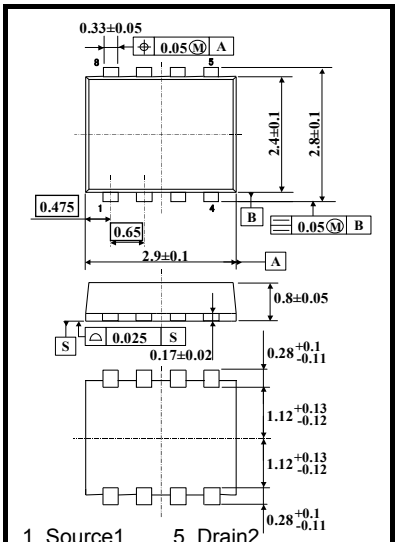
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOSV)

TPCP8303

Lithium Ion Battery Applications
Notebook PC Applications
Portable Equipment Applications

- Low drain-source ON-resistance: $R_{DS(ON)}$ = 41 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 12 S (typ.)
- Low leakage current: I_{DSS} = −10 μA (max) (V_{DS} = −20 V)
- Enhancement mode: V_{th} = −0.3 to −1.0 V (V_{DS} = −10 V, I_D = −1 mA)

Unit: mm



1. Source1 5. Drain2
2. Gate1 6. Drain2
3. Source2 7. Drain1
4. Gate2 8. Drain1

JEDEC	—
JEITA	—
TOSHIBA	2-3V1G

Weight: 0.017 g (typ.)

Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

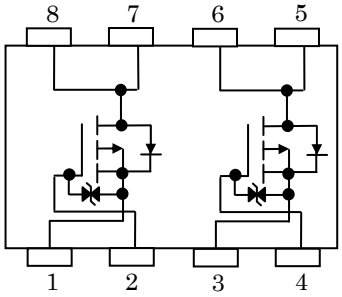
Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	−20	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−20	V
Gate-source voltage		V_{GSS}	±8	V
Drain current	DC (Note 1)	I_D	−3.8	A
	Pulse (Note 1)	I_{DP}	−15.2	
Drain power dissipation (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	$P_{D\ (1)}$	1.48	W
	Single-device value at dual operation (Note 3b)	$P_{D\ (2)}$	1.23	
Drain power dissipation (t = 5 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}	18.8	mJ
Avalanche current		I_{AR}	−3.8	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		E_{AR}	0.04	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.

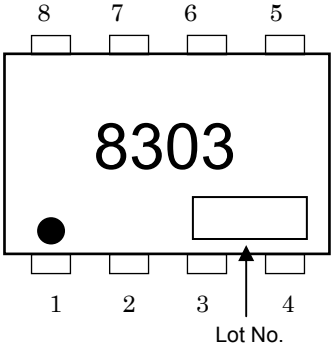
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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



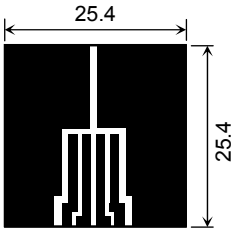
Start of commercial production
2009-05

Thermal Characteristics

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

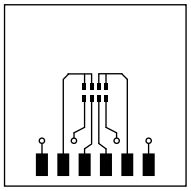
Note 1: Ensure that the channel temperature does not exceed 150°C.

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



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(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.)

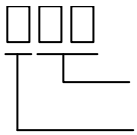
b) The power dissipation and thermal resistance values shown are for a single device. (During dual operation, power is applied to both devices evenly.).

Note 4: V_{DD} = −16 V, T_{ch} = 25°C (initial), L = 1 mH, R_G = 1 Ω, I_{AR} = −3.8 A

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

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

* Weekly code (three digits):



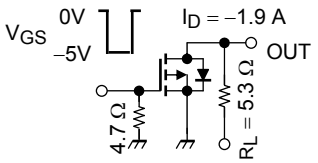
Week of manufacture

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

Year of manufacture

(The last digit of the year)

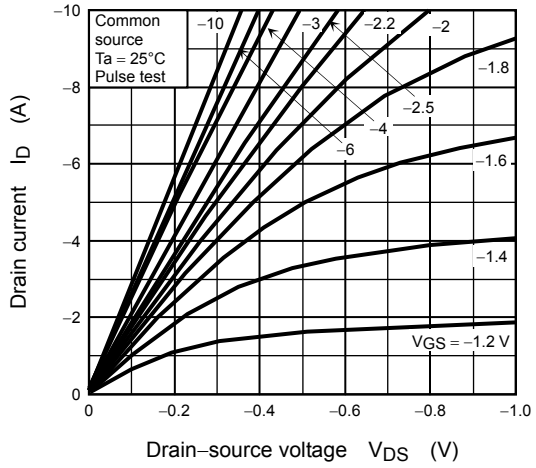
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±8 V, V_{DS} = 0 V	—	—	±1	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 = −1 mA	−0.3	—	−1.0	V
Drain-source ON-resistance		$R_{DS\ (ON)}$	V_{GS} = −1.5 V, I_D = −0.3 A	—	85	144	mΩ
		$R_{DS\ (ON)}$	V_{GS} = −1.8 V, I_D = −1.0 A	—	66	90	
		$R_{DS\ (ON)}$	V_{GS} = −2.5 V, I_D = −1.9 A	—	52	60	
		$R_{DS\ (ON)}$	V_{GS} = −4.5 V, I_D = −1.9 A	—	41	46	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −1.9 A	6	12	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	640	—	pF
Reverse transfer capacitance		C_{rss}		—	100	—	
Output capacitance		C_{oss}		—	140	—	
Switching time	Rise time	t_r		—	12	—	ns
	Turn-on time	t_{on}		—	20	—	
	Fall time	t_f		—	43	—	
	Turn-off time	t_{off}	Duty ≤ 1%, t_w = 10 μs	—	138	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≈ −16 V, V_{GS} = −5 V, I_D = −3.8 A	—	10	—	nC
Gate-source charge1		Q_{gs1}		—	1.6	—	
Gate-drain (“Miller”) charge		Q_{gd}		—	2.1	—	

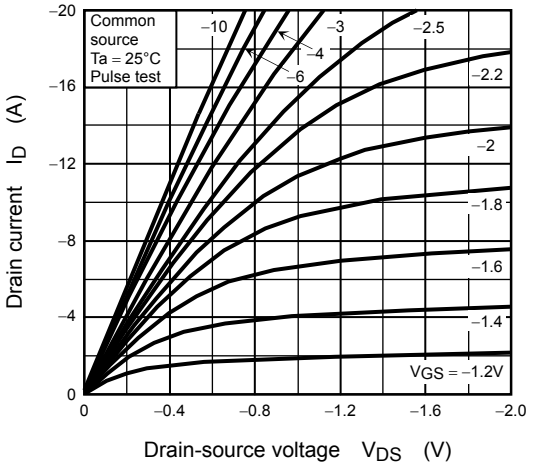
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	−15.2	A
Forward voltage (diode)		V_{DSF}	I_{DR} = −3.8 A, V_{GS} = 0 V	—	—	1.2	V

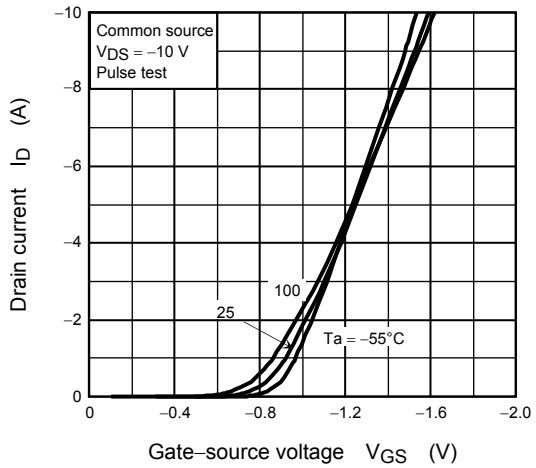
$I_D - V_{DS}$



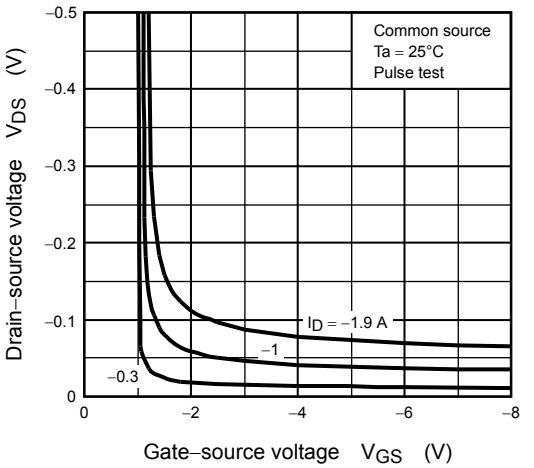
$I_D - V_{DS}$



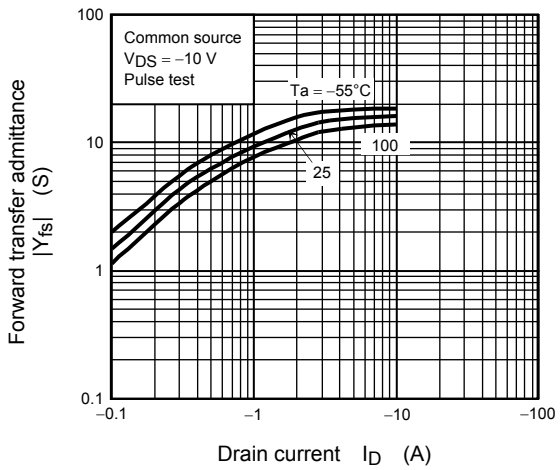
$I_D - V_{GS}$



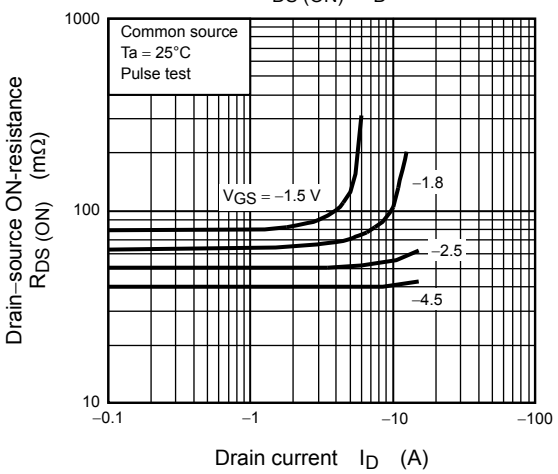
$V_{DS} - V_{GS}$



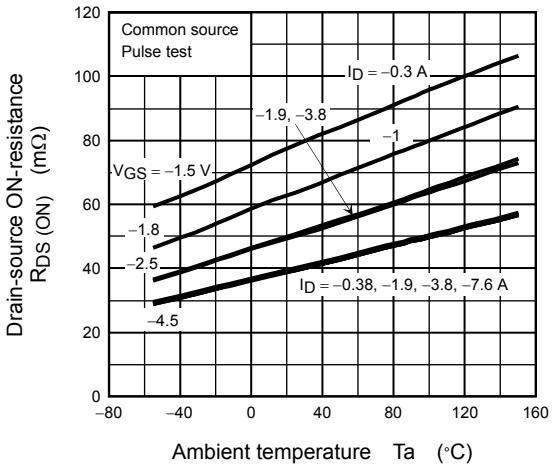
$|Y_{fs}| - I_D$



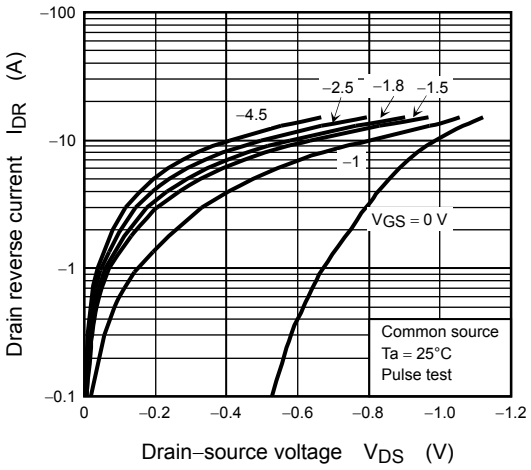
$R_{DS\ (ON)} - I_D$



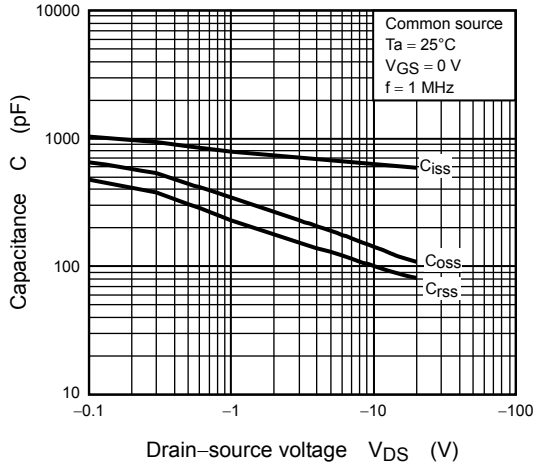
$R_{DS\ (ON)}$ – Ta



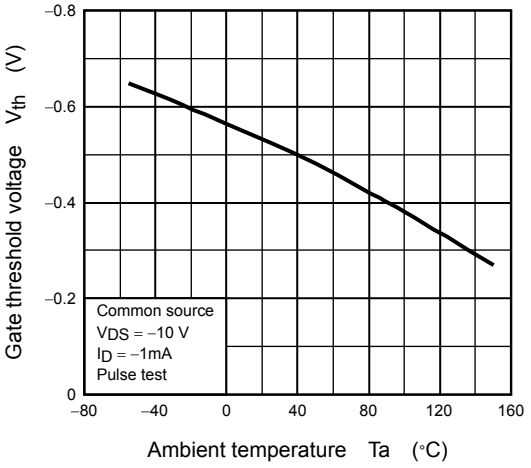
I_{DR} – V_{DS}



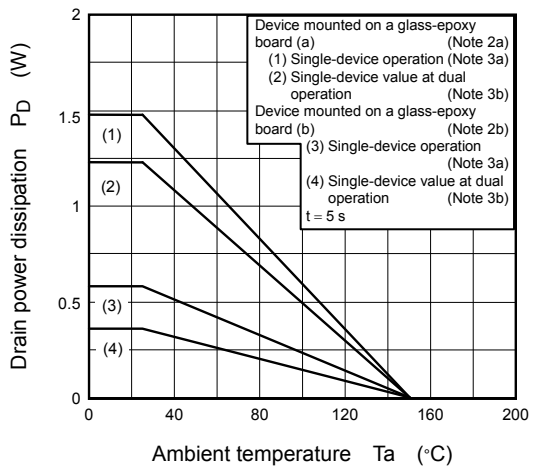
Capacitance – V_{DS}



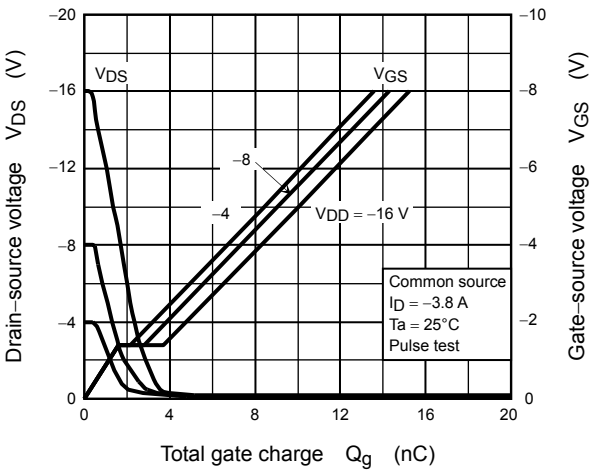
V_{th} – Ta

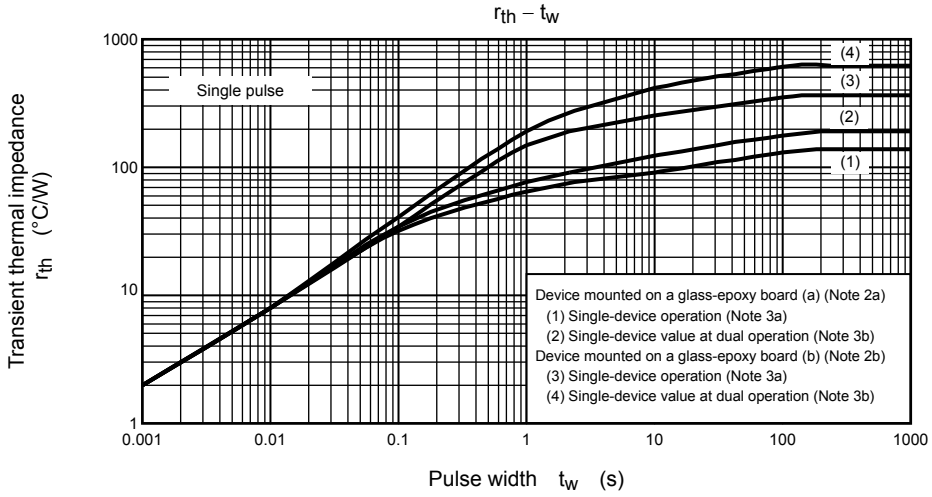


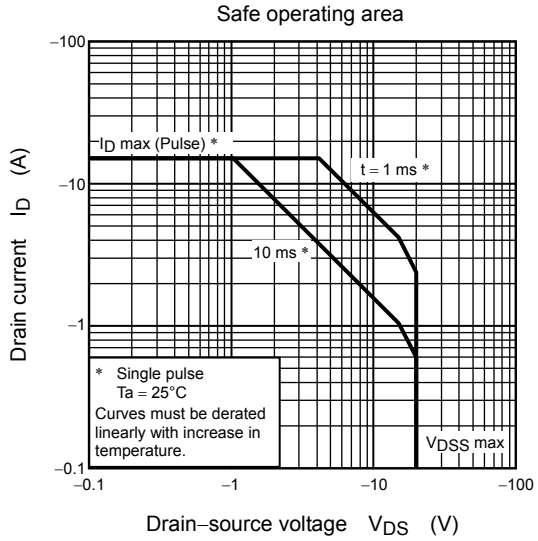
P_D – Ta



Dynamic input/output characteristics




$r_{th} - t_w$
Transient thermal impedance r_{th} (°C/W)
1000
100
10
1
0.001
0.01
0.1
1
10
100
1000
Single pulse
(4)
(3)
(2)
(1)
Device mounted on a glass-epoxy board (a) (Note 2a)
(1) Single-device operation (Note 3a)
(2) Single-device value at dual operation (Note 3b)
Device mounted on a glass-epoxy board (b) (Note 2b)
(3) Single-device operation (Note 3a)
(4) Single-device value at dual operation (Note 3b)
Pulse width t_w (s)


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

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