SIEMENS

ICs for Communication

Prescaler Circuit 1.1 GHz
PMB 2313T

V1.5

Data Sheet 7.96

PMB 2313T Revision History: 7.96	
Previous Releases:	none
Page	Subjects (changes since last revision)

Data Classification

Maximum Ratings

Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

Characteristics

The listed characteristics are ensured over the operating range of the integrated circuit. Typical characteristics specify mean values expected over the production spread. If not otherwise specified, typical characteristics apply at TA = 25 °C and the given supply voltage.

Operating Range

In the operating range the functions given in the circuit description are fullfilled.

For detailed technical information about “Processing Guidelines” and “Quality Assurance” for ICs, see our Product Overview “ICs for Communications”

Edition 7.96

This edition was realized using the software system FrameMaker®.

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Prescaler Circuit 1.1 GHz

PMB 2313T

Preliminary Data

Bipolar IC

Functional Description, Application

The IC is designed for use in mobile radio communication devices up to 1100 MHz.

Due to its low power consumption and low phase noise generation it is suitable for the use in battery powered handheld systems, e.g. GSM, cordless telephone and wireless LANs.

Low supply voltage down to 2.7V.

It can be switched to a low-power standby mode.

Internal current source at the emitter follower output. No external resistor needed in typical applications.

The divide ratio is 1:64/65 or 1:128/129 depending on the external circuit configuration.

The IC is board level compatible to the PMB 2312 prescaler.

Circuit Description

The differential inputs of the IC may be connected either balanced or single ended. In the latter case the unused input must be RF-grounded with a capacitor (about 1.5 nF) with a low serial inductance.

Depending on the logic level at SW input the basic divide ratio of the ECL-stages is fixed to 1:64/65 or 1:128/129. The MOD input determines whether modulus 1:n or 1:n+1 (n=64 or 128 according to SW-level) is active.

The IC can be switched to a low-power standby mode (input STB).

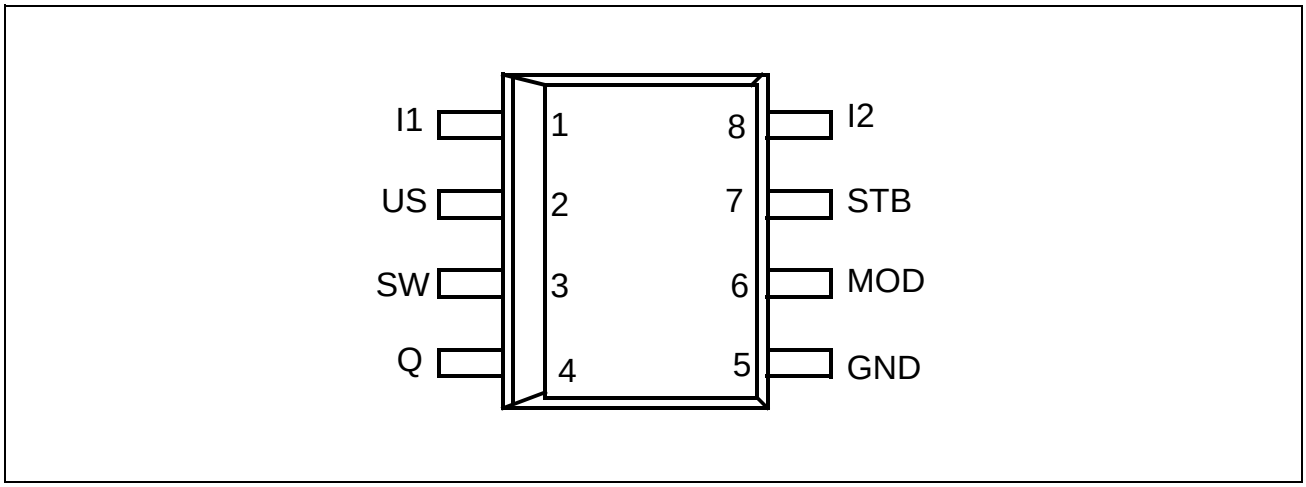
The MOD input is TTL/CMOS compatible.

The emitter follower output is CMOS compatible according to the application circuit on page 11. The minimum logic swing is 0.8 V_{pp}.

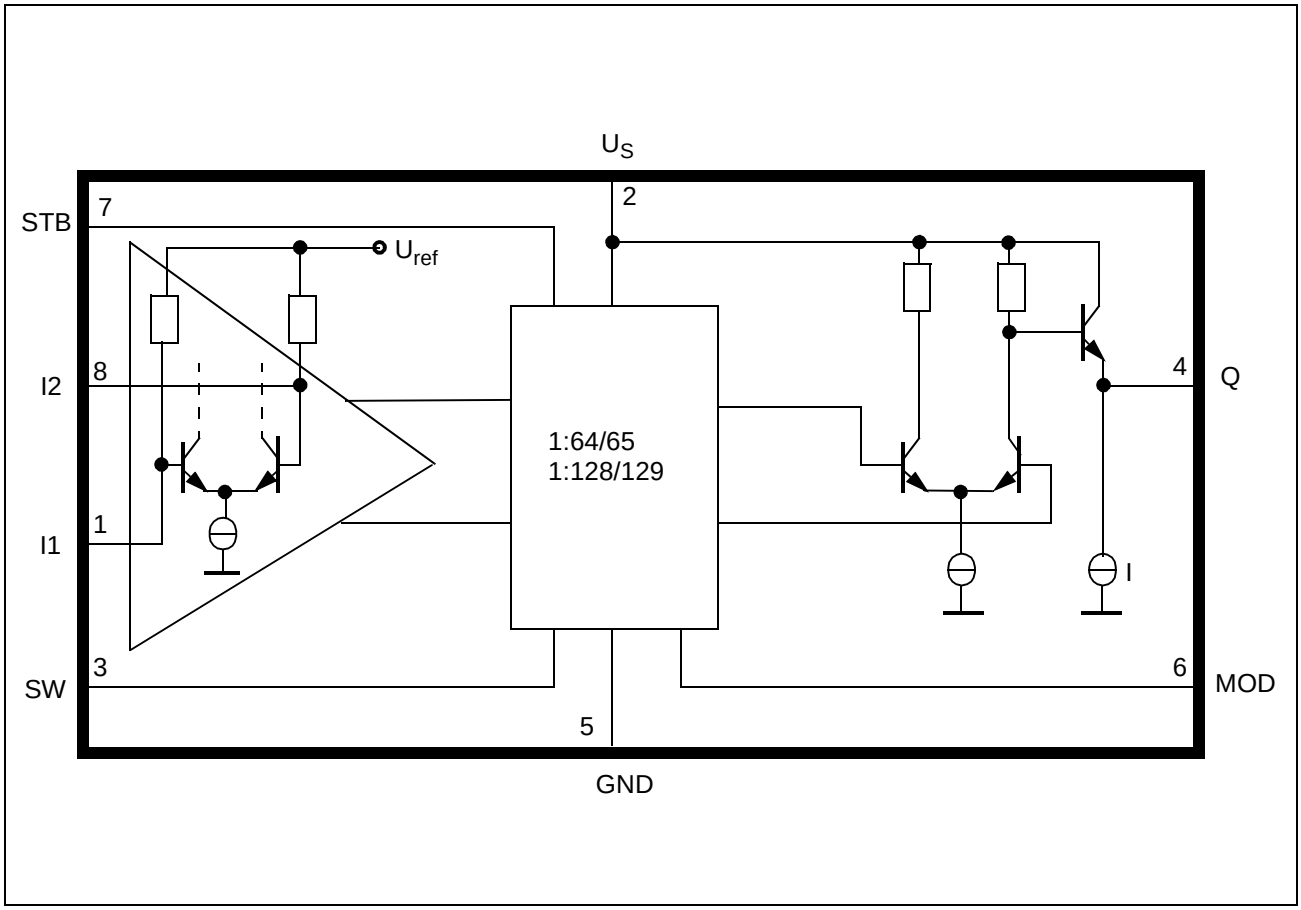
Function table

Input pin	Logic level	Prescaler function
SW	HIGH = U_S-0.1 V to U_S LOW = GND to 0.8 V or open	1:64/65 1:128/129
MOD	HIGH = 2.0 V to U_S or open LOW = GND to 0.8 V	1:64/1:128 1:65/1:129
STB	HIGH = U_S-0.1 V to U_S LOW = GND to 0.8 V	Divider Q=HIGH, STANDBY-mode

Pin Assignment



Pin 1 RF-input I1
Pin 2 supply voltage U_S
Pin 3 divide ratio 1:64/65 - 1:128/129 control input (SW)
Pin 4 output Q
Pin 5 GND
Pin 6 modulus 1:n/n+1 (n=64 or 128) control input (MOD)
Pin 7 standby mode control input (STB)
Pin 8 RF-input I2



Block Diagram

Absolute Maximum Ratings

T_A = -40 to 85 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	U_S	-0.3	6	V	
Input level (Pin 1; Pin 8)	U_I		2	V	U_S=0V
Voltage swing (Pin 1 to 8)	U_{I18}	-2	2	V	
Input level (Pin 3; Pin 6; Pin 7)	U_{SW}, U_{MOD}, U_{STB},	-0.3	U_S+0.7V or 5.5V if U_S+0.7V > 5.5V	V	U_S=2.7...5.5V
Output level (Pin 4)	U_Q		U_S	V	
Output current (Pin 4)	$-I_Q$		5	mA	
Junction temperature	T_j		125	°C	
Storage temperature	T_S	-65	125	°C	
Thermal resistance system-ambient	R_{thsa}		185	K/W	

The maximum ratings may not be exceeded under any circumstances, not even momentarily and individually, as permanent damage to the IC will result.

ESD-integrity (according MIL-STD 883D, Meth. 3015.7): 500V

Operating Range

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply Voltage	U_S	2.7	5.5	V	
Input frequency	f	50	1400	MHz	
Ambient temperature	T_A	-40	85	°C	

Within the operational range the IC operates as described in the circuit description. The AC / DC characteristic limits are not guaranteed.

AC/DC Characteristics
T_A = -20 to 85 °C

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Supply voltage U_S=2.7 to 5.5V **Ambient temperature** T_A = -20 to 85 °C (refered to the test circuit)						
Supply current	I_S		1.9	2.4	mA	inputs RF-grounded, U_S=2.7, T_A = 25 °C, STB= U_S output open
	I_S		1.95	2.45	mA	inputs RF-grounded, U_S=4.0, T_A = 25 °C, STB= U_S output open
	I_S		2.00	2.5	mA	inputs RF-grounded, U_S=5.5, T_A = 25 °C, STB= U_S output open
Supply current in standby-mode	I_{STB}			0.1	mA	inputs RF-grounded, output open, STB = GND
Input level dynamicrange (see diagram 2)	U_{in}	25		400	mV_{rms}	100-1000MHz (sine wave)
	P_{in}	-19		5	dBm	100-1000MHz (sine wave)
	U_{in}	25		280	mV_{rms}	1000-1100MHz (sine wave)
	P_{in}	-19		2	dBm	1000-1100MHz (sine wave)
Output logic swing	U_Q	1	1.1		V_{PP}	C_L <= 12pF, R_L=2kΩ
	U_Q	0.8	1.1		V_{PP}	C_L <= 8pF
SW voltage High	U_{SWH}	U_S-0.1V		U_S	V	
SW voltage Low	U_{SWL}	GND		0.8	V	
SW input current High	I_{SWH}			60	µA	SW=U_S
SW input current Low	$-I_{SWL}$			30	µA	SW=GND
MOD voltage High	U_{MODH}	2.3		U_S	V	
MOD voltage Low	U_{MODL}	GND		0.8	V	
MOD input current High	I_{MODH}			50	µA	MOD=U_S
MOD input current Low	I_{MODL}			120	µA	MOD=GND

AC /DC characteristics involve the spread of values guaranteed within the specified suply voltage and ambient temperature range. Typical characteristics are the median of the production.

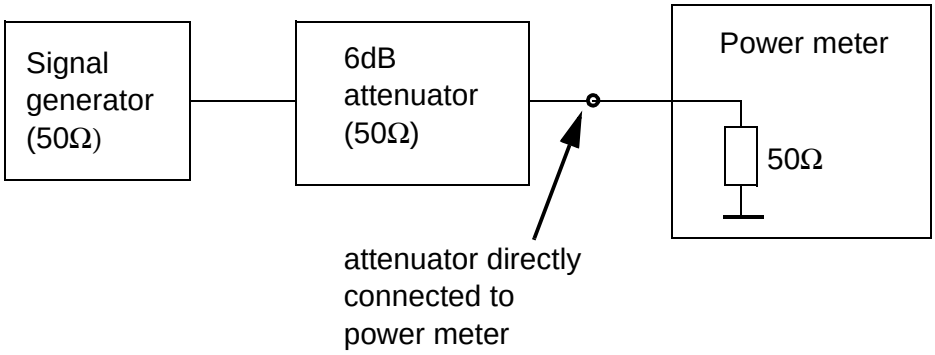
AC/DC Characteristics
T_A = -20 to 85 °C

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
STB voltage High	U_{STBH}	U_S-0.1		U_S	V	
STB voltage Low	U_{STBL}	GND		0.8	V	
STB input current High	I_{STBH}			30	µA	STB = U_S
STB input current Low	$-I_{STBL}$			60	µA	STB = GND
Internal current source (see block diagram)	I		400		µA	
Delay times						
MOD setup time (diagram 1)	t_{set}			29	ns	

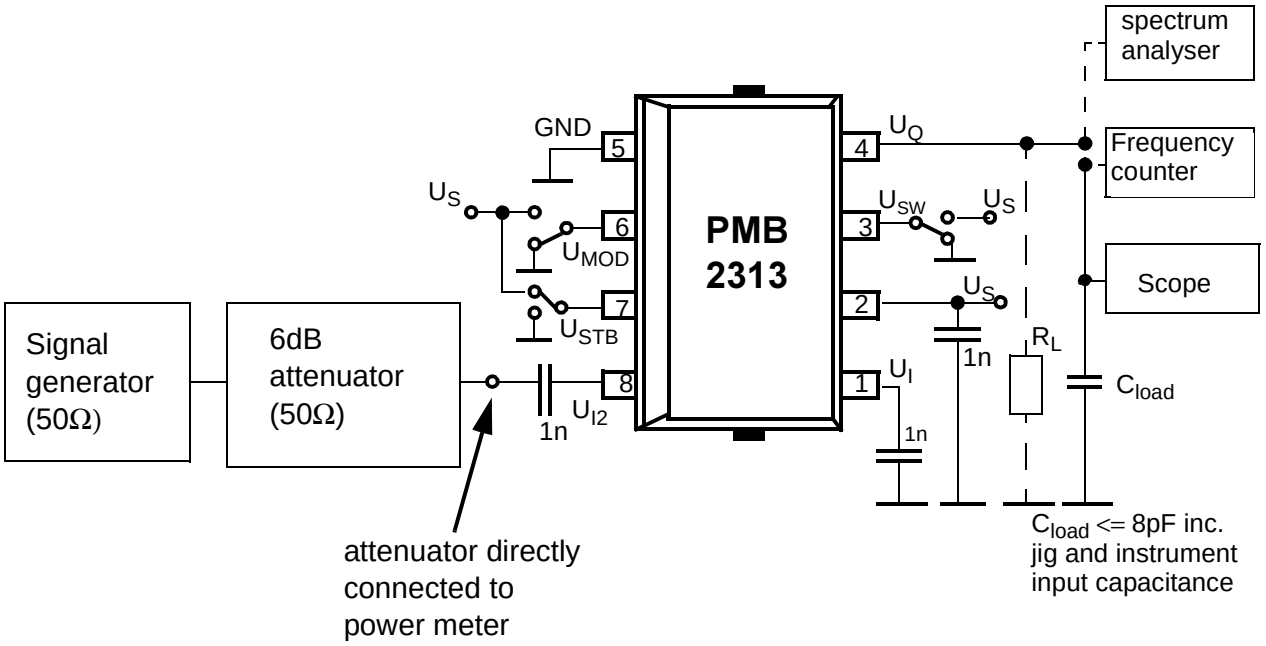
AC /DC characteristics involve the spread of values guaranteed within the specified suply voltage and ambient temperature range. Typical characteristics are the median of the production.

Test circuit

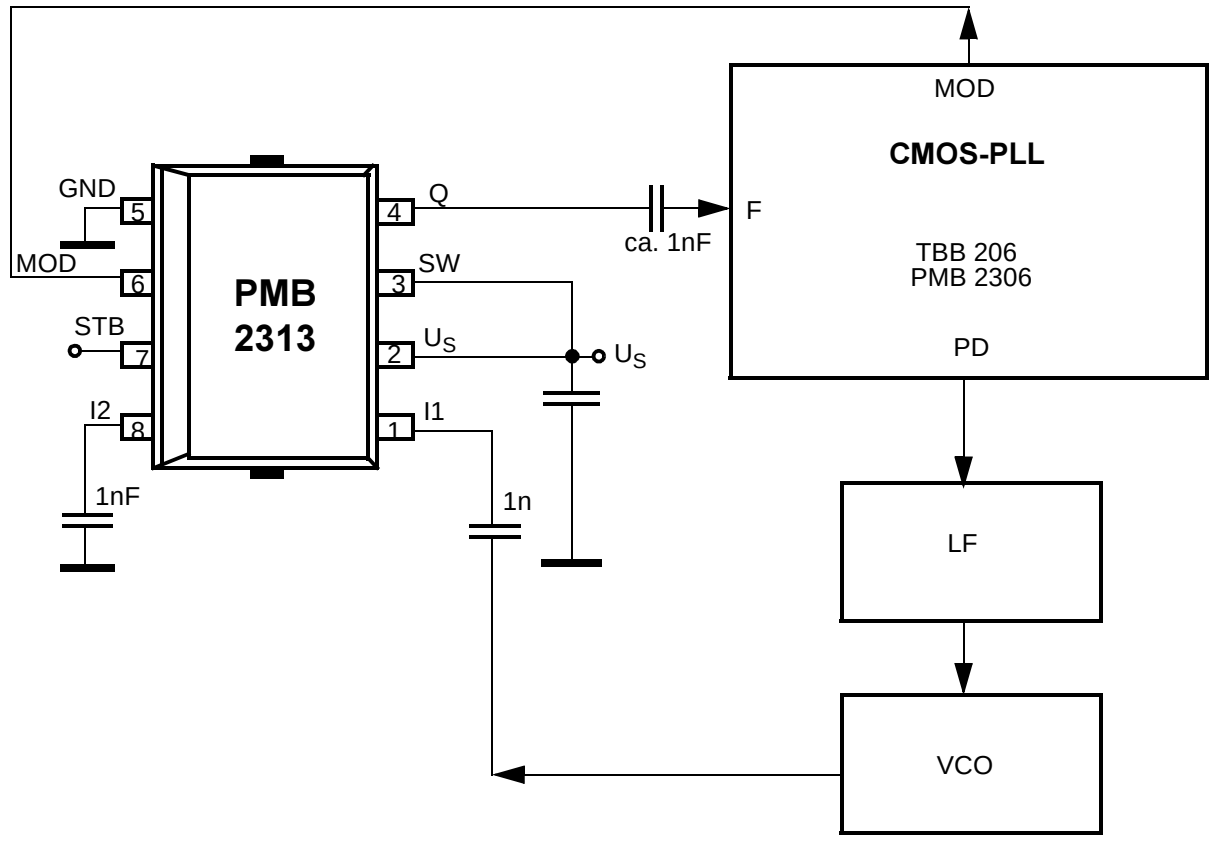
Calibration of the signal generator



Input sensitivity and output logic swing measurement



Application Circuit



(SW connected for 1:64/65 divider ratio)

Definition of Modulus Setup Time

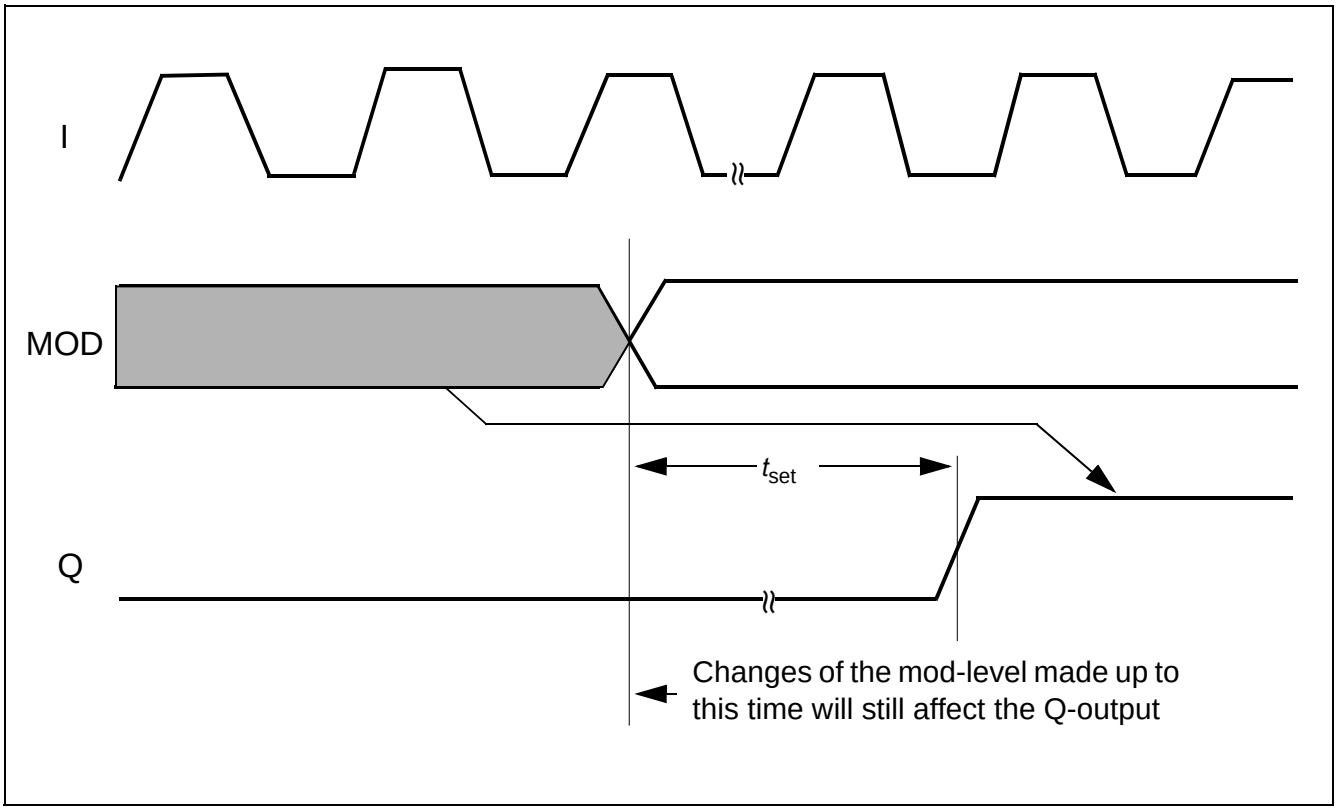
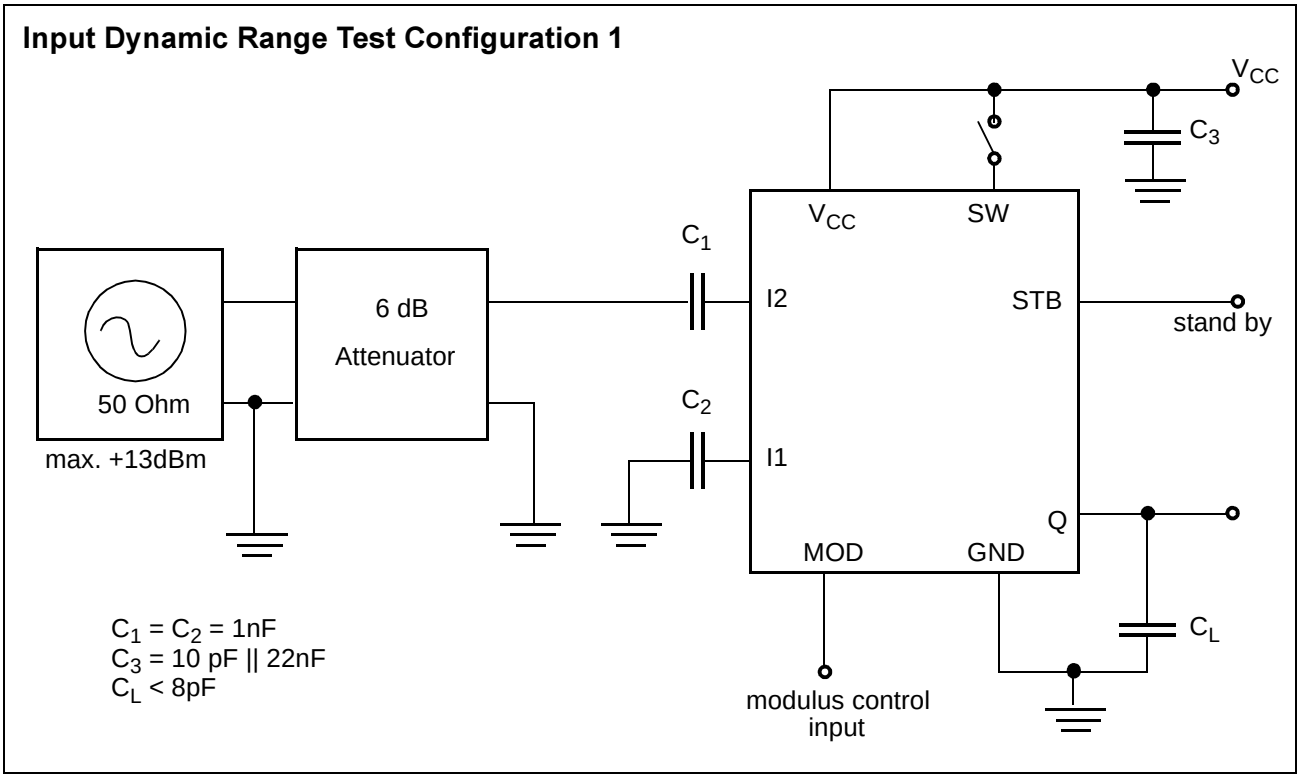


Diagram 1

Diagram 2


Input Dynamic Range Test Configuration 1
V_{CC}
C_3
V_{CC}
SW
C_1
6 dB
Attenuator
I2
STB
stand by
50 Ohm
max. +13dBm
C_2
I1
Q
MOD
GND
C_L
$C_1 = C_2 = 1nF$
$C_3 = 10$ pF || 22nF
$C_L < 8pF$
modulus control input

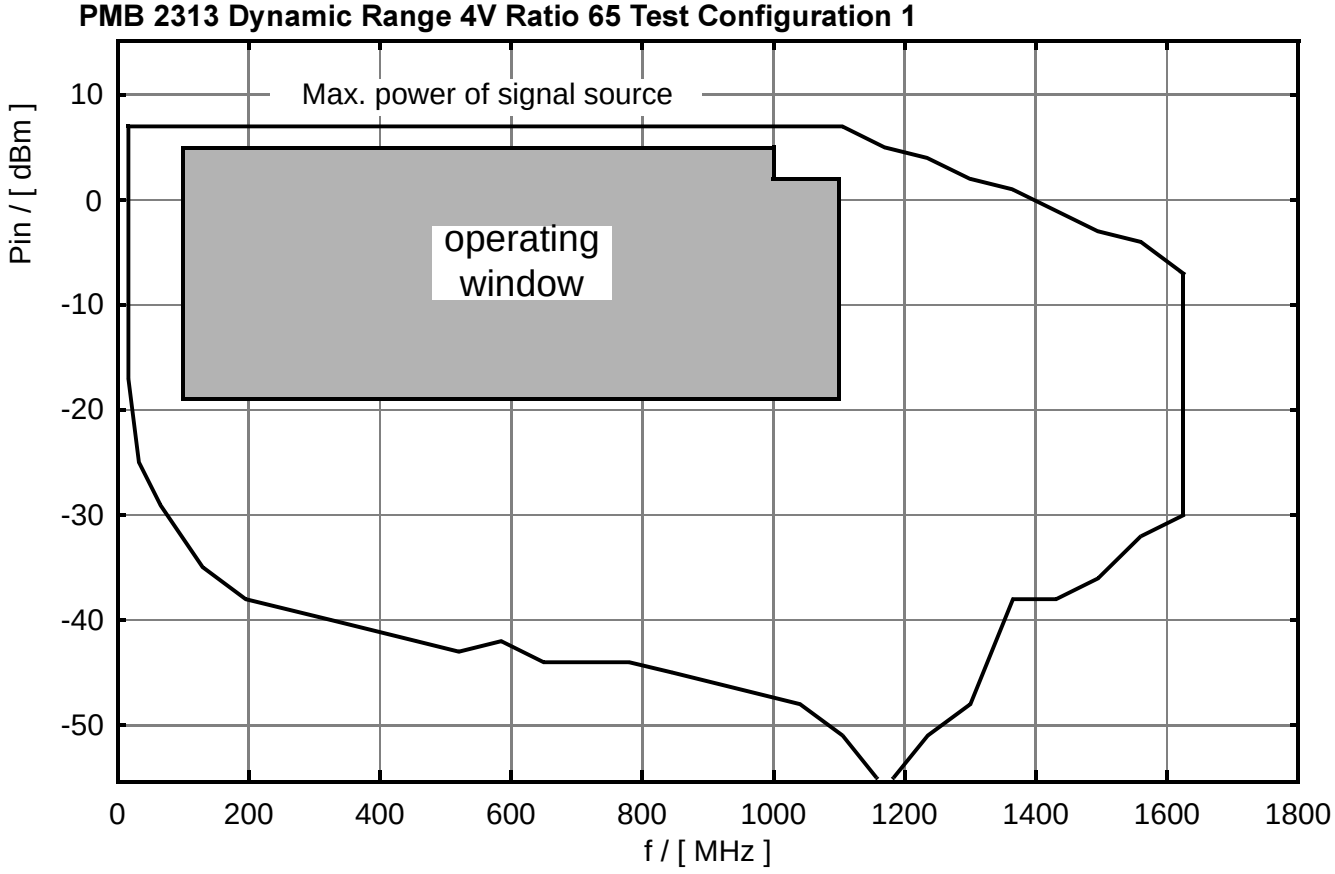
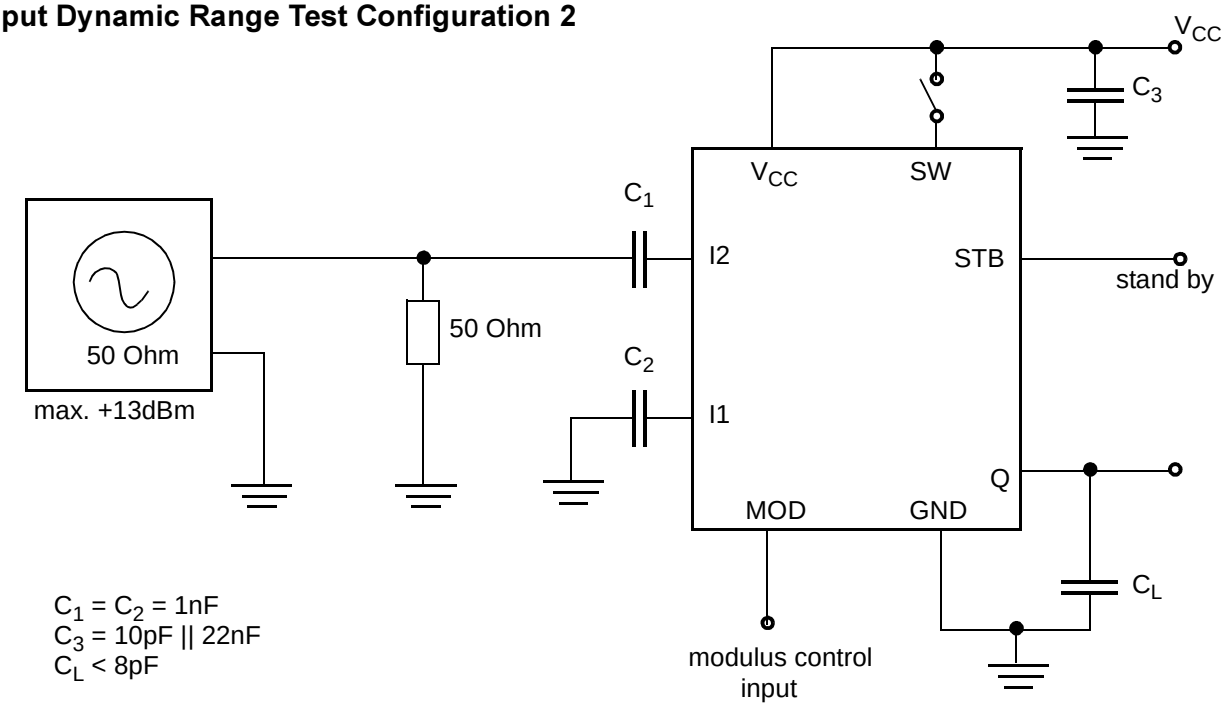
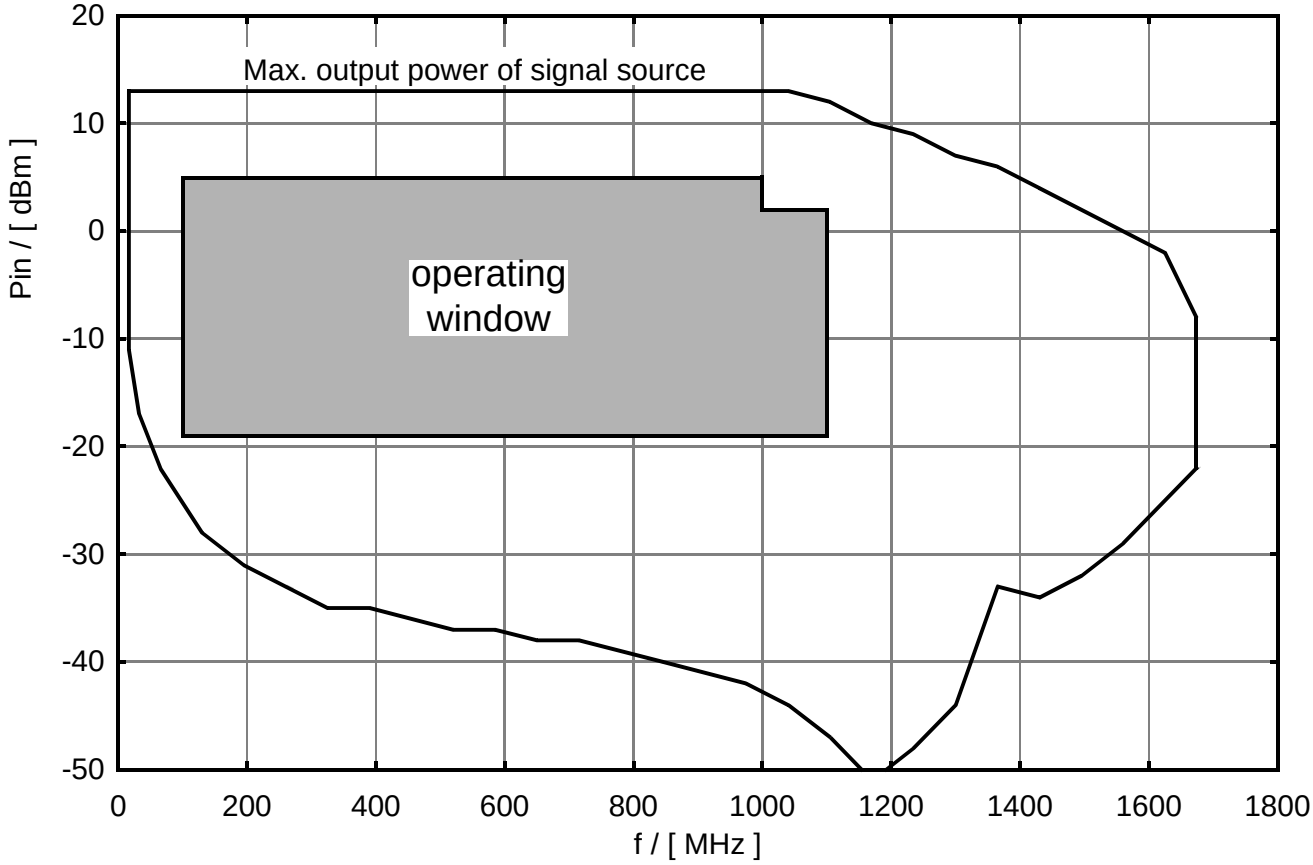

PMB 2313 Dynamic Range 4V Ratio 65 Test Configuration 1
Max. power of signal source
operating window
Pin / [dBm]
10
0
-10
-20
-30
-40
-50
0
200
400
600
800
1000
1200
1400
1600
1800
f / [MHz]

Diagram 3

Input Dynamic Range Test Configuration 2

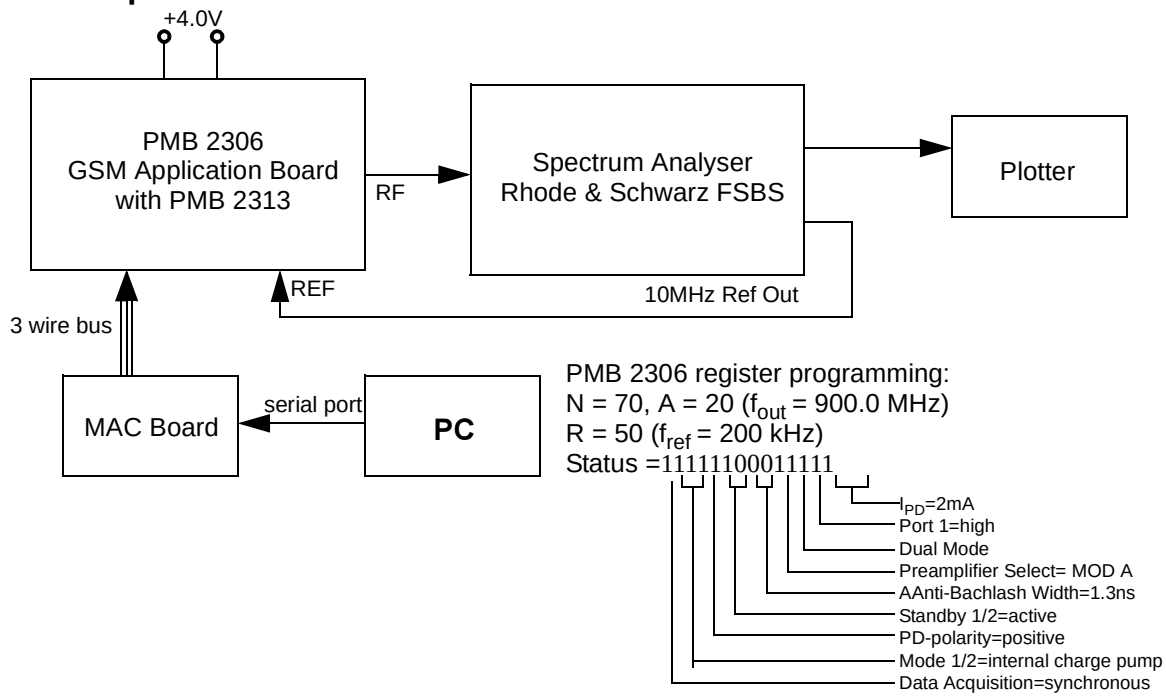


PMB 2313 Dynamic Range 4V Ratio 65 Test Configuration 2

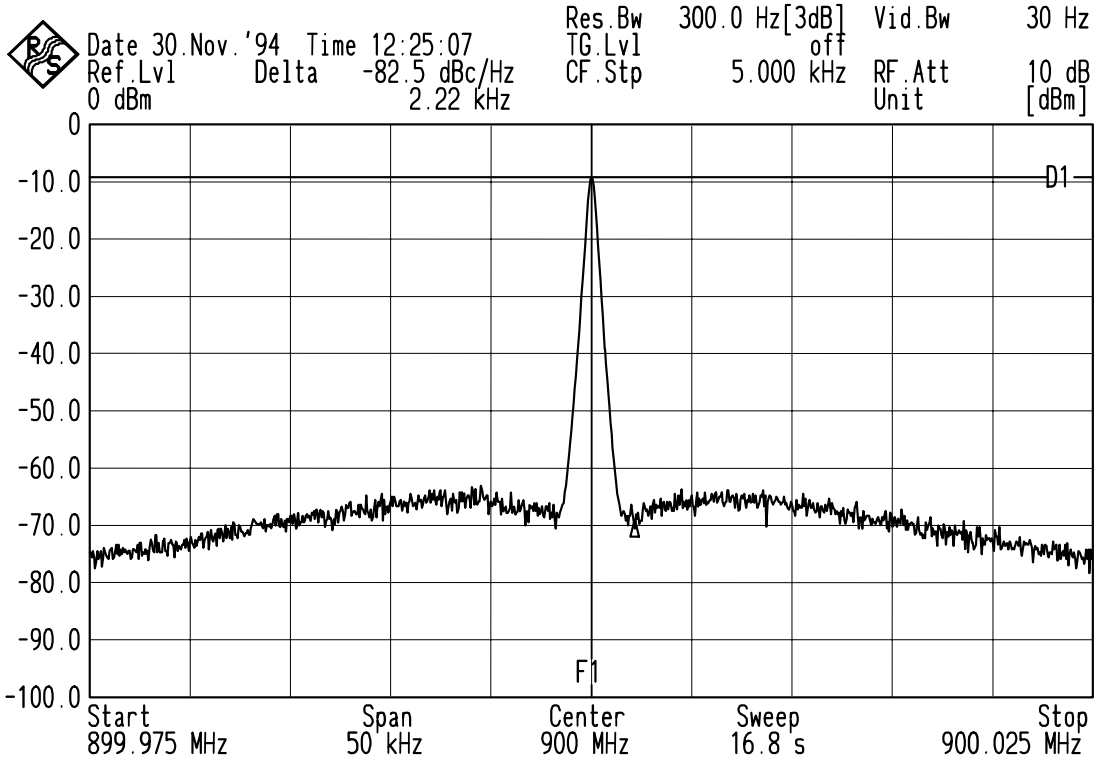


Phase Noise Measurement

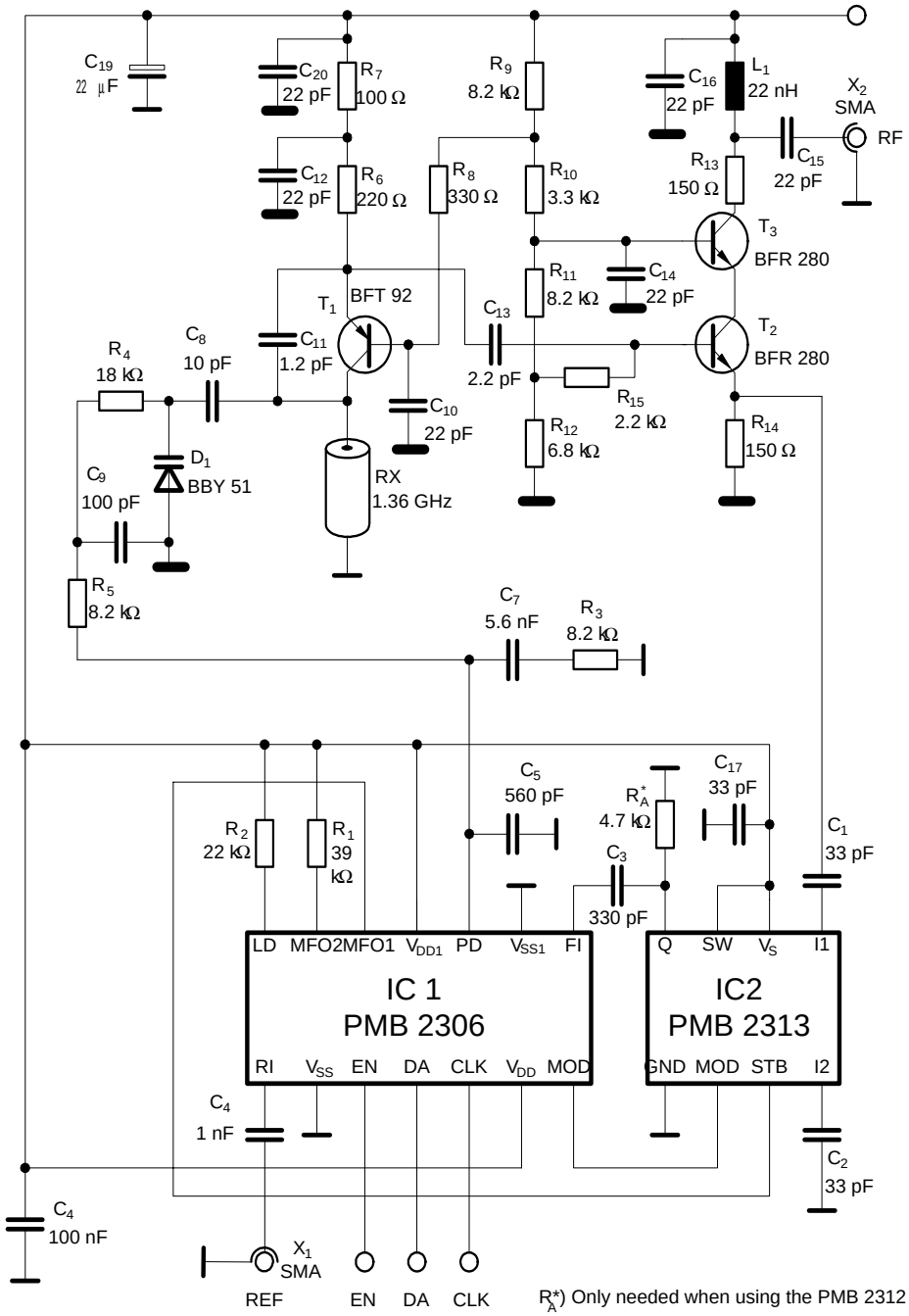
Test Setup



Measured Spectrum



PMB 2306 GSM Application Board



Circuit Diagram

PMB 2306 GSM Application Board

List of Components

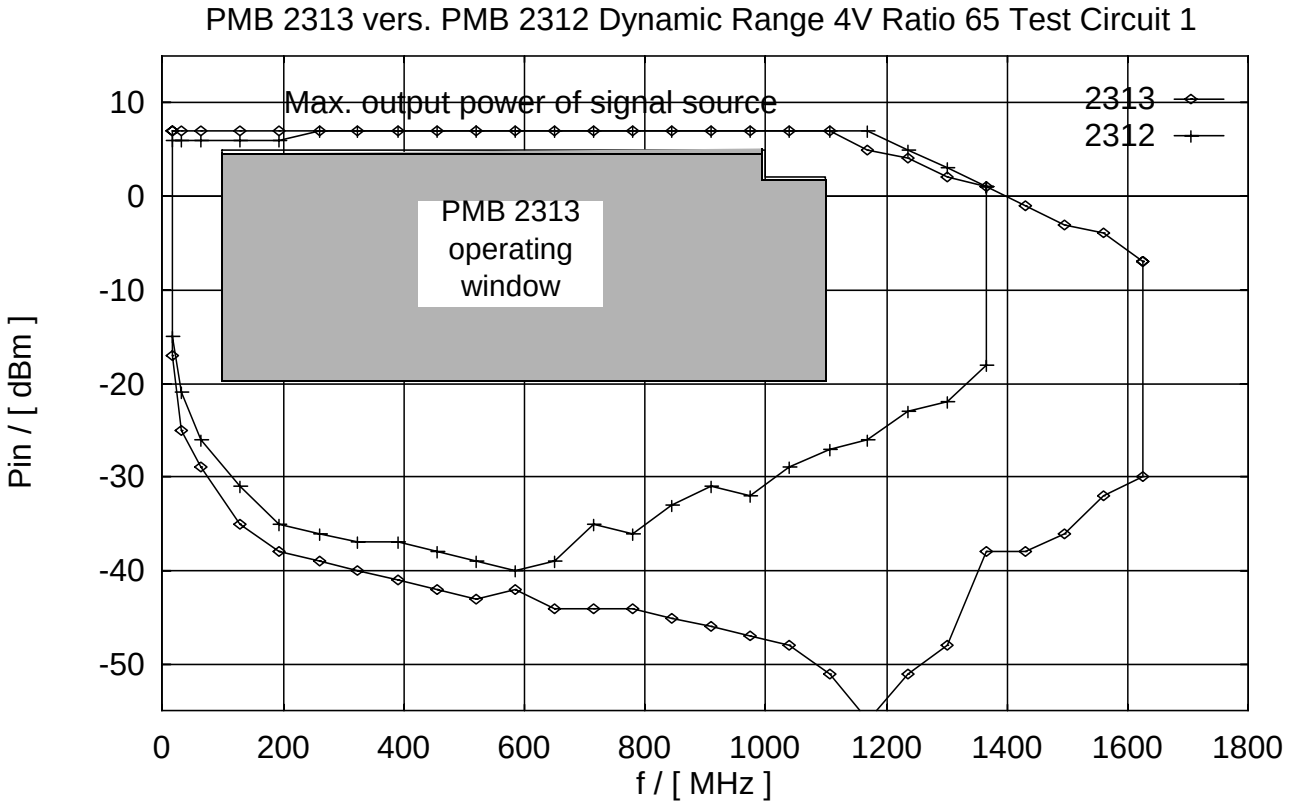
Item	Quantity	Reference		Part	
1	1	R7	100Ω	SMD/0805	B54102-A1101-X60
2	2	R13, R14	150Ω	SMD/0805	B54102-A1151-J60
3	1	R6	220Ω	SMD/0805	B54102-A1221-J60
4	1	R8	330Ω	SMD/0805	B54102-A1331-J60
5	1	R15	2.2kΩ	SMD/0805	B54102-A1222-J60
6	1	R10	3.3kΩ	SMD/0805	B54102-A1332-J60
7	1	RA	4.7kΩ	SMD/0805	B54102-A1472-J60
8	1	R12	6.8kΩ	SMD/0805	B54102-A1682-J60
9	4	R3, R5, R9, R11	8.2kΩ	SMD/0805	B54102-A1822-J60
10	1	R4	18kΩ	SMD/0805	B54102-A1183-J60
11	1	R2	22kΩ	SMD/0805	B54102-A1223-J60
12	1	R1	39kΩ	SMD/0805	B54102-A1393-J60
13	1	L1	22nH	SIMID 01	B82412-A3220-M
14	1	C11	1.2pF	COG/0805	B37940-K5010-C262
15	1	C13	2.2pF	COG/0805	B37940-K5020-C262
16	1	C8	10pF	COG/0805	B37940-K5100-J62
17	6	C10, C12, C14			
		C15, C16, C30	22pF	COG/0805	B37940-K5220-J62
18	3	C1, C2, C17	33pF	COG/0805	B37940-K5330-J62
19	1	C9	100pF	COG/0805	B37940-K5101-J62
20	1	C3	330pF	COG/0805	B37940-K5331-J62
21	1	C5	560pF	COG/0805	B37940-K5561-J62
22	1	C4	1.0nF		
23	1	C7	5.6nF	COG/1210	
24	1	C6	100nF	X7R/1210	B37950-K5104-K62
25	1	C19	22µF		
26	1	D1	BBY51		Q62702-B631
27	2	T2, T3	BFR280		Q62702-F1298
28	1	T1	BFT92		Q62702-F1062
29	2	X1, X2	SMA		Connector
30	1	RX	1.3GHz		B69620-G1307-A410
31	1	IC1	PMB 2306T P-DSO-14		Q67100-H6423 (TUBE)
		or	PMB 2306T P-DSO-14		Q67106-H6423 (T+R)
32	1	IC2	PMB 2313T P-DSO-8-1		Q ?? (TUBE)
		or	PMB 2313T P-DSO-8-1		Q 67006-A6116 (T+R)

Replacing the PMB 2312 by the PMB 2313

	PMB 2312	PMB 2313	Test Condition
Supply current (typ.):	5.7mA	1.95 mA	inputs RF-grounded, U_S = 4.0 V, T_{amb} = 25 °C STB open, output open
Input frequency	200 - 1000 MHz	100 - 1100 MHz	
Supply voltage	4.0 - 5.5V	2.7 - 5.5 V	
Output stage load:	internal load resistor	internal current source	
Phase noise:	same performance, see section "Phase Noise Measurement"		
Input impedance (typ.):	40 Ω || 1.3 pF	750 Ω || 560 fF	f = 900 MHz, C_1= C_2 = 1 nF U_S = 4.0 V, T_{amb} = 25 °C
	66 Ω || 1.4 pF	1150 Ω || 350 fF	f = 450 MHz, C_1= C_2= 1 nF U_S = 4.0 V, T_{amb} = 25 °C
Input sensitivity:	see following diagram		

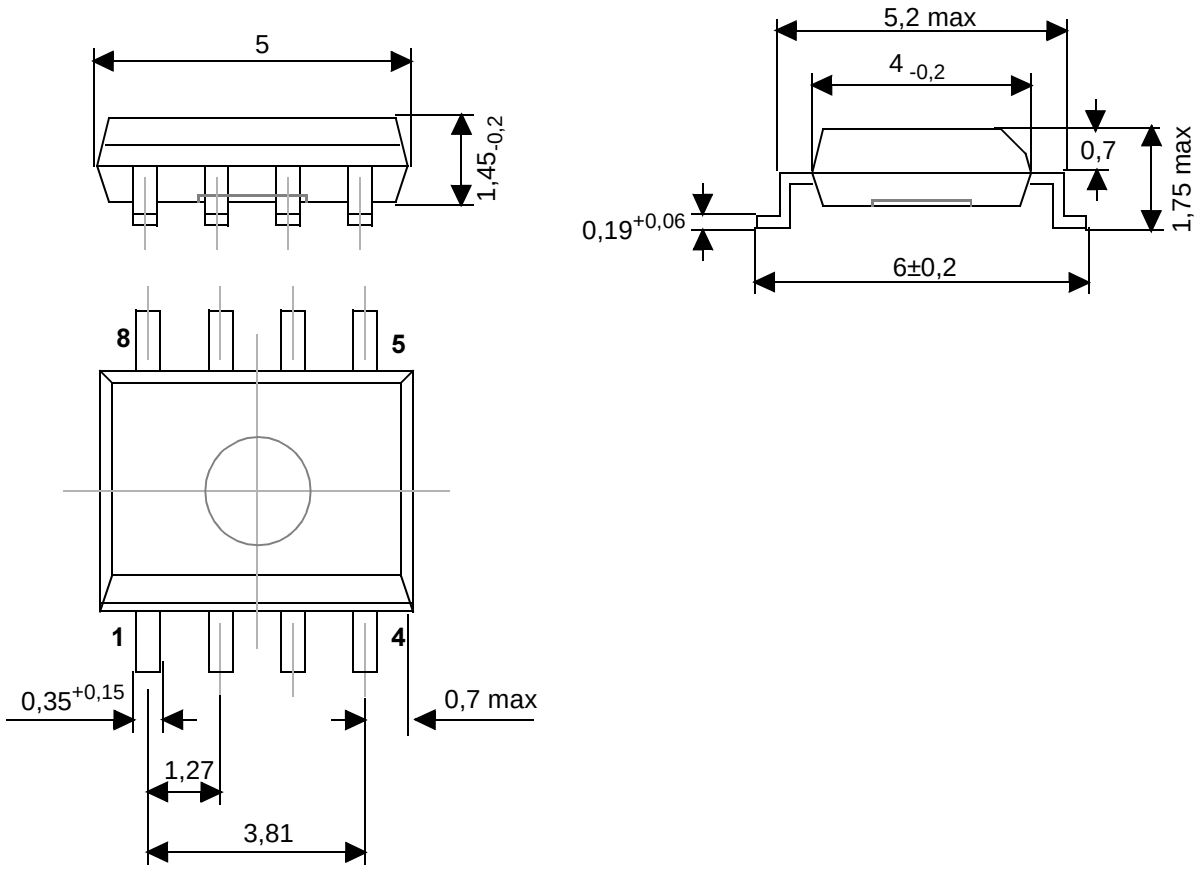
Due to the internal output current source of the PMB 2313, an external load resistor may be omitted in most cases.

Input Sensitivity of PMB 2313 versus PMB 2312
Measurement according to Test Configuration 1



Package Outlines

Plastic-Package, P-DSO-8



(Dual-in-Line-Package, Small-Outline)
20 A 8 DIN 41870 T16 (SMD)