

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

# TPCF8302

Notebook PC Applications  
Portable Equipment Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 44 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 6.2 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \mu\text{A}$  (max) ( $V_{DS} = -20 \text{ V}$ )
- Enhancement mode:  $V_{th} = -0.5$  to  $-1.2 \text{ V}$   
( $V_{DS} = -10 \text{ V}$ ,  $I_D = -200 \mu\text{A}$ )

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

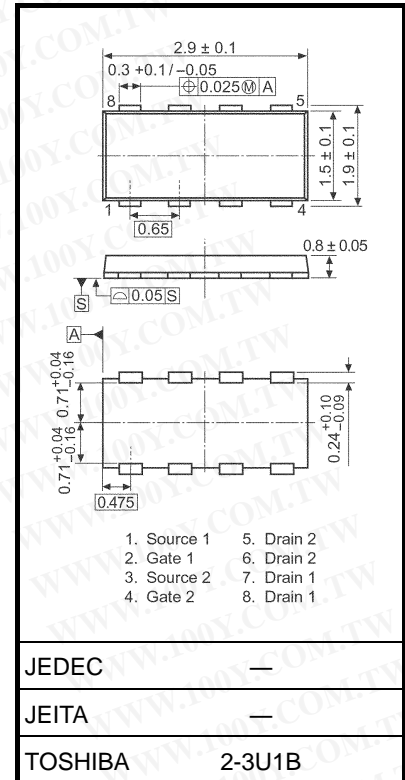
Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	-20	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-20	V
Gate-source voltage		$V_{GSS}$	$\pm 10$	V
Drain current	DC (Note 1)	$I_D$	-3.0	A
	Pulse (Note 1)	$I_{DP}$	-12	
Drain power dissipation ( $t = 5 \text{ s}$ ) (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)		$E_{AS}$	0.58	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	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55~150	$^\circ\text{C}$

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

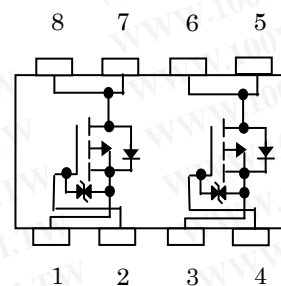
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.011 g (typ.)

## Circuit Configuration

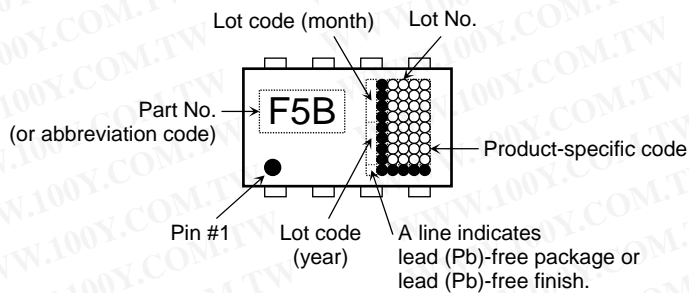


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## Thermal Characteristics

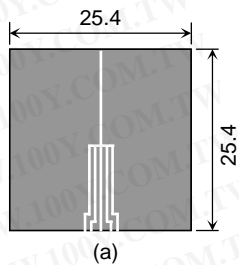
Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	R <sub>th</sub> (ch-a) (1)	92.6	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	111.6	
Thermal resistance, channel to ambient (t = 5 s) (Note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

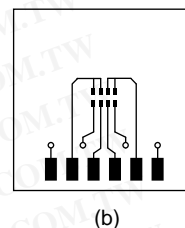


Note 1: Ensure that the channel temperature does not exceed 150°C.

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



FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)



FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)

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

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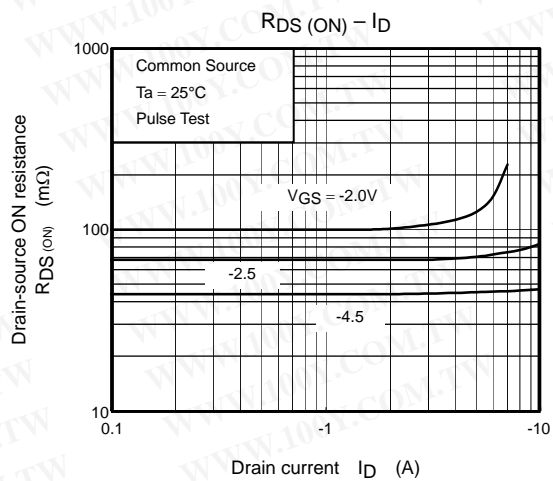
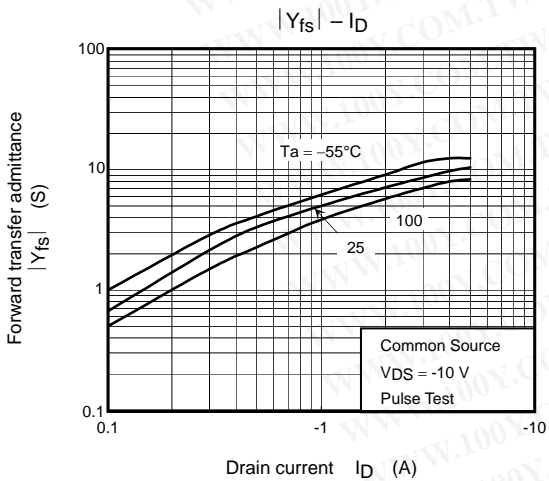
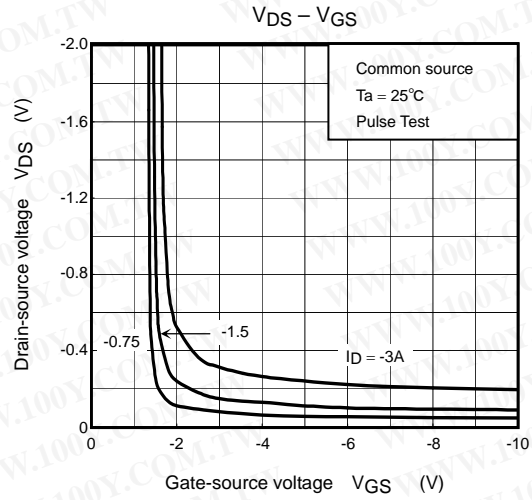
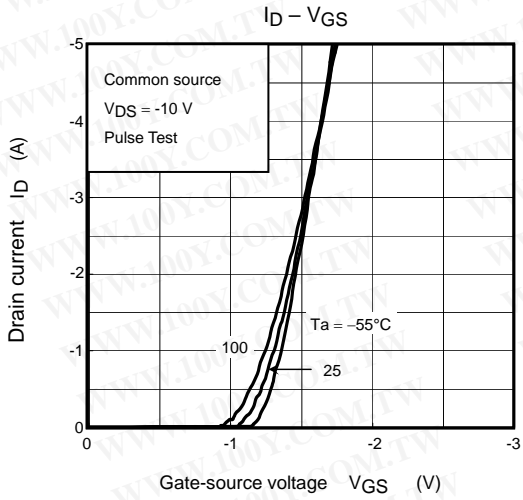
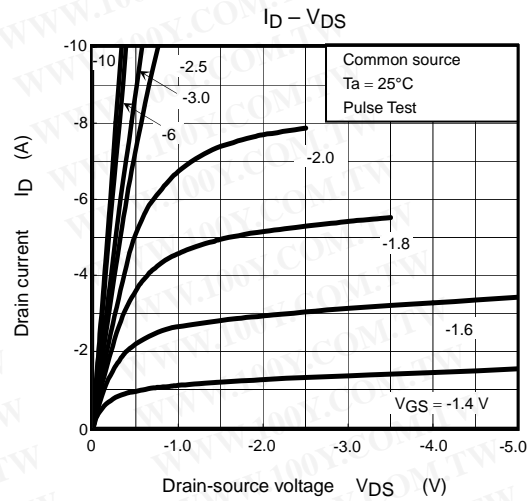
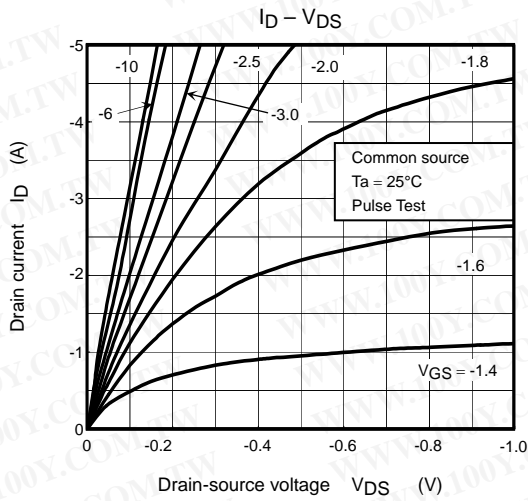
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 10V, V_{DS} = 0V$	—	—	$\pm 10$	$\mu A$
Drain cut-off current		$I_{DSS}$	$V_{DS} = -20V, V_{GS} = 0V$	—	—	-10	$\mu A$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10mA, V_{GS} = 0V$	-20	—	—	V
		$V_{(BR)DSX}$	$I_D = -10mA, V_{GS} = 10V$	-10	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = -10V, I_D = -200\mu A$	-0.5	—	-1.2	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -2.0V, I_D = -1.5A$	—	100	200	m $\Omega$
		$R_{DS(ON)}$	$V_{GS} = -2.5V, I_D = -1.5A$	—	68	95	
		$R_{DS(ON)}$	$V_{GS} = -4.5V, I_D = -1.5A$	—	44	59	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10V, I_D = -1.5A$	3.1	6.2	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10V, V_{GS} = 0V, f = 1MHz$	—	800	—	pF
Reverse transfer capacitance		$C_{rss}$		—	120	—	
Output capacitance		$C_{oss}$		—	160	—	
Switching time	Rise time	$t_r$	<p><math>V_{GS} = 0V, -5V</math>  <math>I_D = -1.5A</math>  <math>V_{OUT}</math>  <math>R_L = 6.7\Omega</math>  <math>V_{DD} \approx -10V</math>                      Duty <math>\leq 1\%</math>, <math>t_w = 10\mu s</math></p>	—	6.2	—	ns
	Turn-on time	$t_{on}$		—	15	—	
	Fall time	$t_f$		—	17	—	
	Turn-off time	$t_{off}$		—	51	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -16V, V_{GS} = -5V, I_D = -3A$	—	11	—	nC
Gate-source charge1		$Q_{gs1}$		—	1.1	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	3.3	—	

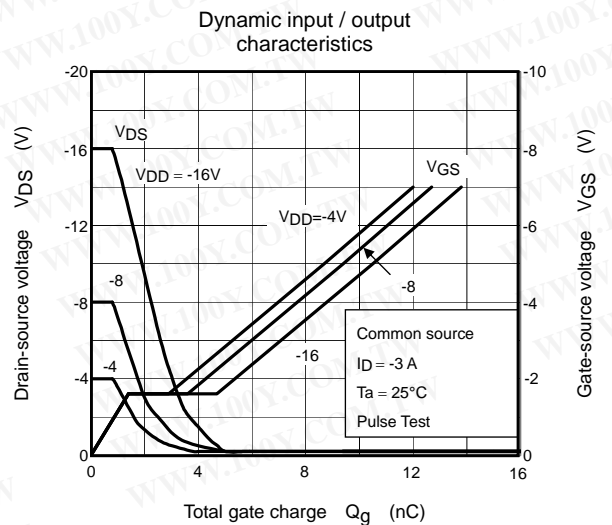
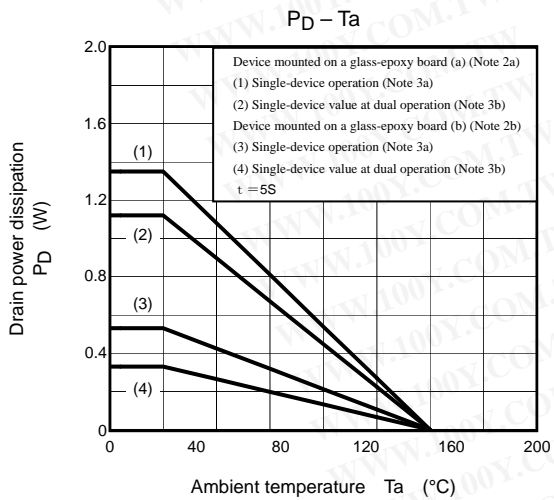
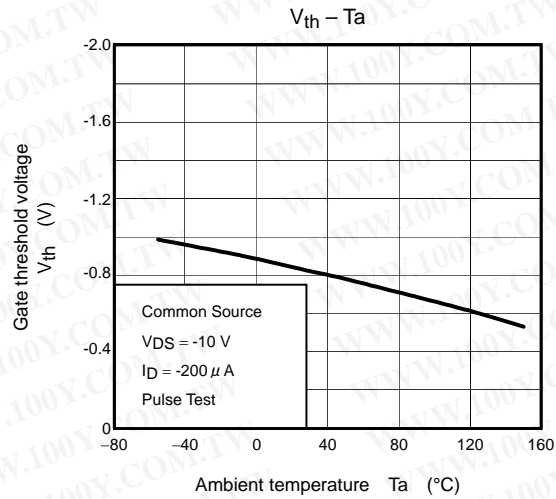
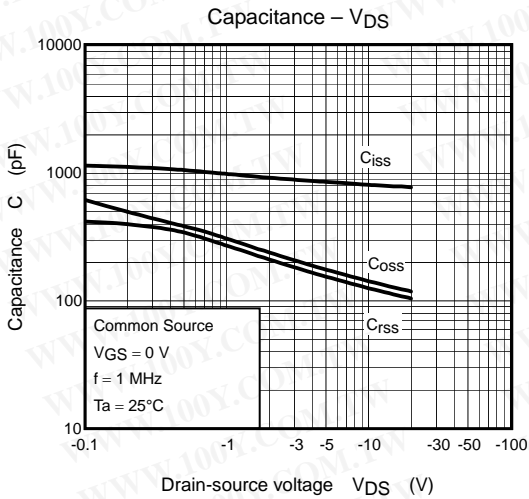
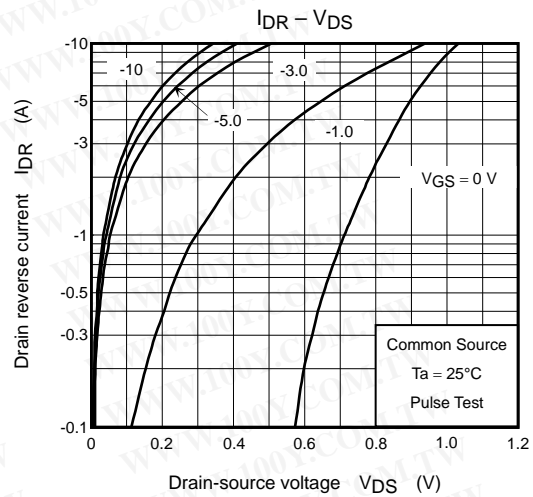
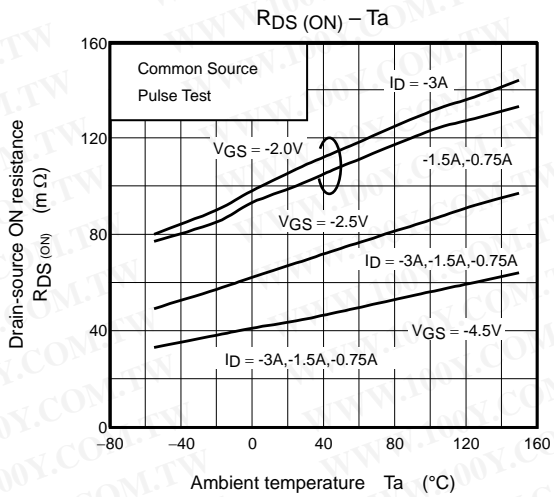
## Source-Drain Ratings and Characteristics (Ta = 25°C)

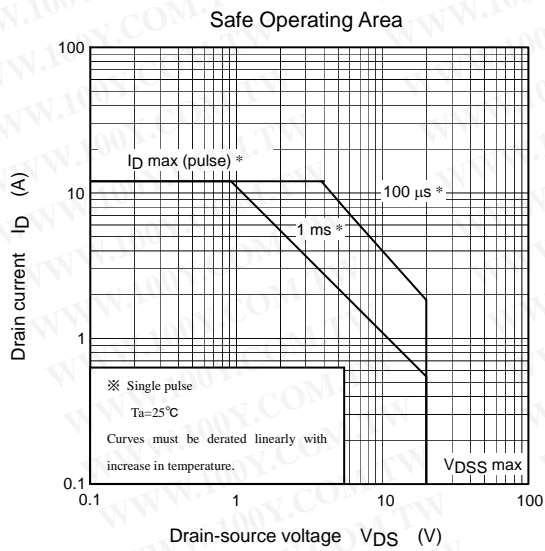
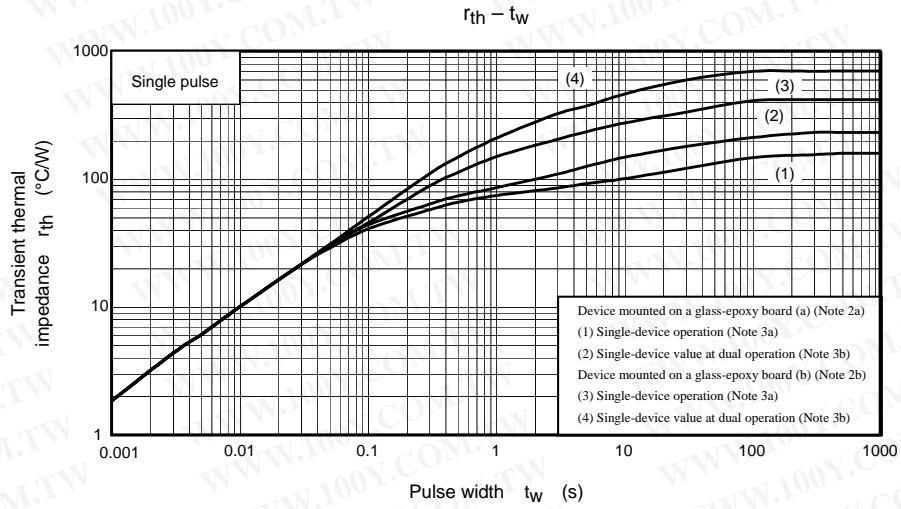
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	-12	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = -3.0A, V_{GS} = 0V$	—	—	1.2	V

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