

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

# TPCF8201

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-mode:  $V_{th} = 0.5 \text{ to } 1.2 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 200 \text{ }\mu\text{A}$ )

## Absolute Maximum Ratings (Ta = 25°C)

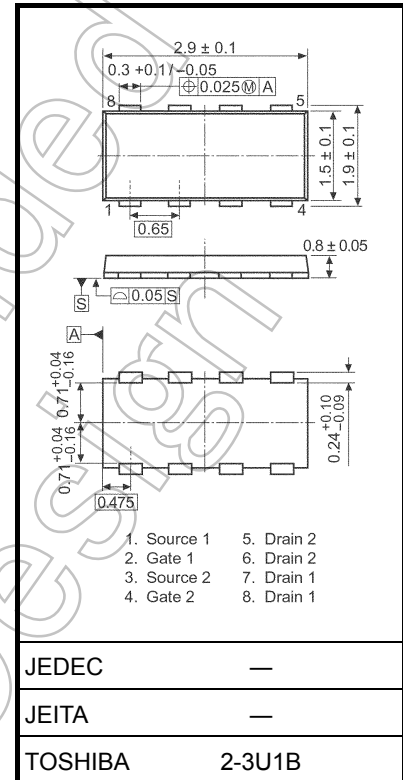
Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	20	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	20	V
Gate-source voltage		$V_{GSS}$	$\pm 12$	V
Drain current	DC (Note 1)	$I_D$	3	A
	Pulse (Note 1)	$I_{DP}$	12	
Drain power dissipation (t = 5 s) (Note 2a)	Single-device 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 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	
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
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55 to 150	°C

Note: For Notes 1 to 5, refer to the next page.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

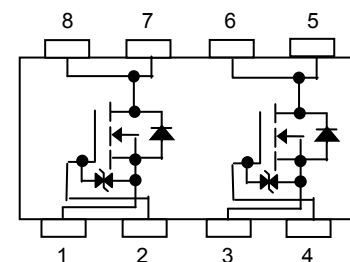
This transistor is an electrostatic-sensitive device. Handle with caution.

Unit: mm



Weight: 0.011 g (typ.)

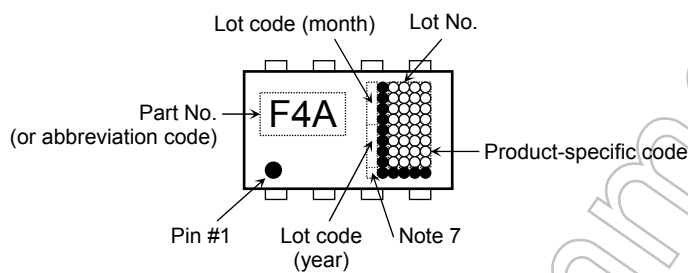
## Circuit Configuration



## Thermal Characteristics

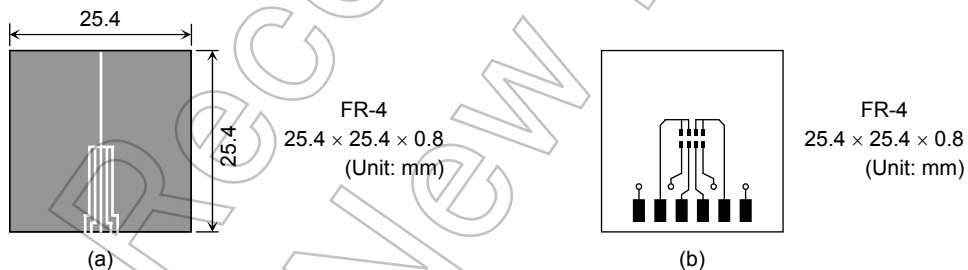
Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	R <sub>th</sub> (ch-a) (1)	92.6	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	111.6	
Thermal resistance, channel to ambient (t = 5 s) (Note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

## Marking (Note 6)



Note 1: Ensure that the channel temperature does not exceed 150°C.

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



Note 3: a) he power dissipation and thermal resistance values are shown for a single device. (During single-device operation, power is only applied to one device.)

b) he 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<sub>DD</sub> = 16 V, T<sub>ch</sub> = 25°C (initial), L = 0.5 mH, R<sub>G</sub> = 25 Ω, I<sub>AR</sub> = 1.5 A

Note 5: Repetitive rating: Pulse width limited by maximum channel temperature

Note 6: “●” on the lower left of the marking indicates Pin 1.

Note 7 A dot marking identifies the indication of product Labels.

Without a dot: [[Pb]]/INCLUDES > MCV

With a dot: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

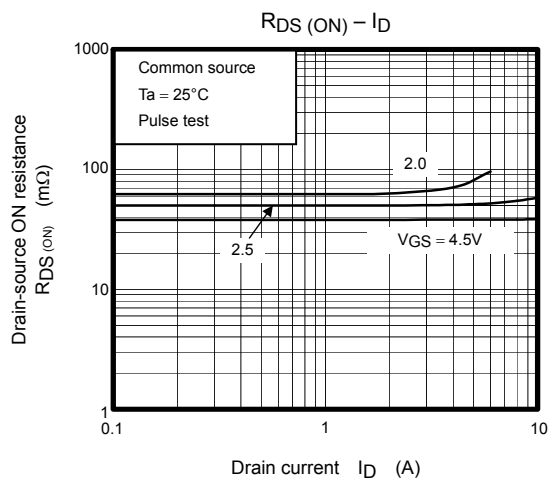
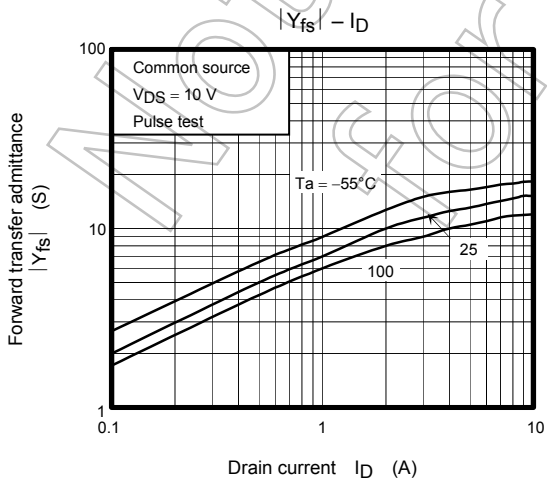
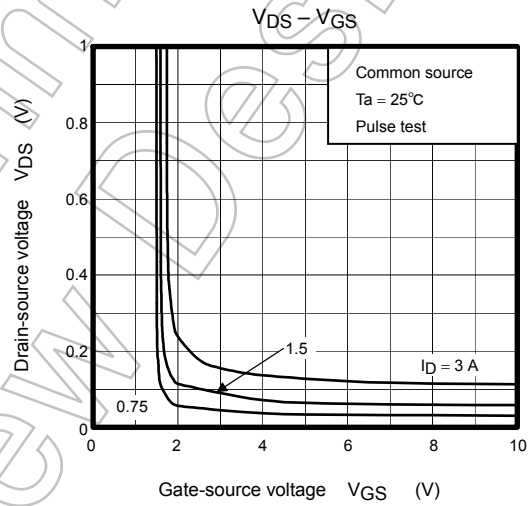
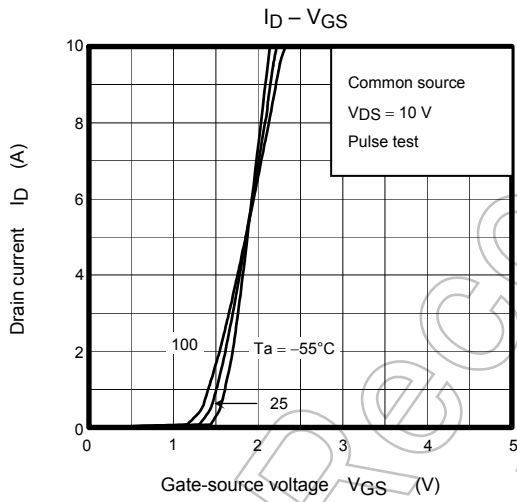
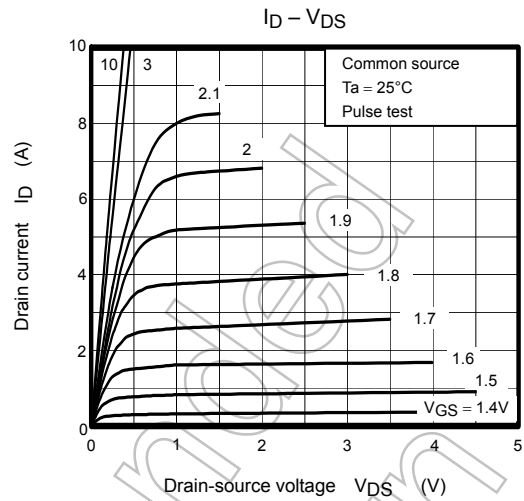
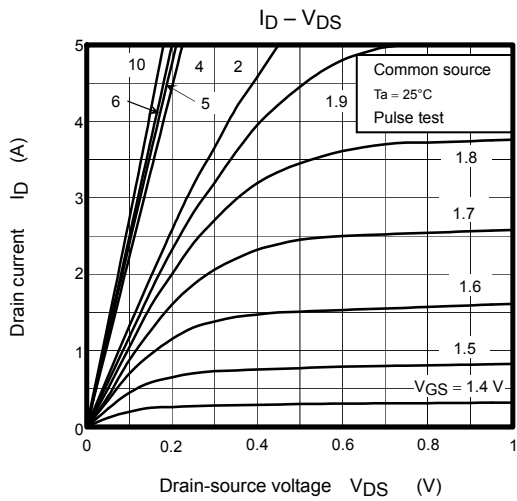
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

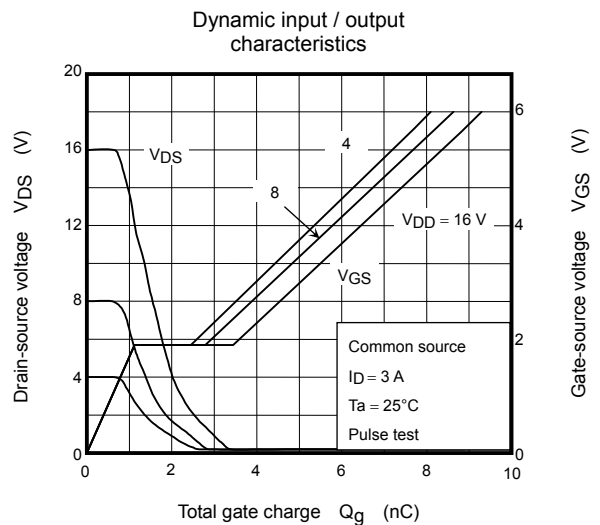
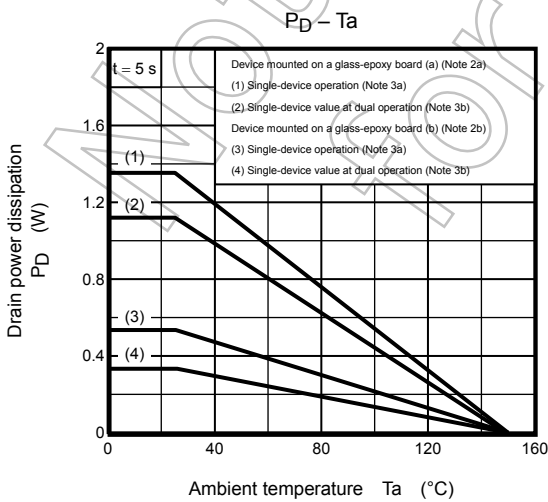
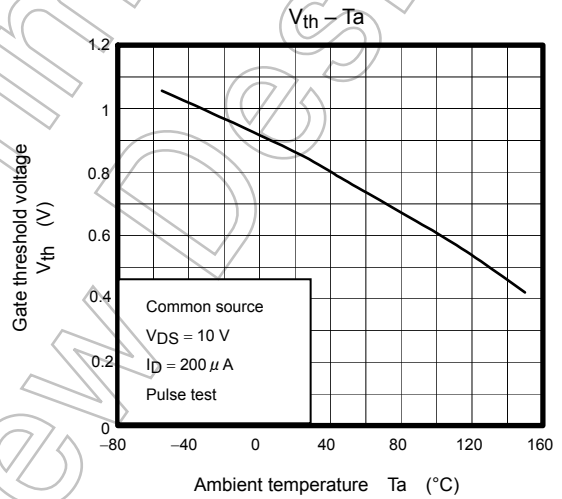
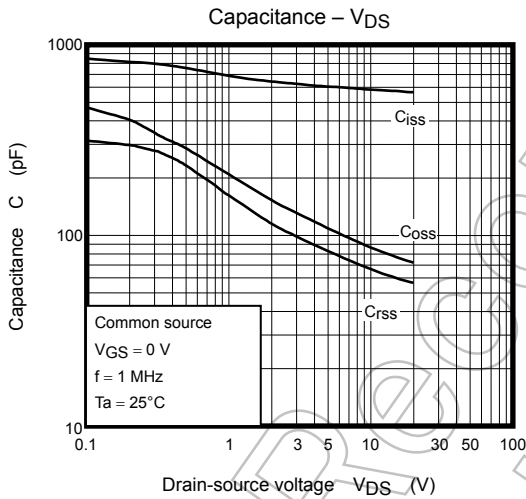
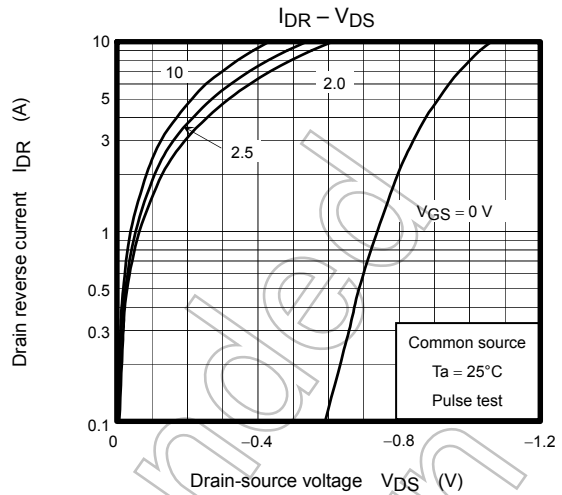
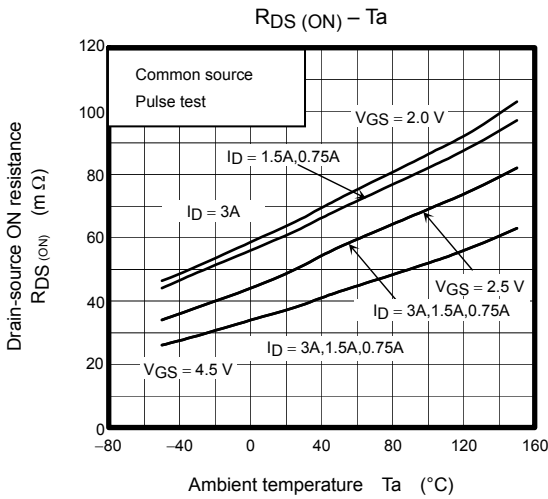
## Electrical Characteristics (Ta = 25°C)

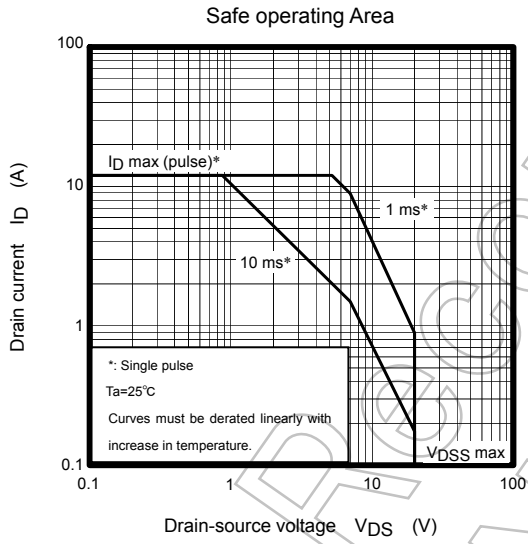
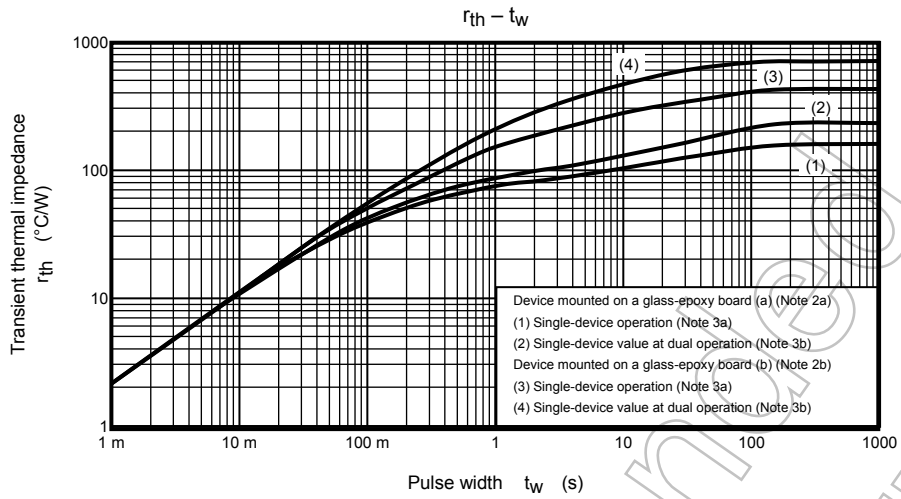
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	20	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -12\text{ V}$	8	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 200\ \mu\text{A}$	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 $\Omega$
		$R_{DS(ON)}$	$V_{GS} = 2.5\text{ V}, I_D = 1.5\text{ A}$	—	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	$t_r$		—	3.0	—	ns
	Turn-on time	$t_{on}$		—	7.5	—	
	Fall time	$t_f$		—	4.4	—	
	Turn-off time	$t_{off}$		Duty $\leq 1\%$ , $t_w = 10\ \mu\text{s}$	—	26	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 16\text{ V}, V_{GS} = 5\text{ V}, I_D = 3.0\text{ A}$	—	7.5	—	nC
Gate-source charge1		$Q_{gs1}$		—	1.3	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	2.1	—	

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

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







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