

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 : $V_{th} = 0.8\text{-}2.5 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

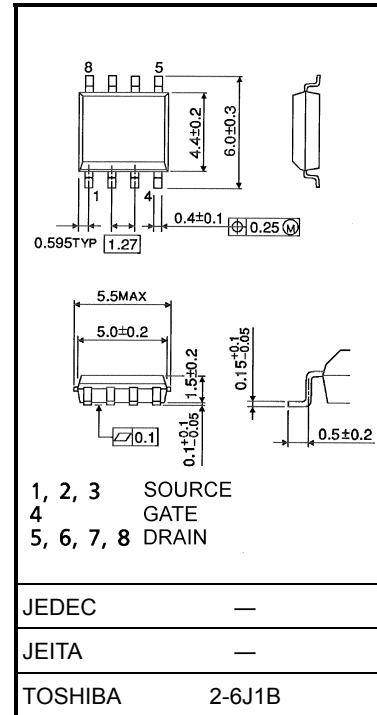
Maximum Ratings (Ta = 25°C)

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}	± 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.

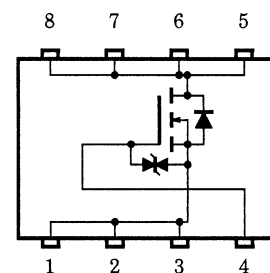
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

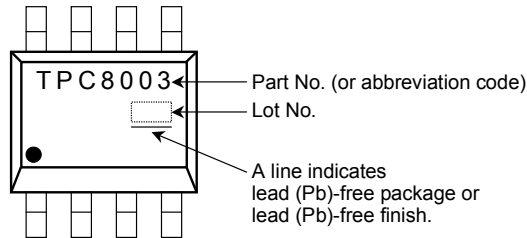
Circuit Configuration



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

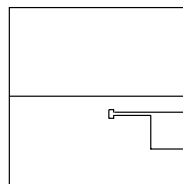
Marking (Note 5)



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

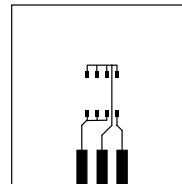
Note 2: (a) Device mounted on a glass-epoxy board (a)

(b) Device mounted on a glass-epoxy board (b)



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

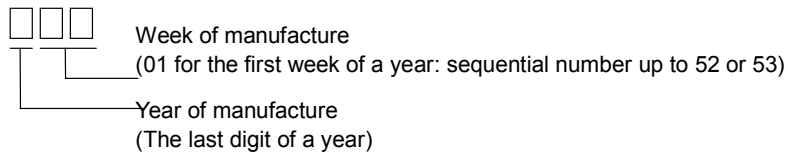
(b)

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)

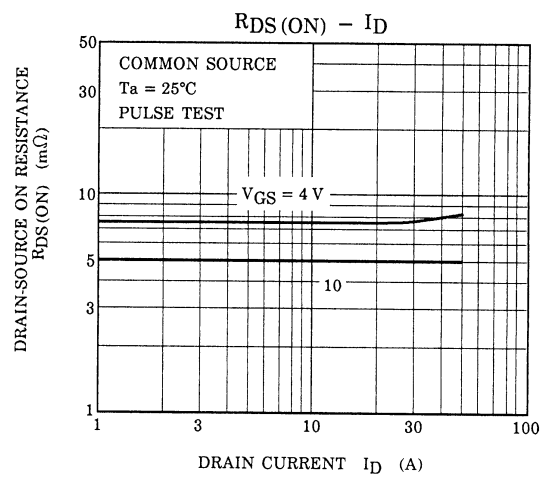
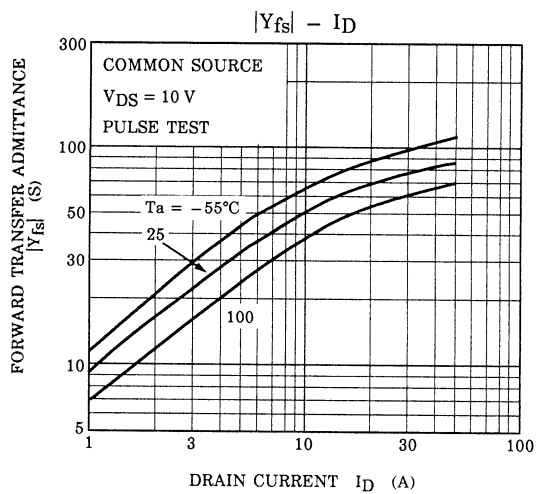
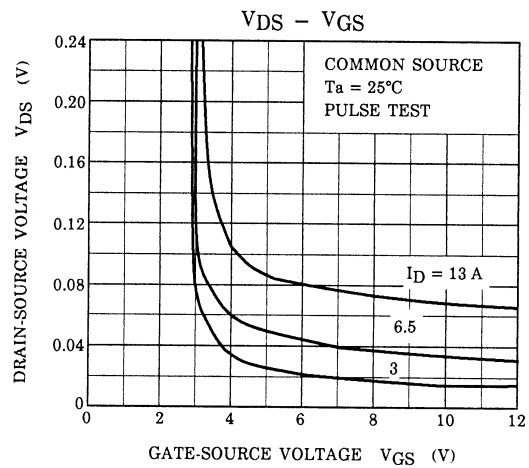
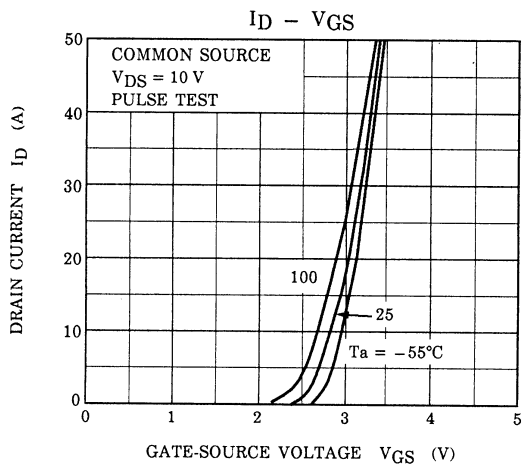
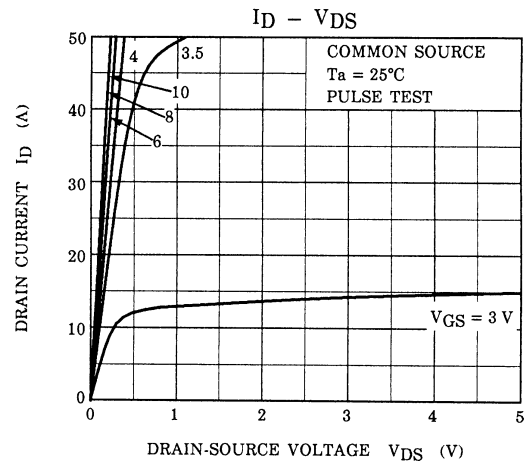
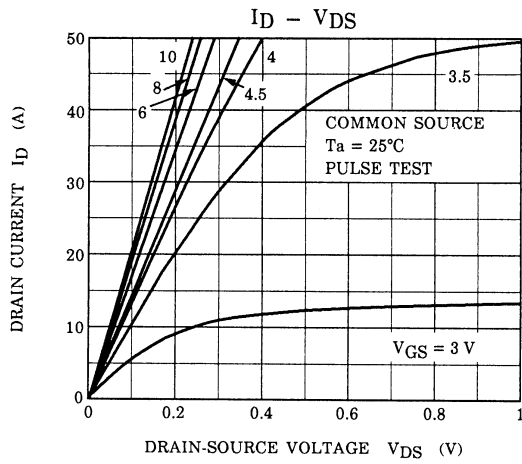


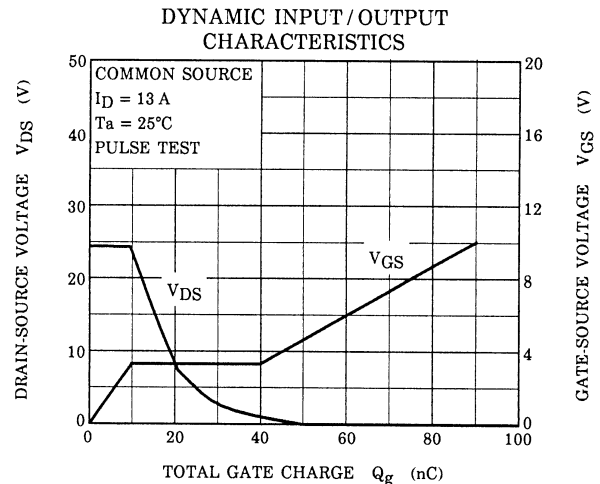
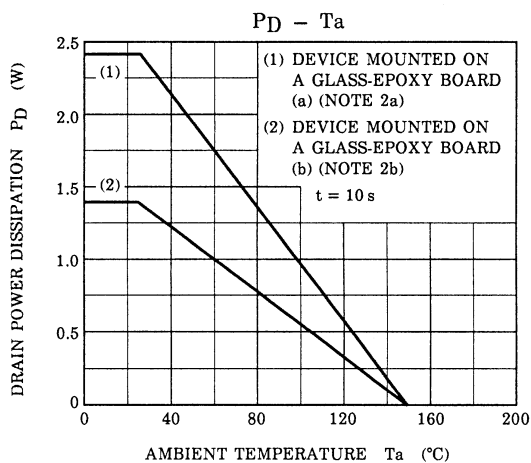
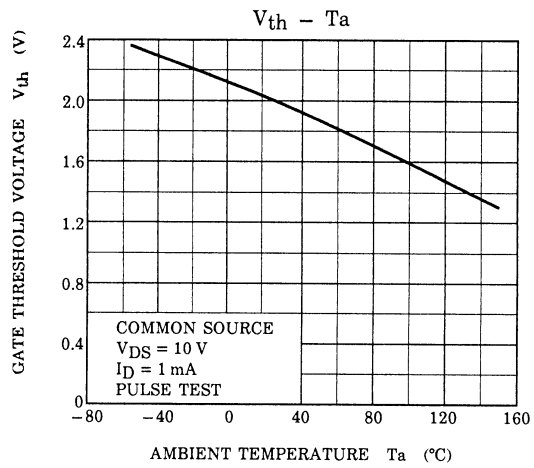
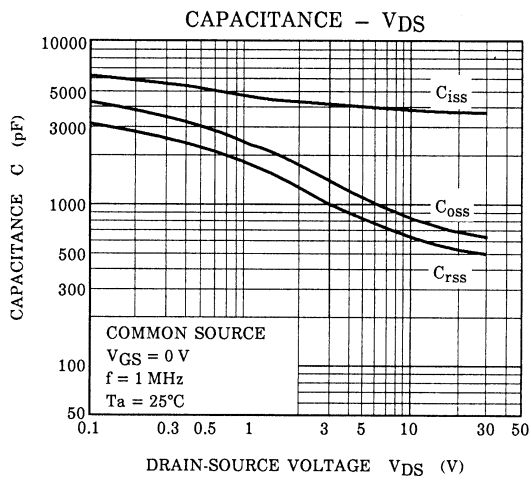
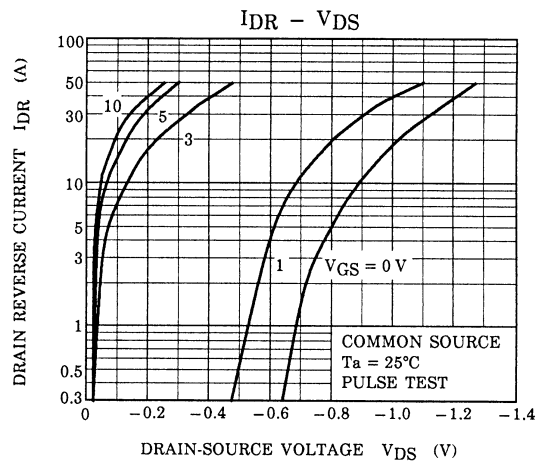
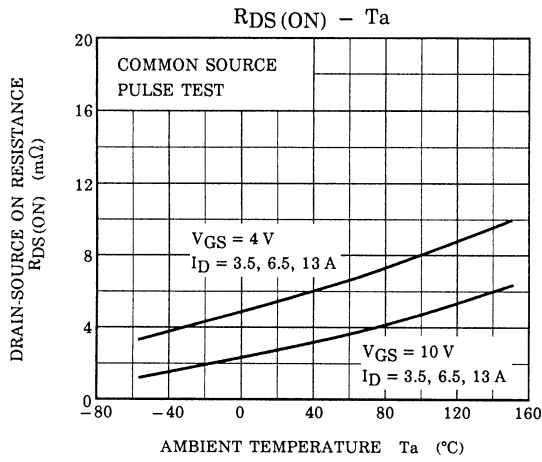
Electrical Characteristics (Ta = 25°C)

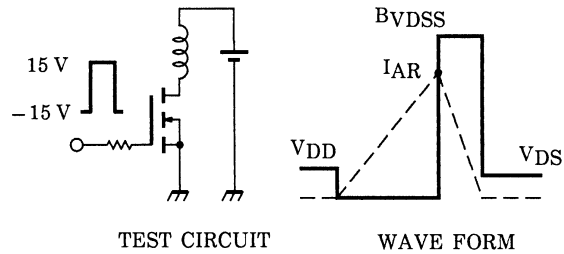
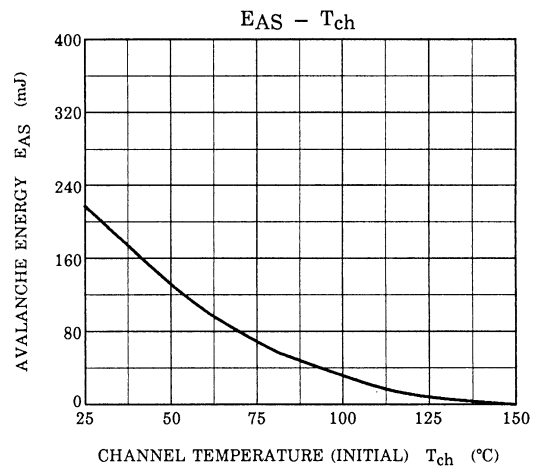
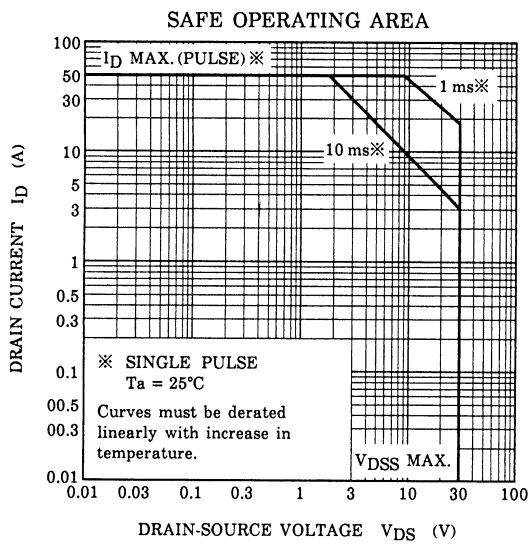
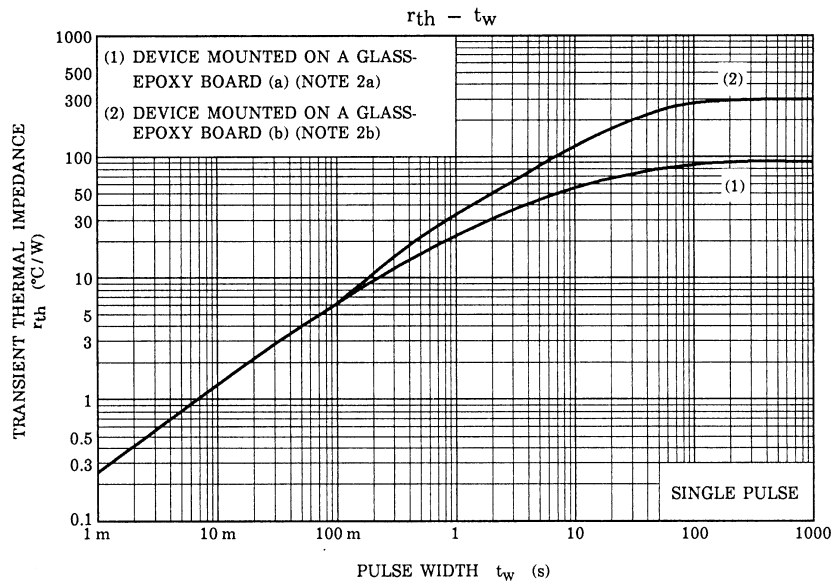
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current		I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	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> $V_{GS} = 10\text{ V}$ 0 V $I_D = 6.5\text{ A}$ V_{OUT} $R_L = 2.3\ \Omega$ $V_{DD} \approx 15\text{ V}$ $Duty \leq 1\%, t_w = 10\ \mu\text{s}$ </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 $I_{AR} = 13\text{ A}$, $R_G = 25\ \Omega$
 $V_{DD} = 24\text{ V}$, $L = 1.0\text{ mH}$

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