BGU7052

SiGe:C Low Noise High Linearity Amplifier

Rev. 2 — 21 February 2012 Product data sheet

1. Product profile

1.1 General description

The BGU7052 is a low noise high linearity amplifier for wireless infrastructure applications. The LNA has a high input and output return loss and is designed to operate between 1.5 GHz and 2.5 GHz. It is housed in a 3 × 3 × 0.85 mm^3 10-terminal plastic thin small outline package. The LNA is ESD protected on all terminals.

1.2 Features and benefits

- Low Noise Figure (NF) = 0.76 dB at 1900 MHz
- High linearity performance, $IP3_O$ = 35 dBm at 1900 MHz
- High input and output return loss
- Unconditionally stable
- 110 GHz transit frequency - SiGe:C technology
- Supply voltage 3.3 V
- Small 10-terminal leadless package 3 × 3 × 0.85 mm^3
- Moisture sensitivity level 1

1.3 Applications

- LNA for wireless infrastructure applications (1.5 GHz to 2.5 GHz)
- Low noise applications

1.4 Quick reference data

Table 1. Quick reference data

f = 1900 MHz; T_{amb} = 25 °C; input and output 50 Ω; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		3.0	3.3	3.6	V
I_{CC}	supply current		63	80	95	mA
G_{ass}	associated gain		18.5	20	21.5	dB
NF	noise figure		-	0.76	0.95	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		13	14.5	-	dBm
$IP3_O$	output third-order intercept point		32	35	-	dBm

2. Pinning information

2.1 Pinning

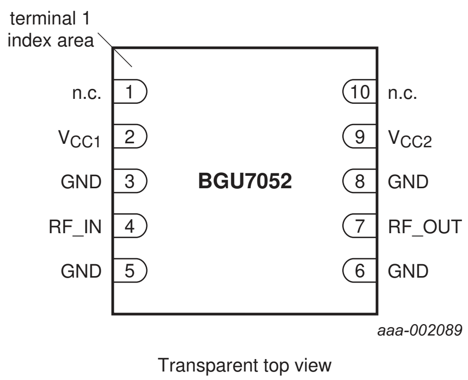


Fig 1. Pin configuration

2.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
n.c.	1, 10	not connected
GND	3, 5, 6, 8	ground
RF_IN	4	RF input
RF_OUT	7	RF output
V_{CC}	2, 9	supply voltage

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BGU7052	HVSON10	plastic thermal enhanced very thin small outline package; no leads; 10 terminals; body 3 x 3 x 0.85 mm	SOT650-1

4. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		0	5	V
P_{tot}	total power dissipation		-	300	mW
$P_{i(RF)CW}$	continuous waveform RF input power	V_{CC} = 3.3 V	-	20	dBm
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		–40	+85	°C
V_{ESD}	electrostatic discharge voltage	Human Body Model (HBM); According JEDEC standard 22-A114E	-	4	kV
		Charged Device Model (CDM); According JEDEC standard 22-C101B	-	2	kV

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j\text{-}sp)}$	thermal resistance from junction to solder point		20	K/W

6. Characteristics

Table 6. Characteristics

V_{CC} = 3.3 V; T_{amb} = 25 °C; input and output 50 Ω; unless otherwise specified. All RF parameters are measured at the device RF in and RF output terminals.

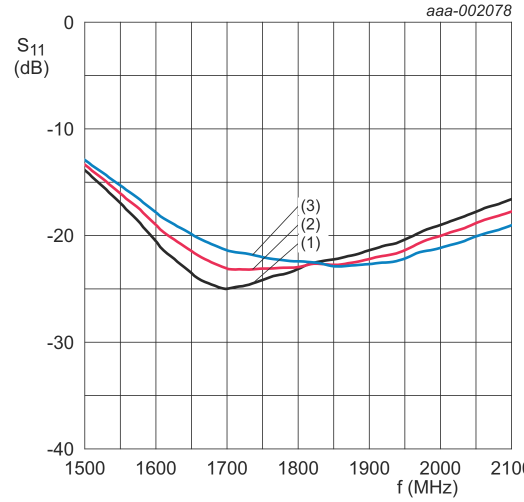
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CC}	supply current		63	80	95	mA
G_{ass}	associated gain	f = 1750 MHz	-	21.5	-	dB
		f = 1900 MHz	18.5	20	21.5	dB
		f = 1950 MHz	-	19.7	-	dB
NF	noise figure	f = 1750 MHz	-	0.76	-	dB
		f = 1900 MHz	-	0.76	0.95	dB
		f = 1950 MHz	-	0.79	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 1750 MHz	-	15.5	-	dBm
		f = 1900 MHz	13	14.5	-	dBm
		f = 1950 MHz	-	14.5	-	dBm
$IP3_O$	output third-order intercept point	f = 1750 MHz	-	36.8	-	dBm
		f = 1900 MHz	32	35.3	-	dBm
		f = 1950 MHz	-	35.1	-	dBm

Table 6. Characteristics *...continued*

V_{CC} = 3.3 V; T_{amb} = 25 °C; input and output 50 Ω; unless otherwise specified. All RF parameters are measured at the device RF in and RF output terminals.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RL_{in}	input return loss	f = 1750 MHz	-	23	-	dB
		f = 1900 MHz	-	23	-	dB
		f = 1950 MHz	-	22	-	dB
RL_{out}	output return loss	f = 1750 MHz	-	22	-	dB
		f = 1900 MHz	-	22	-	dB
		f = 1950 MHz	-	21	-	dB
ISL	isolation	f = 1750 MHz	-	28.5	-	dB
		f = 1900 MHz	-	27.5	-	dB
		f = 1950 MHz	-	27	-	dB
K	Rollett stability factor	0 GHz ≤ f ≤ 25 GHz	1	-	-	

6.1 Performance curves



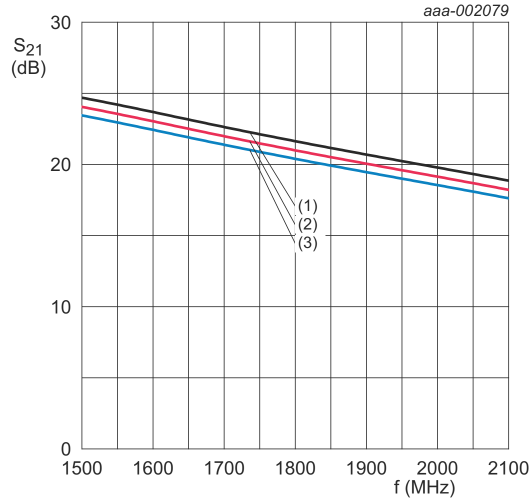
V_{CC} = 3.3 V.

(1) T_j = −40 °C

(2) T_j = 25 °C

(3) T_j = 85 °C

Fig 2. Input reflection coefficient as a function of frequency



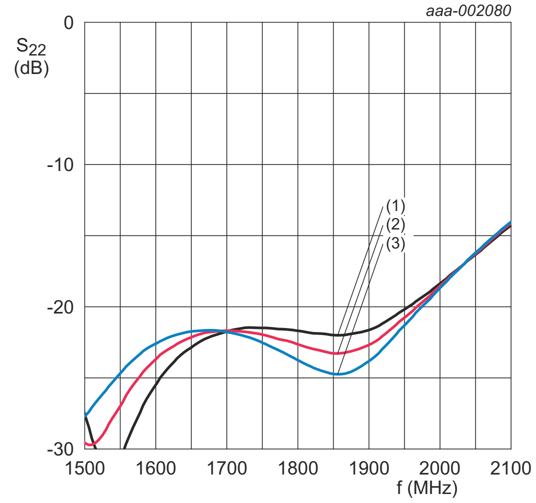
V_{CC} = 3.3 V.

(1) T_j = −40 °C

(2) T_j = 25 °C

(3) T_j = 85 °C

Fig 3. Forward transmission coefficient as a function of frequency



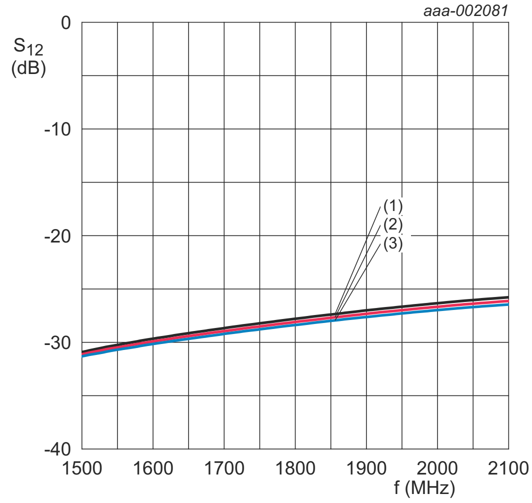
V_{CC} = 3.3 V.

(1) T_j = –40 °C

(2) T_j = 25 °C

(3) T_j = 85 °C

Fig 4. Output reflection coefficient as a function of frequency



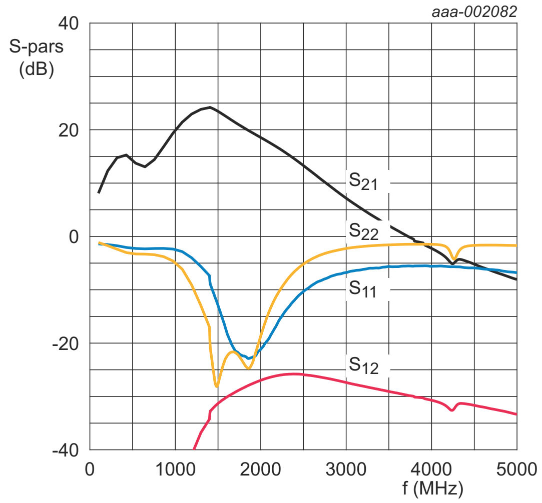
V_{CC} = 3.3 V.

(1) T_j = –40 °C

(2) T_j = 25 °C

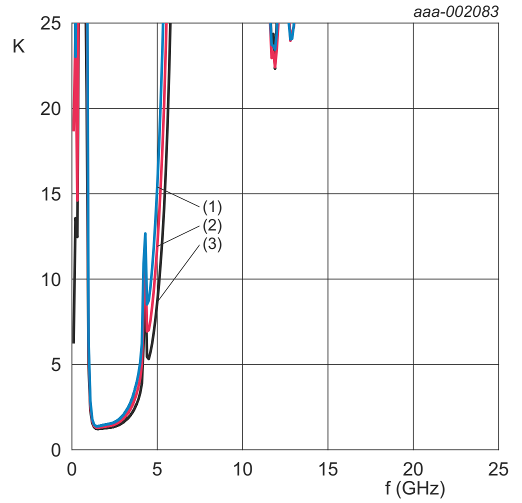
(3) T_j = 85 °C

Fig 5. Reverse transmission coefficient as a function of frequency



V_{CC} = 3.3 V; T_{amb} = 25 °C.

Fig 6. Wideband s-parameters as a function of frequency



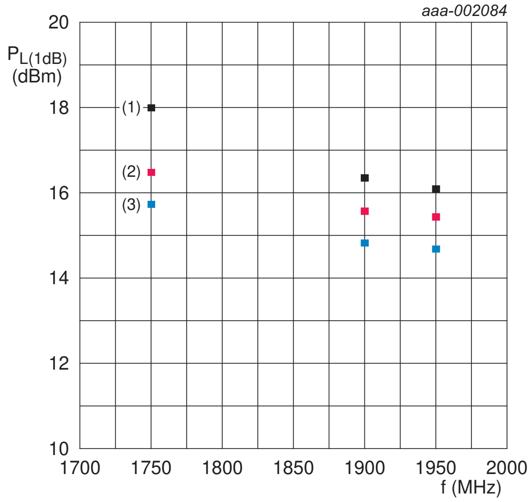
V_{CC} = 3.3 V.

(1) T_j = –40 °C

(2) T_j = 25 °C

(3) T_j = 85 °C

Fig 7. Stability K-factor as a function of frequency



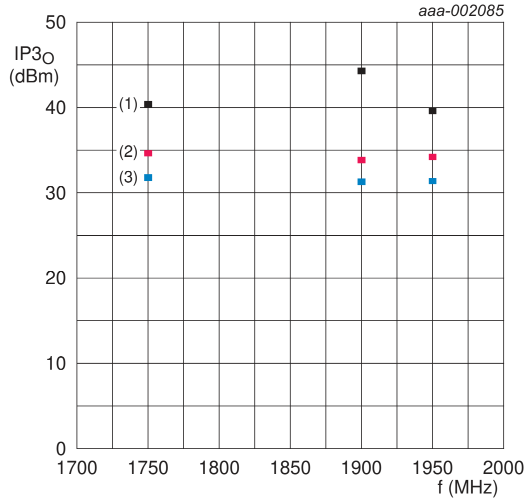
V_{CC} = 3.3 V.

(1) T_j = −40 °C

(2) T_j = 25 °C

(3) T_j = 85 °C

Fig 8. Output power at 1 dB gain compression as a function of frequency



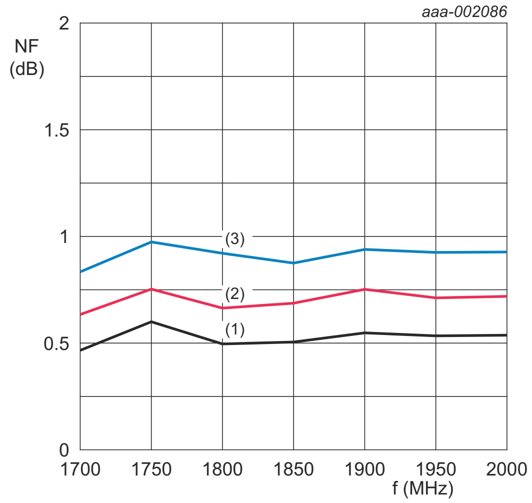
V_{CC} = 3.3 V.

(1) T_j = −40 °C

(2) T_j = 25 °C

(3) T_j = 85 °C

Fig 9. Output third-order intercept point as a function of frequency



V_{CC} = 3.3 V.

(1) T_j = −40 °C

(2) T_j = 25 °C

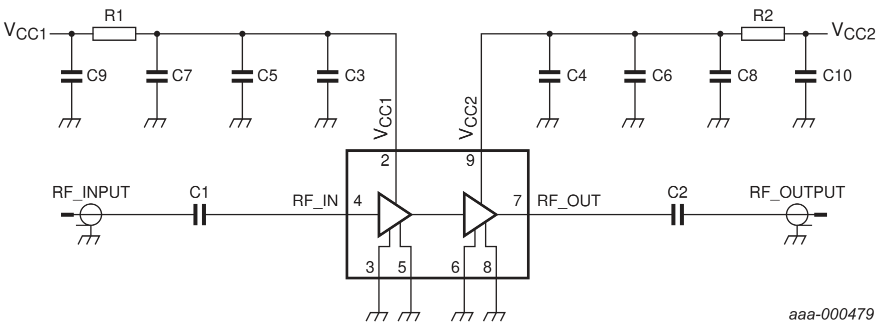
(3) T_j = 85 °C

Fig 10. Noise figure as function of frequency

7. Application information

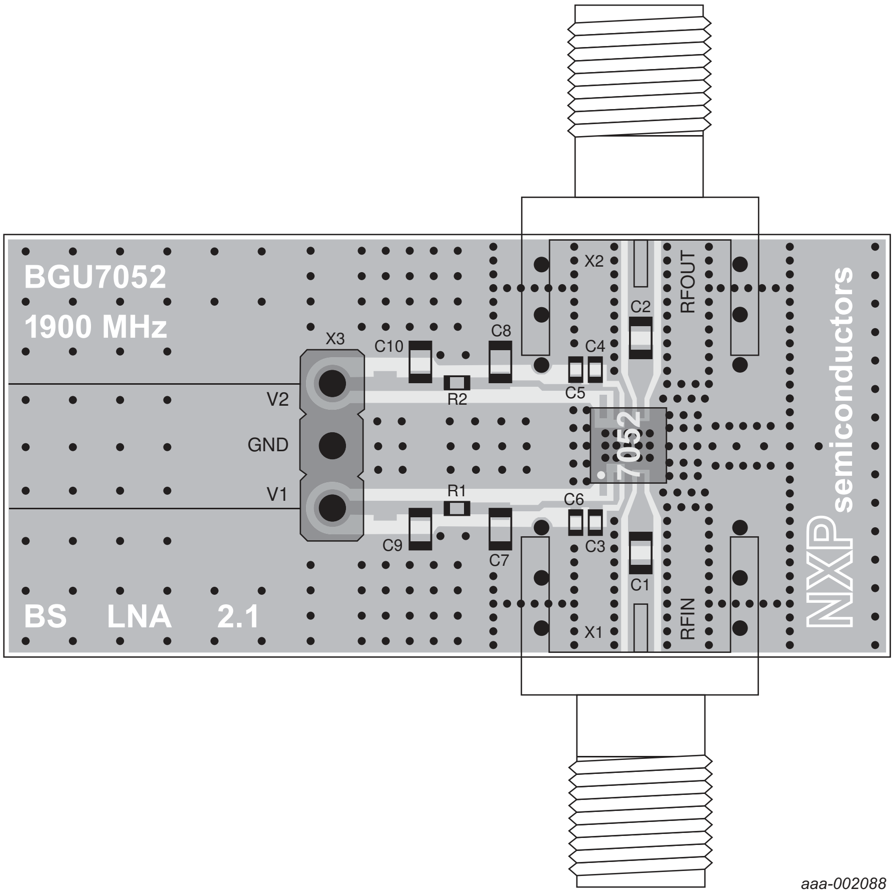
Figure 11 shows the typical application circuit for the BGU7052. The device is internally matched to 50 Ω, and therefore does not need any external matching. The value of the input and output DC blocking C1 and C2 are recommended to be 1 nF. DC decoupling capacitors C3 and C4 should be located as close as possible to the BGU7052.

In case different system blocks are supplied via the same voltage rail, it is recommended to use a bias choke in the bias line on the positions of R1 and R2. The value of this choke is depending on the frequency that needs to be dececoupled.



See Table 7 for a list of components.

Fig 11. Schematics of application board



See Table 7 for a list of components.

Fig 12. Layout of the evaluation board

Table 7. List of components

See Figure 11 for schematics.

Component	Description		Value	Size	Function
C1, C2	capacitor	[1]	1 nF	0402	DC block
C3, C4	capacitor	[1]	100 pF	0402	bias decoupling
C5, C6	capacitor	[1]	100 nF	0402	bias decoupling
C7, C8, C9, C10	capacitor	[2]	100 nF	0603	optional
R1, R2	resistor		0 Ω	0402	

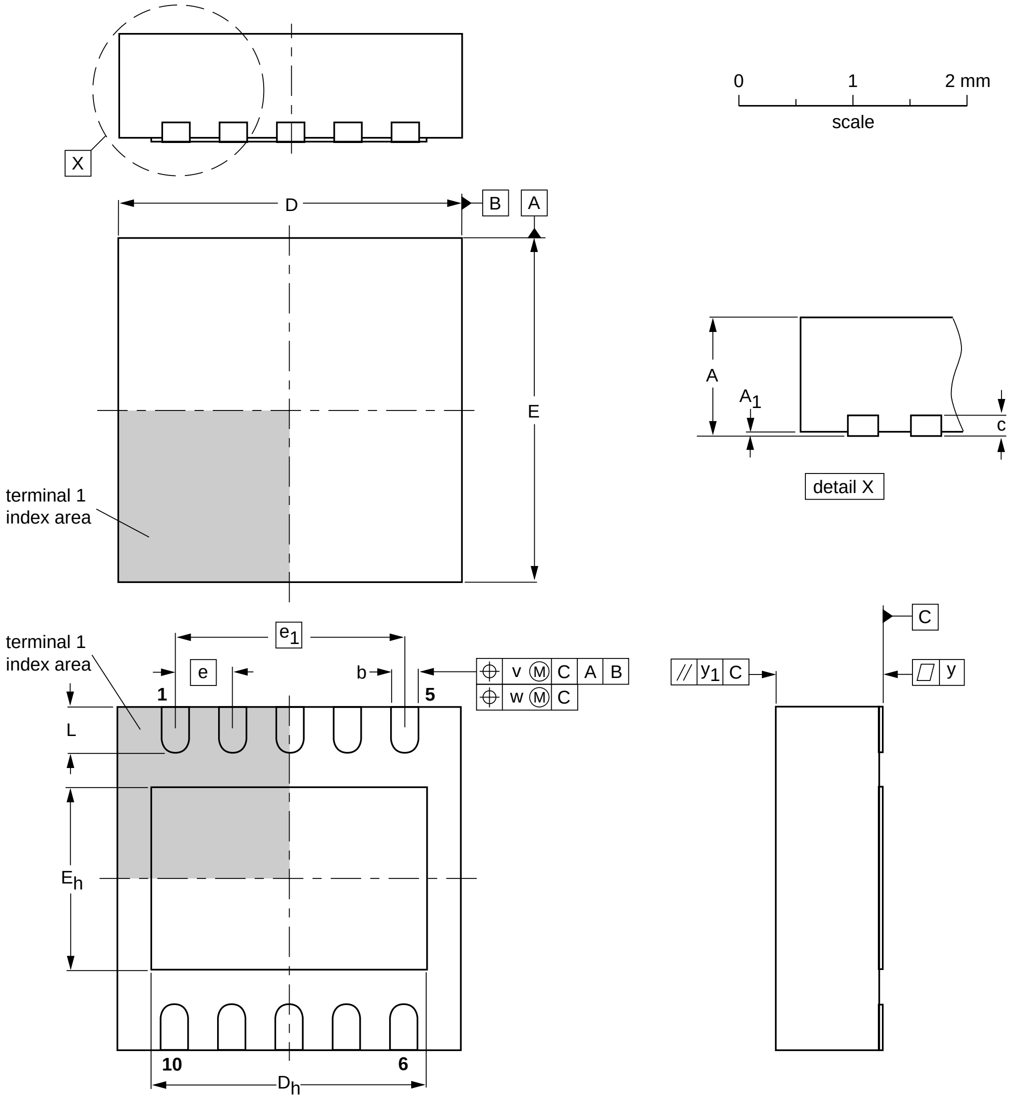
[1] Murata GRM155 or capacitor of same quality.

[2] Murata GRM188 or capacitor of same quality.

8. Package outline

HVSON10: plastic thermal enhanced very thin small outline package; no leads; 10 terminals; body 3 x 3 x 0.85 mm

SOT650-1



DIMENSIONS (mm are the original dimensions)

UNIT	A(1) max.	A_1	b	c	D(1)	D_h	E(1)	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	3.1 2.9	2.55 2.15	3.1 2.9	1.75 1.45	0.5	2	0.55 0.30	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT650-1	- - -	MO-229	- - -			~~01-01-22~~ 02-02-08

Fig 13. Package outline SOT650-1 (HVSON10)

9. Abbreviations

Table 8. Abbreviations

Acronym	Description
AC	Alternating Current
ESD	ElectroStatic Discharge
HBM	Human Body Model
LNA	Low Noise Amplifier
PDA	Personal Digital Assistant
RF	Radio Frequency
SiGe:C	Silicon Germanium Carbon

10. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGU7052 v.2	20120221	Product data sheet	-	BGU7052 v.1
Modifications:	• Table 6: updated			
BGU7052 v.1	20120214	Product data sheet	-	-

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11.1 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.
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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".

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13. Contents

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