

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: $R_{DS\ (ON)} = 7\ m\Omega$ (typ.)
- Low leakage current: $I_{DSS} = -10\ \mu A$ (max) ($V_{DS} = -30\ V$)
- Enhancement mode: $V_{th} = -0.8$ to $-2.0\ V$ ($V_{DS} = -10\ V$, $I_D = -0.5\ mA$)

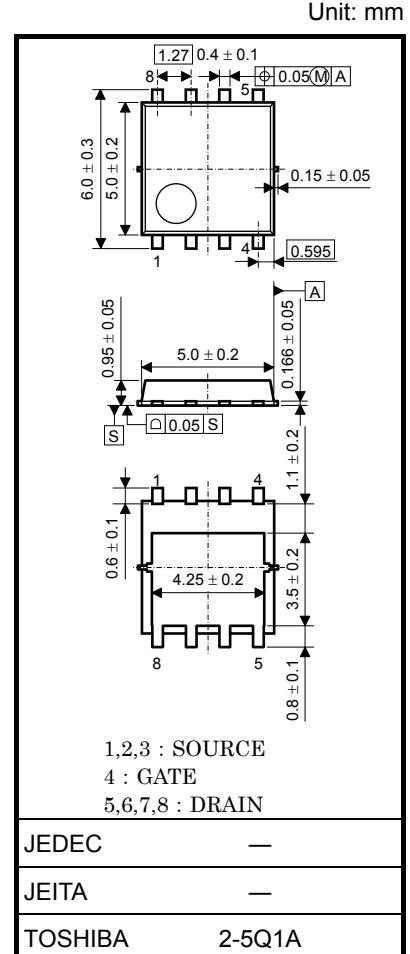
Absolute Maximum Ratings ($T_a = 25^\circ C$)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	-30	V
Drain-gate voltage ($R_{GS} = 20\ k\Omega$)	V_{DGR}	-30	V
Gate-source voltage	V_{GSS}	-25/+20	V
Drain current	DC (Note 1)	I_D	A
	Pulsed (Note 1)	I_{DP}	
Drain power dissipation ($T_c = 25^\circ C$)	P_D	30	W
Drain power dissipation ($t = 10\ s$) (Note 2a)	P_D	2.8	W
Drain power dissipation ($t = 10\ s$) (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.

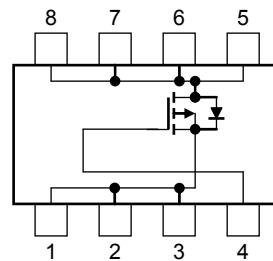
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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



Weight: 0.076 g (typ.)

Circuit Configuration

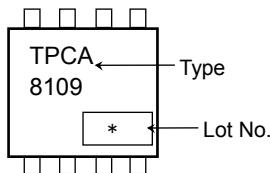


Start of commercial production
2009-10

Thermal Characteristics

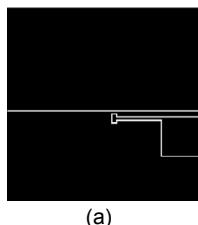
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case ($T_c=25^{\circ}\text{C}$)	R_{th} (ch-c)	4.17	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ($t = 10$ s) (Note 2a)	R_{th} (ch-a)	44.6	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ($t = 10$ s) (Note 2b)	R_{th}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

Marking (Note 4)



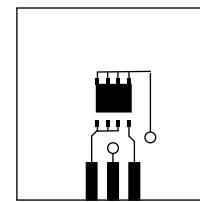
Note 1: Please use devices on condition that the channel temperature is below 150°C .

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



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)

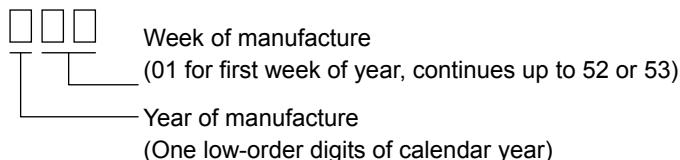


FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

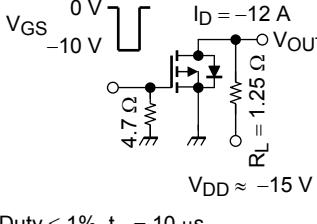
(b)

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

Note 4: * Weekly code: (Three digits)



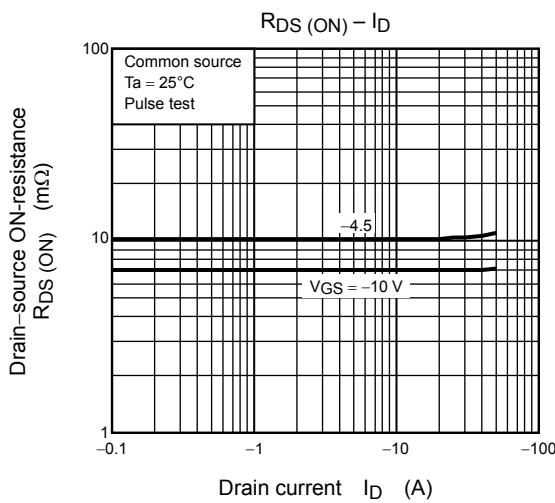
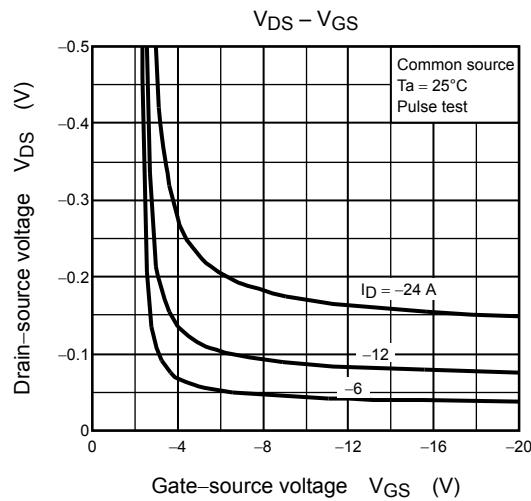
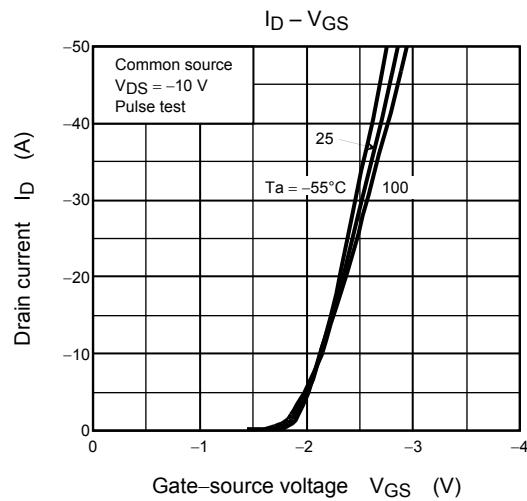
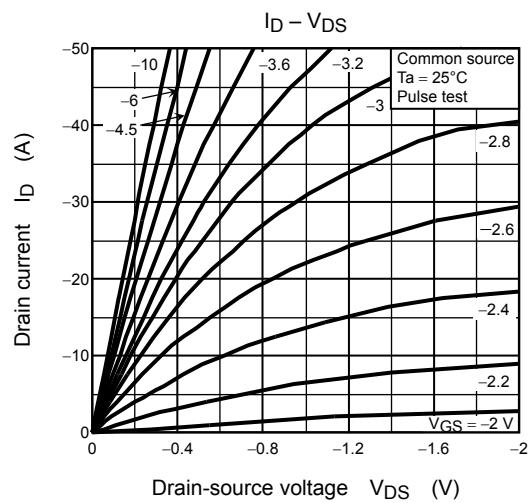
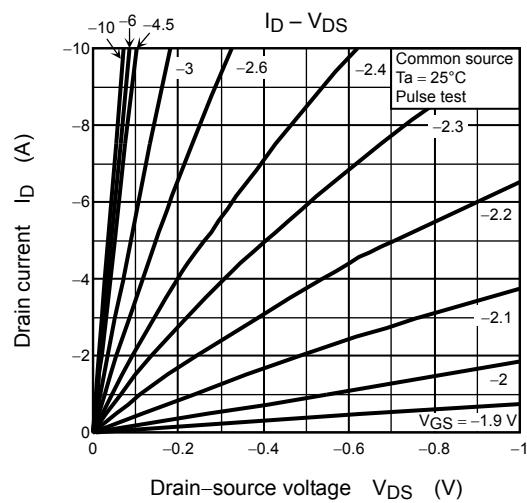
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

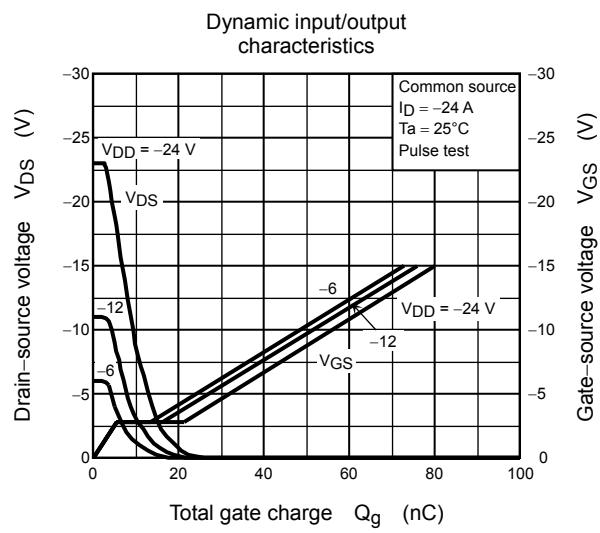
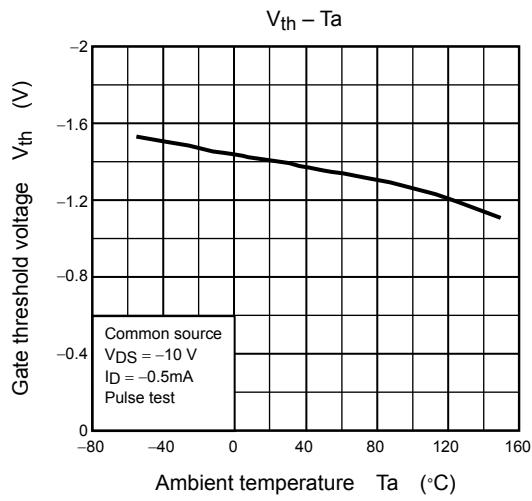
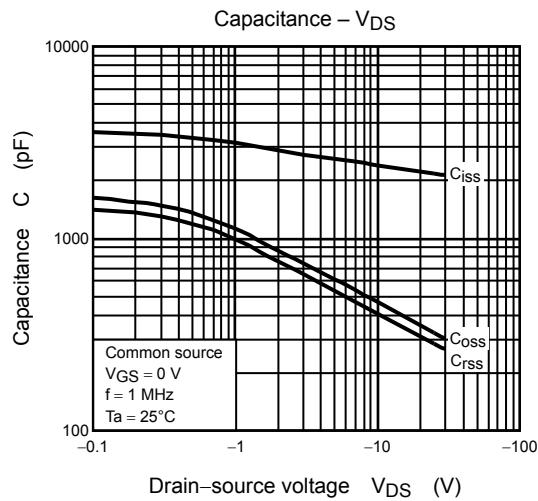
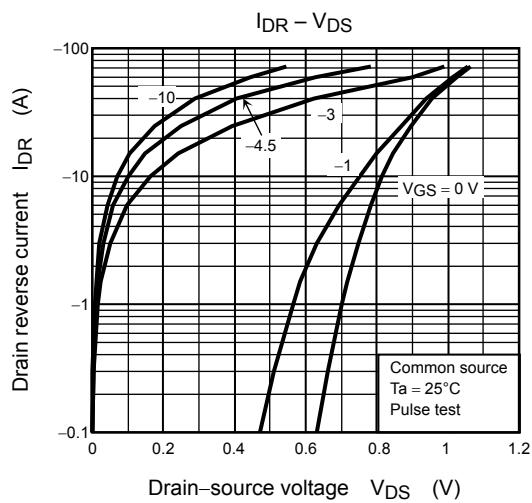
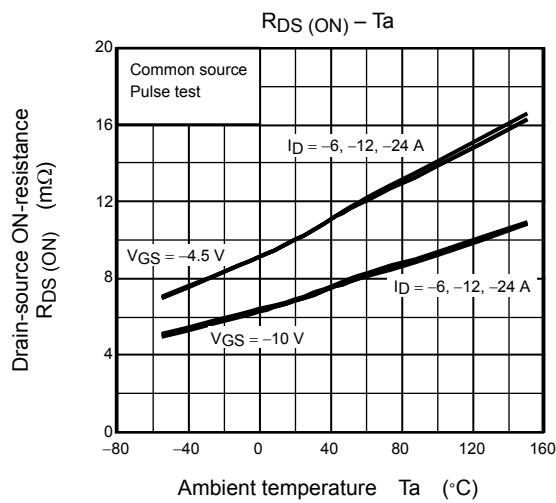
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$	—	—	± 100	nA
Drain cut-OFF current	I_{DSS}	$V_{DS} = -30\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	-10	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = -10\text{ mA}$, $V_{GS} = 0\text{ V}$	-30	—	—	V
	$V_{(\text{BR})\text{DSX}}$	$I_D = -10\text{ mA}$, $V_{GS} = 10\text{ V}$ (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	$R_{DS\text{ (ON)}}$	$V_{GS} = -4.5\text{ V}$, $I_D = -12\text{ A}$	—	10	13	$\text{m}\Omega$
		$V_{GS} = -10\text{ V}$, $I_D = -12\text{ A}$	—	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}		—	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	—	

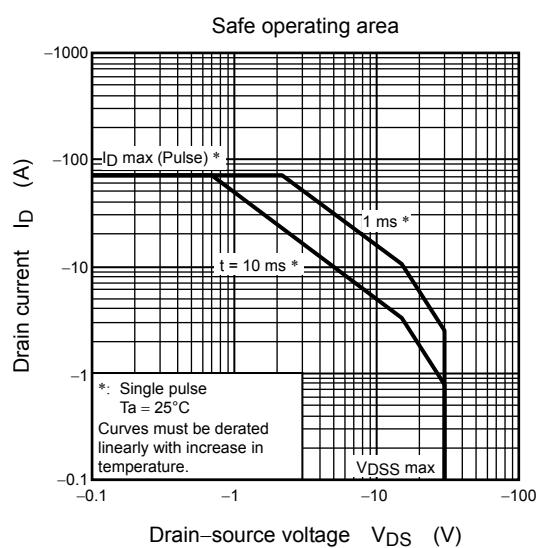
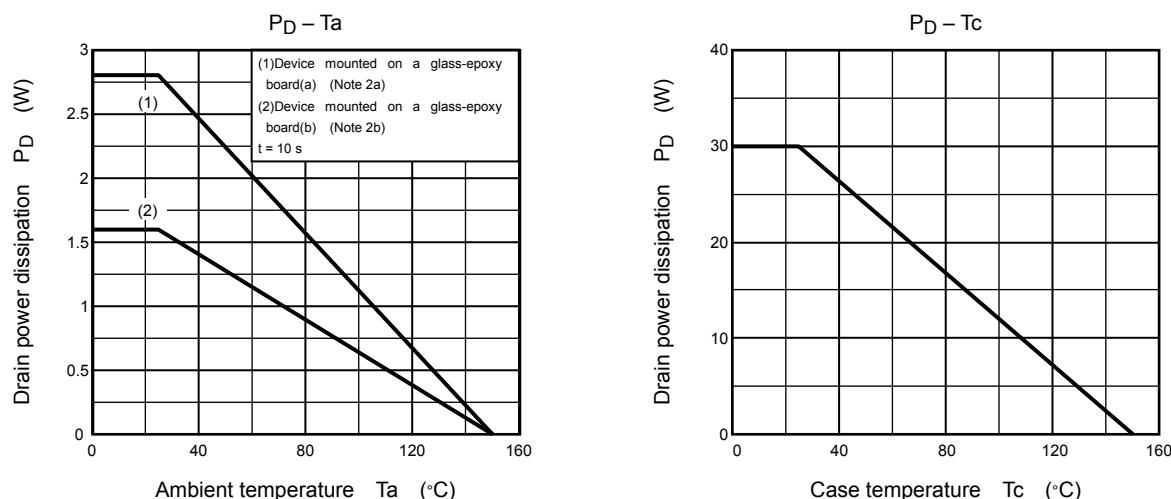
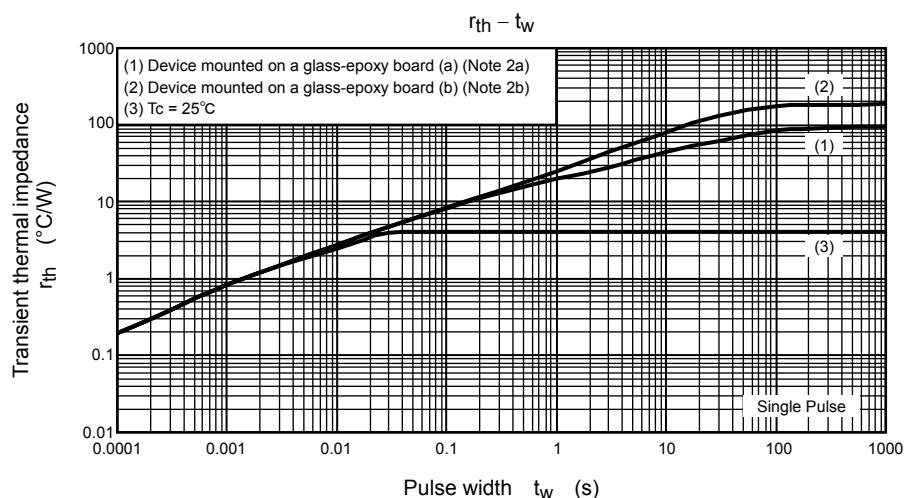
Source-Drain Ratings and Characteristics ($T_a = 25^\circ\text{C}$)

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

Note 5: $V_{(\text{BR})\text{DSX}}$ 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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