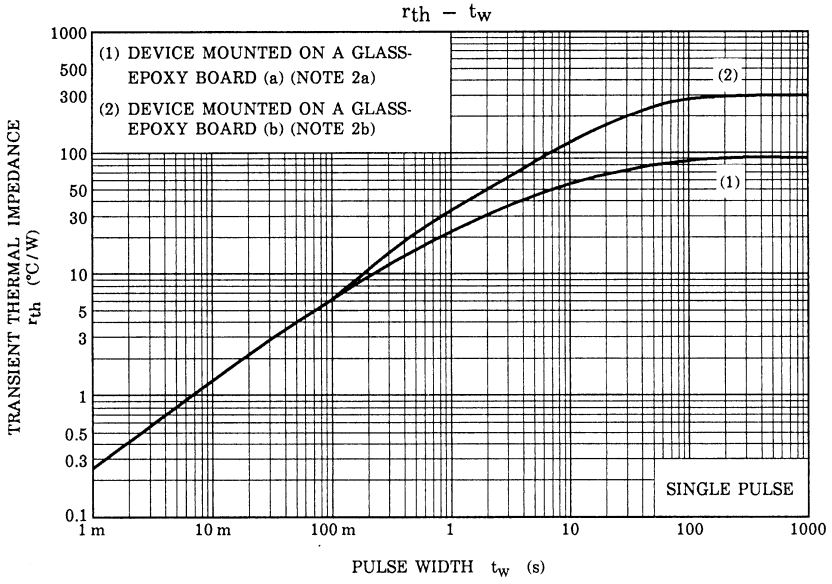
P_D – Ta



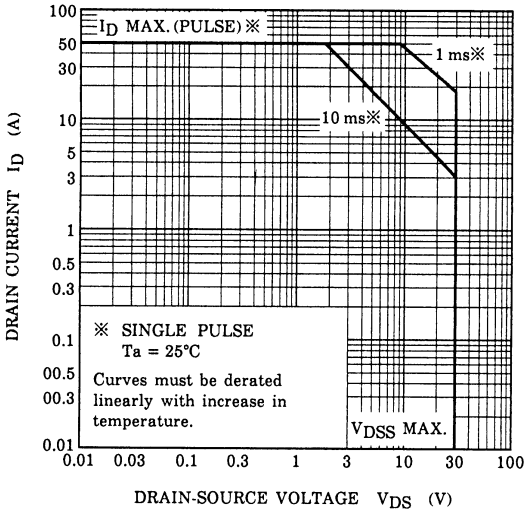
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



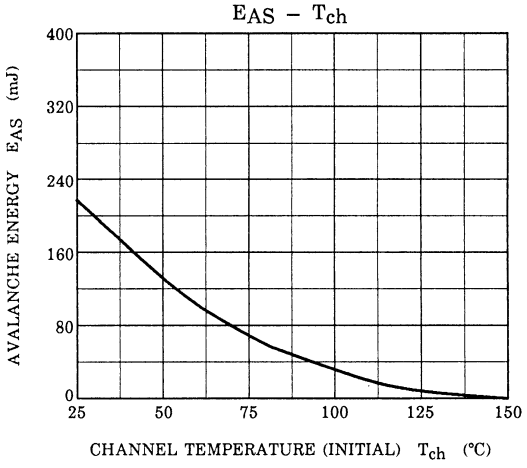
r_{th} – t_w

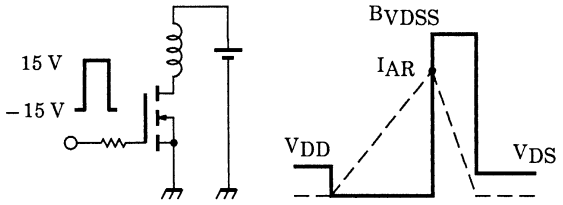


SAFE OPERATING AREA



E_{AS} – T_{ch}





TEST CIRCUIT WAVE FORM

T_{ch} = 25°C (Initial)
Peak I_{AR} = 13 A, R_G = 25 Ω
V_{DD} = 24 V, L = 1.0 mH

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

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