

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

TPCA8109

Lithium Ion Battery Applications
Power Management Switch Applications

- Small footprint due to small and thin package
- Low drain-source ON-resistance: $R_{DS(ON)} = 7 \text{ m}\Omega$ (typ.)
- Low leakage current: $I_{DSS} = -10 \text{ }\mu\text{A}$ (max) ($V_{DS} = -30 \text{ V}$)
- Enhancement mode: $V_{th} = -0.8 \text{ to } -2.0 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -0.5 \text{ mA}$)

Absolute Maximum Ratings (Ta = 25°C)

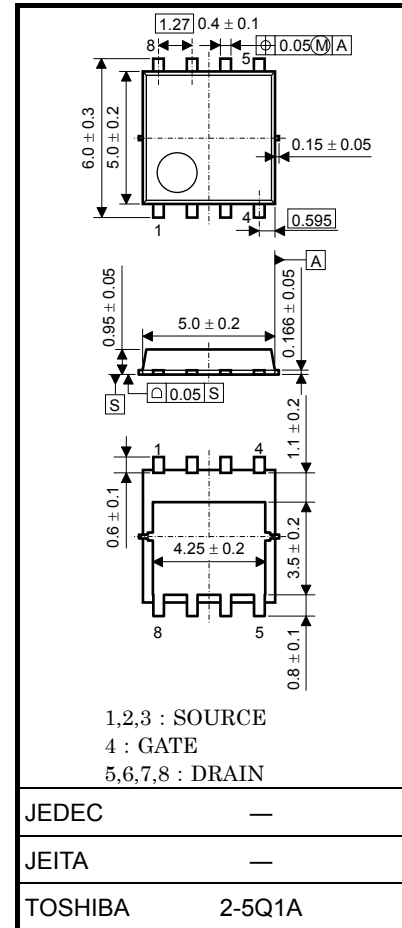
Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	-30	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	-30	V
Gate-source voltage		V_{GSS}	-25/+20	V
Drain current	DC (Note 1)	I_D	-24	A
	Pulsed (Note 1)	I_{DP}	-72	
Drain power dissipation	($T_c=25^\circ\text{C}$)	P_D	30	W
Drain power dissipation	($t = 10 \text{ s}$) (Note 2a)	P_D	2.8	W
Drain power dissipation	($t = 10 \text{ s}$) (Note 2b)	P_D	1.6	W
Single pulse avalanche energy	(Note 3)	E_{AS}	75	mJ
Avalanche current		I_{AR}	-24	A
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55 to 150	°C

Note: For Notes 1 to 3, refer to 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).

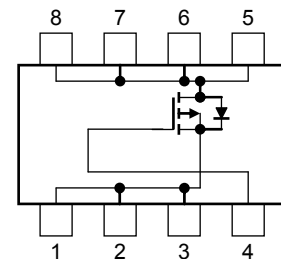
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.076 g (typ.)

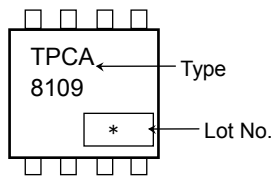
Circuit Configuration



Thermal Characteristics

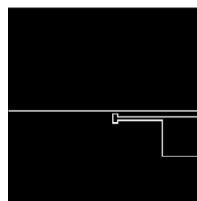
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case ($T_c=25^\circ\text{C}$)	$R_{th(ch-c)}$	4.17	$^\circ\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2a)	$R_{th(ch-a)}$	44.6	$^\circ\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2b)	$R_{th(ch-a)}$	78.1	$^\circ\text{C/W}$

Marking (Note 4)



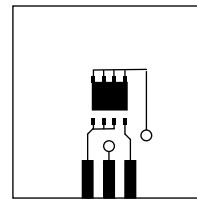
Note 1: Please use devices on condition that the channel temperature is below 150°C .

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



(a)

FR-4
 $25.4 \times 25.4 \times 0.8$
 (Unit: mm)

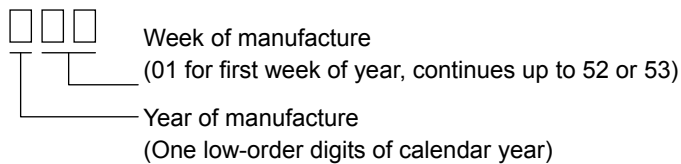


(b)

FR-4
 $25.4 \times 25.4 \times 0.8$
 (Unit: mm)

Note 3: $V_{DD} = -24\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 100\mu\text{H}$, $R_G = 25\ \Omega$, $I_{AR} = -24\text{ A}$

Note 4: * Weekly code: (Three digits)



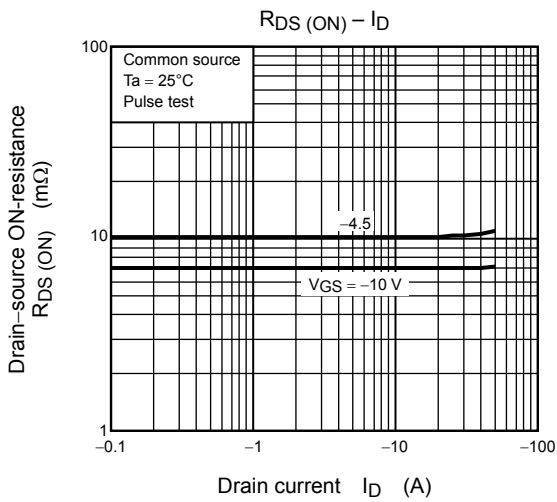
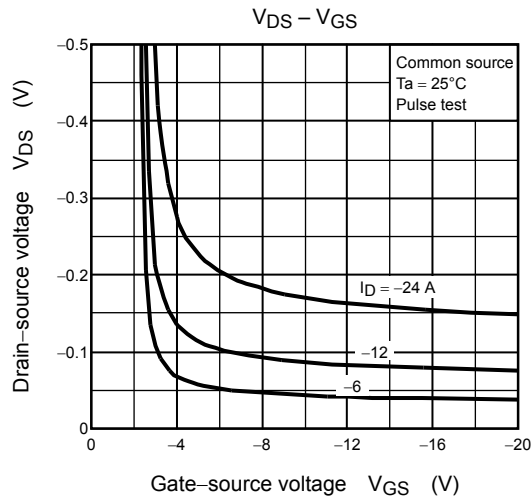
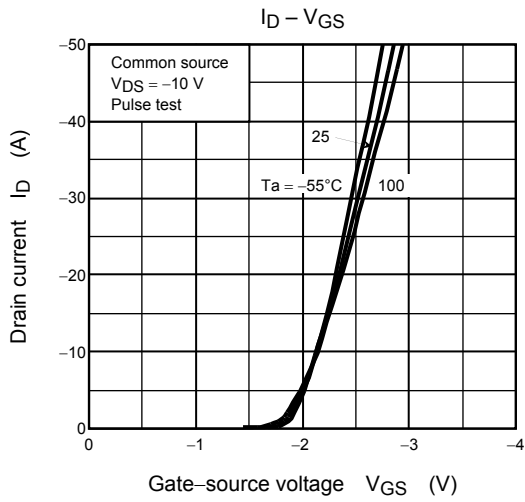
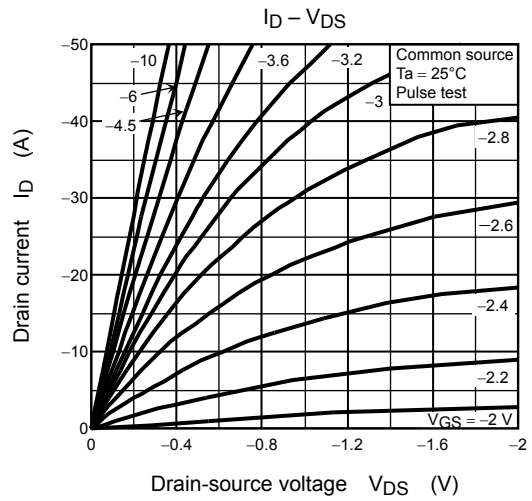
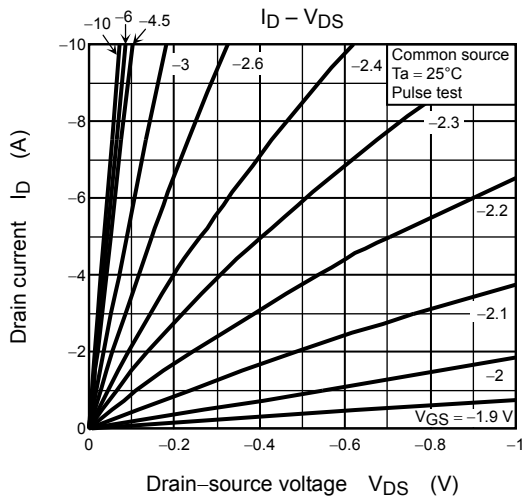
Electrical Characteristics (Ta = 25°C)

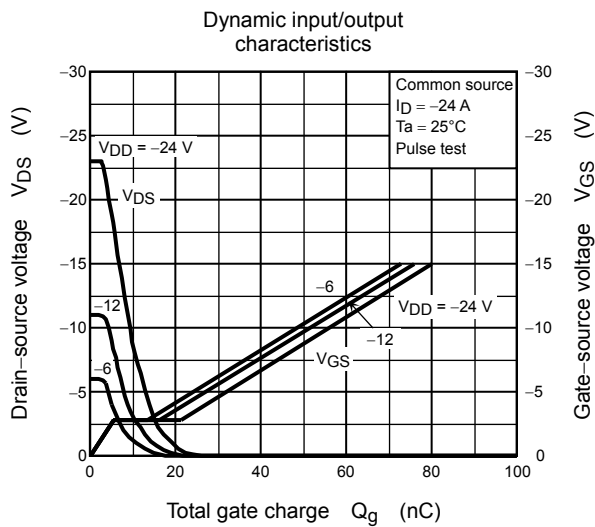
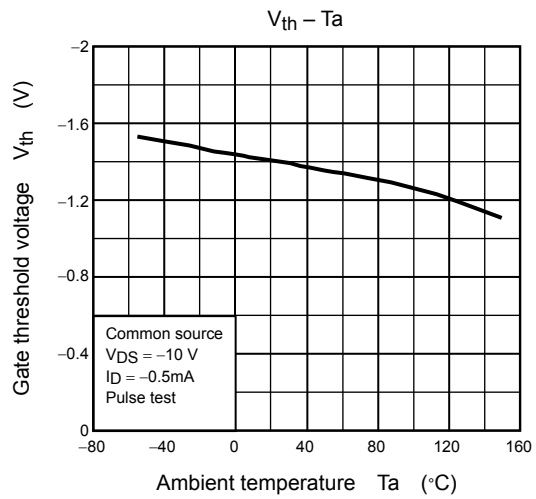
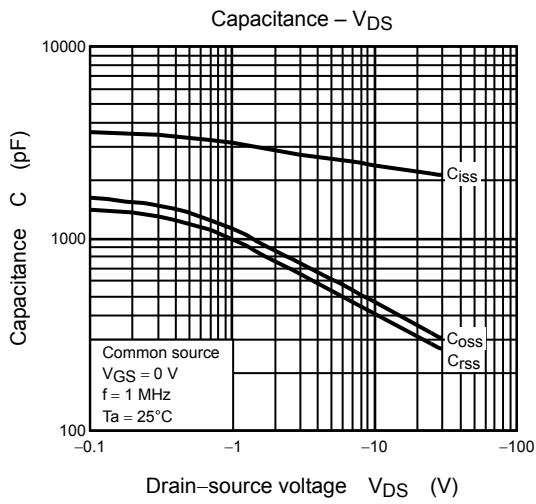
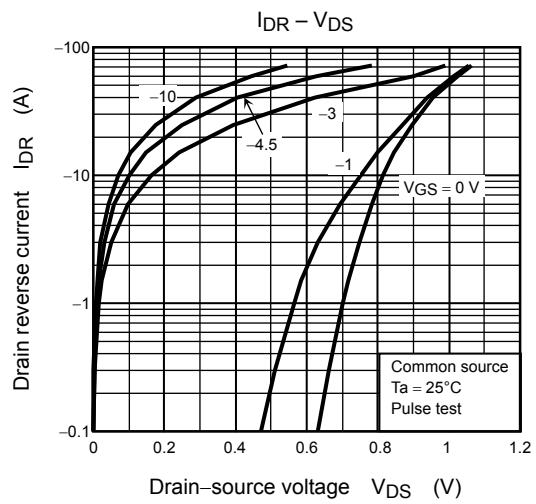
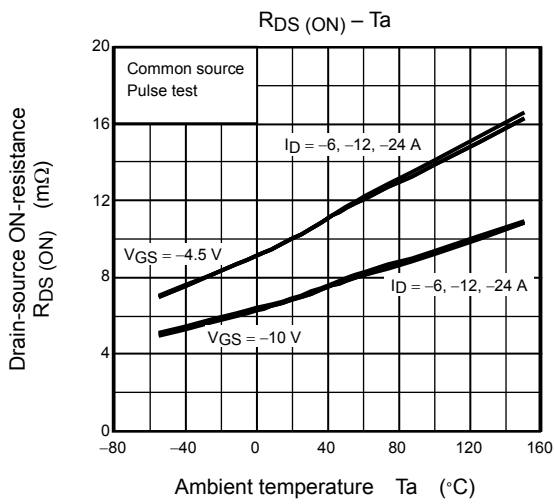
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 100	nA
Drain cut-OFF current		I_{DSS}	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-30	—	—	V
		$V_{(BR)DSX}$	$I_D = -10\text{ mA}, V_{GS} = 10\text{ V}$ (Note5)	-21	—	—	
Gate threshold voltage		V_{th}	$V_{DS} = -10\text{ V}, I_D = -0.5\text{ mA}$	-0.8	—	-2.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -4.5\text{ V}, I_D = -12\text{ A}$	—	10	13	m Ω
			$V_{GS} = -10\text{ V}, I_D = -12\text{ A}$	—	7	9	
Input capacitance		C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	2400	—	pF
Reverse transfer capacitance		C_{rss}		—	400	—	
Output capacitance		C_{oss}		—	460	—	
Switching time	Rise time	t_r		—	9.2	—	ns
	Turn-on time	t_{on}		—	16	—	
	Fall time	t_f		—	58	—	
	Turn-off time	t_{off}		Duty $\leq 1\%$, $t_w = 10\ \mu\text{s}$	—	172	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx -24\text{ V}, V_{GS} = -10\text{ V}, I_D = -24\text{ A}$	—	56	—	nC
Gate-source charge 1		Q_{gs1}		—	5.6	—	
Gate-drain ("miller") charge		Q_{gd}		—	15	—	

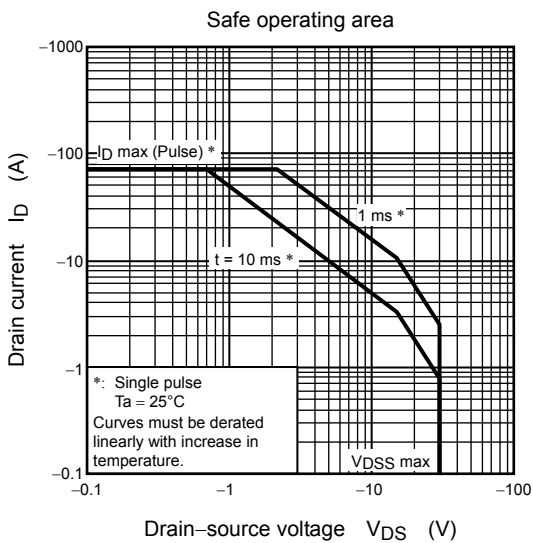
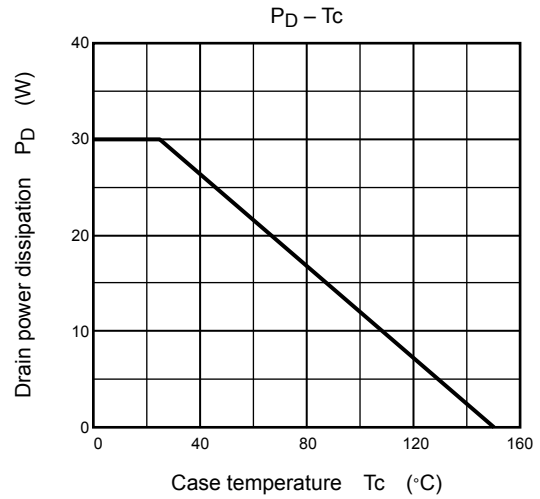
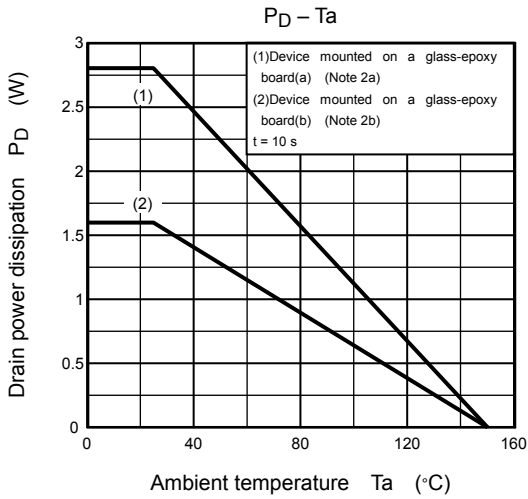
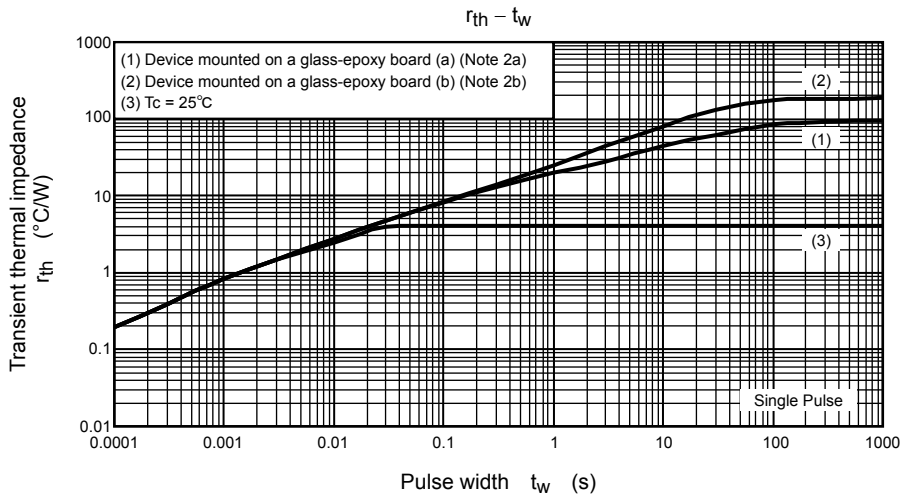
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	-72	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = -24\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.2	V

Note 5: $V_{(BR)DSX}$ mode (the application of a plus voltage between gate and source) may cause decrease in maximum rating of drain-source voltage.







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