

TOSHIBA Field Effect Transistor with Built-in Schottky Barrier Diode  
Silicon N-Channel MOS Type (Ultra-High-Speed U-MOS III)

# TPC8A02-H

High-Efficiency DC/DC Converter Applications

Notebook PC Applications

Portable-Equipment Applications

- Built-in schottky barrier diode  
Low forward voltage:  $V_{DSF} = 0.6V(\text{Max.})$
- High-speed switching.
- Small gate charge.:  $Q_{SW} = 11 \text{ nC}(\text{Typ.})$
- Low drain-source ON-resistance:  $R_{DS}(\text{ON}) = 4.3 \text{ m}\Omega(\text{typ.})$
- High forward transfer admittance:  $|Y_{fs}| = 40 \text{ S}(\text{typ.})$
- Low leakage current:  $I_{DSS} = 100 \mu\text{A}(\text{max}) (V_{DS} = 30 \text{ V})$
- Enhancement mode:  $V_{th} = 1.1 \text{ to } 2.3 \text{ V} (V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA})$

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

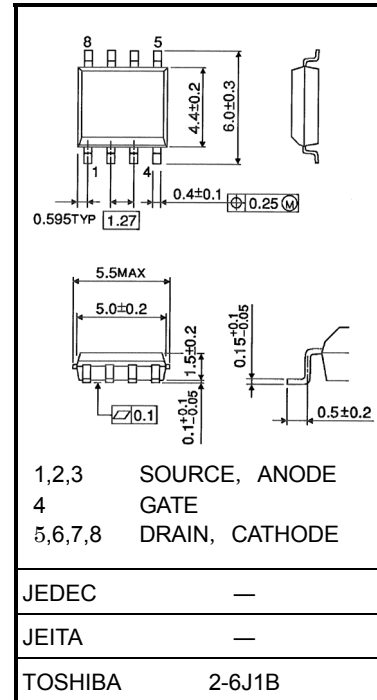
Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	30	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	30	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	16	A
	Pulse (Note 1)	$I_{DP}$	48	
Drain power dissipation (t = 10 s) (Note 2a)		$P_D$	1.9	W
Drain power dissipation (t = 10 s) (Note 2b)		$P_D$	1.0	W
Single-pulse avalanche energy (Note 3)		$E_{AS}$	166	mJ
Avalanche current		$I_{AR}$	16	A
Repetitive avalanche energy (Note 2a) (Note 4)		$E_{AR}$	0.11	mJ
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55 to 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).

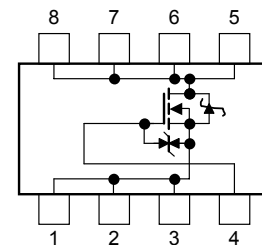
This transistor is an electrostatic-sensitive device. Handle with care. Schottky barrier diodes have large-reverse-current-leakage characteristic compared to other rectifier products. This current leakage combined with improper operating temperature or voltage may cause thermal runaway. Please take forward and reverse loss into consideration during design.

Unit: mm



Weight: 0.085 g (typ.)

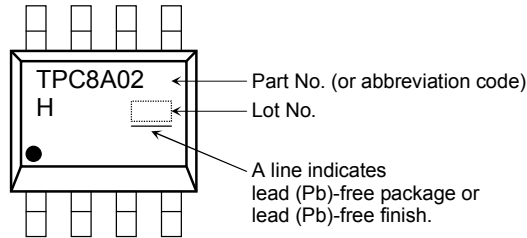
## Circuit Configuration



## Thermal Characteristics

Characteristic	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

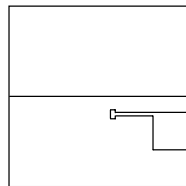
## Marking (Note 5)



Note 1: The channel temperature should not exceed 150°C during use.

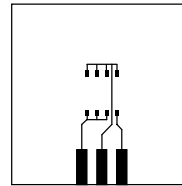
Note 2:

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



(a)

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



(b)

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

Note 3:  $V_{DD} = 24\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\Omega$ ,  $I_{AR} = 16\text{ A}$

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: (Three digits)



Week of manufacture

(01 for the first week of the year: continuing up to 52 or 53)

Year of manufacture

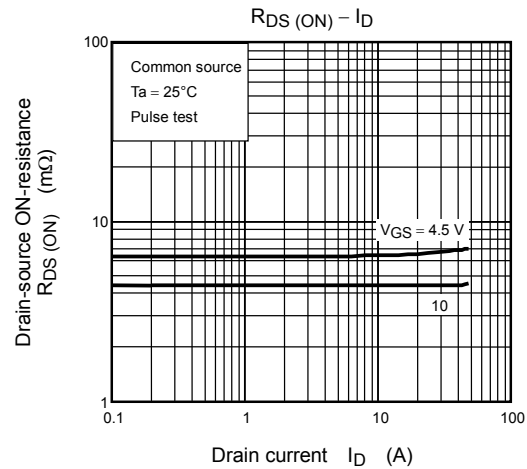
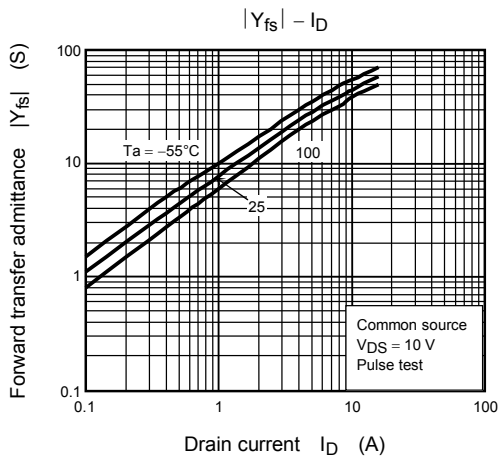
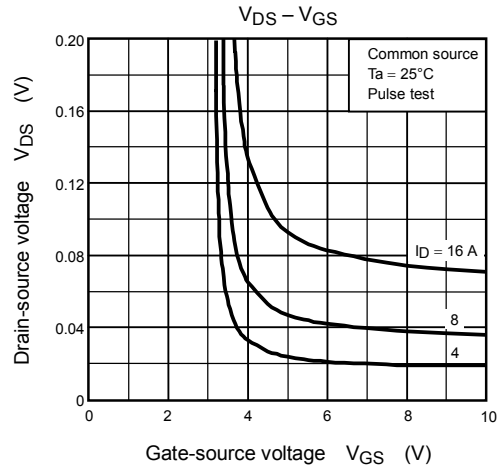
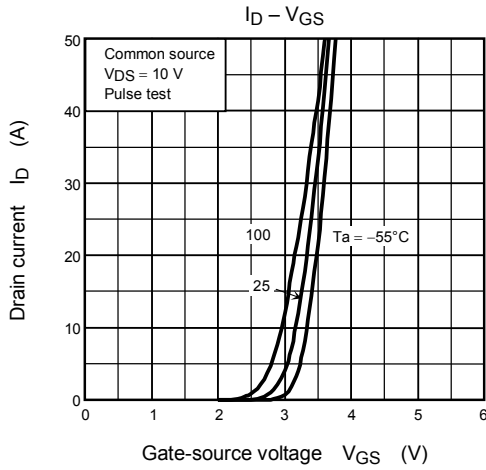
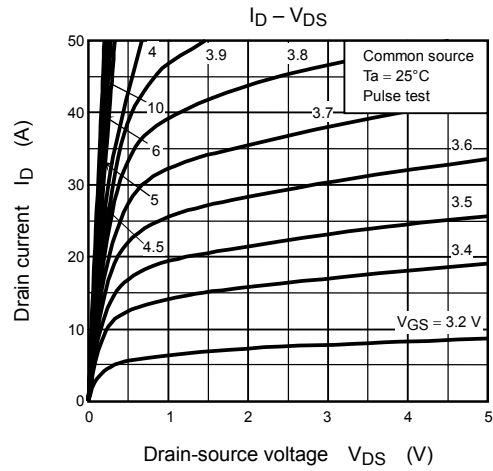
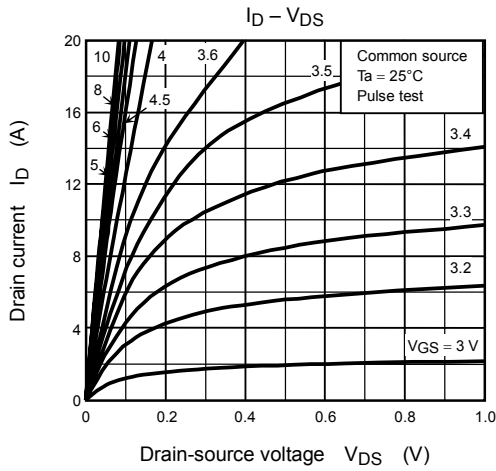
(The last digit of the calendar year)

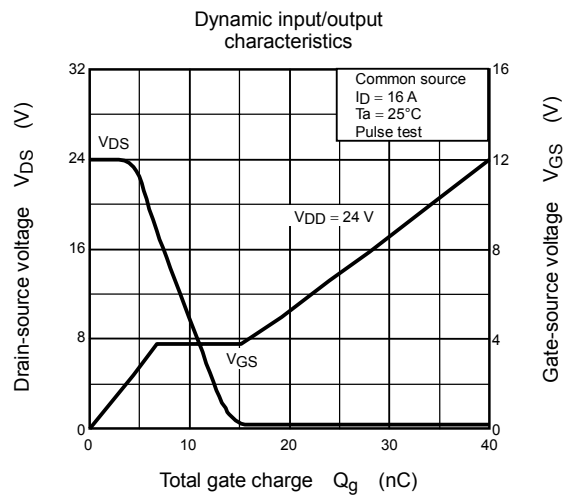
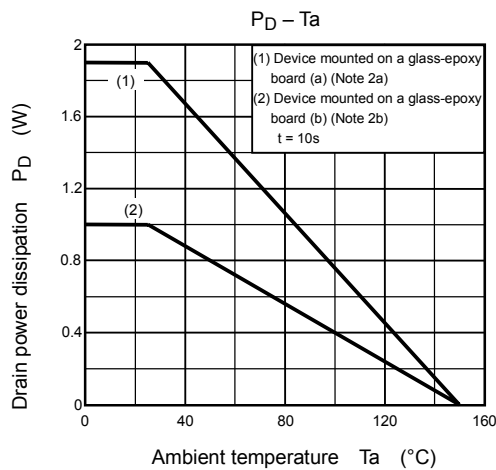
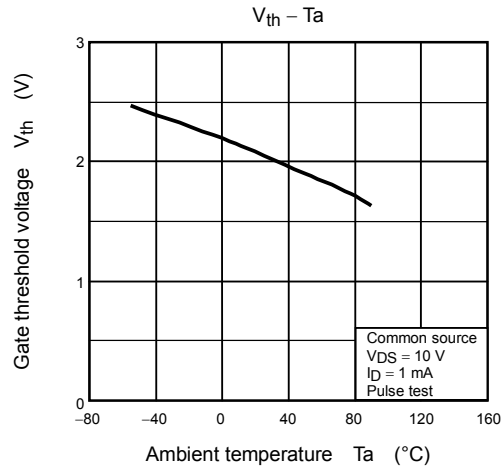
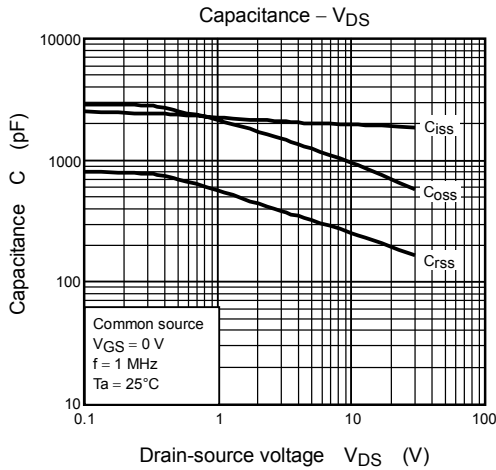
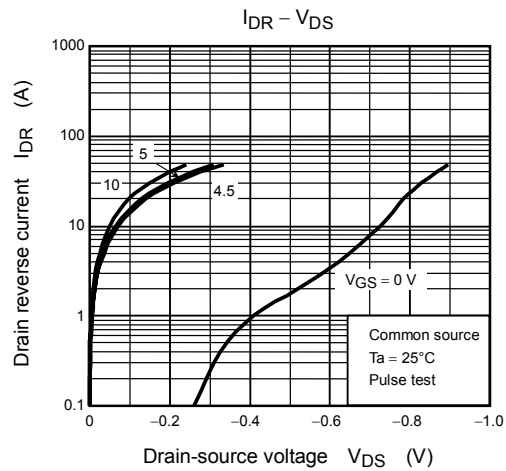
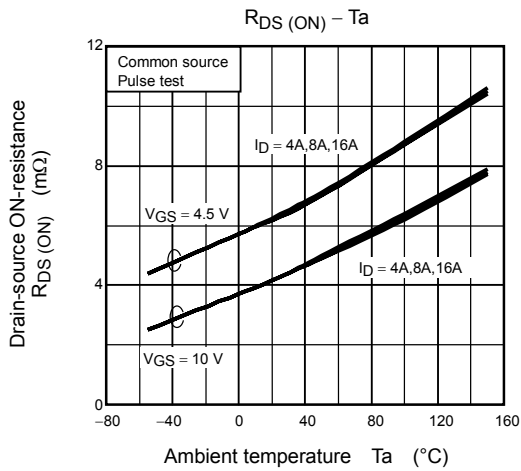
## Electrical Characteristics (Ta = 25°C)

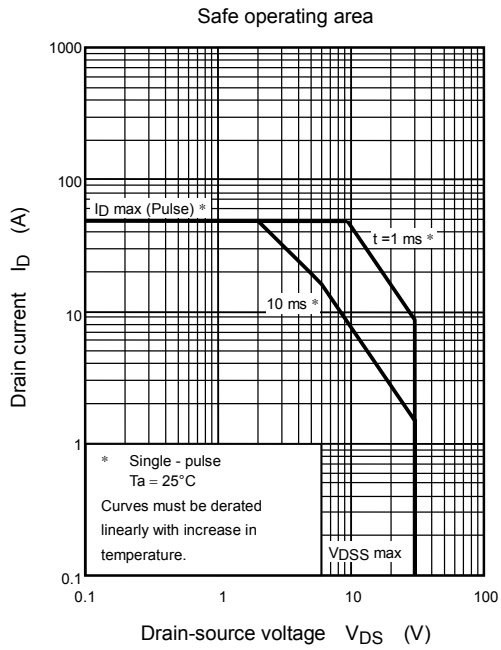
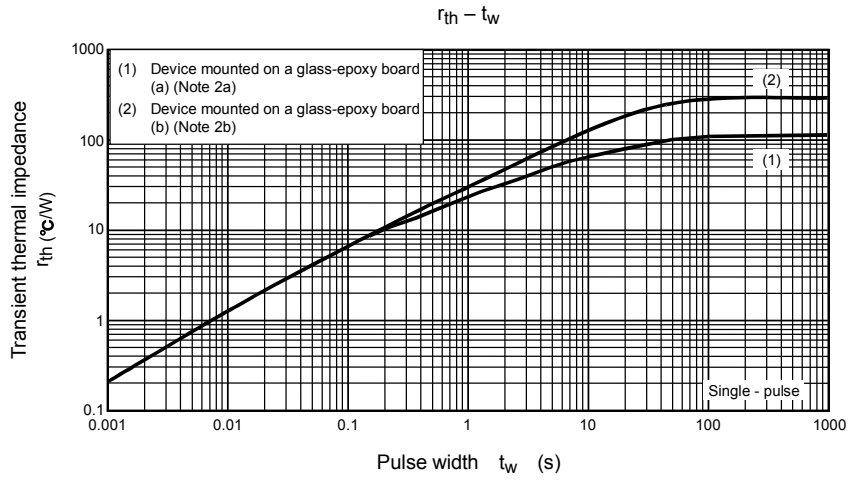
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cutoff current		$I_{DSS}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	30	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$	15	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.1	—	2.3	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$	—	6.2	8.5	$\text{m}\Omega$
			$V_{GS} = 10\text{ V}, I_D = 8\text{ A}$	—	4.3	5.6	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 8\text{ A}$	20	40	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1970	—	pF
Reverse transfer capacitance		$C_{rss}$		—	240	—	
Output capacitance		$C_{oss}$		—	950	—	
Switching time	Rise time	$t_r$		—	6	—	ns
	Turn-on time	$t_{on}$		—	14	—	
	Fall time	$t_f$		—	12	—	
	Turn-off time	$t_{off}$		—	26	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 24\text{ V}, V_{GS} = 10\text{ V}, I_D = 16\text{ A}$	—	34	—	nC
			$V_{DD} \approx 24\text{ V}, V_{GS} = 5\text{ V}, I_D = 16\text{ A}$	—	19	—	
Gate-source charge 1		$Q_{gs1}$	$V_{DD} \approx 24\text{ V}, V_{GS} = 10\text{ V}, I_D = 16\text{ A}$	—	6	—	
Gate-drain ("Miller") charge		$Q_{gd}$		—	8.4	—	
Gate switch charge		$Q_{sw}$		—	11	—	

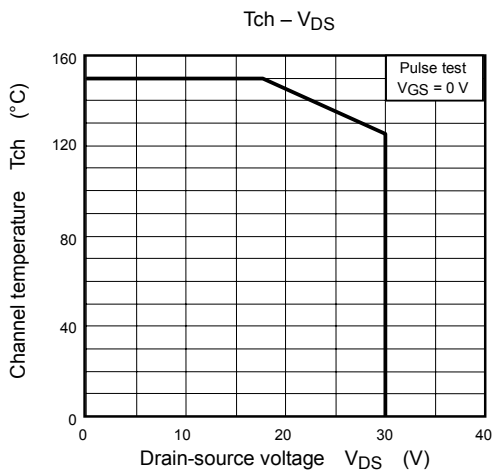
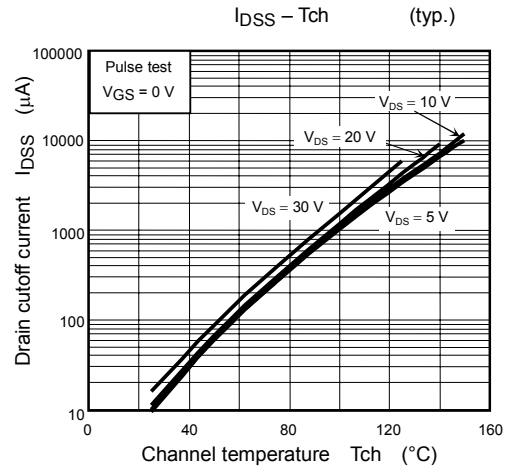
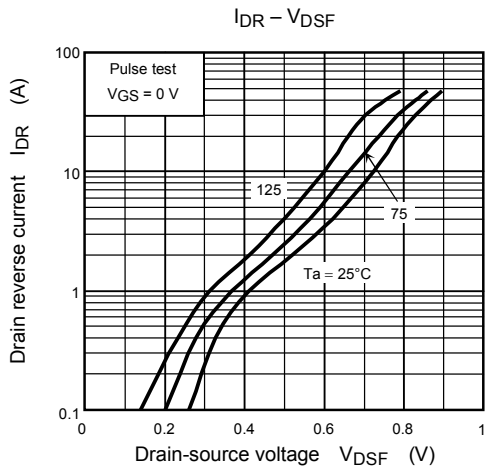
## Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward current	Pulse (Note 1)	$I_{FP}$	—	—	—	48	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 1.0\text{ A}, V_{GS} = 0\text{ V}$	—	-0.45	-0.6	V
			$I_{DR} = 16\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	









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