

# TPCP8301

Lithium Ion Battery Applications  
Notebook PC Applications  
Portable Equipment Applications

- Lead (Pb)-free
- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 25 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 14 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -20 \text{ V}$ )
- Enhancement model:  $V_{th} = -0.5 \text{ to } -1.2 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -200 \text{ }\mu\text{A}$ )

### Absolute Maximum Ratings (Ta = 25°C)

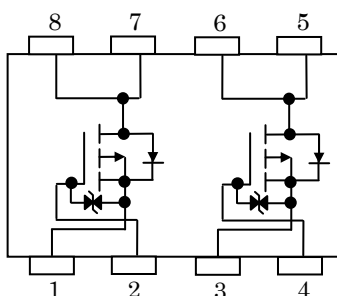
Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	−20	V
Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )		$V_{DGR}$	−20	V
Gate-source voltage		$V_{GSS}$	±12	V
Drain current	DC (Note 1)	$I_D$	−5	A
	Pulse (Note 1)	$I_{DP}$	−20	
Drain power dissipation ( $t = 5\text{ s}$ ) (Note 2a)	Single-device operation (Note 3a)	$P_D$ (1)	1.48	W
	Single-device value at dual operation (Note 3b)	$P_D$ (2)	1.23	
Drain power dissipation ( $t = 5\text{ s}$ ) (Note 2b)	Single-device operation (Note 3a)	$P_D$ (1)	0.58	
	Single-device value at dual operation (Note 3b)	$P_D$ (2)	0.36	
Single-pulse avalanche energy (Note 4)		$E_{AS}$	6.5	mJ
Avalanche current		$I_{AR}$	−5	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		$E_{AR}$	0.12	mJ
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	−55 to 150	°C

Note: For Notes 1 to 6, see the next page.

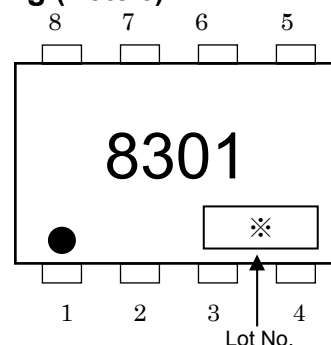
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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

### Circuit Configuration



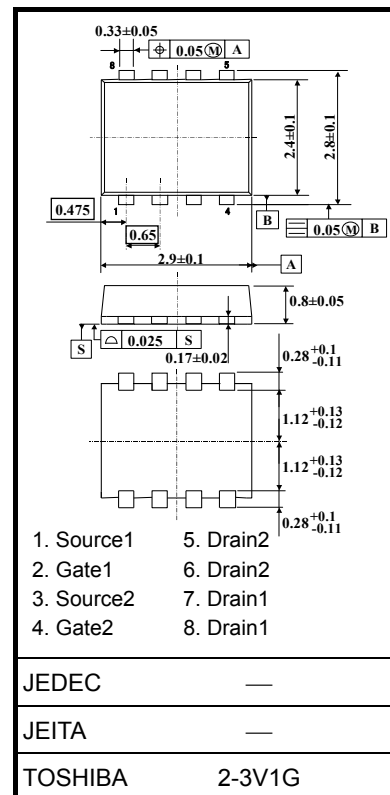
### Marking (Note 6)



Lot No.

Unit: mm

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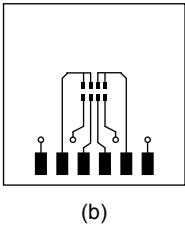
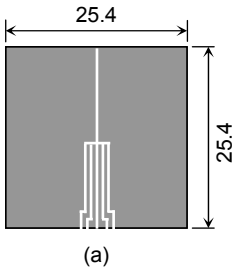


Thermal Characteristics

Characteristic		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)	84.5	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	101.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	R <sub>th</sub> (ch-a) (1)	215.5	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th</sub> (ch-a) (2)	347.2	

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)



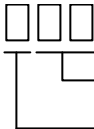
Note 3: a) The power dissipation and thermal resistance values shown are for a single device. (During single-device operation, power is applied to one device only.)  
b) The power dissipation and thermal resistance values shown are for a single device. (During dual operation, power is applied to both devices evenly.).

Note 4: V<sub>DD</sub> = -16 V, T<sub>ch</sub> = 25°C (initial), L = 0.2 mH, R<sub>G</sub> = 25 Ω, I<sub>AR</sub> = -5 A

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

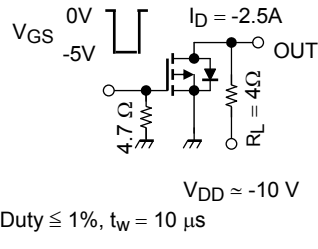
Note 6: ● on the lower left of the marking indicates Pin 1.

\* Weekly code (3 digits):



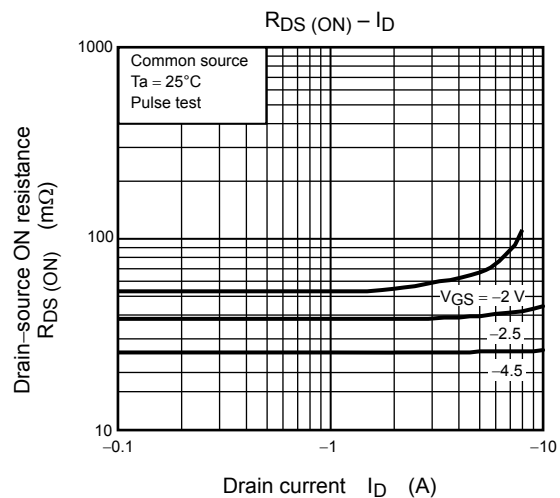
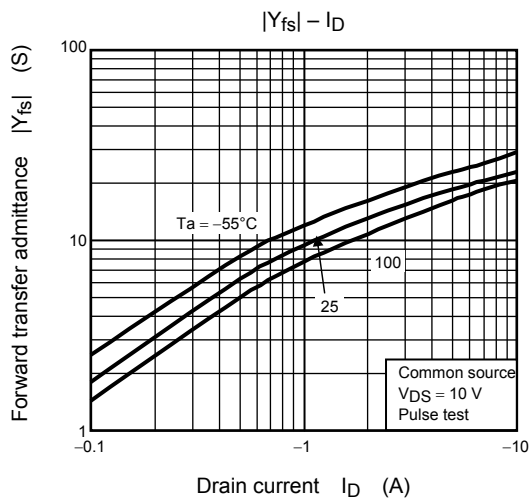
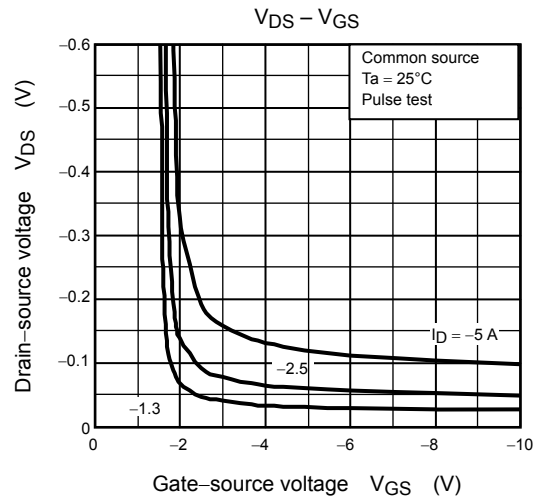
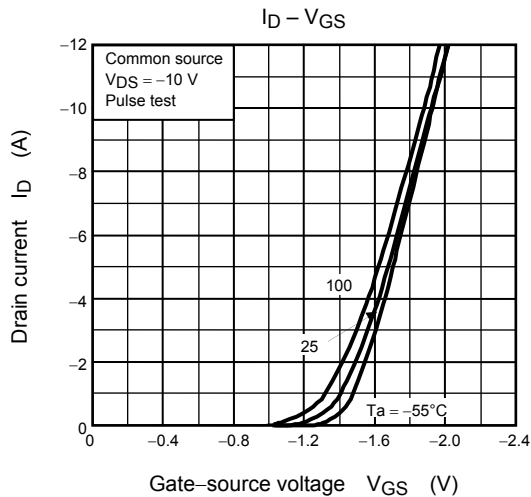
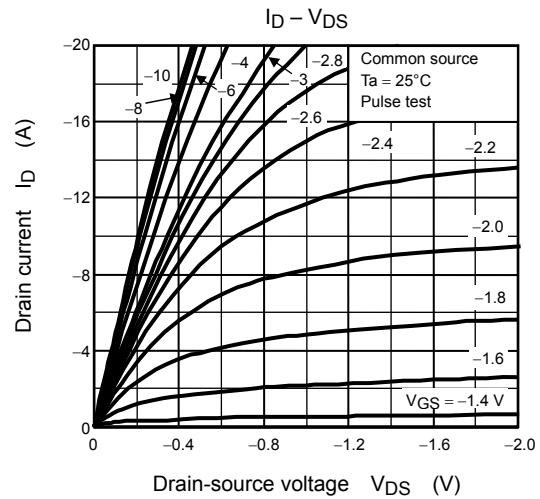
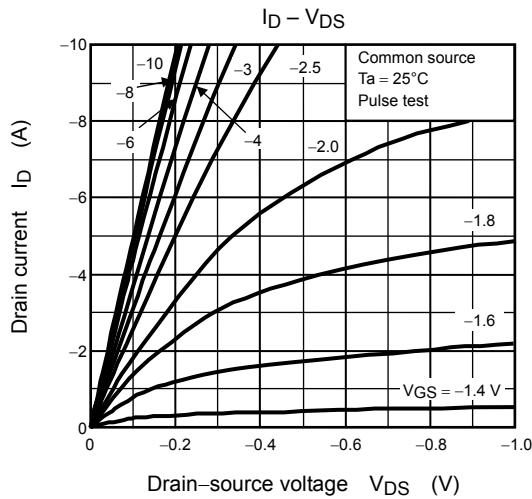
Week of manufacture  
(01 for the first week of the year, continuing up to 52 or 53)  
Year of manufacture  
(The last digit of the calendar year)

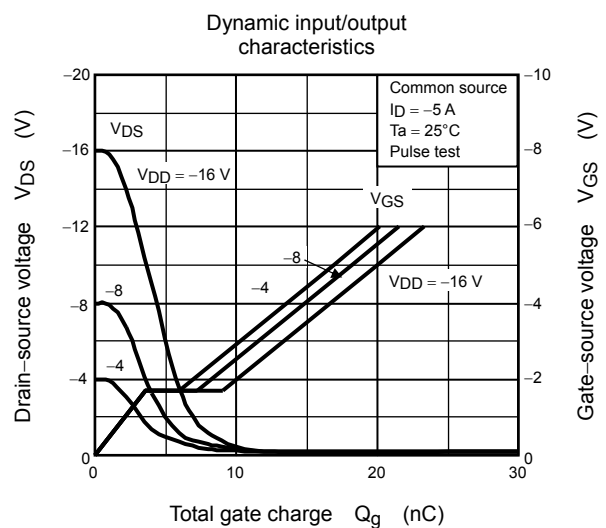
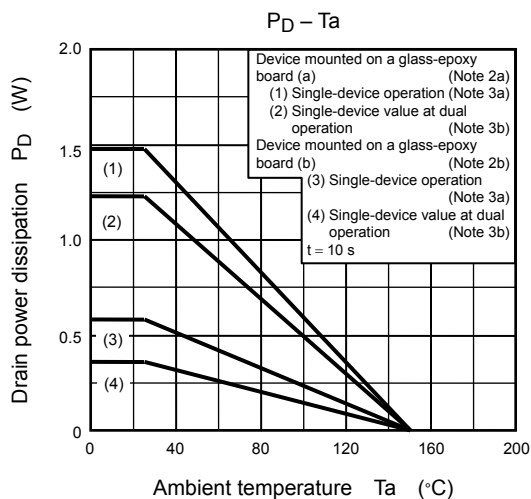
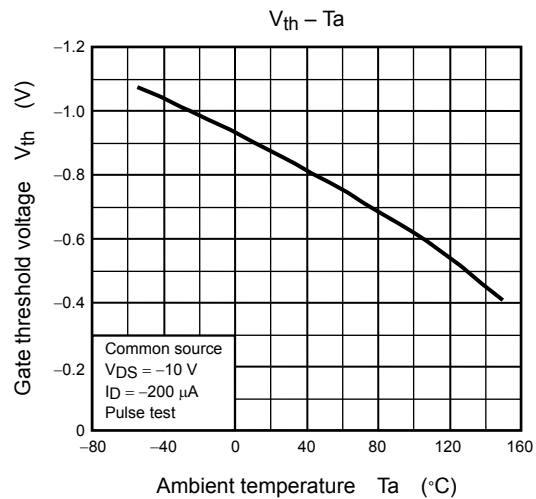
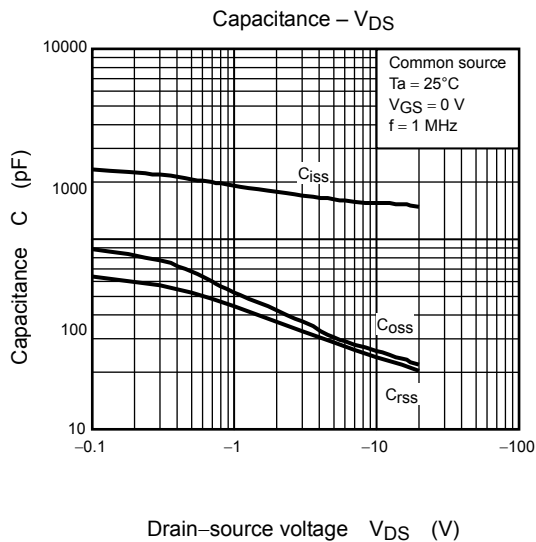
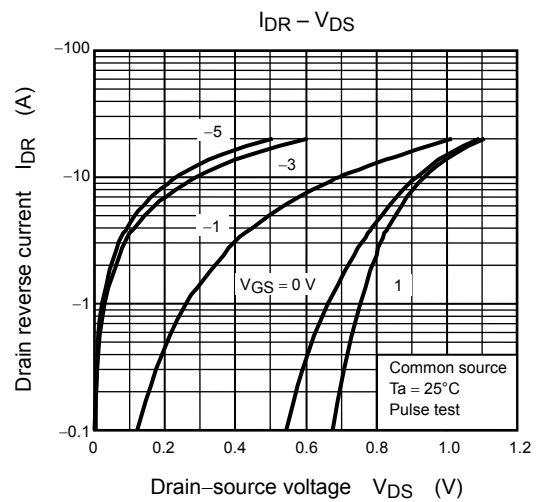
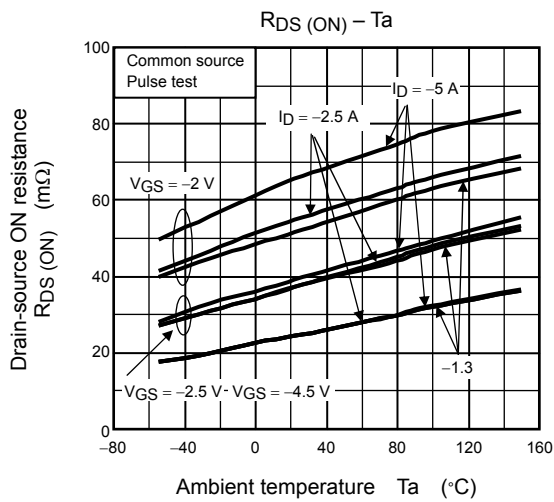
## Electrical Characteristics (Ta = 25°C)

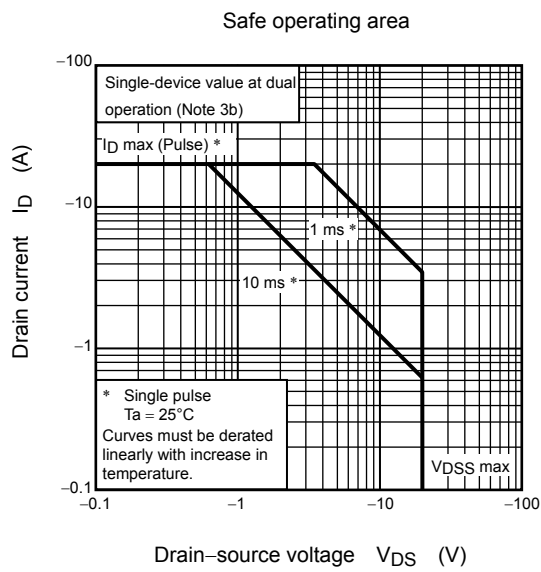
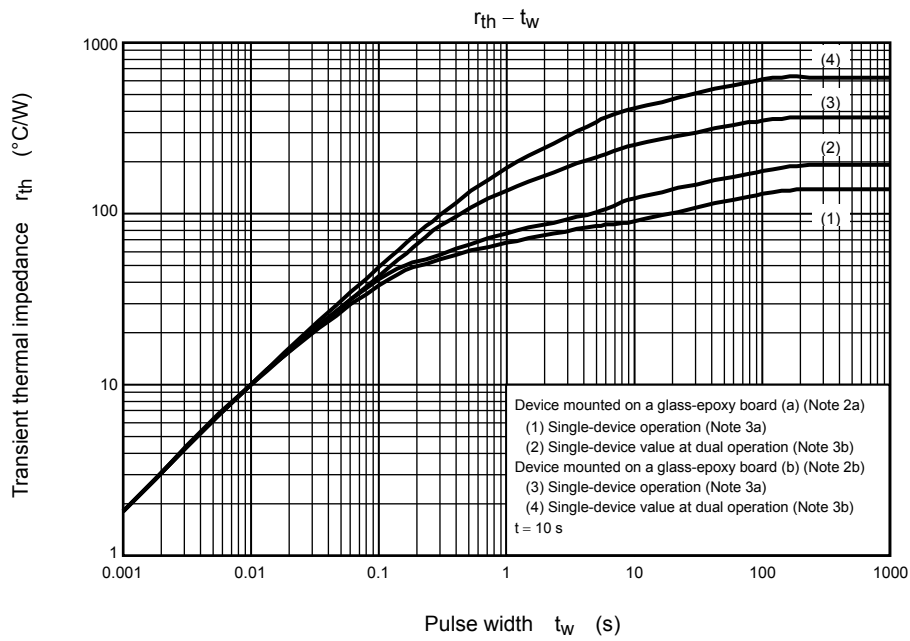
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±10 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain cutoff current		I <sub>DSS</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V <sub>(BR) DSS</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 0 V	-20	—	—	V
		V <sub>(BR) DSX</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = -12 V	-8	—	—	
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -200 μA	-0.5	—	-1.2	V
Drain-source ON-resistance		R <sub>DS (ON)</sub>	V <sub>GS</sub> = -2.0 V, I <sub>D</sub> = -1.3 A	—	55	130	mΩ
		R <sub>DS (ON)</sub>	V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -2.5 A	—	38	60	
		R <sub>DS (ON)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.5 A	—	25	31	
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = 2.5 A	7	14	—	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	1500	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	240	—	
Output capacitance		C <sub>oss</sub>		—	220	—	
Switching time	Rise time	t <sub>r</sub>		—	10	—	ns
	Turn-on time	t <sub>on</sub>		—	20	—	
	Fall time	t <sub>f</sub>		—	50	—	
	Turn-off time	t <sub>off</sub>		—	170	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ -16 V, V <sub>GS</sub> = -5 V, I <sub>D</sub> = -5 A	—	20	—	nC
Gate-source charge1		Q <sub>gs1</sub>		—	3.6	—	
Gate-drain ("Miller") charge		Q <sub>gd</sub>		—	5.5	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I <sub>DRP</sub>	—	—	—	-20	A
Forward voltage (diode)		V <sub>DSF</sub>	I <sub>DR</sub> = -5 A, V <sub>GS</sub> = 0 V	—	—	1.2	V







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