

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

# TPCP8002

Notebook PC Applications  
 Portable Equipment Applications

- Lead (Pb)-Free
- Small footprint due to small and thin package
- Low drain-source ON-resistance  
 :  $R_{DS(ON)} = 7 \text{ m}\Omega$  (typ.)
- High forward transfer admittance  
 :  $|Y_{fs}| = 36 \text{ S}$  (typ.)
- Low leakage current  
 :  $I_{DSS} = 10 \text{ }\mu\text{A}$  ( $V_{DS} = 20 \text{ V}$ )
- Enhancement mode  
 :  $V_{th} = 0.5 \text{ to } 1.2 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 0.2 \text{ mA}$ )

## Absolute Maximum Ratings (Ta = 25°C)

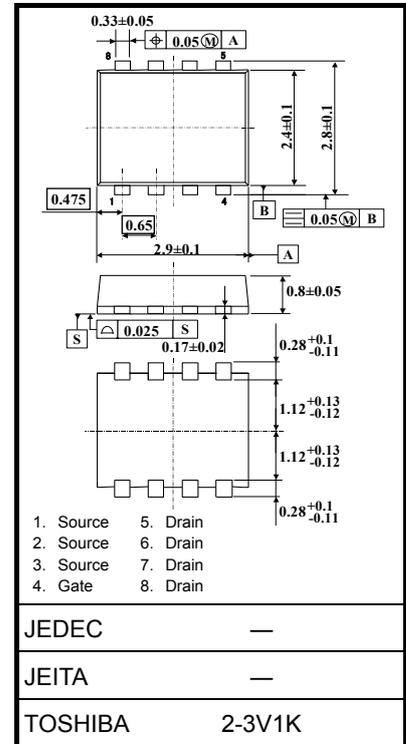
Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	20	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	20	V
Gate-source voltage		$V_{GSS}$	$\pm 12$	V
Drain current	DC (Note 1)	$I_D$	9.1	A
	Pulse (Note 1)	$I_{DP}$	36.4	
Drain power dissipation (t = 5 s) (Note 2a)		$P_D$	1.68	W
Drain power dissipation (t = 5 s) (Note 2b)		$P_D$	0.84	
Single pulse avalanche energy (Note 3)		$E_{AS}$	21.5	mJ
Avalanche current		$I_{AR}$	9.1	A
Repetitive avalanche energy (Note 4)		$E_{AR}$	0.168	mJ
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55~150	°C

Note: For Notes 1 to 5, refer to the next page.

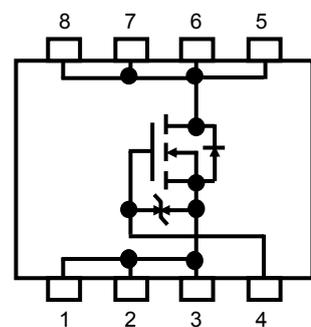
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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

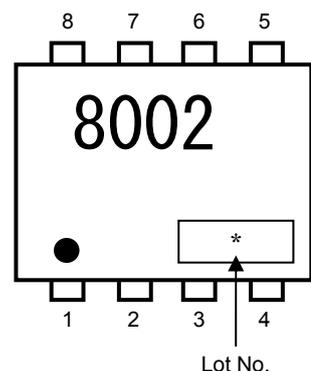
Unit: mm



## Circuit Configuration



## Marking (Note 5)

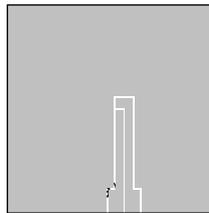


## Thermal Characteristics

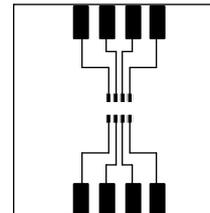
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	$R_{th(ch-a)}$	74.4	°C/W
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	$R_{th(ch-a)}$	148.8	°C/W

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 × 0.8t  
Unit : (mm)



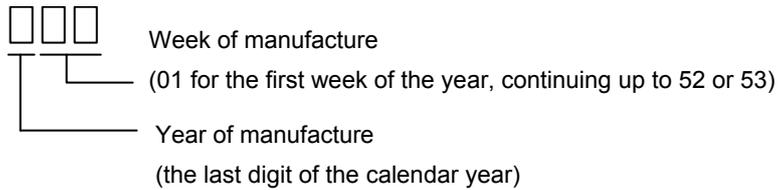
FR-4  
25.4 × 25.4 × 0.8t  
Unit : (mm)

Note 3:  $V_{DD} = 16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.2\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = 9.1\text{ A}$

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

Note 5: ● on the lower left of the marking indicates Pin 1.

\* Weekly code (3 digits):

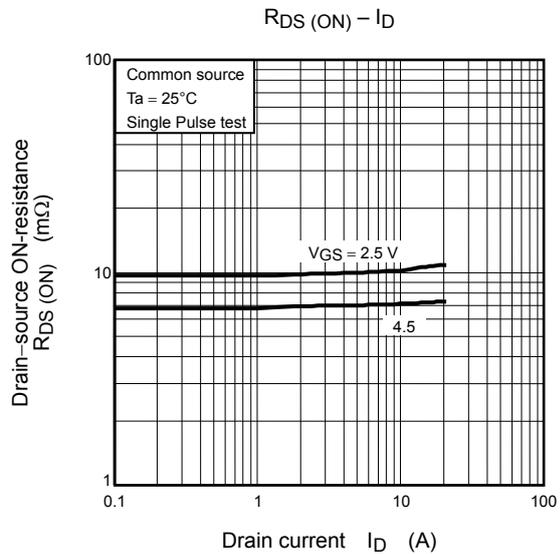
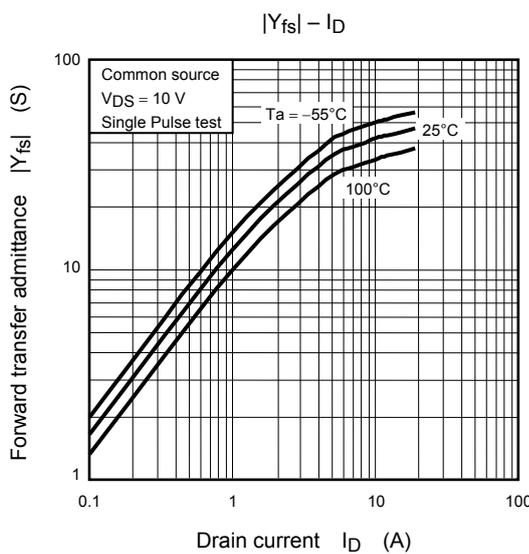
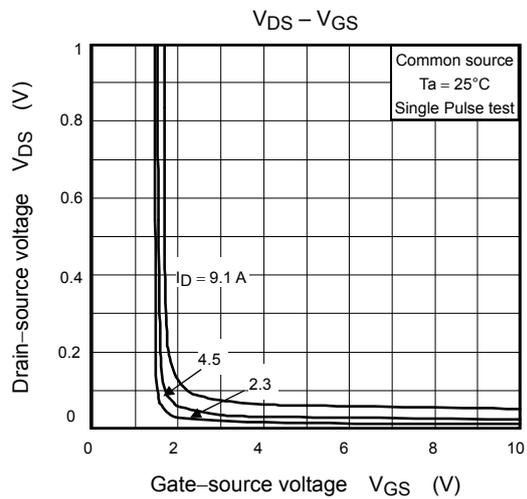
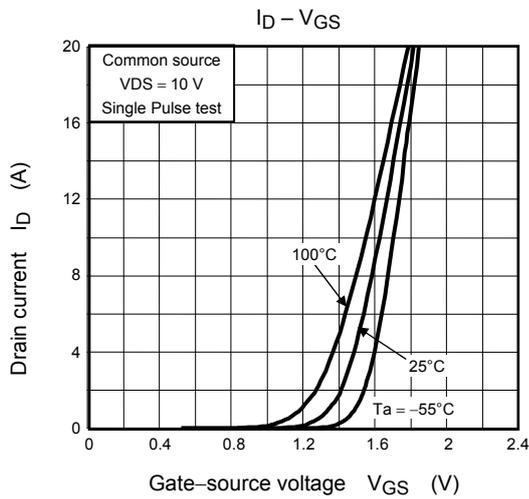
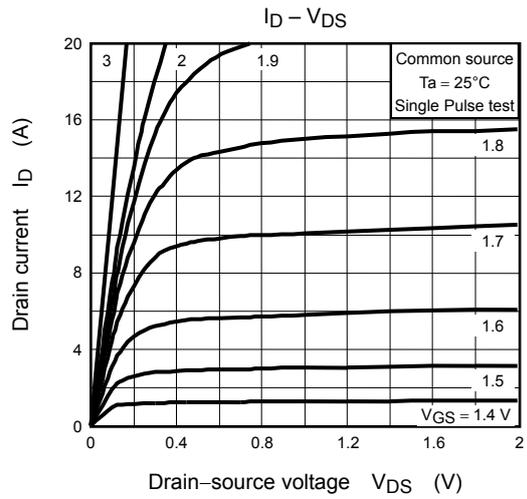
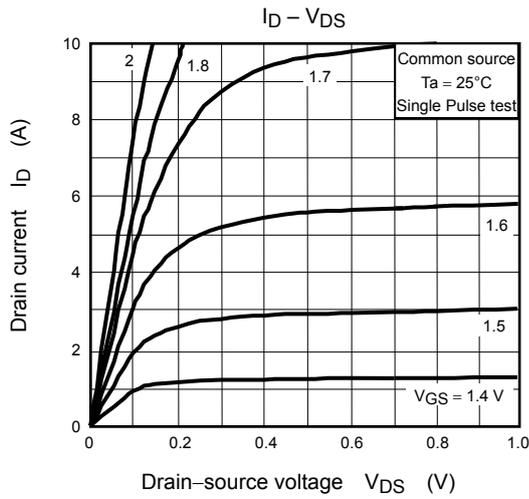


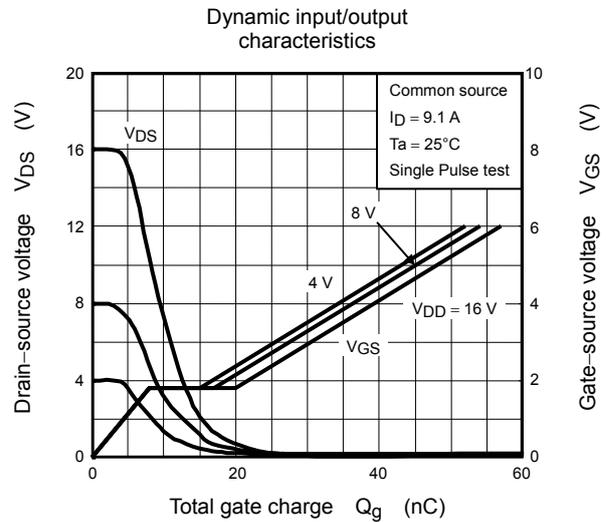
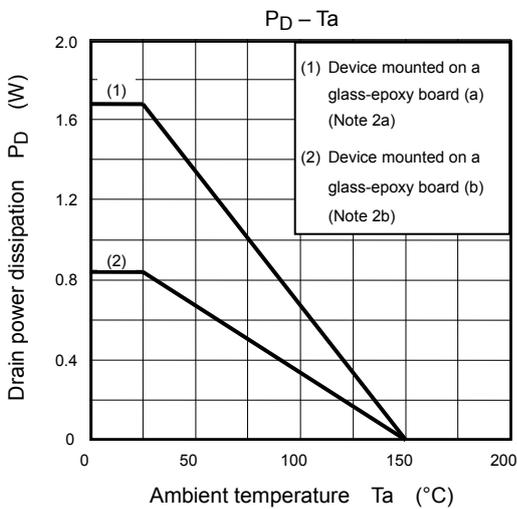
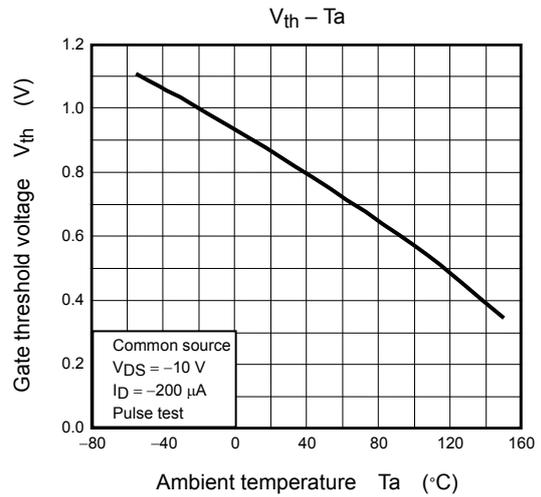
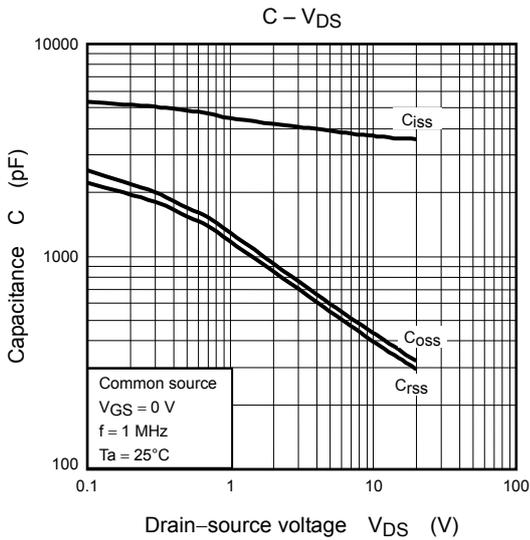
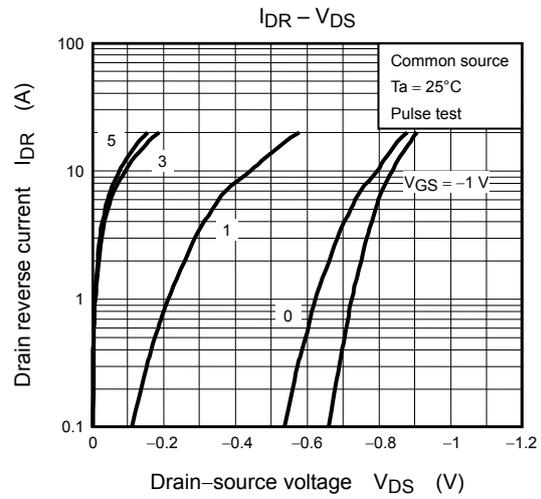
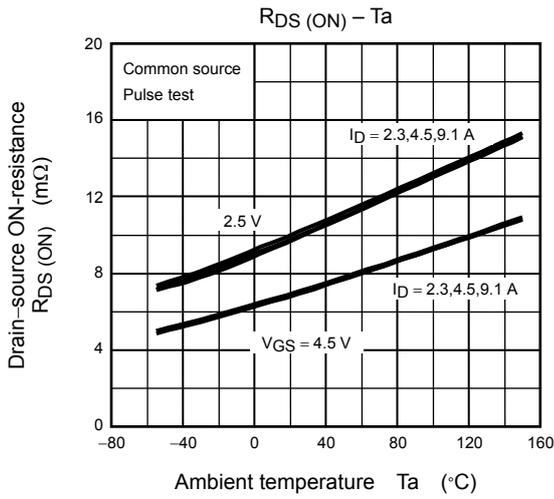
**Electrical Characteristics (Ta = 25°C)**

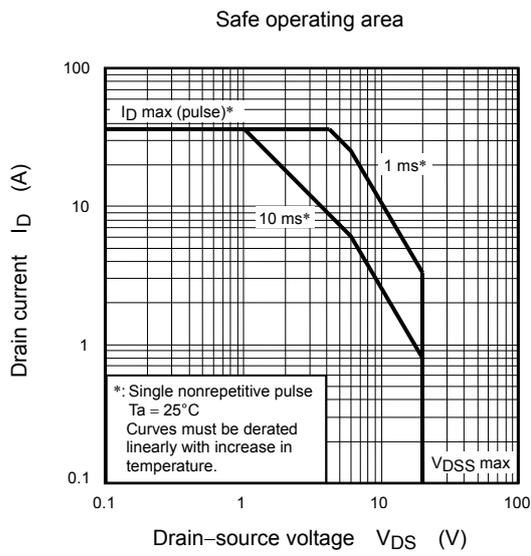
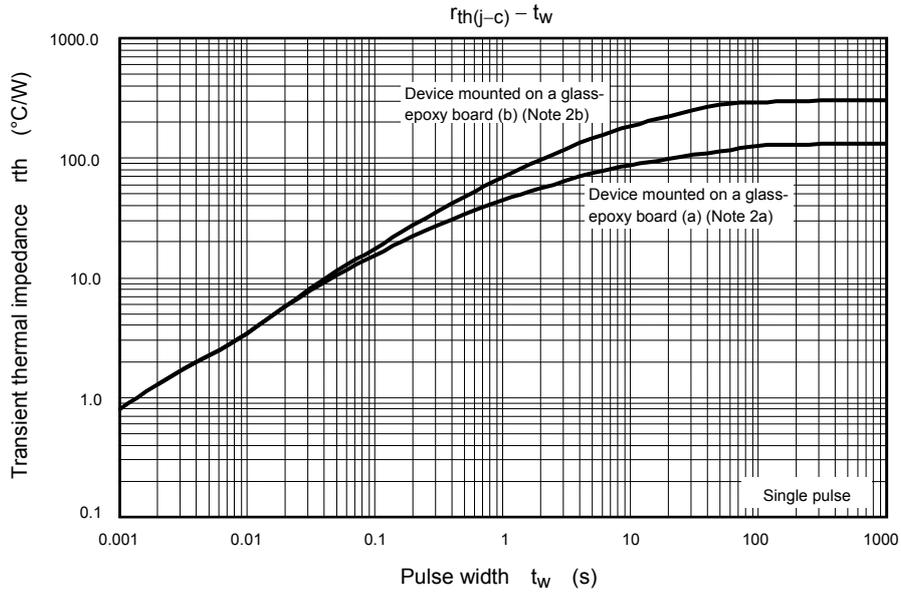
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	20	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -12\text{ V}$	8	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 0.2\text{ mA}$	0.5	—	1.2	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = 2.5\text{ V}, I_D = 4.5\text{ A}$	—	10	13.7	m $\Omega$
			$V_{GS} = 4.5\text{ V}, I_D = 4.5\text{ A}$	—	7	10	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 4.5\text{ A}$	18	36	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	3700	—	pF
Reverse transfer capacitance		$C_{rss}$		—	400	—	
Output capacitance		$C_{oss}$		—	450	—	
Switching time	Rise time	$t_r$	<p><math>V_{GS} = 5\text{ V}</math> <math>0\text{ V}</math> <math>I_D = 4.5\text{ A}</math> <math>V_{DD} \approx 10\text{ V}</math> <math>R_L = 2.22\ \Omega</math> <math>4.7\ \Omega</math> <math>V_{OUT}</math> Duty <math>\leq 1\%</math>, <math>t_w = 10\ \mu\text{s}</math></p>	—	14	—	ns
	Turn-on time	$t_{on}$		—	24	—	
	Fall time	$t_f$		—	30	—	
	Turn-off time	$t_{off}$		—	110	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 16\text{ V}, V_{GS} = 5\text{ V}, I_D = 9.1\text{ A}$	—	48	—	nC
Gate-source charge 1		$Q_{gs1}$		—	8	—	
Gate-drain ("Miller") charge		$Q_{gd}$		—	12	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	36.4	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 9.1\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	V







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