

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( -MOSVII)

# TPCA8007-H

Switching Regulator Applications

Motor Drive Applications

- Small footprint due to small and thin package
- High speed switching
- Low drain-source ON resistance  
:  $R_{DS(ON)} = 30 \text{ m}\Omega$  (typ.) ( $V_G=10\text{V}$ ,  $I_D=10\text{A}$ )
- High forward transfer admittance:  $|Y_{fs}| = 19 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \mu\text{A}$  (max) ( $V_{DS} = 100 \text{ V}$ )
- Enhancement mode:  $V_{th} = 3.0$  to  $5.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

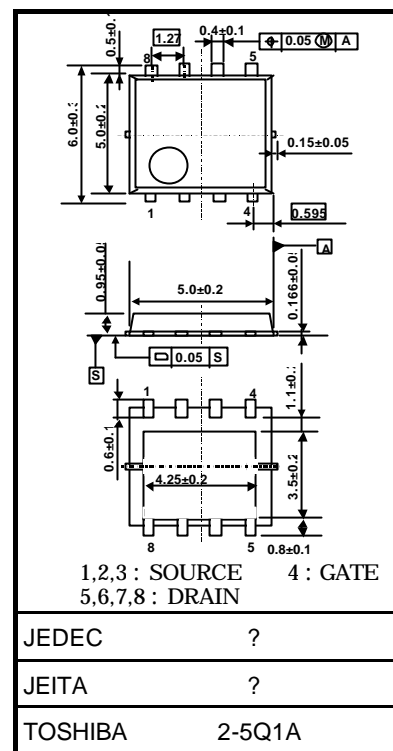
## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics		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)	$I_D$	20	A
	Pulsed (Note 1)	$I_{DP}$	40	
Drain power dissipation ( $T_c=25^\circ\text{C}$ )		$P_D$	45	W
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2a)		$P_D$	2.8	W
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2b)		$P_D$	1.6	W
Single pulse avalanche energy (Note 3)		$E_{AS}$	351	mJ
Avalanche current		$I_{AR}$	20	A
Repetitive avalanche energy (Note 2a) (Note 4)		$E_{AR}$	4.5	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

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

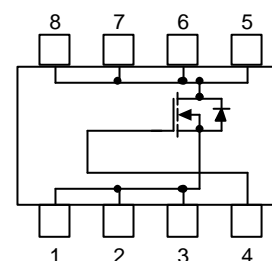
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

## Circuit Configuration

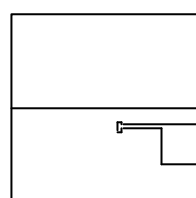


## Thermal Characteristics

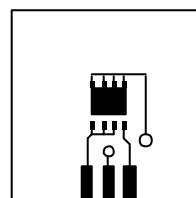
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case ( $T_c=25$ )	$R_{th(ch-c)}$	2.78	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ( $t = 10$ s) (Note 2a)	$R_{th(ch-a)}$	44.6	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ( $t = 10$ s) (Note 2b)	$R_{th(ch-a)}$	78.1	$^{\circ}\text{C/W}$

Note 1: Please use devices on condition that the channel temperature is below  $150^{\circ}\text{C}$ .

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



(a)

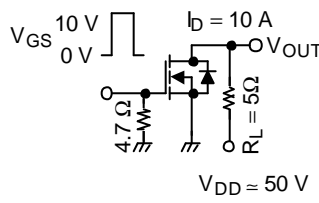


(b)

Note 3:  $V_{DD} = 50\text{ V}$  ,  $T_{ch} = 25^{\circ}\text{C}$  (initial) ,  $L = 1.0\text{ mH}$  ,  $R_G = 25\ \Omega$  ,  $I_{AR} = 20\text{ A}$

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

## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 100$	nA
Drain cut-OFF current		$I_{DSS}$	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	100	—	—	V
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	3.0	—	5.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	—	30	47	$\text{m}\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$	9.5	19	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1000	—	pF
Reverse transfer capacitance		$C_{rss}$		—	21	—	
Output capacitance		$C_{oss}$		—	500	—	
Switching time	Rise time	$t_r$	 <p><math>V_{DD} \approx 50\text{ V}</math> Duty <math>\leq 1\%</math>, <math>t_w = 10\text{ }\mu\text{s}</math></p>	—	(2)	—	ns
	Turn-ON time	$t_{on}$		—	(13)	—	
	Fall time	$t_f$		—	3	—	
	Turn-OFF time	$t_{off}$		—	13	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} = 80\text{ V}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	—	15	—	nC
Gate-source charge 1		$Q_{gs1}$		—	7.2	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	5.0	—	
Gate switch charge		$Q_{SW}$		—	8.5	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse ( $t_w=1\text{ms}$ )	$I_{DRP}$	—	—	—	40	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 20\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V

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