

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

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: $V_{th} = -0.5$ to -1.2 V ($V_{DS} = -10 \text{ V}$, $I_D = -200 \text{ }\mu\text{A}$)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

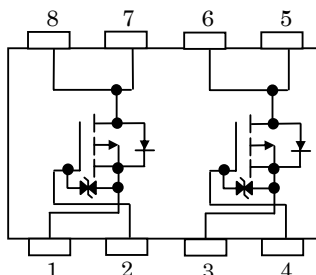
Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	-20	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	-20	V
Gate-source voltage		V_{GSS}	± 12	V
Drain current	DC (Note 1)	I_D	-5	A
	Pulse (Note 1)	I_{DP}	-20	
Drain power dissipation ($t = 5 \text{ s}$) (Note 2a)	Single-device 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	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

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

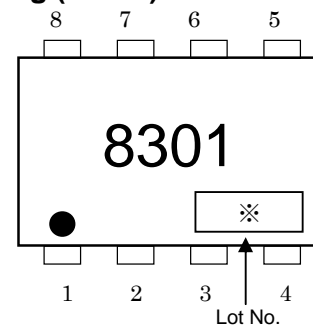
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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

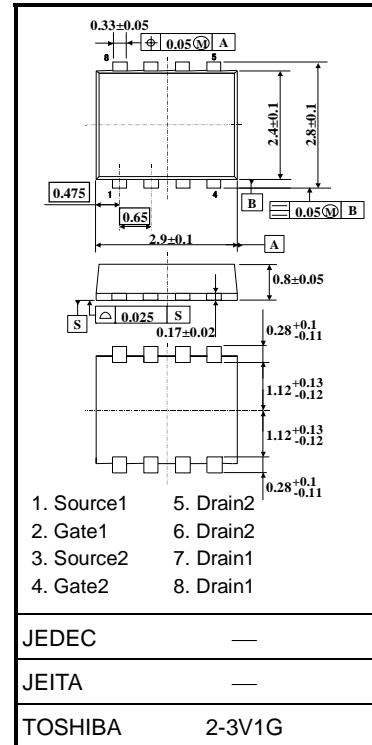
Circuit Configuration



Marking (Note 6)



Unit: mm



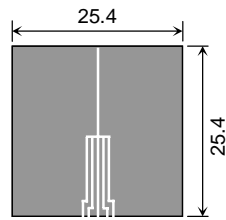
Weight: 0.017 g (typ.)

Thermal Characteristics

Characteristic		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th (ch-a) (1)}$	84.5	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th (ch-a) (2)}$	101.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	$R_{th (ch-a) (1)}$	215.5	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th (ch-a) (2)}$	347.2	

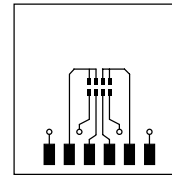
Note 1: Ensure that the channel temperature does not exceed 150°C.

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



(a)

FR-4
25.4 × 25.4 × 0.8
(Unit: mm)



(b)

FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

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: $V_{DD} = -16\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.2\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = -5\text{ A}$

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

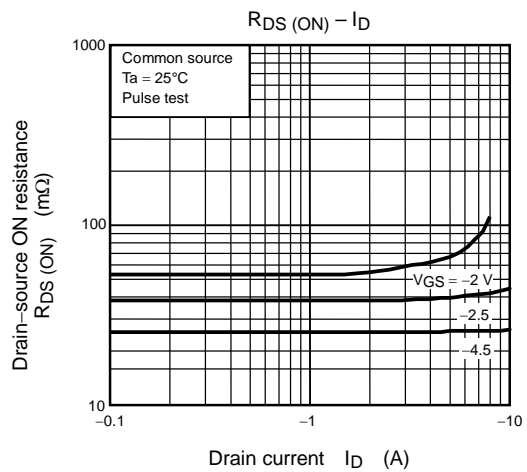
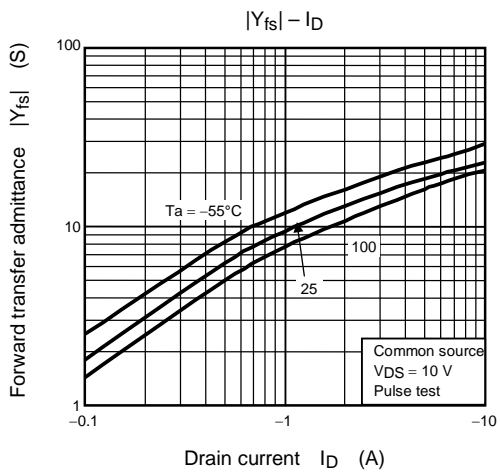
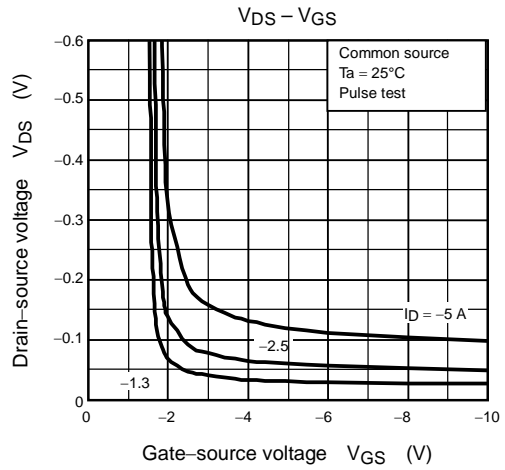
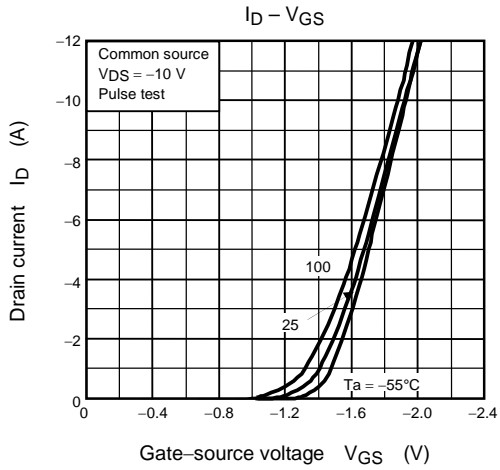
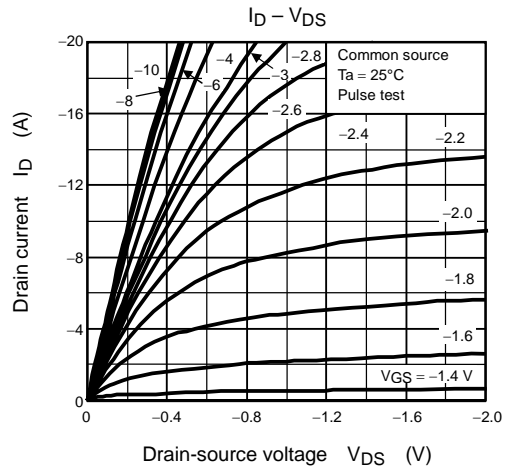
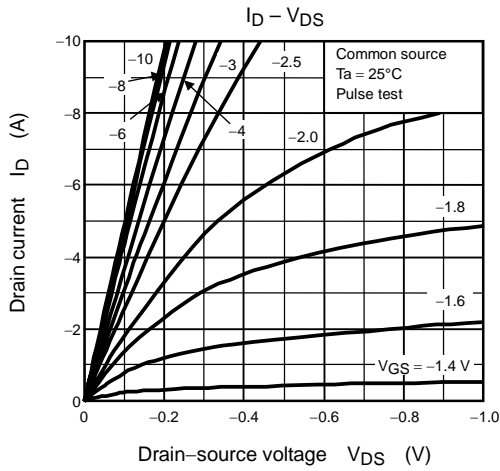
(The last digit of the calendar year)

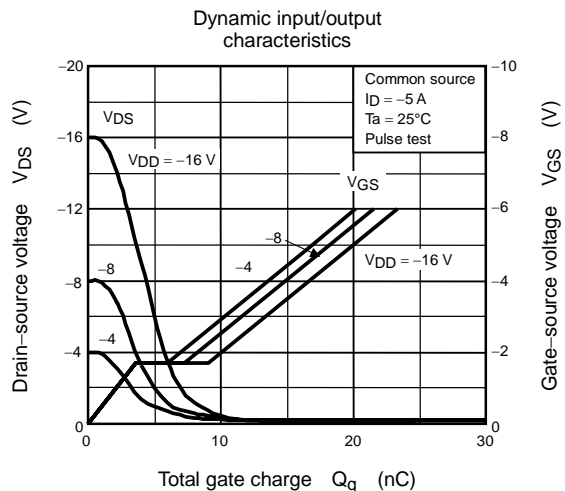
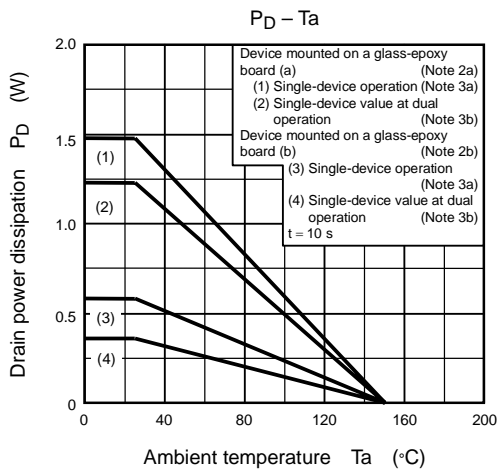
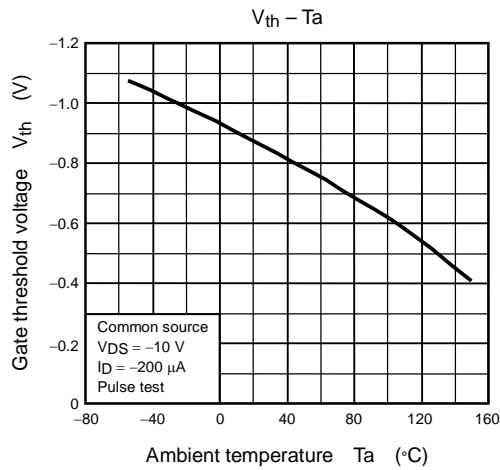
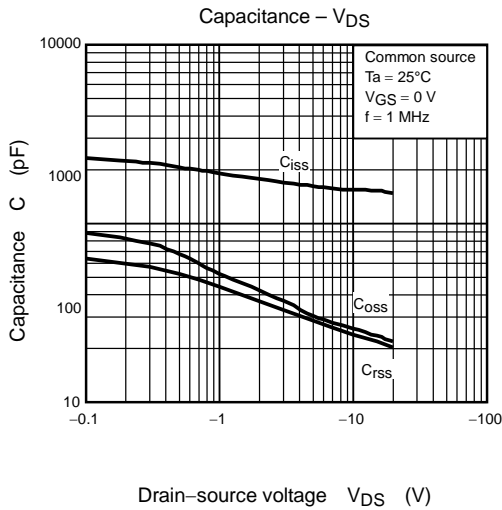
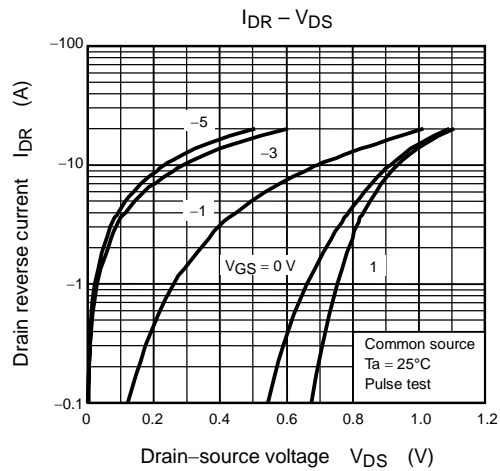
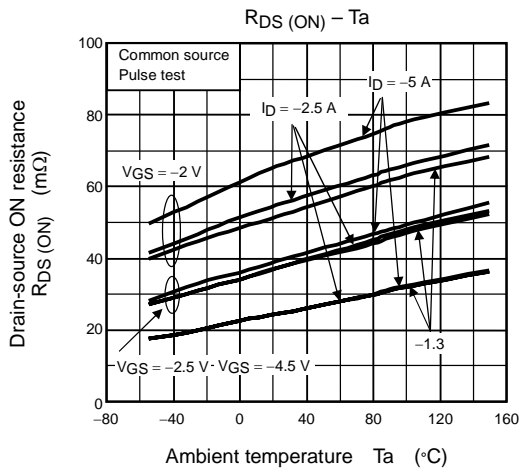
Electrical Characteristics (Ta = 25°C)

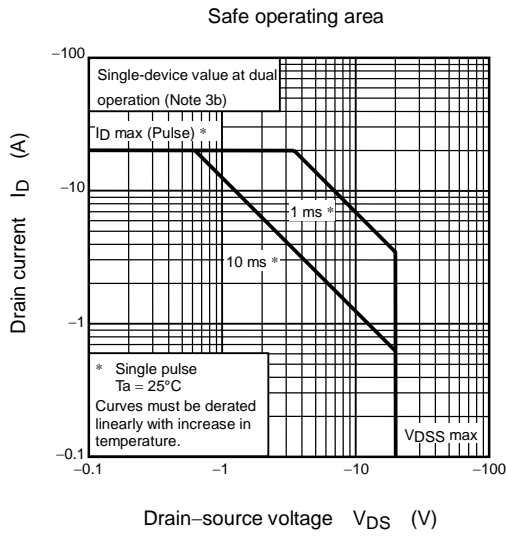
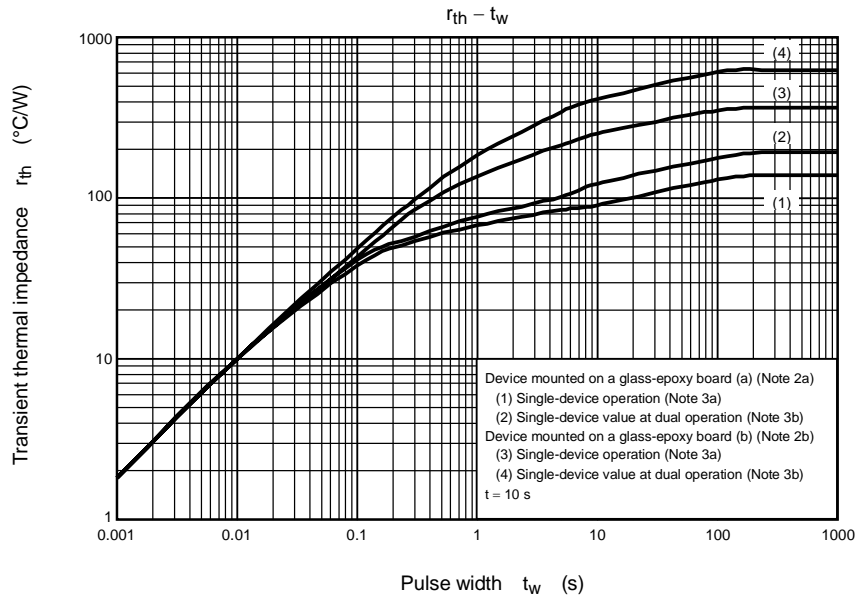
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cutoff current		I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-20	—	—	V
		$V_{(BR)DSX}$	$I_D = -10\text{ mA}, V_{GS} = -12\text{ V}$	-8	—	—	
Gate threshold voltage		V_{th}	$V_{DS} = -10\text{ V}, I_D = -200\text{ }\mu\text{A}$	-0.5	—	-1.2	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = -2.0\text{ V}, I_D = -1.3\text{ A}$	—	55	130	m Ω
		$R_{DS(ON)}$	$V_{GS} = -2.5\text{ V}, I_D = -2.5\text{ A}$	—	38	60	
		$R_{DS(ON)}$	$V_{GS} = -4.5\text{ V}, I_D = -2.5\text{ A}$	—	25	31	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = 2.5\text{ A}$	7	14	—	S
Input capacitance		C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1500	—	pF
Reverse transfer capacitance		C_{rss}		—	240	—	
Output capacitance		C_{oss}		—	220	—	
Switching time	Rise time	t_r		—	10	—	ns
	Turn-on time	t_{on}		—	20	—	
	Fall time	t_f		—	50	—	
	Turn-off time	t_{off}		Duty $\leq 1\%$, $t_w = 10\text{ }\mu\text{s}$	—	170	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx -16\text{ V}, V_{GS} = -5\text{ V}, I_D = -5\text{ A}$	—	20	—	nC
Gate-source charge ¹		Q_{gs1}		—	3.6	—	
Gate-drain ("Miller") charge		Q_{gd}		—	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_{DRP}	—	—	—	-20	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.2	V







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