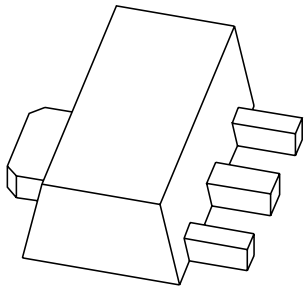


# DATA SHEET



## **PXT4401** NPN switching transistor

Product data sheet  
Supersedes data of 1999 Apr 14

2004 Nov 22

# 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 <sup>(1)</sup>
PXT4401	*2X

### Note

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

### PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

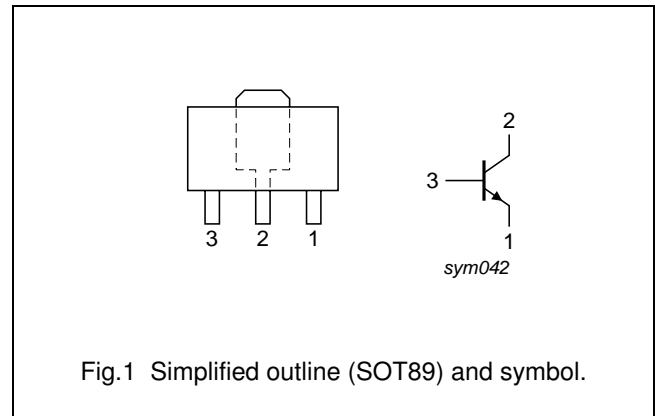


Fig.1 Simplified outline (SOT89) and symbol.

### ORDERING INFORMATION

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

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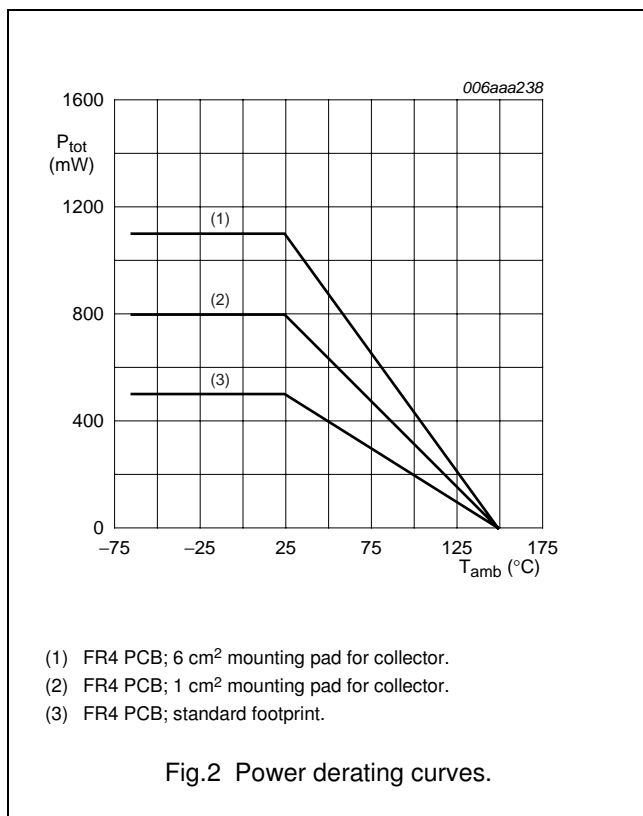
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	60	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	40	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	5	V
I <sub>C</sub>	collector current (DC)		–	600	mA
I <sub>CM</sub>	peak collector current		–	800	mA
I <sub>BM</sub>	peak base current		–	200	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C note 1 note 2 note 3	–	0.5 0.8 1.1	W W W
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	150	°C
T <sub>amb</sub>	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<sup>2</sup>.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm<sup>2</sup>.



NPN switching transistor

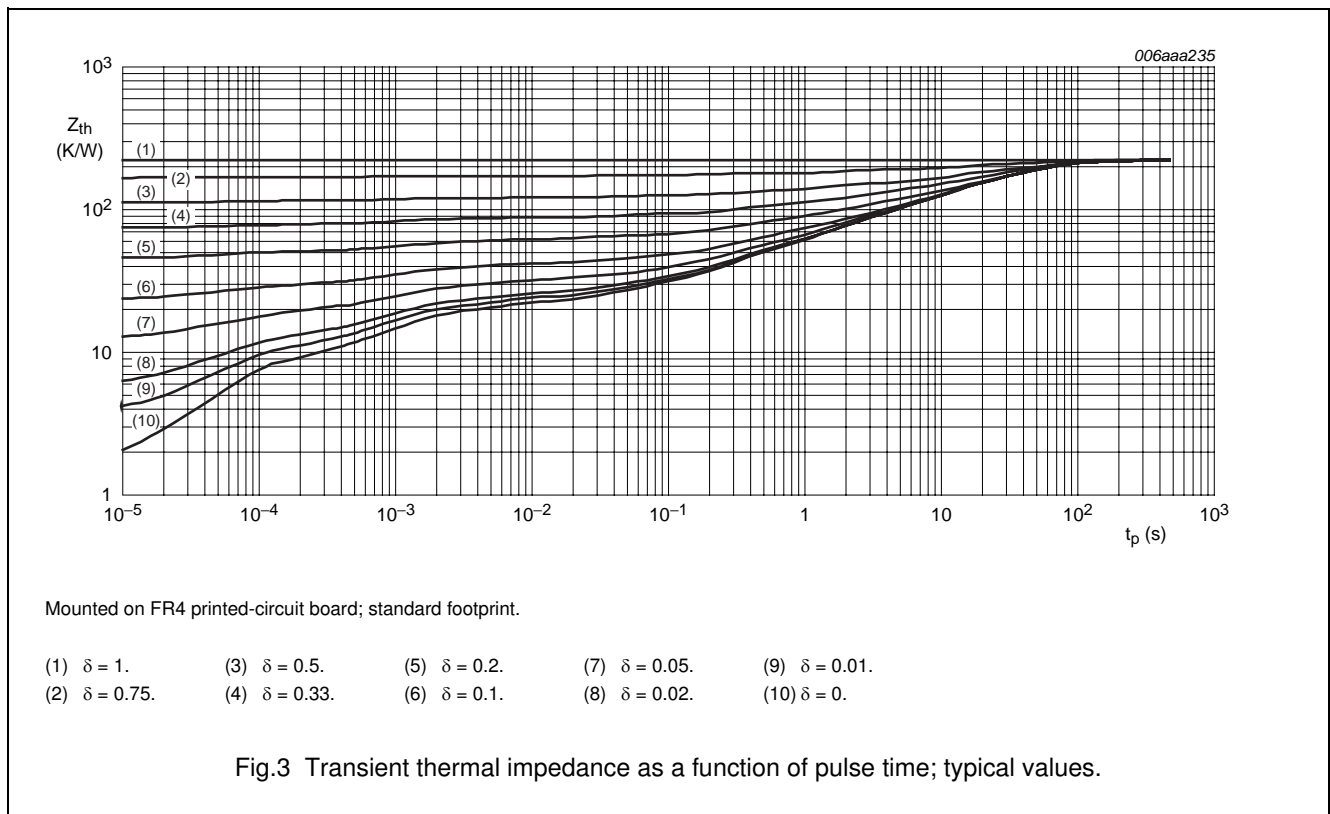
PXT4401

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th(j-a)</sub>	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 <sub>th(j-s)</sub>	thermal resistance from junction to soldering point		30	K/W

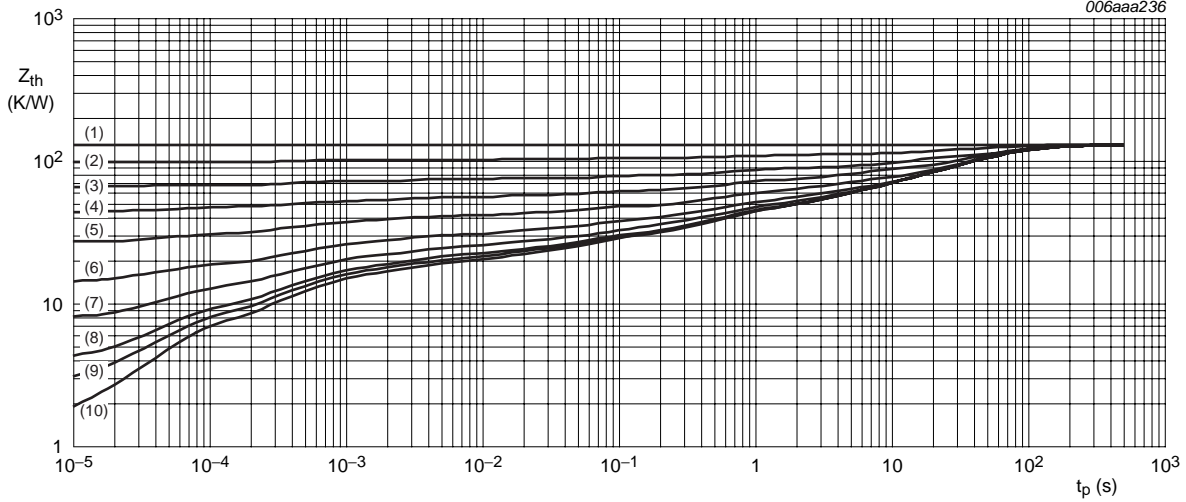
**Notes**

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<sup>2</sup>.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm<sup>2</sup>.



# NPN switching transistor

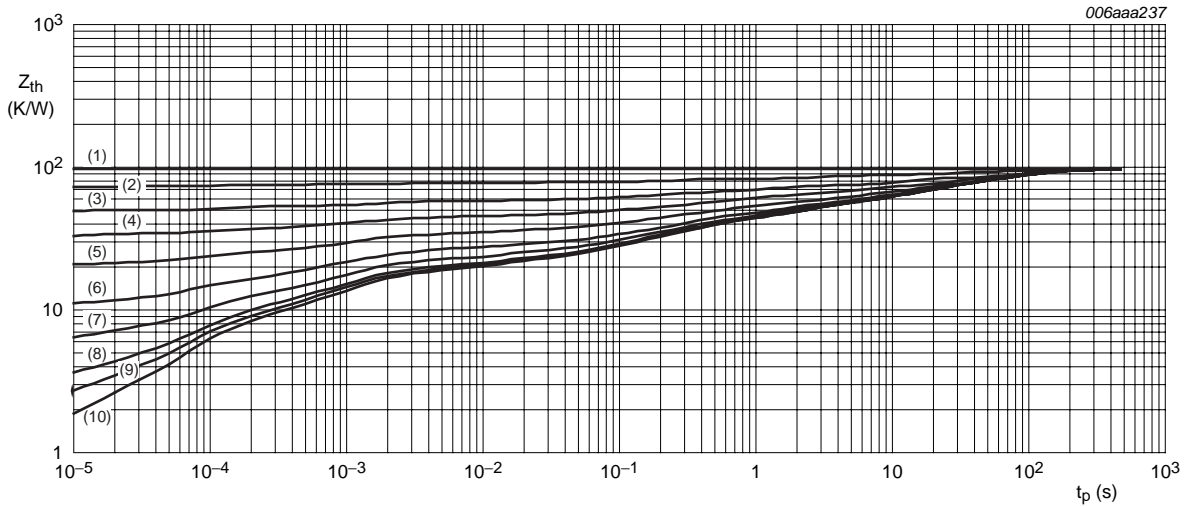
# PXT4401



Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm<sup>2</sup>.

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

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<sup>2</sup>.

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

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

## NPN switching transistor

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**CHARACTERISTICS** $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector-base cut-off current	$I_E = 0\text{ A}$ ; $V_{CB} = 60\text{ V}$	–	50	nA
$I_{EBO}$	emitter-base cut-off current	$I_C = 0\text{ A}$ ; $V_{EB} = 6\text{ V}$	–	50	nA
$h_{FE}$	DC current gain	$V_{CE} = 1\text{ V}$ ; (see Fig.6)	20	–	
		$I_C = 0.1\text{ mA}$	20	–	
		$I_C = 1\text{ mA}$	40	–	
		$I_C = 10\text{ mA}$	80	–	
		$I_C = 150\text{ mA}$ ; note 1	100	300	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 150\text{ mA}$ ; $I_B = 15\text{ mA}$ ; note 1	–	400	mV
		$I_C = 500\text{ mA}$ ; $I_B = 50\text{ mA}$ ; note 1	–	750	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 150\text{ mA}$ ; $I_B = 15\text{ mA}$ ; note 1	–	950	mV
		$I_C = 500\text{ mA}$ ; $I_B = 50\text{ mA}$ ; note 1	–	1.2	V
$C_c$	collector capacitance	$I_E = i_e = 0\text{ A}$ ; $V_{CB} = 5\text{ V}$ ; $f = 1\text{ MHz}$	–	8	pF
$C_e$	emitter capacitance	$I_C = i_c = 0\text{ A}$ ; $V_{EB} = 500\text{ mV}$ ; $f = 1\text{ MHz}$	–	30	pF
$f_T$	transition frequency	$I_C = 20\text{ mA}$ ; $V_{CE} = 10\text{ V}$ ; $f = 100\text{ MHz}$	250	–	MHz
<b>Switching times (between 10% and 90% levels); (see Fig.7)</b>					
$t_{on}$	turn-on time	$I_{Con} = 150\text{ mA}$ ; $I_{Bon} = 15\text{ mA}$ ; $I_{Boff} = -15\text{ mA}$	–	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:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

NPN switching transistor

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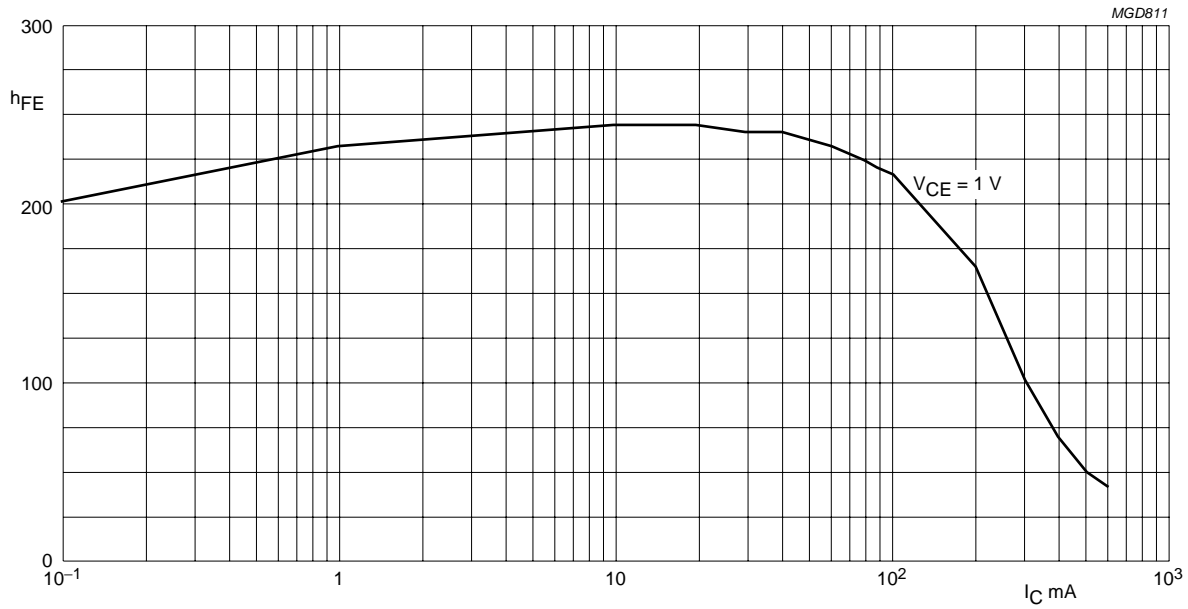
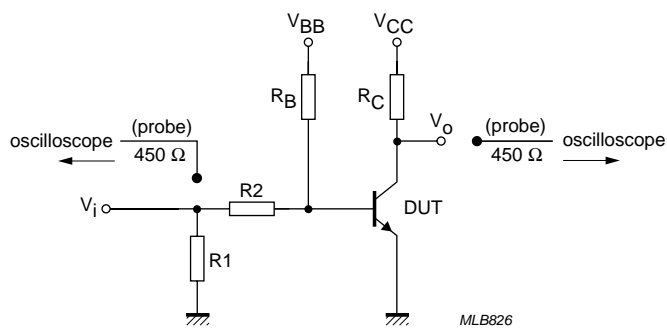


Fig.6 DC current gain; typical values.



$V_i = 9.5 \text{ V}$ ;  $T = 500 \text{ } \mu\text{s}$ ;  $t_p = 10 \text{ } \mu\text{s}$ ;  $t_r = t_f \leq 3 \text{ ns}$ .  
 $R_1 = 68 \text{ } \Omega$ ;  $R_2 = 325 \text{ } \Omega$ ;  $R_B = 325 \text{ } \Omega$ ;  $R_C = 160 \text{ } \Omega$ .  
 $V_{BB} = -3.5 \text{ V}$ ;  $V_{CC} = 29.5 \text{ V}$ .  
 Oscilloscope: input impedance  $Z_i = 50 \text{ } \Omega$ .

Fig.7 Test circuit for switching times.

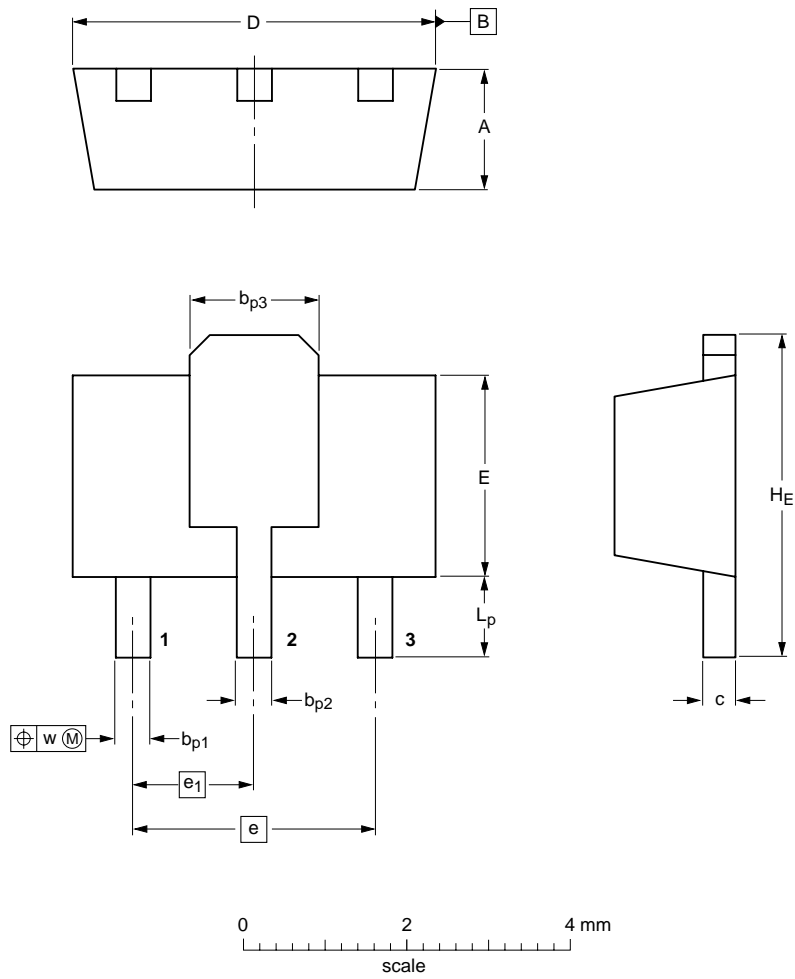
NPN switching transistor

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PACKAGE OUTLINE


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

SOT89



DIMENSIONS (mm are the original dimensions)

UNIT	A	b <sub>p1</sub>	b <sub>p2</sub>	b <sub>p3</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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			04-08-03 06-03-16

NPN switching transistor

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**DATA SHEET STATUS**

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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## **Contact information**

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