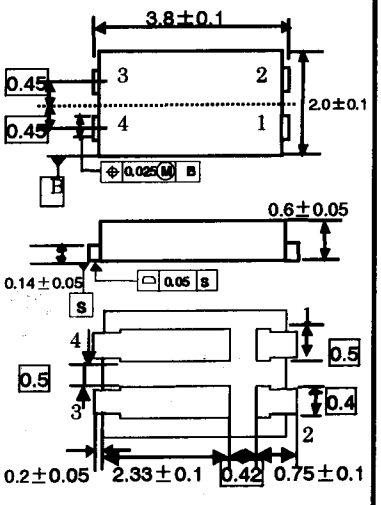
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSIII)

TPCT4201

Lithium Ion Battery Applications

- Lead(Pb)-Free
- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{SS\ (ON)}$ =25.5mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ =15 S (typ.)
- Low leakage current: I_{SSS} = 10 μA (max) (V_{DS} = 20 V)
- Enhancement-mode: V_{th} = 0.5~1.2 V (V_{SS} = 10 V, I_S = 200 μA)
- Common drain

Unit: mm



1.GATE 1. 3.SOURCE 2
2.GATE 2 4.SOURCE 1

JEDEC	—
JEITA	—
TOSHIBA	

Weight: 0.010 g (typ.)

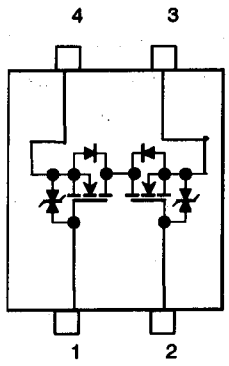
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Source-source voltage		V_{SSS}	20	V
Gate-source voltage		V_{GSS}	±12	V
Drain current	DC (Note 1)	I_S	6	A
	Pulse (Note 1)	I_{SP}	24	
Drain power dissipation (t = 10 s) (Note 2a)	Single-device value at dual operation (Note 3)	P_D	1.7	W
Drain power dissipation (t = 10 s) (Note 2b)	Single-device value at dual operation (Note 3)	P_D	0.51	W
Single pulse avalanche energy (Note 4)		E_{AS}	46.8	mJ
Avalanche current		I_{AR}	6	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3, 5)		E_{AR}	0.17	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

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

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

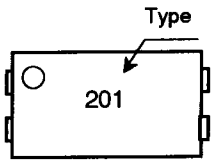
Circuit Configuration



Thermal Characteristics

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	Single-device value at dual operation (Note 3)	$R_{th\ (ch\text{-}a)}$	76	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	Single-device value at dual operation (Note 3)	$R_{th\ (ch\text{-}a)}$	244	°C/W

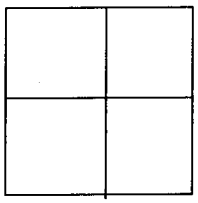
Marking (Note 5)



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

Note 2:

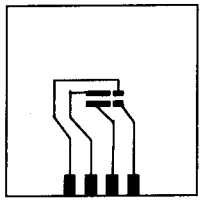
(a) Device mounted on a glass-epoxy board



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

(a)

(b) Device mounted on a glass-epoxy board



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

(b)

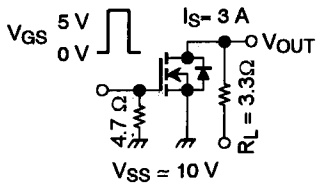
Note 3: The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.)

Note 4: V_{DD} = 16 V, T_{ch} = 25°C (initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = 6 A

Note 5: Repetitive rating: pulse width limited by max channel temperature

Note 6: ○ on lower right of the marking indicates Pin 1.

Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±10 V, V_{SS} = 0 V	—	—	±10	μA
Source cut-OFF current		I_{SSS}	V_{SS} = 20 V, V_{GS} = 0 V	—	—	10	μA
Source -source breakdown voltage		$V_{(BR)\ SSS}$	I_S = 10 mA, V_{GS} = 0 V	20	—	—	V
		$V_{(BR)\ SSX}$	I_S = 10 mA, V_{GS} = −12 V	8	—	—	
Gate threshold voltage		V_{th}	V_{SS} = 10 V, I_S = 200 μA	0.5	—	1.2	V
Source -source ON resistance		$R_{SS\ (ON)}$	V_{GS} = 2.5 V, I_S = 3 A	28	37	49	mΩ
			V_{GS} = 4.0 V, I_S = 3 A	21	27	32	
			V_{GS} = 4.5 V, I_S = 3 A	19	25.5	31	
Forward transfer admittance		$\|Y_{fs}\|$	V_{SS} = 10 V, I_S = 3 A	7.5	15	—	S
Input capacitance		C_{iss}	V_{SS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	1740	—	pF
Reverse transfer capacitance		C_{rss}		—	180	—	
Output capacitance		C_{oss}		—	260	—	
Switching time	Rise time	t_r		—	9	—	ns
	Turn-ON time	t_{on}		—	13	—	
	Fall time	t_f		—	57	—	
	Turn-OFF time	t_{off}		—	145	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{SS} ≈ 16 V, V_{GS} = 5 V, I_D = 6 A	—	21	—	nC
Gate-source charge 1		Q_{gs1}		—	4	—	
Gate- source ("miller") charge		Q_{gs}		—	4	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Source reverse current	Pulse (Note 1)	I_{SRP}	—	—	—	24	A
Forward voltage (diode)		V_{SSF}	I_{SR} = 6 A, V_{GS} = 0 V	—	—	−1.2	V

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