

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:  $Q_{SW} = 6.5 \text{ nC (typ.)}$
- 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:  $I_{DSS} = 10 \text{ }\mu\text{A (max)} \text{ (} V_{DS} = -40\text{V)}$
- 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 ( $T_a = 25^\circ\text{C}$ )

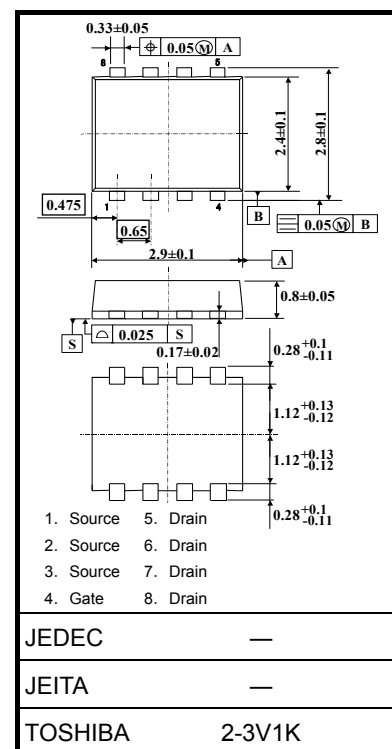
Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	-40	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-40	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	-4.8	A
	Pulsed (Note 1)	$I_{DP}$	-19.2	
Drain power dissipation	( $t = 5 \text{ s}$ ) (Note 2a)	$P_D$	1.68	W
Drain power dissipation	( $t = 5 \text{ s}$ ) (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	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

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.).

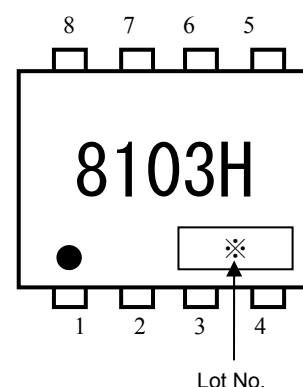
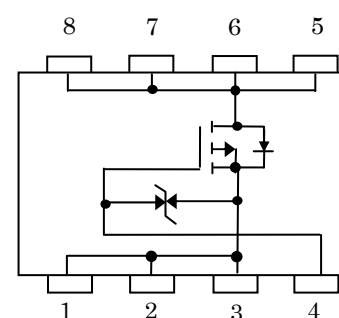
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.017 g (typ.)

### Circuit Configuration

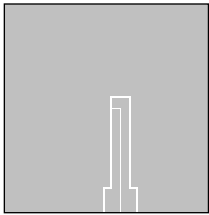


Thermal Characteristics

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

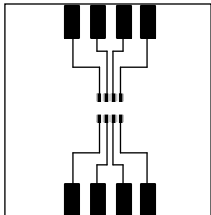
Note 1: The channel temperature should not exceed 150°C during use.

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)



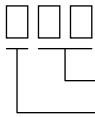
(b)

FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

Note 3:  $V_{DD} = -24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -4.8\text{ A}$

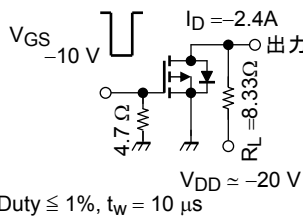
Note 4: Repetitive rating: pulse width limited by max channel temperature

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)

## Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain cutoff current		I <sub>DSS</sub>	V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V <sub>(BR)</sub> DSS	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 0 V	-40	—	—	V
		V <sub>(BR)</sub> DSX	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = -20 V	-20	—	—	
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA	-0.8	—	-2.0	V
Drain-source ON-resistance		R <sub>DS</sub> (ON)	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.4 A	—	42	54	mΩ
			V <sub>GS</sub> = -10 V, I <sub>D</sub> = -2.4 A	—	31	40	
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -2.4 A	5	10	—	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	800	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	115	—	
Output capacitance		C <sub>oss</sub>		—	165	—	
Switching time	Rise time	t <sub>r</sub>		—	6.5	—	ns
	Turn-on time	t <sub>on</sub>		—	12.5	—	
	Fall time	t <sub>f</sub>		—	9	—	
	Turn-off time	t <sub>off</sub>		—	37	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ -32 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -4.8 A	—	19	—	nC
			V <sub>DD</sub> ≈ -32 V, V <sub>GS</sub> = -5 V, I <sub>D</sub> = -4.8 A	—	11	—	
Gate-source charge 1		Q <sub>gs1</sub>	V <sub>DD</sub> ≈ -32 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -4.8 A	—	1.5	—	
Gate-drain (“Miller”) charge		Q <sub>gd</sub>		—	5.5	—	
Gate switch charge		Q <sub>SW</sub>		—	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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