

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (Ultra High speed U-MOSIII)

# TPCP8003-H

High Efficiency DC/DC Converter Applications  
 Notebook PC Applications  
 Portable Equipment Applications

- Small footprint due to a small and thin package
- High speed switching
- Small gate charge:  $Q_{SW} = 7.5 \text{ nC (typ.)}$
- Low drain-source ON-resistance:  $R_{DS(ON)} = 130 \text{ m}\Omega \text{ (typ.)}$
- High forward transfer admittance:  $|Y_{fs}| = 5.4 \text{ S (typ.)}$
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A (max) (}V_{DS} = 100\text{V)}$
- Enhancement mode:  $V_{th} = 1.1 \text{ to } 2.3 \text{ V (}V_{DS} = 10 \text{ V, } I_D = 1\text{mA)}$

## Absolute Maximum Ratings (Ta = 25°C)

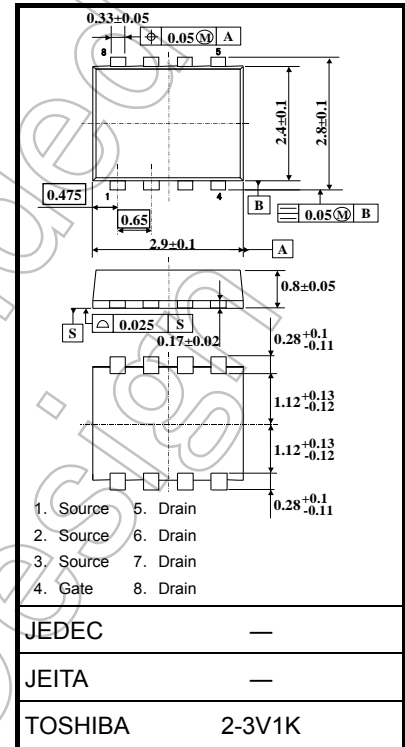
Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	100	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	100	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	2.2	A
	Pulsed (Note 1)	$I_{DP}$	8.8	
Drain power dissipation	(t = 5 s) (Note 2a)	$P_D$	1.68	W
Drain power dissipation	(t = 5 s) (Note 2b)	$P_D$	0.84	W
Single-pulse avalanche energy	(Note 3)	$E_{AS}$	3.93	mJ
Avalanche current		$I_{AR}$	2.2	A
Repetitive avalanche energy	( $T_c=25^\circ\text{C}$ ) (Note 4)	$E_{AR}$	0.016	mJ
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55 to 150	°C

Note: For Notes 1 to 4, refer to the next page.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

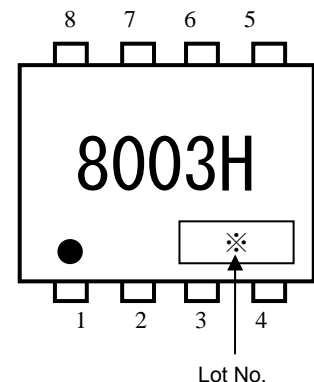
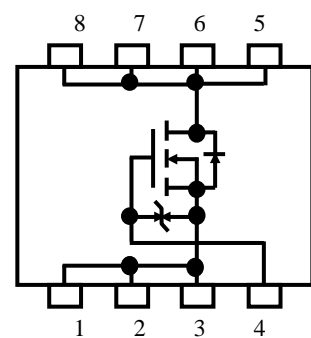
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.017 g (typ.)

## Circuit Configuration

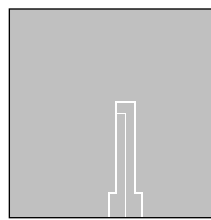


**Thermal Characteristics**

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	$R_{th(ch-a)}$	74.4	°C/W
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	$R_{th(ch-a)}$	148.8	°C/W

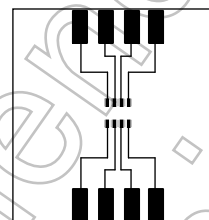
Note 1: The channel temperature should not exceed 150°C during use.

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



(a)

FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)



(b)

FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

Note 3:  $V_{DD} = 24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1\text{ mH}$ ,  $R_G = 1\ \Omega$ ,  $I_{AR} = 2.2\text{ A}$

Note 4: Repetitive rating: pulse width limited by max channel temperature

Note 5: \* Weekly code: (Three digits)



Week of manufacture  
(01 for first week of the year, continuing up to 52 or 53)

Year of manufacture  
(The last digit of the calendar year)

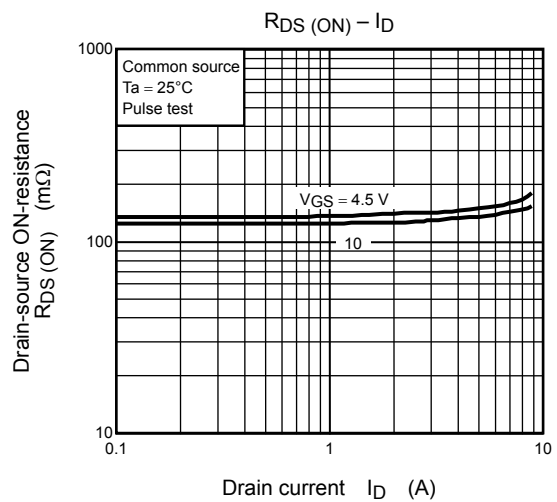
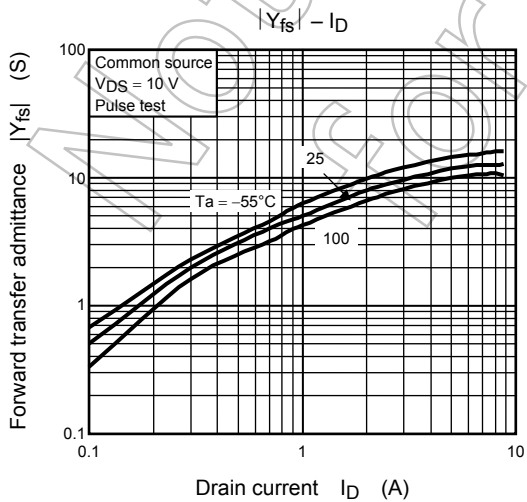
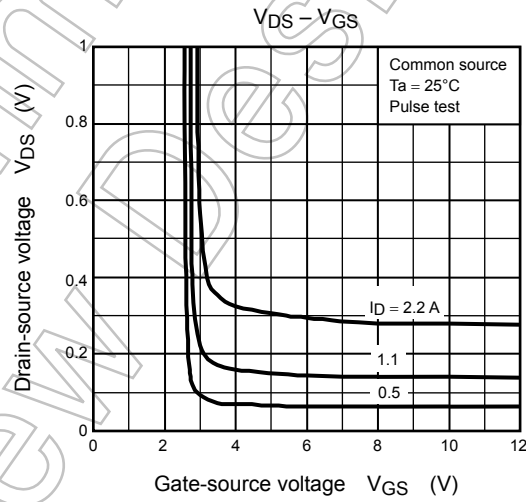
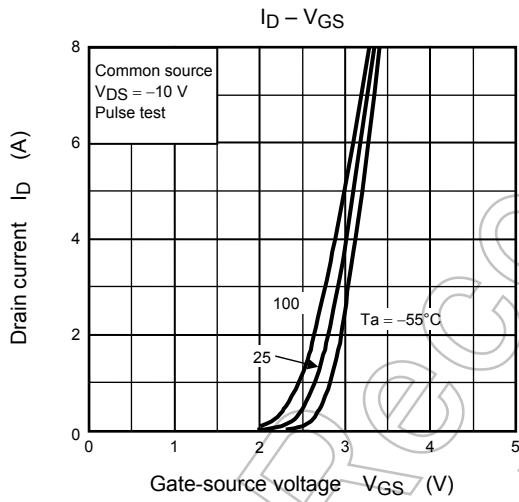
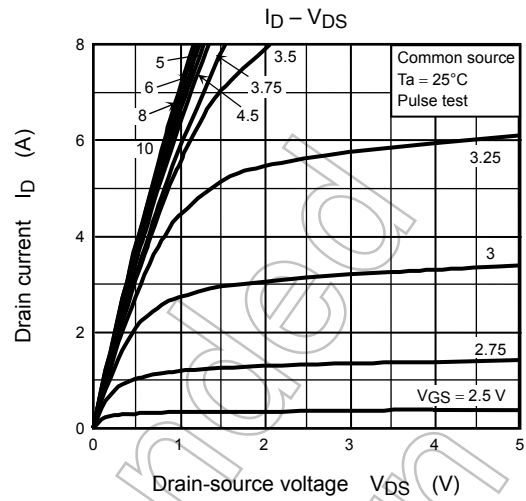
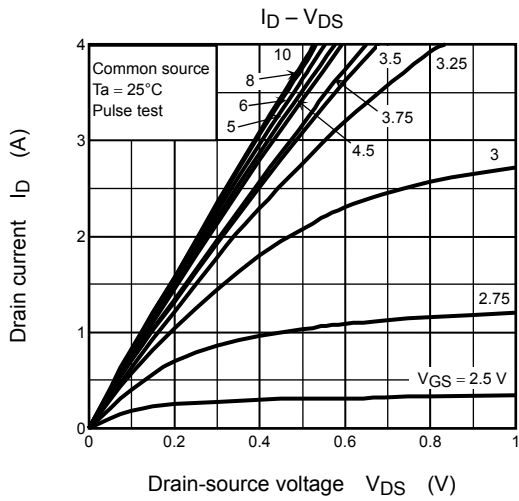
Not Recommended for New Design

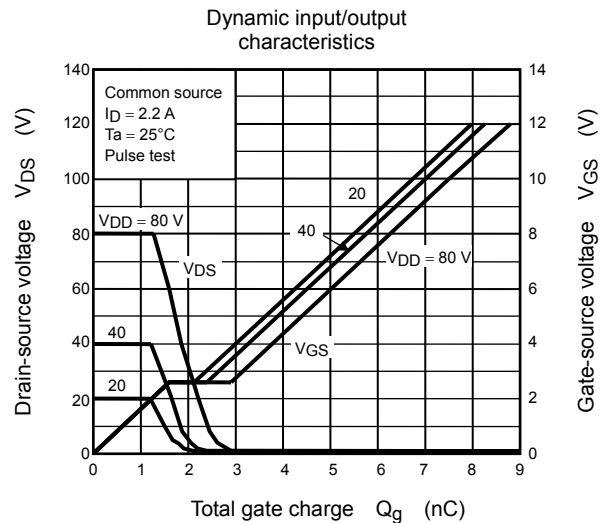
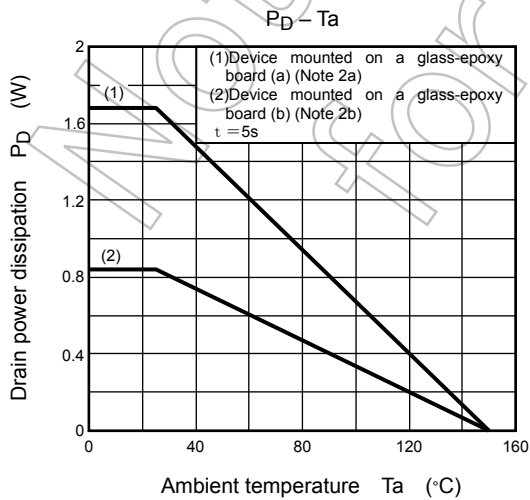
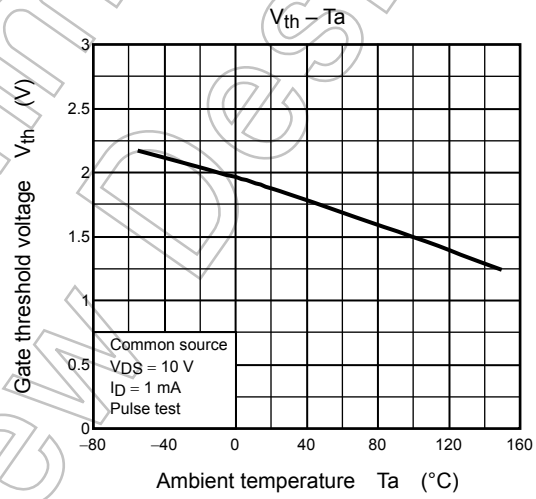
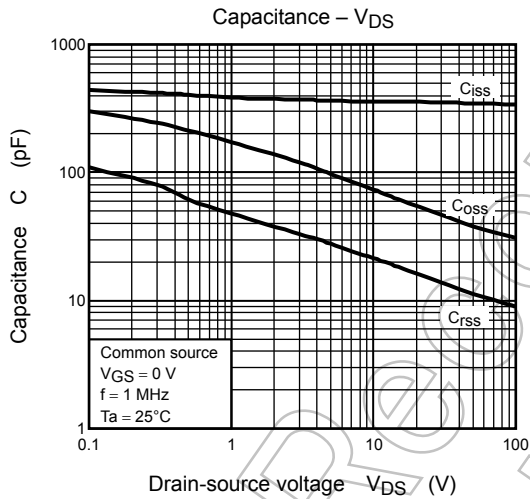
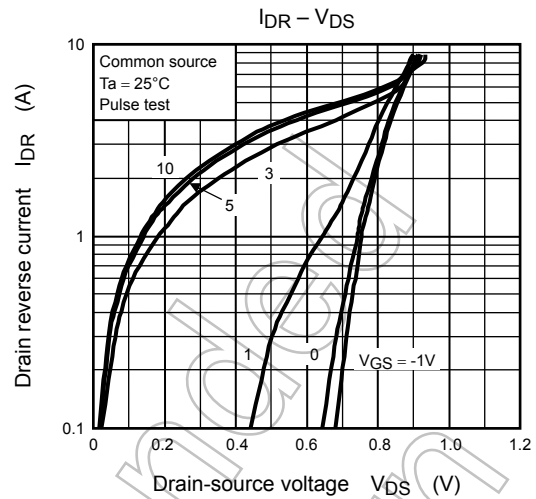
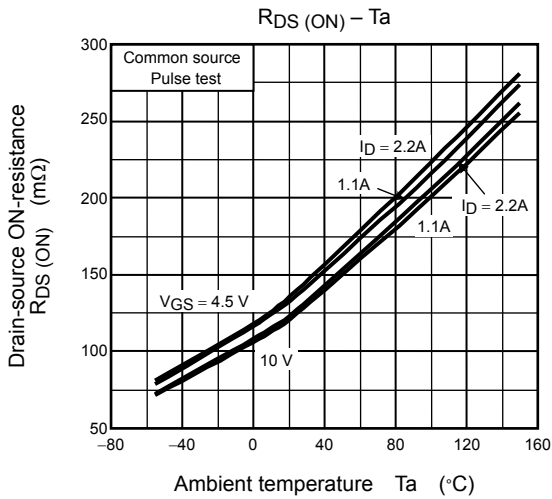
## Electrical Characteristics (Ta = 25°C)

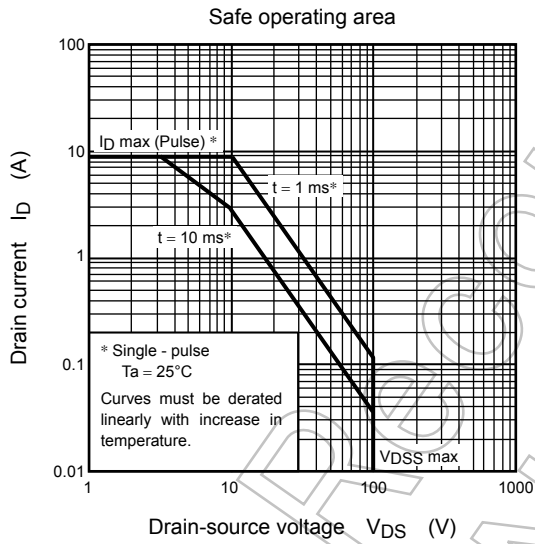
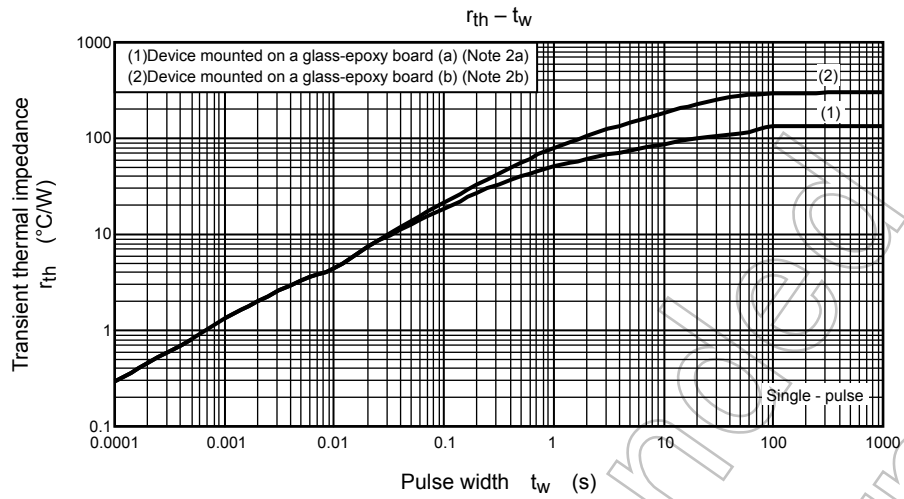
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cutoff current		$I_{DSS}$	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	100	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$	60	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.1	—	2.3	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = 4.5\text{ V}, I_D = 1.1\text{ A}$	—	140	190	$\text{m}\Omega$
			$V_{GS} = 10\text{ V}, I_D = 1.1\text{ A}$	—	130	180	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 1.1\text{ A}$	2.7	5.4	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	360	—	pF
Reverse transfer capacitance		$C_{rss}$		—	22	—	
Output capacitance		$C_{oss}$		—	75	—	
Switching time	Rise time	$t_r$		—	7	—	ns
	Turn-on time	$t_{on}$		—	14	—	
	Fall time	$t_f$		—	3	—	
	Turn-off time	$t_{off}$		—	17	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 80\text{ V}, V_{GS} = 10\text{ V}, I_D = 2.2\text{ A}$	—	7.5	—	nC
			$V_{DD} \approx 80\text{ V}, V_{GS} = 5\text{ V}, I_D = 2.2\text{ A}$	—	4.5	—	
Gate-source charge 1		$Q_{gs1}$		—	1.6	—	
Gate-drain ("Miller") charge		$Q_{gd}$	$V_{DD} \approx 80\text{ V}, V_{GS} = 10\text{ V}, I_D = 2.2\text{ A}$	—	1.3	—	
Gate switch charge		$Q_{sw}$		—	2.0	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	8.8	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 2.2\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	V







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