

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

# TPCF8003

Notebook PC Applications  
 Portable Equipment Applications

- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 14 \text{ m}\Omega$  (typ.)  
 ( $V_{GS} = 4.5\text{V}$ )
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 20 \text{ V}$ )
- Enhancement mode:  $V_{th} = 0.5$  to  $1.2 \text{ V}$   
 ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 200 \text{ }\mu\text{A}$ )

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

Characteristics		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)	$I_D$	7	A
	Pulse (Note 1)	$I_{DP}$	28	
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2a)		$P_D$	2.5	W
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2b)		$P_D$	0.7	W
Single pulse avalanche energy (Note 3)		$E_{AS}$	3.2	mJ
Avalanche current		$I_{AR}$	3.5	A
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

Note: 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.).

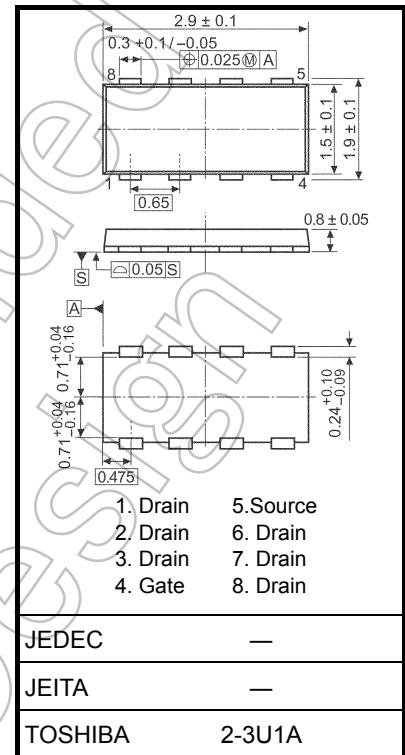
### Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient ( $t = 5 \text{ s}$ ) (Note 2a)	$R_{th(ch-a)}$	50.0	$^\circ\text{C/W}$
Thermal resistance, channel to ambient ( $t = 5 \text{ s}$ ) (Note 2b)	$R_{th(ch-a)}$	178.6	$^\circ\text{C/W}$

Note: For Notes 1 to 3, refer to the next page.

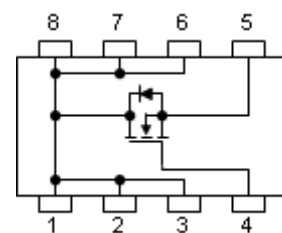
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



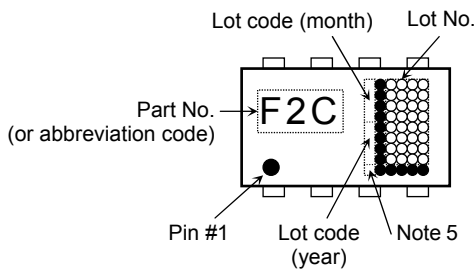
Weight: 0.011 g (typ.)

### Circuit Configuration



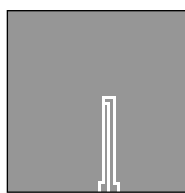
Start of commercial production  
 2009-10

## Marking (Note 4)



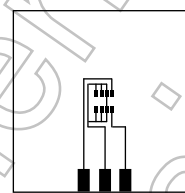
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a)  
 (b) Device mounted on a glass-epoxy board (b)



(a)

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



(b)

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

Note 3:  $V_{DD} = 16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.2\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = 3.5\text{ A}$

Note 4: • on lower left of the marking indicates Pin 1.

Note 5: A dot marking for identifying the indication of product Labels.

Without a dot: [[Pb]]/INCLUDES > MCV

With a dot: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

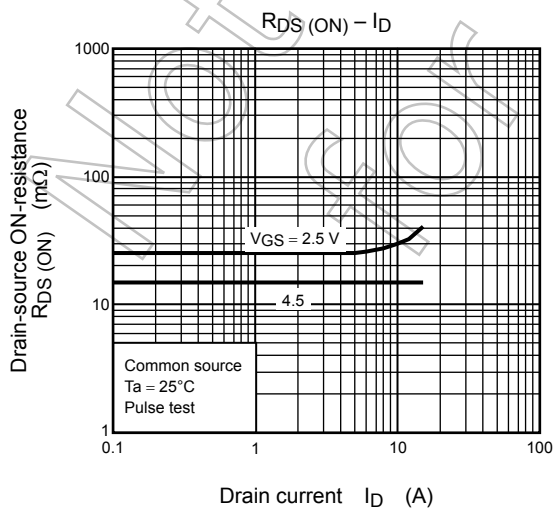
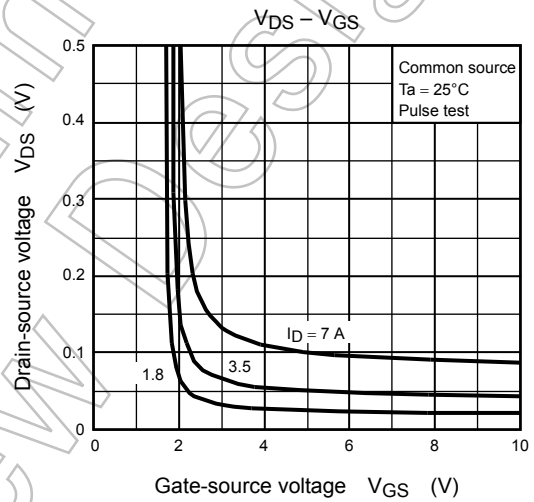
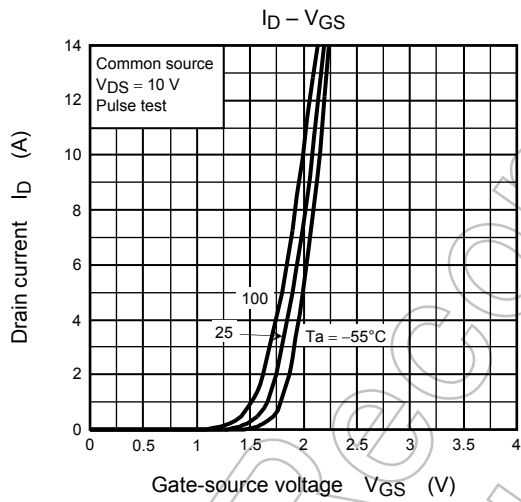
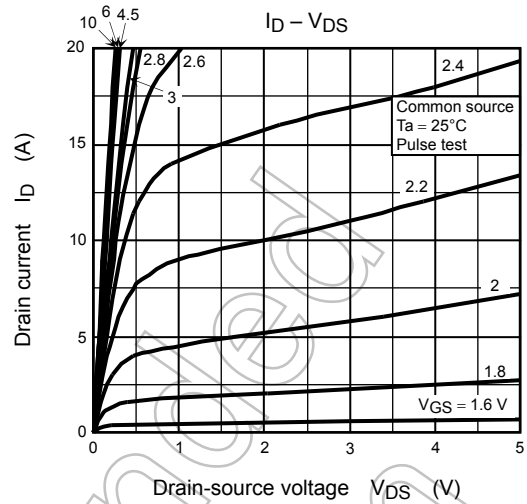
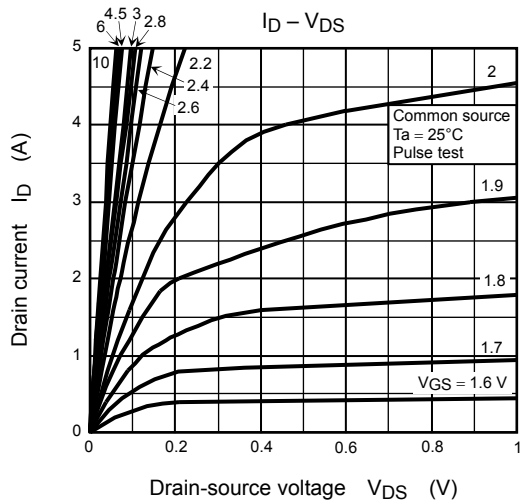
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

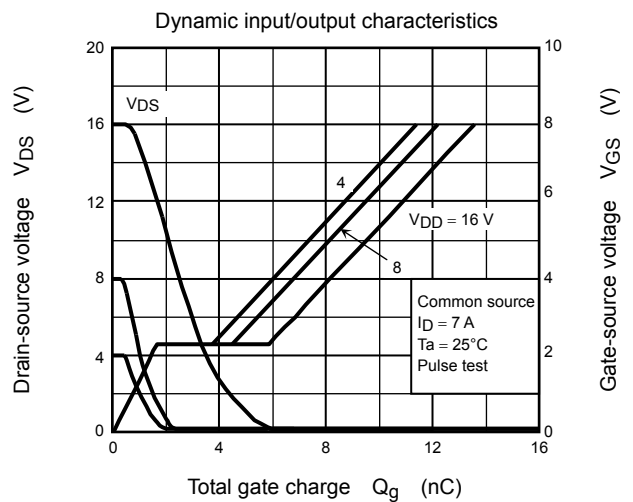
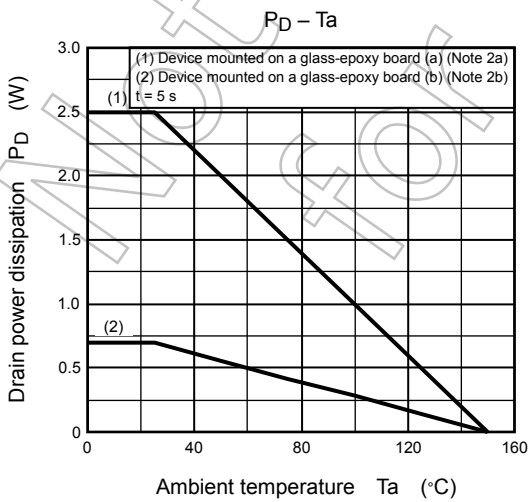
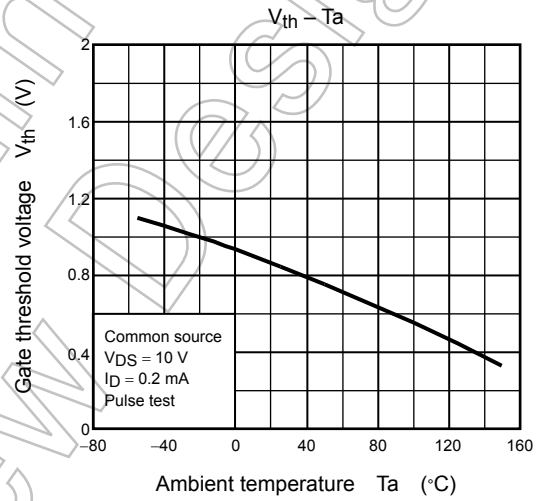
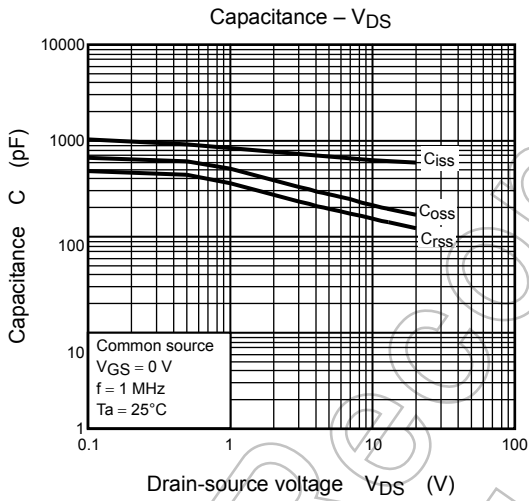
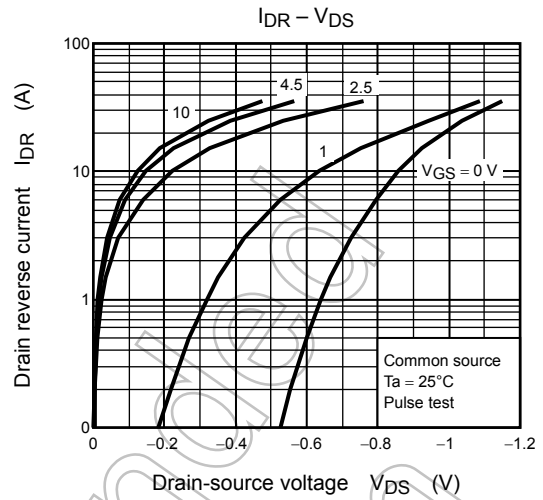
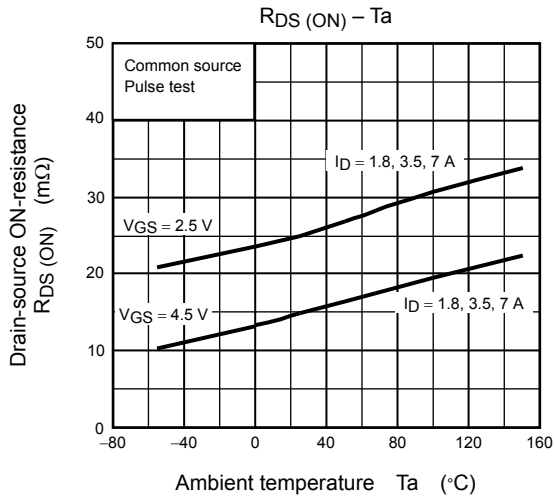
## Electrical Characteristics (Ta = 25°C)

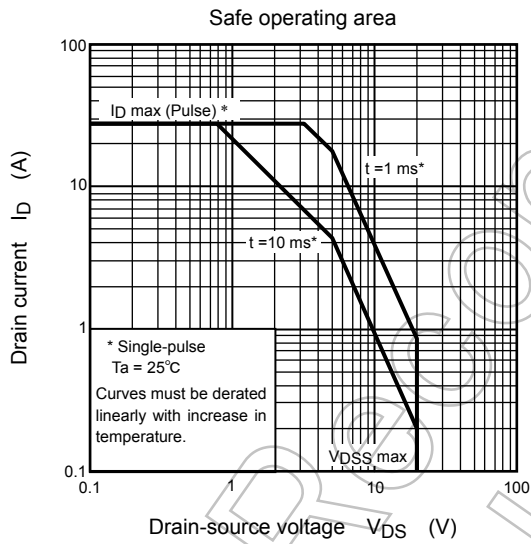
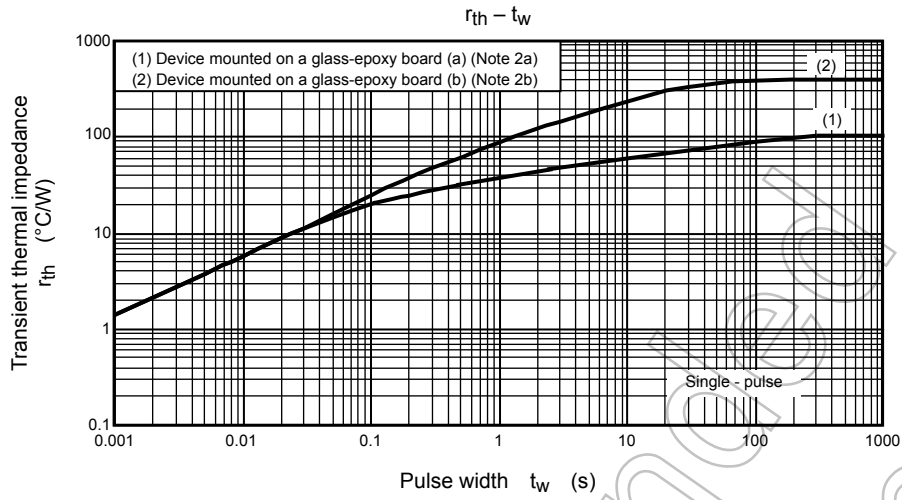
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 100$	nA
Drain cut-off current		$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	20	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -12\text{ V}$	8	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 200\text{ }\mu\text{A}$	0.5	—	1.2	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = 2.5\text{ V}, I_D = 3.5\text{ A}$	—	24	34	m $\Omega$
			$V_{GS} = 4.5\text{ V}, I_D = 3.5\text{ A}$	—	14	18	
Input capacitance		$C_{iss}$		—	500	—	pF
Reverse transfer capacitance		$C_{rss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	155	—	
Output capacitance		$C_{oss}$		—	215	—	
Switching time	Rise time	$t_r$		—	5.2	—	ns
	Turn-on time	$t_{on}$		—	11	—	
	Fall time	$t_f$		—	10	—	
	Turn-off time	$t_{off}$		—	23	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 16\text{ V}, V_{GS} = 5\text{ V}, I_D = 7.0\text{ A}$	—	9.5	—	nC
Gate-source charge 1		$Q_{gs1}$		—	1.6	—	
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)	$I_{DRP}$	—	—	—	28	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 7.0\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	V







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