

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

## TPC8041

Lithium Ion Battery Applications  
Portable Equipment Applications  
Notebook PC Applications

Unit: mm

- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 5.5 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 26 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement mode:  $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

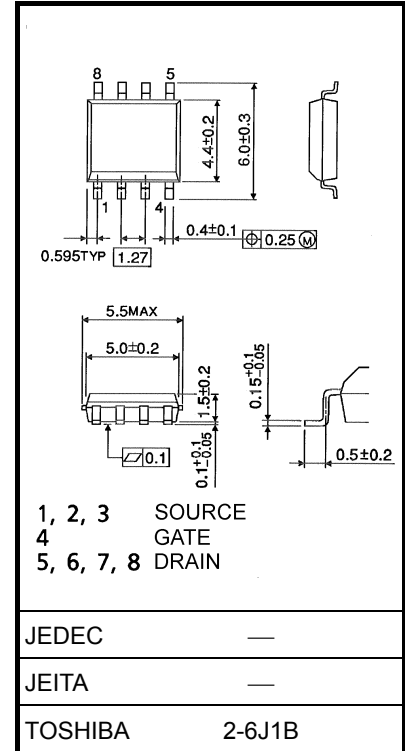
### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

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	$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	A
	Pulse (Note 1)	$I_{DP}$	
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2a)	$P_D$	1.9	W
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2b)	$P_D$	1.0	W
Single pulse avalanche energy (Note 3)	$E_{AS}$	44	mJ
Avalanche current	$I_{AR}$	13	A
Repetitive avalanche energy (Note 2a) (Note 4)	$E_{AR}$	0.066	mJ
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ\text{C}$

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

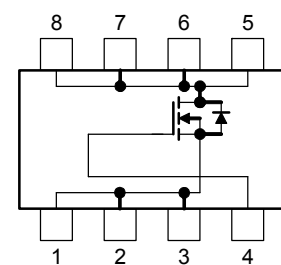
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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



Weight: 0.08 g (typ.)

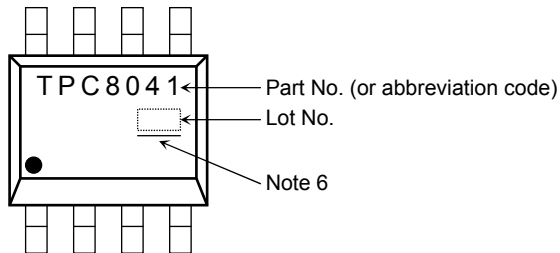
### Circuit Configuration



## Thermal Characteristics

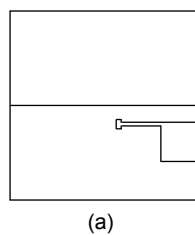
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th(ch-a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th(ch-a)}$	125	°C/W

## Marking (Note 5)

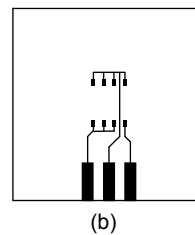


Note 1: Ensure that the channel temperature does not exceed 150°C.

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



FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)



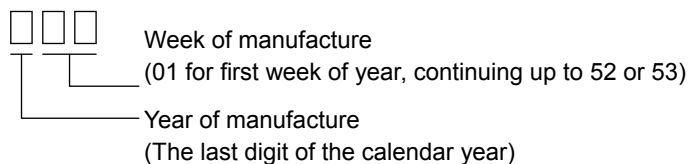
FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)

Note 3:  $V_{DD} = 24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.2\text{ mH}$ ,  $I_{AR} = 13\text{ A}$

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

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

\* Weekly code: (Three digits)



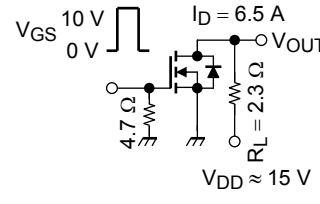
Note 6: A line under a Lot No. identifies the indication of product Labels.

Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

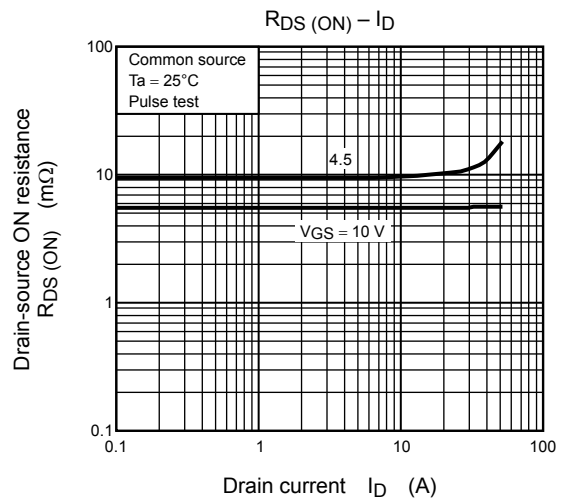
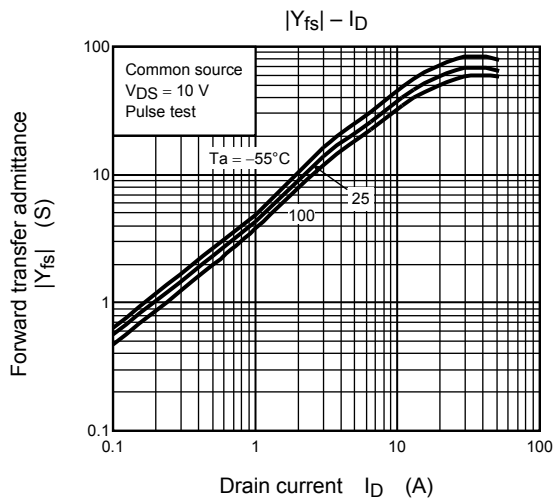
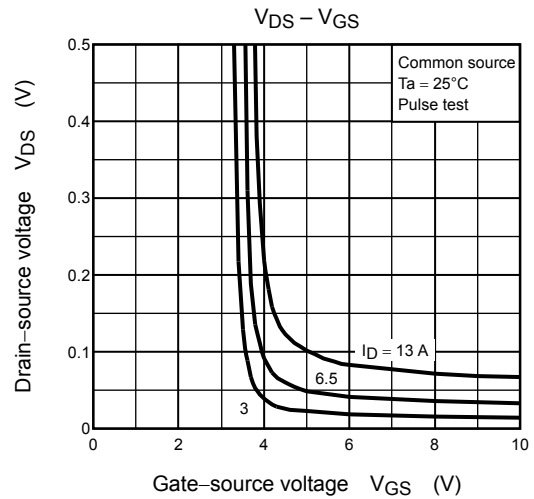
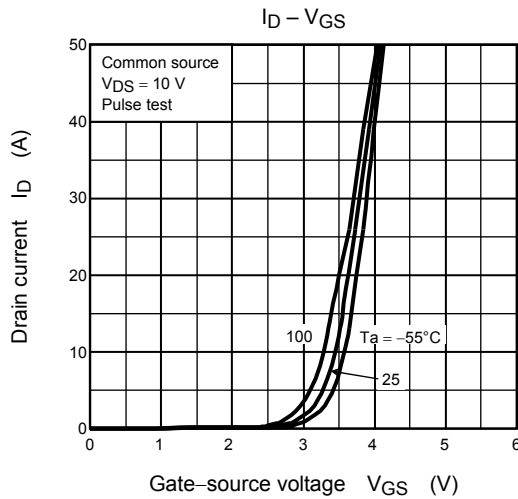
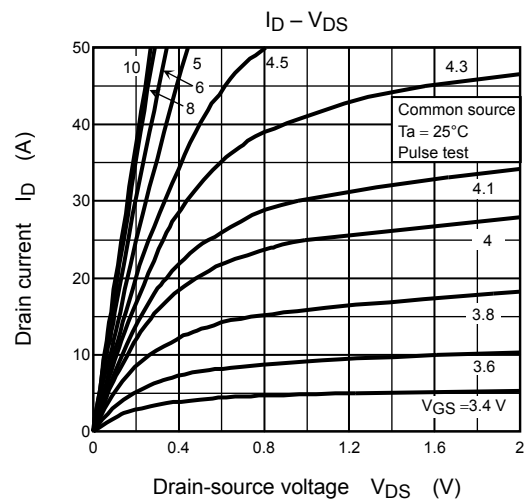
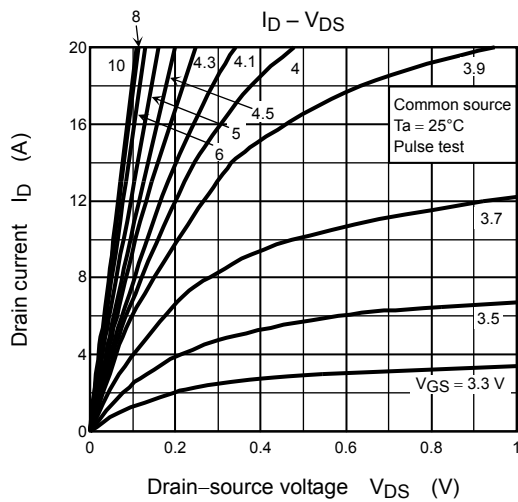
Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

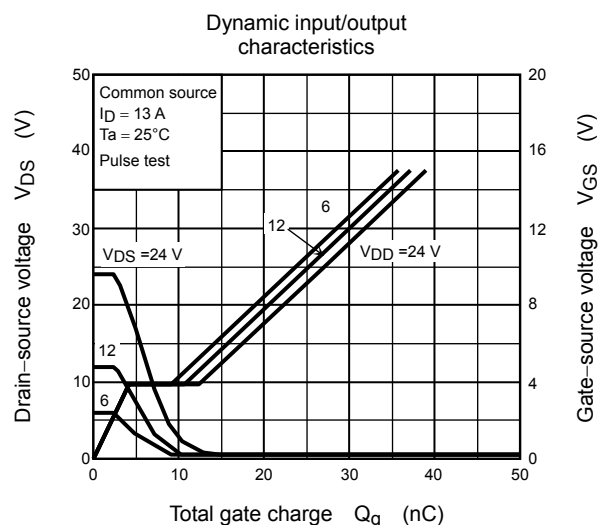
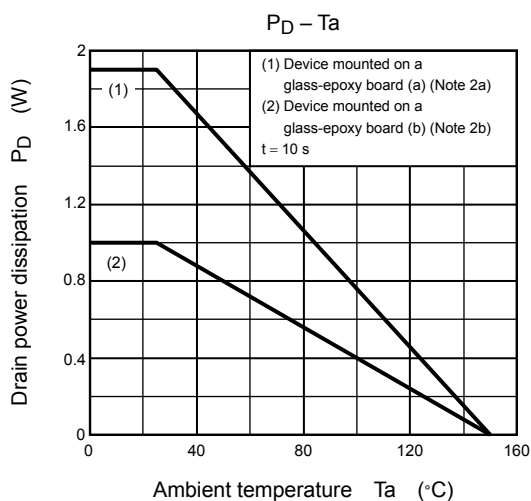
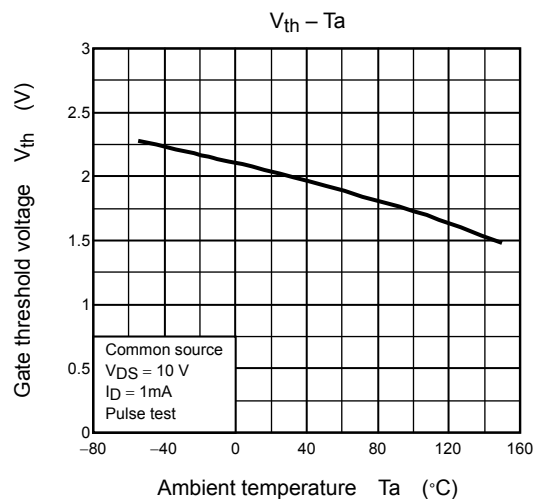
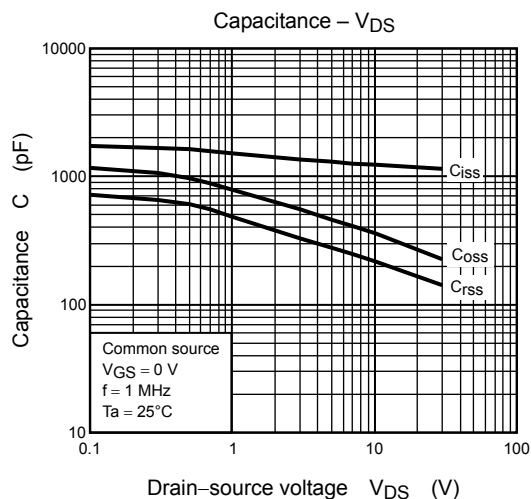
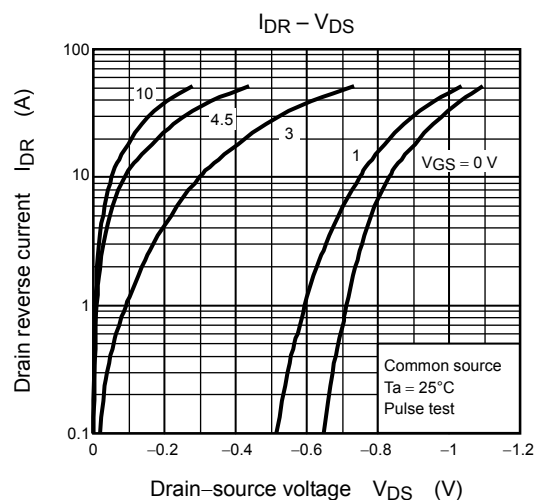
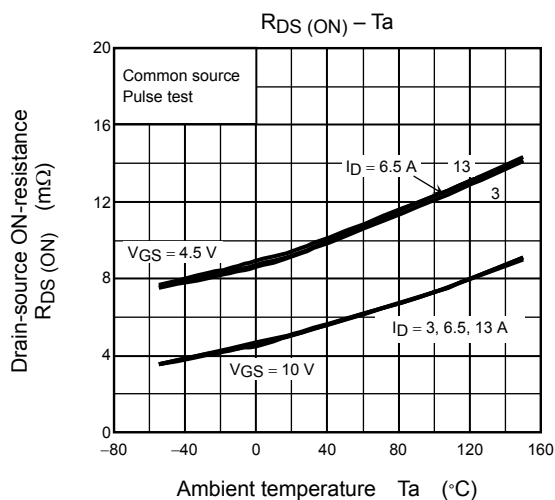
## Electrical Characteristics (Ta = 25°C)

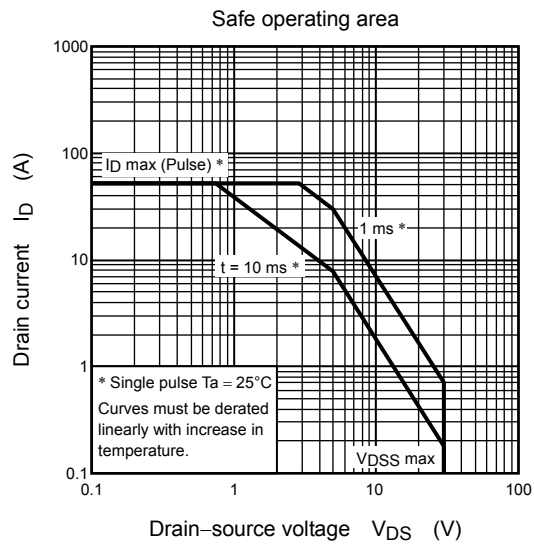
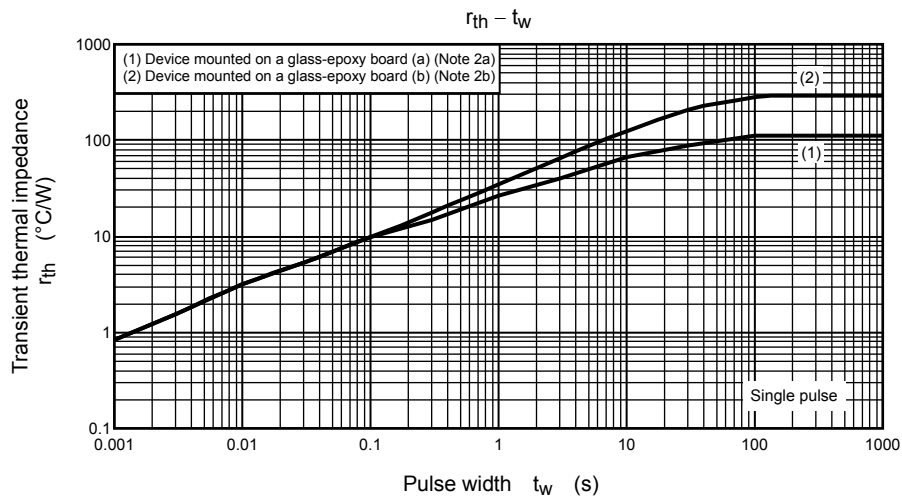
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V	—	—	±100	nA
Drain cut-OFF current		I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V	—	—	10	μA
Drain-source breakdown voltage		V <sub>(BR)</sub> DSS	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	30	—	—	V
		V <sub>(BR)</sub> DSX	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = −20 V	10	—	—	
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.3	—	2.5	V
Drain-source ON-resistance		R <sub>DS</sub> (ON)	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 6.5 A	—	9	13.5	mΩ
			V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6.5 A	—	5.5	7	
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 6.5 A	13	26	—	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	1270	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	240	—	
Output capacitance		C <sub>oss</sub>		—	380	—	
Switching time	Rise time	t <sub>r</sub>	 <p>Duty ≤ 1%, t<sub>W</sub> = 10 μs</p>	—	11	—	ns
	Turn-ON time	t <sub>on</sub>		—	20	—	
	Fall time	t <sub>f</sub>		—	15	—	
	Turn-OFF time	t <sub>off</sub>		—	39	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ 24 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 13 A	—	27	—	nC
Gate-source charge 1		Q <sub>gs1</sub>		—	4.2	—	
Gate-drain (“miller”) charge		Q <sub>gd</sub>		—	8.2	—	

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	52	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 13 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V







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