

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

TPCA8128

Lithium Ion Battery Applications

Power Management Switch Applications

- Small footprint due to compact and slim package
- Low drain-source ON resistance : $R_{DS(ON)} = 3.7 \text{ m}\Omega$ (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 ($T_a = 25^\circ\text{C}$)

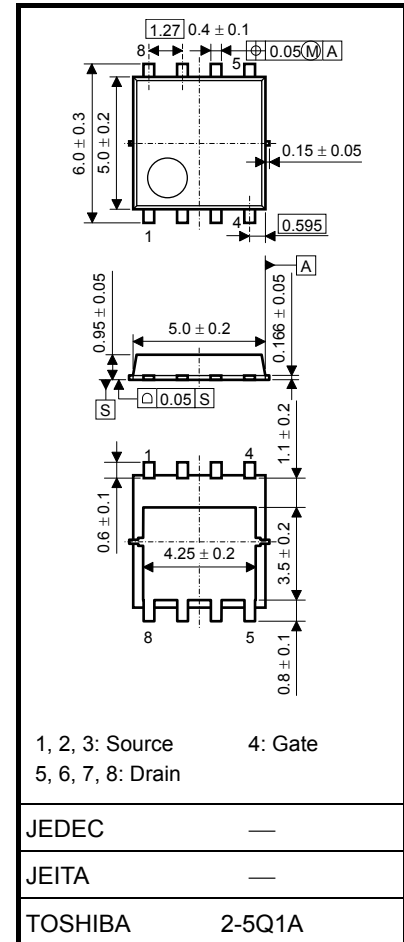
Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	-30	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	-30	V
Gate-source voltage		V_{GSS}	-25/+20	V
Drain current	DC (Note 1)	I_D	-34	A
	Pulse (Note 1)	I_{DP}	-102	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	45	W
Drain power dissipation ($t = 10 \text{ s}$) (Note 2a)		P_D	2.8	
Drain power dissipation ($t = 10 \text{ s}$) (Note 2b)		P_D	1.6	
Single pulse avalanche energy (Note 3)		E_{AS}	150	mJ
Avalanche current		I_{AR}	-34	A
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

Note: For (Note 1), (Note 2), (Note 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).

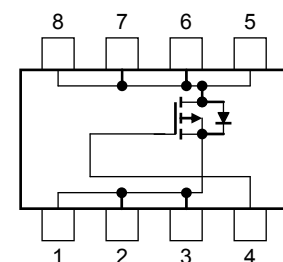
This transistor is an electrostatic-sensitive device. Handle with caution.

Unit: mm



Weight: 0.076 g (typ.)

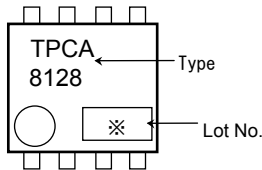
Circuit Configuration



Thermal Characteristics

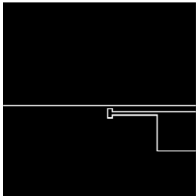
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case ($T_c = 25\text{ }^{\circ}\text{C}$)	$R_{th(ch-c)}$	2.78	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2a)	$R_{th(ch-a)}$	44.6	$^{\circ}\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2b)	$R_{th(ch-a)}$	78.1	

Marking (Note 4)



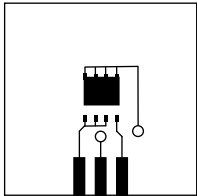
Note 1: The channel temperature should not exceed 150°C during use.

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)

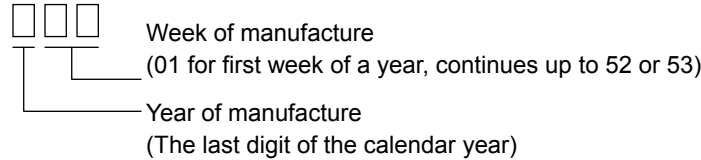


FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

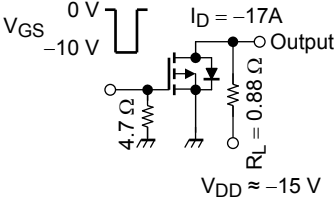
(b)

Note 3: $V_{DD} = -24\text{ V}$, $T_{ch} = 25^{\circ}\text{C}$ (initial), $L = 100\text{ }\mu\text{H}$, $R_G = 25\text{ }\Omega$, $I_{AR} = -34\text{ A}$

Note 4: ※ Weekly code: (Three digits)



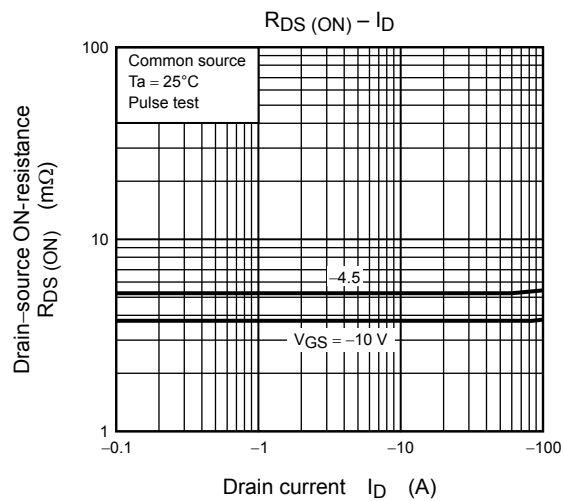
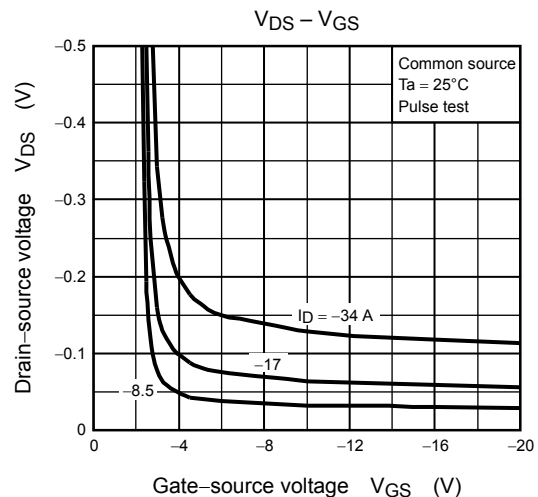
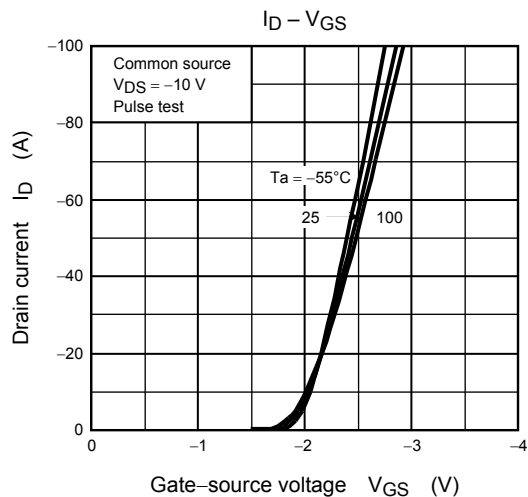
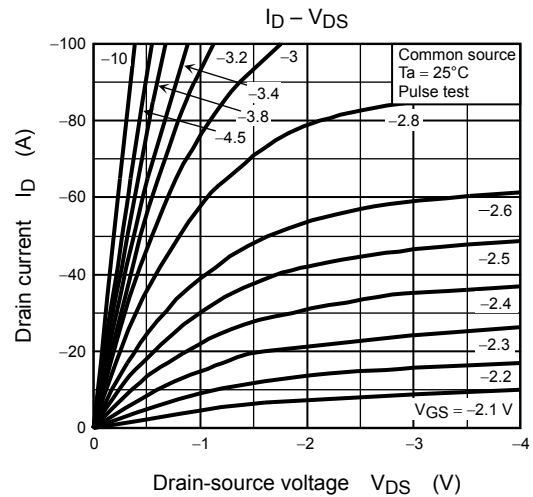
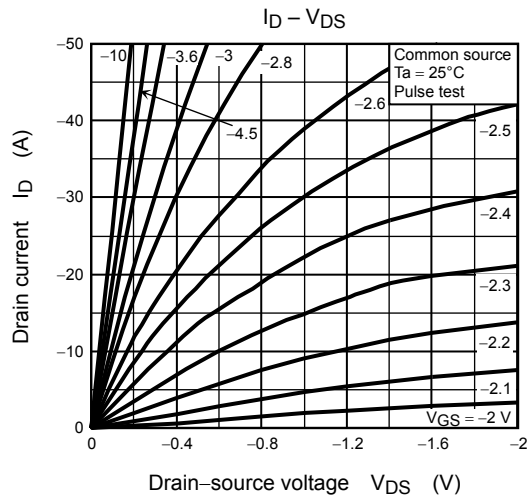
Electrical Characteristics (Ta = 25°C)

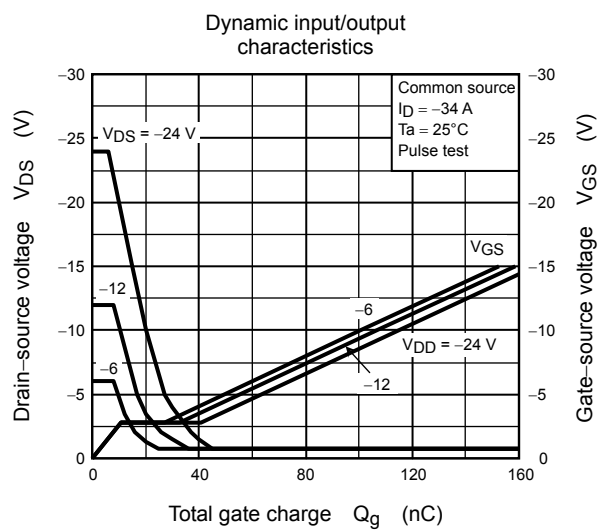
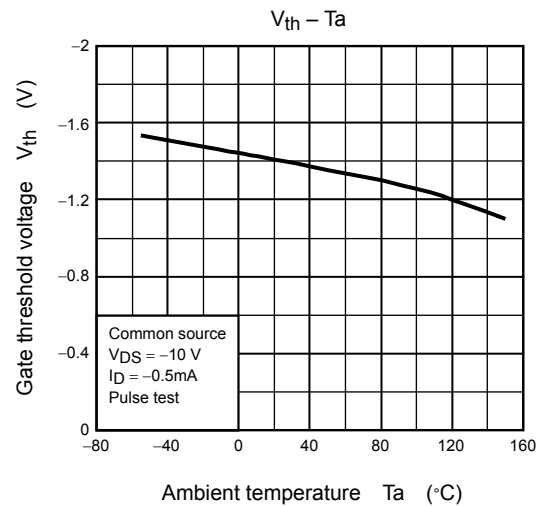
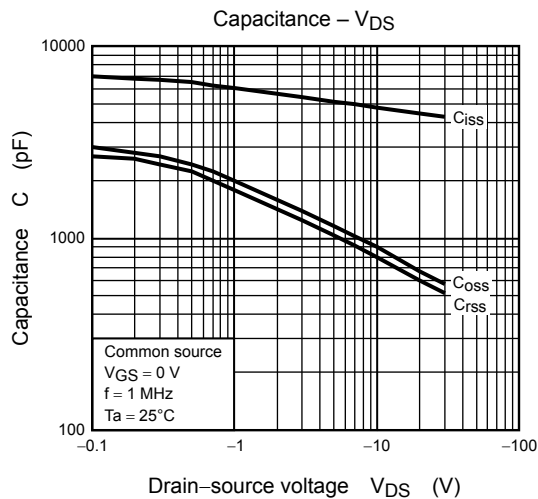
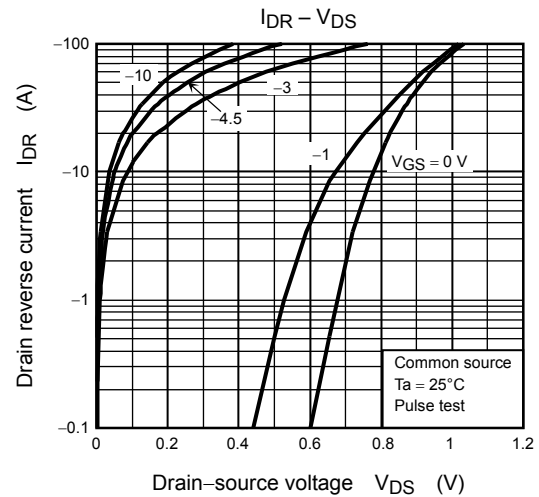
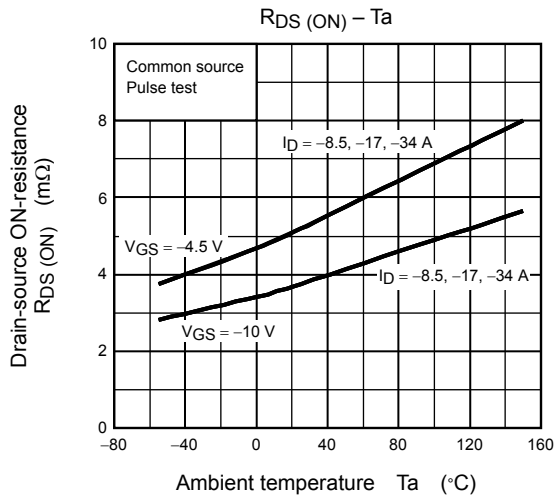
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V	—	—	±100	nA
Drain cut-off current		I _{DSS}	V _{DS} = -30 V, V _{GS} = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V (BR) DSS	I _D = -10 mA, V _{GS} = 0 V	-30	—	—	V
		V (BR) DSX	I _D = -10 mA, V _{GS} = 10 V (Note 5)	-21	—	—	
Gate threshold voltage		V _{th}	V _{DS} = -10 V, I _D = -0.5mA	-0.8	—	-2.0	V
Drain-source ON resistance		R _{DS (ON)}	V _{GS} = -4.5 V, I _D = -17 A	—	5.1	6.7	mΩ
			V _{GS} = -10 V, I _D = -17 A	—	3.7	4.8	
Input capacitance		C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	4800	—	pF
Reverse transfer capacitance		C _{rss}		—	800	—	
Output capacitance		C _{oss}		—	900	—	
Switching time	Rise time	t _r		—	11	—	ns
	Turn-on time	t _{on}		—	21	—	
	Fall time	t _f		—	135	—	
	Turn-off time	t _{off}		Duty ≤ 1%, t _w = 10 μs	—	390	
Total gate charge (gate-source plus gate-drain)		Q _g	V _{DD} ≈ -24 V, V _{GS} = -10 V I _D = -34 A	—	115	—	nC
Gate-source charge 1		Q _{gs1}		—	11	—	
Gate-drain ("Miller") charge		Q _{gd}		—	30	—	

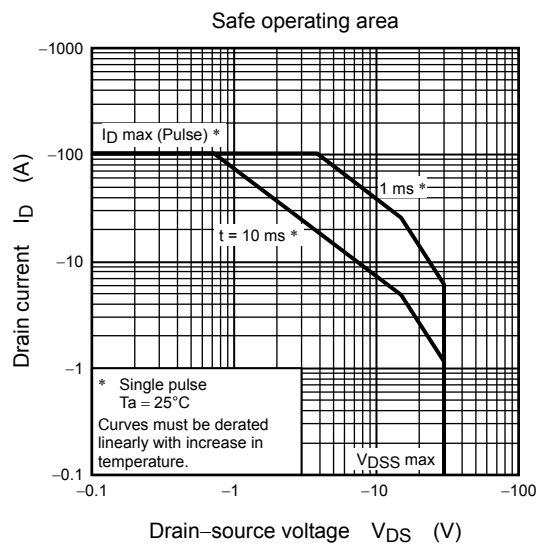
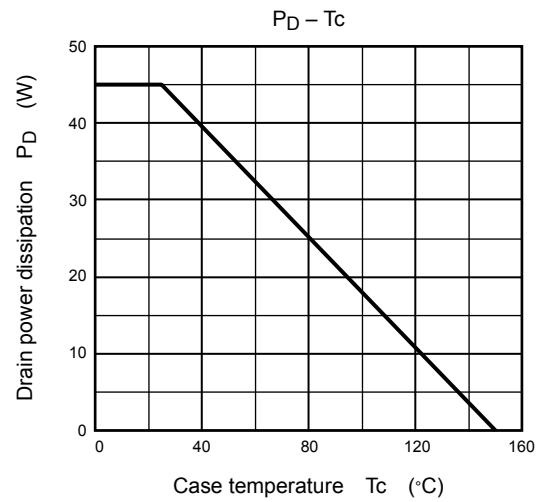
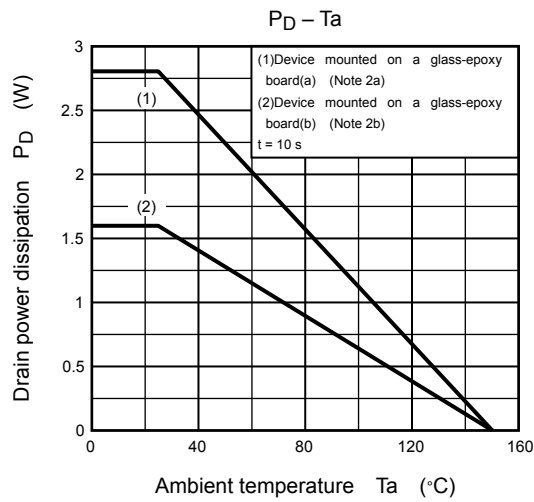
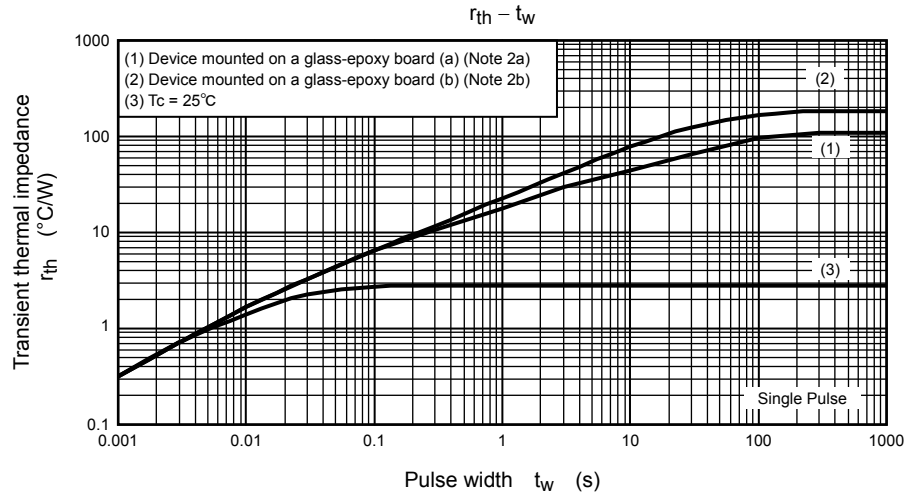
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	-102	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = -34 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.2	V

Note 5: V_{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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