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

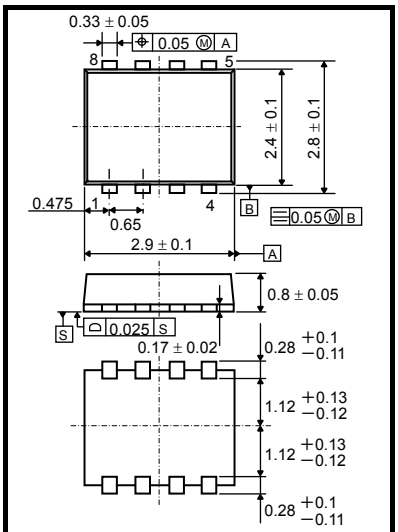
TPCP8006

Notebook PC Applications

Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON-resistance: $R_{DS\ (ON)}$ = 6.5 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 36 S (typ.)
- Low leakage current: I_{DSS} = 10 μA (V_{DS} = 20 V)
- Enhancement mode: V_{th} = 0.5 to 1.2 V (V_{DS} = 10 V, I_D = 1 mA)

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-3V1K

Weight: 0.017g(typ.)

Absolute Maximum Ratings (Ta = 25°C)

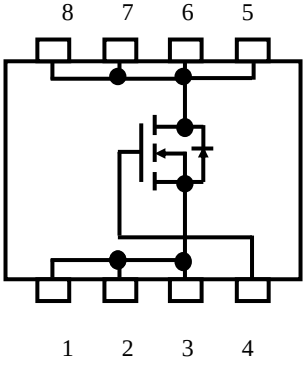
Characteristic			Symbol	Rating	Unit
Drain-source voltage			V_{DSS}	20	V
Drain-gate voltage (R_{GS} = 20 kΩ)			V_{DGR}	20	V
Gate-source voltage			V_{GSS}	±12	V
Drain current	DC	(Note 1)	I_D	9.1	A
	Pulse	(Note 1)	I_{DP}	36.4	
Drain power dissipation (t = 5 s) (Note 2a)			P_D	1.68	W
Drain power dissipation (t = 5 s) (Note 2b)			P_D	0.84	
Single pulse avalanche energy (Note 3)			E_{AS}	21.5	mJ
Avalanche current			I_{AR}	9.1	A
Repetitive avalanche energy (Note 4)			E_{AR}	0.168	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.

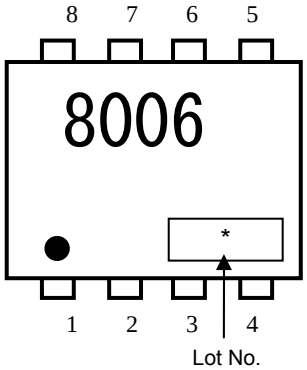
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e.operating temperature/current/voltage, etc.) are within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

Circuit Configuration



Marking (Note 5)

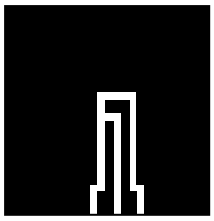


Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	$R_{th\ (ch\text{-}a)}$	74.4	°C/W
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	148.8	°C/W

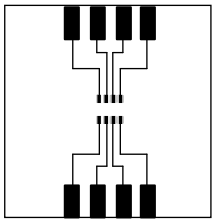
Note 1: Ensure that the channel temperature does not exceed 150°C.

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 × 0.8t
Unit: (mm)

(a)



FR-4
25.4 × 25.4 × 0.8t
Unit: (mm)

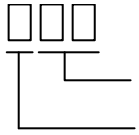
(b)

Note 3: V_{DD} = 16 V, T_{ch} = 25°C (initial), L = 0.2 mH, R_G = 25 Ω, I_{AR} = 9.1 A

Note 4: Repetitive rating: pulse width limited by maximum channel temperature.

Note 5: ● on the lower left of the marking indicates Pin 1.

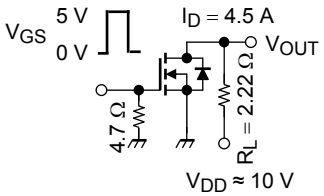
* Weekly code (Three digits):



Week of manufacture
(01 for the first week of the year, continuing up to 52 or 53)

Year of manufacture
(The last digit of the year)

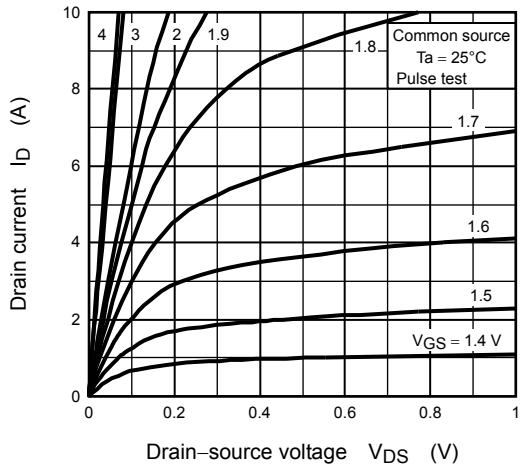
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±12 V, V_{DS} = 0 V	—	—	±100	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 = 1 mA	0.5	—	1.2	V
Drain-source ON-resistance		$R_{DS\ (ON)}$	V_{GS} = 2.5 V, I_D = 4.5 A	—	9.5	13.7	mΩ
			V_{GS} = 4.5 V, I_D = 4.5 A	—	6.5	10	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 4.5 A	18	36	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	1480	—	pF
Reverse transfer capacitance		C_{rss}		—	330	—	
Output capacitance		C_{oss}		—	470	—	
Switching time	Rise time	t_r	 Duty ≤ 1%, t_w = 10 μs	—	8	—	ns
	Turn-on time	t_{on}		—	16	—	
	Fall time	t_f		—	19	—	
	Turn-off time	t_{off}		—	53	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≈ 16 V, V_{GS} = 5 V, I_D = 9.1 A	—	22	—	nC
Gate-source charge 1		Q_{gs1}		—	4	—	
Gate-drain (“Miller”) charge		Q_{gd}		—	7	—	

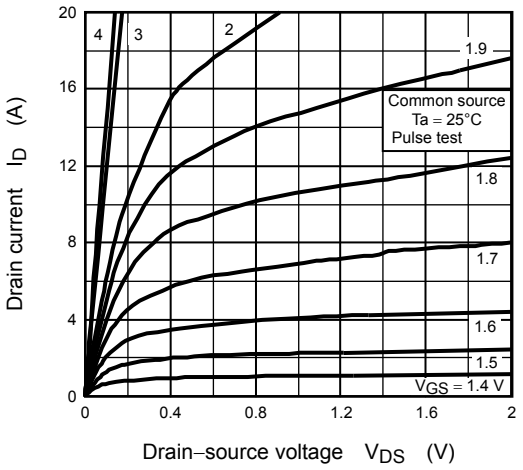
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	36.4	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 9.1 A, V_{GS} = 0 V	—	—	−1.2	V

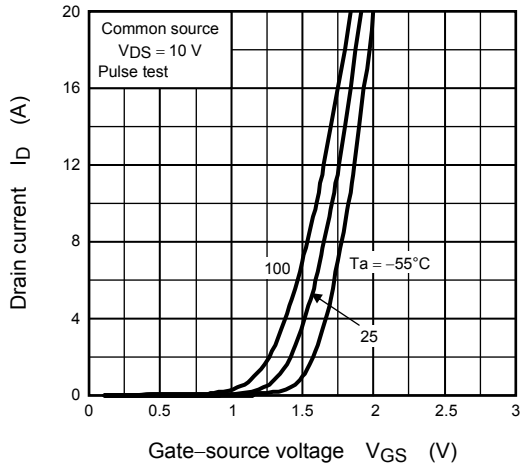
$I_D - V_{DS}$



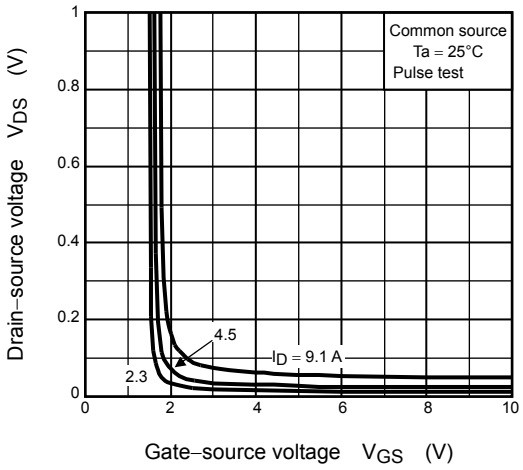
$I_D - V_{DS}$



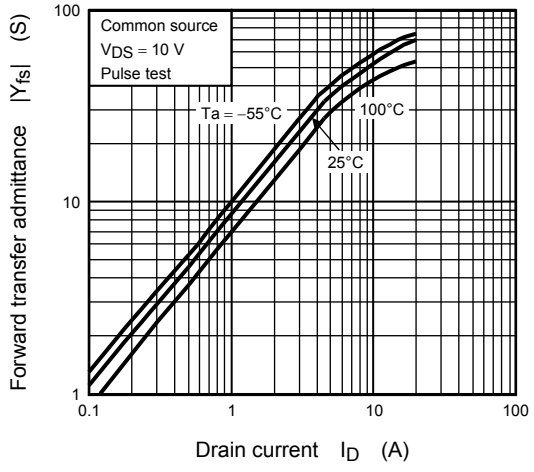
$I_D - V_{GS}$



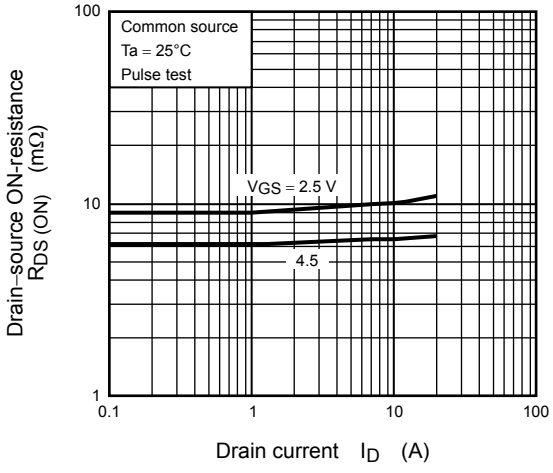
$V_{DS} - V_{GS}$



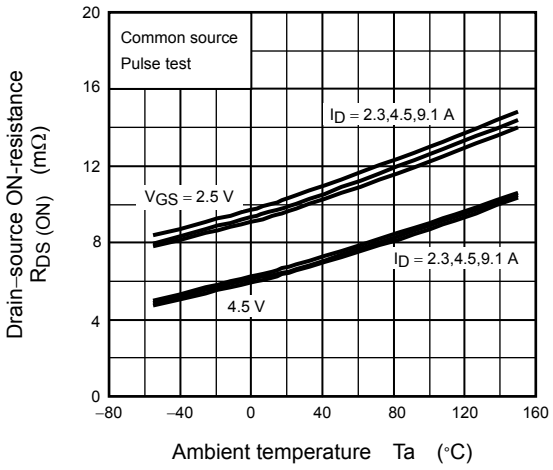
$|Y_{fs}| - I_D$



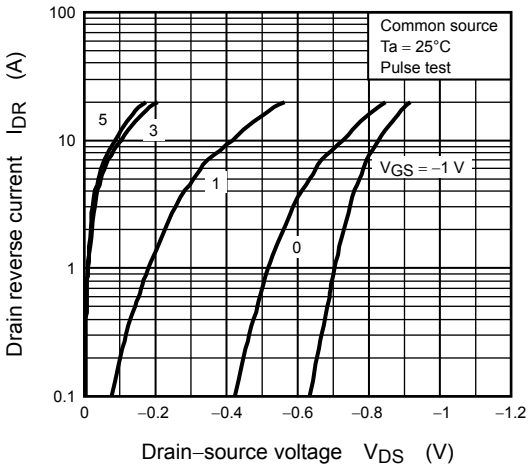
$R_{DS\ (ON)} - I_D$



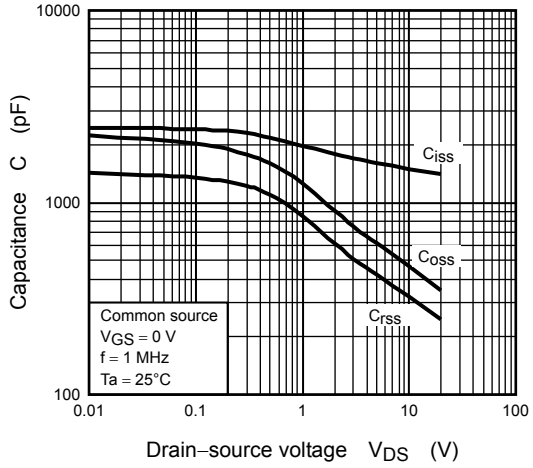
$R_{DS\ (ON)}$ – Ta



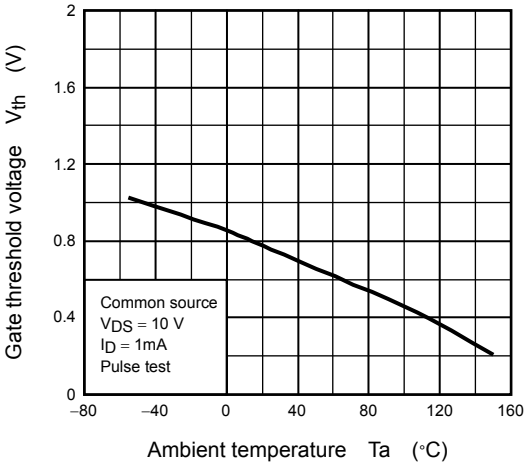
I_{DR} – V_{DS}



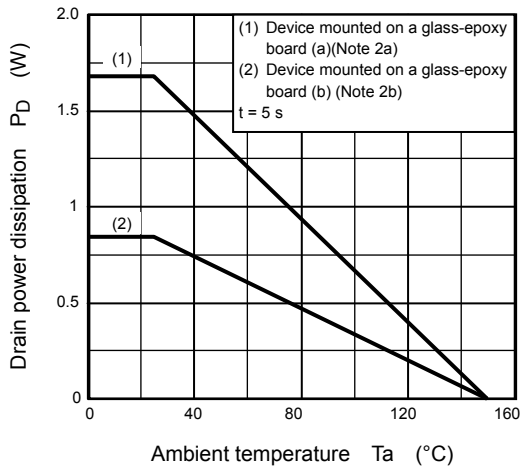
C – V_{DS}



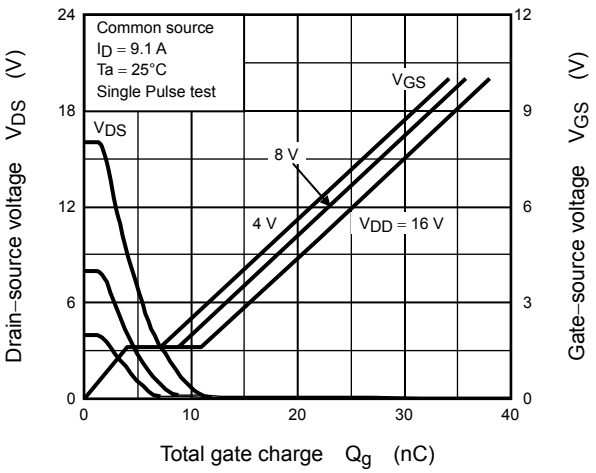
V_{th} – Ta

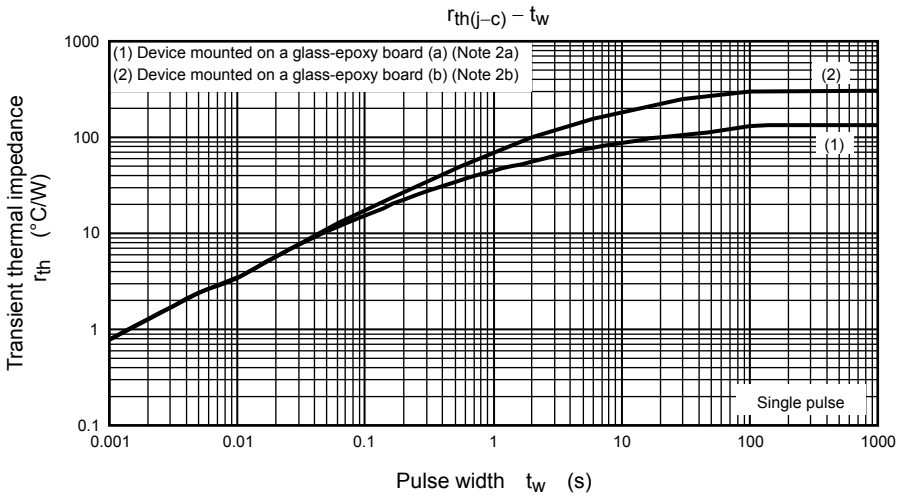


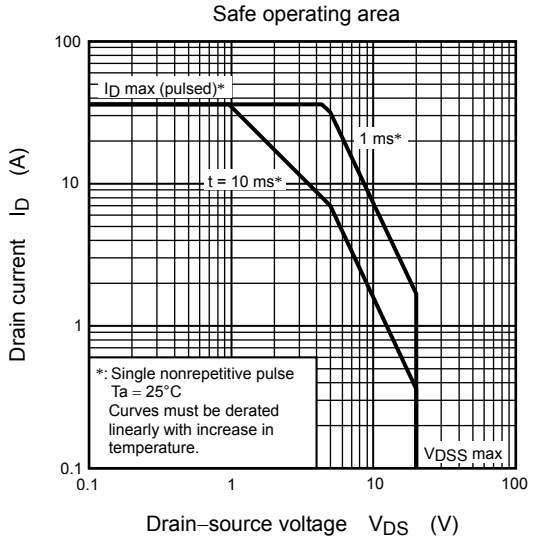
P_D – Ta



Dynamic input/output characteristics




$r_{th(j-c)} - t_w$
(1) Device mounted on a glass-epoxy board (a) (Note 2a)
(2) Device mounted on a glass-epoxy board (b) (Note 2b)
(2)
(1)
Single pulse
Transient thermal impedance r_{th} (°C/W)
1000
100
10
1
0.1
0.001
0.01
0.1
1
10
100
1000
Pulse width t_w (s)


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

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