

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 :  $R_{DS(ON)} = 5.4 \text{ m}\Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 21 \text{ S}$  (typ.)
- Low leakage current :  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement mode :  $V_{th} = 0.8\sim 2.5 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

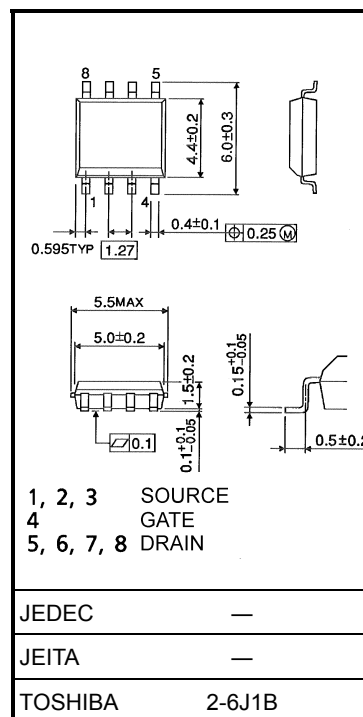
## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics		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 (Note 1)	$I_D$	13	A
	Pulse (Note 1)	$I_{DP}$	52	
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2a)		$P_D$	2.4	W
Drain power dissipation ( $t = 10 \text{ s}$ ) (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	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	$-55$ to $150$	$^\circ\text{C}$

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

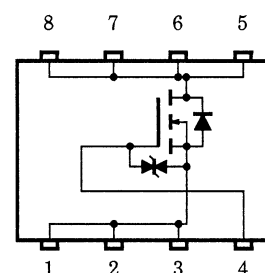
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

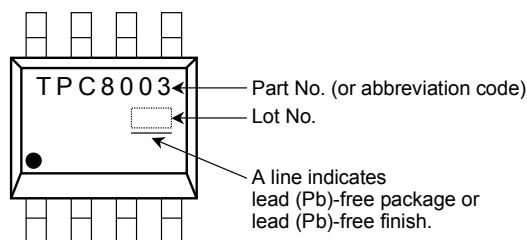
## Circuit Configuration



## Thermal Characteristics

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

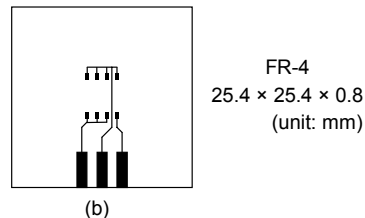
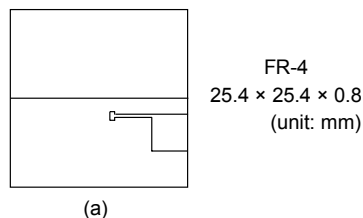
## Marking (Note 5)



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)

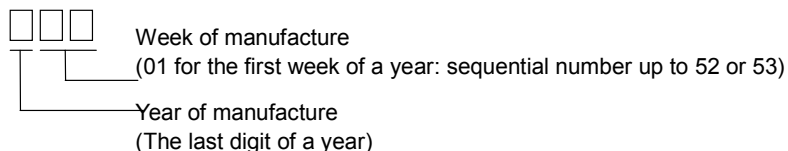


Note 3:  $V_{DD} = 24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = 13\text{ A}$

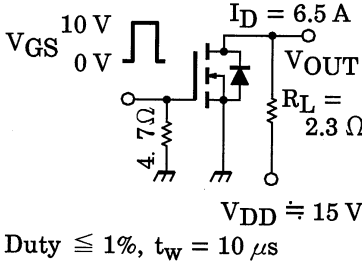
Note 4: Reptitive rating: pulse width limited by maximum channel temperature

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

※ Weekly code: (Three digits)

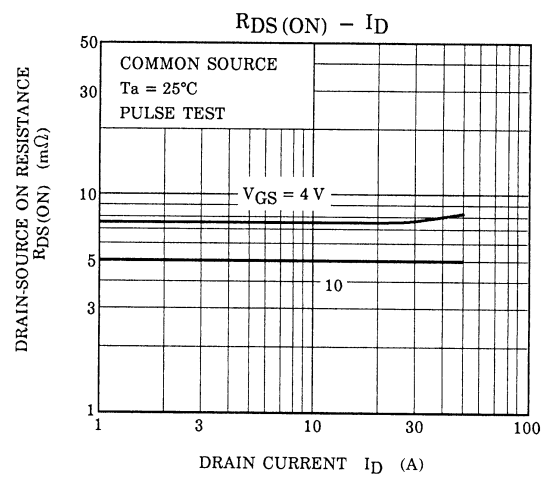
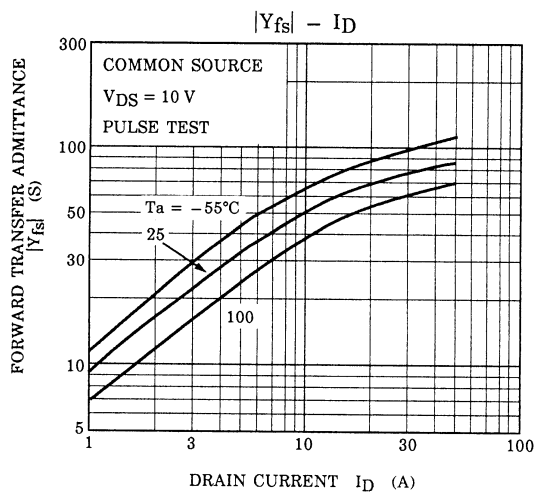
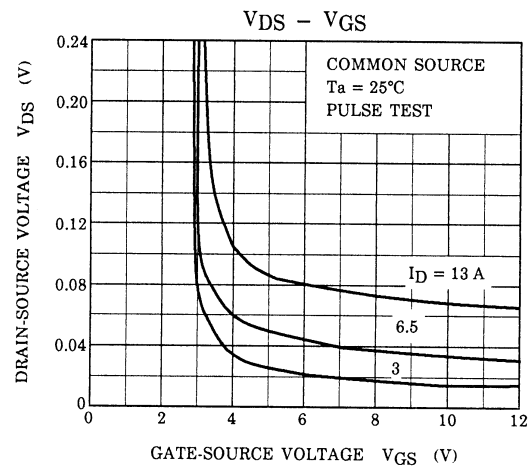
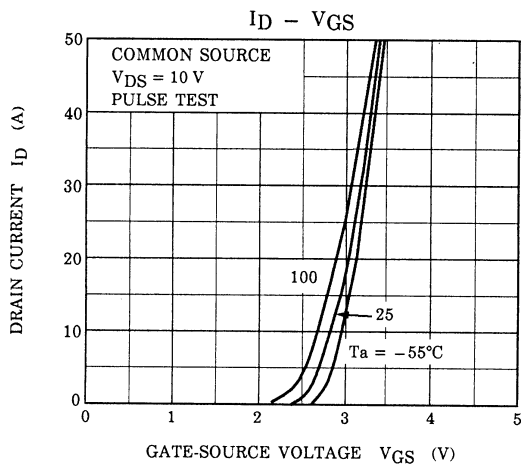
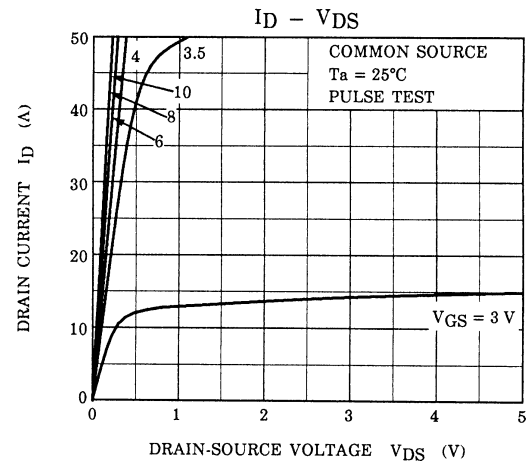
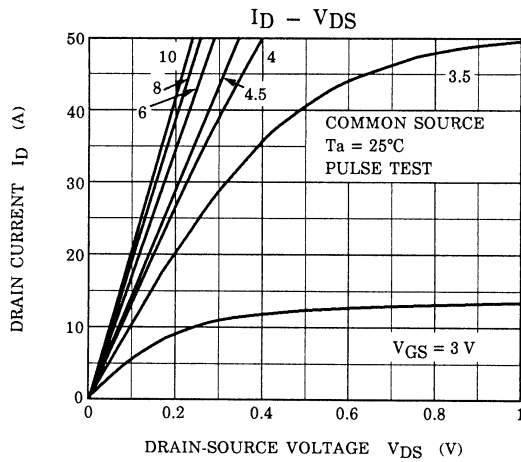


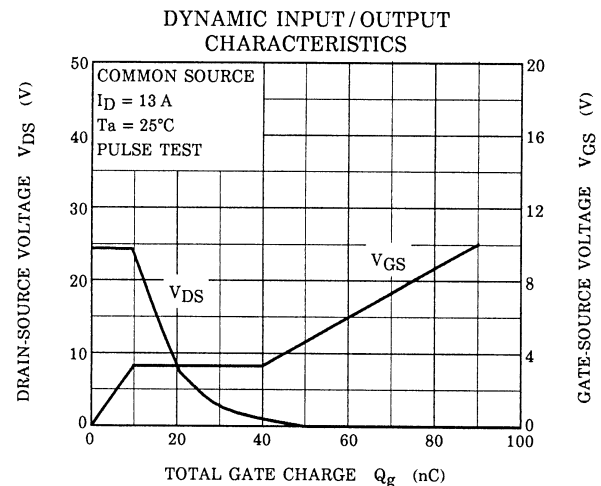
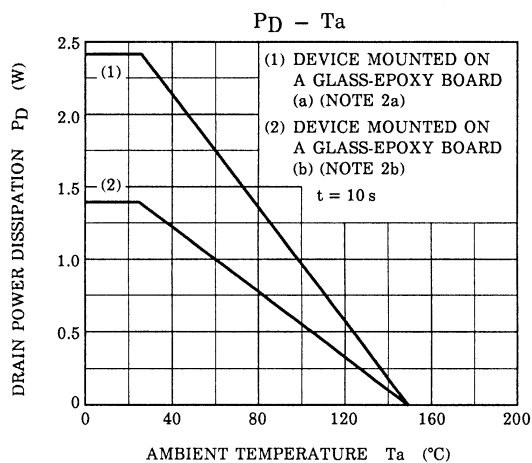
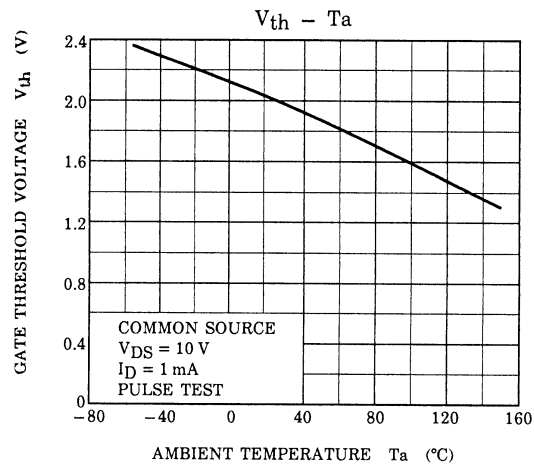
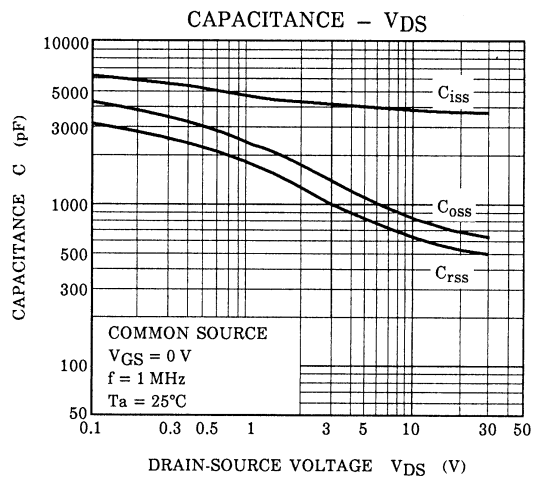
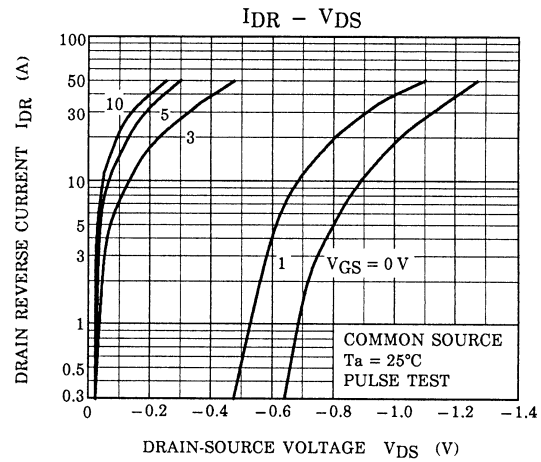
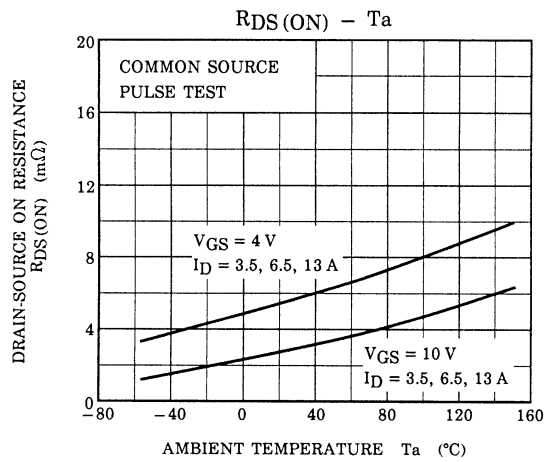
## Electrical Characteristics (Ta = 25°C)

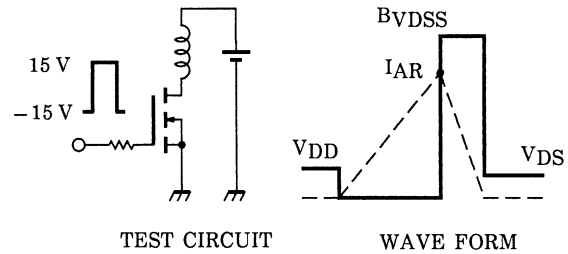
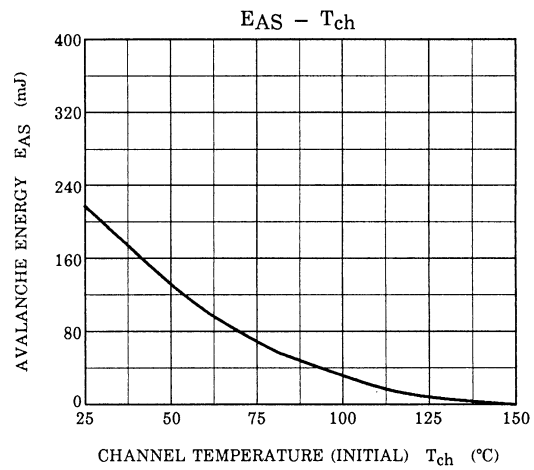
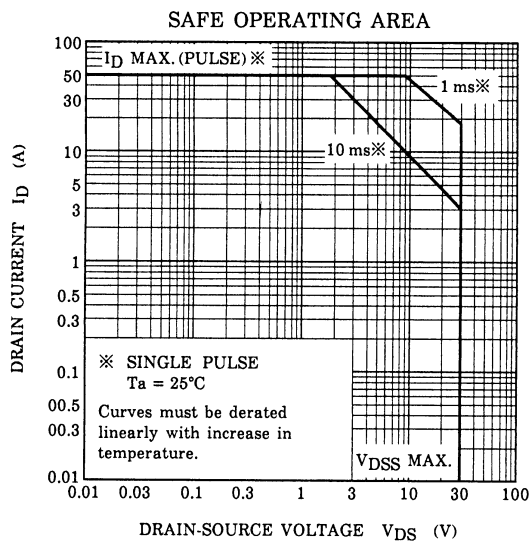
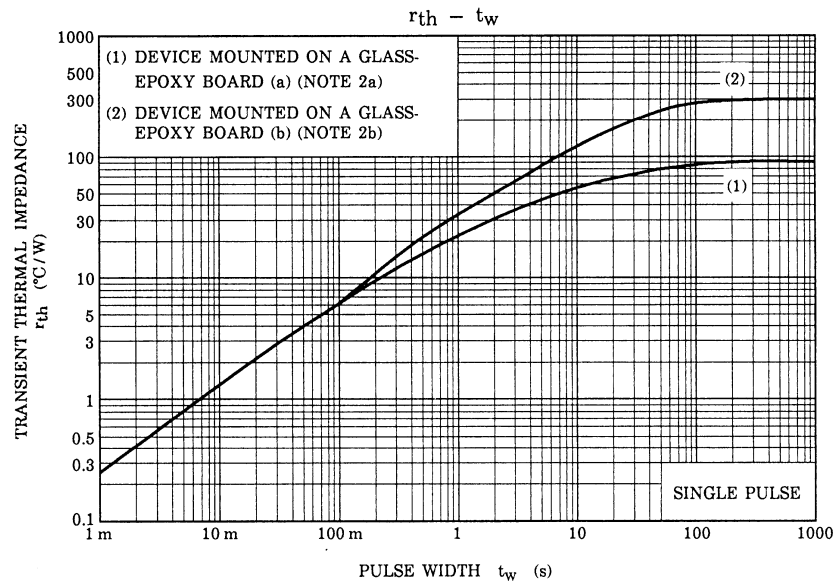
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR) DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	30	—	—	V
		$V_{(BR) DSX}$	$I_D = 10 \text{ mA}, V_{GS} = -20 \text{ V}$	15	—	—	V
Gate threshold voltage		$V_{th}$	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	0.8	—	2.5	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 4 \text{ V}, I_D = 6.5 \text{ A}$	—	8.3	13	$\text{m}\Omega$
		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 6.5 \text{ A}$	—	5.4	7	$\text{m}\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 6.5 \text{ A}$	10.5	21	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	4380	—	pF
Reverse transfer capacitance		$C_{rss}$		—	500	—	
Output capacitance		$C_{oss}$		—	890	—	
Switching time	Rise time	$t_r$	 <p> <math>V_{GS} = 10 \text{ V}</math>  <math>0 \text{ V}</math>  <math>I_D = 6.5 \text{ A}</math>  <math>V_{OUT}</math>  <math>R_L = 2.3 \Omega</math>  <math>V_{DD} \approx 15 \text{ V}</math>  <math>\text{Duty} \leq 1\%, t_W = 10 \mu\text{s}</math> </p>	—	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)		$Q_g$	$V_{DD} \approx 24 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 13 \text{ A}$	—	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)		$V_{DSF}$	$I_{DR} = 13 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V







$T_{ch} = 25^\circ\text{C}$  (Initial)  
Peak  $I_{AR} = 13\text{ A}$ ,  $R_G = 25\ \Omega$   
 $V_{DD} = 24\text{ V}$ ,  $L = 1.0\text{ mH}$

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

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