

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 $3 \times 3 \times 0.85 \text{ mm}^3$ 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, $\text{IP3}_\text{O} = 35 \text{ dBm}$ 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 $3 \times 3 \times 0.85 \text{ mm}^3$
- 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

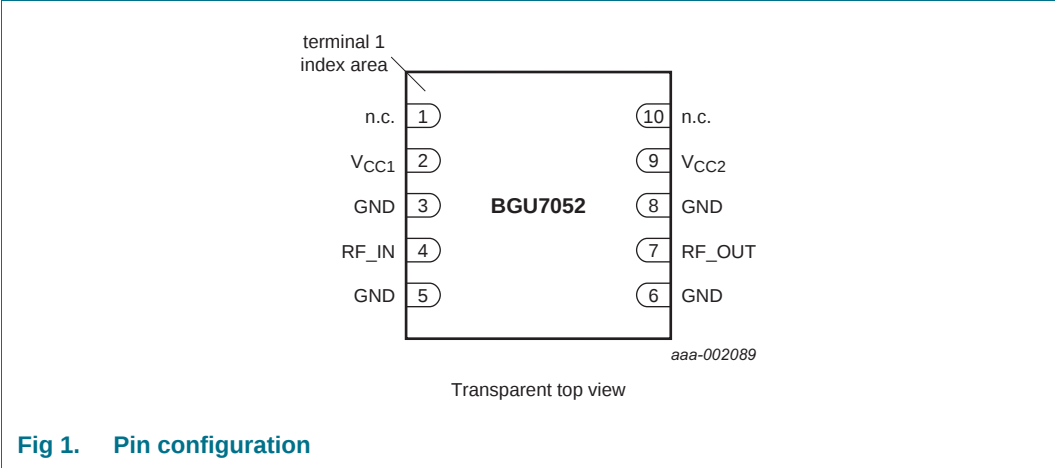
$f = 1900 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; input and output $50 \text{ }\Omega$; unless otherwise specified.

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
$P_{\text{L}(1\text{dB})}$	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



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	$V_{CC} = 3.3\text{ V}$	-	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
$R_{th(j-sp)}$	thermal resistance from junction to solder point		20	K/W

6. Characteristics

Table 6. Characteristics

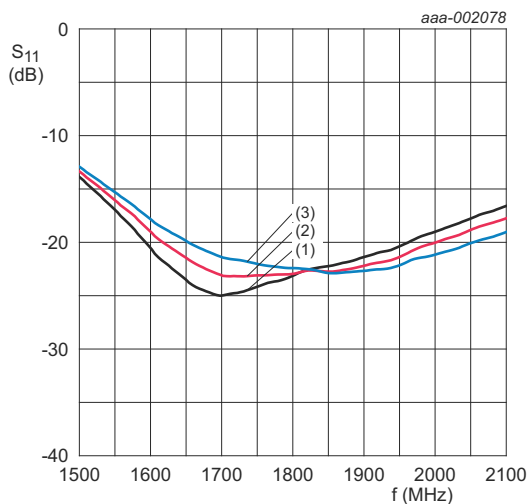
$V_{CC} = 3.3\text{ V}$; $T_{amb} = 25\text{ °C}$; input and output $50\text{ }\Omega$; unless otherwise specified. All RF parameters are measured at the device RF in and RF output terminals.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CC}	supply current		63	80	95	mA
G_{ass}	associated gain	$f = 1750\text{ MHz}$	-	21.5	-	dB
		$f = 1900\text{ MHz}$	18.5	20	21.5	dB
		$f = 1950\text{ MHz}$	-	19.7	-	dB
NF	noise figure	$f = 1750\text{ MHz}$	-	0.76	-	dB
		$f = 1900\text{ MHz}$	-	0.76	0.95	dB
		$f = 1950\text{ MHz}$	-	0.79	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	$f = 1750\text{ MHz}$	-	15.5	-	dBm
		$f = 1900\text{ MHz}$	13	14.5	-	dBm
		$f = 1950\text{ MHz}$	-	14.5	-	dBm
IP3 _O	output third-order intercept point	$f = 1750\text{ MHz}$	-	36.8	-	dBm
		$f = 1900\text{ MHz}$	32	35.3	-	dBm
		$f = 1950\text{ MHz}$	-	35.1	-	dBm

Table 6. Characteristics ...continued
 $V_{CC} = 3.3\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; input and output $50\text{ }\Omega$; unless otherwise specified. All RF parameters are measured at the device RF in and RF output terminals.

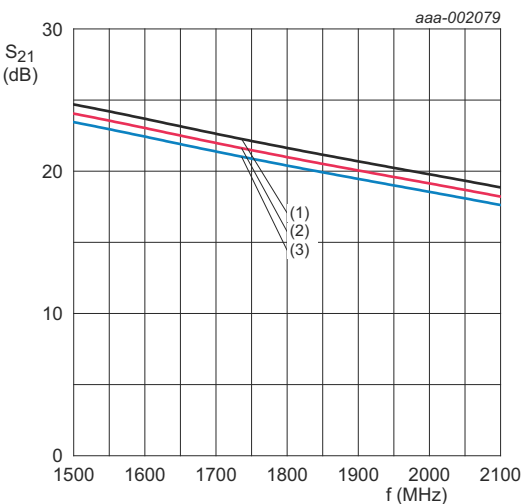
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RL _{in}	input return loss	f = 1750 MHz	-	23	-	dB
		f = 1900 MHz	-	23	-	dB
		f = 1950 MHz	-	22	-	dB
RL _{out}	output return loss	f = 1750 MHz	-	22	-	dB
		f = 1900 MHz	-	22	-	dB
		f = 1950 MHz	-	21	-	dB
ISL	isolation	f = 1750 MHz	-	28.5	-	dB
		f = 1900 MHz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

6.1 Performance curves



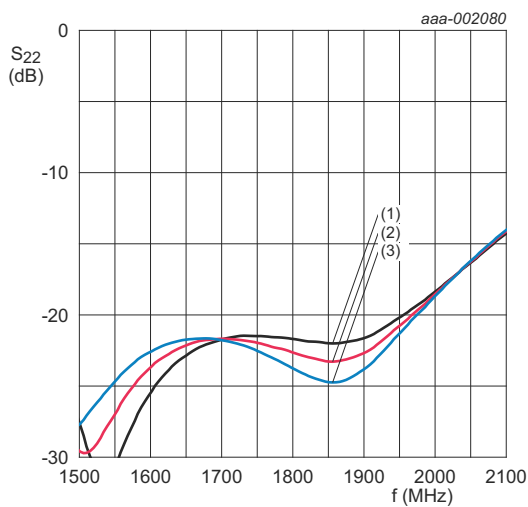
$V_{CC} = 3.3\text{ V}$.
(1) $T_j = -40\text{ }^{\circ}\text{C}$
(2) $T_j = 25\text{ }^{\circ}\text{C}$
(3) $T_j = 85\text{ }^{\circ}\text{C}$

Fig 2. Input reflection coefficient as a function of frequency



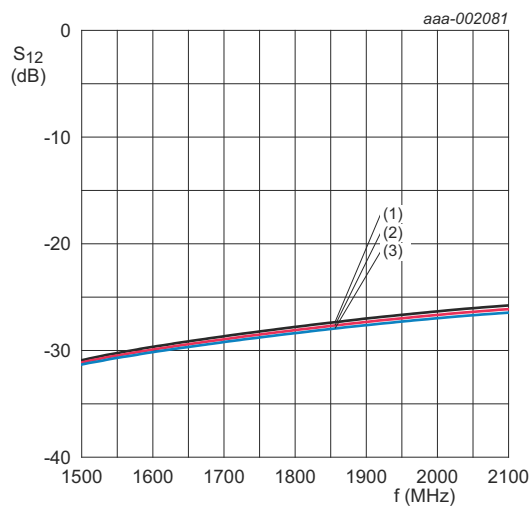
$V_{CC} = 3.3\text{ V}$.
(1) $T_j = -40\text{ }^{\circ}\text{C}$
(2) $T_j = 25\text{ }^{\circ}\text{C}$
(3) $T_j = 85\text{ }^{\circ}\text{C}$

Fig 3. Forward transmission coefficient as a function of frequency



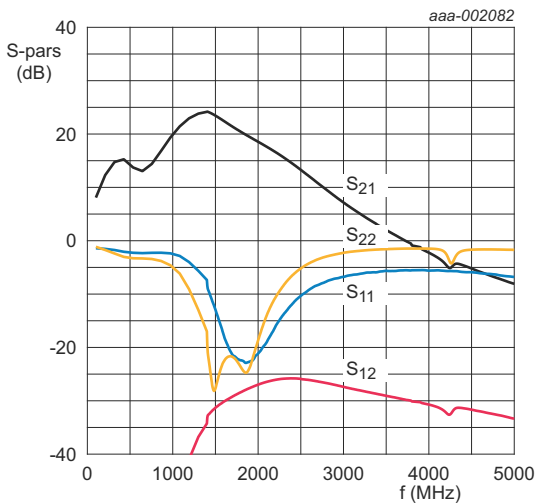
$V_{CC} = 3.3\text{ V.}$
(1) $T_j = -40\text{ }^{\circ}\text{C}$
(2) $T_j = 25\text{ }^{\circ}\text{C}$
(3) $T_j = 85\text{ }^{\circ}\text{C}$

Fig 4. Output reflection coefficient as a function of frequency



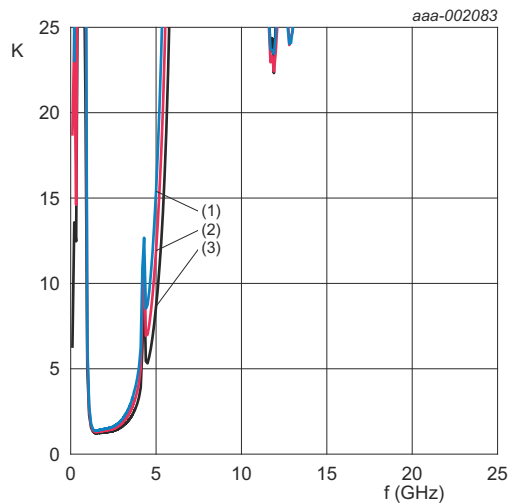
$V_{CC} = 3.3\text{ V.}$
(1) $T_j = -40\text{ }^{\circ}\text{C}$
(2) $T_j = 25\text{ }^{\circ}\text{C}$
(3) $T_j = 85\text{ }^{\circ}\text{C}$

Fig 5. Reverse transmission coefficient as a function of frequency



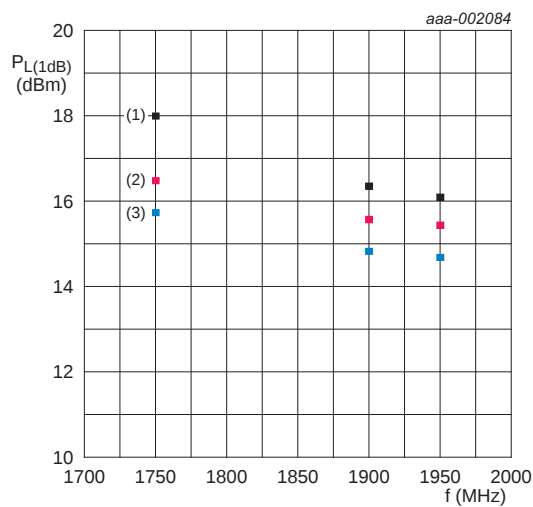
$V_{CC} = 3.3\text{ V; } T_{amb} = 25\text{ }^{\circ}\text{C.}$

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



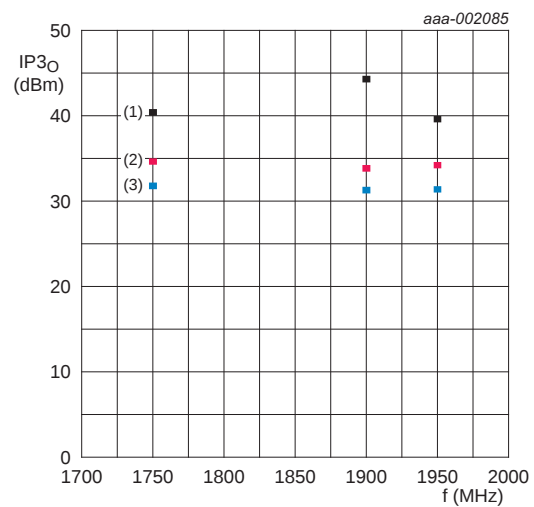
$V_{CC} = 3.3\text{ V.}$
(1) $T_j = -40\text{ }^{\circ}\text{C}$
(2) $T_j = 25\text{ }^{\circ}\text{C}$
(3) $T_j = 85\text{ }^{\circ}\text{C}$

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



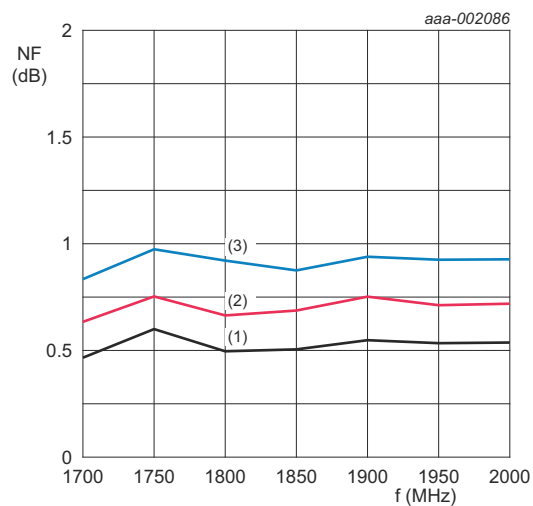
$V_{CC} = 3.3\text{ V.}$
(1) $T_j = -40^\circ\text{C}$
(2) $T_j = 25^\circ\text{C}$
(3) $T_j = 85^\circ\text{C}$

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



$V_{CC} = 3.3\text{ V.}$
(1) $T_j = -40^\circ\text{C}$
(2) $T_j = 25^\circ\text{C}$
(3) $T_j = 85^\circ\text{C}$

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



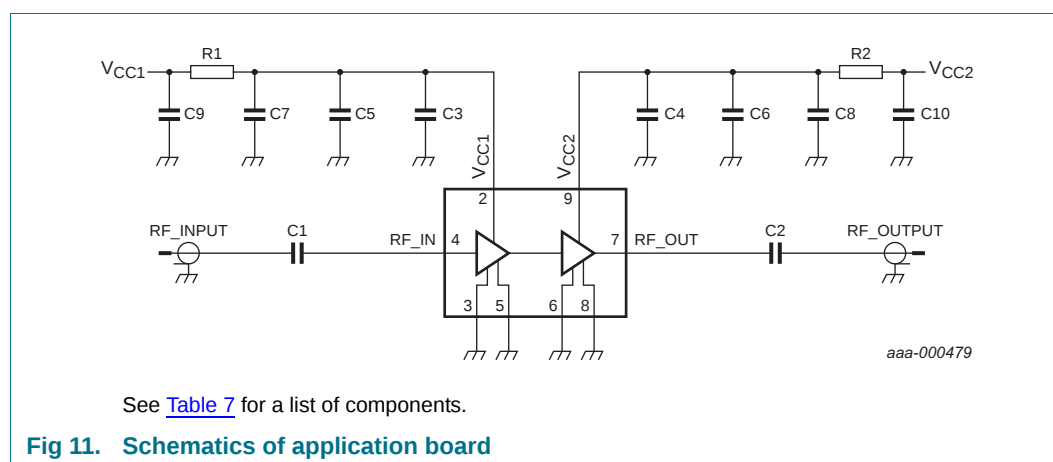
$V_{CC} = 3.3\text{ V.}$
(1) $T_j = -40^\circ\text{C}$
(2) $T_j = 25^\circ\text{C}$
(3) $T_j = 85^\circ\text{C}$

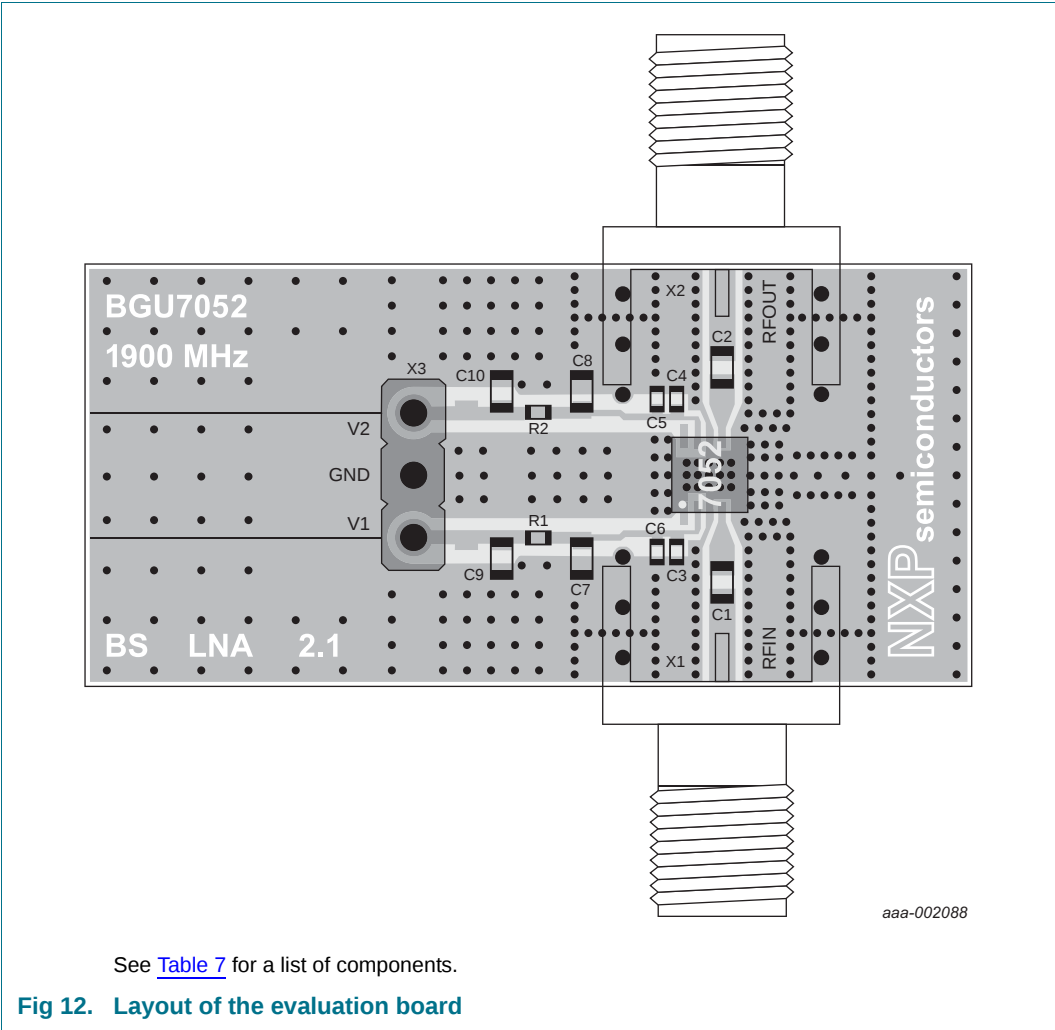
Fig 10. Noise figure as function of frequency

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 decoupled.





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

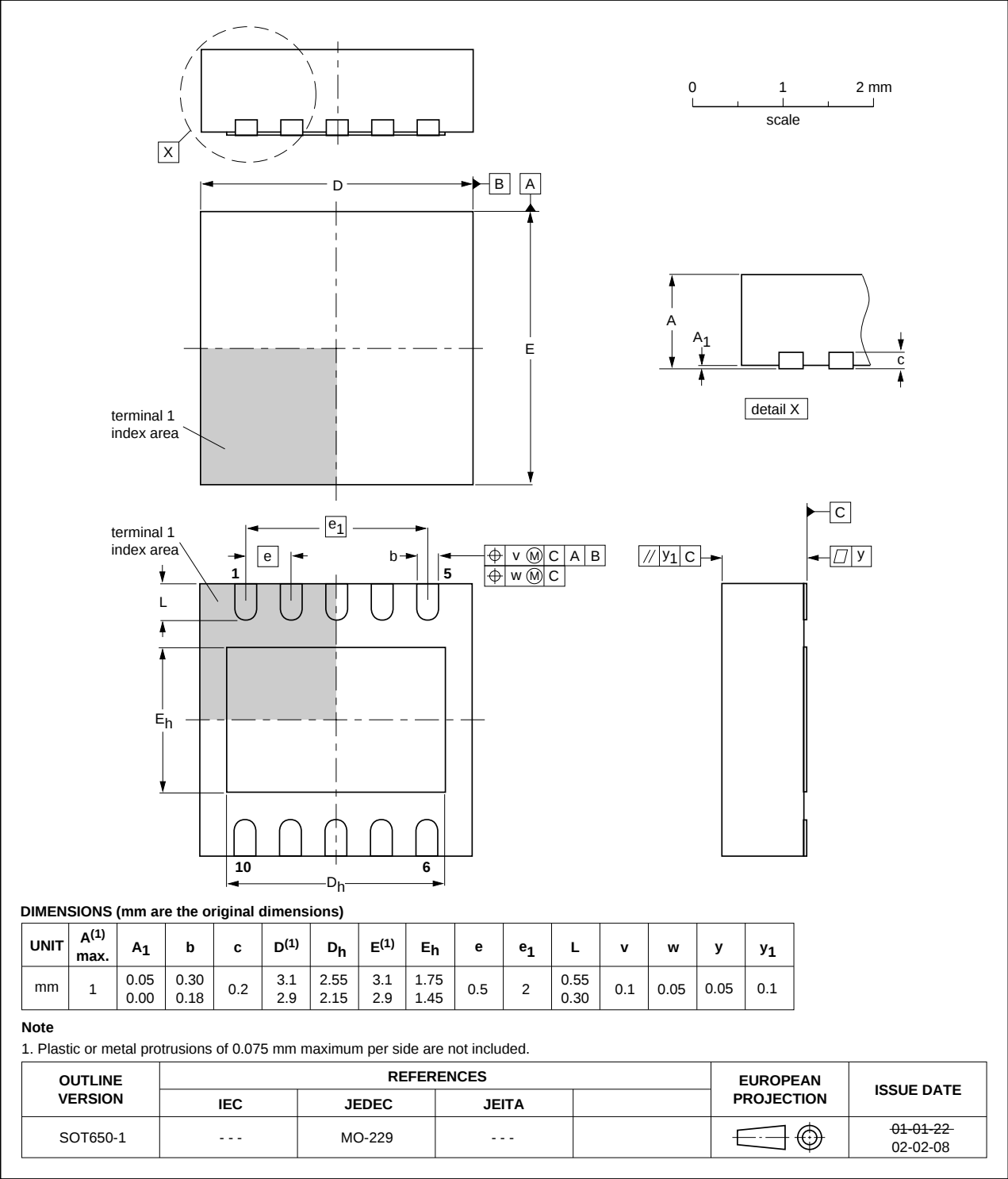


Fig 13. Package outline SOT650-1 (HVSON10)

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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Document status ^{[1][2]}	Product status ^[3]	Definition
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[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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Date of release: 21 February 2012

Document identifier: BGU7052