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

PRELIMINARY | # TPCA8011-H

High Speed and High Efficiency DC-DC Converters

Notebook PC Applications

Portable Equipment Applications

Unit: mm

- Small footprint due to small and thin package
- High speed switching
- Small gate charge: Q_{sw} = 11 nC (typ.)
- Low drain-source ON resistance: $R_{DS (ON)}$ = 3.1 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = TBD S (typ.)
- Low leakage current: I_{DSS} = 10 µA (max) (V_{DS} = 30 V)
- Enhancement mode: V_{th} = 1.1 to 2.3 V (V_{DS} = 10 V, I_D = 1 mA)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	20	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	20	V
Gate-source voltage		V_{GSS}	±12	V
Drain current	DC (Note 1)	I_D	40	A
	Pulsed (Note 1)	I_{DP}	120	
Drain power dissipation (Tc=25)		P_D	45	W
Drain power dissipation (t = 10 s) (Note 2a)		P_D	2.8	W
Drain power dissipation (t = 10 s) (Note 2b)		P_D	1.6	W
Single pulse avalanche energy (Note 3)		E_{AS}	208	mJ
Avalanche current		I_{AR}	40	A
Repetitive avalanche energy (Tc=25) (Note 4)		E_{AR}	TBD	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

0.5±0.1 1.27 0.4±0.1 ⊕ 0.05 (M) A
6.0±0.3 5.0±0.2 0.15±0.05
0.595
0.95±0.05 5.0±0.2 A
0.166±0.05
S □ 0.05 S
1.1±0.2
0.6±0.1 4.25±0.2 3.5±0.2
0.8±0.1

1,2,3 SOURCE   4   GATE
5,6,7,8 DRAIN

JEDEC	—
JEITA	—
TOSHIBA	2-5Q1A

Weight: 0.080 g (typ.)

Circuit Configuration

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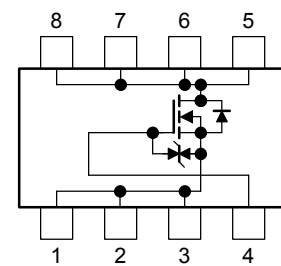
Thermal Characteristics
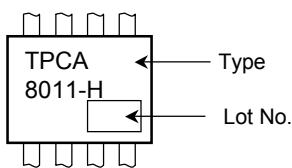
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case (Tc=25℃)	$R_{th\,(ch-c)}$	2.78	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th\,(ch-a)}$	44.6	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th\,(ch-a)}$	78.1	°C/W

Marking (Note 5)
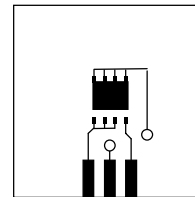

TPCA 8011-H — Type — Lot No.

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
(Unit: mm)

(a)

FR-4
25.4 × 25.4 × 0.8
(Unit: mm)
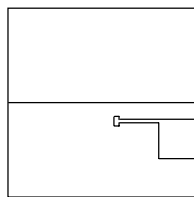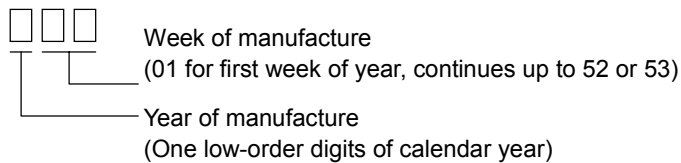
(b)

Note 3: V_{DD} = 24 V, T_{ch} = 25°C (initial), L = 0.1 mH, R_G = 25 Ω, I_{AR} = 35 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 year, continues up to 52 or 53)

Year of manufacture
(One low-order digits of calendar year)

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Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm10V$, $V_{DS} = 0$ V	—	—	±10	μA
Drain cut-OFF current		I_{DSS}	$V_{DS} = 20$ V, $V_{GS} = 0$ V	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10$ mA, $V_{GS} = 0$ V	20	—	—	V
		$V_{(BR)DSX}$	$I_D = 10$ mA, $V_{GS} = -12$ V	8	—	—	
Gate threshold voltage		V_{th}	$V_{DS} = 10$ V, $I_D = 200\mu$ A	0.5	—	1.2	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 2.5$ V, $I_D = 20$ A	—	4.0	5.4	mΩ
			$V_{GS} = 4.5$V, $I_D = 20$ A	—	3.1	4.1	
Forward transfer admittance		$|Y_{fs}|$	$V_{DS} = 10$ V, $I_D = 20$ A	TBD	TBD	—	S
Input capacitance		C_{iss}		—	1870	—	pF
Reverse transfer capacitance		C_{rss}	$V_{DS} = 10$ V, $V_{GS} = 0$ V, $f = 1$ MHz	—	312	—	
Output capacitance		C_{oss}		—	1370	—	
Switching time	Rise time	t_r		—	TBD	—	ns
	Turn-ON time	t_{on}		—	TBD	—	
	Fall time	t_f		—	TBD	—	
	Turn-OFF time	t_{off}	Duty ≦ 1%, $t_w = 10$ μs	—	TBD	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \simeq 16$ V, $V_{GS} = 10$ V, $I_D = 40$ A	—	38	—	nC
			$V_{DD} \simeq 16$ V, $V_{GS} = 5$ V, $I_D = 40$ A	—	TBD	—	
Gate-source charge 1		Q_{gs1}		—	TBD	—	
Gate-drain ("miller") charge		Q_{gd}	$V_{DD} \simeq 16$ V, $V_{GS} = 10$ V, $I_D = 40$ A	—	8	—	
Gate switch charge		Q_{SW}		—	11	—	

Switching time test circuit:
V_{GS} 5 V / 0 V, $I_D = 20$ A, V_{OUT}, $R_L = 0.5\ \Omega$, 4.7 Ω, $V_{DD} \simeq 10$ V

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	120	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 40$ A, $V_{GS} = 0$ V	—	—	−1.2	V

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