

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: $V_{th} = -0.8$ to -2.0 V ($V_{DS} = -10 \text{ V}$, $I_D = -0.5 \text{ mA}$)

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

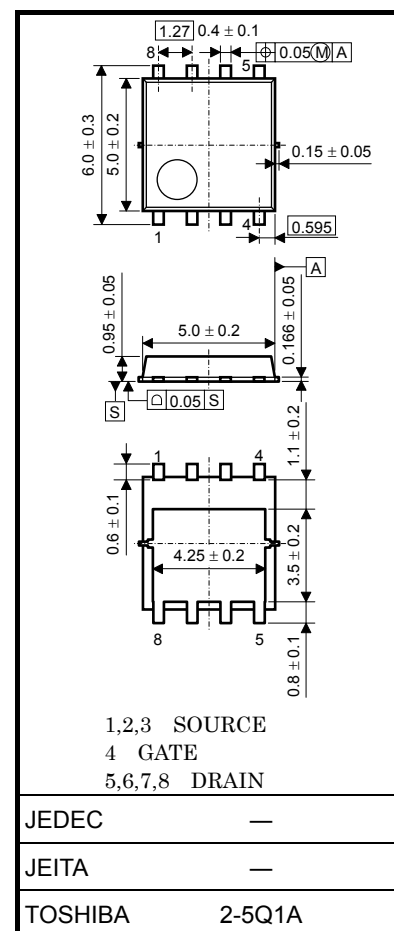
Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	-30	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	-30	V
Gate-source voltage		V_{GSS}	-25/+20	V
Drain current	DC (Note 1)	I_D	-24	A
	Pulsed (Note 1)	I_{DP}	-72	
Drain power dissipation ($T_c=25^\circ\text{C}$)		P_D	30	W
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	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

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).

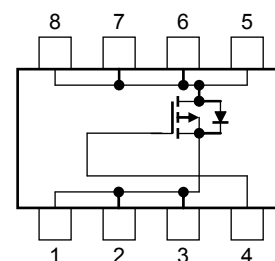
This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.076 g (typ.)

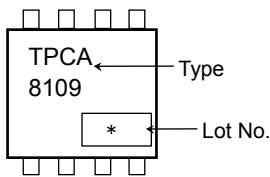
Circuit Configuration



Thermal Characteristics

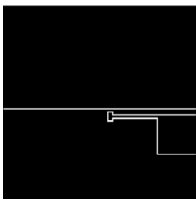
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case (Tc=25°C)	R _{th} (ch-c)	4.17	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	R _{th} (ch-a)	44.6	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	R _{th} (ch-a)	78.1	°C/W

Marking (Note 4)



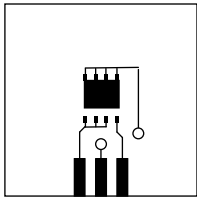
Note 1: Please use devices on condition that the channel temperature is below 150°C.

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 × 25.4 × 0.8
(Unit: mm)

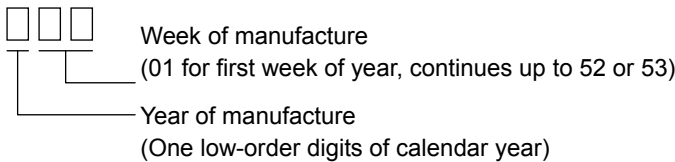


(b)

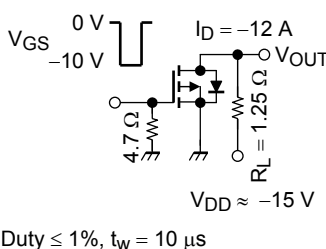
FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

Note 3: V_{DD} = -24 V, T_{ch} = 25°C (initial), L = 100μH, R_G = 25 Ω, I_{AR} = -24 A

Note 4: * Weekly code: (Three digits)



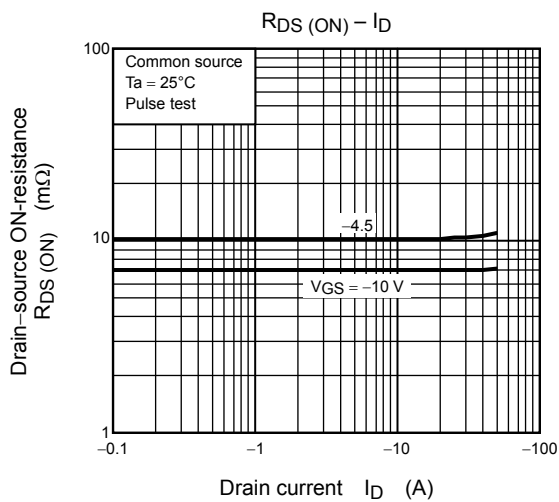
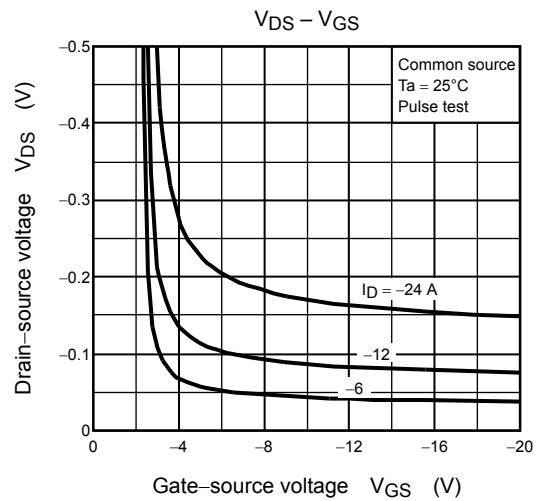
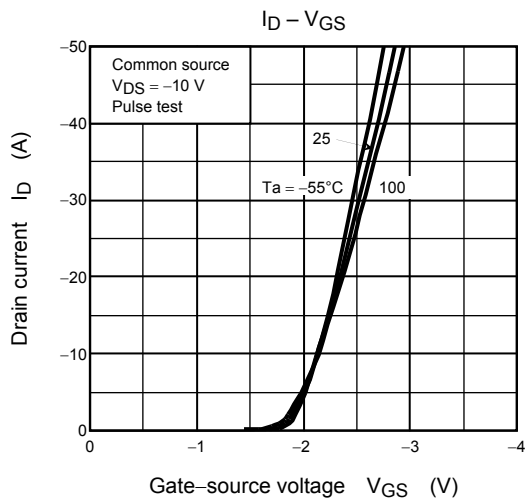
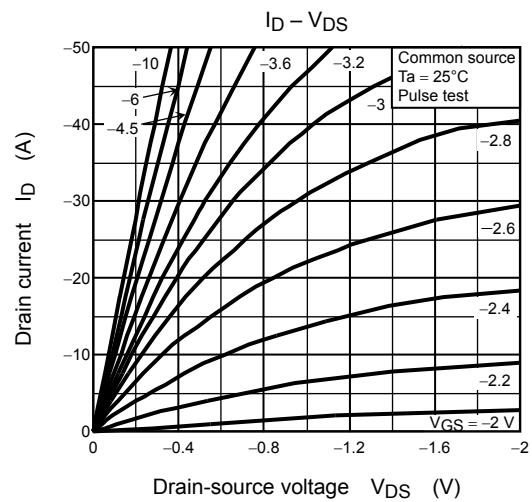
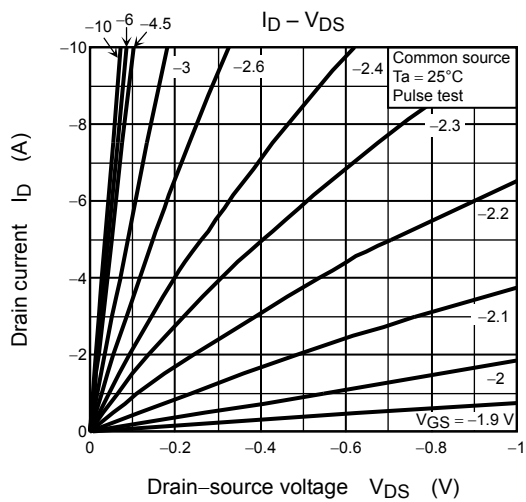
Electrical Characteristics (Ta = 25°C)

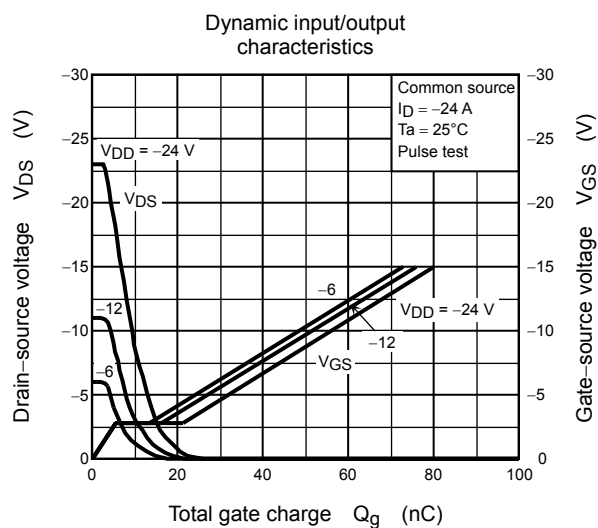
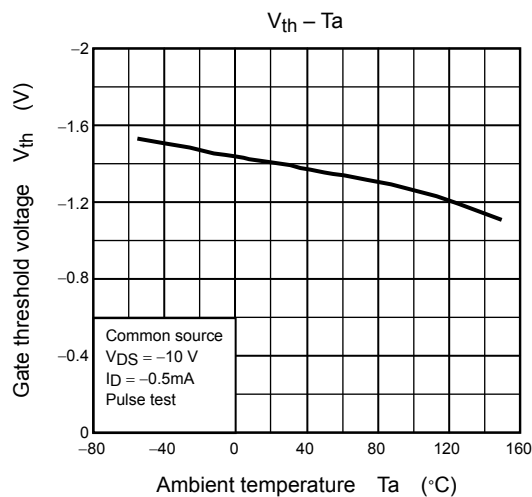
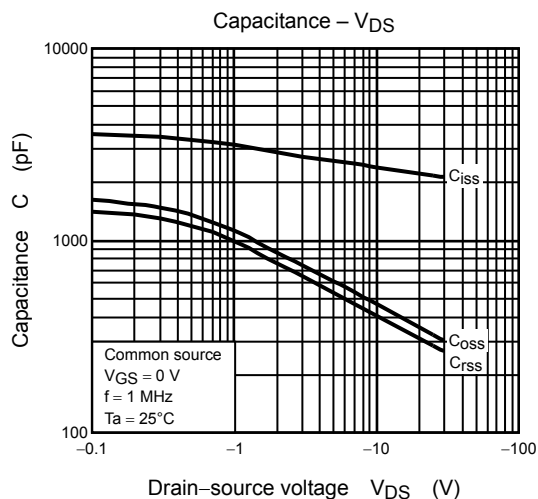
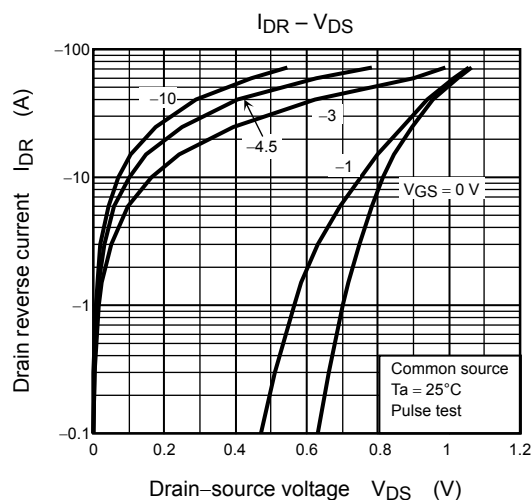
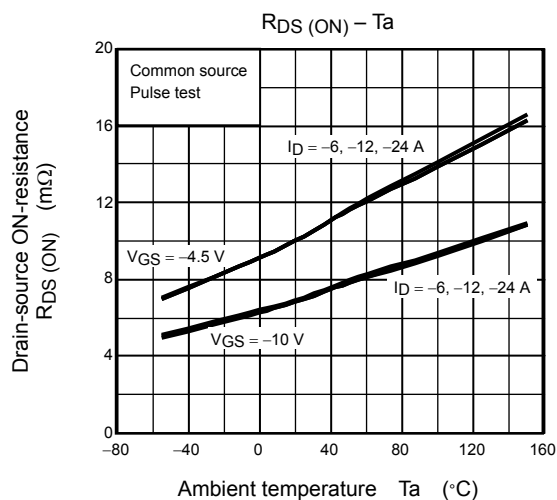
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V	—	—	±100	nA
Drain cut-OFF current		I _{DSS}	V _{DS} = -30 V, V _{GS} = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V _(BR) DSS	I _D = -10 mA, V _{GS} = 0 V	-30	—	—	V
		V _(BR) DSX	I _D = -10 mA, V _{GS} = 10 V (Note5)	-21	—	—	
Gate threshold voltage		V _{th}	V _{DS} = -10 V, I _D = -0.5 mA	-0.8	—	-2.0	V
Drain-source ON resistance		R _{DS} (ON)	V _{GS} = -4.5V, I _D = -12 A	—	10	13	mΩ
			V _{GS} = -10 V, I _D = -12 A	—	7	9	
Input capacitance		C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 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}		—	172	—	
Total gate charge (gate-source plus gate-drain)		Q _g	V _{DD} ≈ -24 V, V _{GS} = -10 V, I _D = -24 A	—	56	—	nC
Gate-source charge 1		Q _{gs1}		—	5.6	—	
Gate-drain (“miller”) charge		Q _{gd}		—	15	—	

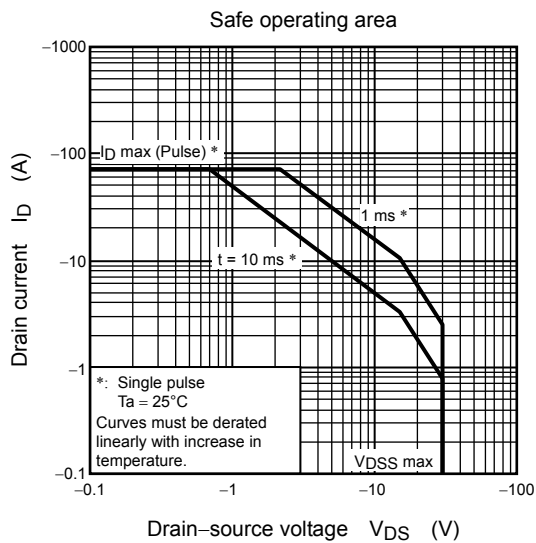
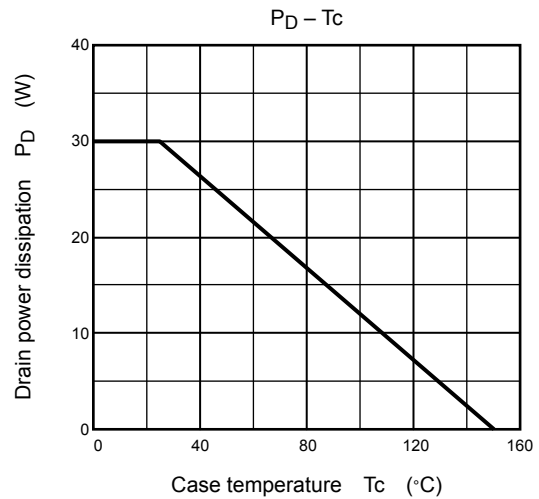
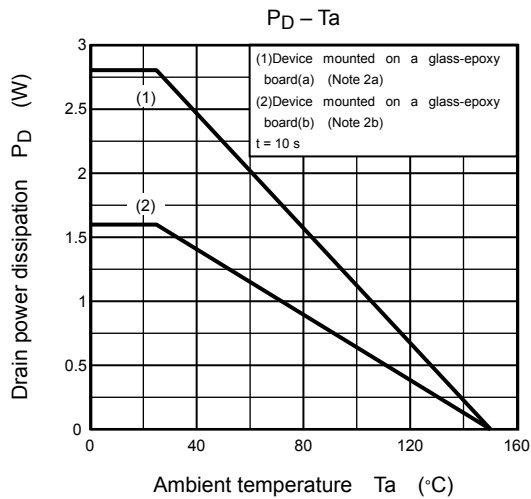
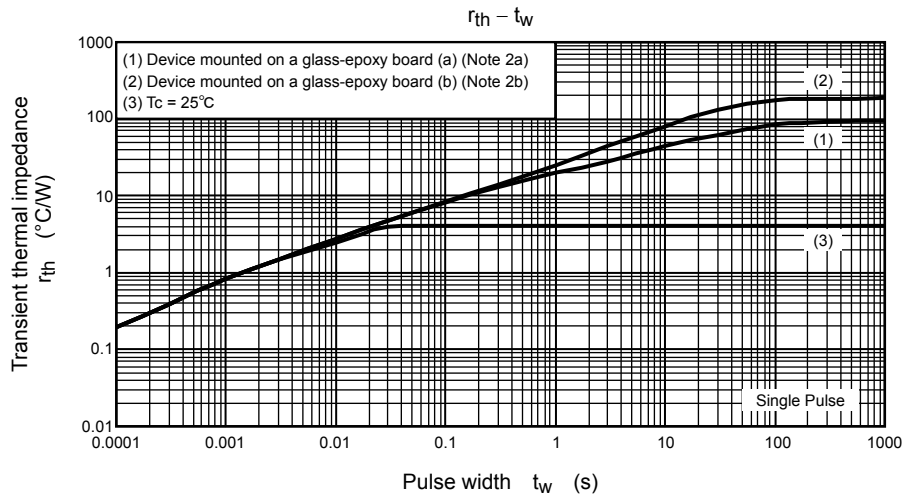
Source-Drain Ratings and Characteristics (Ta = 25°C)

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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