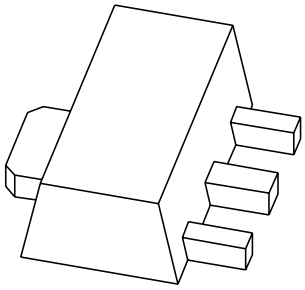
DATA SHEET



PXT4401
NPN switching transistor

Product specification
Supersedes data of 1999 Apr 14

2004 Nov 22

Philips
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NPN switching transistor PXT4401

FEATURES

- High current (max. 600 mA)
- Low voltage (max. 40 V).

APPLICATIONS

- Switching and linear amplification in industrial and consumer applications.

DESCRIPTION

NPN switching transistor in a SOT89 plastic package.
PNP complement: PXT4403.

MARKING

TYPE NUMBER	MARKING CODE(1)
PXT4401	*2X

Note

1. * = p: Made in Hong Kong.
   * = t: Made in Malaysia.
   * = W: Made in China.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

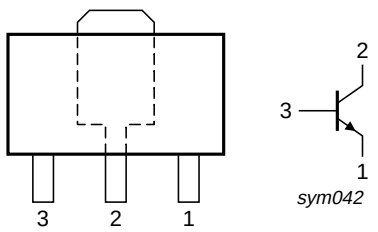


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PXT4401	SC-62	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

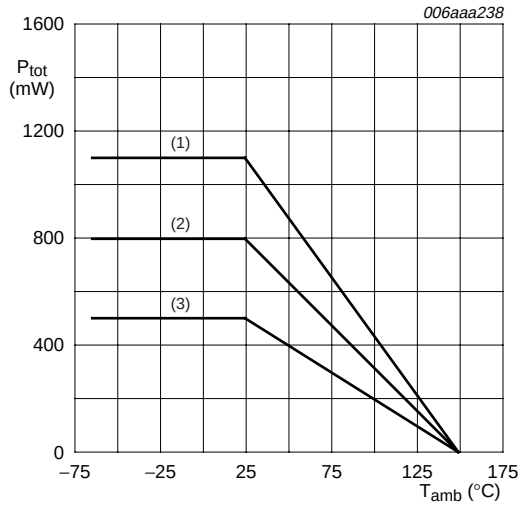
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	40	V
V_{EBO}	emitter-base voltage	open collector	–	5	V
I_C	collector current (DC)		–	600	mA
I_{CM}	peak collector current		–	800	mA
I_{BM}	peak base current		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C			
		note 1	–	0.5	W
		note 2	–	0.8	W
		note 3	–	1.1	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	ambient temperature		–65	+150	°C

Notes

1. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm^2.



(1) FR4 PCB; 6 cm^2 mounting pad for collector.
(2) FR4 PCB; 1 cm^2 mounting pad for collector.
(3) FR4 PCB; standard footprint.

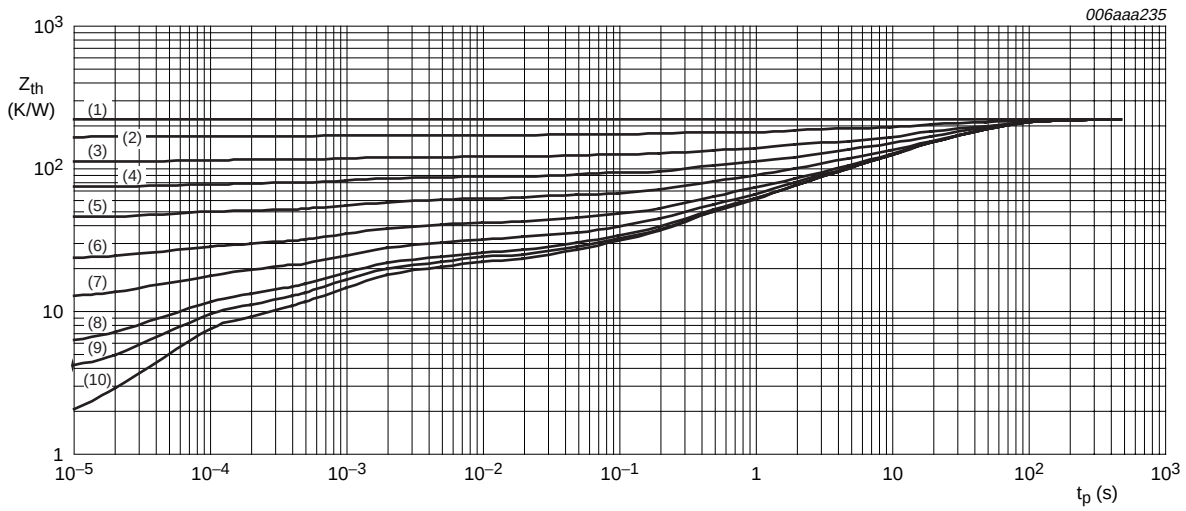
Fig.2 Power derating curves.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		
		note 1	250	K/W
		note 2	156	K/W
		note 3	113	K/W
$R_{th(j-s)}$	thermal resistance from junction to soldering point		30	K/W

Notes

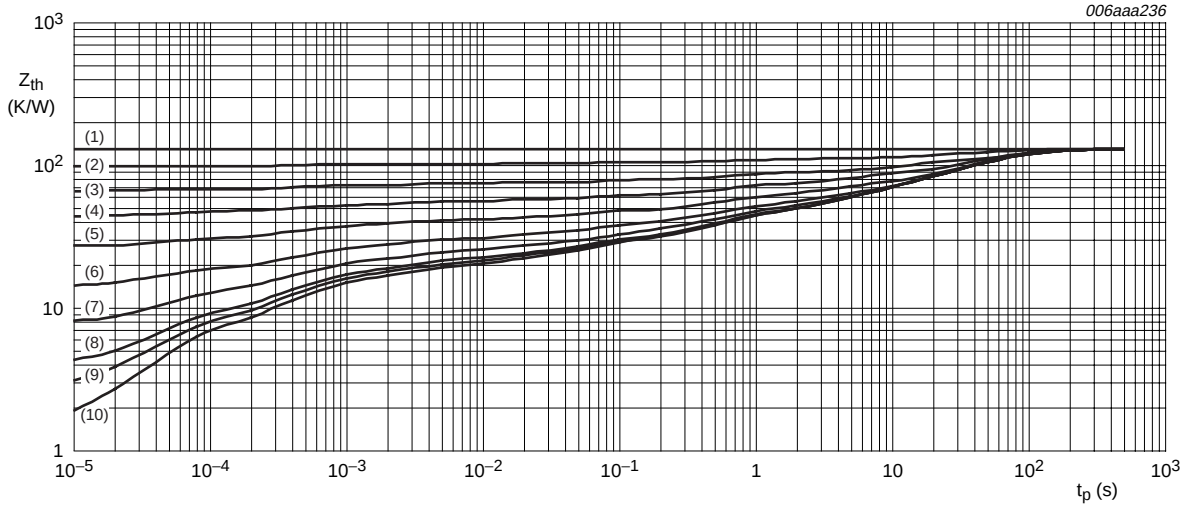
1. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm^2.



Mounted on FR4 printed-circuit board; standard footprint.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

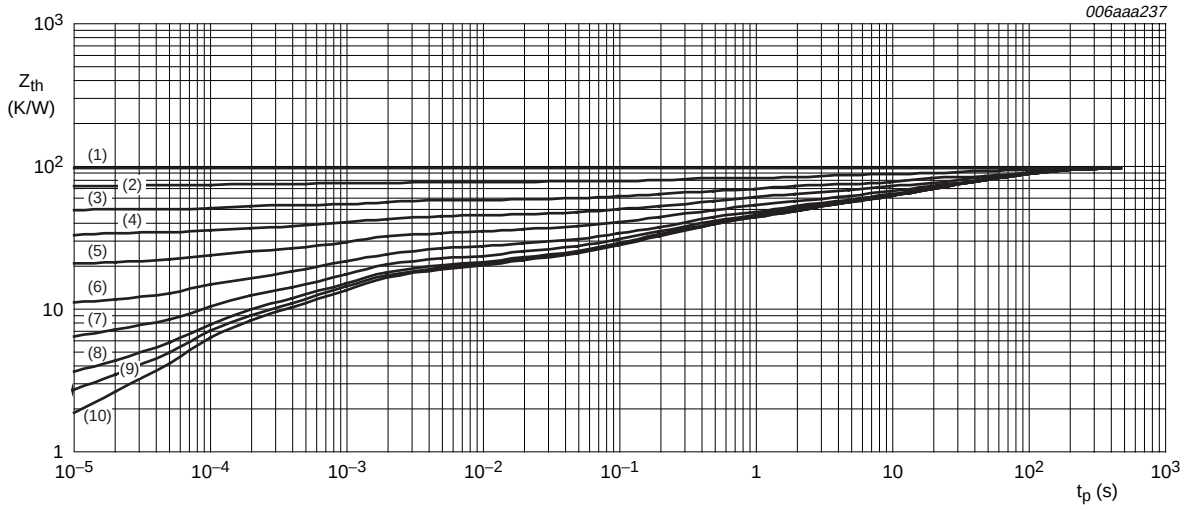
Fig.3 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm^2.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.4 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm^2.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.5 Transient thermal impedance as a function of pulse time; typical values.

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	I_E = 0 A; V_{CB} = 60 V	–	50	nA
I_{EBO}	emitter-base cut-off current	I_C = 0 A; V_{EB} = 6 V	–	50	nA
h_{FE}	DC current gain	V_{CE} = 1 V; (see Fig.6)	20	–	
		I_C = 0.1 mA	20	–	
		I_C = 1 mA	40	–	
		I_C = 10 mA	80	–	
		I_C = 150 mA; note 1	100	300	
		I_C = 500 mA; V_{CE} = 2 V; note 1	40	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA; note 1	–	400	mV
		I_C = 500 mA; I_B = 50 mA; note 1	–	750	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA; note 1	–	950	mV
		I_C = 500 mA; I_B = 50 mA; note 1	–	1.2	V
C_c	collector capacitance	$I_E = i_e$ = 0 A; V_{CB} = 5 V; f = 1 MHz	–	8	pF
C_e	emitter capacitance	$I_C = i_c$ = 0 A; V_{EB} = 500 mV; f = 1 MHz	–	30	pF
f_T	transition frequency	I_C = 20 mA; V_{CE} = 10 V; f =100 MHz	250	–	MHz
Switching times (between 10% and 90% levels); (see Fig.7)					
t_{on}	turn-on time	I_{Con} = 150 mA; I_{Bon} = 15 mA; I_{Boff} = –15 mA	–	35	ns
t_d	delay time		–	15	ns
t_r	rise time		–	20	ns
t_{off}	turn-off time		–	250	ns
t_s	storage time		–	200	ns
t_f	fall time		–	60	ns

Note

1. Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.

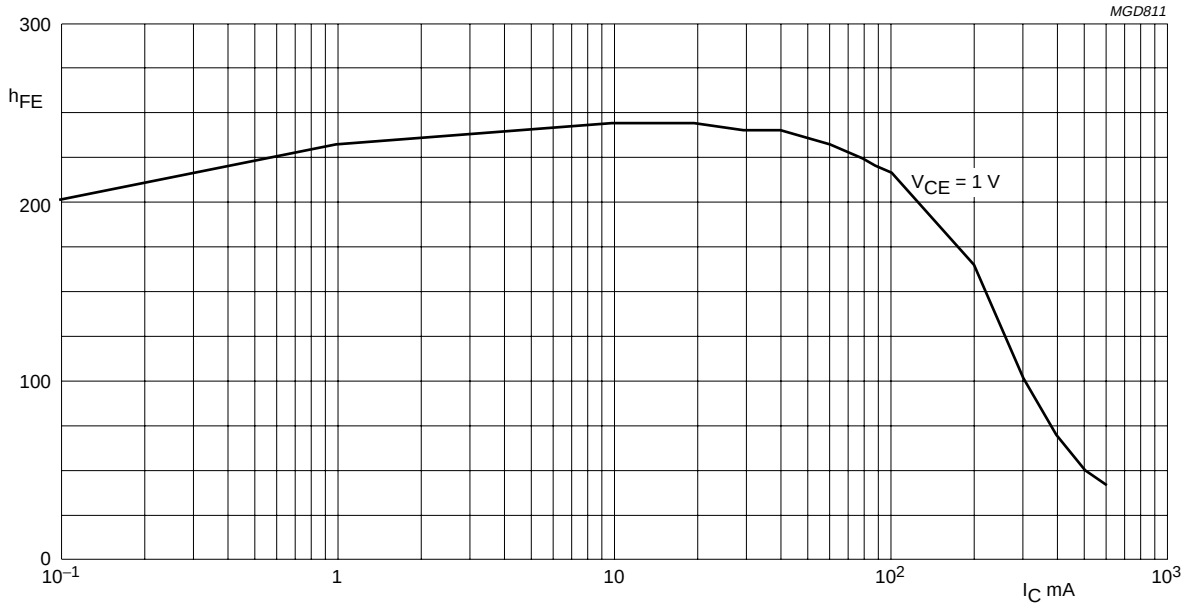
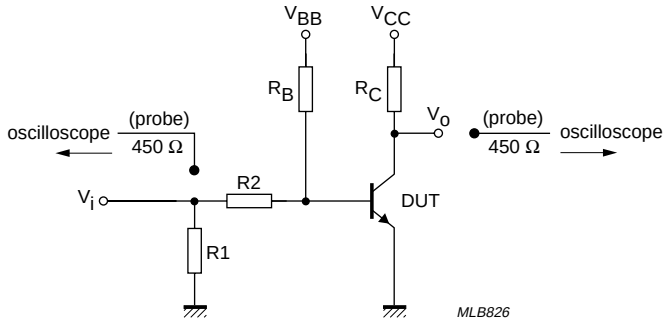


Fig.6 DC current gain; typical values.

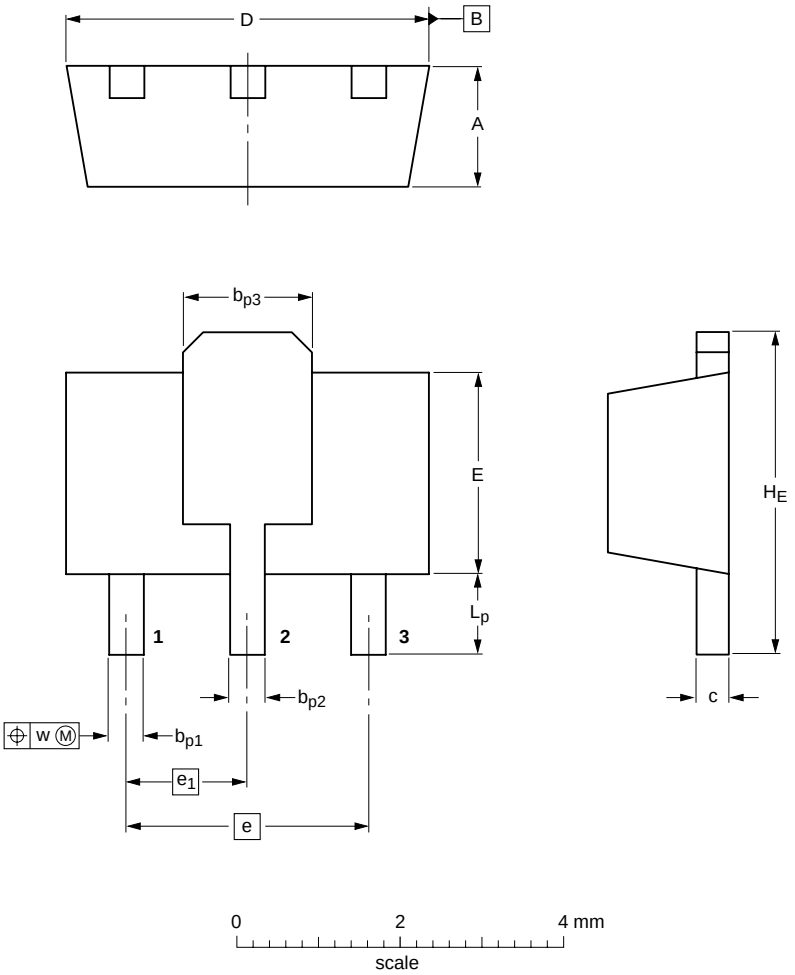


V_i = 9.5 V; T = 500 μs; t_p = 10 μs; $t_r = t_f \leq 3$ ns.
R1 = 68 Ω; R2 = 325 Ω; R_B = 325 Ω; R_C = 160 Ω.
V_{BB} = –3.5 V; V_{CC} = 29.5 V.
Oscilloscope: input impedance Z_i = 50 Ω.

Fig.7 Test circuit for switching times.

PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 3 leads **SOT89**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_{p1}	b_{p2}	b_{p3}	c	D	E	e	e_1	H_E	L_p	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.23	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	1.2 0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT89		TO-243	SC-62			~~99-09-13~~ 04-08-03

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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For additional information please visit **http://www.semiconductors.philips.com**. Fax: **+31 40 27 24825**
For sales offices addresses send e-mail to: **sales.addresses@www.semiconductors.philips.com**.

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