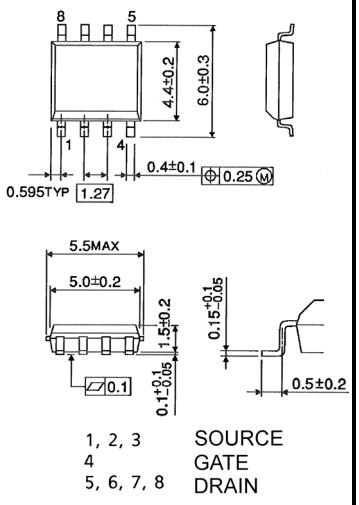
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOS IV)

TPC8113

Lithium Ion Battery Applications
Notebook PC Applications
Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 8 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 23 S (typ.)
- Low leakage current: I_{DSS} = −10 μA (max) (V_{DS} = −30 V)
- Enhancement-mode: V_{th} = −0.8 to −2.0 V (V_{DS} = −10 V, I_D = −1 mA)

Unit: mm



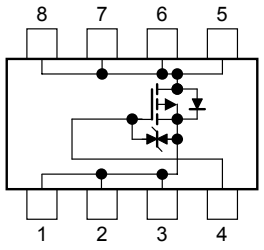
JEDEC	—
JEITA	—
TOSHIBA	2-6J1B

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	DC (Note 1)	I_D	−11	A
	Pulse (Note 1)	I_{DP}	−44	
Drain power dissipation (t = 10 s) (Note 2a)		P_D	1.9	W
Drain power dissipation (t = 10 s) (Note 2b)		P_D	1.0	W
Single pulse avalanche energy (Note 3)		E_{AS}	31.5	mJ
Avalanche current		I_{AR}	−11	A
Repetitive avalanche energy (Note 2a) (Note 4)		E_{AR}	0.19	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Circuit Configuration



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

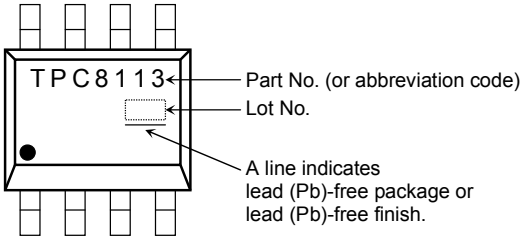
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within 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)	$R_{th\ (ch\text{-}a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	125	°C/W

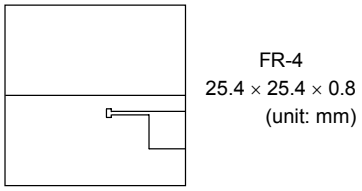
Marking (Note 5)



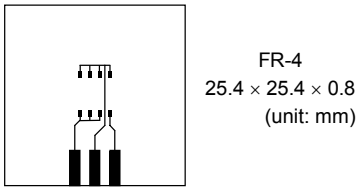
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2:

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



(a)



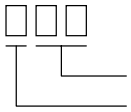
(b)

Note 3: V_{DD} = −24 V, T_{ch} = 25°C (initial), L = 0.2 mH, R_G = 25 Ω, I_{AR} = −11 A

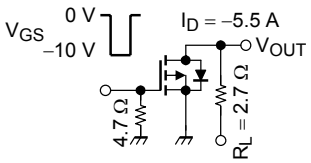
Note 4: Repetitive rating: pulse width limited by maximum channel temperature

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

※ Weekly code: (Three digits)



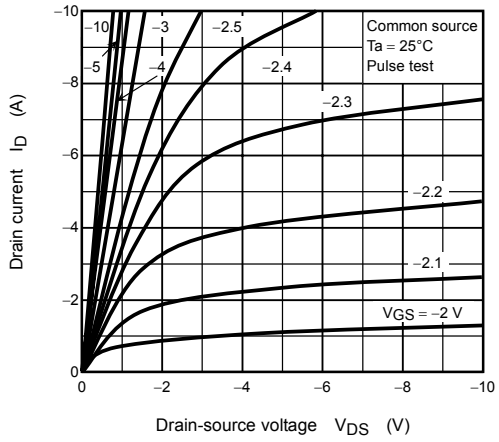
Electrical Characteristics (Ta = 25°C)

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
		$V_{(BR)\ DSX}$	I_D = −10 mA, V_{GS} = 20 V	−15	—	—	
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 = −5.5 A	—	12	18	mΩ
			V_{GS} = −10 V, I_D = −5.5 A	—	8	10	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −5.5 A	11	23	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	4500	—	pF
Reverse transfer capacitance		C_{rss}		—	540	—	
Output capacitance		C_{oss}		—	650	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	6	—	ns
	Turn-ON time	t_{on}		—	13	—	
	Fall time	t_f		—	120	—	
	Turn-OFF time	t_{off}		—	340	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≃ −24 V, V_{GS} = −10 V, I_D = −11 A	—	107	—	nC
Gate-source charge 1		Q_{gs1}		—	12	—	
Gate-drain (“miller”) charge		Q_{gd}		—	20	—	

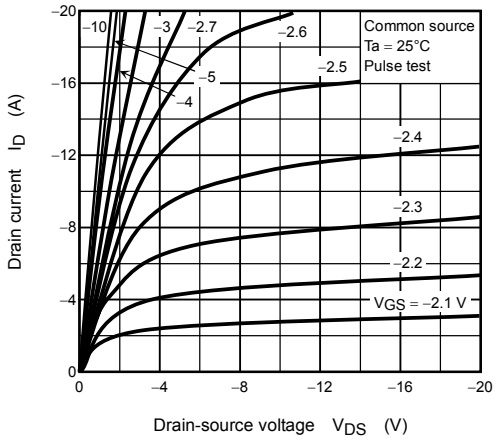
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics			Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse	(Note 1)	I_{DRP}	—	—	—	−44	A
Forward voltage (diode)			V_{DSF}	I_{DR} = −11 A, V_{GS} = 0 V	—	—	1.2	V

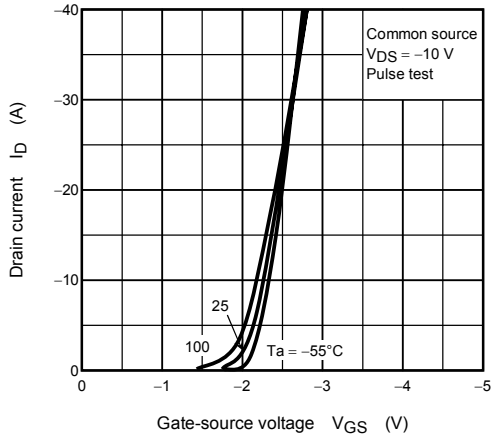
$I_D - V_{DS}$



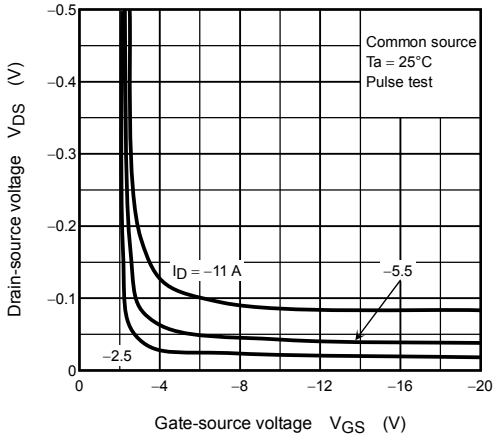
$I_D - V_{DS}$



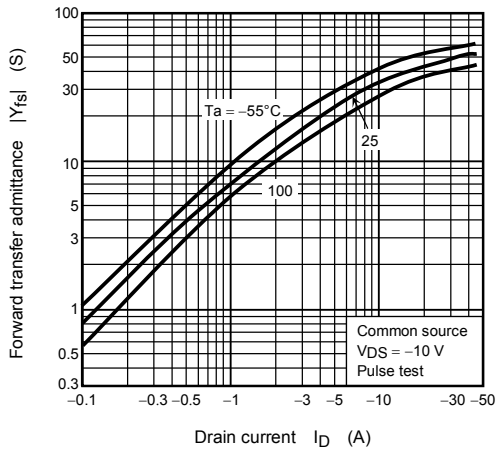
$I_D - V_{GS}$



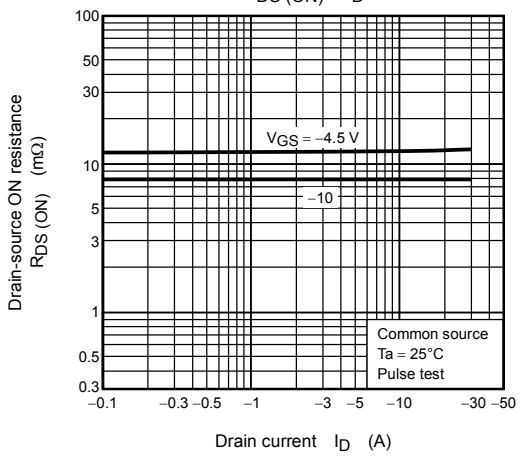
$V_{DS} - V_{GS}$



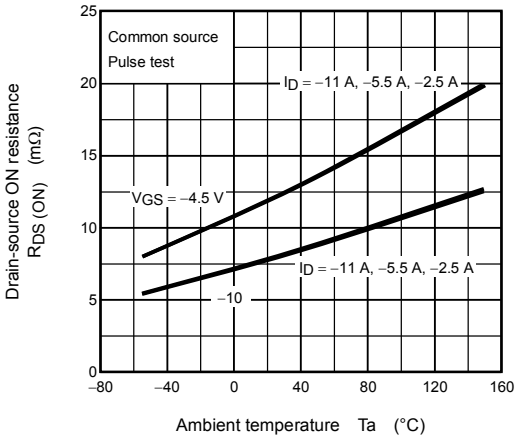
$|Y_{fs}| - I_D$



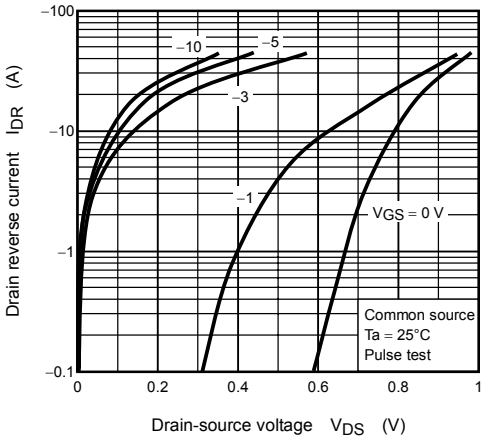
$R_{DS\ (ON)} - I_D$



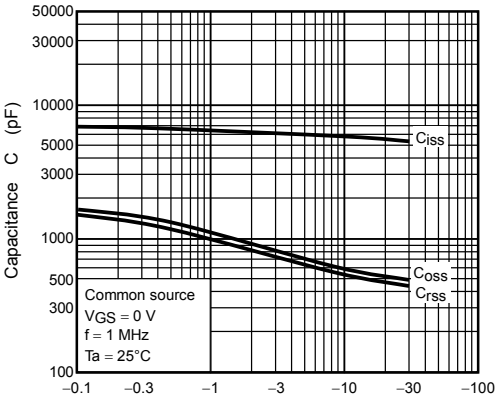
$R_{DS\ (ON)}$ – Ta



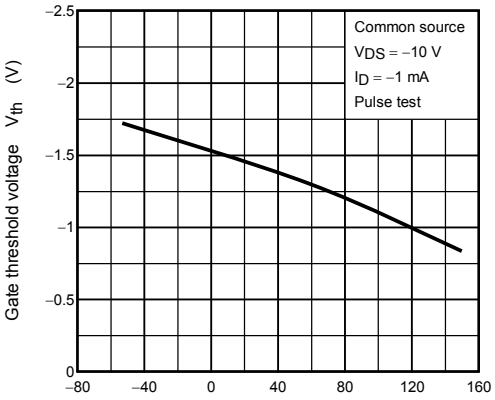
I_{DR} – V_{DS}



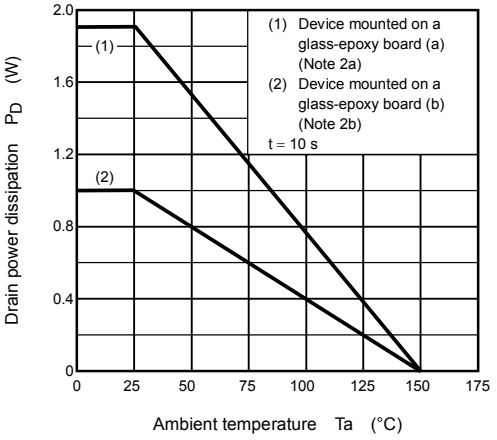
Capacitance – V_{DS}



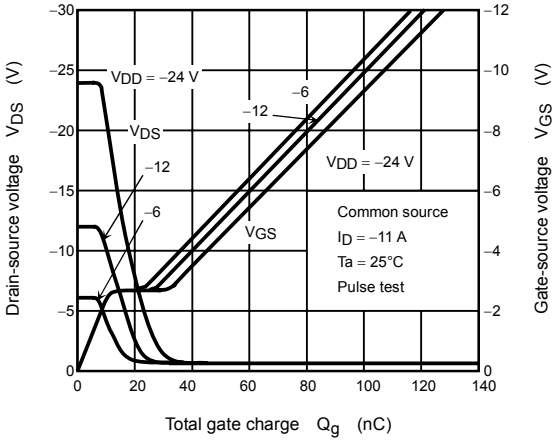
V_{th} – Ta

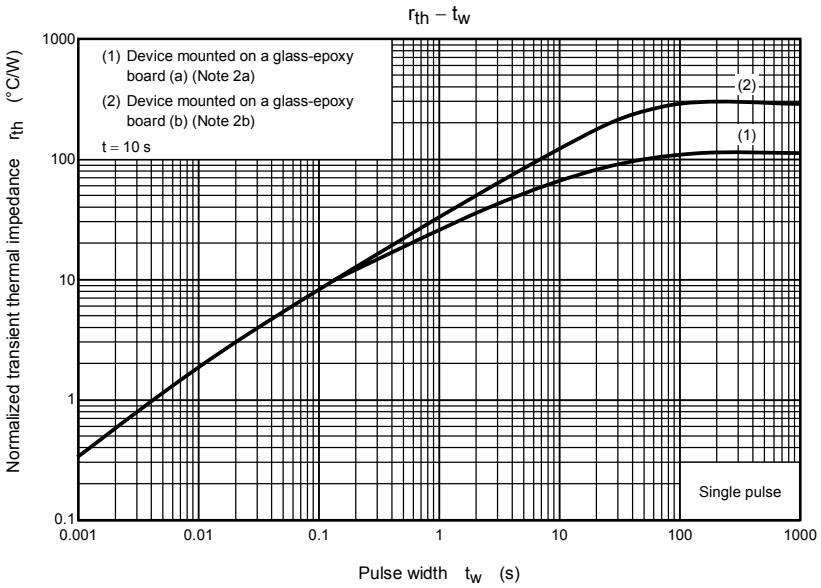


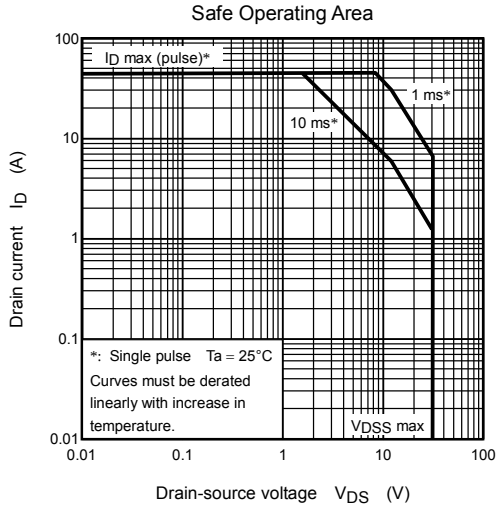
P_D – Ta



Dynamic Input/Output Characteristics




$r_{th} - t_w$
(1) Device mounted on a glass-epoxy board (a) (Note 2a)
(2) Device mounted on a glass-epoxy board (b) (Note 2b)
t = 10 s
Single pulse
Normalized transient thermal impedance r_{th} (°C/W)
Pulse width t_w (s)
1000
100
10
1
0.1
0.001
0.01
0.1
1
10
100
1000


Safe Operating Area
I_D max (pulse)*
1 ms*
10 ms*
*: Single pulse Ta = 25°C
Curves must be derated linearly with increase in temperature.
V_{DSS} max
Drain current I_D (A)
Drain-source voltage V_{DS} (V)
100
10
1
0.1
0.01
0.01
0.1
1
10
100

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