SIEMENS

ICs for Communications

Prescaler Circuit 1.1 GHz

PMB 2313T Version 1.2

Data Sheet 08.95

T2313-TV12-D1-7600

PMB 2313T **Revision History:**	**08.95**
Previous Releases:	none
Page	Subjects (changes since last revision)

Edition 08.95

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Prescaler Circuit 1.1 GHz PMB 2313T

Version 1.2 **Bipolar IC**

Features

- Low power consumption
- TTL/CMOS compatible MOD input
- Low-power standby mode
- Switchable divider ratios 64/65 or 128/129
- Low supply voltage down to 2.7 V

P-DSO-8

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.

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

The divider 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.

Type	Ordering Code	Package
PMB 2313T	Q67000-A6116	P-DSO-8 (SMD)
PMB 2313T	Q67006-A6116	P-DSO-8 (SMD, Tape & Reel)

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 depending on the application frequency) with low serial inductance.

Depending on the logic level at SW input the basic divider 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 9**. The minimum logic swing is 0.8 Vpp.

Function Table

Input Pin	Logic Level	Prescaler Function
SW	HIGH = V_S – 0.1 V to V_S LOW = GND to 0.8 V or open	1:64/65 1:128/129
MOD	HIGH = 2.0 V to V_S or open LOW = GND to 0.8 V	1:64/1:128 1:65/1:129
STB	HIGH = V_S – 0.1 V to V_S LOW = GND to 0.8 V	Divider Q = HIGH, STANDBY-mode

Pin Configuration

(top view)

P-DSO-8-1

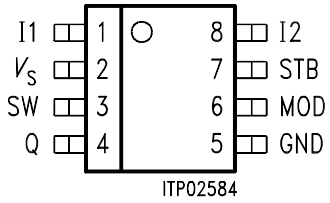


Figure 1

Pin Definitions and Functions

Pin No.	Symbol	Function
1	I1	RF-input I1
2	V_S	Supply voltage V_S
3	SW	Divider ratio 1:64/65 - 1:128/129 control input (SW)
4	Q	Output Q
5	I2	GND
6	STB	Modulus 1:n/n + 1 (n = 64 or 128) control input (MOD)
7	MOD	Standby mode control input (STB)
8	GND	RF-input I2

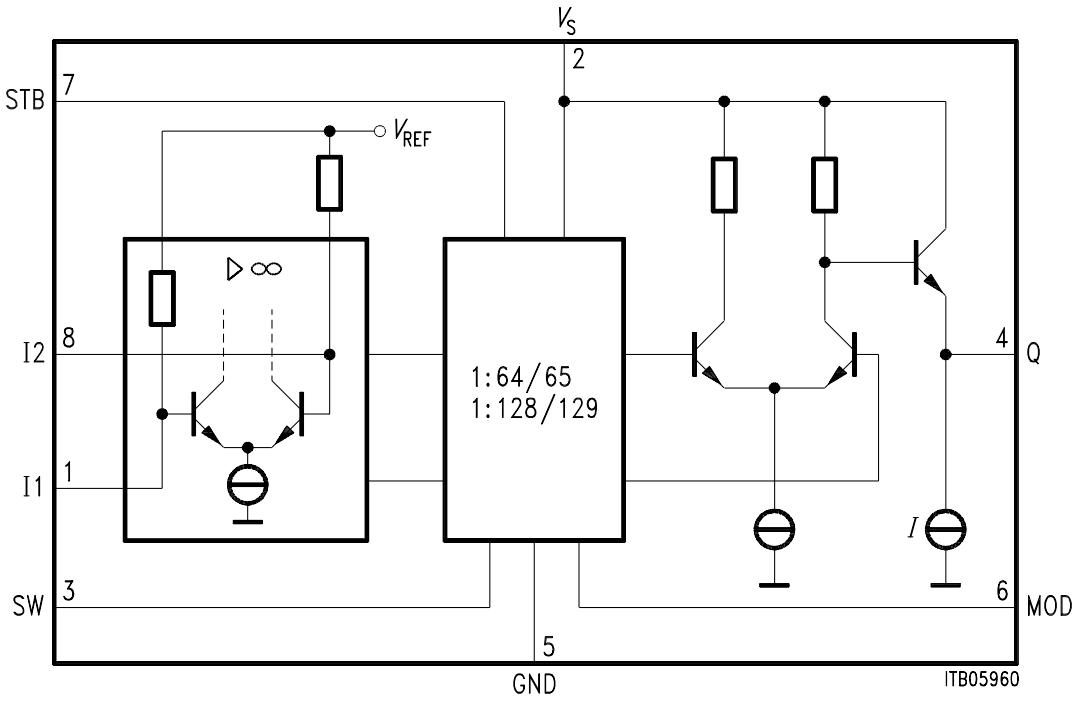


Figure 2
Block Diagram

Absolute Maximum Ratings

T_A = – 40 to 85 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	V_S	– 0.3	6	V	
Input level (Pin 1; Pin 8)	V_I		2	V	V_S = 0 V
Voltage swing (Pin 1 to 8)	V_{I18}	– 2	2	V	
Input level (Pin 3; Pin 6; Pin 7)	V_{SW}, V_{MOD}, V_{STB}	– 0.3	V_S + 0.7 V or 5.5 V if V_S + 0.7 V > 5.5 V	V	V_S = 2.7 … 5.5 V
Output level (Pin 4)	V_Q		V_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): 500 V

Operating Range

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	V_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 V_S = 2.7 to 5.5 V **Ambient temperature** T_A = – 20 to 85 °C (referred to the test circuit)						
Supply current	I_S		1.9	2.4	mA	Inputs RF-grounded, V_S = 2.7, T_A = 25 ˚C, STB = V_S output open
	I_S		1.95	2.45	mA	inputs RF-grounded, V_S = 4.0, T_A = 25 ˚C, STB = V_S output open
	I_S		2.00	2.5	mA	inputs RF-grounded, V_S = 5.5, T_A = 25 ˚C, STB = V_S output open
Supply current in standby-mode	I_{STB}			0.1	mA	inputs RF-grounded, output open, STB = GND
Input level	V_{IN}	25		400	mVrms	100-1000 MHz (sine wave)
dynamic range	P_{IN}	– 19		5	dBm	100-1000 MHz (sine wave)
(**see figure 6**)	V_{IN}	25		280	mVrms	1000-1100 MHz (sine wave)
	P_{IN}	– 19		2	dBm	1000-1100 MHz (sine wave)
Output logic swing	V_Q	1	1.1		Vpp	C_L ≤ 12 pF, R_L = 2 kΩ
	V_Q	0.8	1.1		Vpp	C_L ≤ 8 pF
SW voltage High	V_{SWH}	V_S – 0.1 V		V_S	V	
SW voltage Low	V_{SWL}	GND		0.8	V	
SW input current High	I_{SWH}			60	µA	SW = V_S
SW input current Low	$-I_{SWL}$			30	µA	SW = GND
MOD voltage High	V_{MODH}	2.3		V_S	V	
MOD voltage Low	V_{MODL}	GND		0.8	V	
MOD input current High	I_{MODH}			50	µA	MOD = V_S
MOD input current Low	I_{MODL}			120	µA	MOD = GND

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

AC/DC Characteristics (cont'd)
T_A = – 20 to 85 ˚C

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
STB voltage High	V_{STBH}	V_S – 0.1		V_S	V	
STB voltage Low	V_{STBL}	GND		0.8	V	
STB input current High	I_{STBH}			30	µA	STB = V_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 (**figure 5**)	t_{set}			29	ns	

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

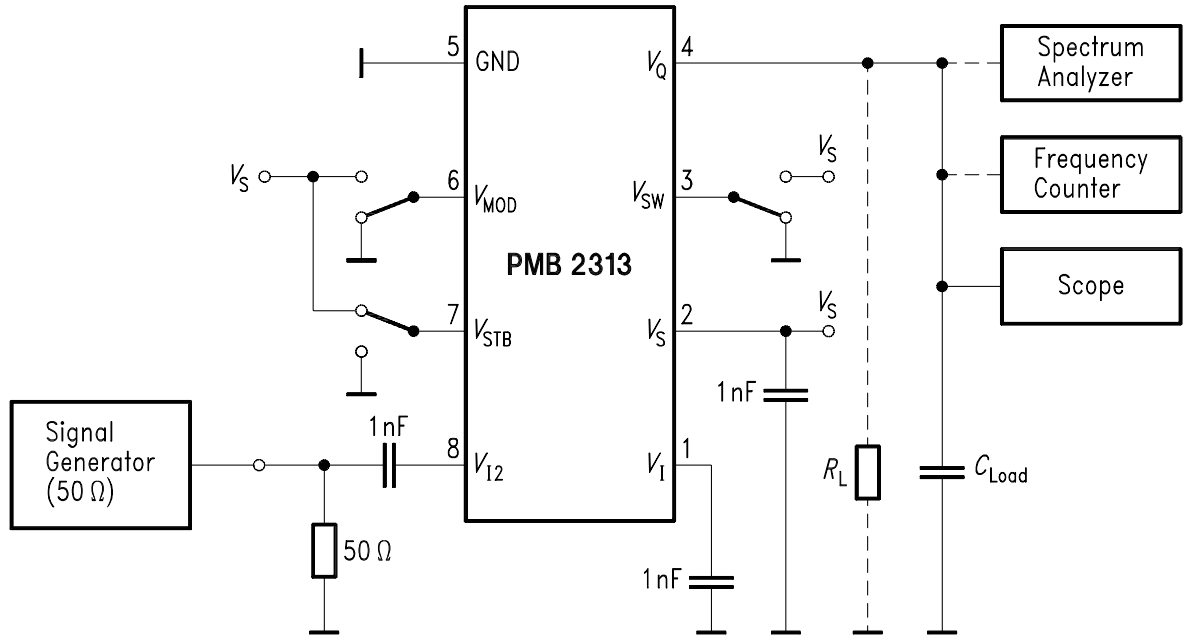


Figure 3
Test Circuit
Input Sensitivity and Output Logic Swing Measurement

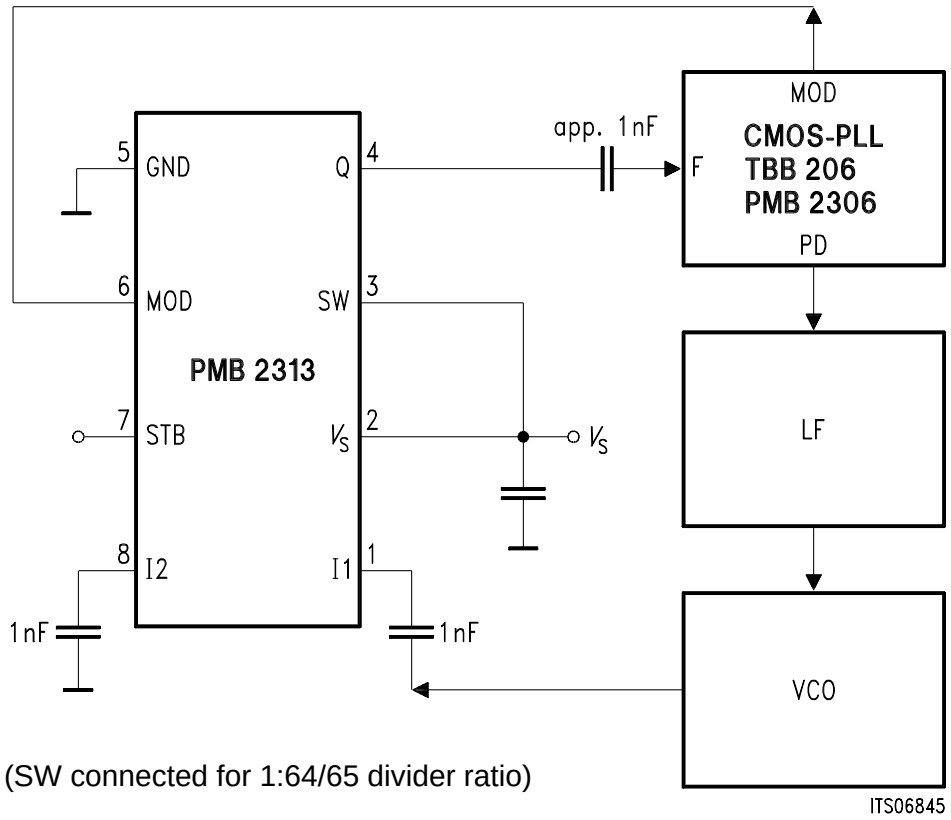


Figure 4
Application Circuit

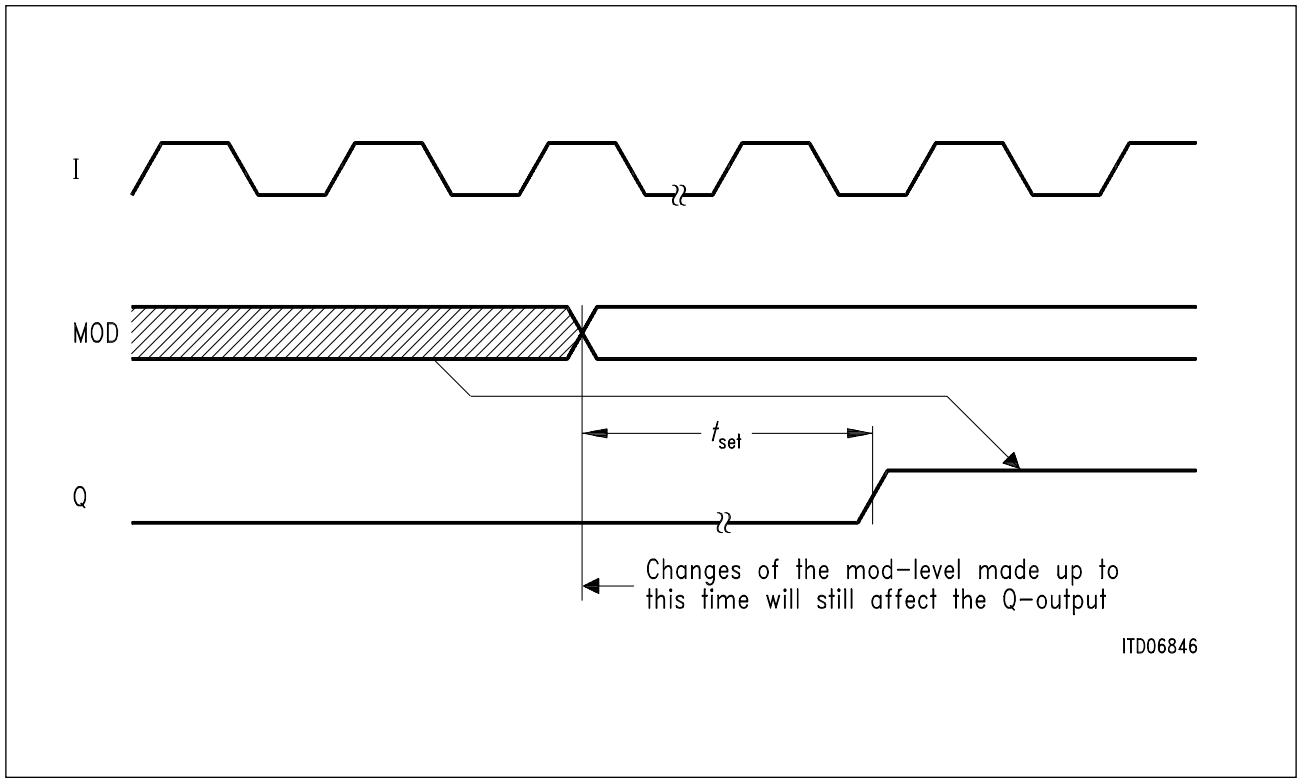


Figure 5
Definition of Modulus Setup Time

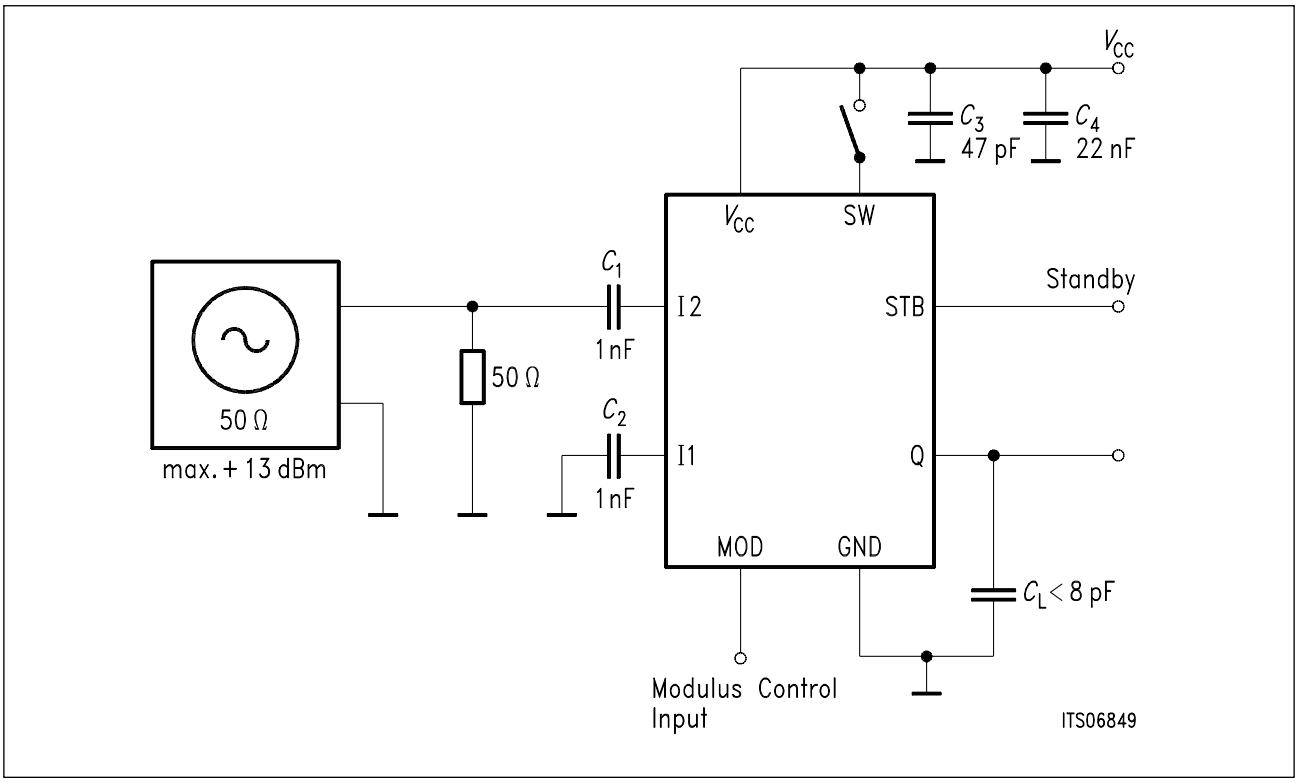


Figure 6
Input Dynamic Range Test Configuration 1

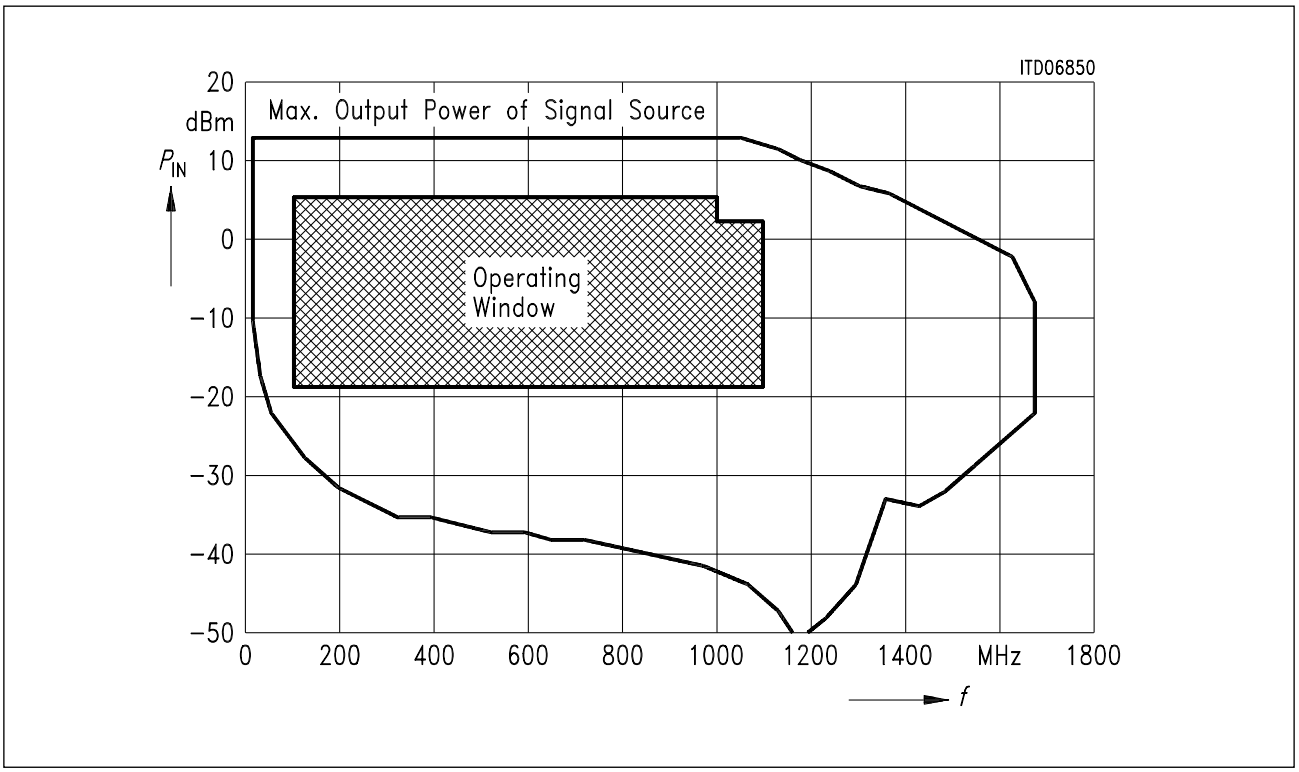


Figure 7
PMB 2313 Dynamic Range V_{CC} = 4 V Divider Ratio 65, Test Configuration 1

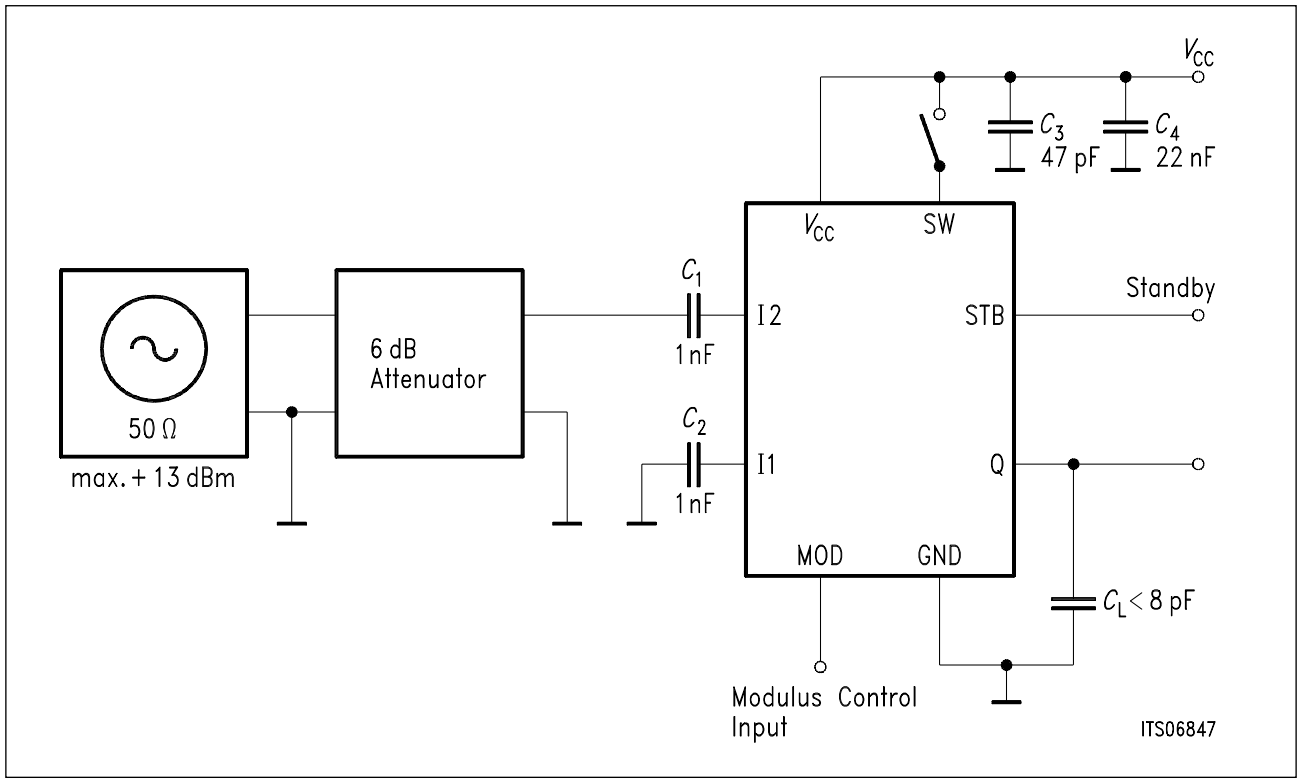


Figure 8
Input Dynamic Range Test Configuration 2

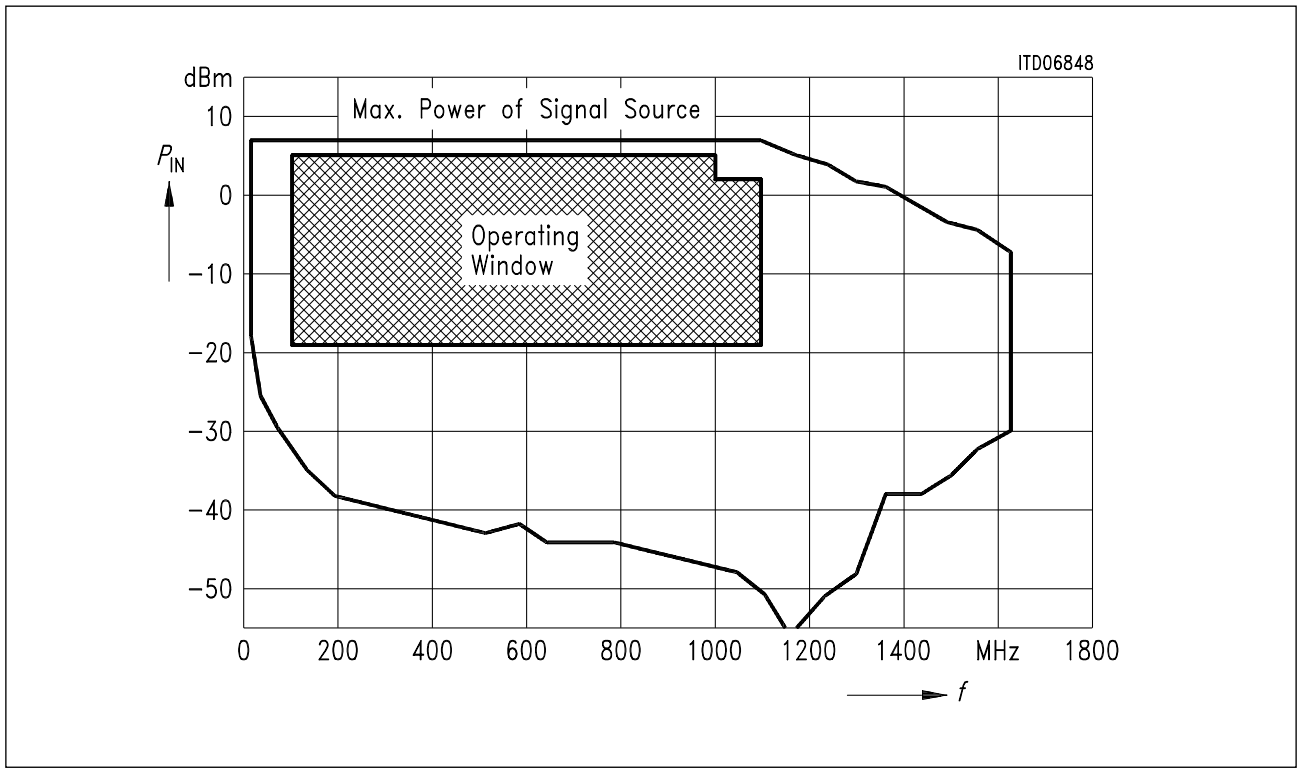


Figure 9
PMB 2313 Dynamic Range V_{CC} = 4 V Divider Ratio 65, Test Configuration 2

Phase Noise Measurement

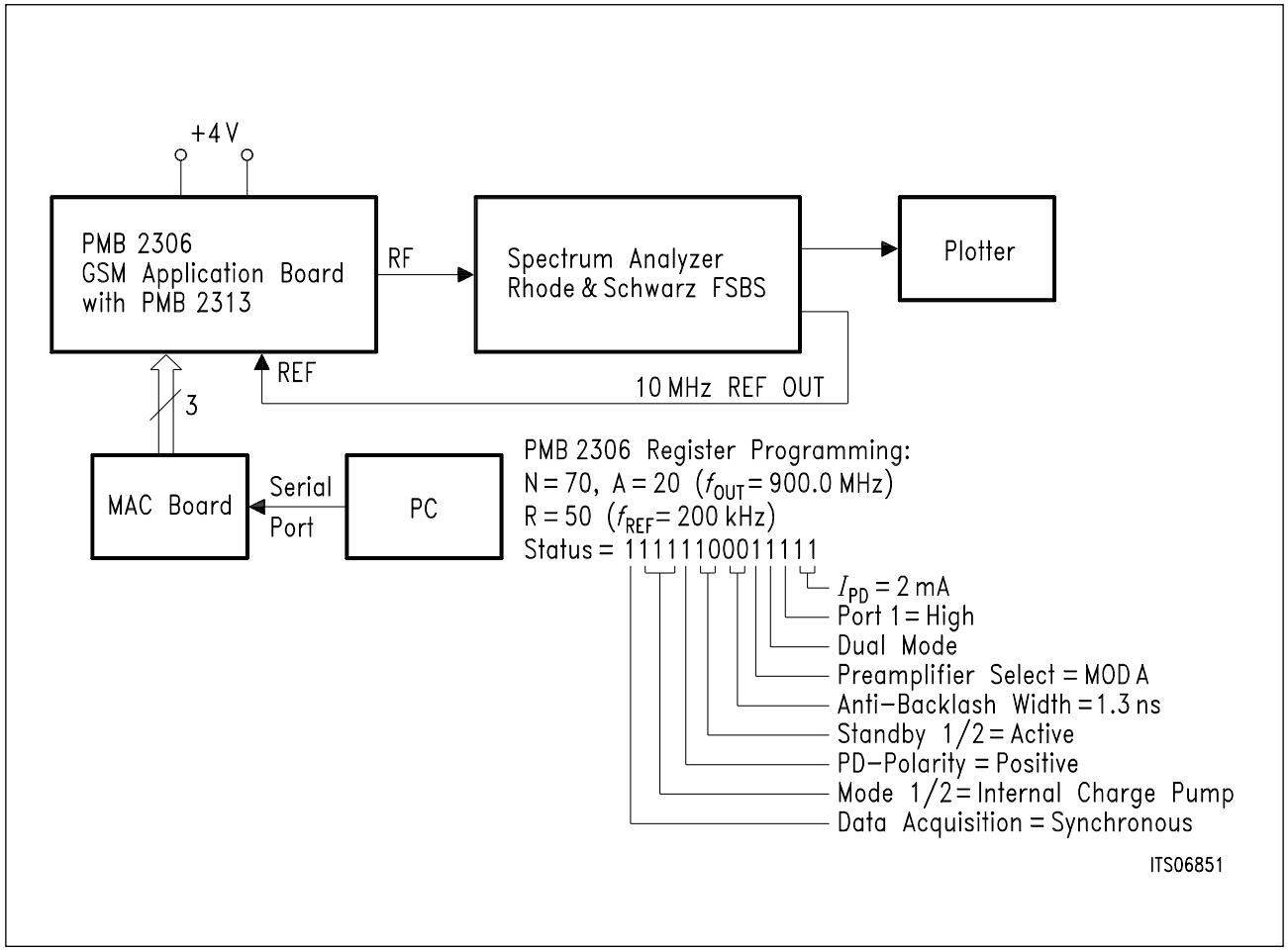


Figure 10
Test Setup

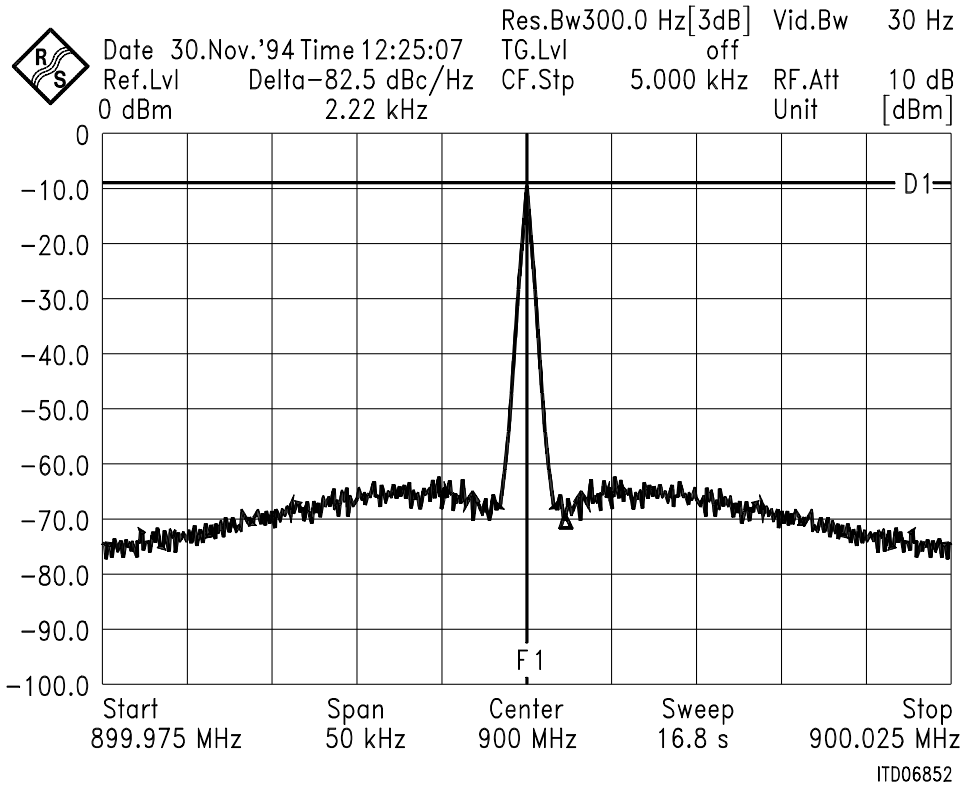


Figure 11
Measured Spectrum

PMB 2306 GSM Application Board

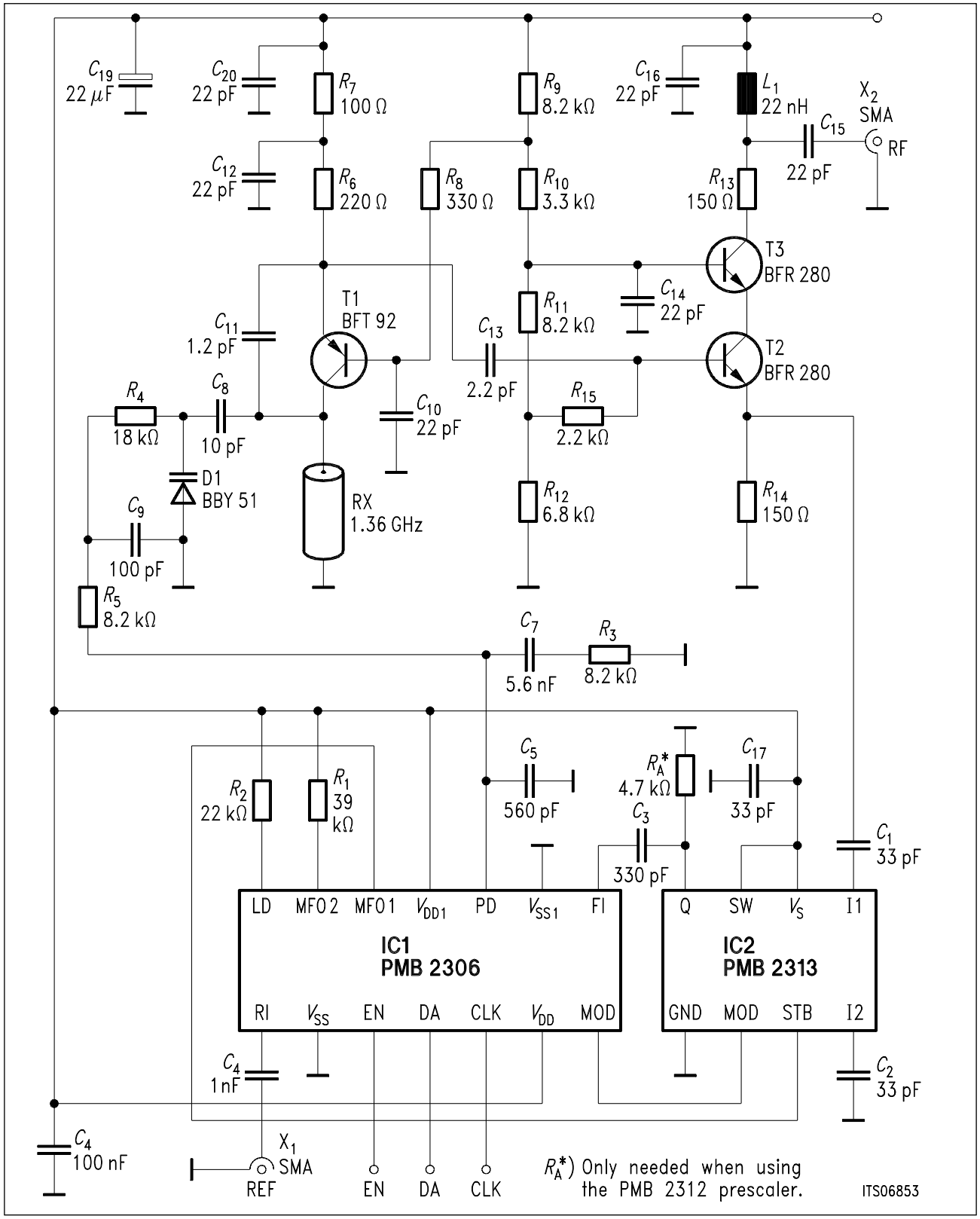


Figure 12
Circuit Diagram

PMB 2306 GSM Application Board

List of Components

Item	Quantity	Reference		Part	
1	1	R7	100 Ω	SMD/0805	B54102-A1101-X60
2	2	R13, R14	150 Ω	SMD/0805	B54102-A1151-J60
3	1	R6	220 Ω	SMD/0805	B54102-A1221-J60
4	1	R8	330 Ω	SMD/0805	B54102-A1331-J60
5	1	R15	2.2 kΩ	SMD/0805	B54102-A1222-J60
6	1	R10	3.3 kΩ	SMD/0805	B54102-A1332-J60
7	1	RA	4.7 kΩ	SMD/0805	B54102-A1472-J60
8	1	R12	6.8 kΩ	SMD/0805	B54102-A1682-J60
9	4	R3, R5, R9, R11	8.2 kΩ	SMD/0805	B54102-A1822-J60
10	1	R4	18 kΩ	SMD/0805	B54102-A1183-J60
11	1	R2	22 kΩ	SMD/0805	B54102-A1223-J60
12	1	R1	39 kΩ	SMD/0805	B54102-A1393-J60
13	1	L1	22 nH	SIMID 01	B82412-A3220-M
14	1	C11	1.2 pF	COG/0805	B37940-K5010-C262
15	1	C13	2.2 pF	COG/0805	B37940-K5020-C262
16	1	C8	10 pF	COG/0805	B37940-K5100-J62
17	6	C10, C12, C14 C15, C16, C30	22 pF	COG/0805	B37940-K5220-J62
18	3	C1, C2, C17	33 pF	COG/0805	B37940-K5330-J62
19	1	C9	100 pF	COG/0805	B37940-K5101-J62
20	1	C3	330 pF	COG/0805	B37940-K5331-J62
21	1	C5	560 pF	COG/0805	B37940-K5561-J62
22	1	C4	1.0 nF		
23	1	C7	5.6 nF	COG/1210	
24	1	C6	100 nF	X7R/1210	B37950-K5104-K62
25	1	C19	22 µF		
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	1.3 GHz		B69620-G1307-A410
31	1	IC1	PMB 2306T P-DSO-14		Q67106-H6423 (T+R)
		or	PMB 2306T P-DSO-14		Q67100-H6423 (Tube)
32	1	IC2	PMB 2313T P-DSO-8-1		Q67006-A6116 (T+R)
		or	PMB 2313T P-DSO-8-1		Q67000-A6116 (Tube)

Replacing the PMB 2312 by the PMB 2313

	PMB 2312	PMB 2313	Test Condition
Supply current (typ.):	5.7 mA	1.95 mA	Inputs RF-grounded, V_S = 4.0 V, T_A = 25 ˚C STB open, output open
Input frequency	200 - 1000 MHz	100 - 1100 MHz	
Supply voltage	4.0 - 5.5 V	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 V_S = 4.0 V, T_A = 25 ˚C
	66 Ω || 1.4 pF	1150 Ω || 350 fF	f = 450 MHz, $C_1 = C_2$ = 1 nF V_S = 4.0 V, T_A = 25 ˚C
Input sensitivity:	**see figure 13**		

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

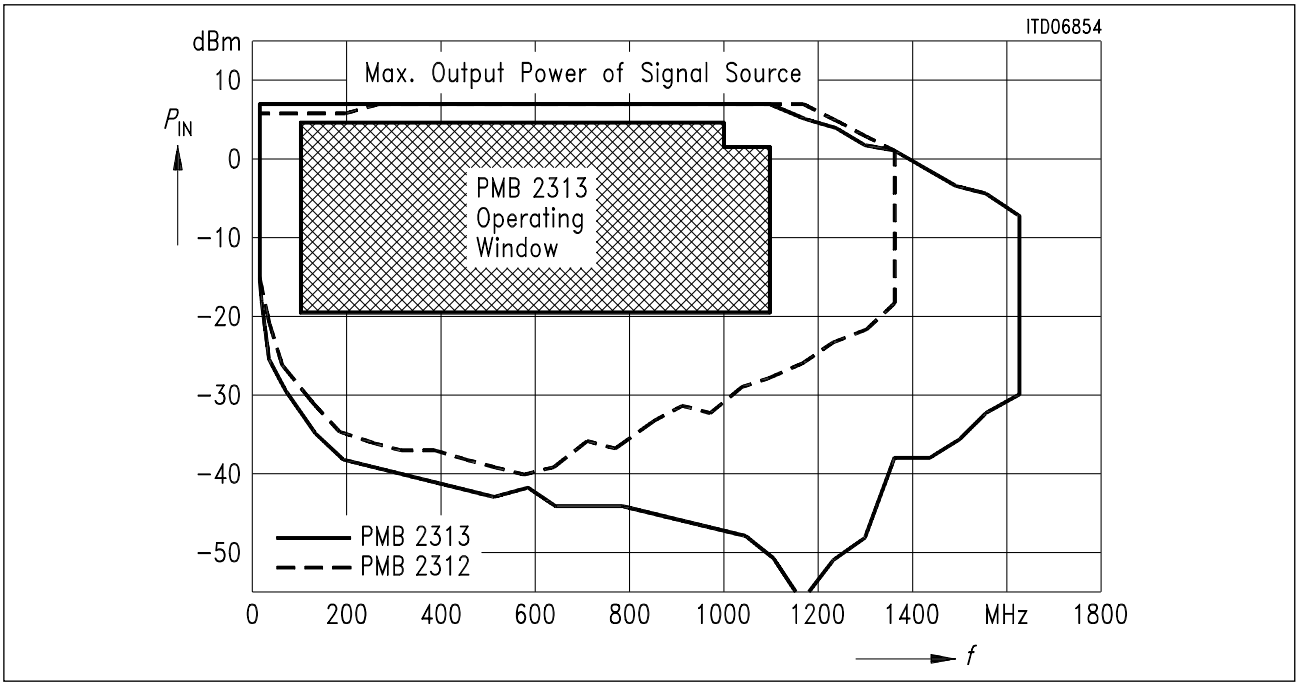
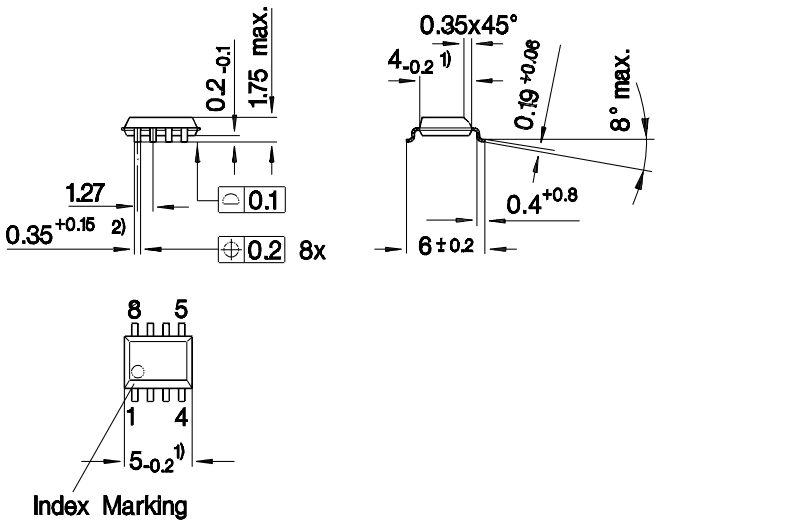


Figure 13
PMB 2313 vers. PMB 2312 Dynamic Range V_{CC} = 4 V Divider Ratio 65, Test Configuration 2

Package Outlines

P-DSO-8
(Plastic Dual Small Outline Package)



1) Does not include plastic or metal protrusion of 0.15 max. per side
2) Does not include dambar protrusion

GPS05121

Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book “Package Information”.

SMD = Surface Mounted Device

Dimensions in mm