

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $\pi$ -MOSV)

# TPCS8004

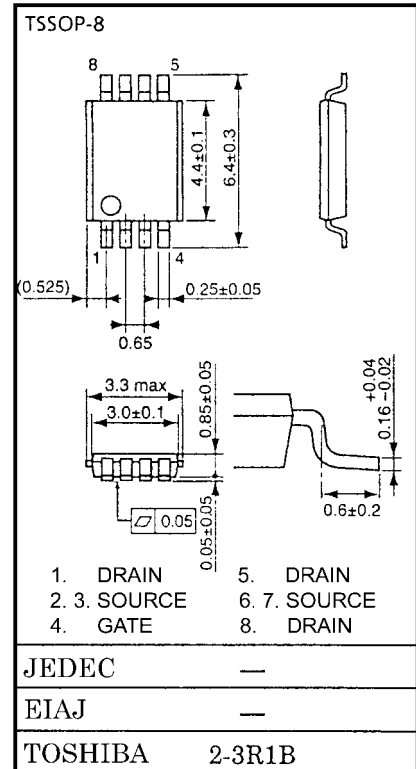
High Speed Switching Applications  
 Switching Regulator Applications  
 DC-DC Converter

INDUSTRIAL APPLICATIONS  
 UNIT: mm

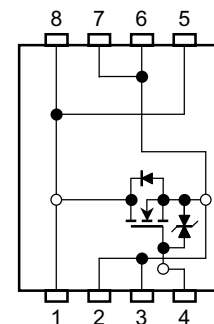
- Low drain-source ON resistance:  $R_{DS(ON)} = 0.56 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 1.8 S$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \mu A$  (max) ( $V_{DS} = 200 V$ )
- Enhancement-model:  $V_{th} = 1.5 \sim 3.5 V$  ( $V_{DS} = 10 V, I_D = 1 mA$ )

### 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		$V_{GSS}$	$\pm 20$	V
Drain current	DC	$I_D$	1.3	A
	Pulse	$I_{DP}$	5.2	
Drain power dissipation ( $T_a = 25^\circ C$ ) (Note1)		$P_D$	1.5	W
Single pulse avalanche energy (Note2)		$E_{AS}$	1.05	mJ
Avalanche current		$I_{AR}$	1.3	A
Repetitive avalanche energy (Note3)		$E_{AR}$	0.15	mJ
Channel temperature		$T_{ch}$	150	$^\circ C$
Storage temperature range		$T_{stg}$	-55~150	$^\circ C$



### Circuit Configuration



### Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	83.3	$^\circ C/W$

Note 1: Drive Operation: Mount on glass epoxy board [1 inch<sup>2</sup> × 0.8 t] ( $\leq 10 s$ )

Note 2:  $V_{DD} = 50 V, T_{ch} = 25^\circ C, L = 1.0 mH, I_{AR} = 1.3 A, R_G = 25 \Omega$

Note 3: Repetitive rating; pulse width limited by max junction temperature.

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

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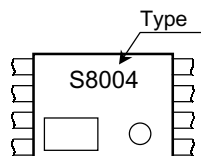
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-OFF current		$I_{DSS}$	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
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	$\Omega$
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	$t_r$		—	4.5	—	ns
	Turn-ON time	$t_{on}$		—	12	—	
	Fall time	$t_f$		—	23	—	
	Turn-OFF time	$t_{off}$		$V_{IN}: t_r, t_f < 5\text{ ns}$ $Duty \leq 1\%, t_w = 10\text{ }\mu\text{s}$	—	54	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} = 160\text{ V}, V_{GS} = 10\text{ V}, I_D = 1.3\text{ A}$	—	12	—	nC
Gate-source charge		$Q_{gs}$		—	8	—	nC
Gate-drain ("miller") charge		$Q_{gd}$		—	4	—	nC

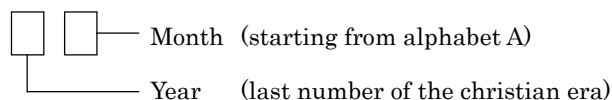
## Source-Drain Diode Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current	$I_{DR}$	—	—	—	1.3	A
Pulse drain reverse current	$I_{DRP}$	—	—	—	5.2	A
Diode forward voltage	$V_{DSF}$	$I_{DR} = 1.3\text{ A}, V_{GS} = 0\text{ V}$	—	—	-20	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 1.3\text{ A}, V_{GS} = 0\text{ V},$	—	89	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	231	—	$\mu\text{C}$

## Marking

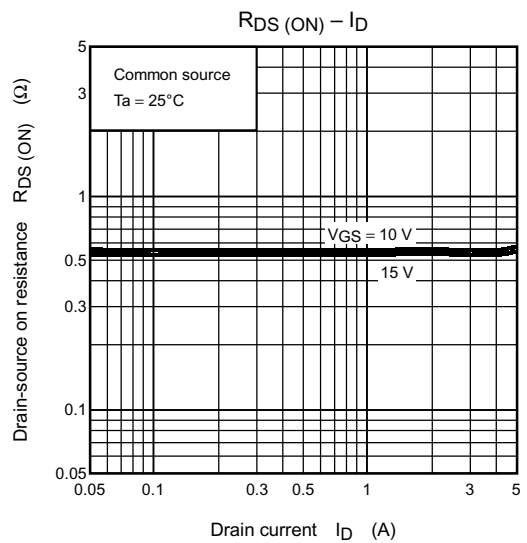
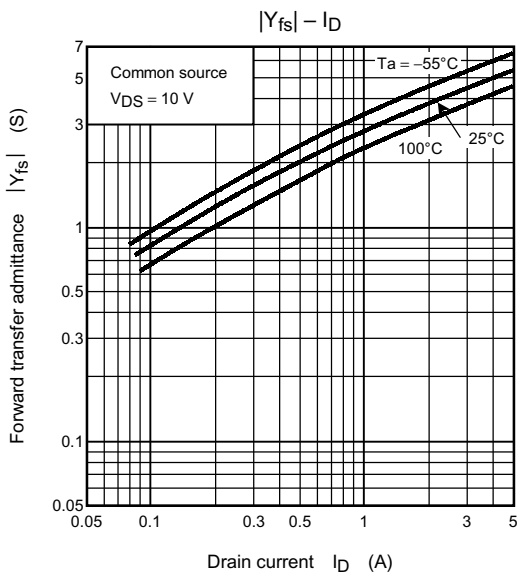
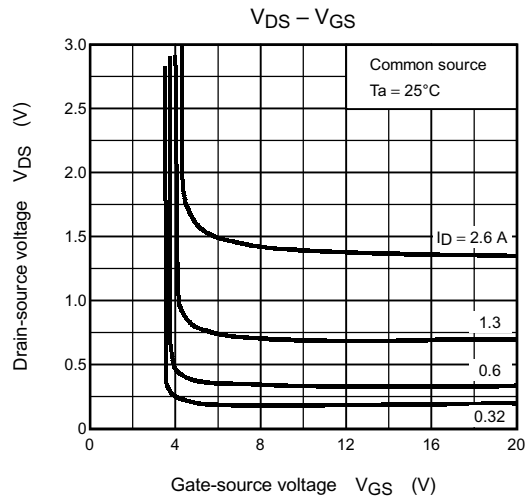
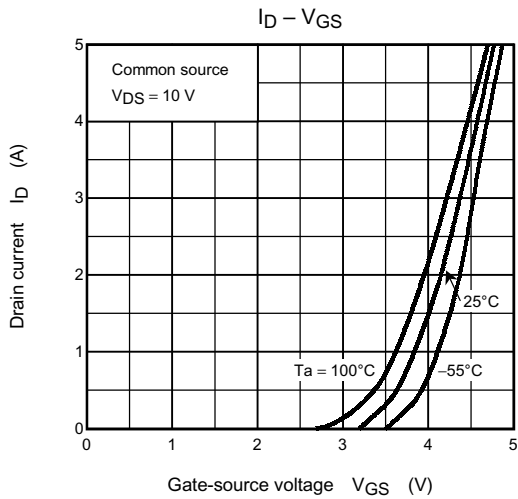
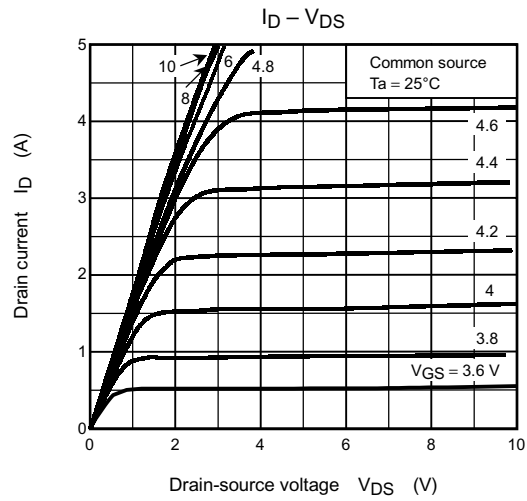
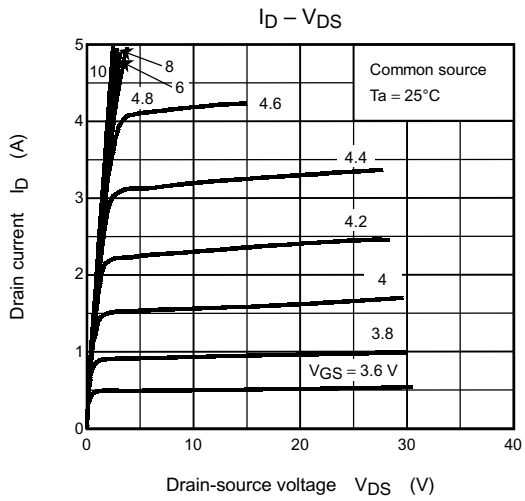


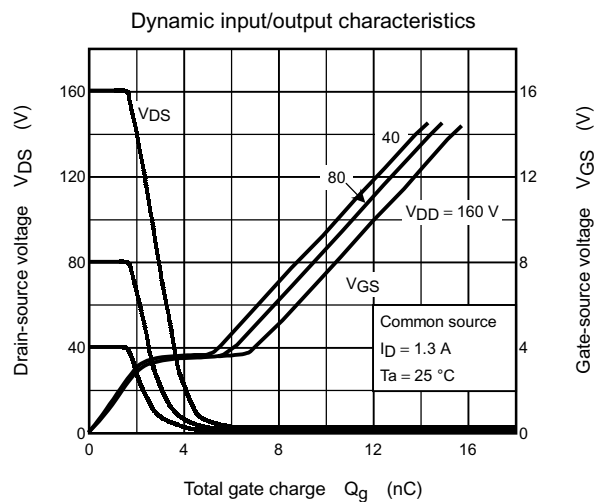
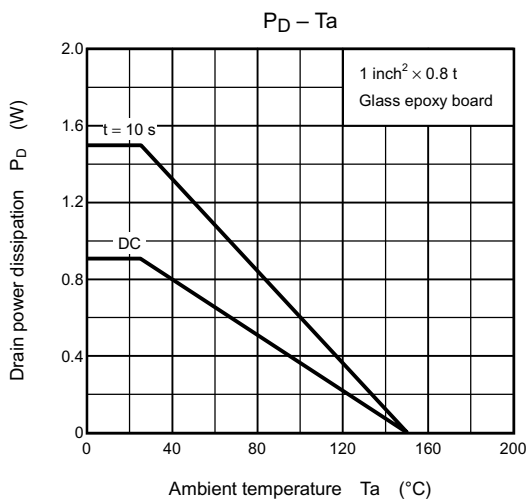
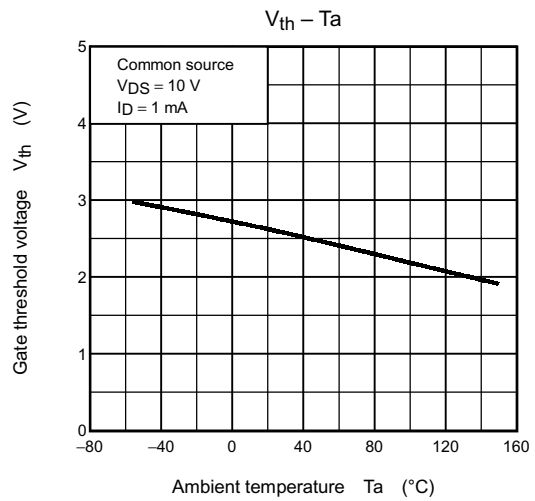
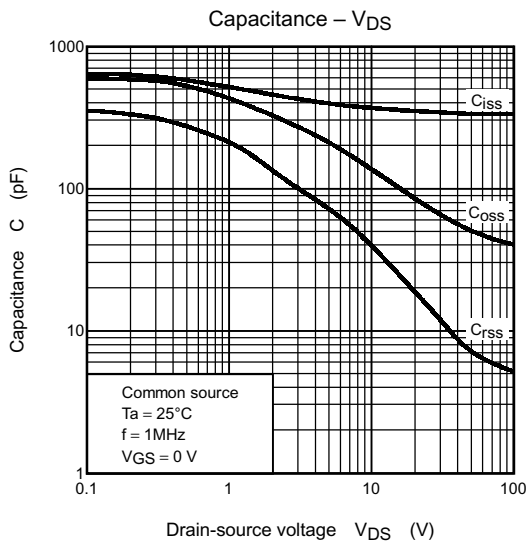
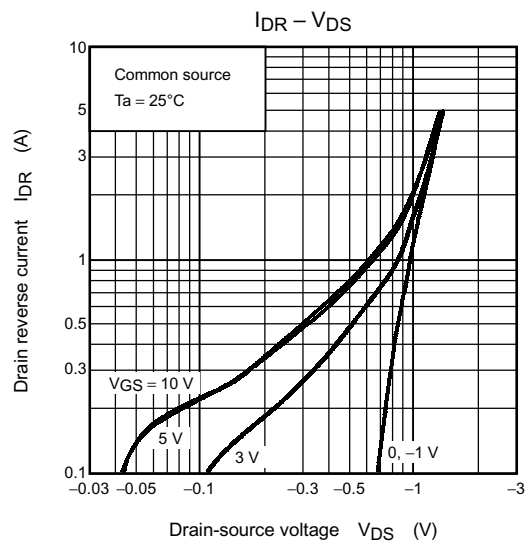
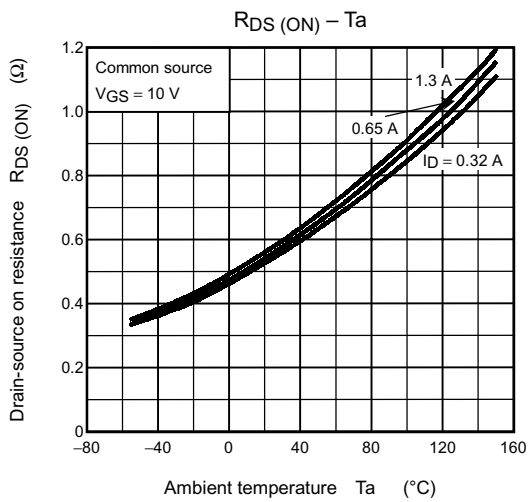
Lot Number

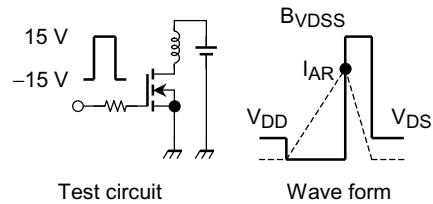
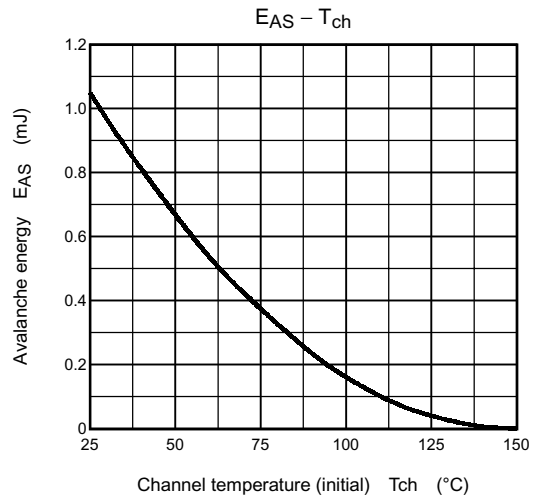
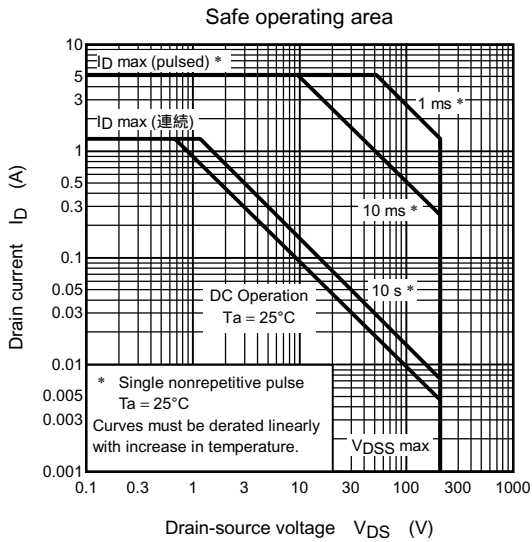
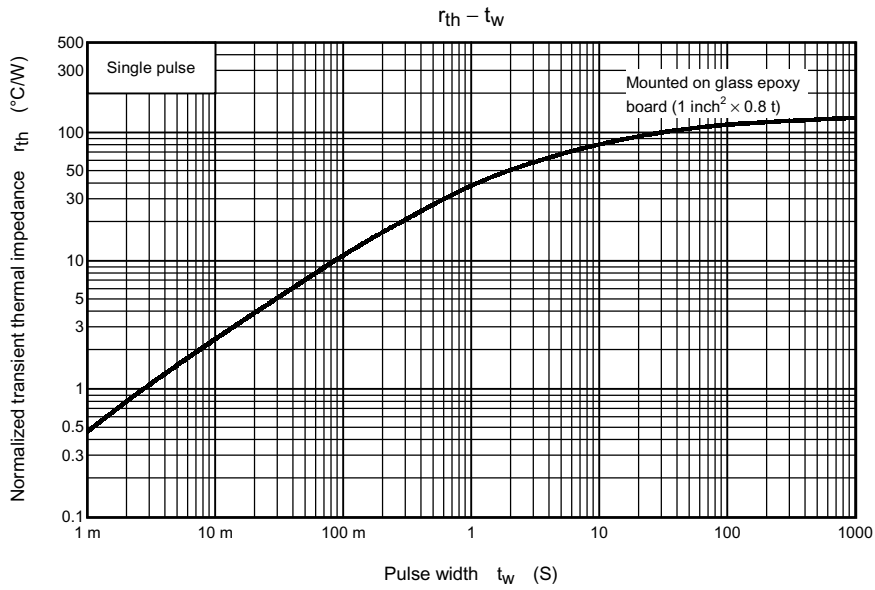


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Peak  $I_{AR} = 1.3 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 50 \text{ V}$ ,  $L = 1 \text{ mH}$

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