

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOS II)

TPC8209

Lithium Ion Battery Applications
Portable Equipment Applications
Notebook PC Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS(ON)} = 30 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 10 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 30 \text{ V}$)
- Enhancement-mode: $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

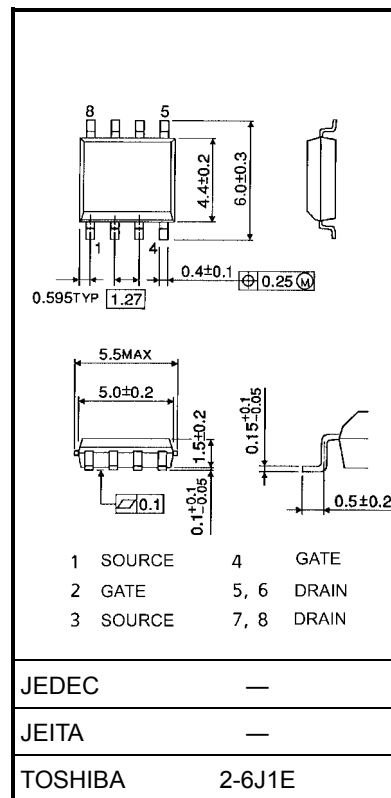
Maximum Ratings ($T_a = 25^\circ\text{C}$)

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}	± 20	V
Drain current	D C (Note 1)	I_D	5	A
	Pulse (Note 1)	I_{DP}	20	
Drain power dissipation ($t = 10\text{s}$) (Note 2a)	Single-device operation (Note 3a)	$P_{D(1)}$	1.5	W
	Single-device value at dual operation (Note 3b)	$P_{D(2)}$	1.1	
Drain power dissipation ($t = 10\text{s}$) (Note 2b)	Single-device operation (Note 3a)	$P_{D(1)}$	0.75	W
	Single-device value at dual operation (Note 3b)	$P_{D(2)}$	0.45	
Single pulse avalanche energy (Note 4)		E_{AS}	32.5	mJ
Avalanche current		I_{AR}	5	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		E_{AR}	0.1	mJ
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	$-55 \sim 150$	$^\circ\text{C}$

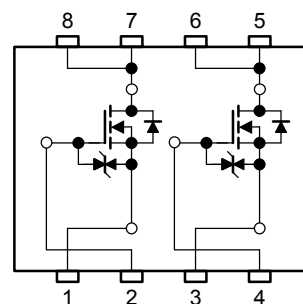
Note: For (Note 1), (Note 2), (Note 3) and (Note 4), please refer to the next page.

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

Unit: mm



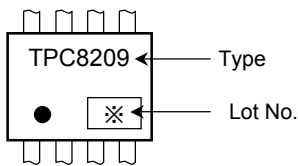
Circuit Configuration



Thermal Characteristics

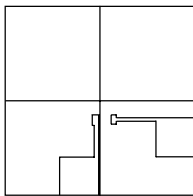
Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10s) (Note 1a)	Single-device operation (Note 2a)	$R_{th (ch-a) (1)}$	83.3	°C/W
	Single-device value at dual operation (Note 2b)	$R_{th (ch-a) (2)}$	114	
Thermal resistance, channel to ambient (t = 10s) (Note 2b)	Single-device operation (Note 2a)	$R_{th (ch-a) (1)}$	167	
	Single-device value at dual operation (Note 2b)	$R_{th (ch-a) (2)}$	278	

Marking (Note 6)



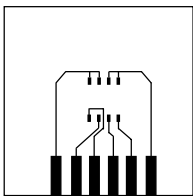
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(unit: mm)

(b)

- a) Device mounted on a glass-epoxy board (a) b) Device mounted on a glass-epoxy board (b)

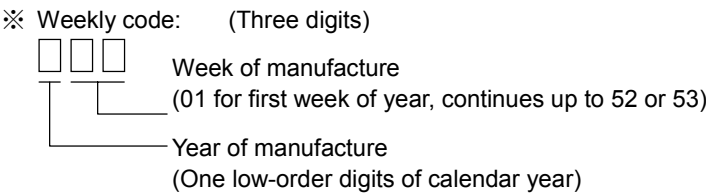
Note 3:

- a) The power dissipation and thermal resistance values are shown for a single device.
(During single-device operation, power is only applied to one device.)
- b) The power dissipation and thermal resistance values are shown for a single device.
(During dual operation, power is evenly applied to both devices.)

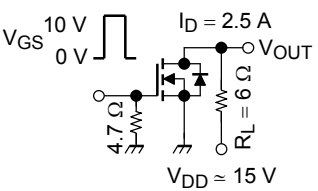
Note 4: $V_{DD} = 24\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.0\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 5\text{ A}$

Note 5: Repetitive rating: pulse width limited by maximum channel temperature

Note 6: • on lower left of the marking indicates Pin 1.

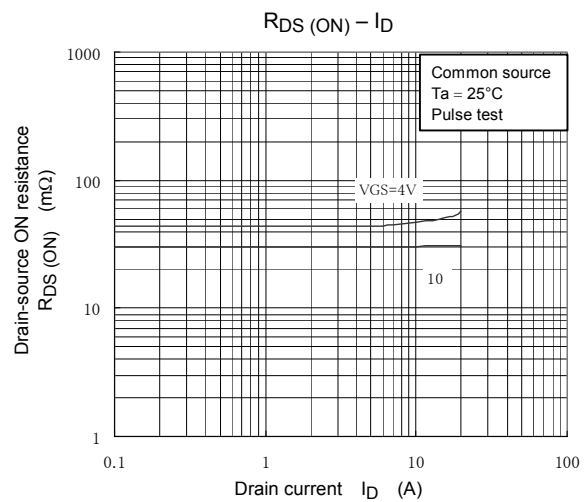
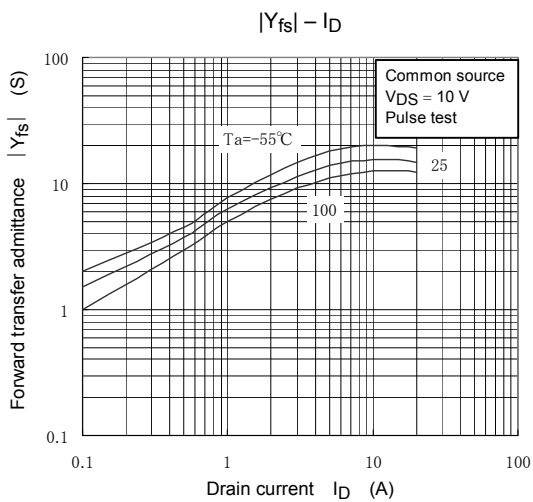
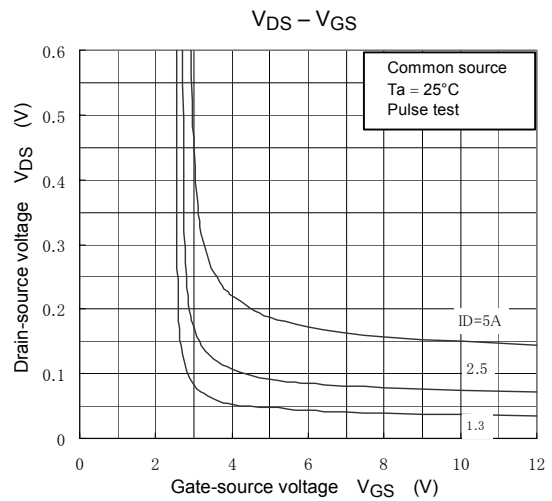
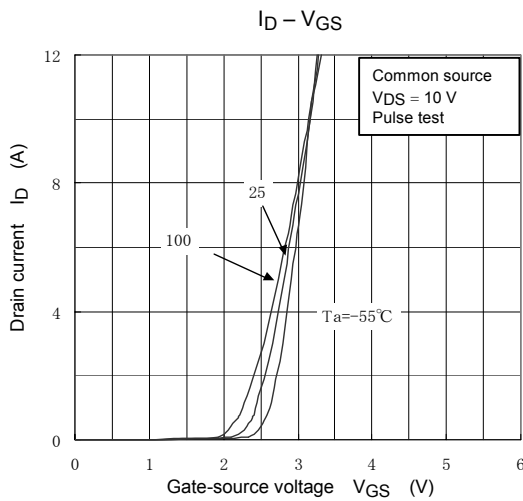
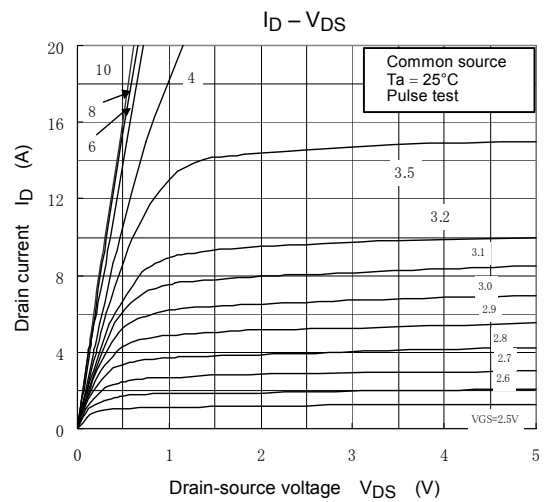
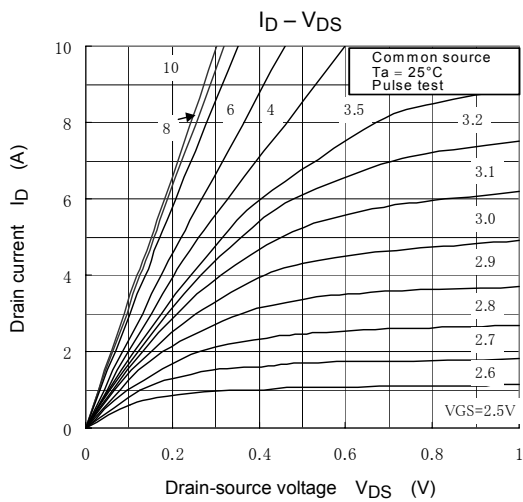


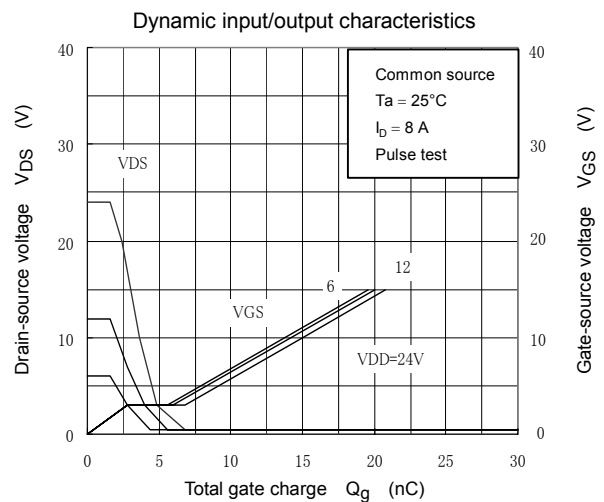
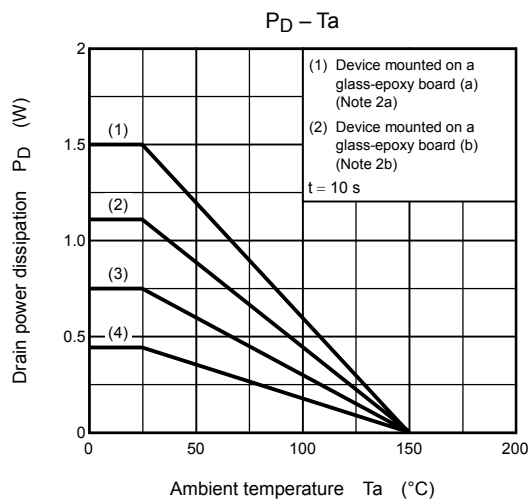
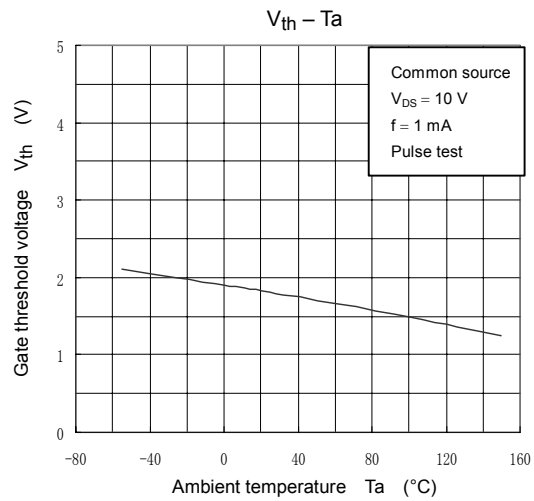
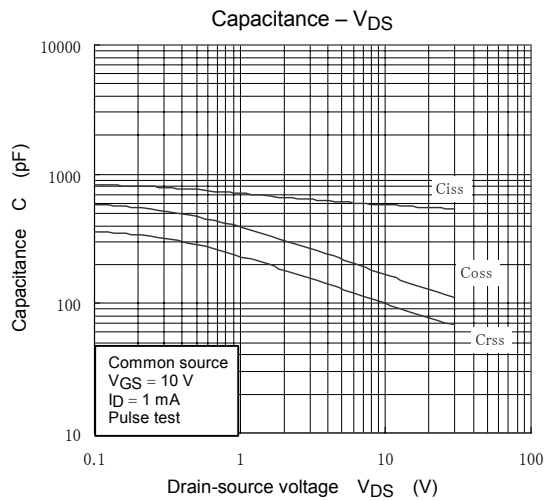
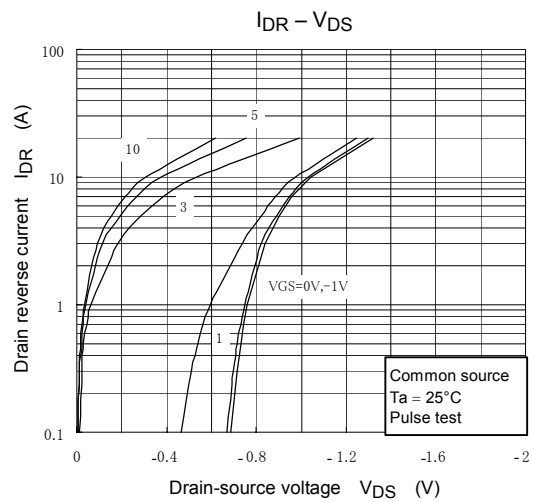
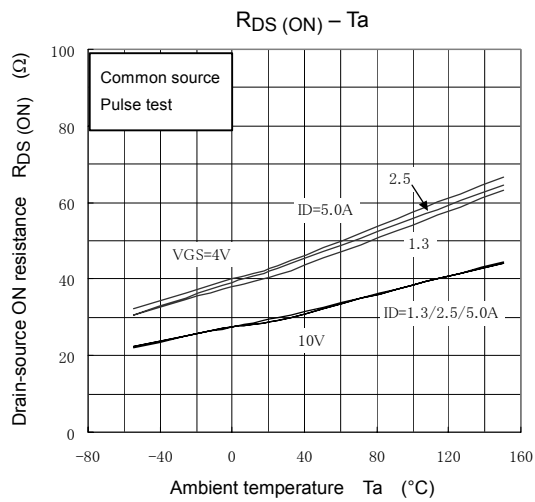
Electrical Characteristics (Ta = 25°C)

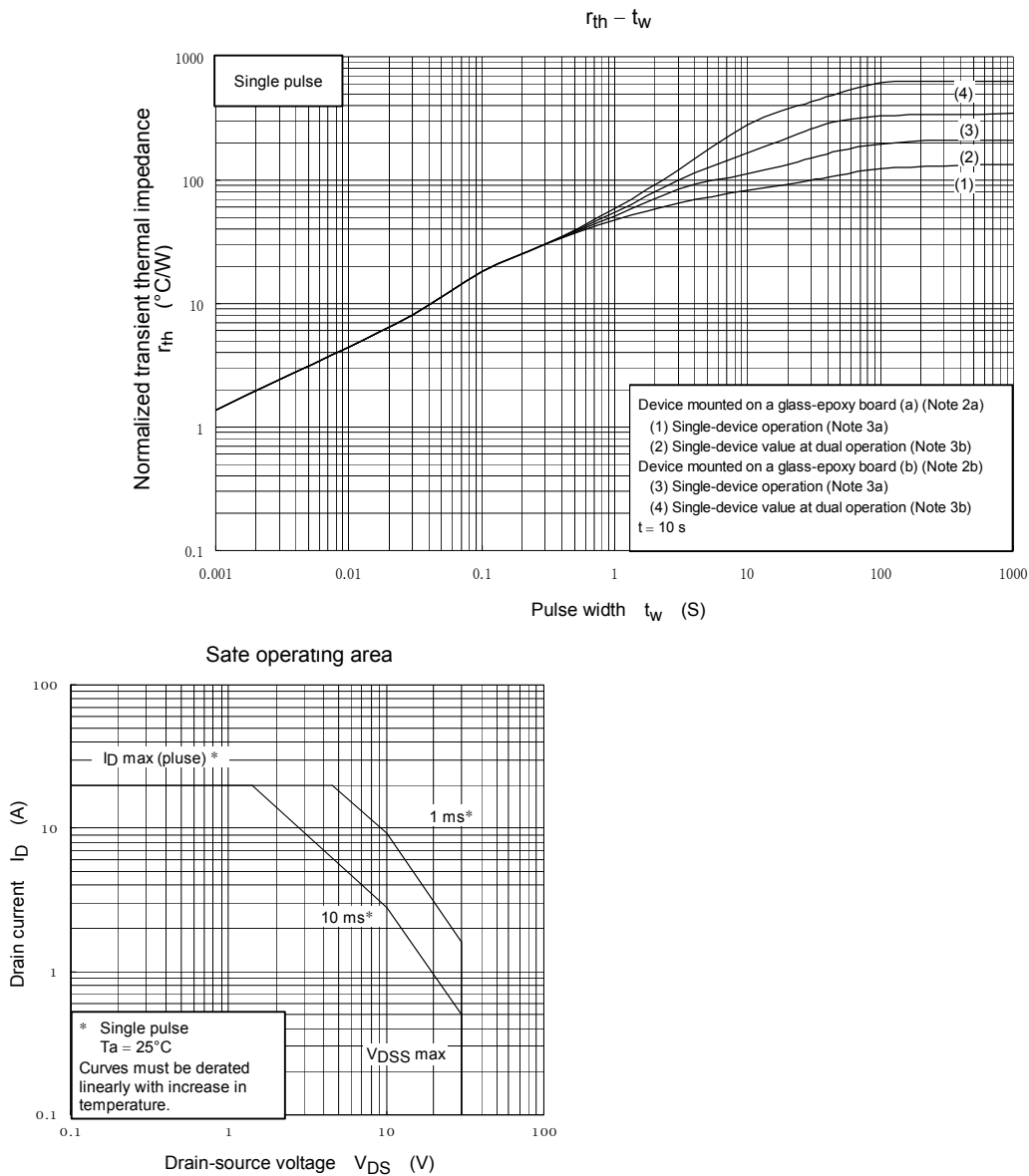
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	± 10	μA
Drain cut-OFF current		I_{DSS}	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR) DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	30	—	—	V
		$V_{(BR) DSS}$	$I_D = 10 \text{ mA}, V_{GS} = -20 \text{ V}$	15	—	—	
Gate threshold voltage		V_{th}	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	1.3	—	2.5	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 4.0 \text{ V}, I_D = 2.5 \text{ A}$	—	43	60	m Ω
		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 2.5 \text{ A}$	—	30	40	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 2.5 \text{ A}$	5	10	—	S
Input capacitance		C_{iss}	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	600	—	pF
Reverse transfer capacitance		C_{rss}		—	95	—	
Output capacitance		C_{oss}		—	160	—	
Switching time	Rise time	t_r	 <p>$V_{GS} = 10 \text{ V}$ 0 V $I_D = 2.5 \text{ A}$ V_{OUT} 4.7Ω $R_L = 6 \Omega$ $V_{DD} \approx 15 \text{ V}$</p> <p>Duty $\leq 1\%$, $t_w = 10 \mu\text{s}$</p>	—	4	—	ns
	Turn-ON time	t_{on}		—	10	—	
	Fall time	t_f		—	9	—	
	Turn-OFF time	t_{off}		—	35	—	
Total gate charge (Gate-source plus gate-drain)		Q_g	$V_{DD} \approx 24 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 5 \text{ A}$	—	15	—	nC
Gate-source charge		Q_{gs}		—	11	—	
Gate-drain ("miller") charge		Q_{gd}		—	4	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	20	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 5 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V







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