

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}	± 12	V
Drain current	DC (Note 1)	I_D	3	A
	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

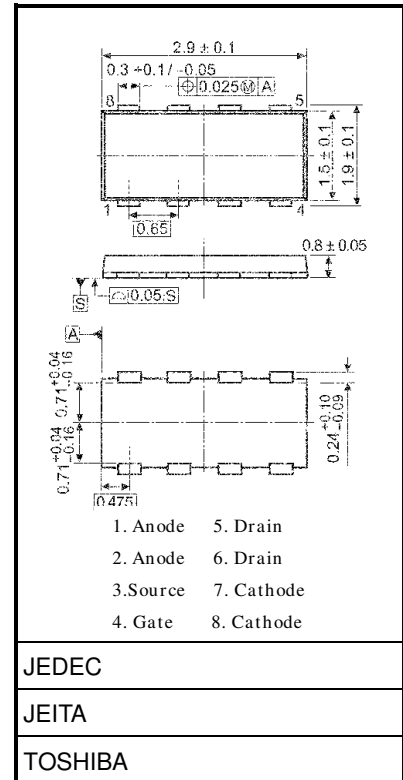
SBD ($T_a = 25^\circ\text{C}$)

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

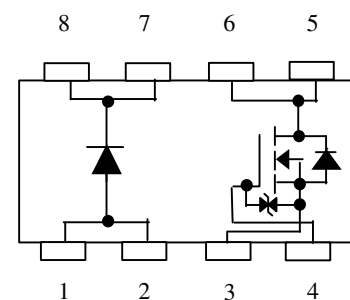
Characteristics		Symbol	Rating	Unit
Drain power dissipation ($t = 5 \text{ s}$) (Note 2a)	Single-device operation (Note 3a)	$P_D(1)$	1.35	W
	Single-device value at dual operation (Note 3b)	$P_D(2)$	1.12	
Drain power dissipation ($t = 5 \text{ s}$) (Note 2b)	Single-device operation (Note 3a)	$P_D(1)$	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

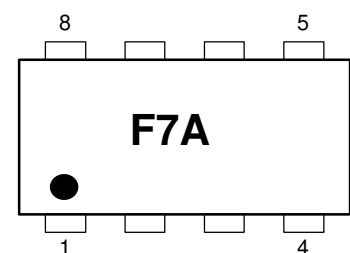


Weight: 0.011 g (typ.)

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

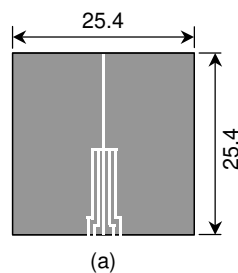
Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th(ch-a)}(1)$	92.6	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th(ch-a)}(2)$	111.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device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

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

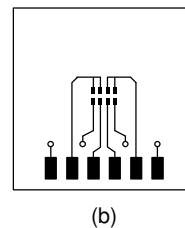
Schottky barrier diodes are having large-reverse-current-leakage characteristic compare to the other rectifier products. This current leakage and improper operating temperature or voltage may cause thermal runaway. Please take forward and reverse loss into consideration when you design.

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)



FR-4
25.4 × 25.4 × 0.8
(単位: mm)



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: $V_{DD} = 16\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.5\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 1.5\text{ A}$

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

Note 6: Rectangular waveform ($\alpha = 180^\circ$), $V_R = 15\text{ V}$.

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

Electrical Characteristics (Ta = 25°C)

MOSFET

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current		I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	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 Ω
		$R_{DS(ON)}$	$V_{GS} = 2.5\text{ V}, I_D = 1.5\text{ A}$	—	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	<p>$V_{GS} = 5\text{ V}$ 0 V $I_D = 1.5\text{ A}$ $4.7\text{ }\Omega$ $R_L = 0.67\text{ }\Omega$ $V_{DD} = 10\text{ V}$ Duty $\leq 1\%$, $t_w = 10\text{ }\mu\text{s}$</p>	—	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	μA
Junction capacitance		C_j	$V_R = 10\text{ V}, f = 1\text{ MHz}$	—	54	—	pF

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