

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

# TPC8109

Lithium Ion Battery Applications  
 Notebook PC Applications  
 Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance:  $R_{DS(ON)} = 14 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 19 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -30 \text{ V}$ )
- Enhancement mode:  $V_{th} = -0.8$  to  $-2.0 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -1 \text{ mA}$ )

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

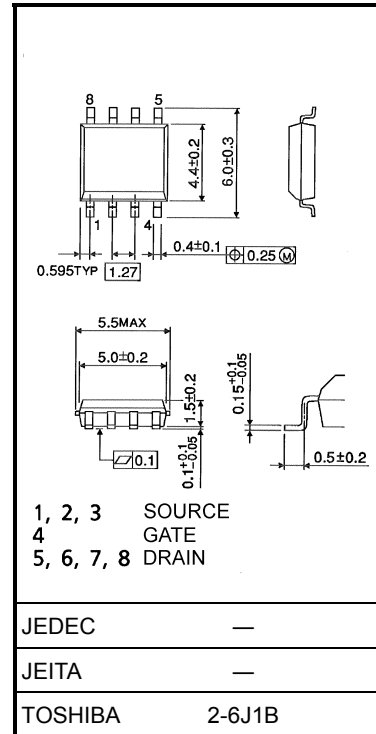
Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	-30	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	-30	V
Gate-source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	-10
	Pulse (Note 1)	$I_{DP}$	-40
Drain power dissipation (t = 10 s) (Note 2a)	$P_D$	1.9	W
Drain power dissipation (t = 10 s) (Note 2b)	$P_D$	1.0	W
Single pulse avalanche energy (Note 3)	$E_{AS}$	130	mJ
Avalanche current	$I_{AR}$	-10	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

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).

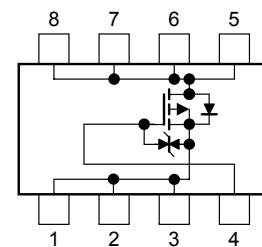
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.080 g (typ.)

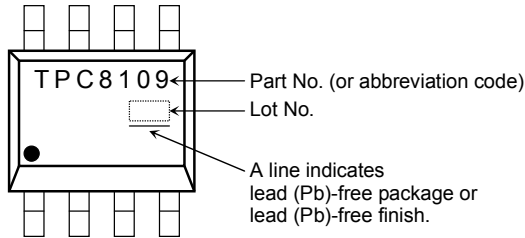
## Circuit Configuration



## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th(ch-a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th(ch-a)}$	125	°C/W

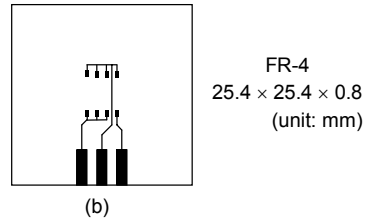
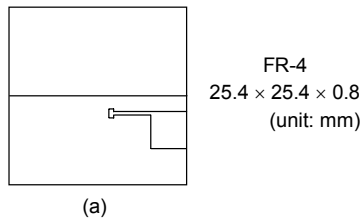
## Marking (Note 5)



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)

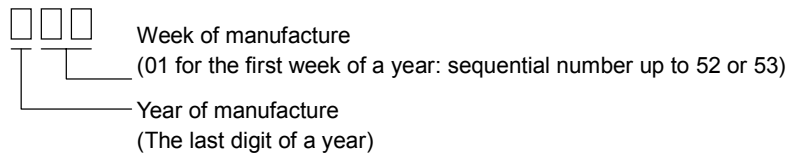


Note 3:  $V_{DD} = -24$  V,  $T_{ch} = 25^{\circ}\text{C}$  (initial),  $L = 1.0$  mH,  $R_G = 25$   $\Omega$ ,  $I_{AR} = -10$  A

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)

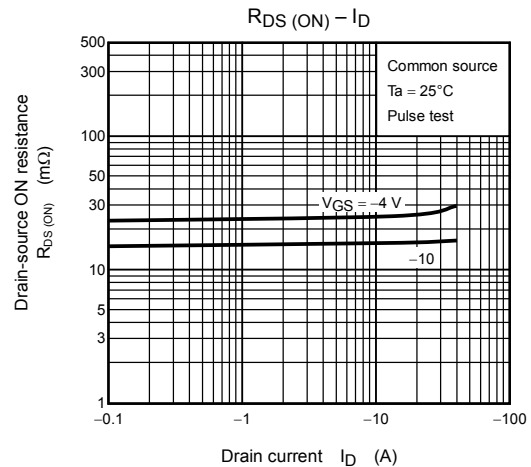
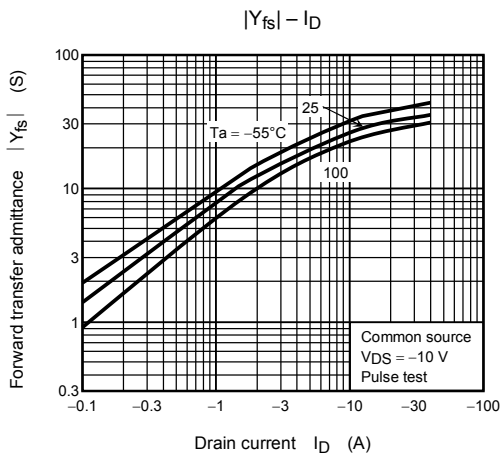
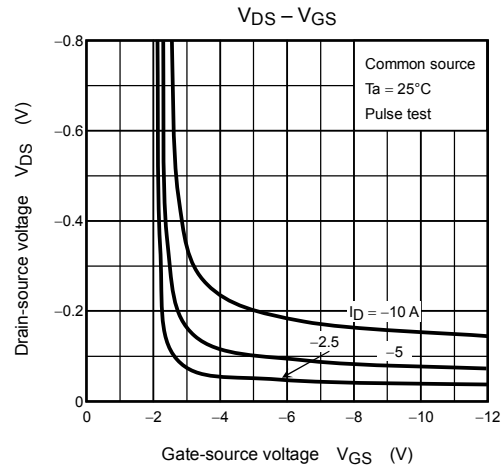
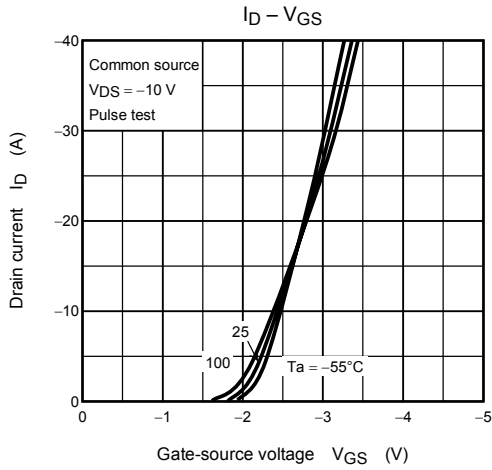
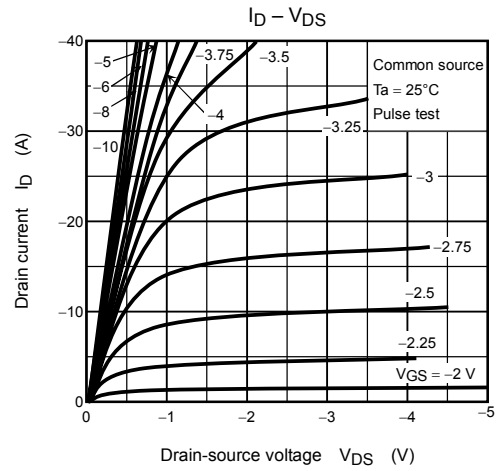
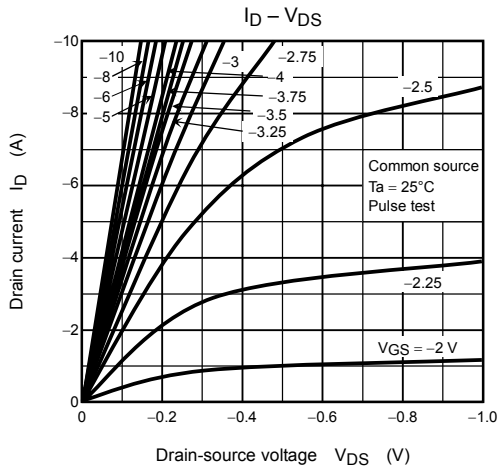


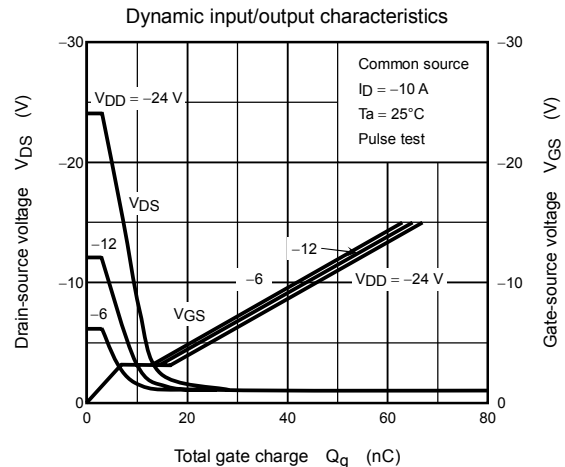
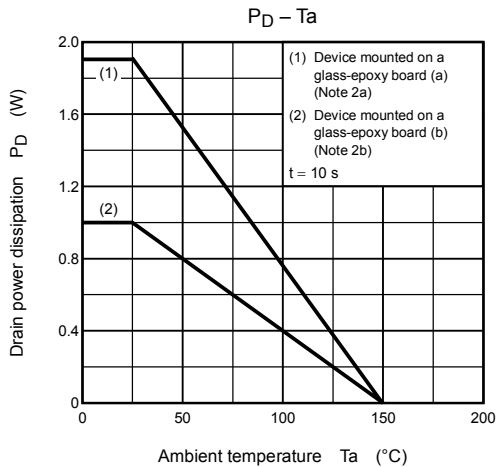
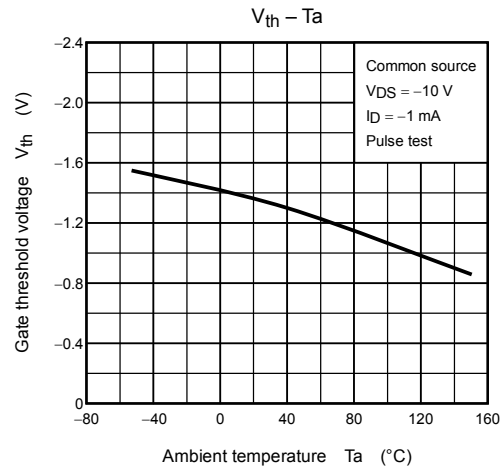
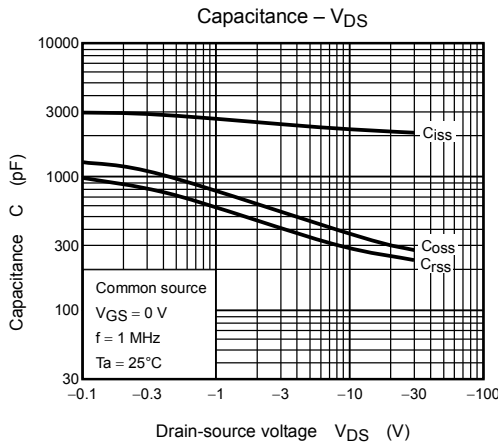
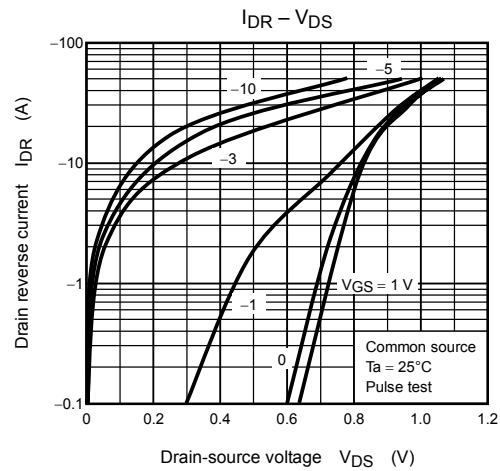
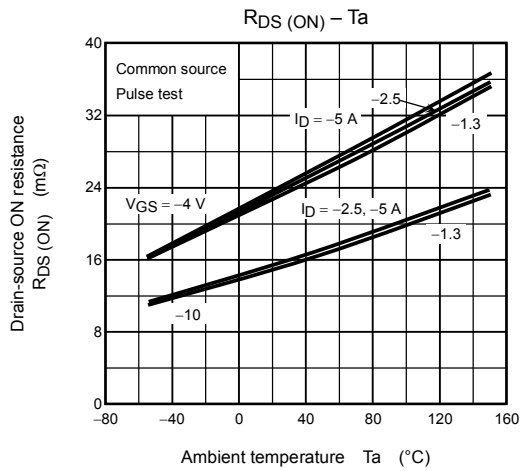
## Electrical Characteristics (Ta = 25°C)

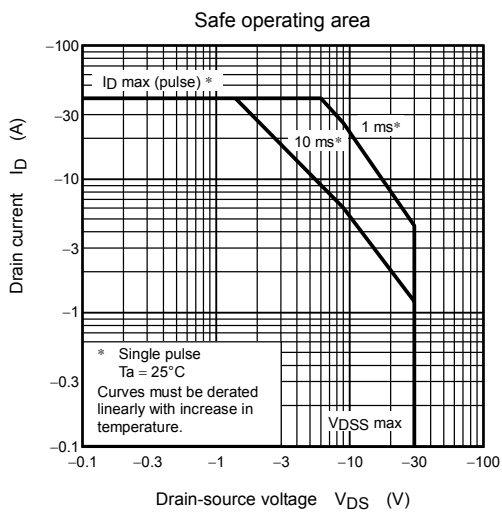
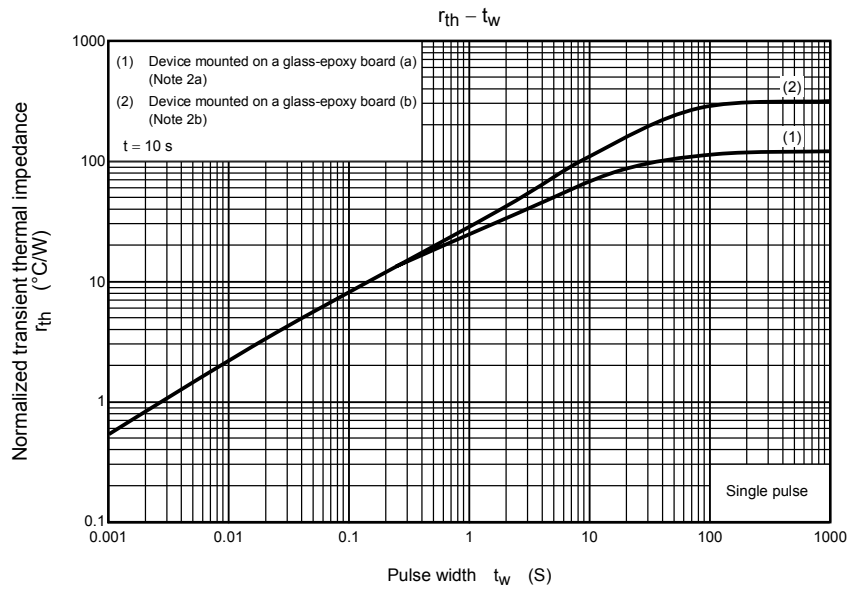
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-OFF current		$I_{DSS}$	$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	-10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$	-30	—	—	V
		$V_{(BR)DSX}$	$I_D = -10 \text{ mA}, V_{GS} = 20 \text{ V}$	-15	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$	-0.8	—	-2.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -4 \text{ V}, I_D = -5 \text{ A}$	—	24	30	$\text{m}\Omega$
			$V_{GS} = -10 \text{ V}, I_D = -5 \text{ A}$	—	14	20	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -5 \text{ A}$	9	19	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	2260	—	pF
Reverse transfer capacitance		$C_{rss}$		—	290	—	
Output capacitance		$C_{oss}$		—	350	—	
Switching time	Rise time	$t_r$	<p><math>V_{GS} = 0 \text{ V}, -10 \text{ V}</math>  <math>I_D = -5 \text{ A}</math>  <math>R_L = 3.0 \Omega</math>  <math>V_{DD} \approx -15 \text{ V}</math>  <math>V_{OUT}</math>  <math>4.7 \Omega</math>  <math>Duty \leq 1\%, t_w = 10 \mu\text{s}</math></p>	—	5	—	ns
	Turn-ON time	$t_{on}$		—	13	—	
	Fall time	$t_f$		—	34	—	
	Turn-OFF time	$t_{off}$		—	143	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -24 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -10 \text{ A}$	—	45	—	nC
Gate-source charge 1		$Q_{gs1}$		—	6.5	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	10	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	-40	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = -11 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.2	V







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