

TOSHIBA Field Effect Transistor Silicon P-Channel MOS Type (Ultra-High-Speed U-MOSIII)

# TPC8116-H

High Efficiency DC/DC Converter Applications  
 Notebook PC Applications  
 Portable Equipment Applications  
 CCFL Inverter Applications

- Small footprint due to a small and thin package
- High speed switching
- Small gate charge:  $Q_{SW} = 9.7 \text{ nC (typ.)}$
- Low drain-source ON-resistance:  $R_{DS(ON)} = 24\text{m}\Omega \text{ (typ.)}$
- High forward transfer admittance:  $|Y_{fs}| = 14 \text{ S (typ.)}$
- Low leakage current:  $I_{DSS} = -10 \mu\text{A (max)}$  ( $V_{DS} = -40 \text{ V}$ )
- Enhancement mode:  $V_{th} = -0.8 \text{ to } -2.0 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -1 \text{ mA}$ )

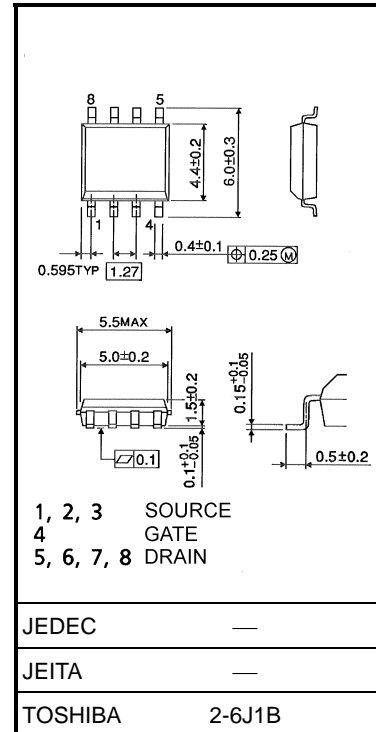
### Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristic		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	-40	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-40	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	-7.5	A
	Pulsed (Note 1)	$I_{DP}$	-30	
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)		$E_{AS}$	26	mJ
Avalanche current		$I_{AR}$	-7.5	A
Repetitive avalanche energy (Note 2a) (Note 4)		$E_{AR}$	0.12	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

Note: For Notes 1 to 4, refer to the next page.

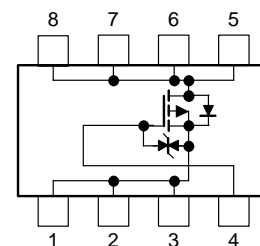
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.085 g (typ.)

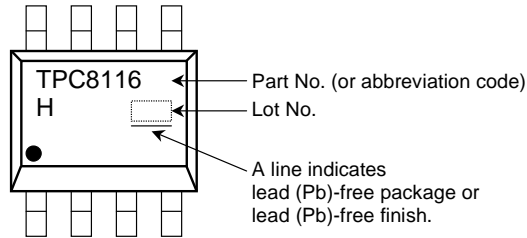
### Circuit Configuration



## Thermal Characteristics

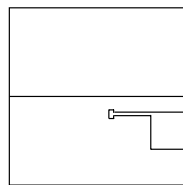
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th(ch-a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th(ch-a)}$	125	°C/W

## Marking (Note 5)



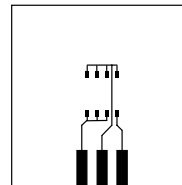
Note 1: The channel temperature should not exceed 150°C during use.

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



FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

(a)



FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

(b)

Note 3:  $V_{DD} = -24$  V,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5$  mH,  $R_G = 25$   $\Omega$ ,  $I_{AR} = -7.5$  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)



Week of manufacture  
(01 for first week of the year, continuing up to 52 or 53)

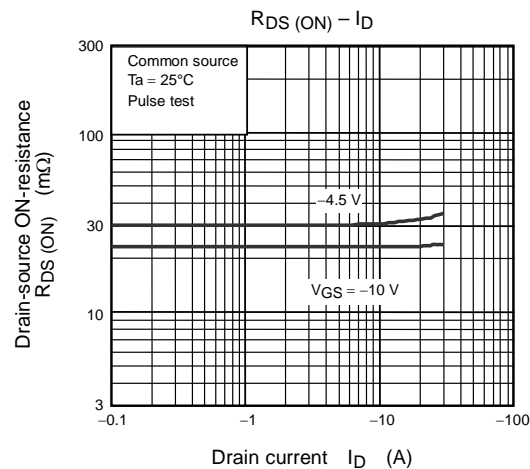
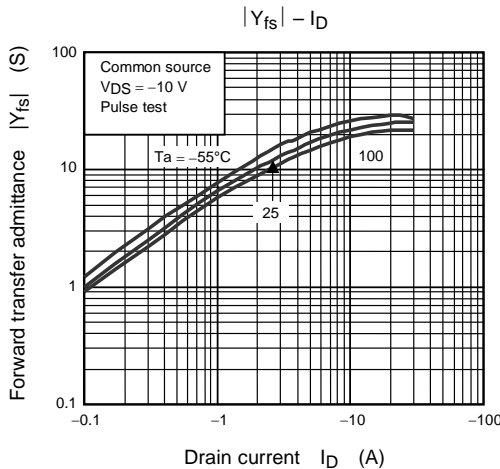
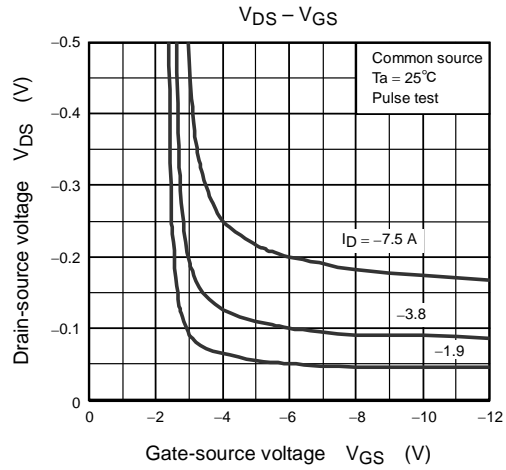
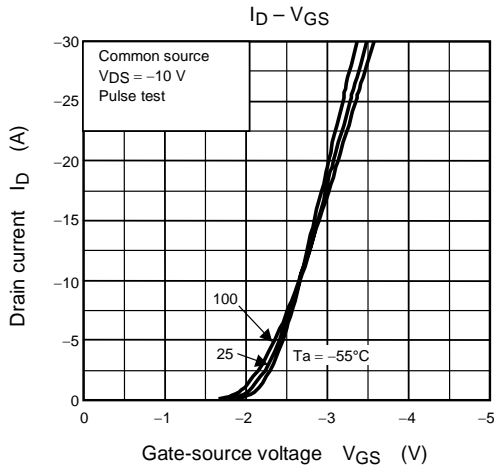
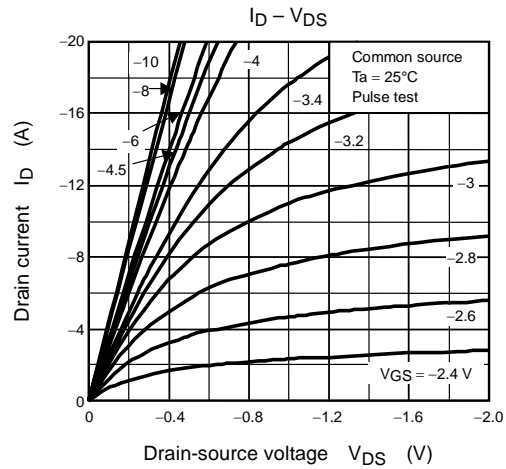
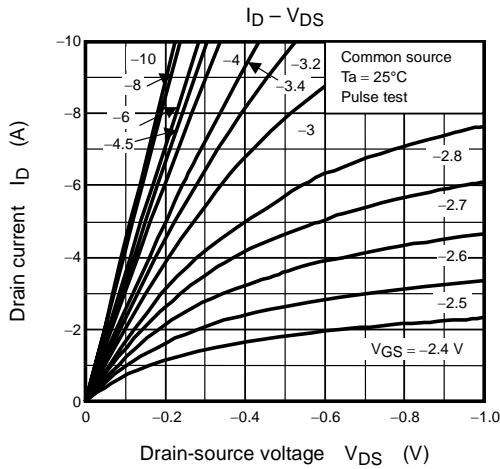
Year of manufacture  
(The last digit of the calendar year)

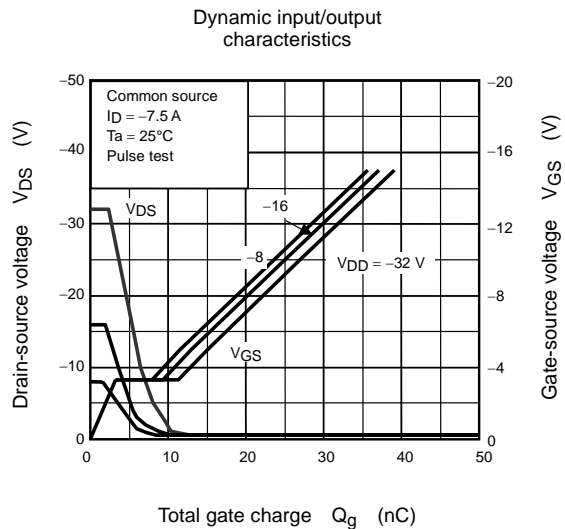
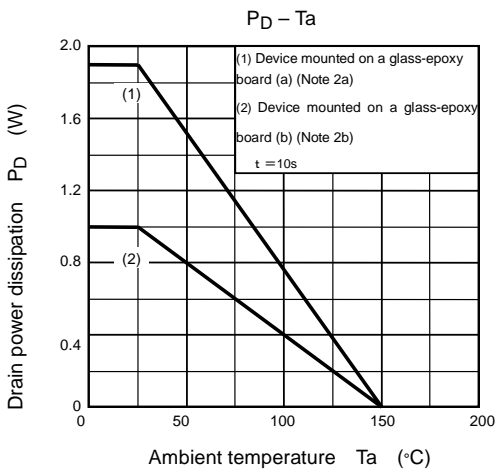
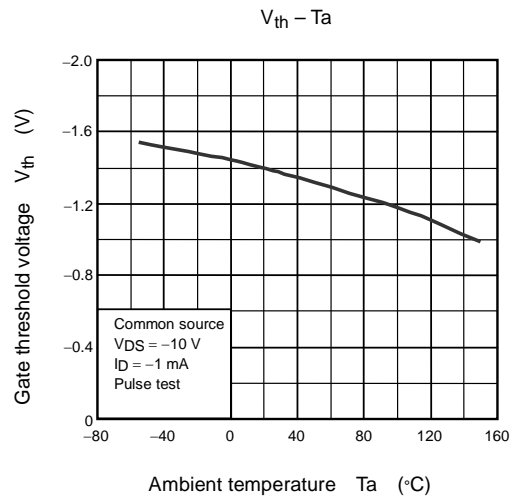
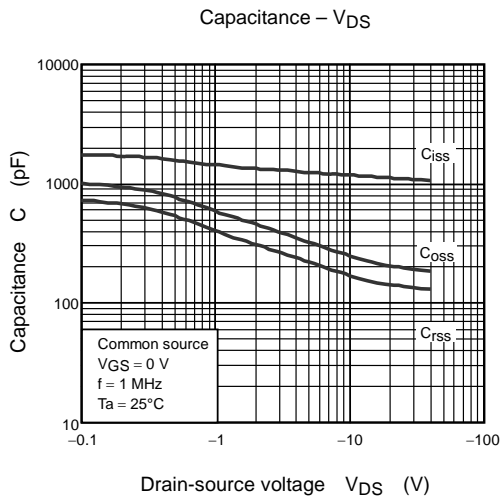
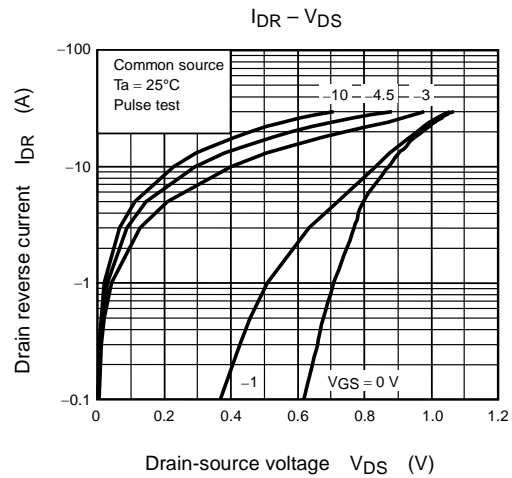
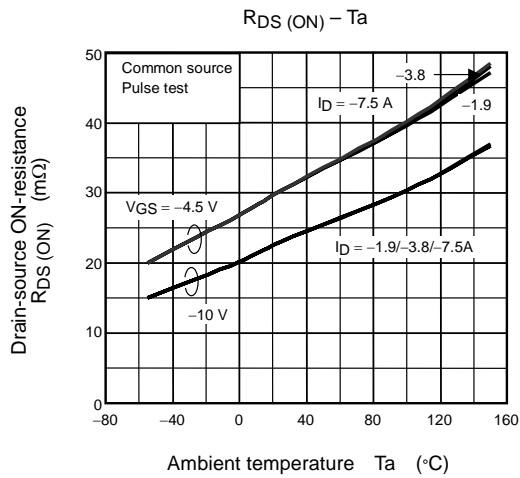
**Electrical Characteristics (Ta = 25°C)**

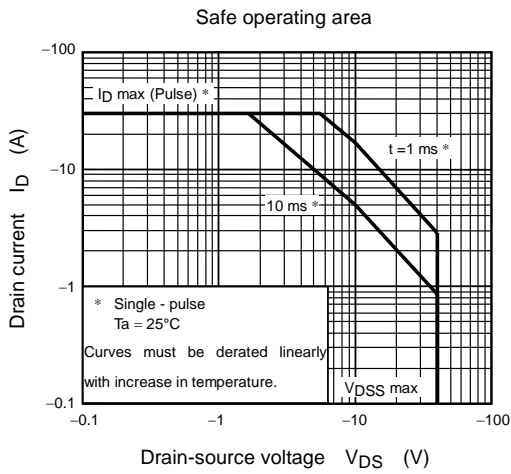
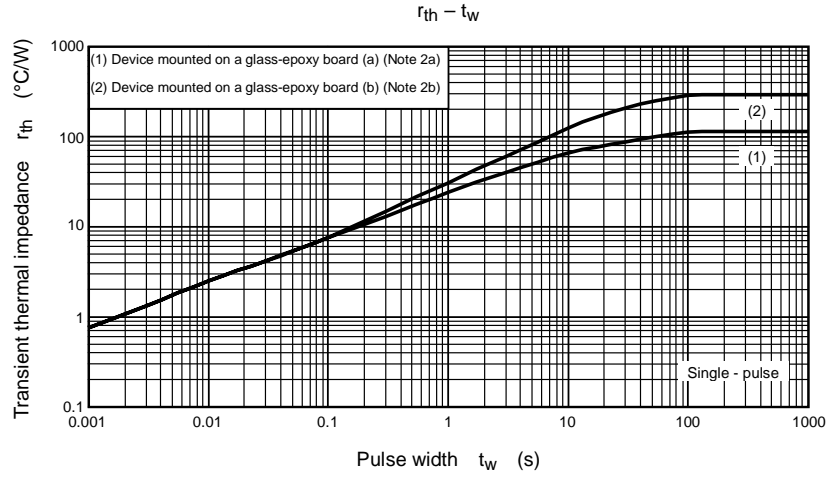
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cutoff current		$I_{DSS}$	$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-40	—	—	V
		$V_{(BR)DSX}$	$I_D = -10\text{ mA}, V_{GS} = 20\text{ V}$	-20	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-0.8	—	-2.0	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = -4.5\text{ V}, I_D = -3.8\text{ A}$	—	29	37	$\text{m}\Omega$
			$V_{GS} = -10\text{ V}, I_D = -3.8\text{ A}$	—	24	30	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -3.8\text{ A}$	7	14	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1190	—	pF
Reverse transfer capacitance		$C_{riss}$		—	170	—	
Output capacitance		$C_{oss}$		—	250	—	
Switching time	Rise time	$t_r$	<p><math>V_{GS} = 0\text{ V}</math> <math>-10\text{ V}</math> <math>I_D = -3.8\text{ A}</math> <math>V_{DD} \approx -20\text{ V}</math> <math>R_L = 5.3\Omega</math> <math>4.7\Omega</math> Duty <math>\leq 1\%</math>, <math>t_w = 10\text{ }\mu\text{s}</math></p>	—	5	—	ns
	Turn-on time	$t_{on}$		—	12	—	
	Fall time	$t_f$		—	12	—	
	Turn-off time	$t_{off}$		—	43	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -32\text{ V}, V_{GS} = -10\text{ V}, I_D = -7.5\text{ A}$	—	27	—	nC
			$V_{DD} \approx -32\text{ V}, V_{GS} = -5\text{ V}, I_D = -7.5\text{ A}$	—	15	—	
Gate-source charge 1		$Q_{gs1}$	$V_{DD} \approx -32\text{ V}, V_{GS} = -10\text{ V}, I_D = -7.5\text{ A}$	—	3.2	—	
Gate-drain ("Miller") charge		$Q_{gd}$		—	8.1	—	
Gate switch charge		$Q_{SW}$		—	9.7	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	$I_{DRP}$	—	—	—	-30	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = -7.5\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.2	V







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