

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

# TPCP8103-H

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

- Small footprint due to a small and thin package
- High speed switching
- Small gate charge:  $Q_{GS} = 6.5 \text{ nC (typ.)}$
- Low drain-source ON-resistance:  $R_{DS(ON)} = 31 \text{ m}\Omega \text{ (typ.)}$
- High forward transfer admittance:  $|Y_{fs}| = 10 \text{ S (typ.)}$
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A (max) (}V_{DS} = -40\text{V)}$
- Enhancement mode:  $V_{th} = -0.8 \text{ to } -2.0 \text{ V (}V_{DS} = -10 \text{ V, }I_D = -1\text{mA)}$

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

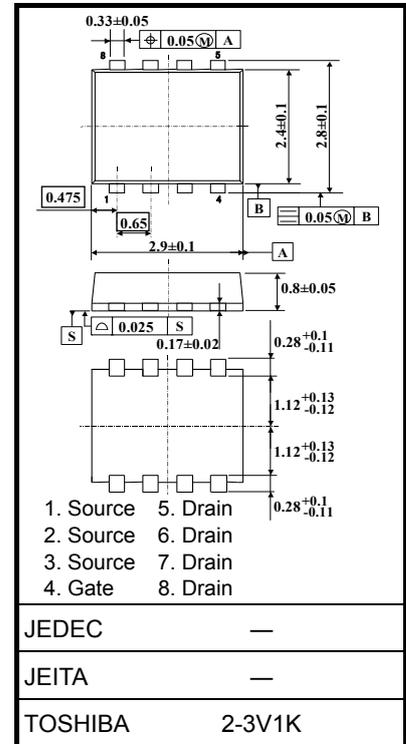
Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	-40	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-40	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	-4.8	A
	Pulsed (Note 1)	$I_{DP}$	-19.2	
Drain power dissipation	(t = 5 s) (Note 2a)	$P_D$	1.68	W
Drain power dissipation	(t = 5 s) (Note 2b)	$P_D$	0.84	W
Single-pulse avalanche energy	(Note 3)	$E_{AS}$	10.7	mJ
Avalanche current		$I_{AR}$	-4.8	A
Repetitive avalanche energy	( $T_c=25^\circ\text{C}$ ) (Note 4)	$E_{AR}$	0.09	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).

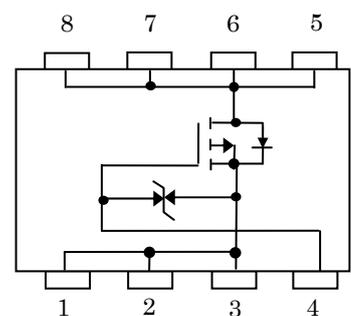
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm

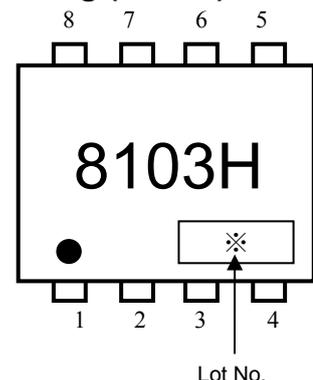


Weight: 0.017 g (typ.)

### Circuit Configuration



### Marking (Note 5)

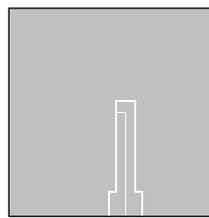


## Thermal Characteristics

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

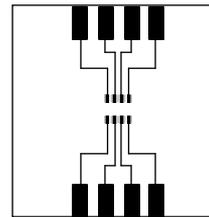
Note 1: The channel temperature should not exceed 150°C during use.

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:  $V_{DD} = -24 V$ ,  $T_{ch} = 25^{\circ}C$  (initial),  $L = 0.5 mH$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = -4.8A$

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

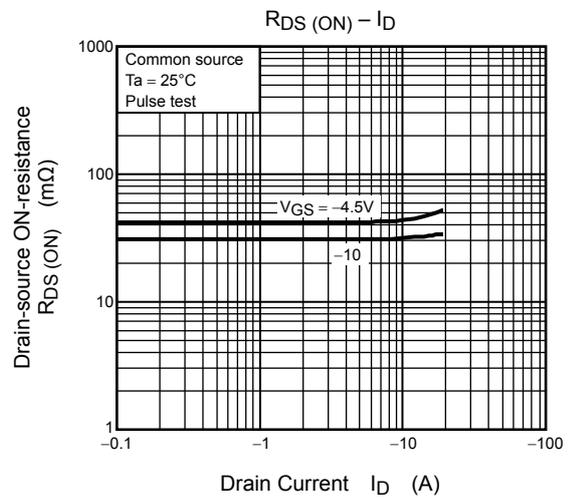
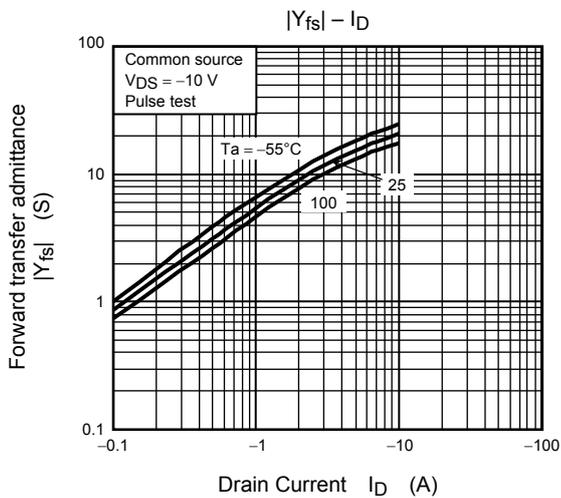
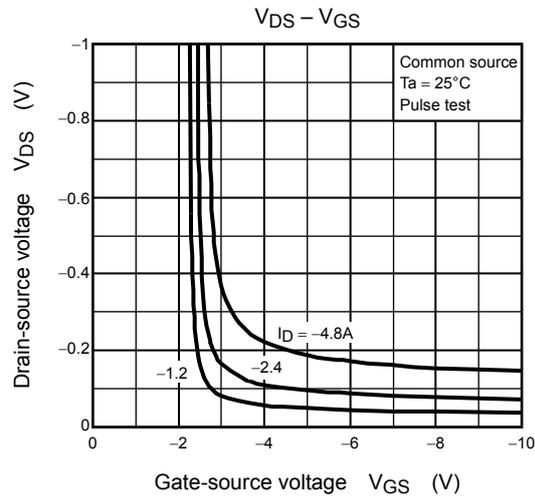
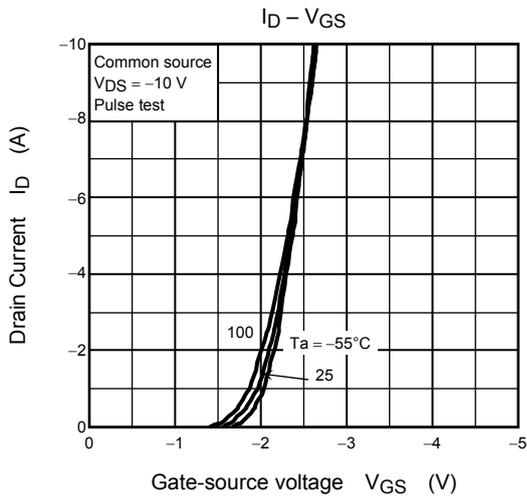
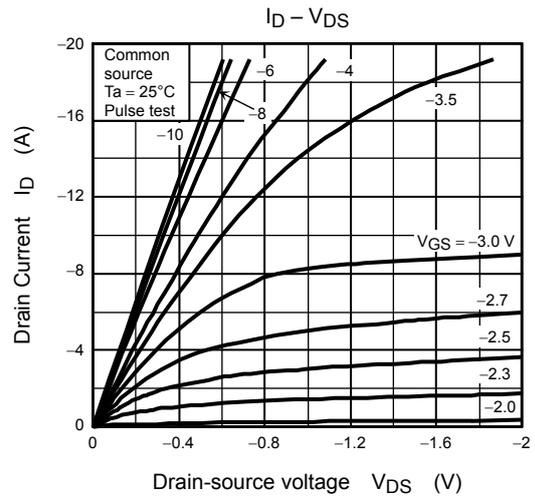
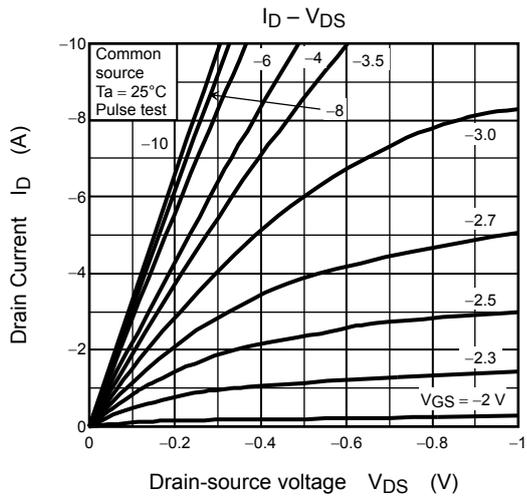
(The last digit of the calendar year)

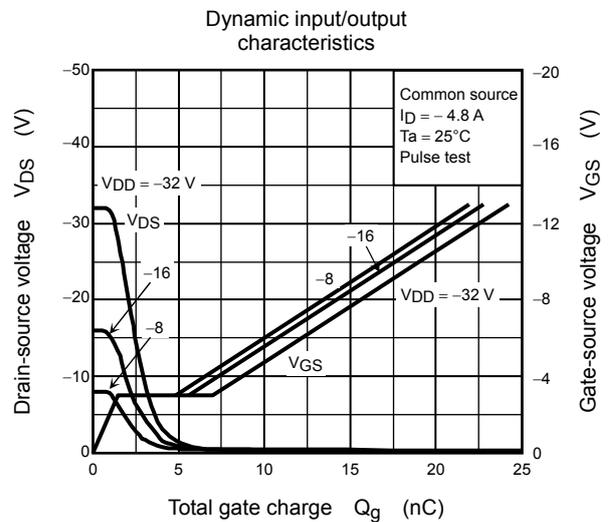
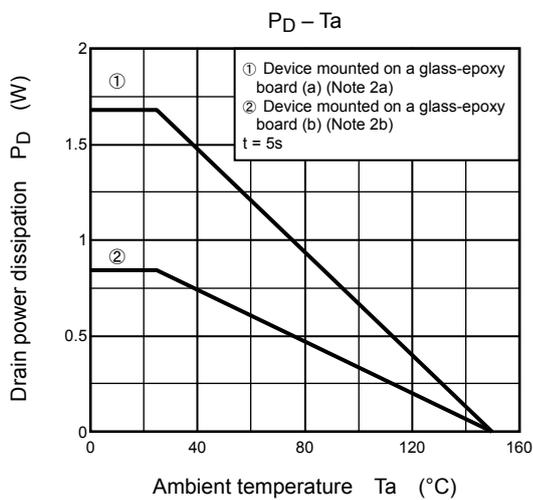
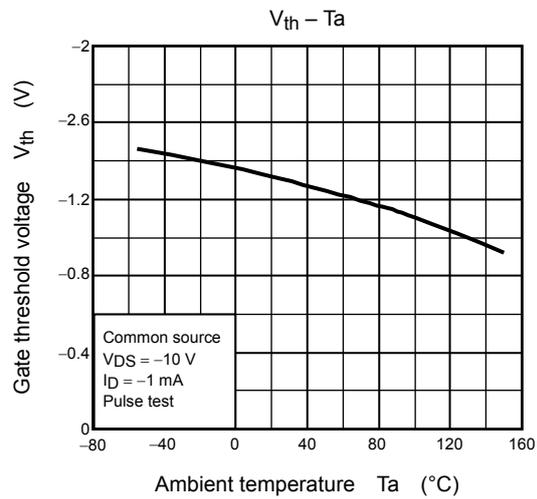
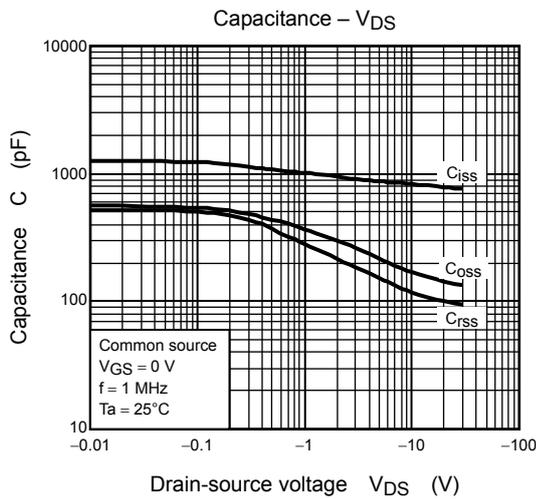
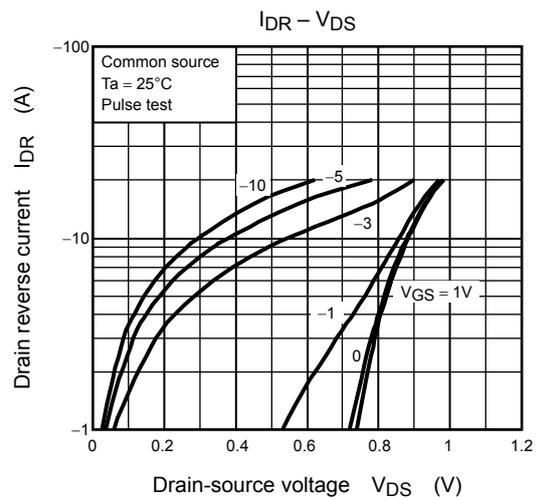
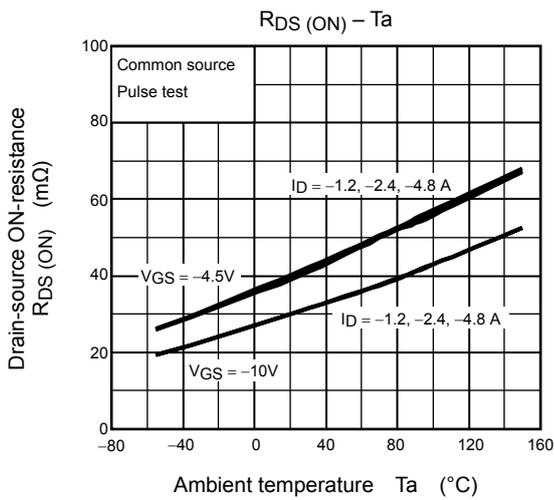
## Electrical Characteristics (Ta = 25°C)

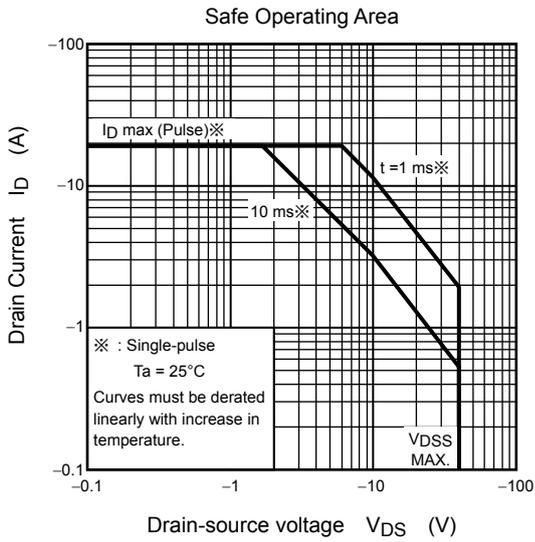
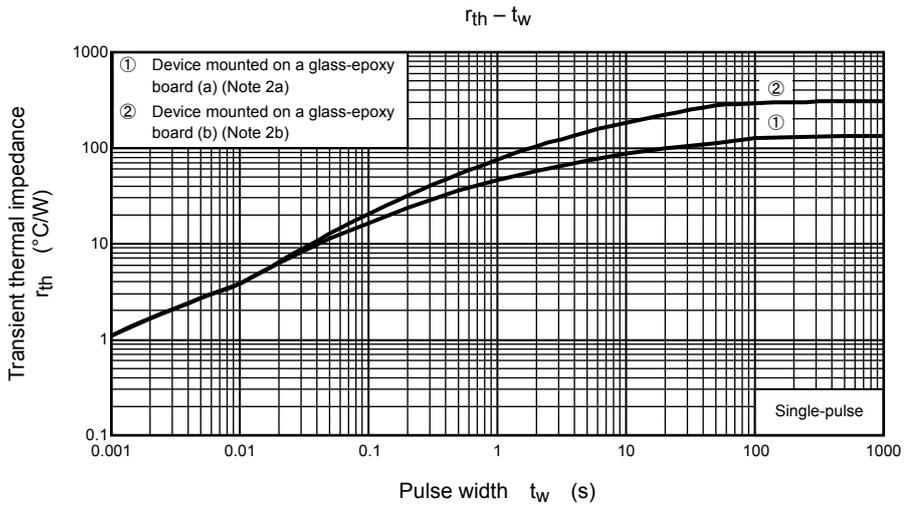
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cutoff current		$I_{DSS}$	$V_{DS} = -40 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	-10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$	-40	—	—	V
		$V_{(BR)DSX}$	$I_D = -10 \text{ mA}, V_{GS} = -20 \text{ V}$	-20	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$	-0.8	—	-2.0	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = -4.5 \text{ V}, I_D = -2.4 \text{ A}$	—	42	54	$\text{m}\Omega$
			$V_{GS} = -10 \text{ V}, I_D = -2.4 \text{ A}$	—	31	40	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -2.4 \text{ A}$	5	10	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	800	—	pF
Reverse transfer capacitance		$C_{rss}$		—	115	—	
Output capacitance		$C_{oss}$		—	165	—	
Switching time	Rise time	$t_r$	<p> <math>V_{GS} = -10 \text{ V}</math>  <math>I_D = -2.4 \text{ A}</math>  <math>4.7 \text{ nF}</math>  <math>8.33 \text{ nF}</math>  <math>R_L = 8.33 \Omega</math>  <math>V_{DD} \approx -20 \text{ V}</math>                      Duty <math>\leq 1\%</math>, <math>t_w = 10 \mu\text{s}</math> </p>	—	6.5	—	ns
	Turn-on time	$t_{on}$		—	12.5	—	
	Fall time	$t_f$		—	9	—	
	Turn-off time	$t_{off}$		—	37	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -32 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -4.8 \text{ A}$	—	19	—	nC
			$V_{DD} \approx -32 \text{ V}, V_{GS} = -5 \text{ V}, I_D = -4.8 \text{ A}$	—	11	—	
Gate-source charge 1		$Q_{gs1}$	$V_{DD} \approx -32 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -4.8 \text{ A}$	—	1.5	—	
Gate-drain ("Miller") charge		$Q_{gd}$		—	5.5	—	
Gate switch charge		$Q_{sw}$		—	6.5	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	-19.2	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = -4.8 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.2	V







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