

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

# TPCF8301

Notebook PC Applications  
 Portable Equipment Applications

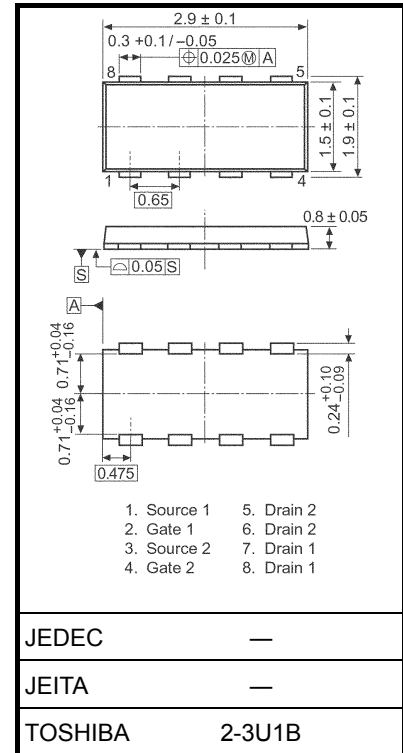
- Low drain-source ON resistance:  $R_{DS(ON)} = 72 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 4.7 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -20 \text{ V}$ )
- Enhancement model:  $V_{th} = -0.5 \text{ to } -1.2 \text{ V}$   
 ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -200 \text{ }\mu\text{A}$ )

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

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		$V_{GSS}$	$\pm 8$	V
Drain current	DC (Note 1)	$I_D$	-2.7	A
	Pulse (Note 1)	$I_{DP}$	-10.8	
Drain power dissipation ( $t = 5 \text{ s}$ ) (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 ( $t = 5 \text{ s}$ ) (Note 2b)	Single-device operation (Note 3a)	$P_D(1)$	0.53	W
	Single-device value at dual operation (Note 3b)	$P_D(2)$	0.33	
Single pulse avalanche energy (Note 4)		$E_{AS}$	1.2	mJ
Avalanche current		$I_{AR}$	-1.35	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		$E_{AR}$	0.11	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55~150	$^\circ\text{C}$

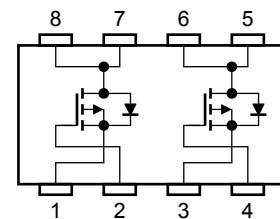
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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.).

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	

Note: (Note 1), (Note 2), (Note 3), (Note 4), (Note 5) and (Note 6): See the next page.

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

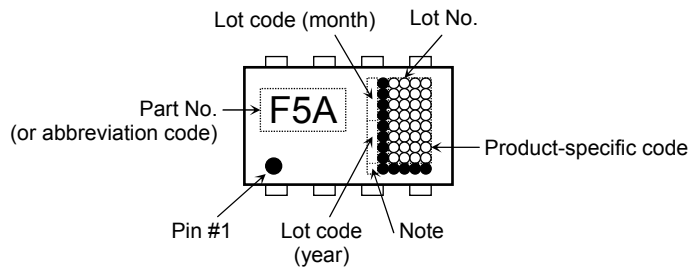
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain cut-off current		I <sub>DSS</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 0 V	-20	—	—	V
		V <sub>(BR)DSX</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 8 V	-12	—	—	
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -200 μA	-0.5	—	-1.2	V
Drain-source ON resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -0.7 A	—	215	300	mΩ
		R <sub>DS(ON)</sub>	V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -1.4 A	—	110	160	
		R <sub>DS(ON)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -1.4 A	—	72	110	
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1.4 A	2.4	4.7	—	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	470	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	70	—	
Output capacitance		C <sub>oss</sub>		—	80	—	
Switching time	Rise time	t <sub>r</sub>		—	5	—	ns
	Turn-on time	t <sub>on</sub>		—	9	—	
	Fall time	t <sub>f</sub>		—	8	—	
	Turn-off time	t <sub>off</sub>		—	26	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ -16 V, V <sub>GS</sub> = -5 V, I <sub>D</sub> = -2.7 A	—	6	—	nC
Gate-source charge		Q <sub>gs</sub>		—	4	—	
Gate-drain ("miller") charge		Q <sub>gd</sub>		—	2	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I <sub>DRP</sub>	—	—	—	-10.8	A
Forward voltage (diode)		V <sub>DSF</sub>	I <sub>DR</sub> = -2.7 A, V <sub>GS</sub> = 0 V	—	—	1.2	V

## Marking (Note 6)



Note: A dot marking for identifying the indication of product Labels.  
 Without a dot: [[Pb]]/INCLUDES > MCV  
 With a dot: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

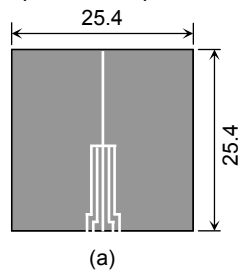
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

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.

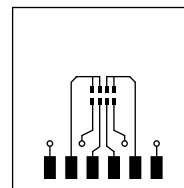
Note 1: Ensure that the channel temperature does not exceed 150°C.

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

Note 3: a) The power dissipation and thermal resistance values are shown for a single device



FR-4  
 25.4 × 25.4 × 0.8  
 (unit: mm)



FR-4  
 25.4 × 25.4 × 0.8  
 (unit: mm)

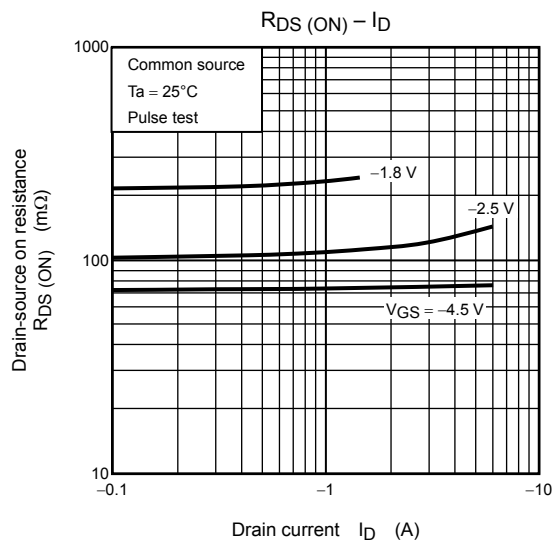
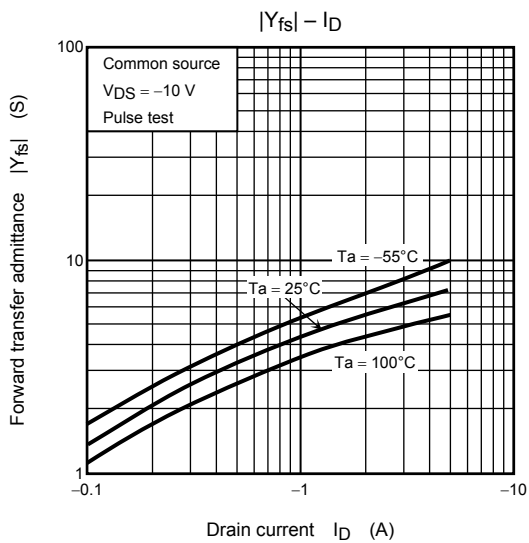
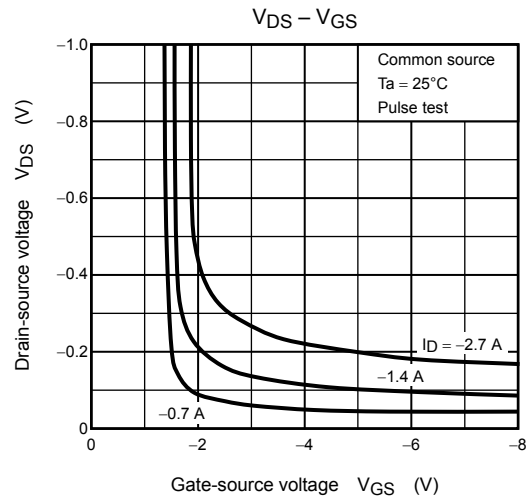
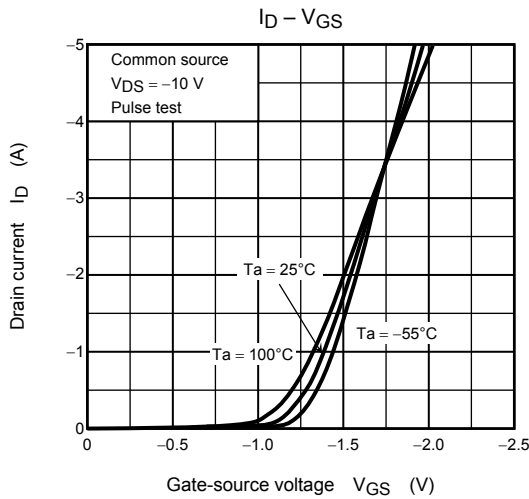
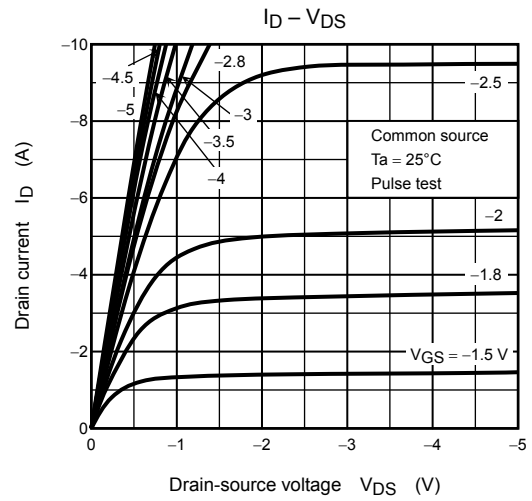
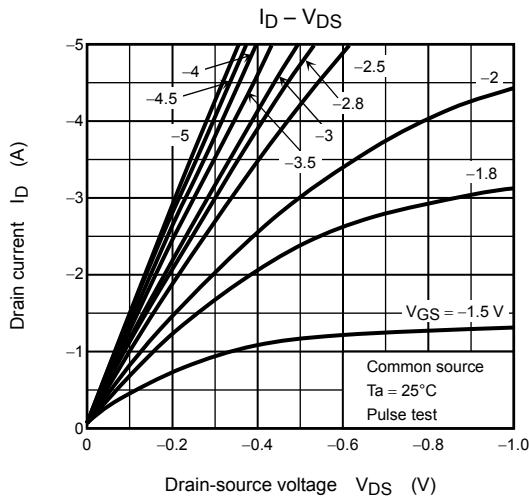
(a) (During single-device operation, power is only applied to one device.)

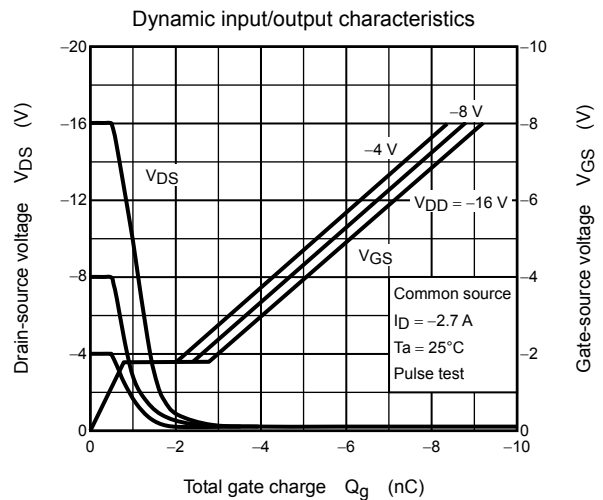
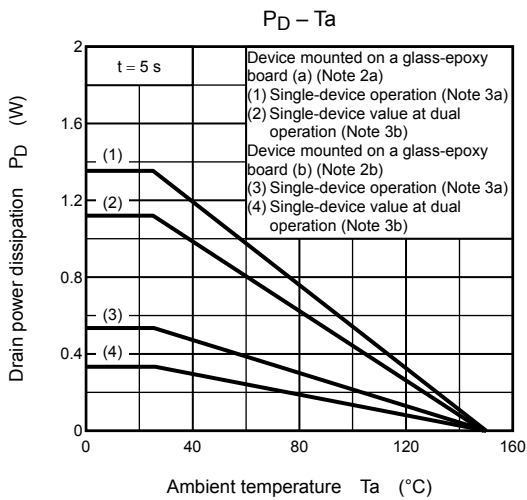
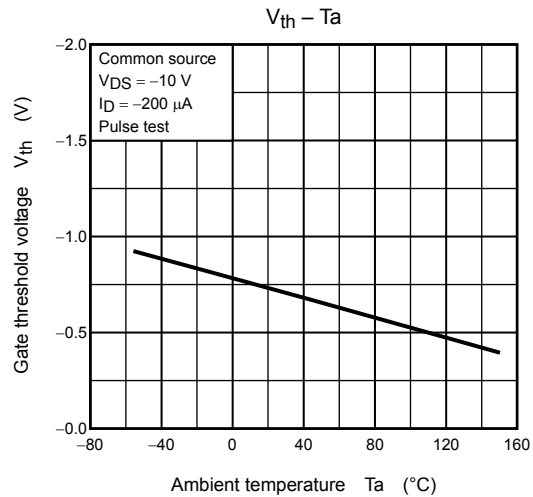
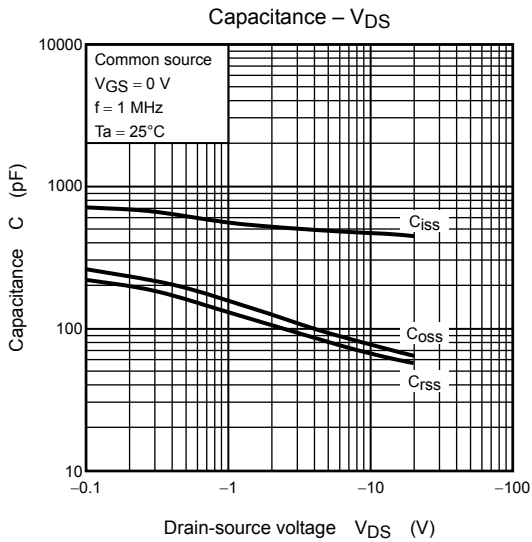
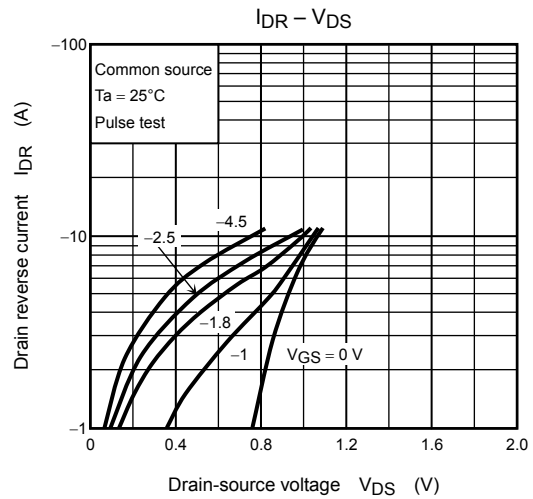
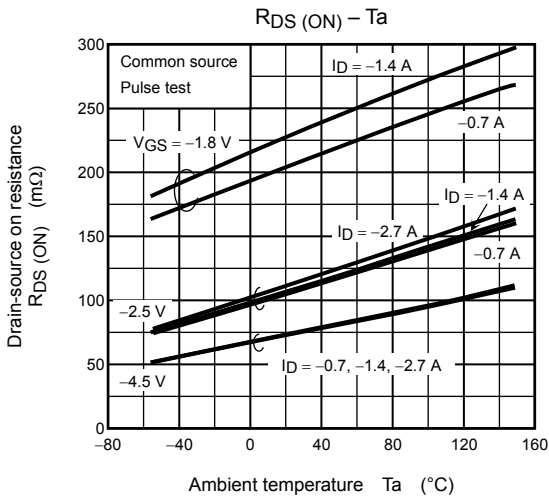
(b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.)

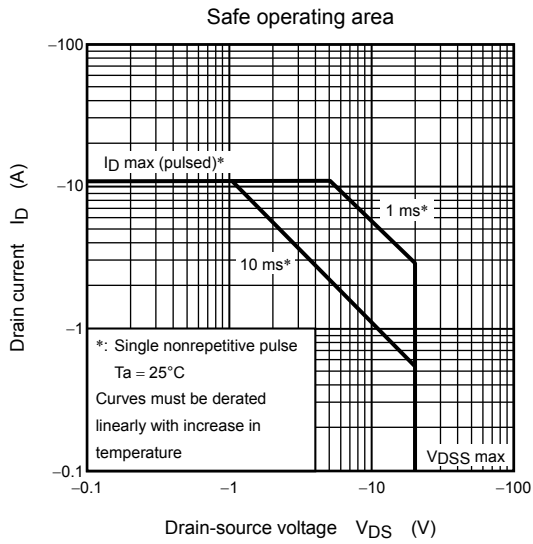
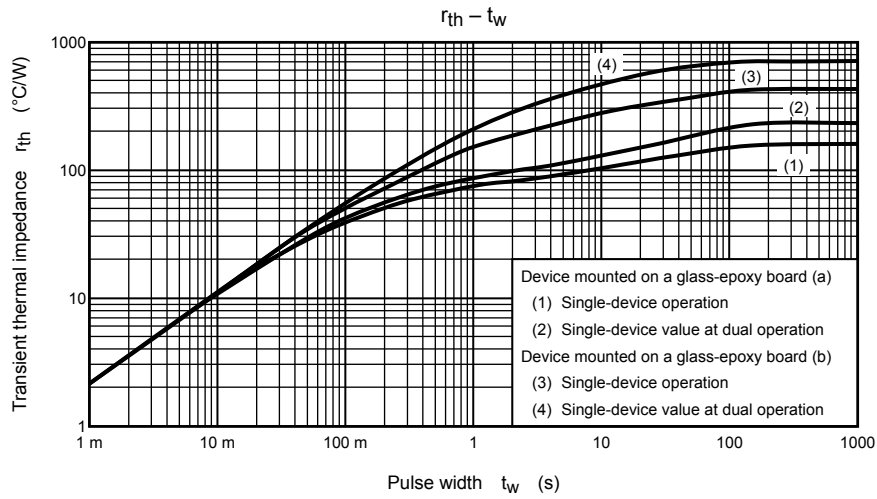
Note 4:  $V_{DD} = -16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -1.35\text{ A}$

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

Note 6: A dot on the lower left of the marking indicates Pin 1







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