

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π-MOSV)

TPCS8004

High-Speed Switching Applications
 Switching Regulator Applications
 DC-DC Converter Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS(ON)} = 0.56 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 1.8 S$ (typ.)
- Low leakage current: $I_{DSS} = 100 \mu A$ (max) ($V_{DS} = 200 V$)
- Enhancement model: $V_{th} = 1.5 \sim 3.5 V$ ($V_{DS} = 10 V, I_D = 1 mA$)

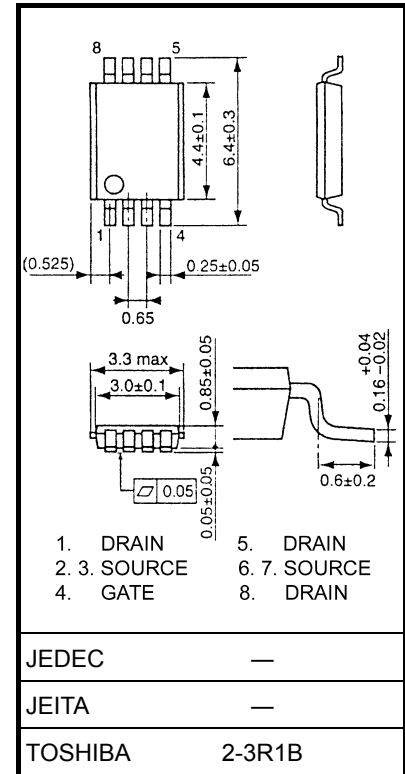
Maximum Ratings ($T_a = 25^\circ C$)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	200	V
Drain-gate voltage ($R_{GS} = 20 k\Omega$)	V_{DGR}	200	V
Gate-source voltage	V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	1.3
	Pulse (Note 1)	I_{DP}	5.2
Drain power dissipation ($t = 10 s$) (Note 2a)	P_D	1.5	W
Single pulse avalanche energy(Note3)	E_{AS}	1.05	mJ
Avalanche current	I_{AR}	1.3	A
Repetitive avalanche energy (Note2a, Note 4)	E_{AR}	0.15	mJ
Channel temperature	T_{ch}	150	$^\circ C$
Storage temperature range	T_{stg}	$-55 \sim 150$	$^\circ C$

Note 1, Note 2, Note 3 and Note 4: See the next page.

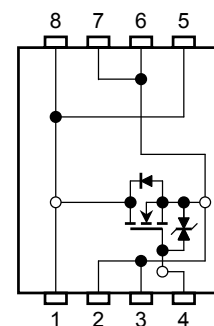
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.035 g (typ.)

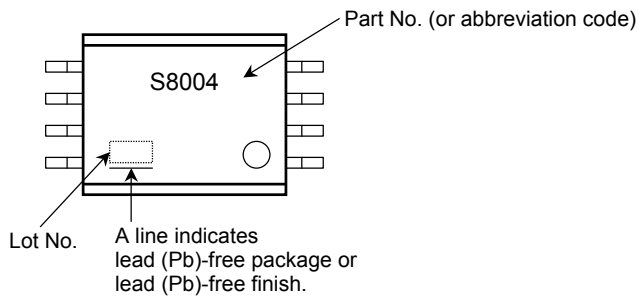
Circuit Configuration



Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th(ch-a)}$	83.3	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th(ch-a)}$	208	°C/W

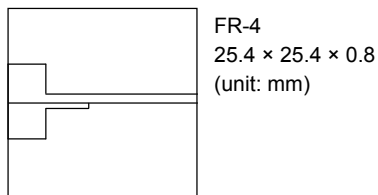
Marking (Note 5)



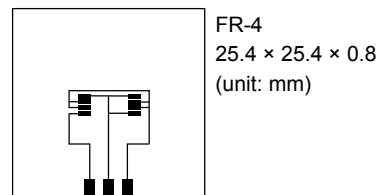
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2:

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



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

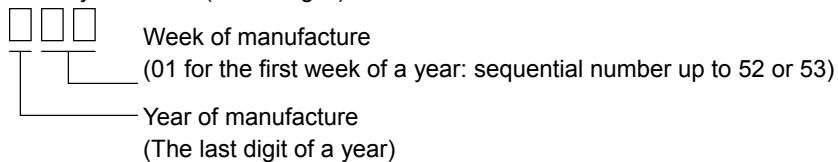


Note 3: $V_{DD} = 50\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.0\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 1.3\text{ A}$

Note 4: Repetitive rating: pulse width limited by maximum channel temperature

Note 5: \bigcirc on lower right of the marking indicates Pin 1.

※ Weekly code: (Three digits)

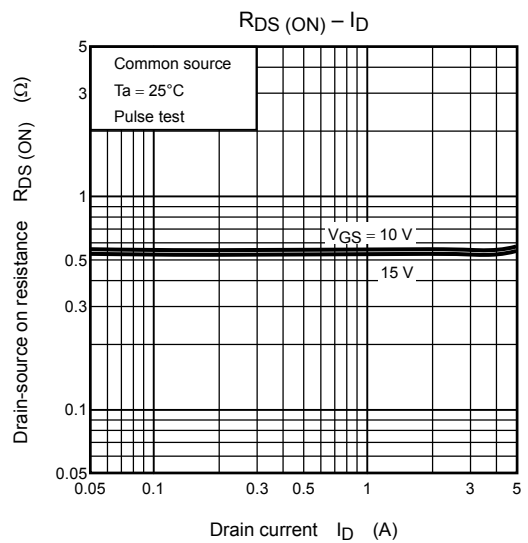
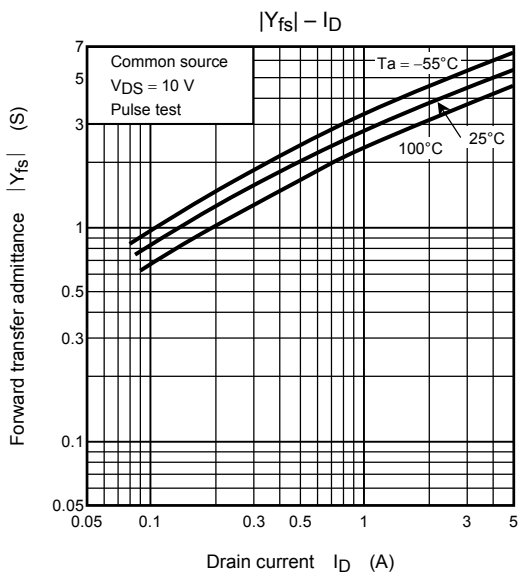
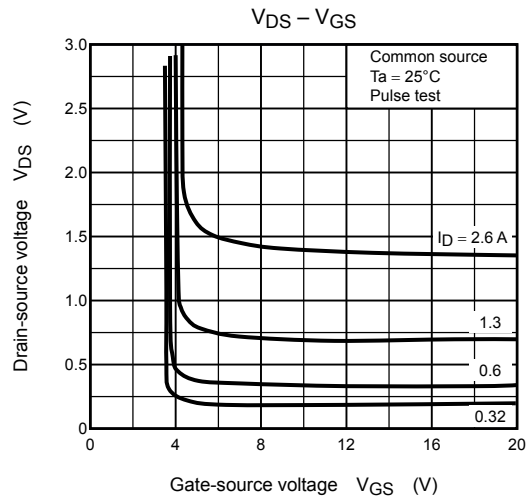
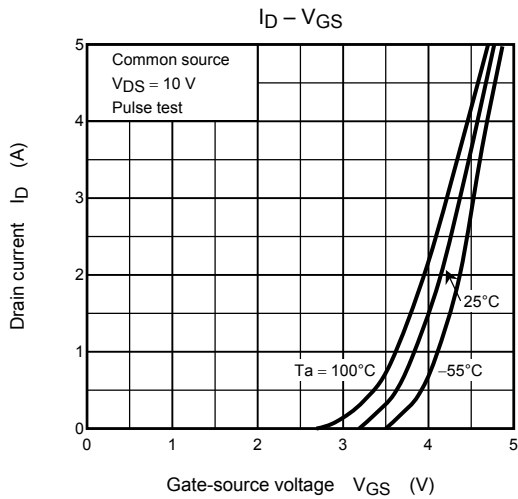
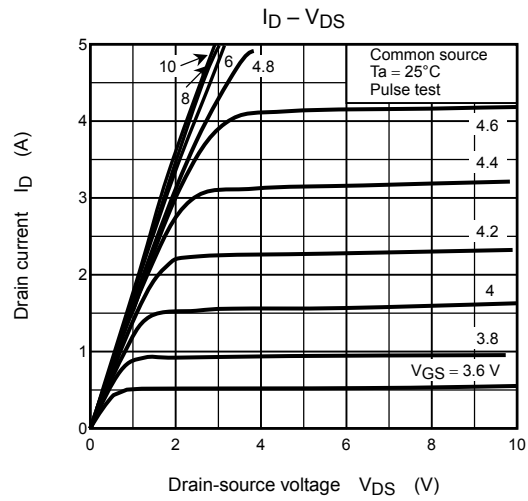
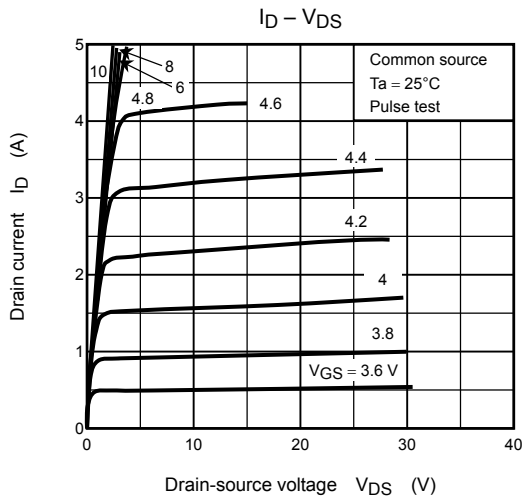


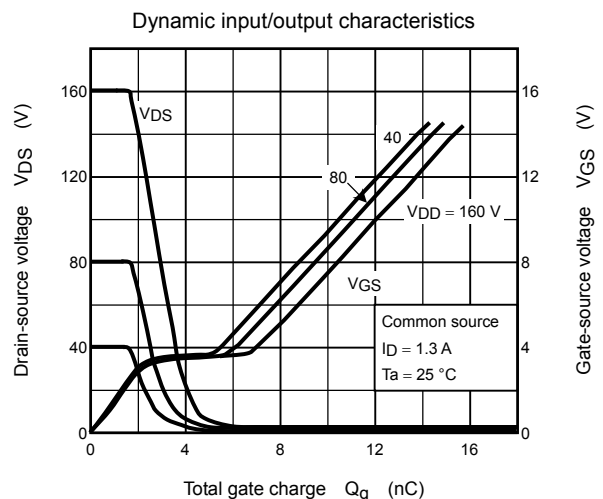
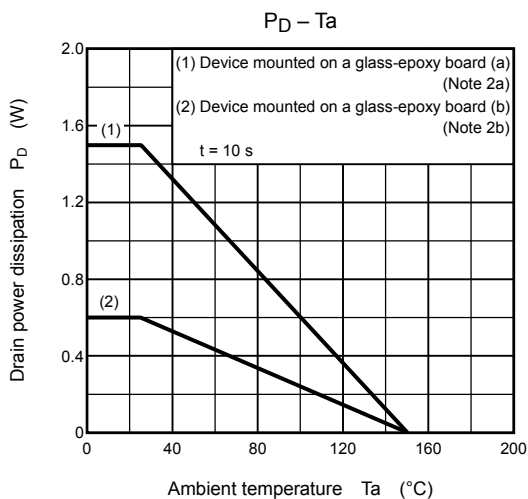
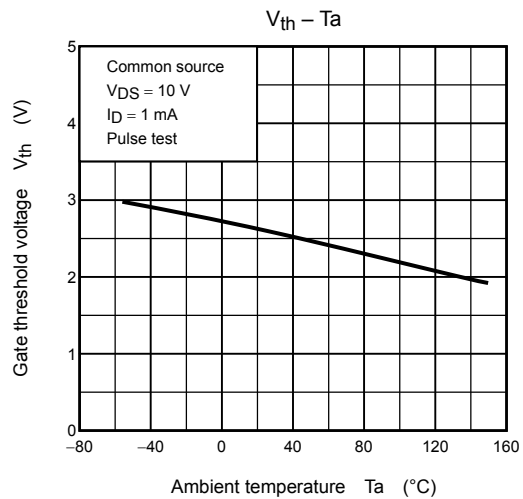
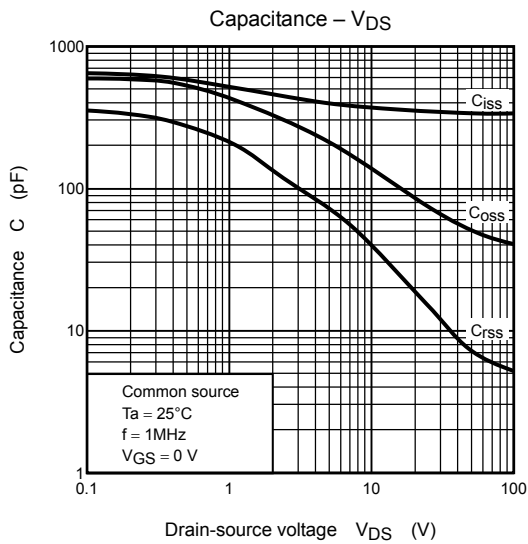
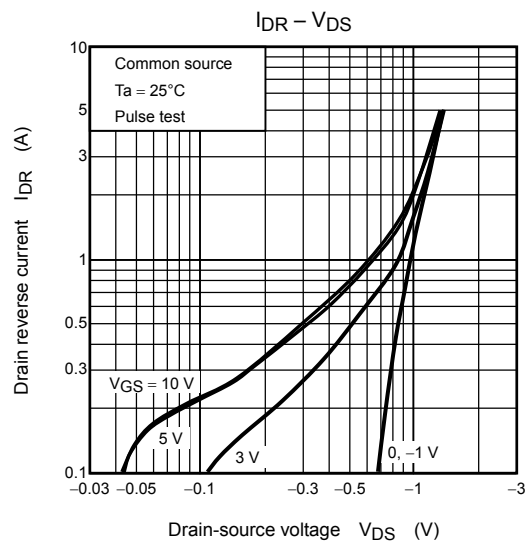
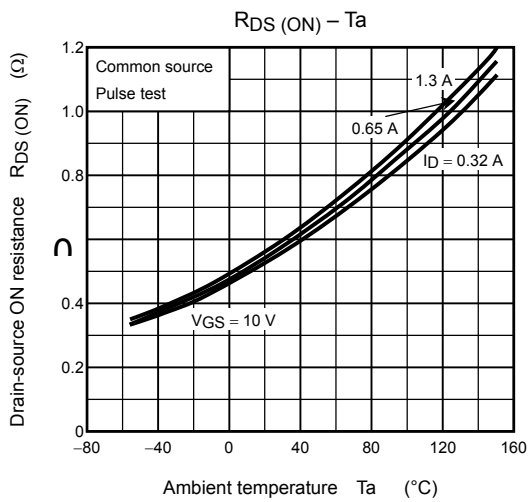
Electrical Characteristics (Ta = 25°C)

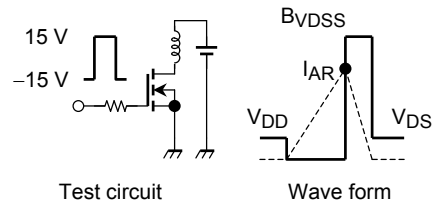
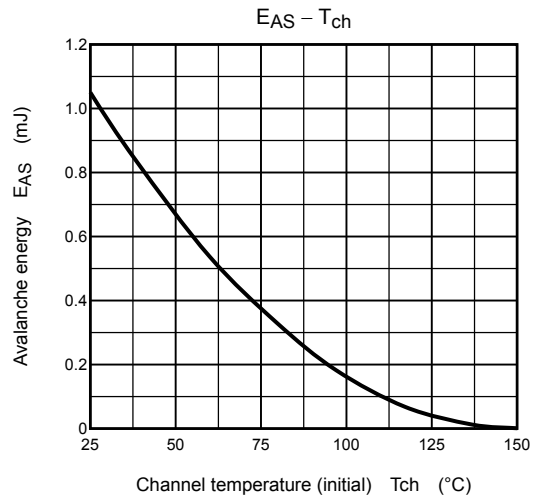
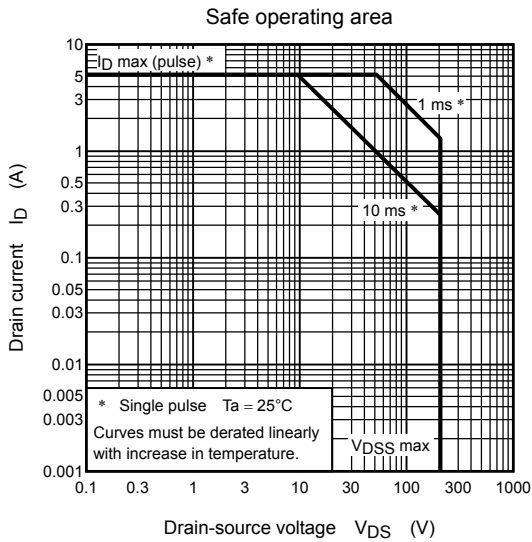
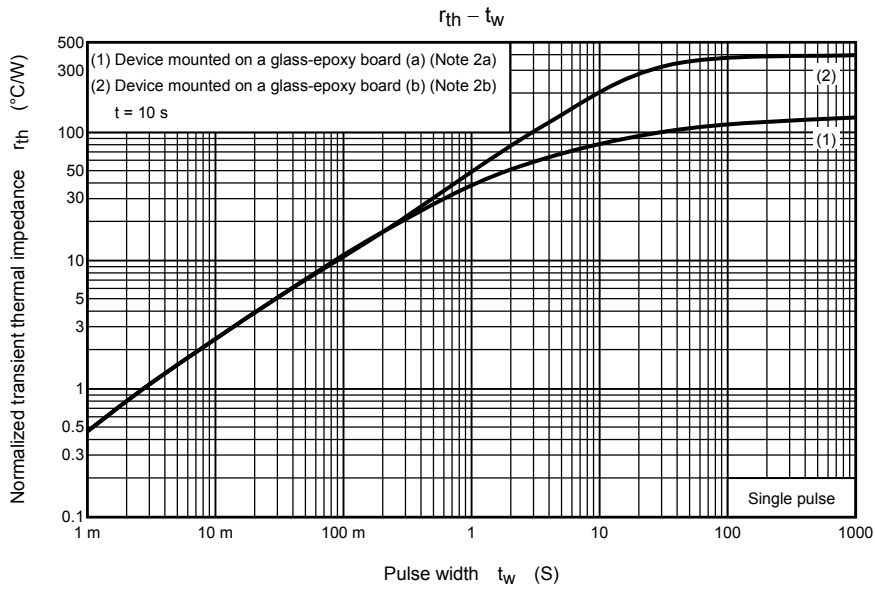
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-OFF current		I_{DSS}	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	200	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.5	—	3.5	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 0.6\text{ A}$	—	0.56	0.8	Ω
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 0.6\text{ A}$	0.9	1.8	—	S
Input capacitance		C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	380	—	pF
Reverse transfer capacitance		C_{rss}		—	40	—	pF
Output capacitance		C_{oss}		—	140	—	pF
Switching time	Rise time	t_r	<p>$V_{GS} = 10\text{ V}, 0\text{ V}$ $I_D = 0.6\text{ A}$ V_{OUT} $R_L = 167\ \Omega$ $V_{DD} \approx 100\text{ V}$ $Duty \leq 1\%, t_w = 10\ \mu\text{s}$</p>	—	4.5	—	ns
	Turn-ON time	t_{on}		—	12	—	
	Fall time	t_f		—	23	—	
	Turn-OFF time	t_{off}		—	54	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx 160\text{ V}, V_{GS} = 10\text{ V}, I_D = 1.3\text{ A}$	—	12	—	nC
Gate-source charge		Q_{gs}		—	8	—	nC
Gate-drain ("miller") charge		Q_{gd}		—	4	—	nC

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current (pulse)	(Note 1)	I_{DRP}	—	—	—	5.2	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 1.3\text{ A}, V_{GS} = 0\text{ V}$	—	—	-2.0	V
Reverse recovery time		t_{rr}	$I_{DR} = 1.3\text{ A}, V_{GS} = 0\text{ V},$	—	89	—	ns
Reverse recovery charge		Q_{rr}	$dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	230	—	nC







$T_{ch} = 25^\circ\text{C}$ (Initial)
 Peak $I_{AR} = 1.3$ A, $R_G = 25 \Omega$
 $V_{DD} = 50$ V, $L = 1$ mH

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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