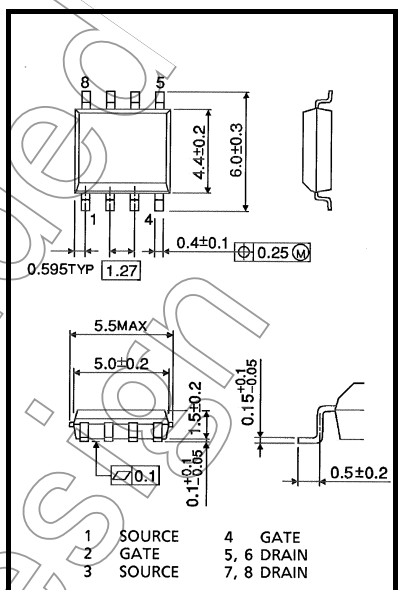
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (L^2−π−MOSVI)

TPC8301

Lithium Ion Battery Applications
Portable Equipment Applications
Notebook PC Applications

- Small footprint due to small and thin package
- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 95 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 4 S (typ.)
- Low leakage current : I_{DSS} = −10 μA (max) (V_{DS} = −30 V)
- Enhancement mode : V_{th} = −0.8~ −2.0 V (V_{DS} = −10 V, I_D = −1 mA)

Unit: mm



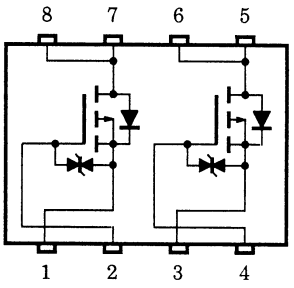
JEDEC	—
JEITA	—
TOSHIBA	2-6J1E

Weight: 0.080 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain−source voltage		V_{DSS}	−30	V
Drain−gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−30	V
Gate−source voltage		V_{GSS}	±20	V
Drain current	D C (Note 1)	I_D	−3.5	A
	Pulse (Note 1)	I_{DP}	−14	
Drain power dissipation (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	$P_{D\ (1)}$	1.5	W
	Single-devece value at dual operation (Note 3b)	$P_{D\ (2)}$	1.0	
Drain power dissipation (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	$P_{D\ (1)}$	0.75	W
	Single-devece value at dual operation (Note 3b)	$P_{D\ (2)}$	0.45	
Single pulse avalanche energy (Note 4)		E_{AS}	16	mJ
Avalanche current		I_{AR}	−3.5	A
Repetitive avalanche energy (Note 2a, Note 3b, Note 5)		E_{AR}	0.10	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

Circuit Configuration



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

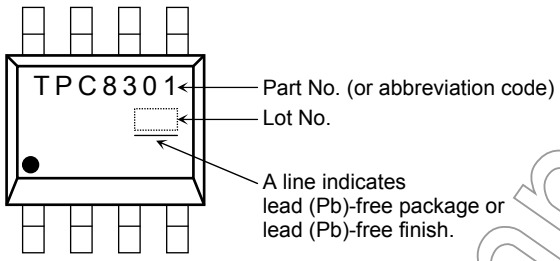
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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

Thermal Characteristics

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	83.3	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	125	
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	167	
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	278	

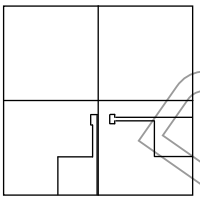
Marking



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

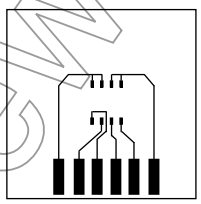
Note 2:

a) Device mounted on a glass-epoxy board (a)



(a)

b) Device mounted on a glass-epoxy board (b)



(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.)

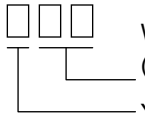
b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.)

Note 4: V_{DD} = −24 V, T_{ch} = 25°C (Initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = −3.5 A

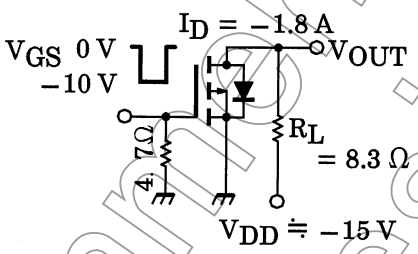
Note 5: Repetitive rating: pulse width limited by maximum channel temperature

Note 6: • on lower left of the marking indicates Pin 1.

※ Weekly code: (Three digits)



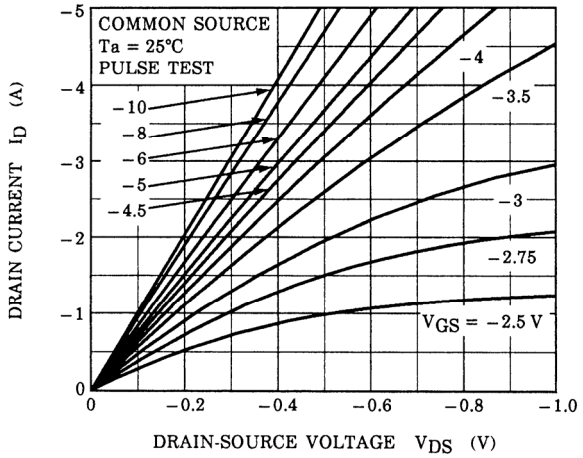
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut−OFF current		I_{DSS}	V_{DS} = −30 V, V_{GS} = 0 V	—	—	−10	μA
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = −10 mA, V_{GS} = 0 V	−30	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = −10 V, I_D = −1 mA	−0.8	—	−2.0	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = −4 V, I_D = −1.8 A	—	155	190	mΩ
		$R_{DS\ (ON)}$	V_{GS} = −10 V, I_D = −1.8 A	—	95	120	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −1.8 A	2	4	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	540	—	pF
Reverse transfer capacitance		C_{rss}		—	80	—	
Output capacitance		C_{oss}		—	290	—	
Switching time	Rise time	t_r		—	11	—	ns
	Turn−ON time	t_{on}		—	17	—	
	Fall time	t_f		—	11	—	
	Turn−OFF time	t_{off}		—	70	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ −24 V, V_{GS} = −10 V, I_D = −3.5 A	—	18	—	nC
Gate−source charge		Q_{gs}		—	13	—	
Gate−drain (“miller”) charge		Q_{gd}		—	5	—	

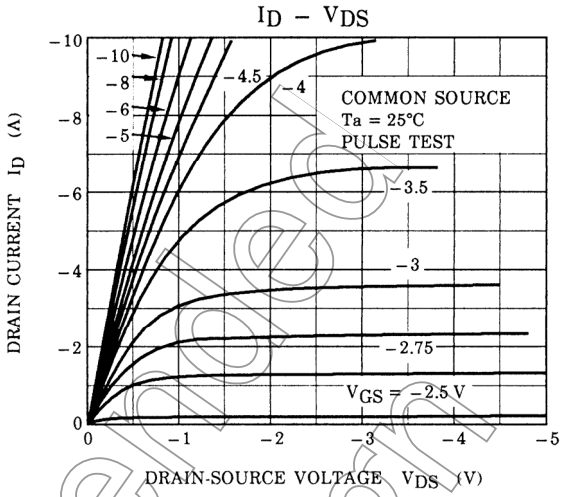
Source−Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	−14	A
Forward voltage (diode)		V_{DSF}	I_{DR} = −3.5 A, V_{GS} = 0 V	—	—	1.2	V

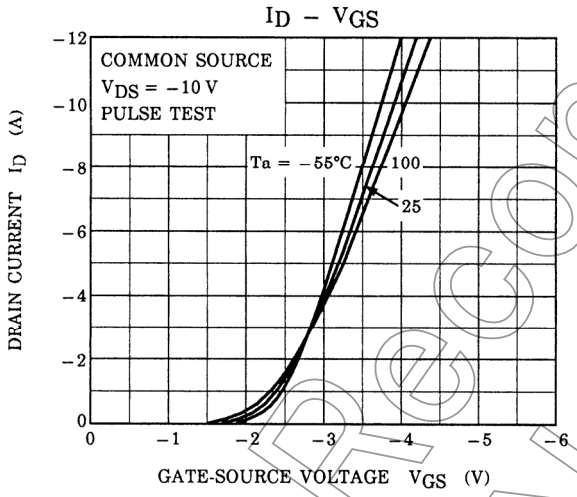
$I_D - V_{DS}$



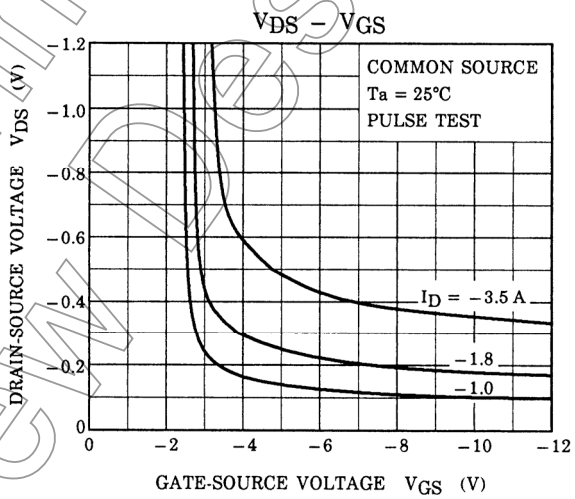
$I_D - V_{DS}$



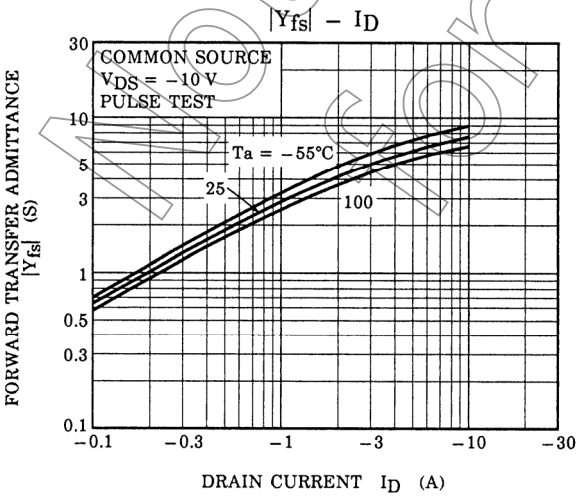
$I_D - V_{GS}$



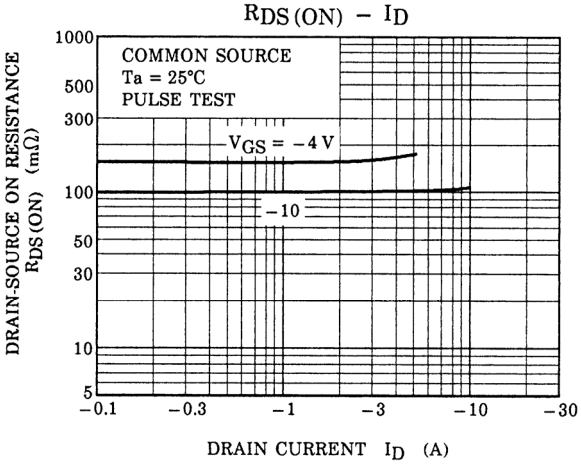
$V_{DS} - V_{GS}$



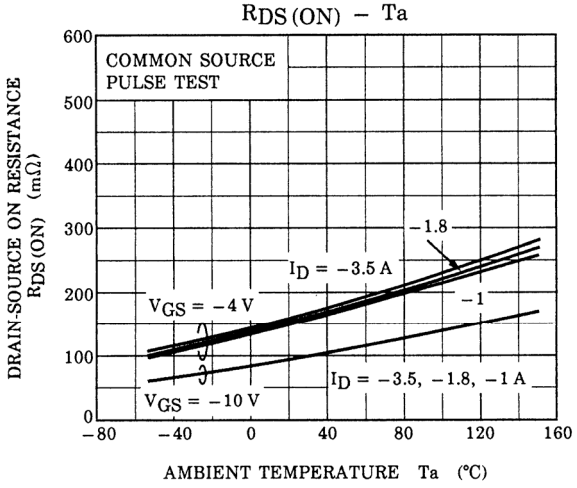
$|Y_{fs}| - I_D$



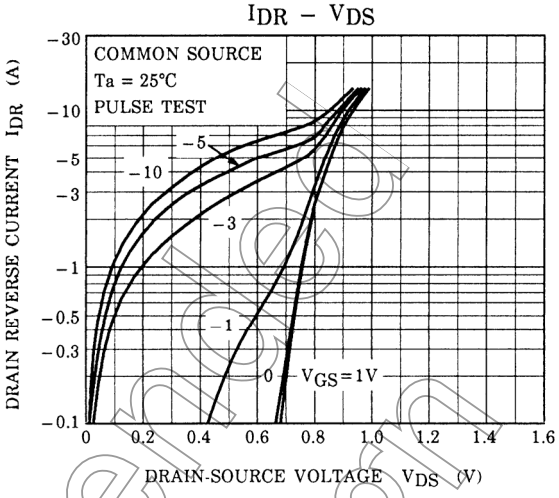
$R_{DS\,(ON)} - I_D$



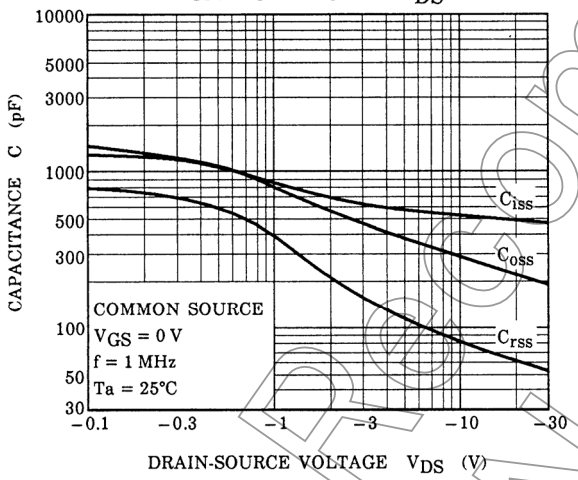
$R_{DS\,(ON)}$ – Ta



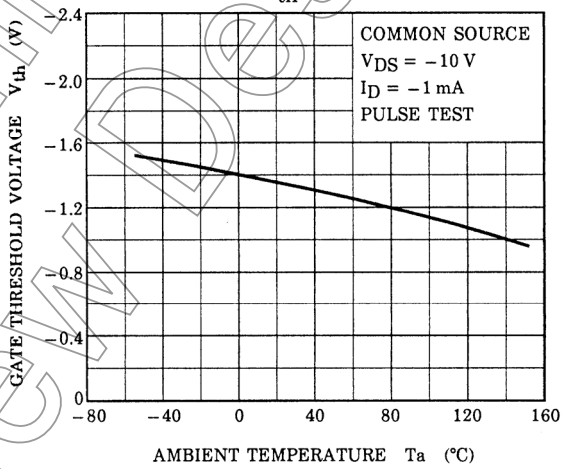
I_{DR} – V_{DS}



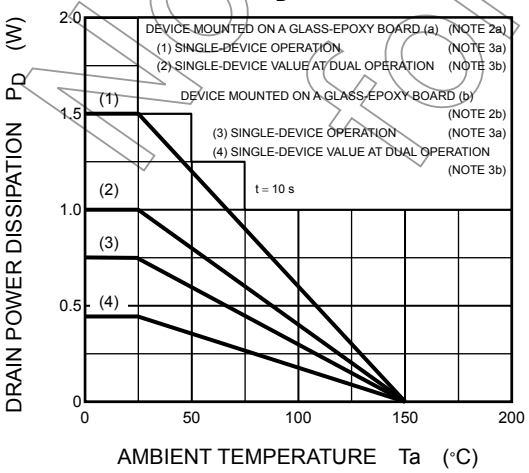
CAPACITANCE – V_{DS}



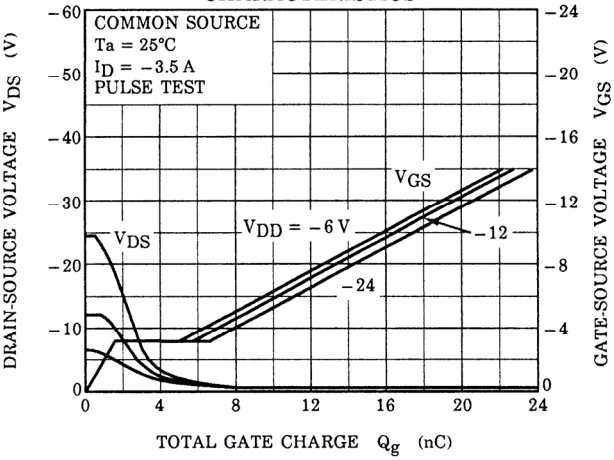
V_{th} – Ta



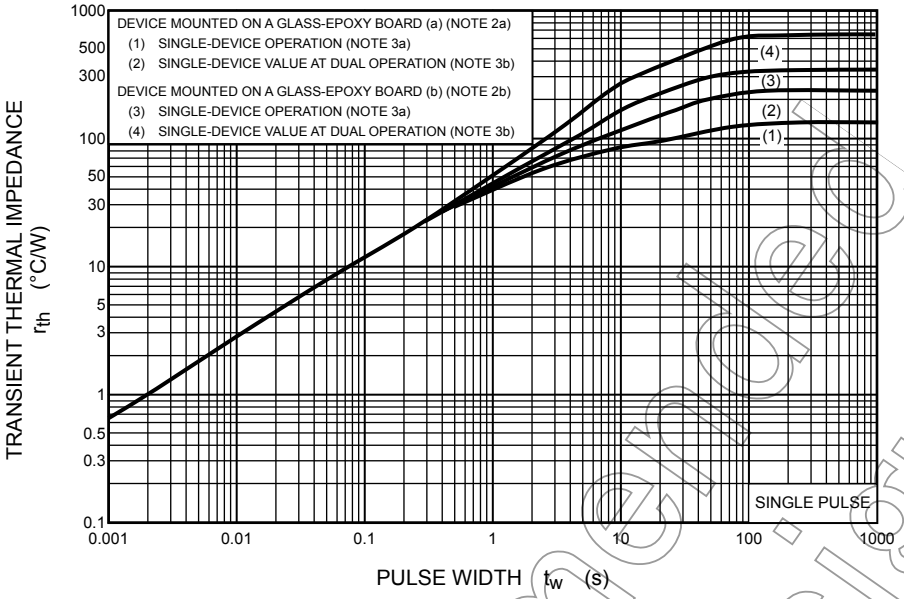
P_D – Ta



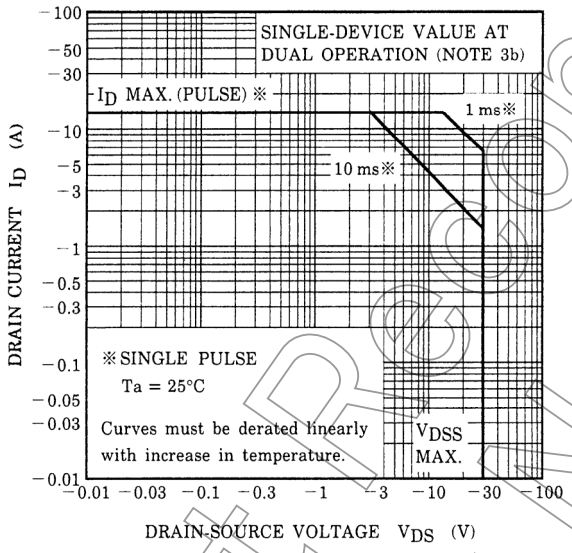
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



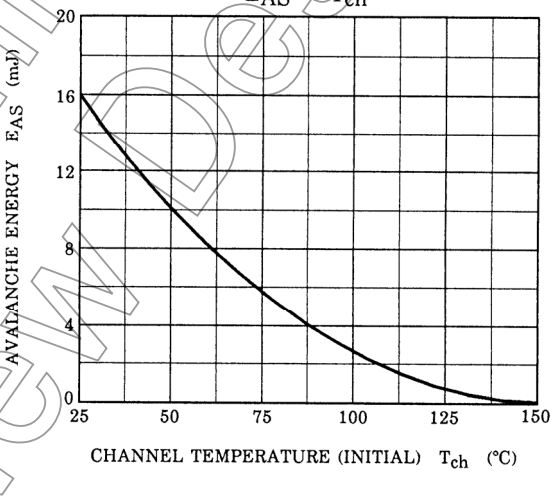
$r_{th} - t_w$

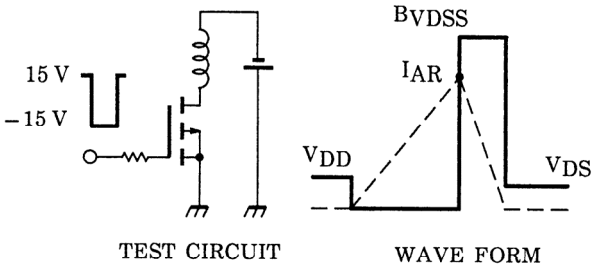


SAFE OPERATING AREA



$E_{AS} - T_{ch}$





T_{ch} = 25°C (Initial)
Peak I_{AR} = −3.5 A, R_G = 25 Ω
V_{DD} = −24 V, L = 1.48 mH

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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20070701-EN GENERAL

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