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

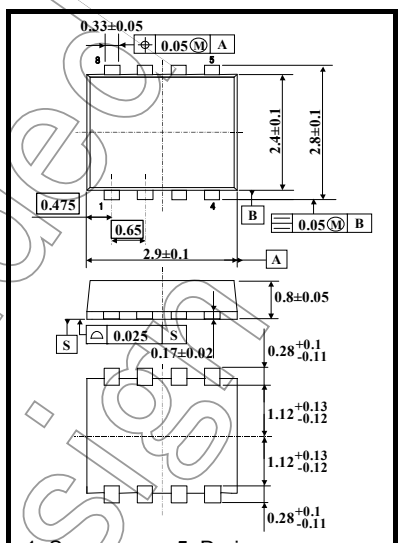
TPCP8101

Notebook PC Applications

Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON-resistance: $R_{DS\ (ON)}$ = 24 mΩ (typ.)
  (V_{GS} = –4.5 V)
- High forward transfer admittance: $|Y_{fs}|$ = 14 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)

Unit: mm



1. Source	5. Drain
2. Source	6. Drain
3. Source	7. Drain
4. Gate	8. Drain

JEDEC	—
JEITA	—
TOSHIBA	2-3V1K

Weight: 0.017 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

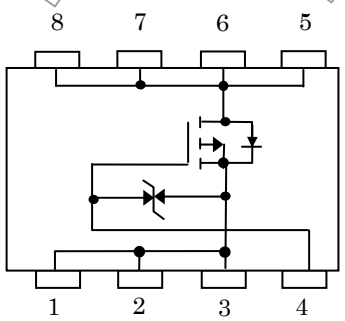
Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	-20	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	-20	V
Gate-source voltage		V_{GSS}	± 8	V
Drain current	DC (Note 1)	I_D	-5.6	A
	Pulse (Note 1)	I_{DP}	-22.4	
Drain power dissipation	(t = 5 s) (Note 2a)	P_D	1.68	W
Drain power dissipation	(t = 5 s) (Note 2b)	P_D	0.84	W
Single-pulse avalanche energy (Note 3)		E_{AS}	20.3	mJ
Avalanche current		I_{AR}	-5.6	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.

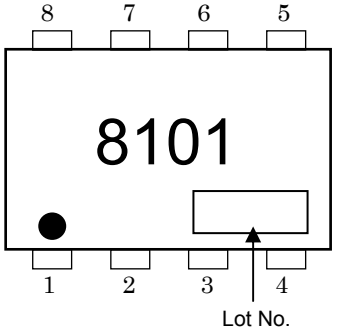
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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

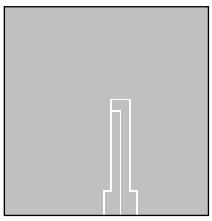


Thermal Characteristics

Characteristics	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

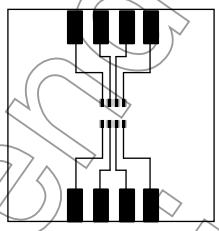
Note 1: Ensure that the channel temperature does not exceed 150°C during use of the device.

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)

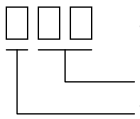
(b)

Note 3: V_{DD} = -16 V, T_{ch} = 25°C (initial), L = 0.5 mH, R_G = 25 Ω, I_{AR} = -5.6 A

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

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

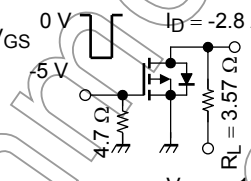
* Weekly code (three digits):



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 calendar year)

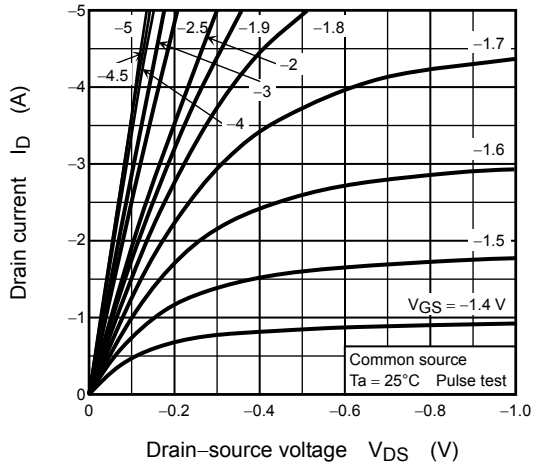
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±8 V, V_{DS} = 0 V	—	—	±10	μA
Drain cutoff 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} = 8 V	-12	—	—	
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} = -1.8 V, I_D = -1.4 A	—	67	90	mΩ
			V_{GS} = -2.5 V, I_D = -2.8 A	—	36	41	
			V_{GS} = -4.5 V, I_D = -2.8 A	—	24	30	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = -10 V, I_D = -2.8 A	7	14	—	S
Input capacitance		C_{iss}	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz	—	1550	—	pF
Reverse transfer capacitance		C_{rss}		—	215	—	
Output capacitance		C_{oss}		—	265	—	
Switching time	Rise time	t_r		—	7	—	ns
	Turn-on time	t_{on}		—	13	—	
	Fall time	t_f		—	21	—	
	Turn-off time	t_{off}		—	68	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≈ -16 V, V_{GS} = -5 V, I_D = -5.6 A	—	19	—	nC
Gate-source charge		Q_{gs}		—	14	—	
Gate-drain (“Miller”) charge		Q_{gd}		—	5	—	

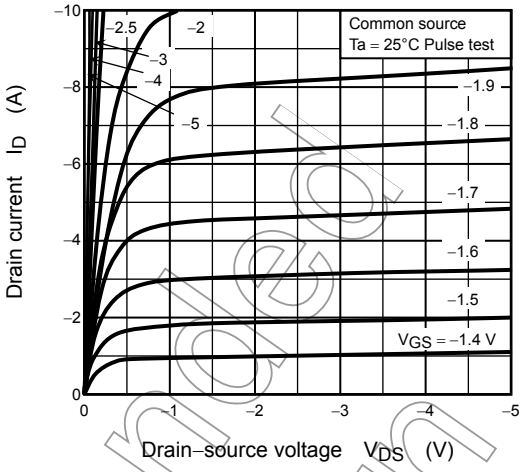
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	-22.4	A
Forward voltage (diode)		V_{DSF}	I_{DR} = -5.6A, V_{GS} = 0 V	—	—	1.2	V

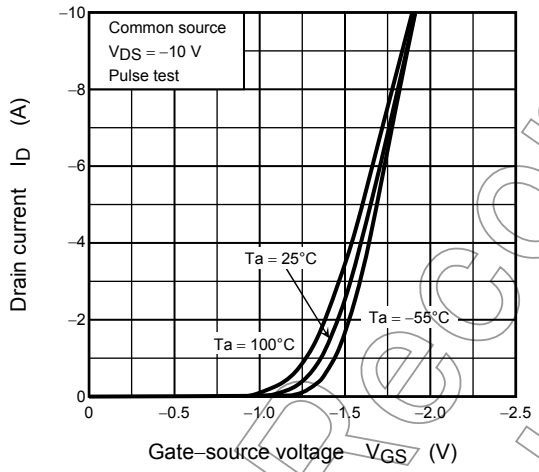
$I_D - V_{DS}$



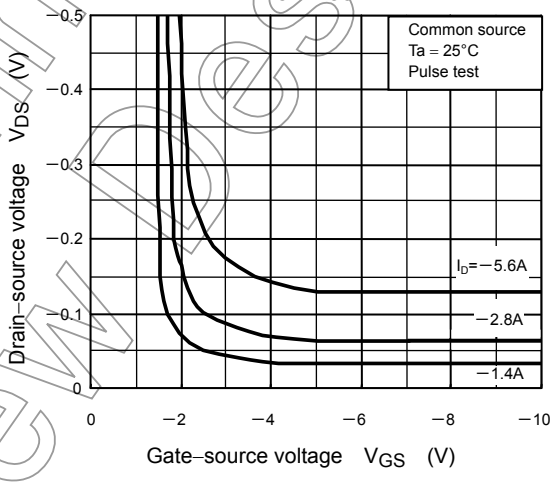
$I_D - V_{DS}$



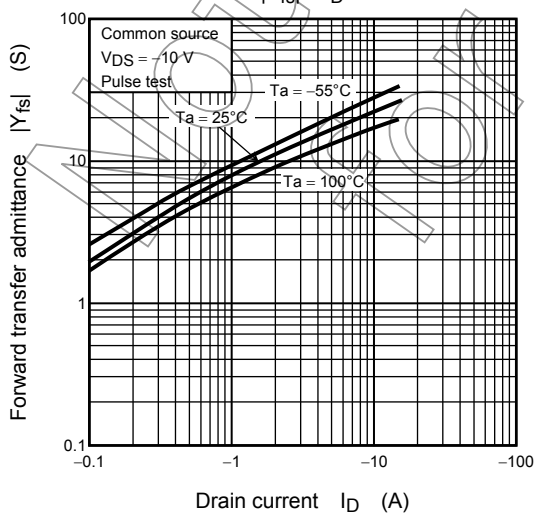
$I_D - V_{GS}$



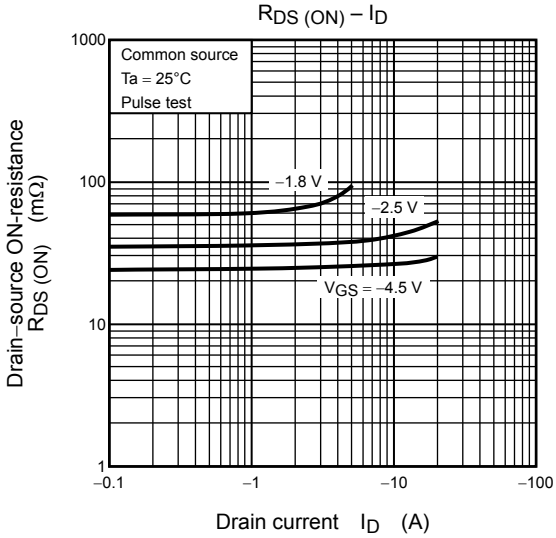
$V_{DS} - V_{GS}$



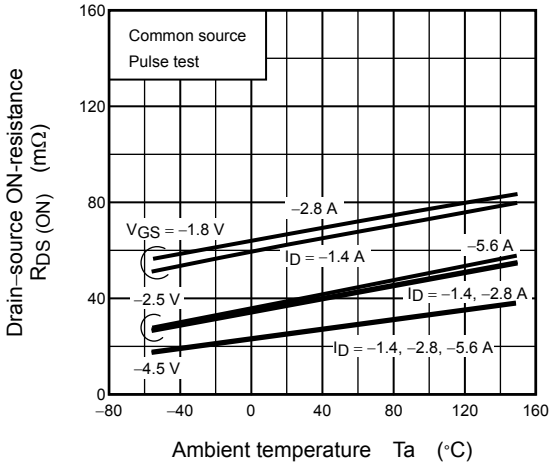
$|Y_{fs}| - I_D$



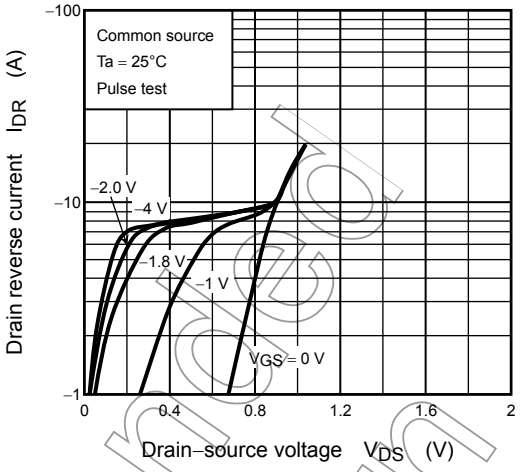
$R_{DS\ (ON)} - I_D$



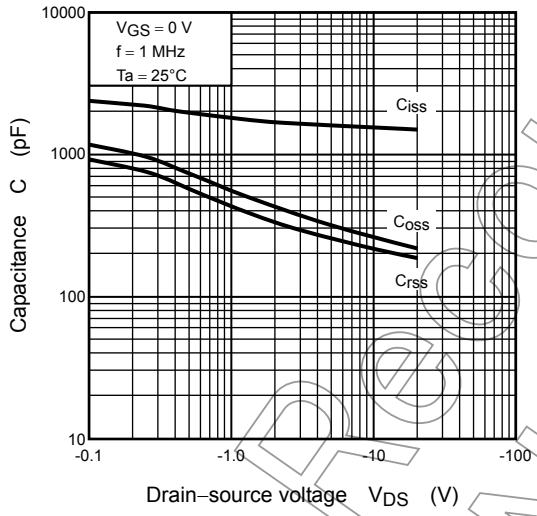
$R_{DS\ (ON)}$ – Ta



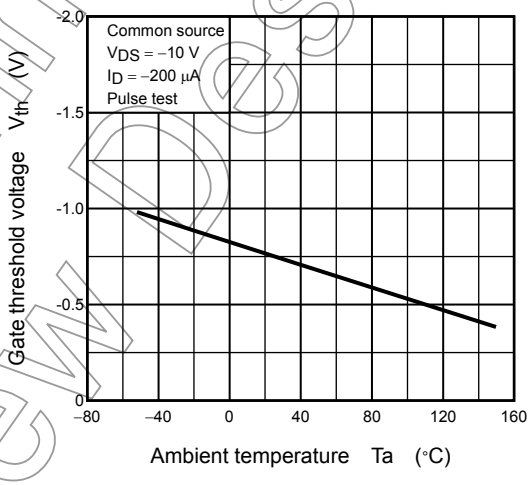
I_{DR} – V_{DS}



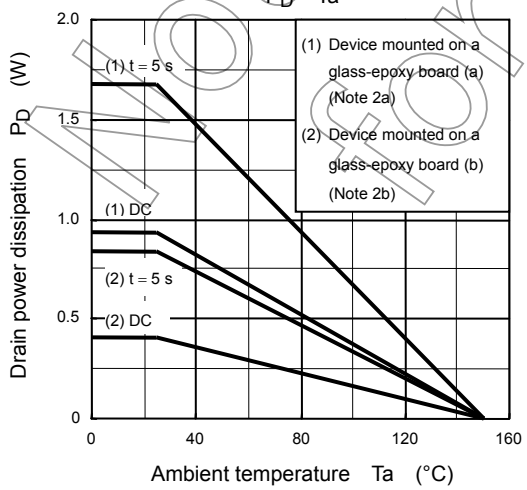
C – V_{DS}



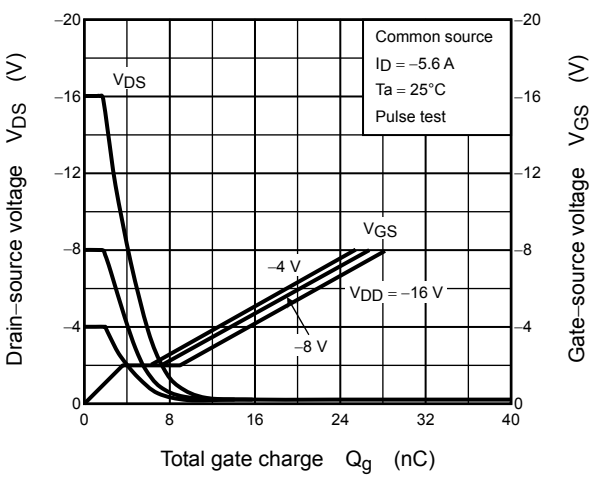
V_{th} – Ta



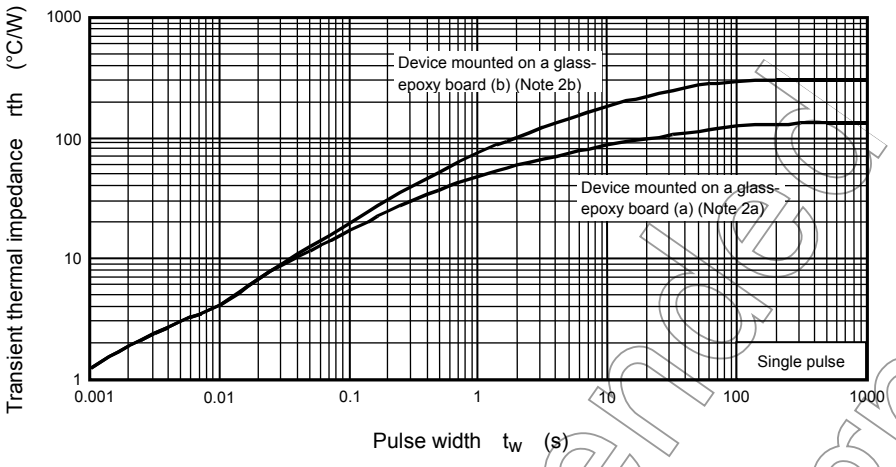
P_D – Ta



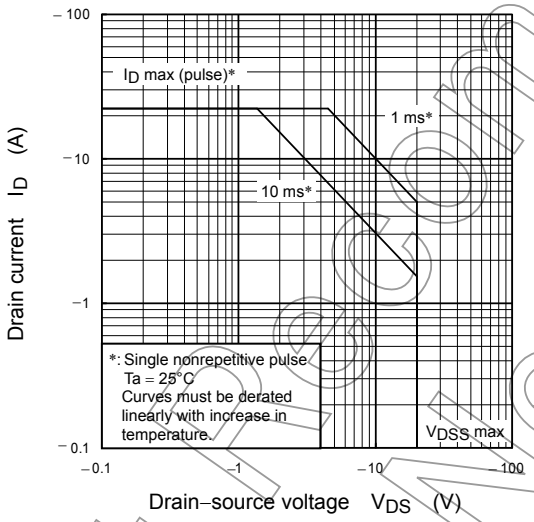
Dynamic input/output characteristics



r_{th} - t_w



Safe operating area



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