THE DATASHEET OF

TPCF8201(TE85L,F,M

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 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 5.4 S (typ.)
- Low leakage current: I_{DSS} = 10 μA (max) (V_{DS} = 20 V)
- Enhancement-model: V_{th} = 0.5 to 1.2 V
  (V_{DS} = 10 V, I_D = 200 μA)

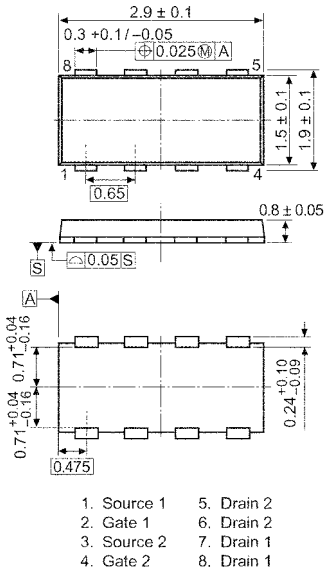
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	20	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	20	V
Gate-source voltage		V_{GSS}	±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}	−55~150	°C

Note: For (Note 1), (Note 2), (Note 3), (Note 4), (Note 5) and (Note 6), please refer to the next page.

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

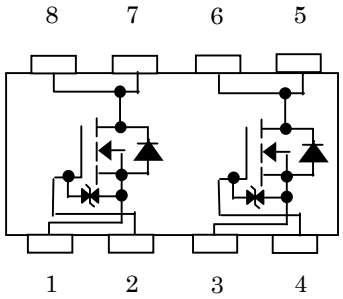
Unit: mm



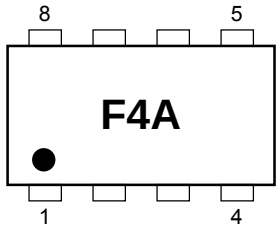
JEDEC	—
JEITA	—
TOSHIBA	2-3U1B

Weight: 0.011 g (typ.)

Circuit Configuration



Marking (Note 6)

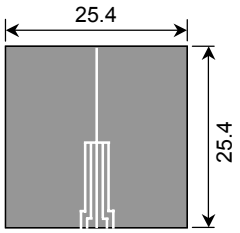


Thermal Characteristics

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	92.6	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	111.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	235.8	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	378.8	

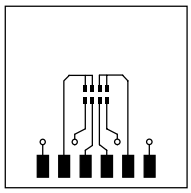
Note 1: Please use devices on condition that the channel temperature is below 150°C.

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



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(b)

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.).

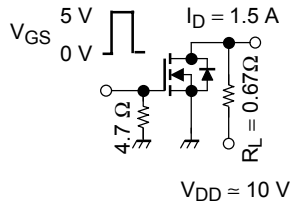
b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.).

Note 4: V_{DD} = 16 V, T_{ch} = 25°C (initial), L = 0.5 mH, R_G = 25 Ω, I_{AR} = 1.5 A

Note 5: Repetitive rating; Pulse width limited by Max. Channel temperature.

Note 6: Black round marking "●" locates on the left lower side of parts number marking "F4A" indicates terminal No. 1.

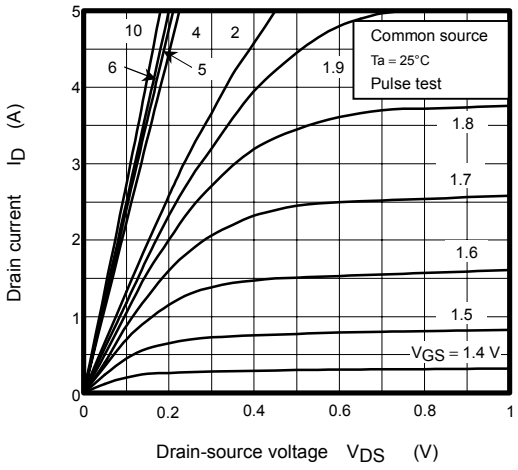
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±10 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut-off current		I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	20	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = -12 V	8	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 200 μA	0.5	—	1.2	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 2.0 V, I_D = 1.5 A	—	62	100	mΩ
		$R_{DS\ (ON)}$	V_{GS} = 2.5 V, I_D = 1.5 A	—	50	66	
		$R_{DS\ (ON)}$	V_{GS} = 4.5 V, I_D = 1.5 A	—	38	49	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 1.5 A	2.7	5.4	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	590	—	pF
Reverse transfer capacitance		C_{rss}		—	70	—	
Output capacitance		C_{oss}		—	85	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	3.0	—	ns
	Turn-on time	t_{on}		—	7.5	—	
	Fall time	t_f		—	4.4	—	
	Turn-off time	t_{off}		—	26	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≃ 16 V, V_{GS} = 5 V, I_D = 3.0 A	—	7.5	—	nC
Gate-source charge1		Q_{gs1}		—	1.3	—	
Gate-drain (“miller”) charge		Q_{gd}		—	2.1	—	

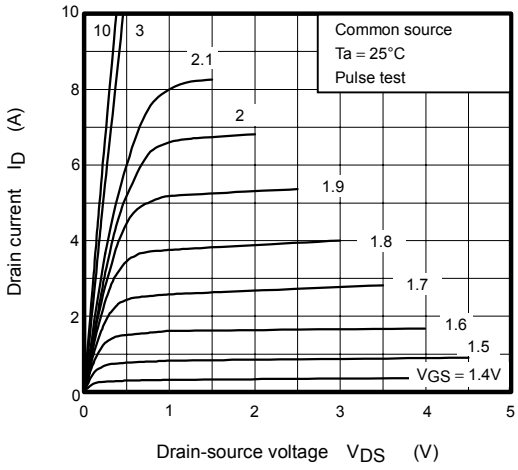
Source-Drain Ratings and Characteristics (Ta = 25°C)

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 A, V_{GS} = 0 V	—	—	-1.2	V

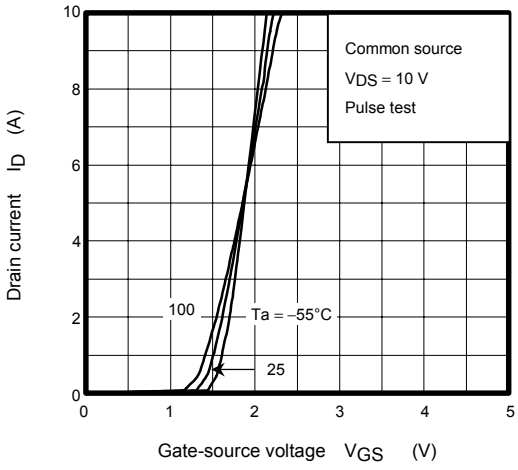
$I_D - V_{DS}$



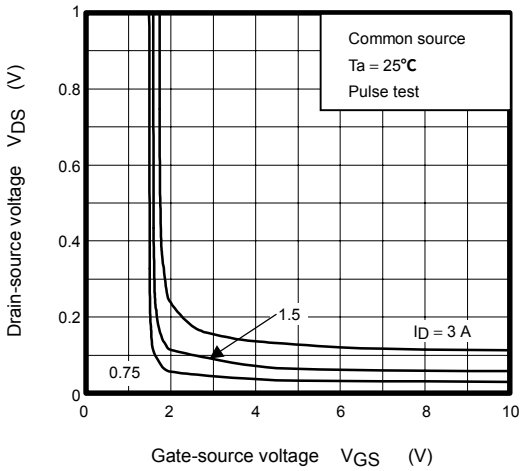
$I_D - V_{DS}$



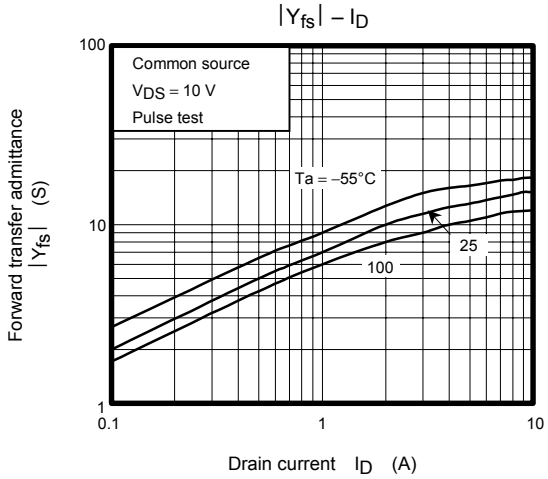
$I_D - V_{GS}$



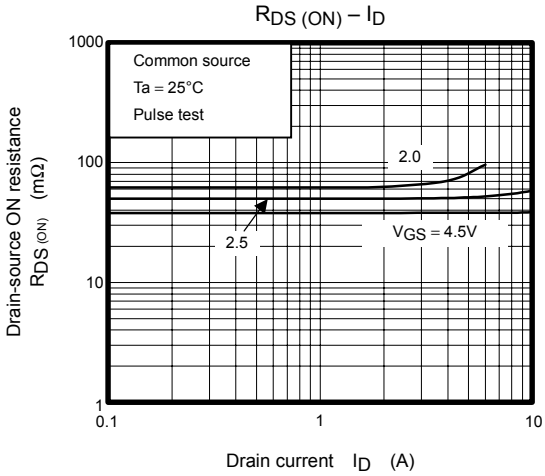
$V_{DS} - V_{GS}$



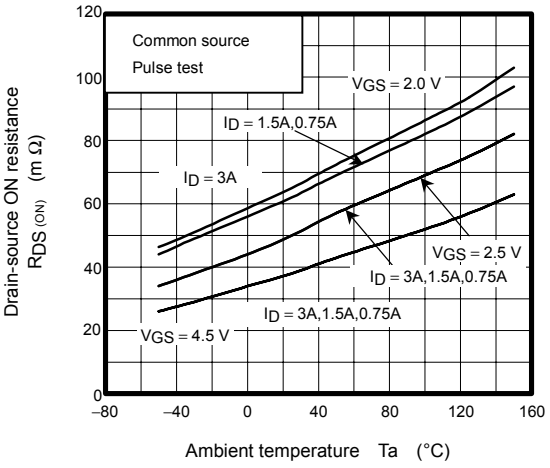
$|Y_{fs}| - I_D$



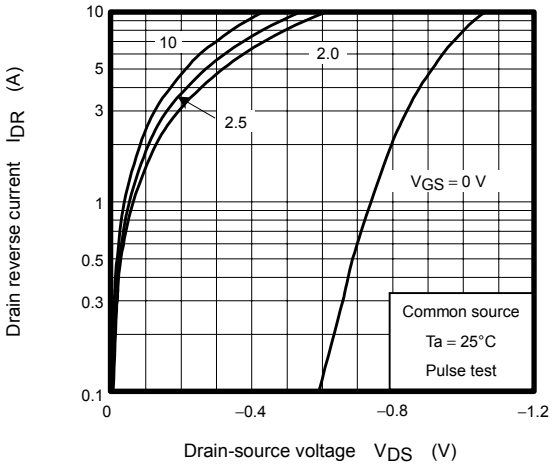
$R_{DS\ (ON)} - I_D$



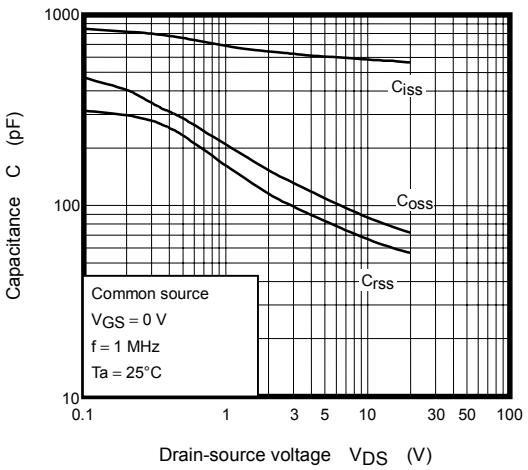
$R_{DS\ (ON)}$ – Ta



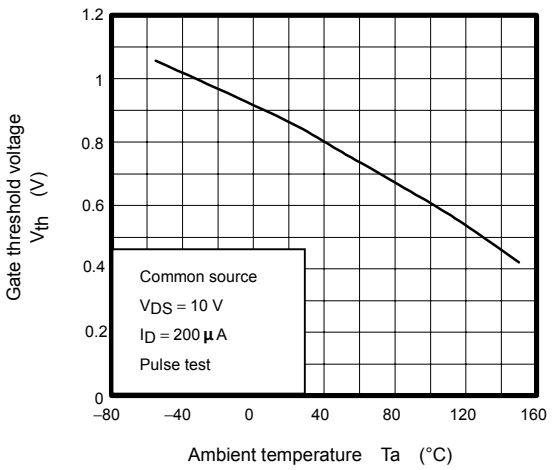
I_{DR} – V_{DS}



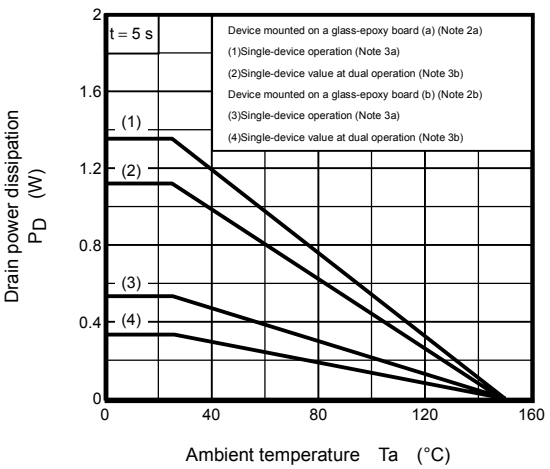
Capacitance – V_{DS}



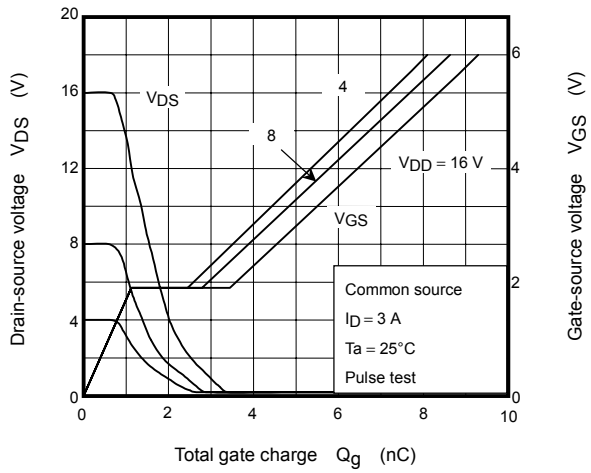
V_{th} – Ta

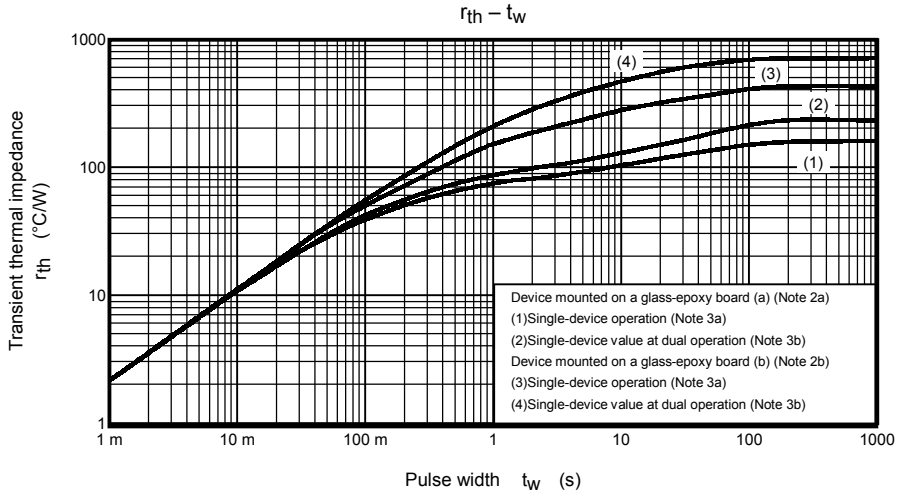


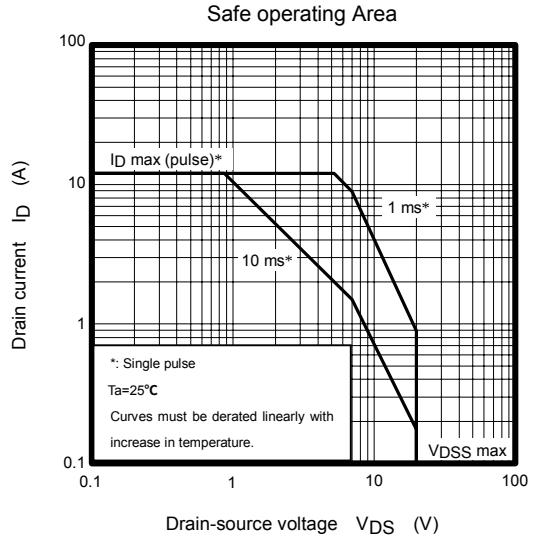
P_D – Ta



Dynamic input / output characteristics




$r_{th} - t_w$
Transient thermal impedance r_{th} (°C/W)
1000
100
10
1
1 m
10 m
100 m
1
10
100
1000
(4)
(3)
(2)
(1)
Device mounted on a glass-epoxy board (a) (Note 2a)
(1)Single-device operation (Note 3a)
(2)Single-device value at dual operation (Note 3b)
Device mounted on a glass-epoxy board (b) (Note 2b)
(3)Single-device operation (Note 3a)
(4)Single-device value at dual operation (Note 3b)
Pulse width t_w (s)


Safe operating Area
Drain current I_D (A)
100
10
1
0.1
I_D max (pulse)*
1 ms*
10 ms*
*: Single pulse
Ta=25°C
Curves must be derated linearly with increase in temperature.
V_{DSS} max
0.1
1
10
100
Drain-source voltage V_{DS} (V)

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