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# TOSHIBA

# TPCF8A01

TOSHIBA Multi-Chip Device Silicon N Channel MOS Type (U-MOS III) / Schottky Barrier Diode

## TPCF8A01

Notebook PC Applications

Portable Equipment Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 38 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 5.4 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 20 \text{ V}$ )
- Enhancement-model:  $V_{th} = 0.5 \text{ to } 1.2 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 200 \text{ }\mu\text{A}$ )
- Low forward voltage:  $V_{FM} = 0.46\text{V}$ (typ.)

### Maximum Ratings

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	20	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	20	V
Gate-source voltage	$V_{GSS}$	$\pm 12$	V
Drain current	DC (Note 1)	$I_D$	3
	Pulse (Note 1)	$I_{DP}$	12
Single pulse avalanche energy (Note 4)	$E_{AS}$	1.46	mJ
Avalanche current	$I_{AR}$	1.5	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)	$E_{AR}$	0.11	mJ

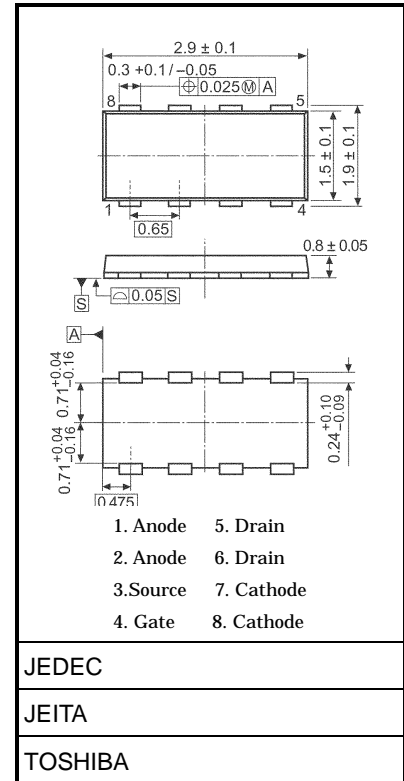
#### SBD ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Repetitive peak reverse voltage	$V_{RRM}$	20	V
Average forward current (Note 2a, 6)	$I_{F(AV)}$	1.0	A
Peak one cycle surge forward current (non-repetitive)	$I_{FSM}$	7(50Hz)	A

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

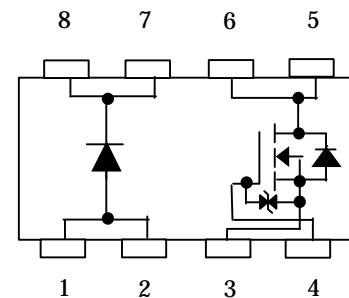
Characteristics	Symbol	Rating	Unit
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2a)	Single-device operation (Note 3a)	$P_D(1)$	1.35
	Single-device value at dual operation (Note 3b)	$P_D(2)$	1.12
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2b)	Single-device operation (Note 3a)	$P_D(1)$	0.53
	Single-device value at dual operation (Note 3b)	$P_D(2)$	0.33
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55~150	$^\circ\text{C}$

Unit: mm

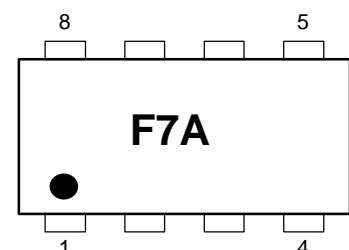


Weight: 0.011 g (typ.)

### Circuit Configuration



### Marking (Note 7)



Note: For (Note 1), (Note 2), (Note 3), (Note 4), (Note 5), (Note 6) and (Note 7), please refer to the next page.

**Thermal Characteristics for MOSFET and SBD**

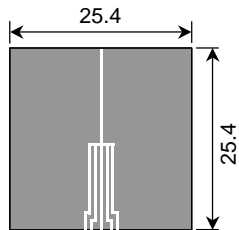
Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	R <sub>th (ch-a) (1)</sub>	92.6	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th (ch-a) (2)</sub>	111.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	R <sub>th (ch-a) (1)</sub>	235.8	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th (ch-a) (2)</sub>	378.8	

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

Schottky barrier diodes are having large-reverse-current-leakage characteristic compare to the other rectifier products. This current leakage and improper operating temperature or voltage may cause thermal runaway. Please take forward and reverse loss into consideration when you design.

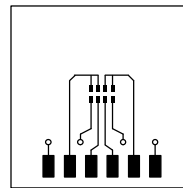
Note 1: Please use devices on condition that the channel temperature is below 150°C.

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  
(単位: mm)



(b)

FR-4  
25.4 × 25.4 × 0.8  
(単位: mm)

Note 3: a) The power dissipation and thermal resistance values are shown for a single device (During single-device operation, power is only applied to one device.).

b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.).

Note 4: V<sub>DD</sub> = 16 V, T<sub>ch</sub> = 25°C (initial), L = 0.5 mH, R<sub>G</sub> = 25 Ω, I<sub>AR</sub> = 1.5 A

Note 5: Repetitive rating; Pulse width limited by Max. Channel temperature.

Note 6: Rectangular waveform (α = 180°), V<sub>R</sub> = 15V.

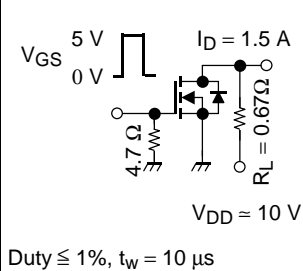
Note 7: Black round marking “ ” locates on the left lower side of parts number marking “F7A” indicates terminal No. 1.

# TOSHIBA

# TPCF8A01

## Electrical Characteristics (Ta = 25°C)

### MOSFET

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	20	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -12\text{ V}$	8	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 200\text{ }\mu\text{A}$	0.5	—	1.2	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 2.0\text{ V}, I_D = 1.5\text{ A}$	—	62	100	m $\Omega$
		$R_{DS(ON)}$	$V_{GS} = 2.5\text{ V}, I_D = 1.5\text{ A}$	—	50	66	
		$R_{DS(ON)}$	$V_{GS} = 4.5\text{ V}, I_D = 1.5\text{ A}$	—	38	49	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 1.5\text{ A}$	2.7	5.4	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	590	—	pF
Reverse transfer capacitance		$C_{rss}$		—	70	—	
Output capacitance		$C_{oss}$		—	85	—	
Switching time	Rise time	$t_r$		—	3.0	—	ns
	Turn-on time	$t_{on}$		—	7.5	—	
	Fall time	$t_f$		—	4.4	—	
	Turn-off time	$t_{off}$		—	26	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} = 16\text{ V}, V_{GS} = 5\text{ V}, I_D = 3.0\text{ A}$	—	7.5	—	nC
Gate-source charge1		$Q_{gs1}$		—	1.3	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	2.1	—	

### MOSFET Source-Drain Ratings and Characteristics

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	12	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 3.0\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	V

### SBD

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward voltage		$V_{FM(1)}$	$I_{FM} = 0.7\text{ A}$	—	0.43	—	V
		$V_{FM(2)}$	$I_{FM} = 1.0\text{ A}$	—	0.46	0.49	V
Repetitive peak reverse current		$I_{RRM}$	$V_{RRM} = 20\text{ V}$	—	—	50	$\mu\text{A}$
Junction capacitance		$C_j$	$V_R = 10\text{ V}, f = 1\text{ MHz}$	—	54	—	pF

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