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

TPCT4204

TENTATIVE

Lithium Ion Secondary Battery Applications

- Lead(Pb)-Free
- Small footprint due to small and thin package
- Low source-source ON resistance: $R_{SS\ (ON)}$ = (22)mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = (25) S (typ.)
- Low leakage current: I_{SSS} = 10 μA (max) (V_{SS} = 30 V)
- Enhancement-model: V_{th} = 0.5to1.2 V(V_{SS} = 10 V, I_S = 200 μA)
- Common drain

Maximum Ratings (Ta = 25°C)

Characteristics			Symbol	Rating	Unit
Source-source voltage			V_{SSS}	30	V
Gate-source voltage			V_{GSS}	±12	V
Source current	DC	(Note 1)	I_S	6	A
	Pulse	(Note 1)	I_{SP}	24	
Power dissipation (t = 10s)		(Note 2a,3)	P_D	1.7	W
Power dissipation (t= 10s)		(Note 2b,3)	P_D	0.51	W
Single pulse avalanche energy		(Note 4)	E_{AS}	TBD	mJ
Avalanche current			I_{AR}	6	A
Repetitive avalanche energy (Note 2a, 5)			E_{AR}	0.17	mJ
Channel temperature			T_{ch}	150	°C
Storage temperature range			T_{stg}	−55to150	°C

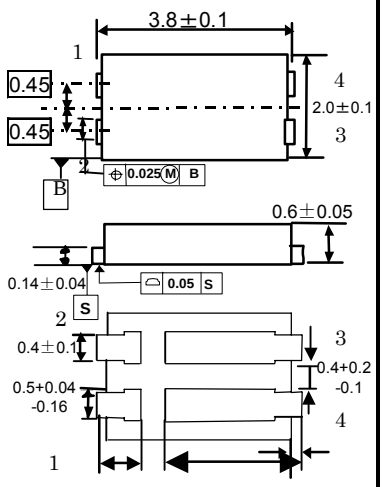
Note: For (Note 1), (Note 2), (Note 3), (Note 4) and (Note 5), please refer to the next page.

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

⚠WARNING

【Handling Precaution for Power MOSFET in use of Protection Circuit for Battery Pack 】
Flame-retardant resins of UL94-V0 flammability class are used in packages,however,they are not noncombustible.
Use a unit,for example PTC Thermistor,which can shut off the power supply if a short-circuit occurs.
If the power supply is not shut off on the occurring short-circuit,a large short-circuit current will flow continuously,which may cause the device to catch fire or smoke.

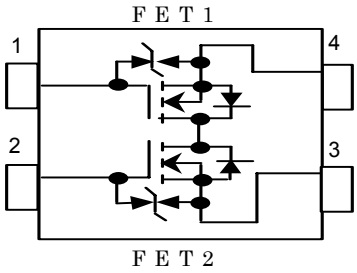
Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-2S1A

Weight: 0.012 g (typ.)

Circuit Configuration



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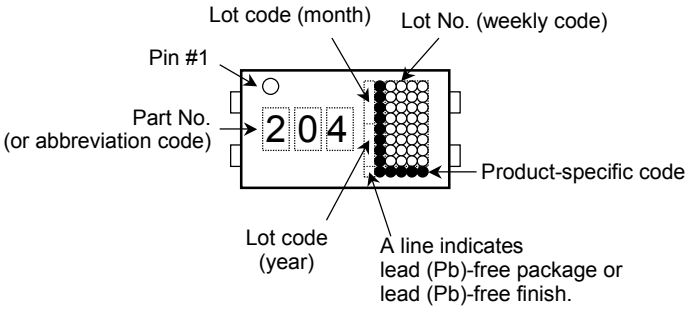
Thermal Characteristics

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

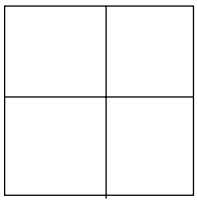
Marking (Note 6)



Note 1: Ensure that the channel temperature does not exceed 150**℃**.

Note 2:

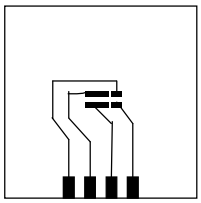
(a) Device mounted on a glass-epoxy board



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 both FETs.

Note 4: V_{DD} = 24 V, T_{ch} = 25°C (initial), L = mH, R_G = 25 Ω, I_{AR} = 6 A

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

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

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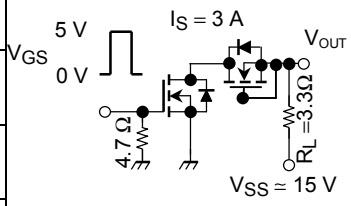
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±10 V, V_{SS} = 0 V (Note 8)	—	—	±10	μA
Source cut-OFF current		I_{SSS}	V_{SS} = 30 V, V_{GS} = 0 V (Note 8)	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)\ SSS}$	I_S = 10 mA, V_{GS} = 0 V (Note 8)	30	—	—	V
		$V_{(BR)\ SSX}$	I_S = 10 mA, V_{GS} = −12 V (Note 8)	15	—	—	
Gate threshold voltage		V_{th}	V_{SS} = 10 V, I_S = 200 μA (Note 8)	0.5	—	1.2	V
Drain-source ON resistance		$R_{SS\ (ON)}$	V_{GS} = 2.5 V, I_S = 3 A (Note 7)	(24)	(33)	(44)	mΩ
			V_{GS} = 4.0 V, I_S = 3 A (Note 7)	(18.5)	(23)	(29.5)	
			V_{GS} = 4.5 V, I_S = 3 A (Note 7)	(17.5)	(22)	(28)	
Forward transfer admittance		$\|Y_{fs}\|$	V_{SS} = 10 V, I_S = 3 A (Note 8)	(12.5)	(25)	—	S
Input capacitance		C_{iss}	V_{SS} = 10 V, V_{GS} = 0 V, f = 1 MHz (Note 8)	—	(1990)	—	pF
Reverse transfer capacitance		C_{rss}		—	(150)	—	
Output capacitance		C_{oss}		—	(210)	—	
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 (Note 8)	—	TBD	—	
Total gate charge		Q_g	V_{SS} ≃ 24 V, V_{GS} = 5 V, I_S = 6 A (Note 8)	—	TBD	—	nC
Gate-source charge1		Q_{gs1}		—	TBD	—	
Diode (source-source) forward voltage		V_{SSF}	I_{SR} = 6 A, V_{GS} = 0 V (Note 9)	—	—	−1.2	V

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