BGB741L7ESD

Internally matched general purpose LNA MMIC for 50 MHz- 3.5 GHz applications

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Product description

The BGB741L7ESD is a high performance broadband low noise amplifier (LNA) MMIC based on Infineon's silicon germanium carbon (SiGe:C) bipolar technology.

Feature list

- Minimum noise figure NF_{min} = 1.05 dB at 2.4 GHz, 3 V, 10 mA
- Supply voltage range V_{CC} = 1.8 to 4.0 V at T_A = 25 °C
- High RF input power robustness of 20 dBm
- Integrated ESD protection: 2 kV HBM at all pins

Product validation

Qualified for industrial applications according to the relevant tests of JEDEC47/20/22.

Potential applications

- Satellite navigation systems (e.g. GPS, GLONASS, BeiDou, Galileo)
- Wireless communications: WLAN 2.4 GHz and 5-6 GHz bands, broadband LTE or WiMAX LNA
- ISM applications like RKE and smart meter, as well as for emerging wireless applications such as DVB-Terrestrial

Device information

Table 1 **Part information**

Product name / Ordering code	Package	Pin configuration				Marking	Pieces / Reel
BGB741L7ESD / BGB741L7ESDE6327XTSA1	TSLP-7-1	1 = V_{CC}	2 = V_{Bias}	3 = RF_{in}	4 = RF_{out}	AY	7500
		5 = V_{Ctrl}	6 = Current adjust	7 = Ground			

Attention: ***ESD (Electrostatic discharge) sensitive device, observe handling precautions***

Functional block diagram

This functional block diagram explains how the BGB707L7ESD is used. The RF power on/off function is controlled by applying V_{Ctrl}. By using an external resistor R_{ext}, the pre-set current of 5.5 mA (when R_{ext} is omitted) can be increased. Base V_B and collector V_C voltages are applied to the respective pins RF_{in} and RF_{out} by external inductors L_B and L_C.

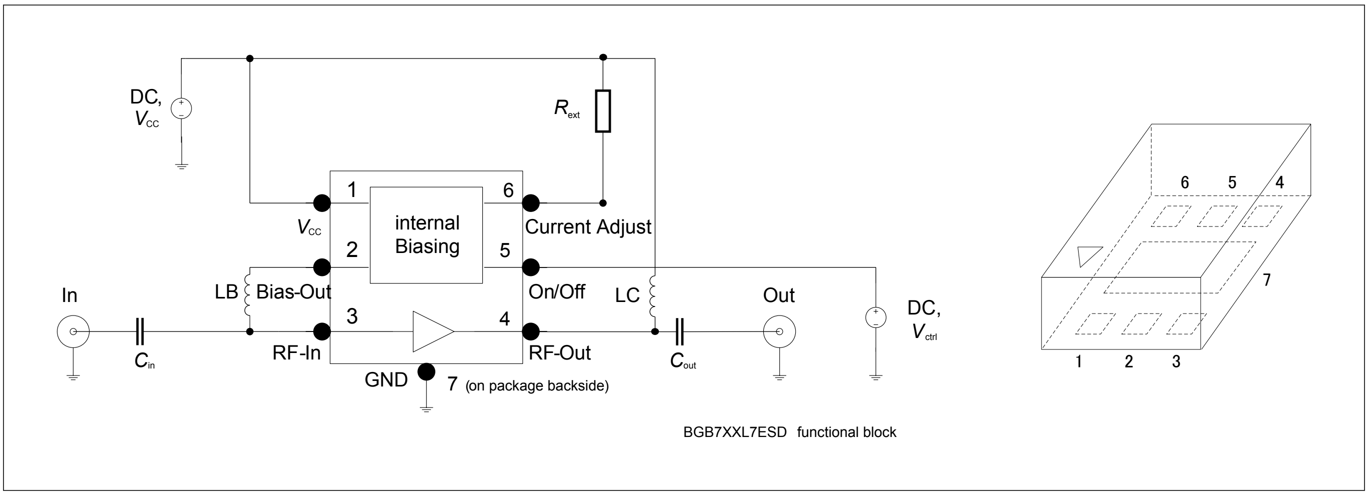

Figure 1 Functional block diagram

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1 Operating conditions

Table 2 Operation conditions at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Supply voltage	V_{CC}	1.8	3	4	V	–
Control voltage in on-mode	$V_{Ctrl\text{-}on}$	1.2	–	V_{CC}		
Control voltage in off-mode	$V_{Ctrl\text{-}off}$	-0.3		0.3		

2 Absolute maximum ratings

Table 3 Absolute maximum ratings at T_A = 25 °C (unless otherwise specified)

Parameter	Symbol	Values		Unit	Note or test condition
		Min.	Max.		
Supply voltage	V_{CC}	–	4 3.5	V	T_A = 25 °C T_A = -55 °C
Supply current	I_{CC}		30	mA	–
DC current at RF_{in}	I_B		3		
Control voltage	V_{Ctrl}		V_{CC}	V	
ESD stress pulse (HBM)	V_{ESD}		+/- 2	kV	
RF input power	P_{RFin}		20	dBm	
Total power dissipation[1)]	P_{tot}		120	mW	$T_S \leq$ 117 °C
Junction temperature	T_J		150	°C	–
Storage temperature	T_{Stg}	-55			

Attention: ***Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Exceeding only one of these values may cause irreversible damage to the integrated circuit.***

1 T_S is the soldering point temperature. T_S is measured on the emitter lead at the soldering point of the PCB

3 Thermal characteristics

Table 4 Thermal resistance

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Junction - soldering point	R_{thJS}	–	275	–	K/W	–

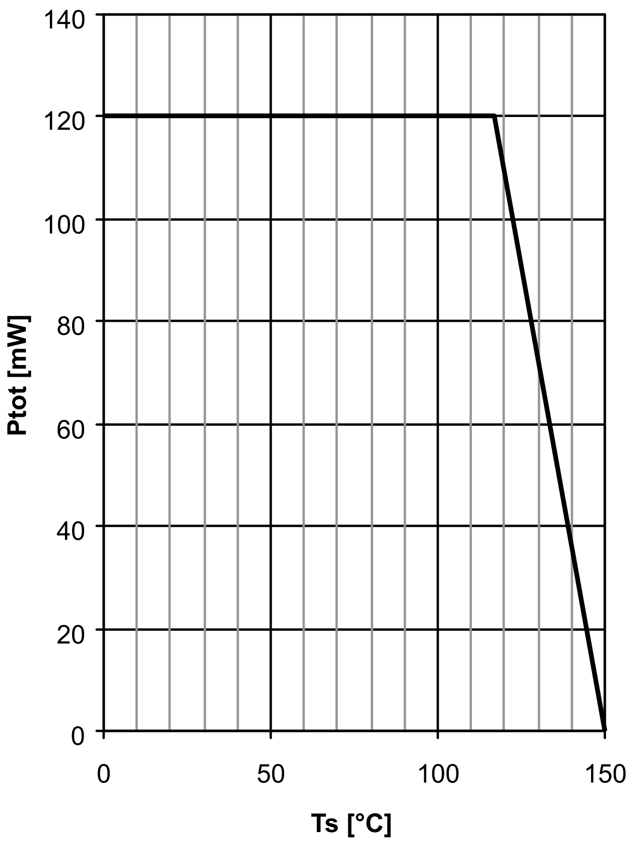

Figure 2 Total power dissipation P_{tot} = f(T_S)

4 Electrical characteristics

4.1 DC characteristics

Table 5 DC characteristics at V_{CC} = 3 V, T_A = 25 °C

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Supply current in on-mode	$I_{CC\text{-}on}$	 5.0 – –	 5.5 6 10	 6.5 – –	mA	V_{Ctrl} = 3 V R_{ext} = open R_{ext} = 30 kΩ R_{ext} = 3 kΩ
Supply current in off-mode	$I_{CC\text{-}off}$	–	–	6	µA	V_{Ctrl} = 0 V
Control current in on-mode	$I_{Ctrl\text{-}on}$		14	20		V_{Ctrl} = 3 V
Control current in off-mode	$I_{Ctrl\text{-}off}$		–	0.1		V_{Ctrl} = 0 V

4.2 Characteristic DC diagrams

The measurement setup is an application circuit according to ***Figure 1*** on page 2, using the integrated biasing. T_A = 25 °C (unless otherwise specified).

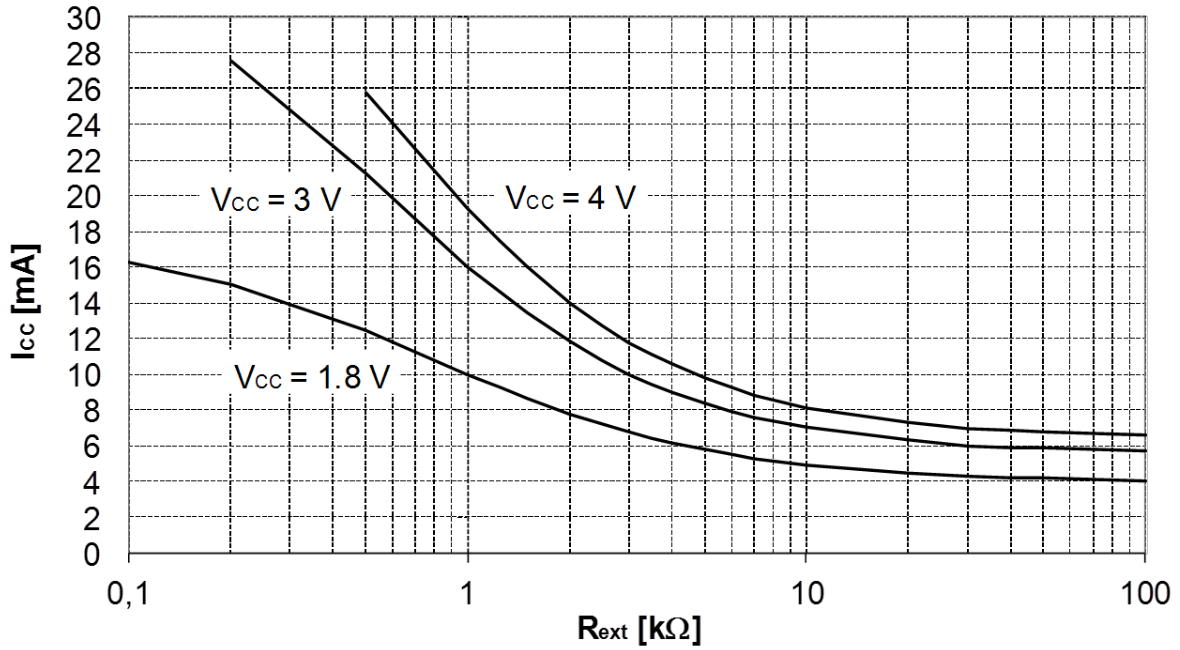

Figure 3 **Supply current vs external resistance I_{CC} = f(R_{ext}), V_{Ctrl} = 3 V, V_{CC} = parameter**

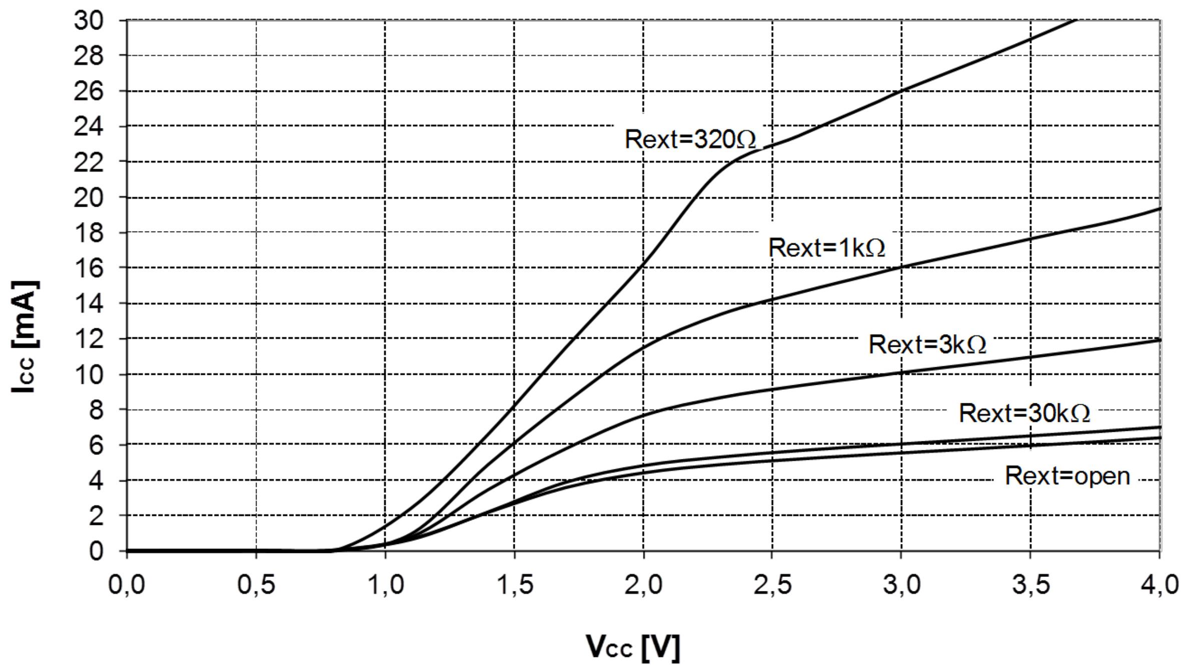

Figure 4 **Supply current vs supply voltage I_{CC} = f(V_{CC}), V_{Ctrl} = 3 V, R_{ext} = parameter**

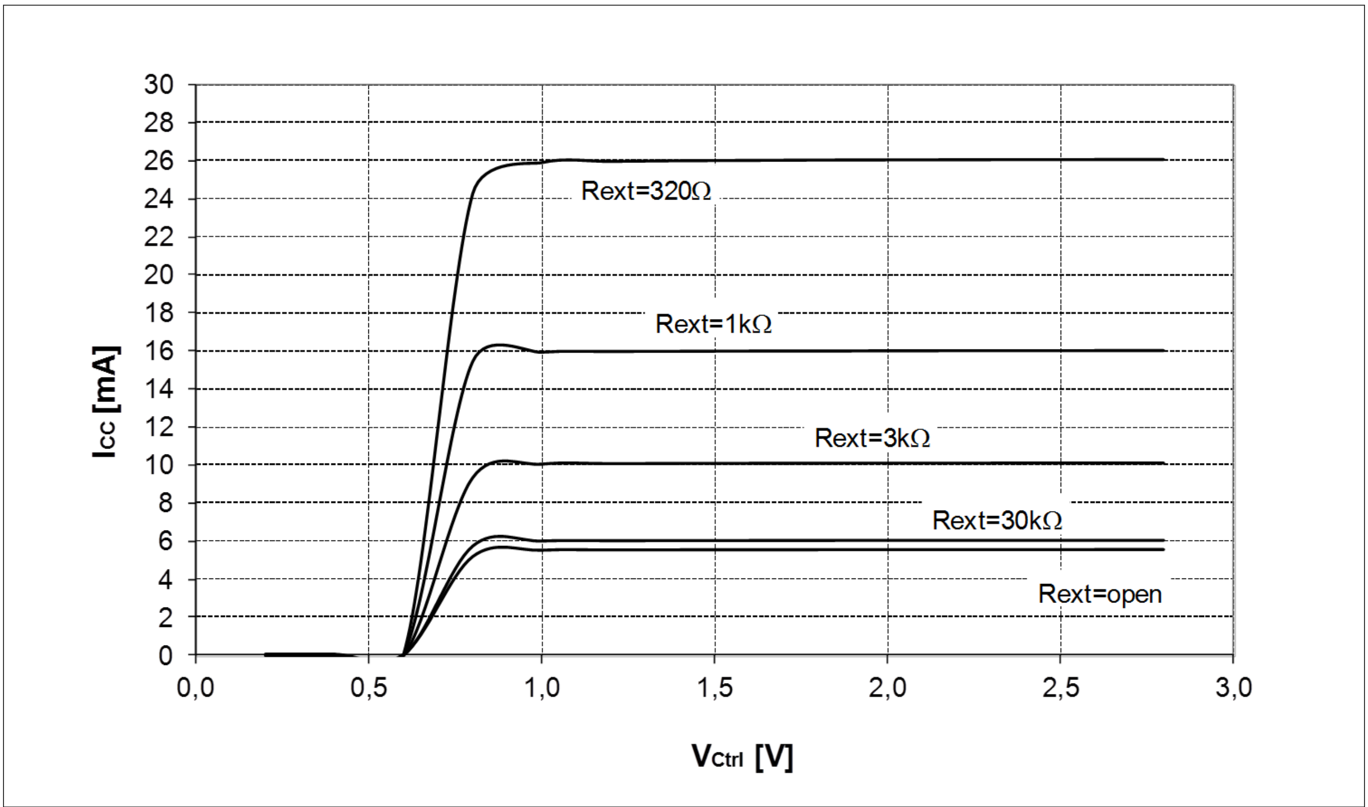

Figure 5 **Supply current vs control voltage $I_{CC} = f(V_{Ctrl})$, $V_{CC} = 3$ V, R_{ext} = parameter**

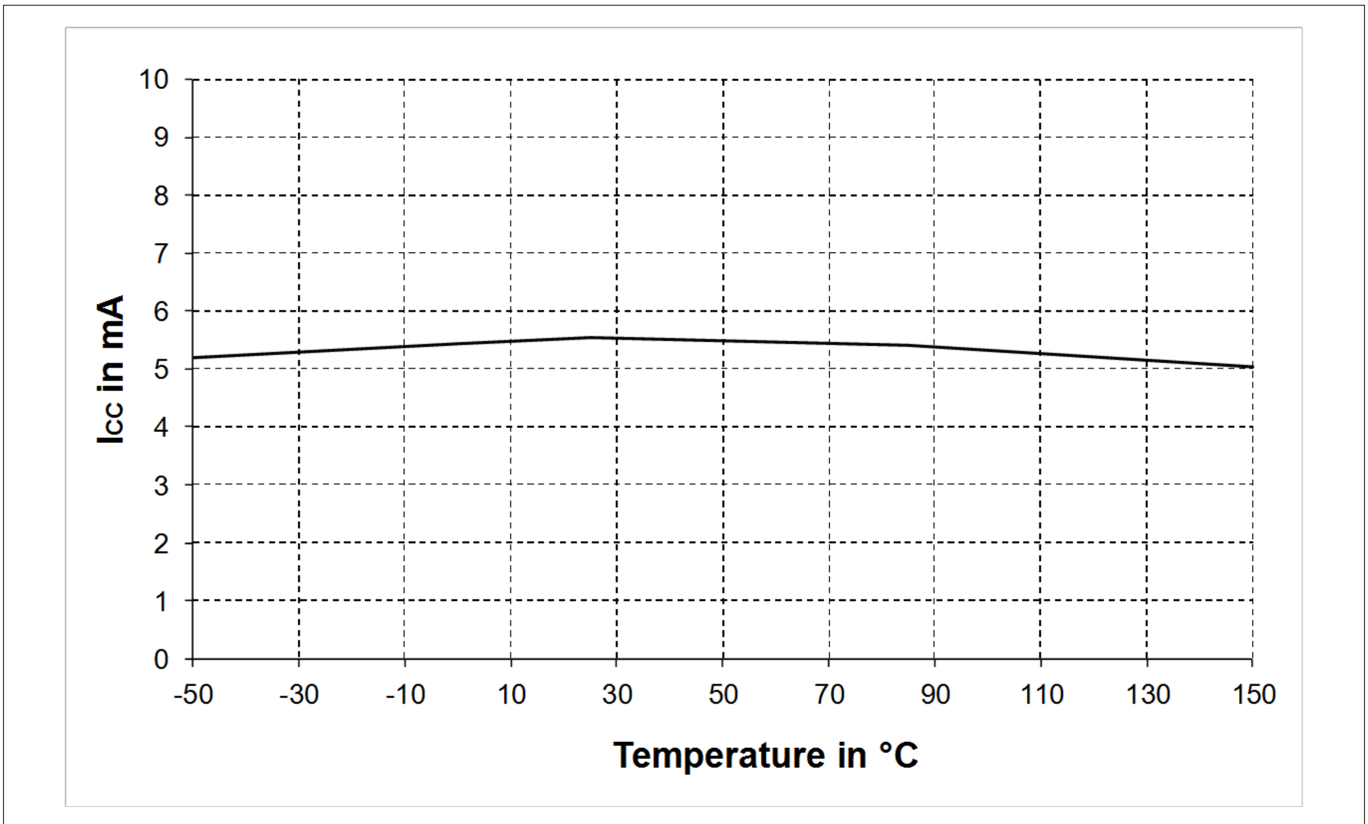

Figure 6 **Supply current vs temperature $I_{CC} = f(T_A)$, $V_{Ctrl} = V_{CC} = 3$ V, R_{ext} = open**

4.3 AC characteristics

The measurement setup is a test fixture with Bias-T's in a 50 Ω system, T_A = 25 °C.

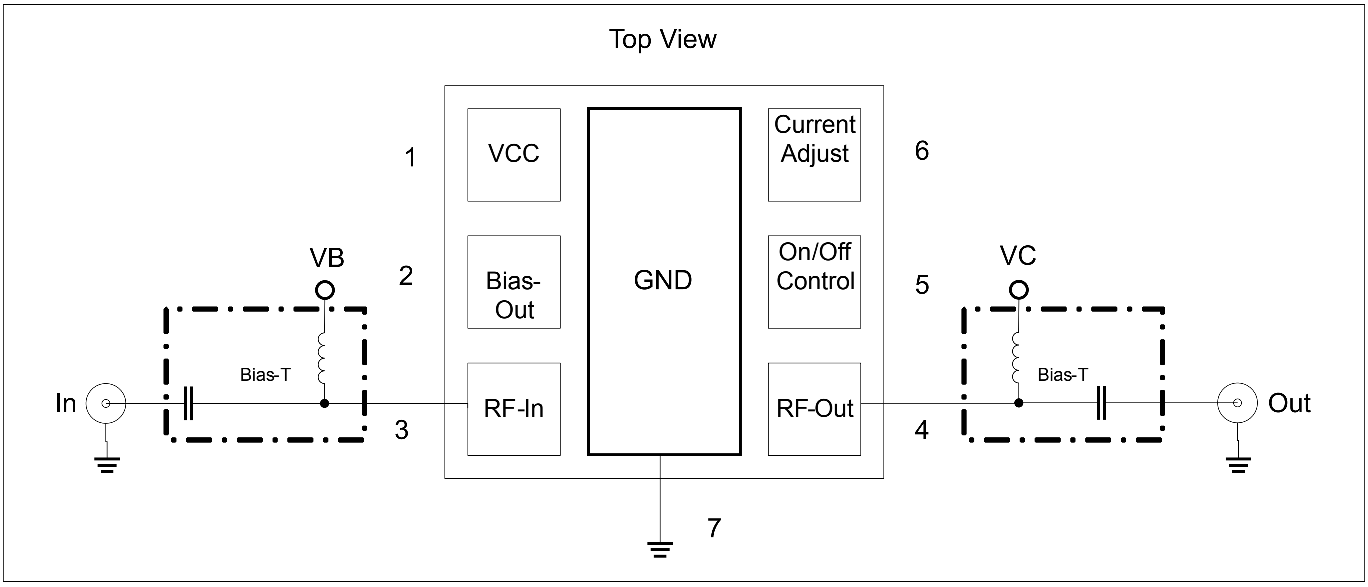

Figure 7 Testing setup

Table 6 AC characteristics, V_C = 3 V, f = 150 MHz

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.05 0.95	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.1 1.05			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		19 21			I_C = 6 mA I_C = 10 mA
Maximum stable power gain	G_{ms}		20 21.5			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-5.5 -8		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		5.5 3.5			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		14 18		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		12.5 18.5			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted
2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

Table 7 AC characteristics, V_C = 3 V, f = 450 MHz

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.05 0.95	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.1 1.05			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		18.5 20.5			I_C = 6 mA I_C = 10 mA
Maximum available power gain	G_{ma}		19 20.5			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-5 -7.5		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		4 2.5			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		15.5 21		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		14.5 28			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted

2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

Table 8 **AC characteristics, V_C = 3 V, f = 900 MHz**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.05 0.95	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.1 1.05			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		18.5 20			I_C = 6 mA I_C = 10 mA
Maximum available power gain	G_{ma}		19 20.5			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-5 -7		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		3 1.5			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		15.5 19		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		14.5 28.5			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted

2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

Table 9 **AC characteristics, V_C = 3 V, f = 1.5 GHz**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.05 1.0	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.1 1.05			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		18 19.5			I_C = 6 mA I_C = 10 mA
Maximum available power gain	G_{ma}		18.5 20			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-4.5 -6.5		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		2.5 1			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		14.5 16		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		14 23			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted

2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

Electrical characteristics

Table 10 AC characteristics, V_C = 3 V, f = 1.9 GHz

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.05 1.05	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.15 1.1			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		17.5 19			I_C = 6 mA I_C = 10 mA
Maximum available power gain	G_{ma}		18 19.5			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-4 -6		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		2.5 1			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		13.5 15		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		13.5 21			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted
2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

Table 11 **AC characteristics, V_C = 3 V, f = 2.4 GHz**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.1 1.05	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.15 1.1			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		17 18.5			I_C = 6 mA I_C = 10 mA
Maximum available power gain	G_{ma}		17.5 19			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-3.5 -5.5		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		3 1			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		12.5 13.5		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		12.5 18			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted

2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

Table 12 AC characteristics, V_C = 3 V, f = 3.5 GHz

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.25 1.2	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.35 1.25			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		15 16.5			I_C = 6 mA I_C = 10 mA
Maximum available power gain	G_{ma}		16 17.5			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-2.5 -4.5		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		3.5 1.5			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		10 10.5		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		10 13.5			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted
2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

Table 13 **AC characteristics, V_C = 3 V, f = 5.5 GHz**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Minimum noise figure [1]	NF_{min}	–	1.8 1.75	–	dB	I_C = 6 mA I_C = 10 mA $Z_S = Z_{S,opt}$
Noise figure in 50 Ω system [2]	NF_{50}		1.95 1.85			I_C = 6 mA I_C = 10 mA $Z_S = Z_L$ = 50 Ω
Transducer gain	$\|S_{21}\|^2$		12 13			I_C = 6 mA I_C = 10 mA
Maximum available power gain	G_{ma}		14 15			I_C = 6 mA I_C = 10 mA
Input 1 dB gain compression point	IP_{1dB}		-1 -3		dBm	I_{Cq} = 6 mA I_{Cq} = 10 mA
Input 3rd order intercept point	IIP_3		8.5 4			I_C = 6 mA I_C = 10 mA
Input return loss	RL_{in}		7 8		dB	I_C = 6 mA I_C = 10 mA
Output return loss	RL_{out}		7 8.5			I_C = 6 mA I_C = 10 mA

1 Test fixture losses are extracted
2 Parameter measured on an application board according to ***Figure 1*** on page 2 presenting a 50 Ω system to the device. I_{Cq} is the quiescent current, that is at small RF input power level. I_C increases as RF input power level approaches IP_{1dB}.

5 Package information TSLP-7-1

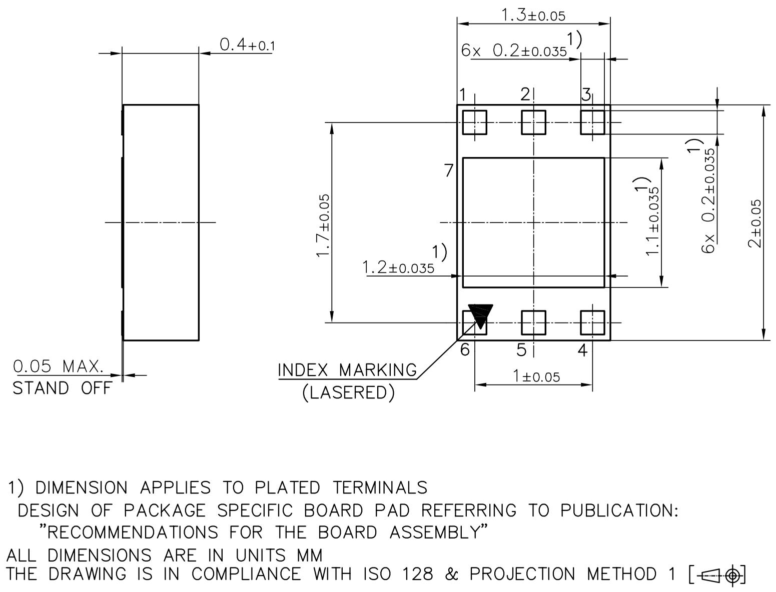

Figure 8 Package outline

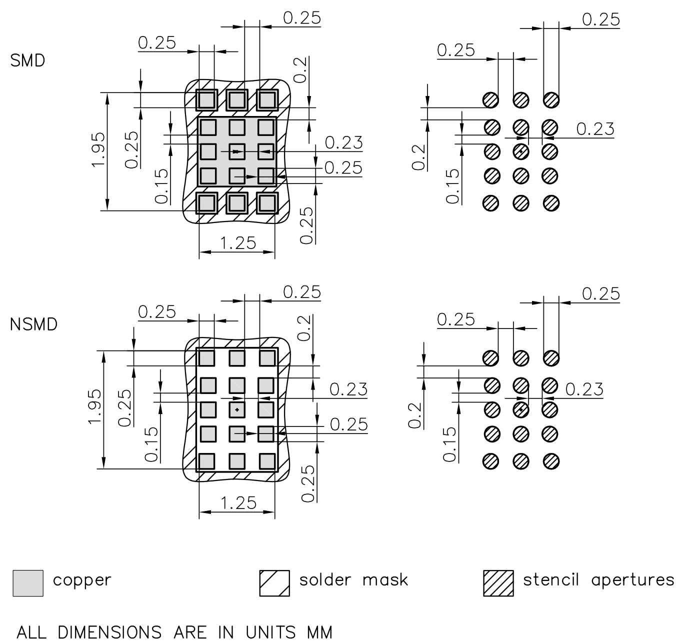

Figure 9 Foot print

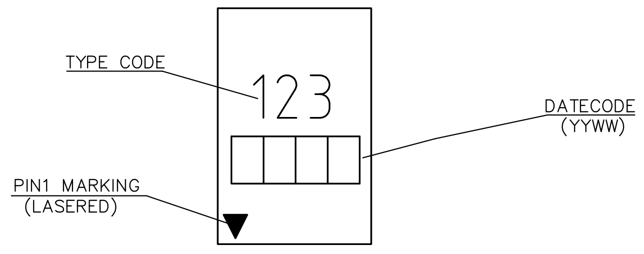

Figure 10 **Marking layout example**

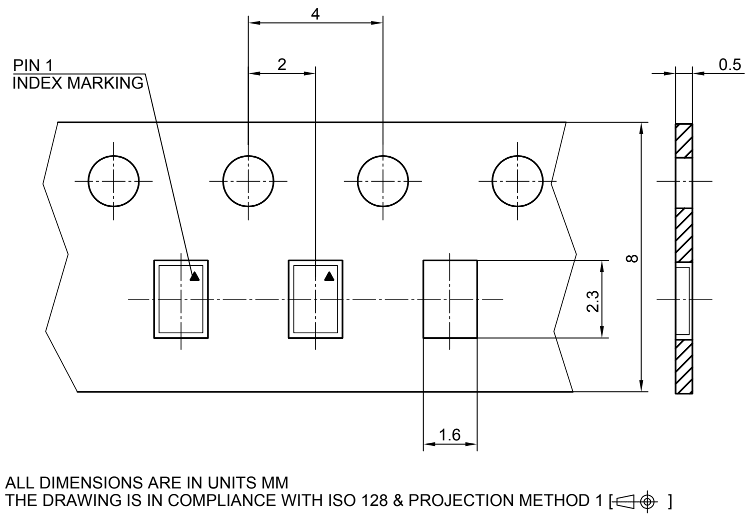

Figure 11 **Tape information**

Note: *See our* ***Recommendations for Printed Circuit Board Assembly of TSLP/TSSLP/TSNP Packages*** *.*
The marking layout is an example. For the real marking code refer to the device information on the first page. The number of characters shown in the layout example is not necessarily the real one. The marking layout can consist of less characters.

Revision history

Document version	Date of release	Description of changes
3.0	2018-09-26	New datasheet layout.

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