

# BGU7005

SiGe:C Low Noise Amplifier MMIC for GPS

Rev. 02 — 4 March 2010

Product data sheet

## 1. Product profile

### 1.1 General description

The BGU7005 is a Low Noise Amplifier (LNA) for GPS receiver applications in a plastic leadless 6-pin, extremely small SOT886 package. The BGU7005 requires only one external matching inductor and one external decoupling capacitor.

The BGU7005 adapts itself to the changing environment resulting from co-habitation of different radio systems in modern cellular handsets. It has been designed for low power consumption and optimal performance when jamming signals from co-existing cellular transmitters are present. At low jamming power levels it delivers 16.5 dB gain at a noise figure of 0.9 dB. During high jamming power levels, resulting for example from a cellular transmit burst, it temporarily increases its bias current to improve sensitivity.

#### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features and benefits

- Small 6-pin leadless package 1 mm × 1.45 mm × 0.5 mm
- Low noise high gain MMIC
- Integrated temperature stabilized bias for easy design
- Requires only one input matching inductor and one supply decoupling capacitor
- Input and output DC decoupled
- Noise figure (NF) = 0.9 dB at 1.575 GHz
- Integrated matching for the output
- Gain 16.5 dB at 1.575 GHz
- High 1 dB compression point of -11 dBm
- High out of band IP<sub>3</sub> of 9 dBm
- 110 GHz transit frequency - SiGe:C technology
- Supply voltage 1.5 V to 2.85 V, optimized for 1.8 V
- Power-down mode current consumption < 1 μA
- Optimized performance at low 4.5 mA supply current
- ESD protection on all pins (HBM > 1 kV)

### 1.3 Applications

- LNA for GPS in handsets, PDA's and Portable Navigation Devices



### 1.4 Quick reference data

**Table 1. Quick reference data**

$f = 1575 \text{ MHz}$ ;  $V_{CC} = 1.8 \text{ V}$ ;  $P_i < -40 \text{ dBm}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ ; input matched to  $50 \text{ }\Omega$  using a  $5.6 \text{ nH}$  inductor; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{CC}$	supply voltage	RF input AC coupled	1.5	-	2.85	V	
$I_{CC}$	supply current	$V_{ENABLE} \geq 0.8 \text{ V}$					
		$P_i < -40 \text{ dBm}$	-	4.5	-	mA	
		$P_i = -20 \text{ dBm}$	-	12	-	mA	
$G_p$	power gain	$P_i < -40 \text{ dBm}$	14	16.5	19	dB	
		$P_i = -20 \text{ dBm}$	15	17.5	20	dB	
NF	noise figure	$P_i < -40 \text{ dBm}$	-	0.9	1.3	dB	
		$P_i = -20 \text{ dBm}$	-	1.2	1.6	dB	
$P_{i(1dB)}$	input power at 1 dB gain compression	$f = 1.575 \text{ GHz}$					
		$V_{CC} = 1.5 \text{ V}$	-15	-12	-	dBm	
		$V_{CC} = 1.8 \text{ V}$	-14	-11	-	dBm	
		$V_{CC} = 2.85 \text{ V}$	-11	-8	-	dBm	
IP <sub>3i</sub>	input third-order intercept point	$f = 1.575 \text{ GHz}$					
		$V_{CC} = 1.5 \text{ V}$	[1]	5	8	-	dBm
		$V_{CC} = 1.8 \text{ V}$	[1]	5	9	-	dBm
		$V_{CC} = 2.85 \text{ V}$	[1]	5	12	-	dBm

[1]  $f_1 = 1713 \text{ MHz}$ ;  $f_2 = 1851 \text{ MHz}$ .

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	GND	<p>bottom view</p>	<p>sym129</p>
2	GND		
3	RF_IN		
4	$V_{CC}$		
5	ENABLE		
6	RF_OUT		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
BGU7005	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm	SOT886

## 4. Marking

Table 4. Marking codes

Type number	Marking code
BGU7005	AC

## 5. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage	RF input AC coupled	-0.2	+3.1	V
$P_{tot}$	total power dissipation	$T_{sp} \leq 130\text{ °C}$	[1]	55	mW
$T_{stg}$	storage temperature		-65	150	°C
$T_j$	junction temperature		-	150	°C

[1]  $T_{sp}$  is the temperature at the soldering point of the emitter lead.

## 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		225	K/W

## 7. Characteristics

Table 7. Characteristics

$f = 1575\text{ MHz}$ ;  $V_{CC} = 1.8\text{ V}$ ;  $V_{ENABLE} \geq 0.8\text{ V}$ ;  $P_i < -40\text{ dBm}$ ;  $T_{amb} = 25\text{ °C}$ ; input matched to  $50\ \Omega$  using a  $5.6\text{ nH}$  inductor; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage	RF input AC coupled	1.5	-	2.85	V
$I_{CC}$	supply current	$V_{ENABLE} \geq 0.8\text{ V}$				
		$P_i < -40\text{ dBm}$	-	4.5	-	mA
		$P_i = -20\text{ dBm}$	-	12	-	mA
		$V_{ENABLE} \leq 0.35\text{ V}$	-	-	0.001	mA
$T_{amb}$	ambient temperature		-40	+25	+85	°C

**Table 7. Characteristics ...continued**

$f = 1575 \text{ MHz}$ ;  $V_{CC} = 1.8 \text{ V}$ ;  $V_{ENABLE} \geq 0.8 \text{ V}$ ;  $P_i < -40 \text{ dBm}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ ; input matched to  $50 \text{ } \Omega$  using a  $5.6 \text{ nH}$  inductor; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit		
$G_p$	power gain	$T_{amb} = 25 \text{ }^\circ\text{C}$						
		no jammer	14	16.5	19	dB		
		$P_i = -20 \text{ dBm}$ ; $f_i = 1575 \text{ MHz}$	15	17.5	20	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 850 \text{ MHz}$	15	17.5	20	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 1850 \text{ MHz}$	15	17.5	20	dB		
		$-40 \text{ }^\circ\text{C} \leq T_{amb} \leq +85 \text{ }^\circ\text{C}$						
		no jammer	13	-	20	dB		
		$P_i = -20 \text{ dBm}$ ; $f_i = 1575 \text{ MHz}$	14	-	21	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 850 \text{ MHz}$	14	-	21	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 1850 \text{ MHz}$	14	-	21	dB		
		$RL_{in}$	input return loss	$P_i < -40 \text{ dBm}$	5	8	-	dB
				$P_i = -20 \text{ dBm}$	6	10	-	dB
$RL_{out}$	output return loss	$P_i < -40 \text{ dBm}$	10	20	-	dB		
		$P_i = -20 \text{ dBm}$	10	14	-	dB		
ISL	isolation		20	23	-	dB		
NF	noise figure	$T_{amb} = 25 \text{ }^\circ\text{C}$						
		no jammer	-	0.9	1.3	dB		
		$P_i = -20 \text{ dBm}$ ; $f_i = 1575 \text{ MHz}$	-	1.2	1.6	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 850 \text{ MHz}$	-	1.1	1.5	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 1850 \text{ MHz}$	-	1.3	1.7	dB		
		$-40 \text{ }^\circ\text{C} \leq T_{amb} \leq +85 \text{ }^\circ\text{C}$						
		no jammer	-	-	1.7	dB		
		$P_i = -20 \text{ dBm}$ ; $f_i = 1575 \text{ MHz}$	-	-	1.9	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 850 \text{ MHz}$	-	-	1.8	dB		
		$P_{jam} = -20 \text{ dBm}$ ; $f_{jam} = 1850 \text{ MHz}$	-	-	2.0	dB		
		$P_{i(1dB)}$	input power at 1 dB gain compression	$f = 1575 \text{ MHz}$				
				$V_{CC} = 1.5 \text{ V}$	-15	-12	-	dBm
$V_{CC} = 1.8 \text{ V}$	-14			-11	-	dBm		
$V_{CC} = 2.85 \text{ V}$	-11			-8	-	dBm		
$f = 806 \text{ MHz to } 928 \text{ MHz}$								
$V_{CC} = 1.5 \text{ V}$	[1]			-15	-12	-	dBm	
$V_{CC} = 1.8 \text{ V}$	[1]			-14	-11	-	dBm	
$V_{CC} = 2.85 \text{ V}$	[1]			-14	-11	-	dBm	
$f = 1612 \text{ MHz to } 1909 \text{ MHz}$								
$V_{CC} = 1.5 \text{ V}$	[1]			-13	-10	-	dBm	
$V_{CC} = 1.8 \text{ V}$	[1]			-12	-9	-	dBm	
$V_{CC} = 2.85 \text{ V}$	[1]			-10	-7	-	dBm	

**Table 7. Characteristics ...continued**

$f = 1575 \text{ MHz}$ ;  $V_{CC} = 1.8 \text{ V}$ ;  $V_{ENABLE} \geq 0.8 \text{ V}$ ;  $P_i < -40 \text{ dBm}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ ; input matched to  $50 \text{ } \Omega$  using a  $5.6 \text{ nH}$  inductor; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
IP <sub>3i</sub>	input third-order intercept point	$f = 1.575 \text{ GHz}$					
		$V_{CC} = 1.5 \text{ V}$	[2]	5	8	-	dBm
		$V_{CC} = 1.8 \text{ V}$	[2]	5	9	-	dBm
		$V_{CC} = 2.85 \text{ V}$	[2]	5	12	-	dBm
t <sub>on</sub>	turn-on time		[3]	-	-	2	$\mu\text{s}$
t <sub>off</sub>	turn-off time		[3]	-	-	1	$\mu\text{s}$
K	Rollett stability factor		1	-	-		

[1] Out of band.

[2]  $f_1 = 1713 \text{ MHz}$ ;  $f_2 = 1851 \text{ MHz}$ .

[3] Within 10 % of the final gain.

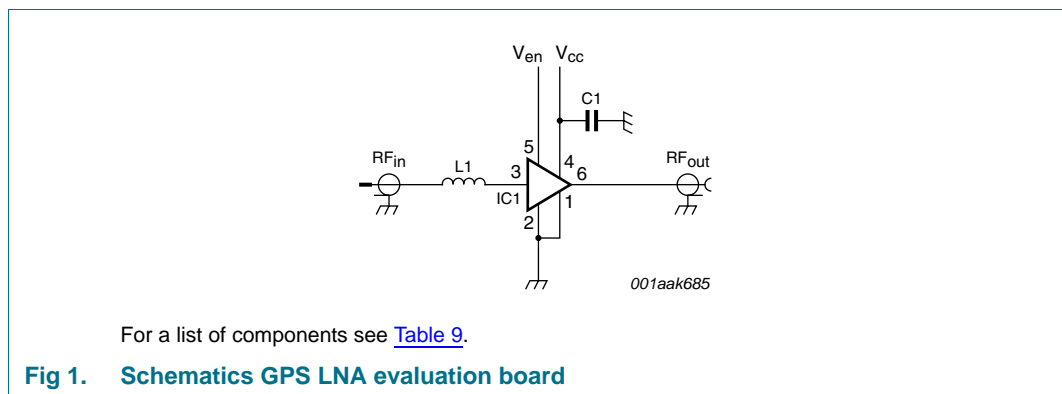
**Table 8. ENABLE (pin 5)**

$-40 \text{ }^\circ\text{C} \leq T_{amb} \leq +85 \text{ }^\circ\text{C}$ ;  $1.5 \text{ V} \leq V_{CC} \leq 2.85 \text{ V}$

V <sub>ENABLE</sub> (V)	State
$\leq 0.35$	OFF
$\geq 0.8$	ON

## 8. Application information

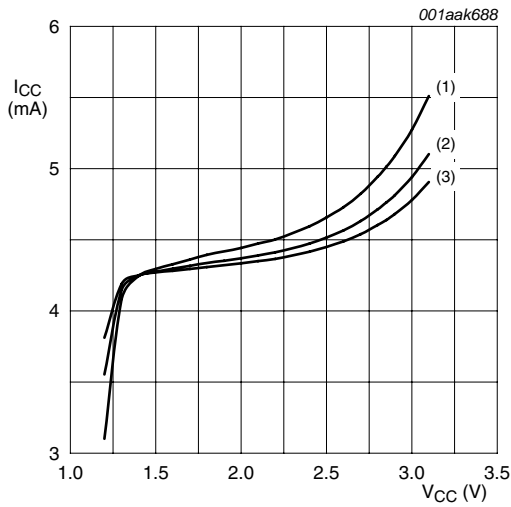
### 8.1 GPS LNA



**Table 9. List of components**

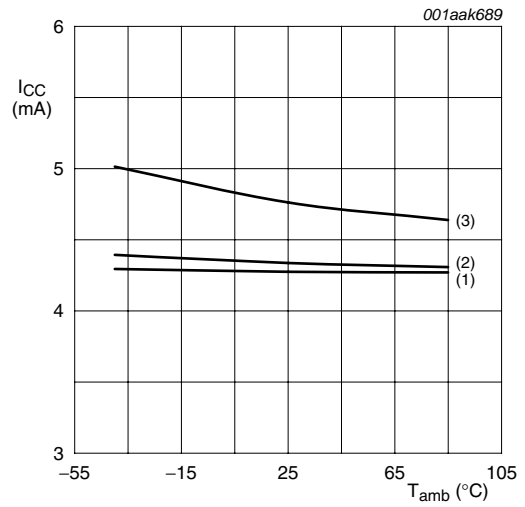
For schematics see [Figure 1](#).

Component	Description	Value	Supplier	Remarks
C1	decoupling capacitor	1 nF	various	
IC1	BGU7005	-	NXP	
L1	high quality matching inductor	5.6 nH	Murata LQW15A	



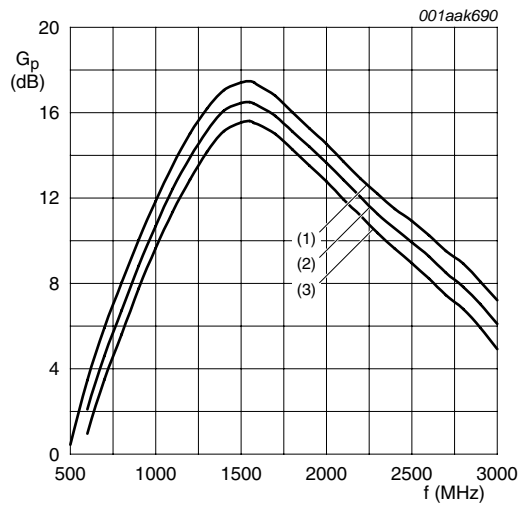
$P_i = -45$  dBm.  
 (1)  $T_{amb} = -40$  °C  
 (2)  $T_{amb} = +25$  °C  
 (3)  $T_{amb} = +85$  °C

**Fig 2. Supply current as a function of supply voltage; typical values**



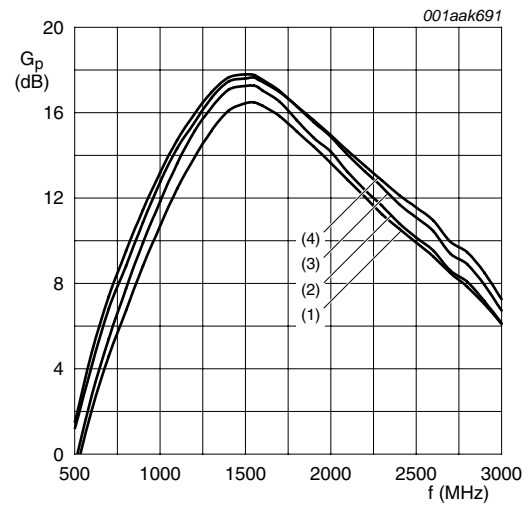
$P_i = -45$  dBm.  
 (1)  $V_{CC} = 1.5$  V  
 (2)  $V_{CC} = 1.8$  V  
 (3)  $V_{CC} = 2.85$  V

**Fig 3. Supply current as a function of ambient temperature; typical values**



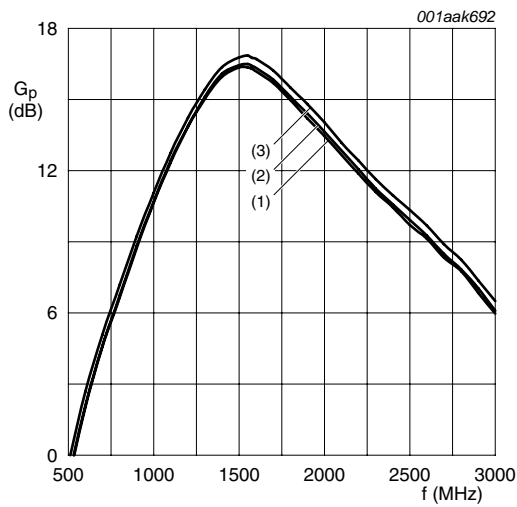
$V_{CC} = 1.8$  V;  $P_i = -45$  dBm.  
 (1)  $T_{amb} = -40$  °C  
 (2)  $T_{amb} = +25$  °C  
 (3)  $T_{amb} = +85$  °C

**Fig 4. Power gain as a function of frequency; typical values**



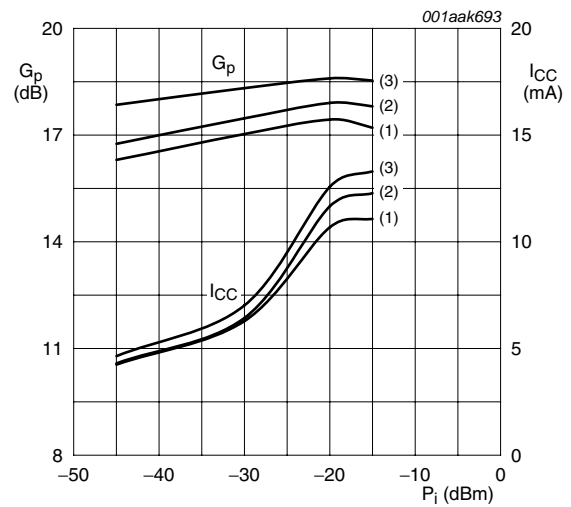
$V_{CC} = 1.8$  V;  $T_{amb} = 25$  °C.  
 (1)  $P_i = -45$  dBm  
 (2)  $P_i = -30$  dBm  
 (3)  $P_i = -20$  dBm  
 (4)  $P_i = -15$  dBm

**Fig 5. Power gain as a function of frequency; typical values**



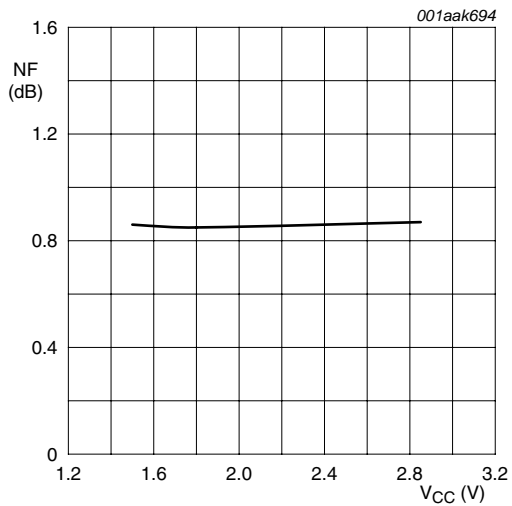
$P_i = -45$  dBm;  $T_{amb} = 25$  °C.  
 (1)  $V_{CC} = 1.5$  V  
 (2)  $V_{CC} = 1.8$  V  
 (3)  $V_{CC} = 2.85$  V

**Fig 6. Power gain as a function of frequency; typical values**



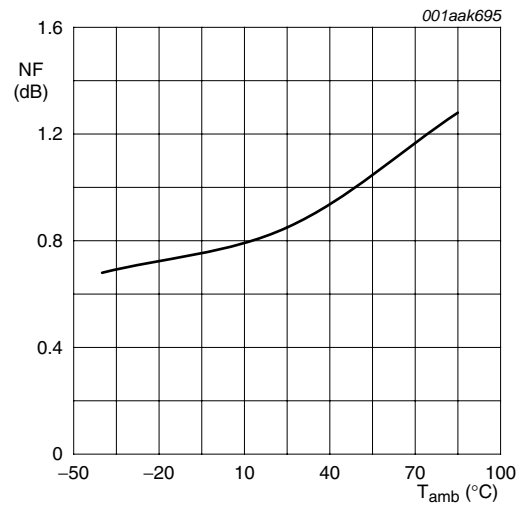
$T_{amb} = 25$  °C;  $f = 1575$  MHz.  
 (1)  $V_{CC} = 1.5$  V  
 (2)  $V_{CC} = 1.8$  V  
 (3)  $V_{CC} = 2.85$  V

**Fig 7. Power gain as a function of input power; typical values**



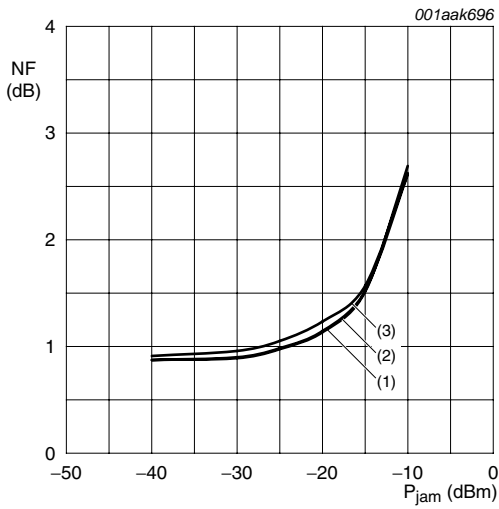
$f = 1575$  MHz;  $T_{amb} = 25$  °C; no jammer.

**Fig 8. Noise figure as a function of supply current; typical values**



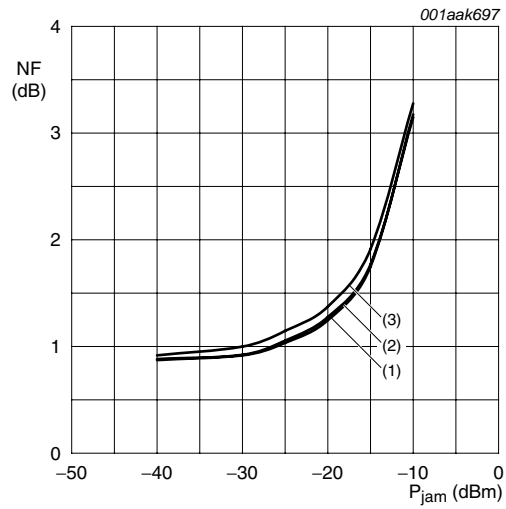
$f = 1575$  MHz;  $V_{CC} = 1.8$  V; no jammer.

**Fig 9. Noise figure as a function of ambient temperature; typical values**



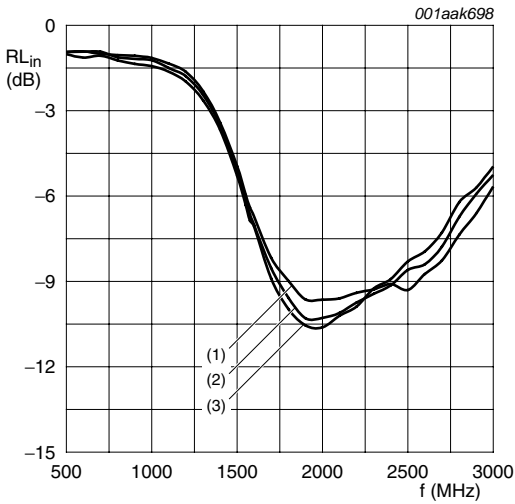
$f_{jam} = 850 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}; f = 1575 \text{ MHz}.$   
 (1)  $V_{CC} = 1.5 \text{ V}$   
 (2)  $V_{CC} = 1.8 \text{ V}$   
 (3)  $V_{CC} = 2.85 \text{ V}$

**Fig 10. Noise figure as a function of jamming power; typical values**



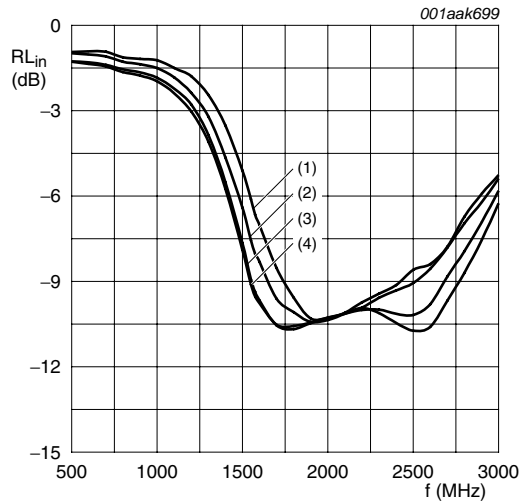
$f_{jam} = 1850 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}; f = 1575 \text{ MHz}.$   
 (1)  $V_{CC} = 1.5 \text{ V}$   
 (2)  $V_{CC} = 1.8 \text{ V}$   
 (3)  $V_{CC} = 2.85 \text{ V}$

**Fig 11. Noise figure as a function of jamming power; typical values**



$V_{CC} = 1.8 \text{ V}; P_i = -45 \text{ dBm}.$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = +25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = +85 \text{ }^\circ\text{C}$

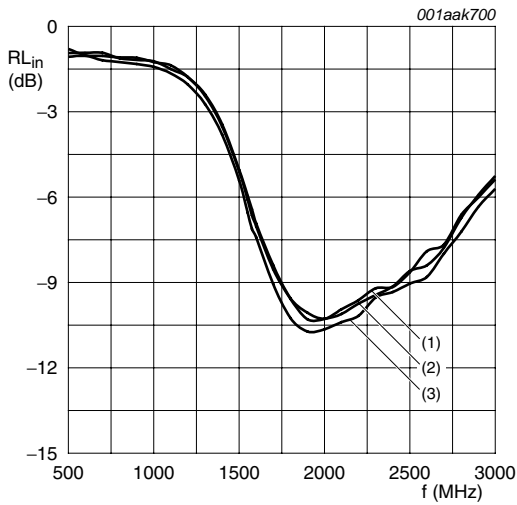
**Fig 12. Input return loss as a function of frequency; typical values**



$V_{CC} = 1.8 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}.$   
 (1)  $P_i = -45 \text{ dBm}$   
 (2)  $P_i = -30 \text{ dBm}$   
 (3)  $P_i = -20 \text{ dBm}$   
 (4)  $P_i = -15 \text{ dBm}$

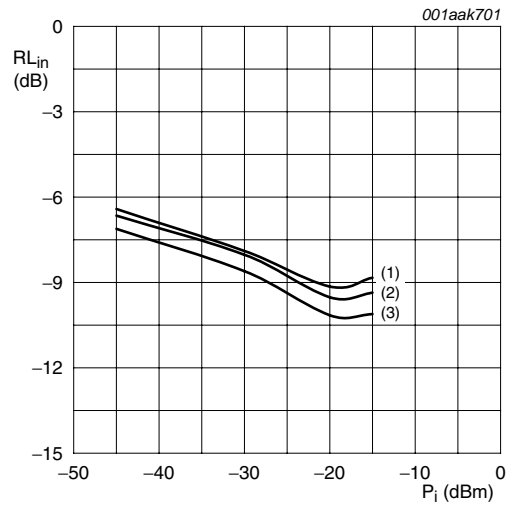
**Fig 13. Input return loss as a function of frequency; typical values**





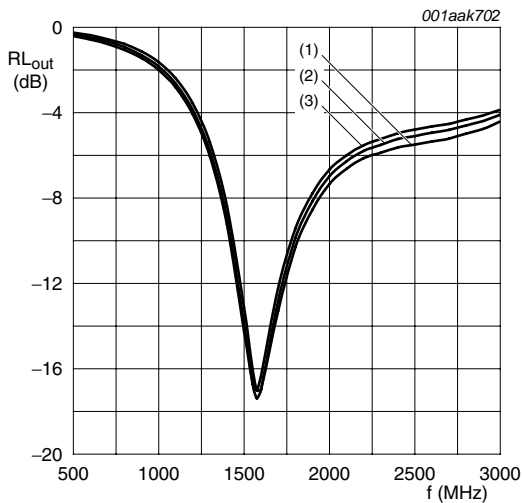
$P_i = -45 \text{ dBm}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}.$   
 (1)  $V_{CC} = 1.5 \text{ V}$   
 (2)  $V_{CC} = 1.8 \text{ V}$   
 (3)  $V_{CC} = 2.85 \text{ V}$

**Fig 14. Input return loss as a function of frequency; typical values**



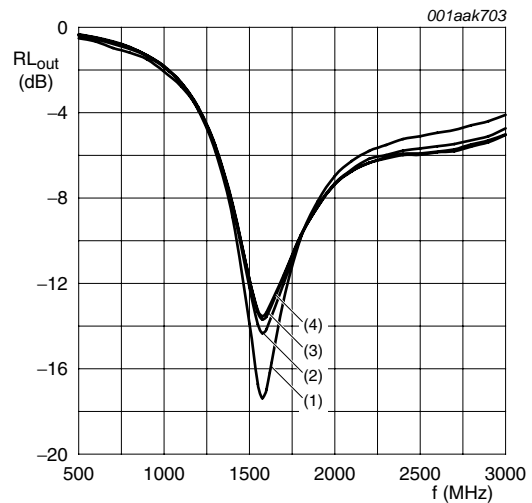
$T_{\text{amb}} = 25 \text{ }^\circ\text{C}; f = 1575 \text{ MHz}.$   
 (1)  $V_{CC} = 1.5 \text{ V}$   
 (2)  $V_{CC} = 1.8 \text{ V}$   
 (3)  $V_{CC} = 2.85 \text{ V}$

**Fig 15. Input return loss as a function of input power; typical values**



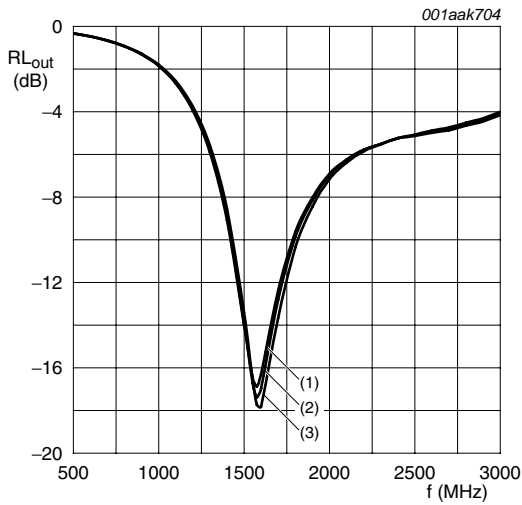
$V_{CC} = 1.8 \text{ V}; P_i = -45 \text{ dBm}.$   
 (1)  $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{\text{amb}} = +25 \text{ }^\circ\text{C}$   
 (3)  $T_{\text{amb}} = +85 \text{ }^\circ\text{C}$

**Fig 16. Output return loss as a function of frequency; typical values**



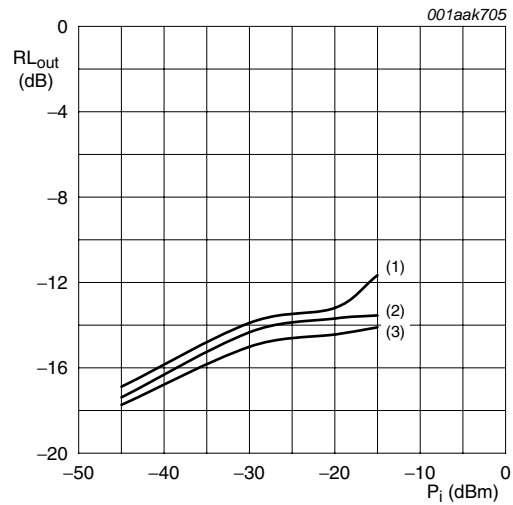
$V_{CC} = 1.8 \text{ V}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}.$   
 (1)  $P_i = -45 \text{ dBm}$   
 (2)  $P_i = -30 \text{ dBm}$   
 (3)  $P_i = -20 \text{ dBm}$   
 (4)  $P_i = -15 \text{ dBm}$

**Fig 17. Output return loss as a function of frequency; typical values**



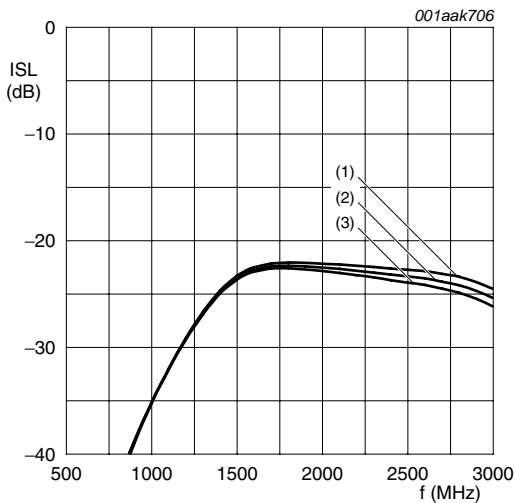
$P_i = -45 \text{ dBm}$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ .  
 (1)  $V_{\text{CC}} = 1.5 \text{ V}$   
 (2)  $V_{\text{CC}} = 1.8 \text{ V}$   
 (3)  $V_{\text{CC}} = 2.85 \text{ V}$

**Fig 18. Output return loss as a function of frequency; typical values**



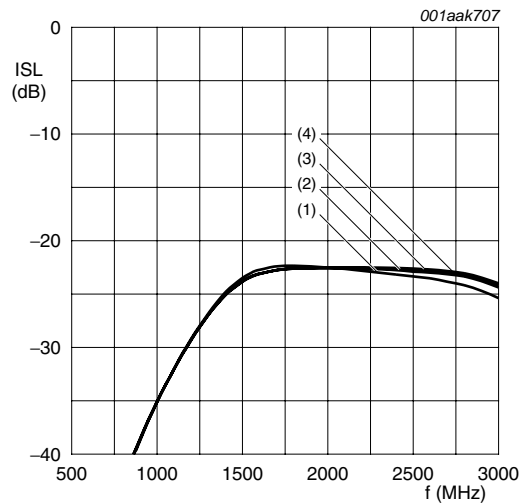
$T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ ;  $f = 1575 \text{ MHz}$ .  
 (1)  $V_{\text{CC}} = 1.5 \text{ V}$   
 (2)  $V_{\text{CC}} = 1.8 \text{ V}$   
 (3)  $V_{\text{CC}} = 2.85 \text{ V}$

**Fig 19. Output return loss as a function of input power; typical values**



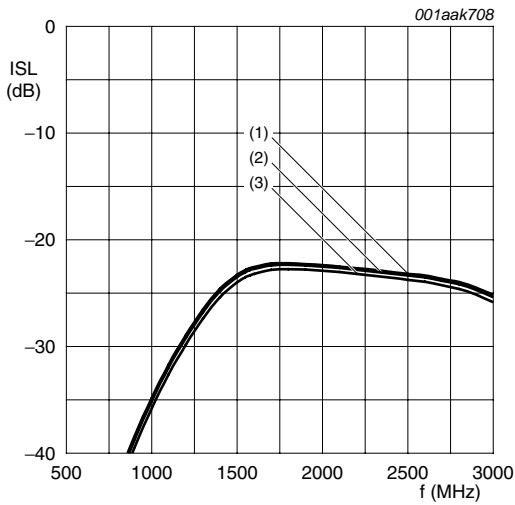
$V_{\text{CC}} = 1.8 \text{ V}$ ;  $P_i = -45 \text{ dBm}$ .  
 (1)  $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{\text{amb}} = +25 \text{ }^\circ\text{C}$   
 (3)  $T_{\text{amb}} = +85 \text{ }^\circ\text{C}$

**Fig 20. Isolation as a function of frequency; typical values**



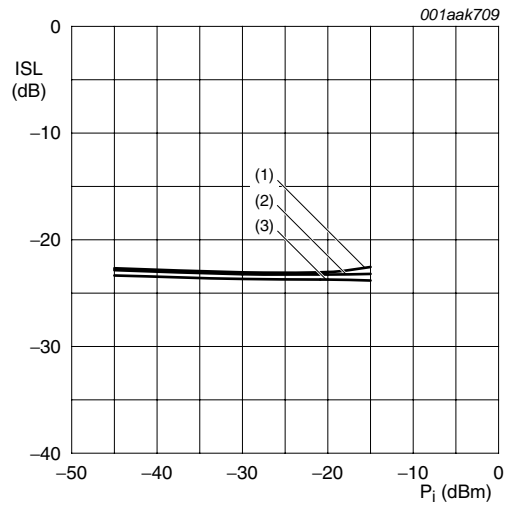
$V_{\text{CC}} = 1.8 \text{ V}$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ .  
 (1)  $P_i = -45 \text{ dBm}$   
 (2)  $P_i = -30 \text{ dBm}$   
 (3)  $P_i = -20 \text{ dBm}$   
 (4)  $P_i = -15 \text{ dBm}$

**Fig 21. Isolation as a function of frequency; typical values**



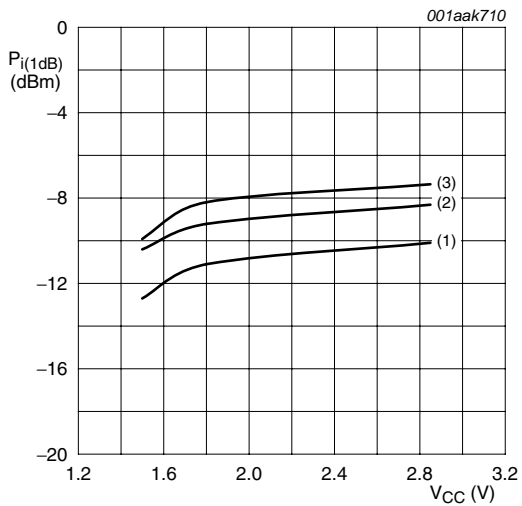
$P_i = -45 \text{ dBm}$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ .  
 (1)  $V_{\text{CC}} = 1.5 \text{ V}$   
 (2)  $V_{\text{CC}} = 1.8 \text{ V}$   
 (3)  $V_{\text{CC}} = 2.85 \text{ V}$

**Fig 22. Isolation as a function of frequency; typical values**



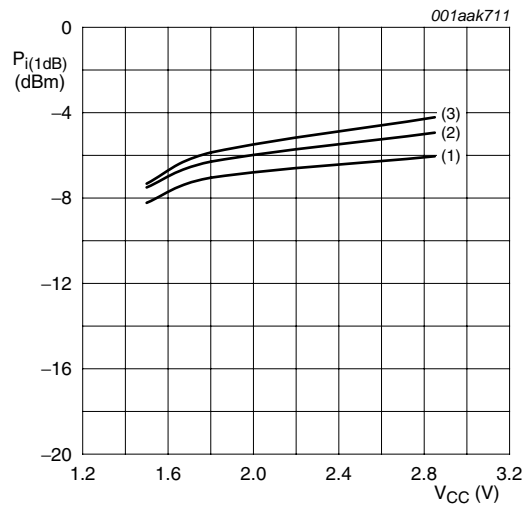
$T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ ;  $f = 1575 \text{ MHz}$ .  
 (1)  $V_{\text{CC}} = 1.5 \text{ V}$   
 (2)  $V_{\text{CC}} = 1.8 \text{ V}$   
 (3)  $V_{\text{CC}} = 2.85 \text{ V}$

**Fig 23. Isolation as a function of input power; typical values**



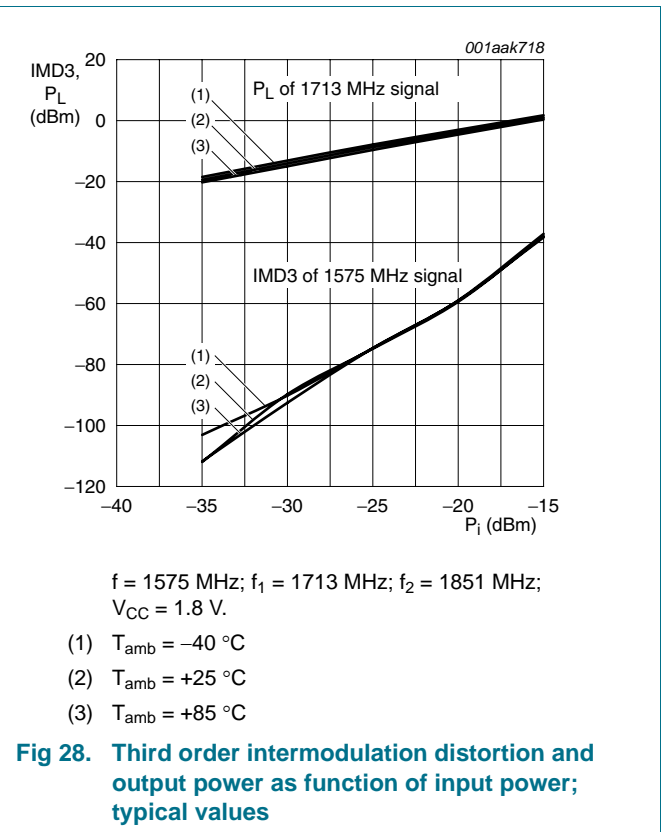
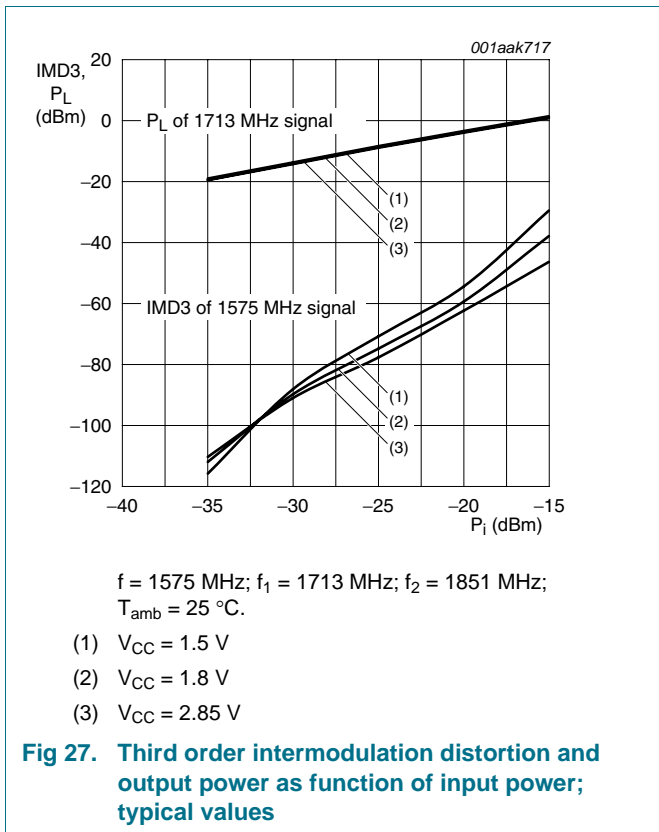
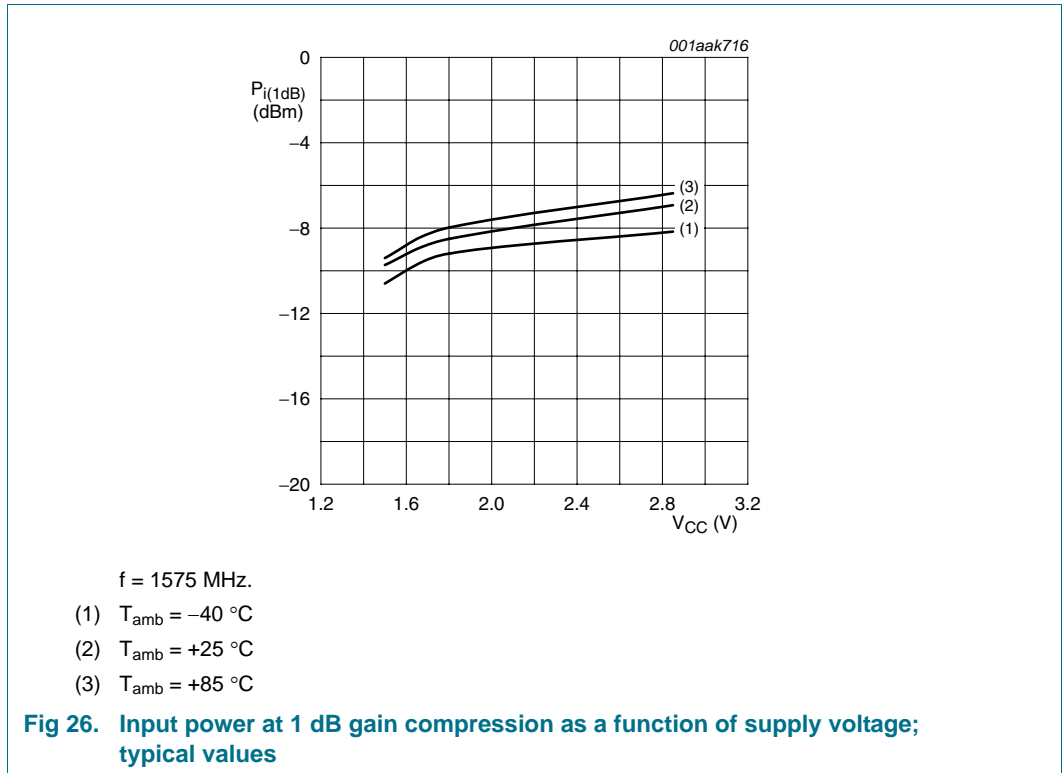
$f = 850 \text{ MHz}$ .  
 (1)  $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{\text{amb}} = +25 \text{ }^\circ\text{C}$   
 (3)  $T_{\text{amb}} = +85 \text{ }^\circ\text{C}$

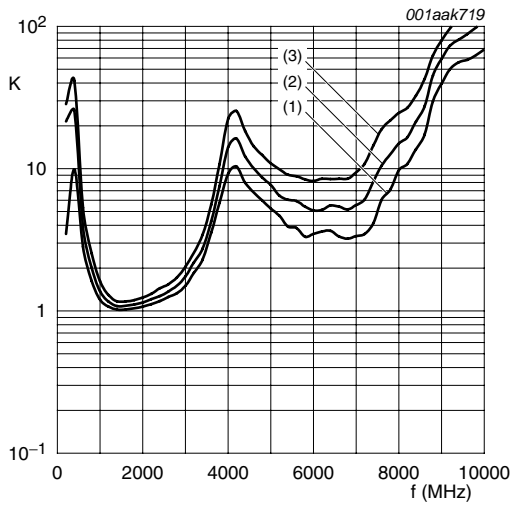
**Fig 24. Input power at 1 dB gain compression as a function of supply voltage; typical values**



$f = 1850 \text{ MHz}$ .  
 (1)  $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{\text{amb}} = +25 \text{ }^\circ\text{C}$   
 (3)  $T_{\text{amb}} = +85 \text{ }^\circ\text{C}$

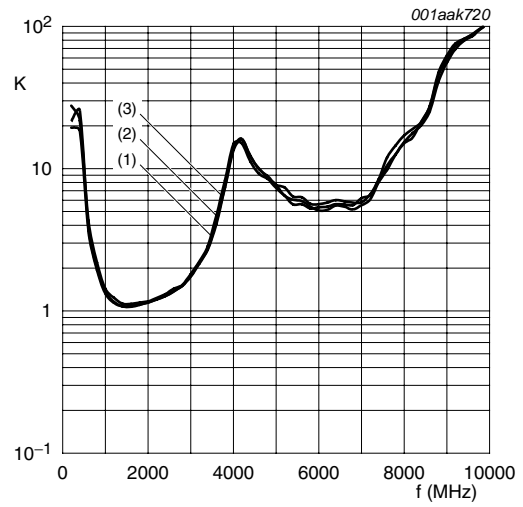
**Fig 25. Input power at 1 dB gain compression as a function of supply voltage; typical values**





$T_{amb} = 25\text{ }^{\circ}\text{C}; P_i = -45\text{ dBm}.$   
 (1)  $V_{CC} = 1.5\text{ V}$   
 (2)  $V_{CC} = 1.8\text{ V}$   
 (3)  $V_{CC} = 2.85\text{ V}$

**Fig 29. Rollett stability factor as a function of frequency; typical values**

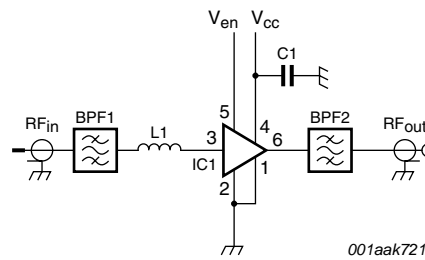


$V_{CC} = 1.8\text{ V}; P_i = -45\text{ dBm}.$   
 (1)  $T_{amb} = -40\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = +25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = +85\text{ }^{\circ}\text{C}$

**Fig 30. Rollett stability factor as a function of frequency; typical values**

**8.2 GPS front-end**

The GPS LNA is typically used in a GPS front-end. A GPS front-end application circuit and its characteristics is provided here.



For a list of components see [Table 10](#).

**Fig 31. Schematics GPS front-end evaluation board**

**Table 10. List of components**For schematics see [Figure 31](#).

Component	Description	Value	Supplier	Remarks
BPF1, BPF2	GPS SAW filter	-	Murata SAFEA1G57KE0F00	Alternatives from Epcos: <ul style="list-style-type: none"> <li>• B9444</li> </ul> Alternatives from Murata: <ul style="list-style-type: none"> <li>• SAFEA1G57KH0F00</li> <li>• SAFEA1G57KB0F00</li> </ul> Alternatives from Fujitsu: <ul style="list-style-type: none"> <li>• FAR-F6KA-1G5754-L4AA</li> <li>• FAR-F6KA-1G5754-L4AJ</li> </ul>
C1	decoupling capacitor	1 nF	Various	
IC1	BGU7005	-	NXP	
L1	high quality matching inductor	5.6 nH	Murata LQW15A	

### 8.3 Characteristics GPS front-end

**Table 11. Characteristics GPS front-end**

$f = 1575$  MHz;  $V_{CC} = 1.8$  V;  $V_{ENABLE} \geq 0.8$  V; power at LNA input  $P_i < -40$  dBm;  $T_{amb} = 25$  °C; input and output matched to  $50 \Omega$ ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{CC}$	supply voltage	RF input AC coupled	1.5	-	2.85	V	
$I_{CC}$	supply current		-	4.5	-	mA	
$T_{amb}$	ambient temperature		-40	+25	+85	°C	
$G_p$	power gain	power at LNA input $P_i < -40$ dBm	[1]	-	14.5	-	dB
		power at LNA input $P_i = -20$ dBm	[1]	-	15.5	-	dB
$RL_{in}$	input return loss	power at LNA input $P_i < -40$ dBm	[1]	-	8.5	-	dB
		power at LNA input $P_i = -20$ dBm	[1]	-	10.5	-	dB
$RL_{out}$	output return loss	power at LNA input $P_i < -40$ dBm	[1]	-	14.5	-	dB
		power at LNA input $P_i = -20$ dBm	[1]	-	12.5	-	dB
NF	noise figure	power at LNA input $P_i < -40$ dBm	[1]	-	1.8	-	dB
		power at LNA input $P_i = -20$ dBm	[1]	-	1.9	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	$f = 1575$ MHz		-8.2		dBm	
		$f = 806$ MHz to $928$ MHz	[2]	31		dBm	
		$f = 1612$ MHz to $1909$ MHz	[2]	40		dBm	
$IP3_i$	input third-order intercept point		[3]	64		dBm	
$\alpha$	attenuation	$f = 850$ MHz	[4]	95	-	-	dBc
		$f = 1850$ MHz	[4]	90	-	-	dBc
$t_{on}$	turn-on time		[5]	-	2	$\mu$ s	
$t_{off}$	turn-off time		[5]	-	1	$\mu$ s	

[1] Power at GPS front-end input = power at LNA input + attenuation BPF1.

[2] Out of band.

[3]  $f_1 = 1713$  MHz;  $f_2 = 1851$  MHz.[4] Relative to  $f = 1575$  MHz.

[5] Within 10 % of the final gain.

## 9. Package outline

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886

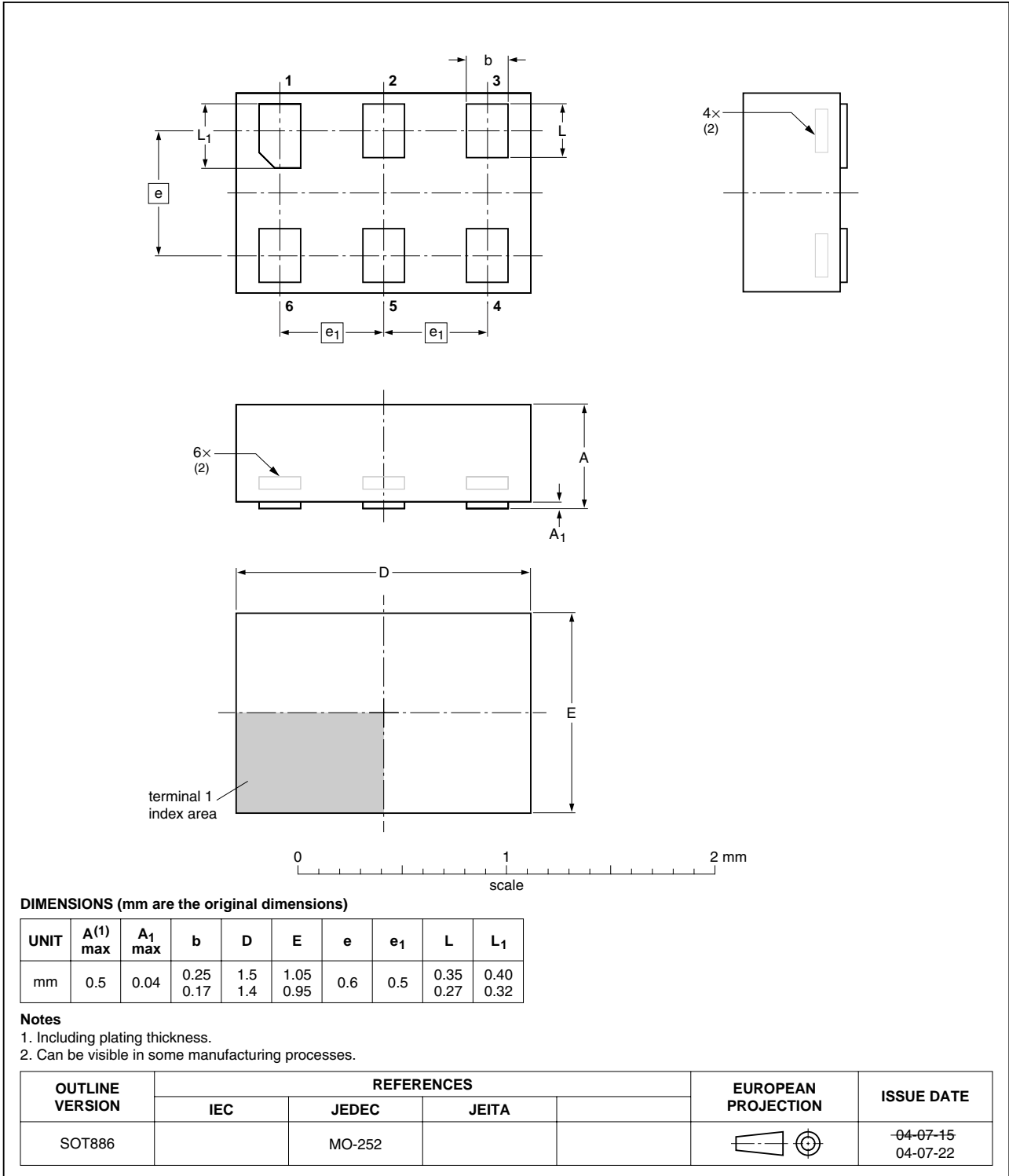


Fig 32. Package outline SOT886 (XSON6)

## 10. Abbreviations

Table 12. Abbreviations

Acronym	Description
AC	Alternating Current
FM	Frequency Modulation
GPS	Global Positioning System
HBM	Human Body Model
LNA	Low Noise Amplifier
MMIC	Monolithic Microwave Integrated Circuit
PDA	Personal Digital Assistant
RF	Radio Frequency
SAW	Surface Acoustic Wave
SiGe:C	Silicon Germanium Carbon

## 11. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGU7005_2	20100304	Product data sheet	-	BGU7005_1
Modifications:	<ul style="list-style-type: none"> <li>The status of this document has been changed into "Product data sheet".</li> <li><a href="#">Table 7 on page 3</a>: The values for ISL have been changed.</li> </ul>			
BGU7005_1	20091028	Preliminary data sheet	-	-



## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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".

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