PBSS4032SPN

30 V NPN/PNP low V_{CEsat} (BISS) transistor

Rev. 2 — 14 October 2010 Product data sheet

1. Product profile

1.1 General description

NPN/PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a SOT96-1 (SO8) medium power Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		NPN/NPN complement	PNP/PNP complement
	Nexperia	Name		
PBSS4032SPN	SOT96-1	SO8	PBSS4032SN	PBSS4032SP

1.2 Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- Optimized switching time
- High collector current capability I_C and I_{CM}
- High collector current gain (h_{FE}) at high I_C
- High efficiency due to less heat generation
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors

1.3 Applications

- DC-to-DC conversion
- Battery-driven devices
- Power management
- Charging circuits

1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
TR1; NPN low V_{CEsat} transistor							
V_{CEO}	collector-emitter voltage	open base		-	-	30	V
I_C	collector current			-	-	5.7	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	10	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = 4$ A; $I_B = 0.4$ A	[1]	-	45	62.5	mΩ

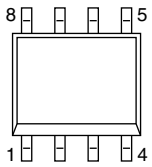
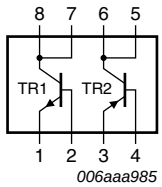
Table 2. Quick reference data *...continued*

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
TR2; PNP low V_{CEsat} transistor							
V_{CEO}	collector-emitter voltage	open base		-	-	–30	V
I_C	collector current			-	-	–4.8	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	–10	A
R_{CEsat}	collector-emitter saturation resistance	I_C = –4 A; I_B = –0.4 A	[1]	-	65	98	mΩ

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

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	emitter TR1		
2	base TR1		
3	emitter TR2		
4	base TR2		
5	collector TR2		
6	collector TR2		
7	collector TR1		
8	collector TR1		

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4032SPN	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

4. Marking

Table 5. Marking codes

Type number	Marking code
PBSS4032SPN	4032SPN

5. Limiting values

Table 6. Limiting values

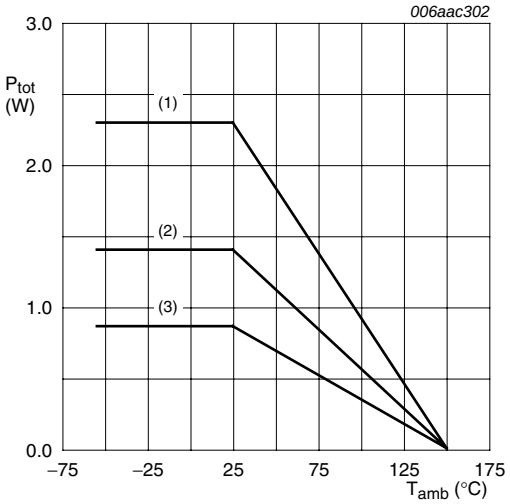
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
TR1 (NPN)						
I_C	collector current			-	5.7	A
TR2 (PNP)						
I_C	collector current			-	–4.8	A
Per transistor; for the PNP transistor with negative polarity						
V_{CBO}	collector-base voltage	open emitter		-	30	V
V_{CEO}	collector-emitter voltage	open base		-	30	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	10	A
I_B	base current			-	1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.73	W
			[2]	-	1	W
			[3]	-	1.7	W
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.86	W
			[2]	-	1.4	W
			[3]	-	2.3	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–55	+150	°C
T_{stg}	storage temperature			–65	+150	°C

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.

[3] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.



(1) Ceramic PCB, Al_2O_3, standard footprint

(2) FR4 PCB, mounting pad for collector 1 cm^2

(3) FR4 PCB, standard footprint

Fig 1. Per device: Power derating curves

6. Thermal characteristics

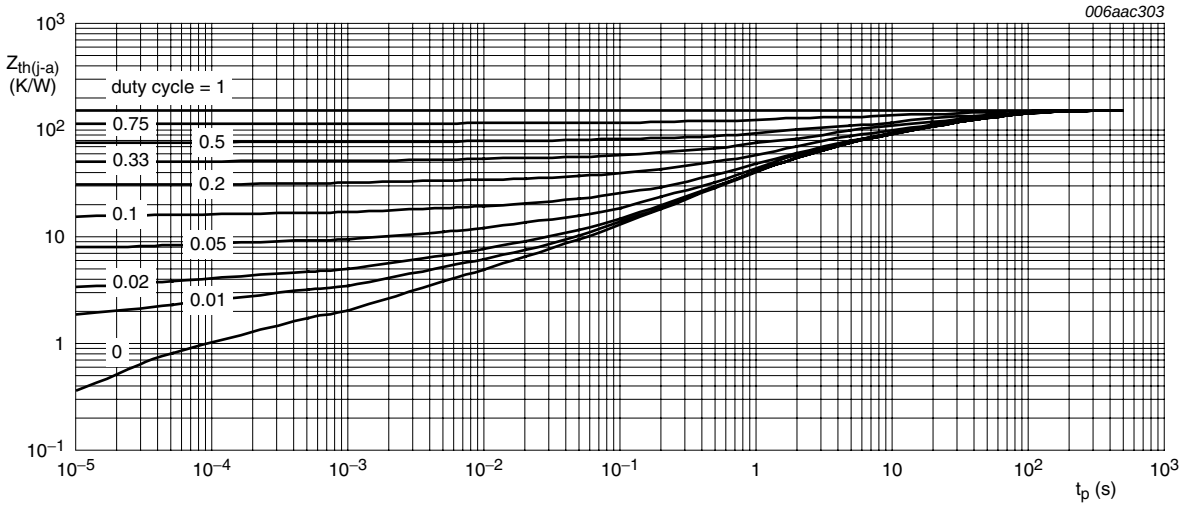
Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	170	K/W
			[2]	-	-	125	K/W
			[3]	-	-	75	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	40	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	145	K/W
			[2]	-	-	90	K/W
			[3]	-	-	55	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

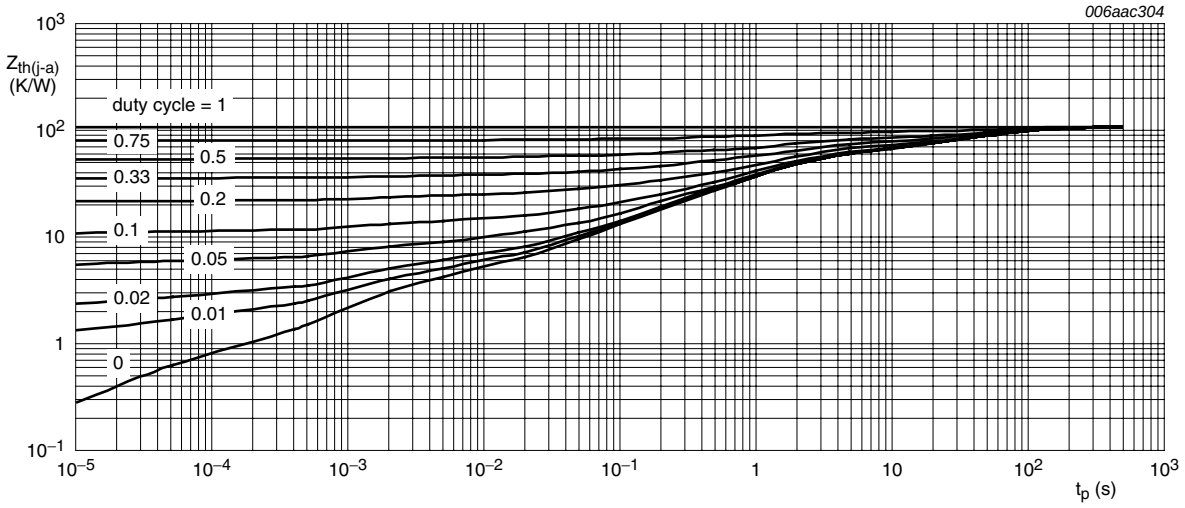
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.

[3] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.



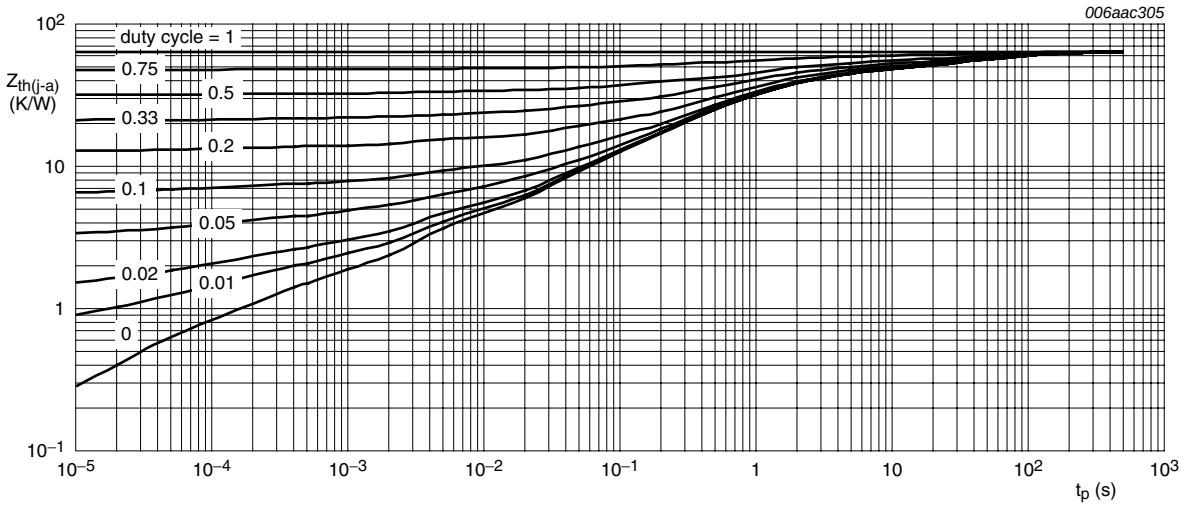
FR4 PCB, standard footprint

Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for collector 1 cm^2

Fig 3. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



Ceramic PCB, Al_2O_3, standard footprint

Fig 4. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 8. Characteristics

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

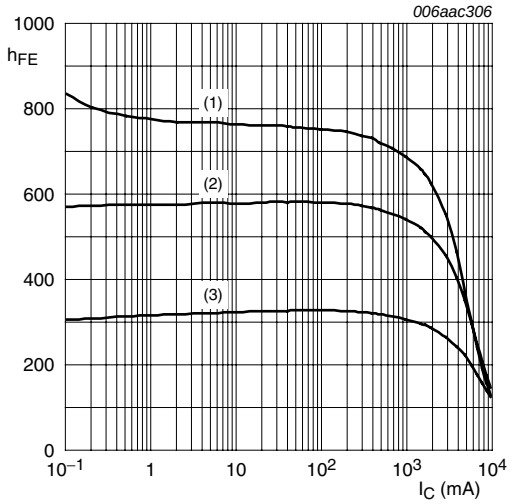
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
TR1; NPN low V_{CEsat} transistor							
I_{CBO}	collector-base cut-off current	V_{CB} = 30 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 30 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = 24 V; V_{BE} = 0 V		-	-	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V	[1]				
		I_C = 500 mA		300	500	-	
		I_C = 1 A		300	500	-	
		I_C = 2 A		250	450	-	
		I_C = 4 A		200	400	-	
		I_C = 6 A		150	300	-	
V_{CEsat}	collector-emitter saturation voltage		[1]				
		I_C = 1 A; I_B = 50 mA		-	90	125	mV
		I_C = 1 A; I_B = 10 mA		-	130	180	mV
		I_C = 2 A; I_B = 40 mA		-	150	210	mV
		I_C = 4 A; I_B = 400 mA		-	185	250	mV
		I_C = 4 A; I_B = 40 mA		-	250	375	mV
		I_C = 6 A; I_B = 300 mA		-	300	450	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 4 A; I_B = 400 mA	[1]	-	45	62.5	mΩ
V_{BEsat}	base-emitter saturation voltage		[1]				
		I_C = 1 A; I_B = 100 mA		-	0.76	0.9	V
		I_C = 4 A; I_B = 400 mA		-	0.91	1.05	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 2 V; I_C = 2 A	[1]	-	0.77	0.85	V
t_d	delay time	V_{CC} = 12.5 V; I_C = 1 A; I_{Bon} = 0.05 A; I_{Boff} = –0.05 A		-	35	-	ns
t_r	rise time			-	30	-	ns
t_{on}	turn-on time			-	65	-	ns
t_s	storage time			-	150	-	ns
t_f	fall time			-	65	-	ns
t_{off}	turn-off time			-	215	-	ns
f_T	transition frequency	V_{CE} = 10 V; I_C = 100 mA; f = 100 MHz		-	140	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	65	-	pF

Table 8. Characteristics *...continued*

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
TR2; PNP low V_{CEsat} transistor							
I_{CBO}	collector-base cut-off current	V_{CB} = –30 V; I_E = 0 A		-	-	–100	nA
		V_{CB} = –30 V; I_E = 0 A; T_j = 150 °C		-	-	–50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = –24 V; V_{BE} = 0 V		-	-	–100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = –5 V; I_C = 0 A		-	-	–100	nA
h_{FE}	DC current gain	V_{CE} = –2 V	[1]				
		I_C = –500 mA		200	380	-	
		I_C = –1 A		200	330	-	
		I_C = –2 A		150	250	-	
		I_C = –4 A		60	100	-	
		I_C = –5 A		40	60	-	
V_{CEsat}	collector-emitter saturation voltage		[1]				
		I_C = –1 A; I_B = –50 mA		-	–115	–165	mV
		I_C = –1 A; I_B = –10 mA		-	–170	–240	mV
		I_C = –2 A; I_B = –40 mA		-	–210	–300	mV
		I_C = –4 A; I_B = –400 mA		-	–260	–390	mV
		I_C = –4 A; I_B = –200 mA		-	–300	–450	mV
		I_C = –5 A; I_B = –250 mA		-	–340	–510	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = –4 A; I_B = –400 mA	[1]	-	65	98	mΩ
V_{BEsat}	base-emitter saturation voltage		[1]				
		I_C = –1 A; I_B = –100 mA		-	–0.8	–0.9	V
		I_C = –4 A; I_B = –400 mA		-	–0.99	–1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = –2 V; I_C = –2 A	[1]	-	–0.81	–0.9	V
t_d	delay time	V_{CC} = –12.5 V; I_C = –1 A; I_{Bon} = –0.05 A; I_{Boff} = 0.05 A		-	30	-	ns
t_r	rise time			-	60	-	ns
t_{on}	turn-on time			-	90	-	ns
t_s	storage time			-	140	-	ns
t_f	fall time			-	80	-	ns
t_{off}	turn-off time			-	220	-	ns
f_T	transition frequency	V_{CE} = –10 V; I_C = –100 mA; f = 100 MHz		-	115	-	MHz
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz		-	85	-	pF

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



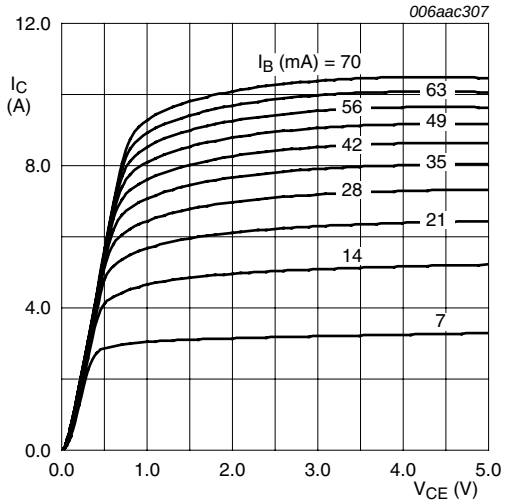
V_{CE} = 2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

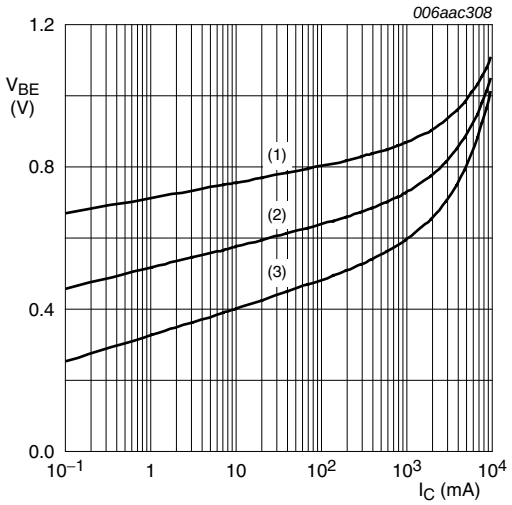
(3) T_{amb} = −55 °C

Fig 5. TR1 (NPN): DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 6. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values



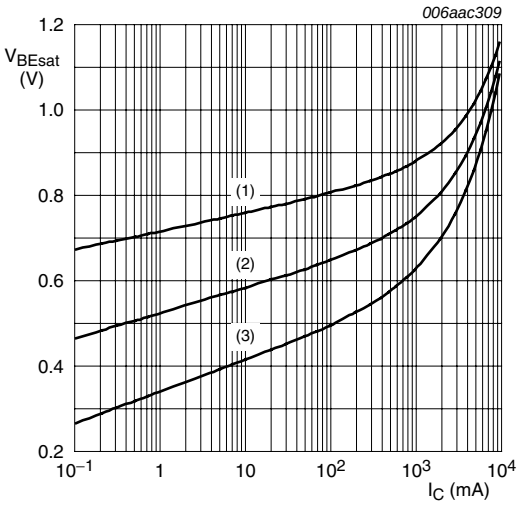
V_{CE} = 2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 7. TR1 (NPN): Base-emitter voltage as a function of collector current; typical values



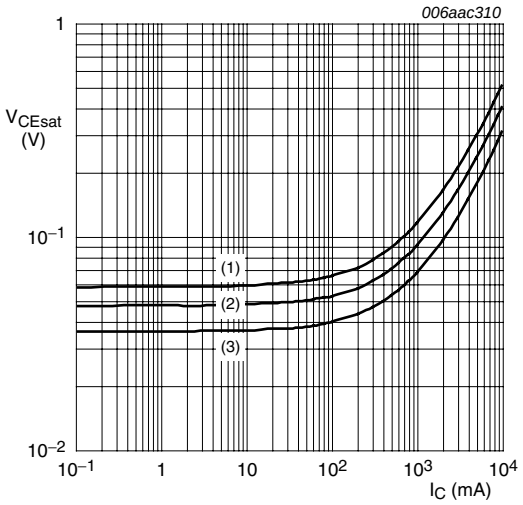
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 8. TR1 (NPN): Base-emitter saturation voltage as a function of collector current; typical values



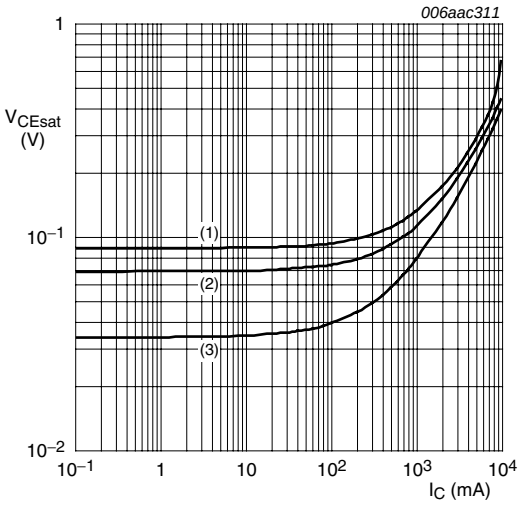
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 9. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values



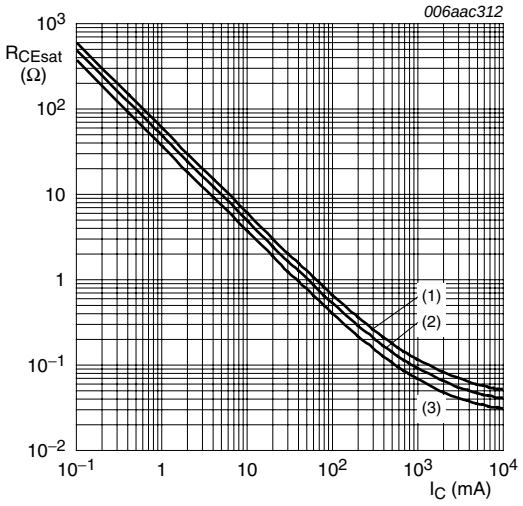
T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

Fig 10. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values



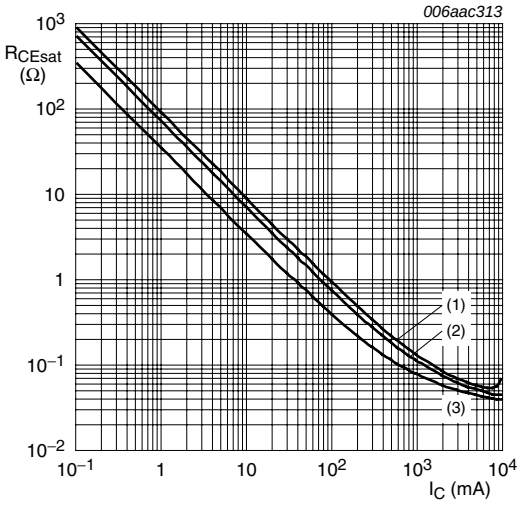
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 11. TR1 (NPN): Collector-emitter saturation resistance as a function of collector current; typical values



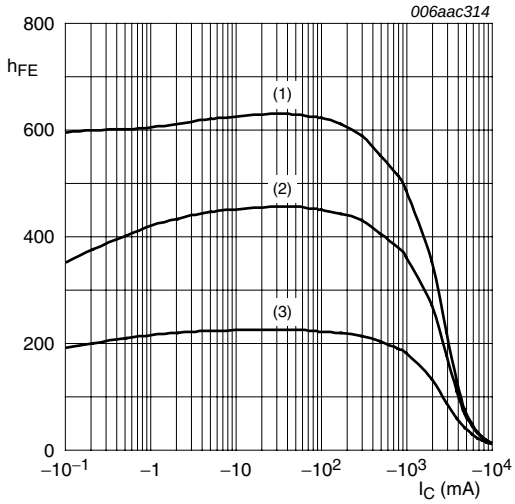
T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

Fig 12. TR1 (NPN): Collector-emitter saturation resistance as a function of collector current; typical values



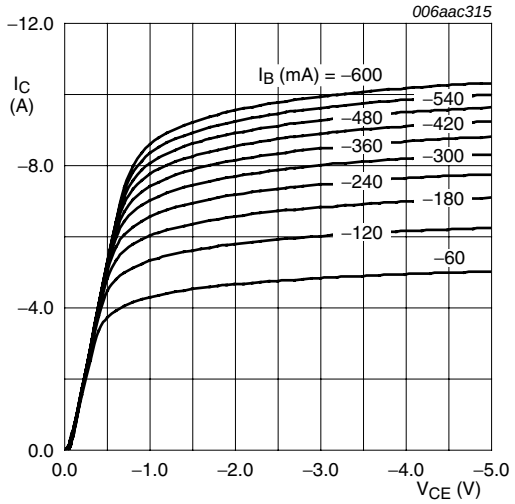
V_{CE} = −2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

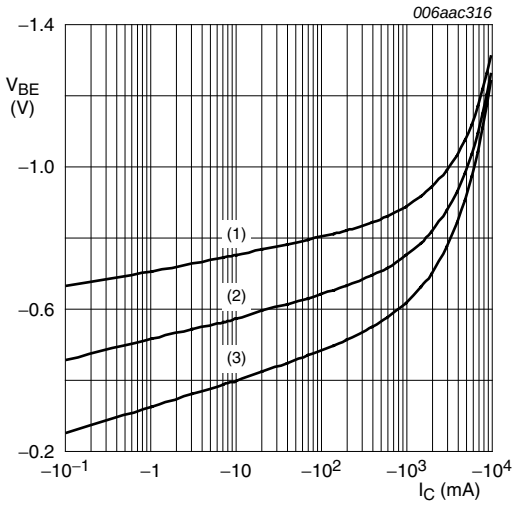
(3) T_{amb} = −55 °C

Fig 13. TR2 (PNP): DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 14. TR2 (PNP): Collector current as a function of collector-emitter voltage; typical values



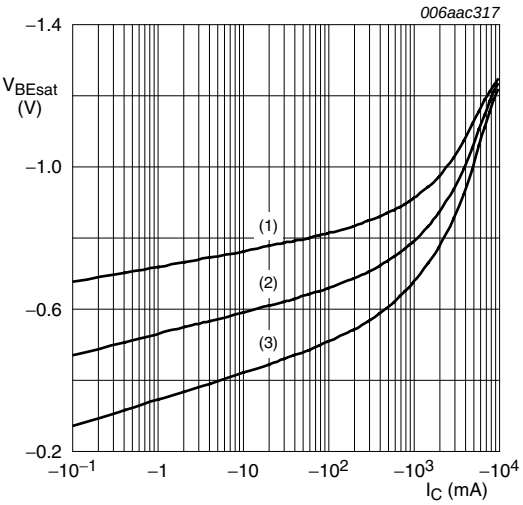
V_{CE} = −2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 15. TR2 (PNP): Base-emitter voltage as a function of collector current; typical values



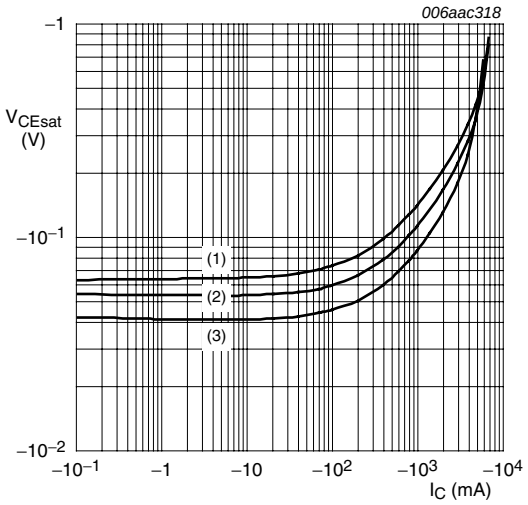
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 16. TR2 (PNP): Base-emitter saturation voltage as a function of collector current; typical values



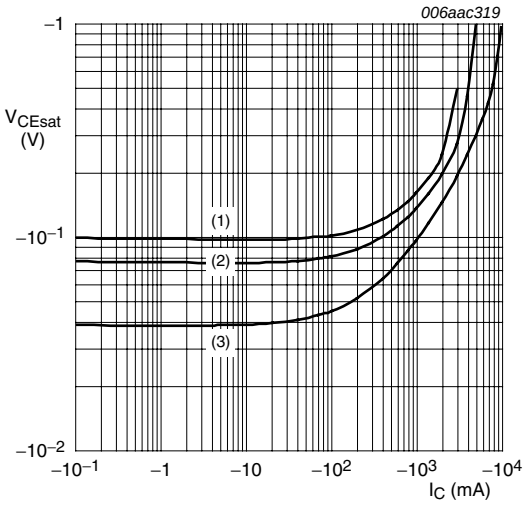
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 17. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



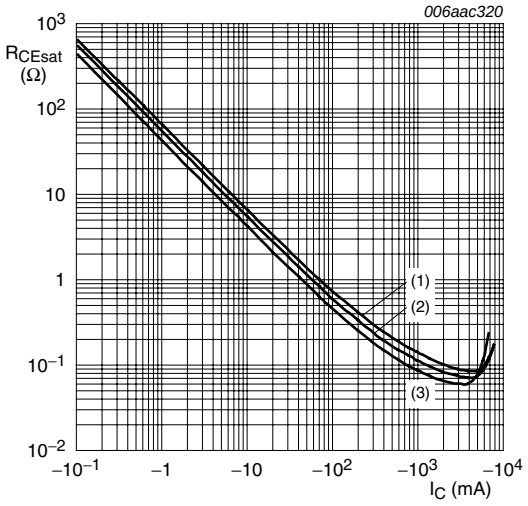
T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

Fig 18. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



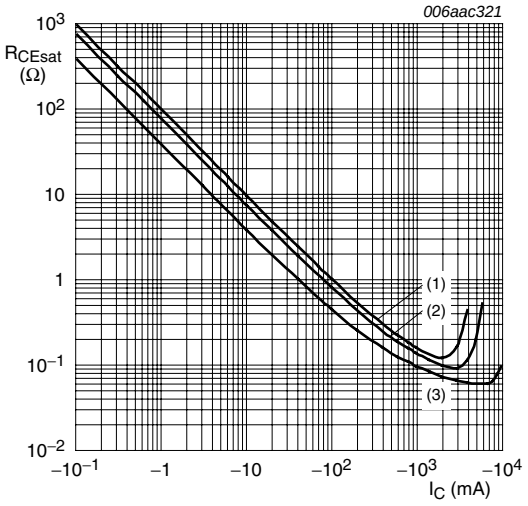
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 19. TR2 (PNP): Collector-emitter saturation resistance as a function of collector current; typical values



T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

Fig 20. TR2 (PNP): Collector-emitter saturation resistance as a function of collector current; typical values

8. Test information

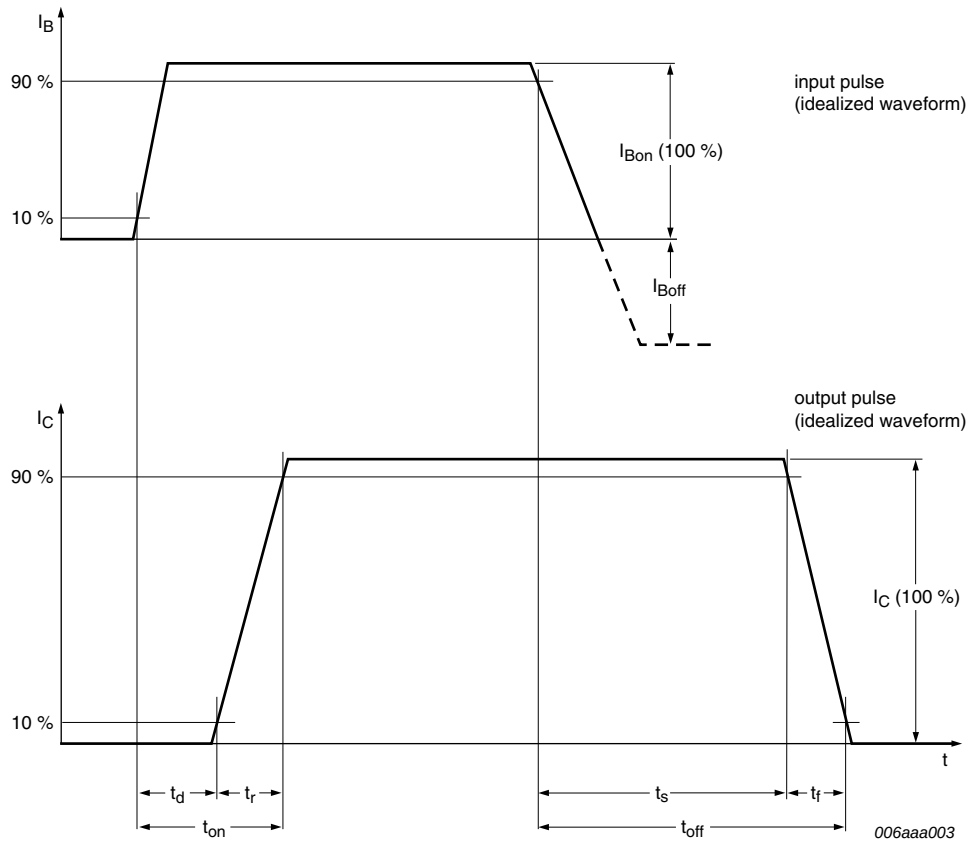
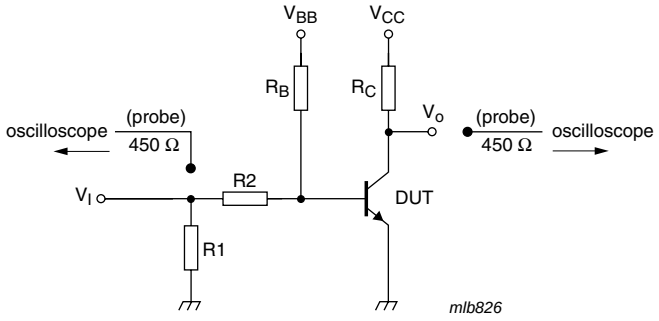


Fig 21. TR1 (NPN): BISS transistor switching time definition



V_{CC} = 12.5 V; I_C = 1 A; I_{Bon} = 0.05 A; I_{Boff} = −0.05 A

Fig 22. TR1 (NPN): Test circuit for switching times

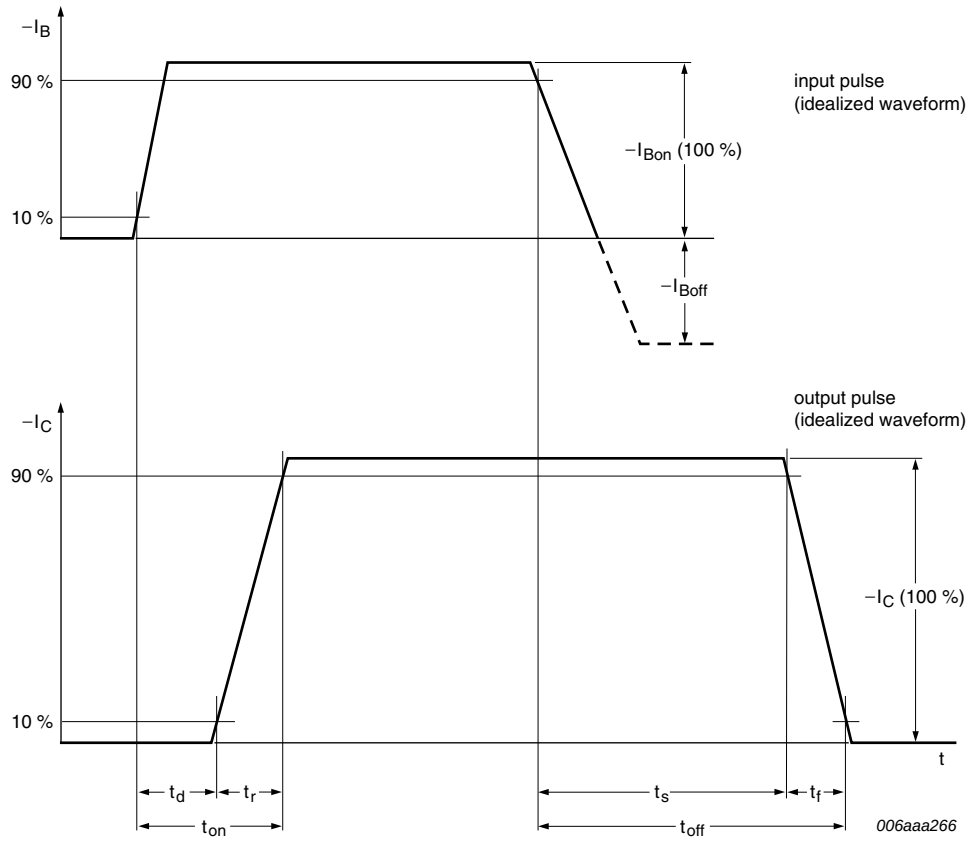
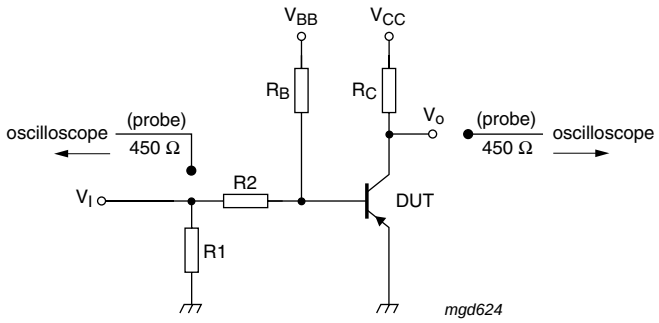


Fig 23. TR2 (PNP): BISS transistor switching time definition



V_{CC} = –12.5 V; I_C = –1 A; I_{Bon} = –0.05 A; I_{Boff} = 0.05 A

Fig 24. TR2 (PNP): Test circuit for switching times

9. Package outline

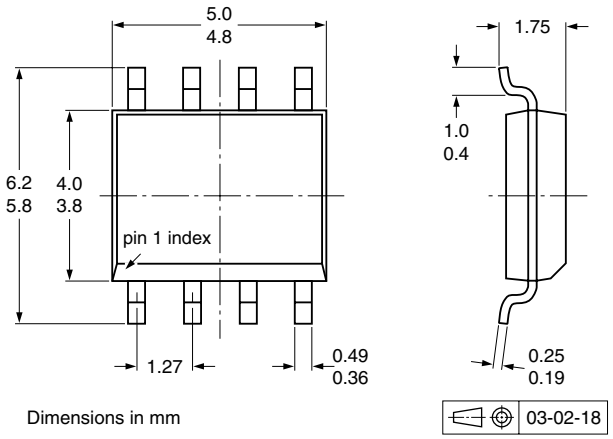


Fig 25. Package outline SOT96-1 (SO8)

10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity	
			1000	2500
PBSS4032SPN	SOT96-1	8 mm pitch, 12 mm tape and reel	-115	-118

[1] For further information and the availability of packing methods, see Section 14.

11. Soldering

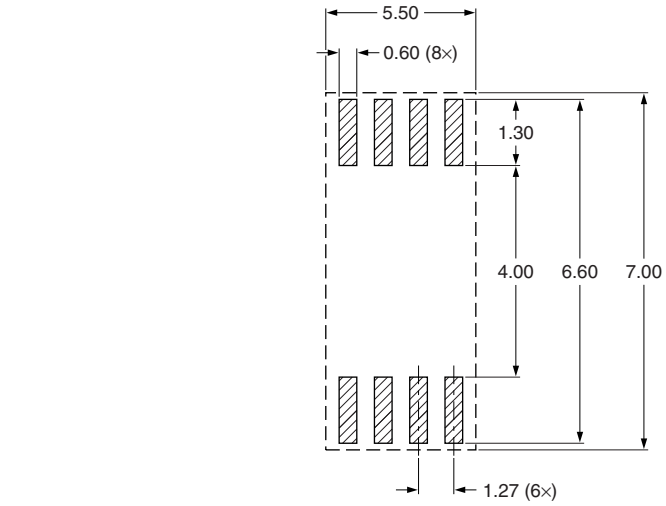


Fig 26. Reflow soldering footprint SOT96-1 (SO8)

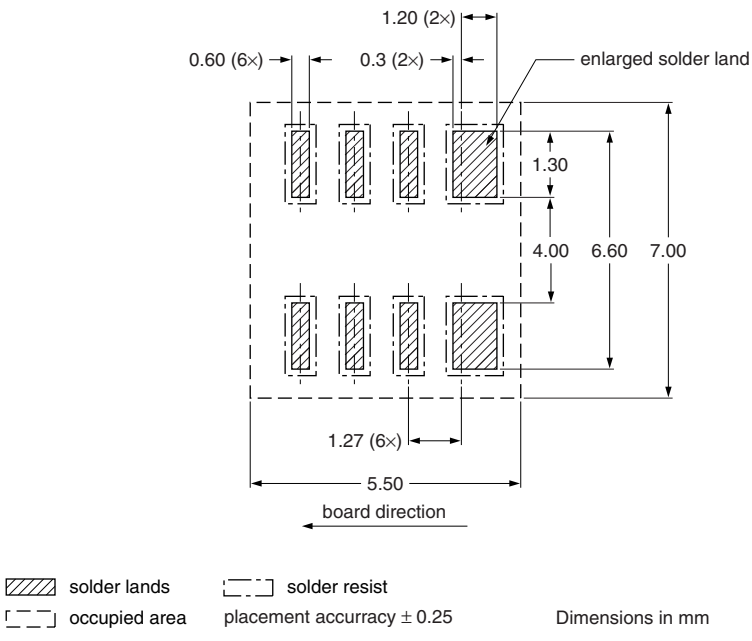


Fig 27. Wave soldering footprint SOT96-1 (SO8)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4032SPN v.2	20101014	Product data sheet	-	PBSS4032SPN v.1
Modifications:	• Figure 1 “Per device: Power derating curves”: updated.			
PBSS4032SPN v.1	20100714	Product data sheet	-	-

13. Legal information

13.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

13.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

13.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of Nexperia.

Right to make changes — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia accepts no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nexperia.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

13.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

14. Contact information

For more information, please visit: **http://www.nexperia.com**

For sales office addresses, please send an email to: **salesaddresses@nexperia.com**

15. Contents

For more information, please visit: http://www.nexperia.com
For sales office addresses, please send an email to: salesaddresses@nexperia.com
Date of release: 14 October 2010

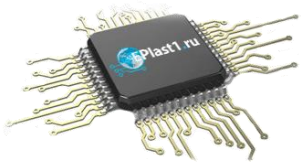
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.