DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC8126GR

900 MHz BAND DIRECT QUADRATURE MODULATOR IC FOR DIGITAL MOBILE COMMUNICATION

DESCRIPTION

The μPC8126GR is a silicon monilithic integrated circuit designed as 900 MHz band direct guadrature modulator for digital mobile communication systems. This Si-MMIC consists of pre-mixer for RF and IF local oscillator and 900 MHz band guadrature modulator which are packaged in 20 pin SSOP. The device has power save function and can operate 2.7 V to 3.6 V supply voltage. Therefore, it can contribute to make RF block small, high performance and low power consumption.

FEATURES

- Direct modulation range : 915 MHz to 960 MHz
- Pre-mixer for RF and IF local oscillator is incorporated.
- External local filter can be applied between pre-mixer output and modulator input port.
- Low operation current : I_{CC} = 35 mA (typ.) @V_{CC} = 3 V
- Equipped with power save function.
- 20 pin SSOP suitable for high density surface mounting.

APPLICATIONS

- Digital cellular phones (PDC900 MHz etc.)

ORDERING INFORMATION

PART NUMBER	PACKAGE	SUPPLYING FORM	QUANTITY
μPC8126GR-E1	20 pin plastic SSOP (225 mil)	Embossed tape, 12 mm wide. Pins 1 through 10 are in tape pull-out direction.	2500 pcs/Reel

To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: μPC8126GR, Quantity: 20 pcs/Unit)

Caution electro-static sensitive devices.

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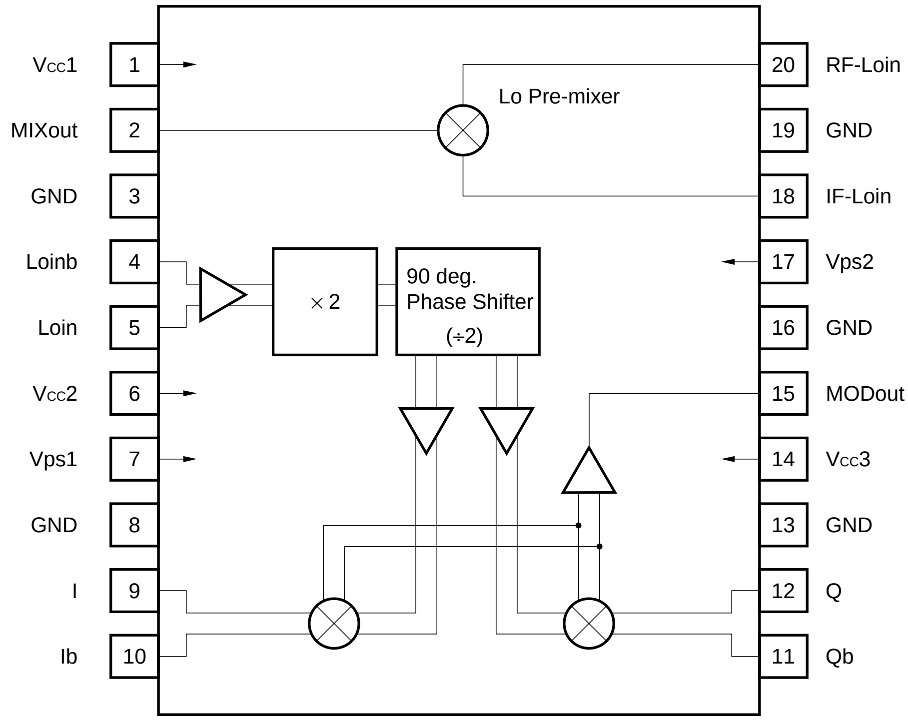
Printed in Japan

The mark ★ shows major revised points.

INTERNAL BLOCK DIAGRAM AND PIN CONNECTIONS (Top View)



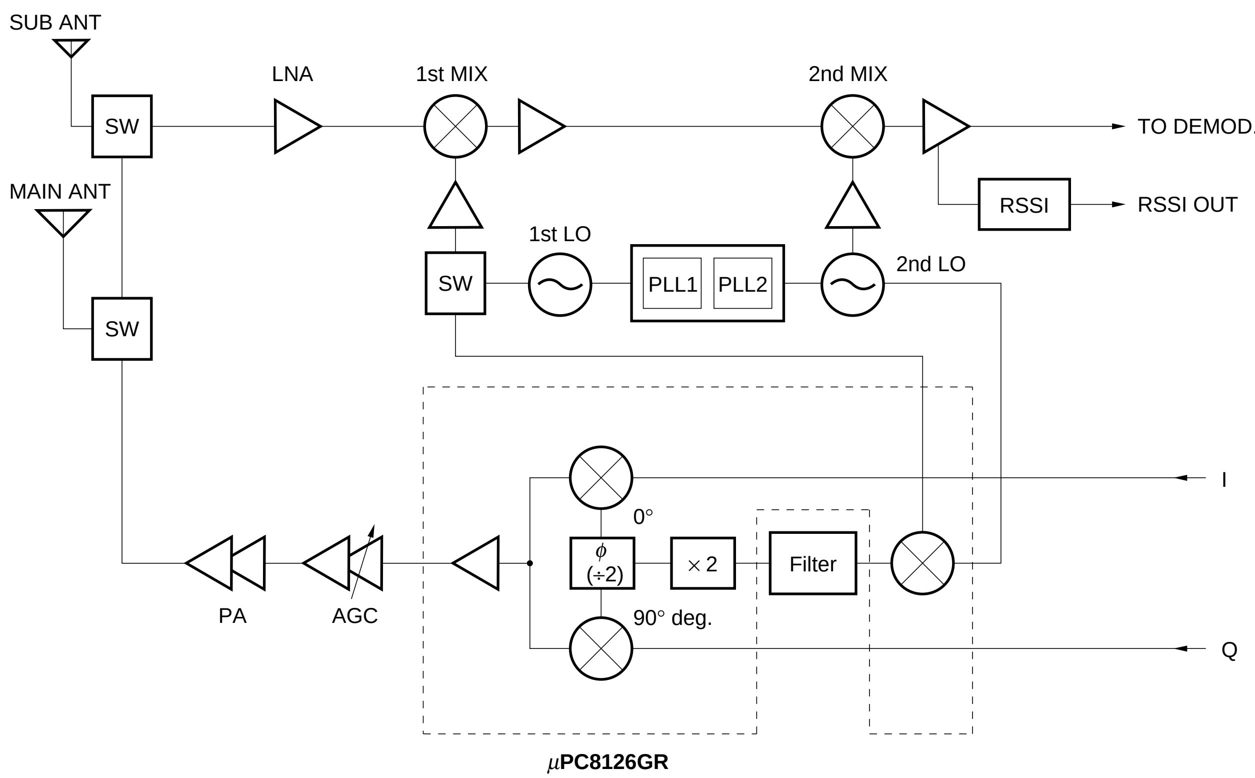
★ QUADRATURE MODULATOR SERIES PRODUCT

Part Number	Functions	I_{CC} (mA)	f_{LO1in} (MHz)	f_{MODout} (MHz)	RF Mixer f_{RFout} (MHz)	Phase Shifter	Package	Application
μPC8101GR	150 MHz Quad.Mod	15/@2.7 V	100 to 300	50 to 150	External	F/F	20-pin SSOP (225 mil)	CT-2 etc.
μPC8104GR	RF Up-Converter + IF Quad.Mod	28/@3.0 V	100 to 400		900 to 1 900	Doubler + F/F		Digital Comm.
μPC8105GR	400 MHz Quad.Mod	16/@3.0 V	100 to 400		External		16-pin SSOP (225 mil)	
μPC8110GR	1 GHz Direct Quad.Mod	24/@3.0 V	800 to 1 000		External		20-pin SSOP (225 mil)	PDC800 MHz, etc.
μPC8125GR	RF Up-Converter + IF Quad.Mod + AGC	36/@3.0 V	220 to 270		1 800 to 2 000			PHS
μPC8126GR	900 MHz Direct Quad.Mod with Offset-Mixer	35/@3.0 V	915 to 960		915 to 960			PDC800 MHz
μPC8126K			889 to 960		889 to 960		28-pin QFN	
μPC8129GR	×2LO IF Quad. Mod+RF Up-Converter	28/@3.0 V	200 to 800	100 to 400	800 to 1 900	F/F	20-pin SSOP (225 mil)	GSM, DCS1800, etc.
μPC8139GR-7JH	Transceiver IC (1.9 GHz Indirect Quad. Mod + RX-IF + IF VCO)	TX: 32.5 RX: 4.8 /@3.0 V	220 to 270		1 800 to 2 000	CR	30-pin TSSOP (225 mil)	PHS
μPC8158K	RF Up-Converter + IF Quad.Mod + AGC	28/@3.0 V	100 to 300		800 to 1 500		28-pin QFN	PDC800 M/1.5 G

Remark As for detail information of series products, please refer to each data sheet.

APPLICATION EXAMPLE

[PDC800MHz]



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITIONS
Supply voltage	V_{CC}	4.0	V	T_A = +25 °C, 1, 6, 14 pin
Power Save Control Voltage	V_{ps}	4.0	V	T_A = +25 °C, 7, 17 pin
Power Dissipation	P_D	430 Note 1	mW	T_A = +85 °C
Operating Ambient Temperature	T_A	–40 to +85	°C	
Storage Temperature	T_{stg}	–55 to +150	°C	

Note 1. Mounted on a 50 × 50 × 1.6 mm double copper clad epoxy glass PWB.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Supply Voltage	V_{CC}	2.7	3.0	3.6	V	
Operating Ambient Temperature	T_A	–25	+25	+75	C	
Pre-Mix. RF Input Frequency	f_{RFin}	700		1200	MHz	P_{RFin} = –11 dBm
Pre-Mix. RF Input Power	P_{RFin}	–13	–11	–9	dBm	
Pre-Mix. IF Input Frequency	f_{IFin}	120	135	270	MHz	P (f_{IFin} × 7) ≤ –65 dBc P_{IFin} = –12 dBm
Pre-Mix. IF Input Power	P_{IFin}	–14	–12	–10	dBm	
Pre-Mix. Output Frequency	f_{MIXout}	915		960	MHz	
Modulator Output Frequency	f_{MODout}	915		960	MHz	
Modulator Lo Input Frequency	f_{Loin}					
Modulator Lo Input Power	P_{Loin}	–22.5	–18.5	–14.5	dBm	
I/Q Input Frequency	$f_{I/Qin}$	DC		10	MHz	
I/Q Input Amplitude	$V_{I/Qin}$			500	mV_{p-p}	Single ended Input
				250		Differential Input

ELECTRICAL CHARACTERISTICS

(T_A = +25 °C, $V_{CC}1 = V_{CC}2 = V_{CC}3$ = 3.0 V, Vps1, Vps2 ≥ 2.2 V Unless Otherwise Specified)

PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
MODULATOR + PRE-MIXER TOTAL (TEST CIRCUIT 1)							
Total Circuit Current		I_{CC} (TOTAL)	24	35	44	mA	No Input signals
Total Circuit Current at Sleep Mode		$I_{CC\ (ps)}$ TOTAL		0	15	μA	Vps ≤ 0.5 V (Low), No Input Signals
Modulator Output Power		P_{MODout}	–12	–9	–6	dBm	f_{IFin} = 135 MHz, P_{IFin} = –12 dBm f_{RFin} = 813 MHz, P_{RFin} = –11 dBm f_{MODout} = 948 MHz + $f_{I/Q}$ $f_{I/Qin}$ = 2.625 kHz $V_{I/Qin}$ = 500 mVp-p (Single ended) I/Q (DC) = Ib/Qb (DC) = $V_{CC}/2$ Data Rate: 42 kbps, RNYQ: α = 0.5 MOD Pattern: All Zero
Local Oscillator Leakage		LoL Note 2		–35	–30	dBc	
Image Rejection		ImR		–40	–30	dBc	
I/Q 3rd Order Intermodulation		$IM_{3\ (I/Q)}$		–45	–30	dBc	
f_{IF-Lo} × 7 Harmonics		$7f_{IF-Lo}$			–65	dBc	
Power Save Response Time	Rise Time	Tps (RISE)		3	5	μs	Vps: Low to High
	Fall Time	Tps (FALL)		3	5	μs	Vps: High to Low
Error Vector Magnitude		EVM		1.6	3.5	%rms	f_{IFin} = 135 MHz, P_{IFin} = –12 dBm f_{RFin} = 813 MHz, P_{RFin} = –11 dBm f_{MODout} = 948 MHz + $f_{I/Q}$ $f_{I/Qin}$ = 2.625 kHz $V_{I/Qin}$ = 500 mVp-p (Single ended) I/Q (DC) = Ib/Qb (DC) = $V_{CC}/2$ Data Rate: 42 kbps, RNYQ: α = 0.5 MOD Pattern: PN9
Adjacent Channel Power		ACP (Δf = ±50 kHz)		–65	–60	dBc	
Port Current-7pin		Ips (7 pin)			620	μA	No Input Signals
Port Current-17pin		Ips (17 pin)			400	μA	No Input Signals

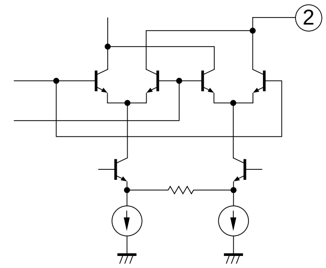
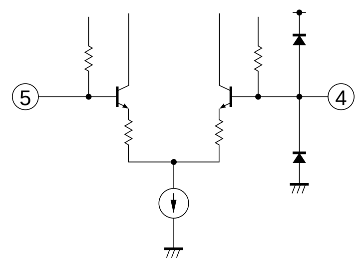
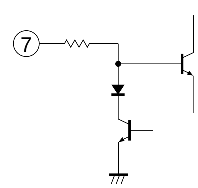
Note 2. $f_{LoL} = f_{IFin} + f_{RFin}$

STANDARD CHARACTERISTICS FOR REFERENCE

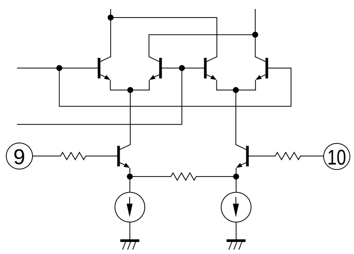
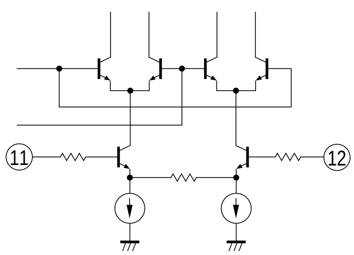
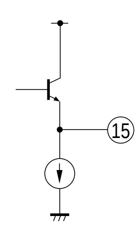
(T_A = +25 °C, $V_{CC}1 = V_{CC}2 = V_{CC}3$ = 3.0 V, Vps1, Vps2 ≥ 2.2 V Unless Otherwise Specified)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
MODULATOR (TEST CIRCUIT 1)						
Modulator Circuit Current	I_{CC} (MOD)		27.5	34	mA	No Input Signals
Modulator Circuit Current at Sleep Mode	$I_{CC\ (ps)}$ (MOD)		0	10	μA	Vps ≤ 0.5 V (Low), No Input Signals
Input Impedance I and Q Port	$Z_{I/Qin}$	90	180		kΩ	$f_{I/Q}$ = DC to 10 MHz
Modulator Output Port VSWR	VSWR (MOD)		1.5 : 1		–	f_{MODout} = 948 MHz
PRE-MIXER (TEST CIRUCIT 2)						
Pre-Mixer Circuit Current	I_{CC} (MIX)		7.5	10	mA	No Input Signals
Pre-Mixer Circuit Current at Sleep Mode	$I_{CC\ (ps)}$ (MIX)		0	5	μA	Vps ≤ 0.5 V (Low), No Input Signals
Pre-Mixer Conversion Gain	CG (MIX)	–5	–3	–1	dB	f_{RFin} = 813 MHz, P_{RFin} = –11 dBm f_{IFin} = 135 MHz, P_{IFin} = –12 dBm f_{MIXout} = 948 MHz
Pre-Mixer Output Power	P_{out} (MIX)	–17	–15	–13	dBm	

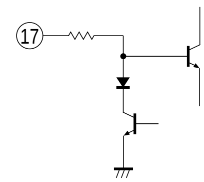
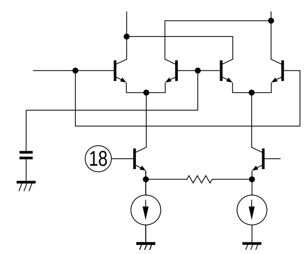
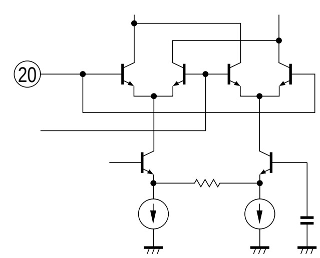
PIN EXPLANATIONS

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Supply Vol. (V)</th><th>Pin Vol. (V) @3 V</th><th>Description</th><th>Equivalent Circuit</th></tr>
<tr><td>1</td><td>$V_{CC}1$ (Pre-Mixer)</td><td>2.7 to 3.6</td><td>–</td><td>Supply voltage pin for the premixer. An internal regulator helps keep the device stable against temperature or V_{CC} variation.</td><td>——</td></tr>
<tr><td>2</td><td>Pre-Mixout</td><td>2.7 to 3.6</td><td>–</td><td>Output from the pre-Mixer. This pin is designed as pen collector. Due to the high impedance output, this pin should be externally equipped with LC matching circuit to next stage.</td><td>
</td></tr>
<tr><td>3</td><td>GND (Modulator)</td><td>0</td><td>–</td><td>Ground pin for the modulator. Connect to the ground with minimum inductance.
Track length should be kept as short as possible.</td><td>——</td></tr>
<tr><td>4</td><td>LOinb</td><td>–</td><td>2.6</td><td>Bypass of Lo input for modulator. This pin is grounded through around 33 pF capacitor.</td><td rowspan="2">
</td></tr>
<tr><td>5</td><td>LOin</td><td>–</td><td>2.6</td><td>Lo input for the phase shifter. Connect around 300 Ω between pin 4 and 5 to match to 50 Ω by LC.</td></tr>
<tr><td>6</td><td>$V_{CC}2$</td><td>2.7 to 3.6</td><td>–</td><td>Supply voltage pin for the phase shifter and IQ Mixer. An internal regulator helps keep the device stable against temperature or V_{CC} variation.</td><td>——</td></tr>
<tr><td>7</td><td>$V_{PS}1$ (Modulator)</td><td>V_{PS}</td><td>–</td><td>Power save control pin for the modulator can control On/Sleep state with bias as follows.
<table>
<tr><th>V_{PS} (V)</th><th>STATE</th></tr>
<tr><td>2.2 to 3.6</td><td>ON (Active Mode)</td></tr>
<tr><td>0 to 0.5</td><td>OFF (Sleep Mode)</td></tr>
</table></td><td>
</td></tr>
<tr><td>8</td><td>GND (Modulator)</td><td>0</td><td>–</td><td>Ground pin for the modulator. Connect to the ground with minimum inductance.
Track length should be kept as short as possible.</td><td>——</td></tr>
</table>

PIN EXPLANATIONS

Pin No.	Symbol	Supply Vol. (V)	Pin Vol. (V) @3 V	Description	Equivalent Circuit
9	I	V_{CC}/2	–	Input for I signal. This input impedance is 180 kΩ. In case of that I/Q input signals are single ended, amplitude of the signal is 500 mVp-p max. **Note 3**	
10	Ib	V_{CC}/2	–	Input for I signal. This input impedance is 180 kΩ. In case of that I/Q input signals are single ended, V_{CC}/2 biased DC signal should be input. In case of that I/Q input signals are differential, amplitude of the signal is 250m Vp-p; max. **Note 3**	
11	Qb	V_{CC}/2	–	Input for Q signal. This input impedance is 180 kΩ. In case of that I/Q input signals are single ended, V_{CC}/2 biased DC signal should be input. In case of that I/Q input signals are differential, amplitude of the signal is 250 mVp-p max. **Note 3**	
12	Q	V_{CC}/2	–	Input for Q signal. This input impedance is 180 kΩ. In case of that I/Q input signals are single ended, amplitude of the signal is 500 mVp-p max. **Note 3**	
13	GND (Modulator)	0	–	Ground pin for the modulator. Connect to the ground with minimum inductance. Track length should be kept as short as possible.	———
14	V_{CC}3	2.7 to 3.6	–	Supply voltage pin for the output buffer amplifier of modulator. An internal regulator helps keep the device stable against temperature or V_{CC} variation.	———
15	MODout	–	1.6	Output pin from the modulator. This is emitter follower output. So this output impedance is low.	
16	GND (Modulator)	0	–	Ground pin for the modulator. Connect to the ground with minimum inductance. Track length should be kept as short as possible.	———

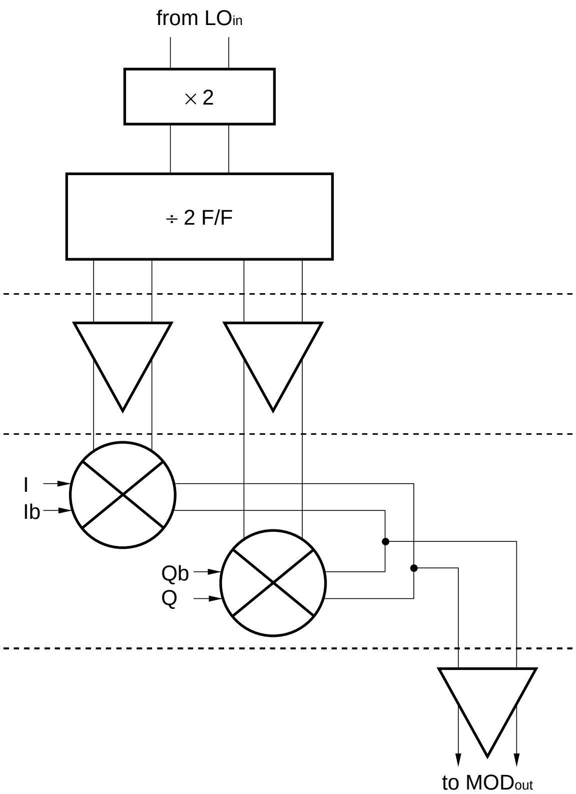
PIN EXPLANATIONS

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Supply Vol. (V)</th><th>Pin Vol. (V) @3 V</th><th>Description</th><th>Equivalent Circuit</th></tr>
<tr><td>17</td><td>V_{PS}2
(Pre-Mix.)</td><td>V_{PS}</td><td>–</td><td>Power save control pin can control the On/Sleep state with bias as follows.
<table><tr><th>V_{PS} (V)</th><th>STATE</th></tr><tr><td>2.2 to 3.6</td><td>ON (Active Mode)</td></tr><tr><td>0 to 0.5</td><td>OFF (Sleep Mode)</td></tr></table></td><td>
</td></tr>
<tr><td>18</td><td>IF-Loin</td><td>–</td><td>1.3</td><td>IF input pin for the pre-Mixer.
This pin is biased internally.
Capacitor should be connected in series, and grounded through 51 Ω.</td><td>
</td></tr>
<tr><td>19</td><td>GND
(Pre-Mix.)</td><td>0</td><td>–</td><td>Ground pin for modulator.
Connect to the ground with minimum inductance.
Track length should be kept as short as possible.</td><td>——</td></tr>
<tr><td>20</td><td>RF-Loin</td><td>–</td><td>2.3</td><td>RF input pin for the pre-Mixer.
This pin is biased internally.
Capacitor should be connected in series, and grounded through 51 Ω.</td><td>
</td></tr>
</table>

Note 3 Relations between amplitude and V_{CC}/2 bias of input signal are following.

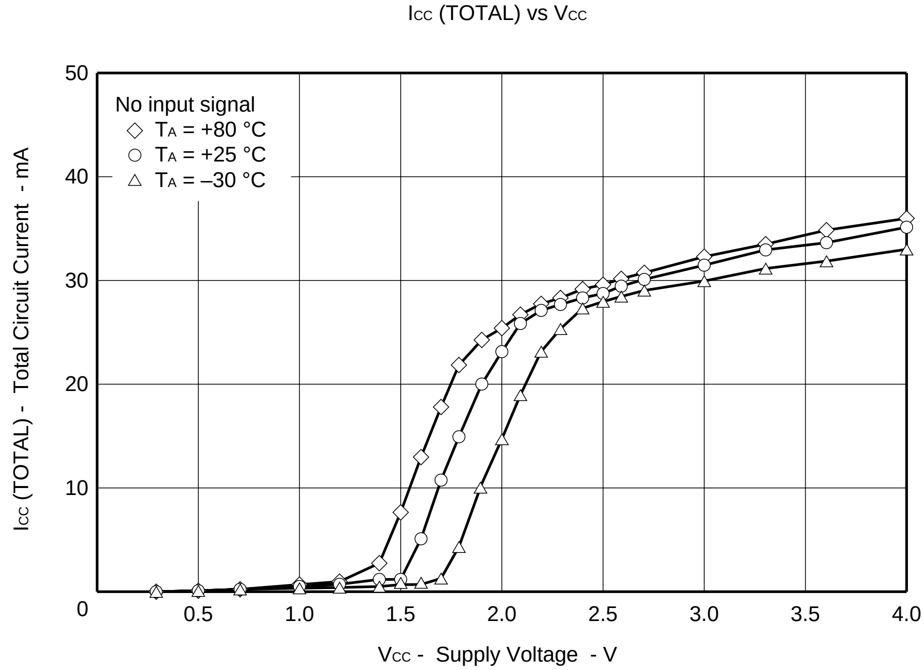
<table>
<tr><th rowspan="2">Supply Voltage (V)
V_{CC}</th><th rowspan="2">I/Q DC Voltage (V)
V_{CC}/2 = I = Ib = Q = Qb</th><th colspan="2">I/Q input signal (mVp-p)</th></tr>
<tr><th>Single ended iinput
I = Q</th><th>Differential input
I = Ib = Q = Qb</th></tr>
<tr><td>2.7 to 3.6</td><td>1.35 to 1.8</td><td>≤ 500</td><td>≤ 250</td></tr>
</table>

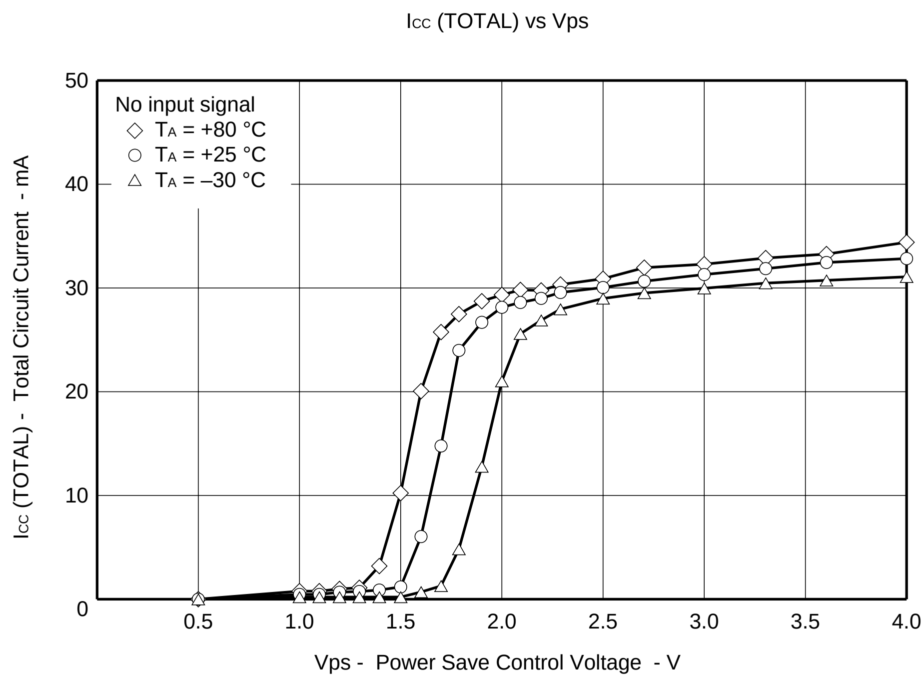
EXPLANATION OF INTERNAL FUNCTION

BLOCK	FUNCTION/OPERATION	BLOCK DIAGRAM
90 ° PHASE SHIFTER	Input signal from Lo is send to digital circuit of T-type flip-flop through frequency doubler. Output signal from T-type F/F is changed to same frequency as Lo input and that have quadrature phase shift, 0 °, 90 °, 180 °, 270 °. These circuits have function of self phase correction to make correctly quadrature signals.	
BUFFER AMP.	Buffer amplifiers for each phase signals to send to each mixers.	
MIXER	Each signals from buffer amp. are quadrature modulated with two double-balanced mixers. High accurate phase and amplitude inputs are realized to good performance for image rejection.	
ADDER	Output signals from each mixers are added with adder and send to final amplifier.	

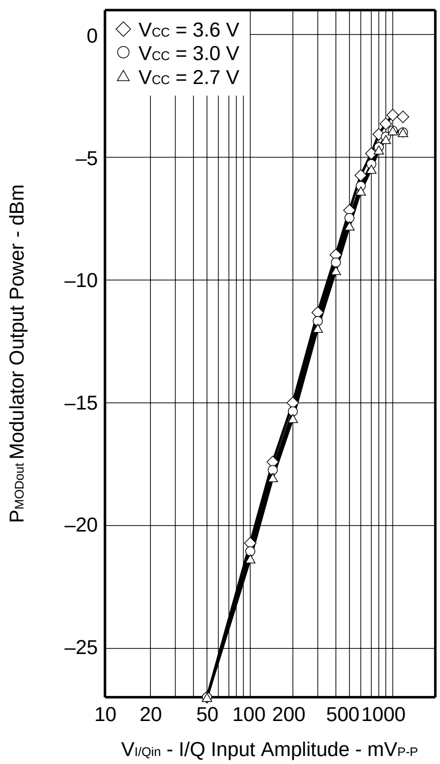
STANDARD TYPICAL CHARACTERISTICS 〈Modulator+Pre-Mixer Total〉

Test Circuit 2, T_A = +25 °C, $V_{CC}1$ = $V_{CC}2$ = $V_{CC}3$ = 3.0 V, Vps1 = Vps2 = 3.0 V,
I/Q (DC) = Ib/Qb (DC) = V_{CC}/2, $V_{I/Qin}$ = 420 mVp-p (Differential Input), $f_{I/Qin}$ = 2.625 kHz,
f_{IFin} = 135 MHz, P_{IFin} = –12 dBm, f_{RFin} = 813 MHz, P_{RFin} = –11 dBm, f_{MODout} = 948 MHz + $f_{I/Qin}$,
Data Rate = 42 kbps, RNYQ : α = 0.5,
MOD Pattern : All Zero, Unless Otherwise Specified

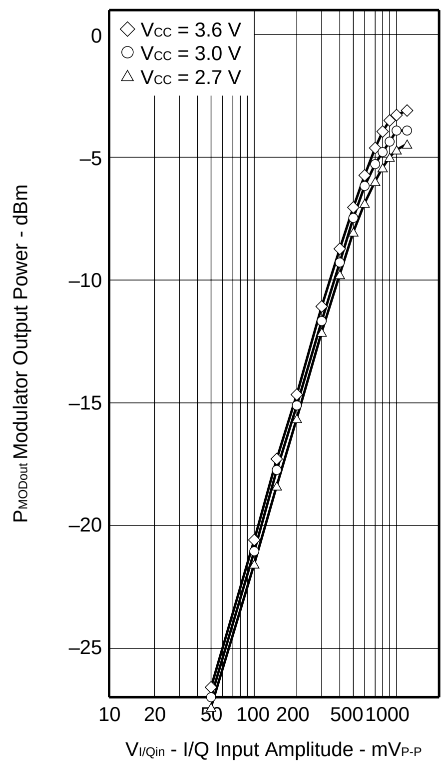




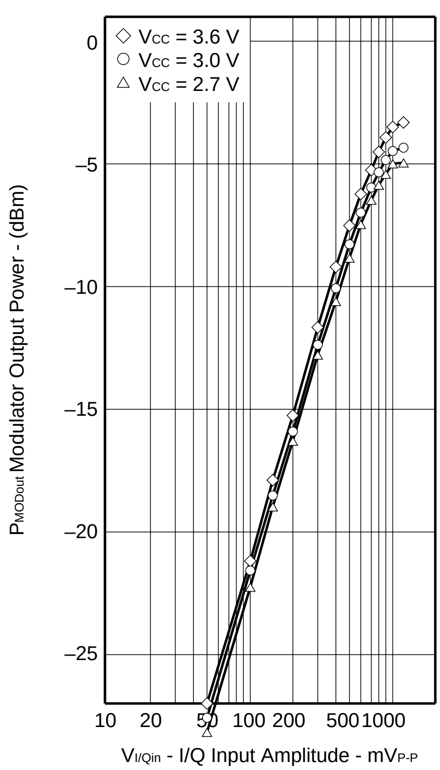
PMODout vs VI/Qin
(at TA = –30 °C)



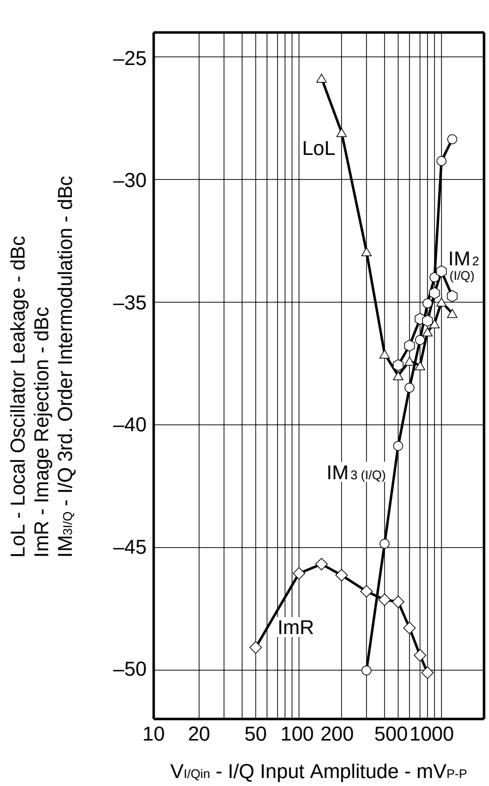
PMODout vs VI/Qin
(at TA = +25 °C)



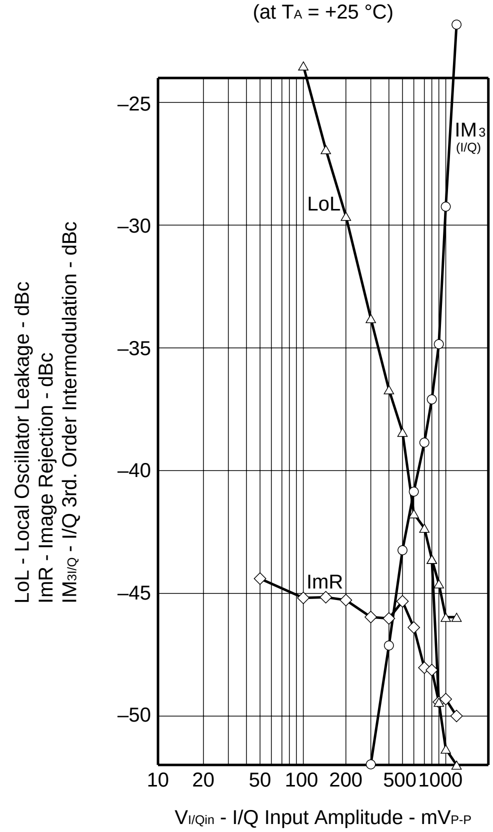
PMODout vs VI/Qin
(at TA = +80 °C)



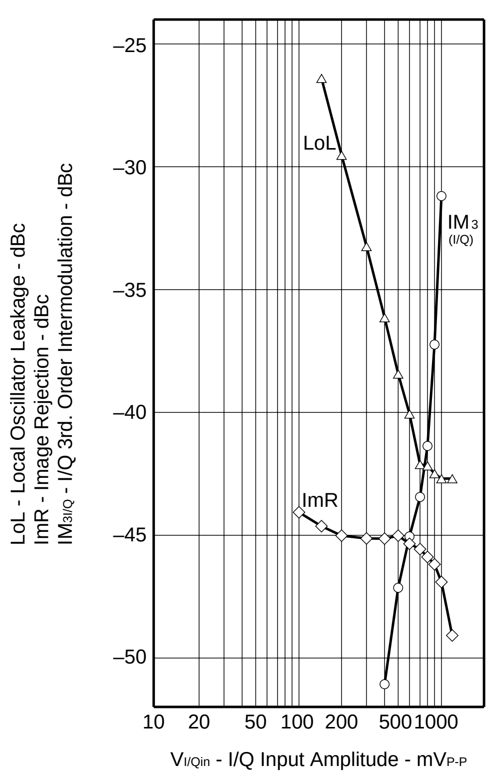
LoL, ImR, IM3I/Q vs VI/Qin
(at TA = –30 °C)



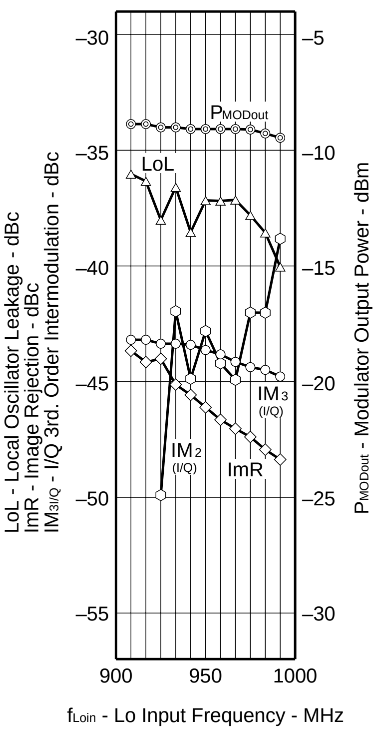
LoL, ImR, IM3I/Q vs VI/Qin
(at TA = +25 °C)



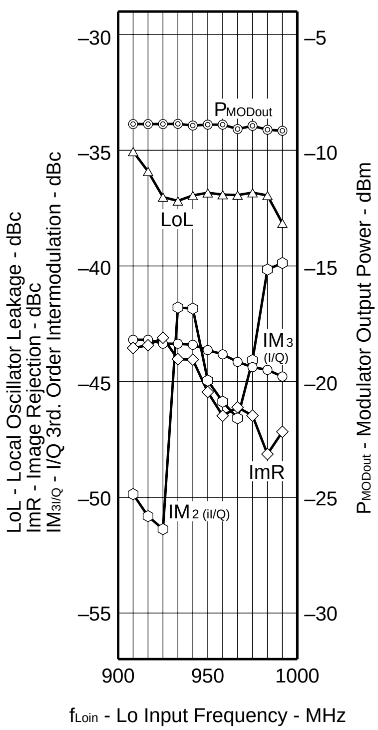
LoL, ImR, IM3I/Q vs VI/Qin
(at TA = +80 °C)



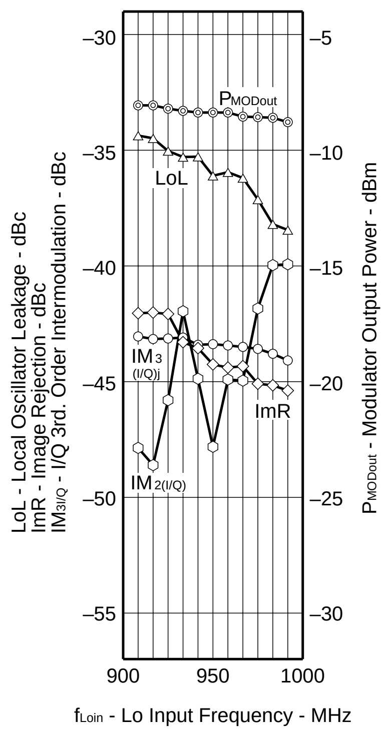
PMODout, LoL, ImR, IM3I/Q vs fLoin
(at VCC = 2.7 V, TA = –30 °C)



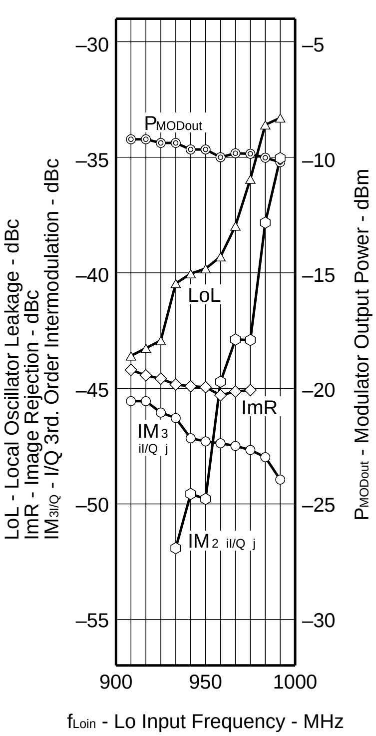
PMODout, LoL, ImR, IM3I/Q vs fLoin
(at VCC = 3.0 V, TA = –30 °C)



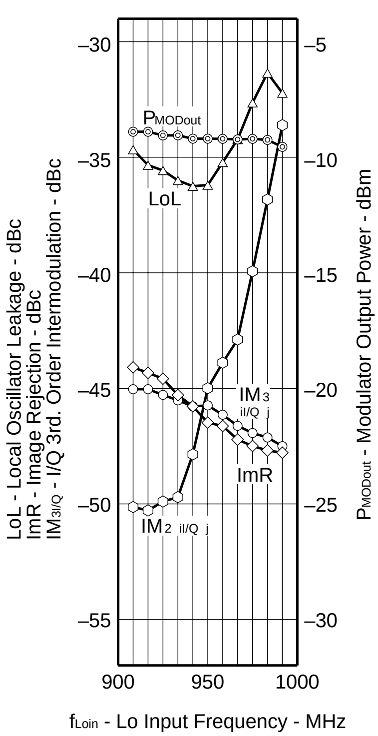
PMODout, LoL, ImR, IM3I/Q vs fLoin
(at VCC = 3.6 V, TA = –30 °C)



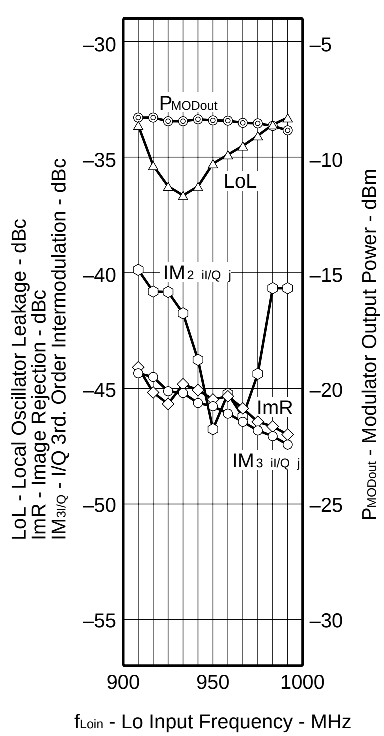
PMODout, LoL, ImR, IM3I/Q vs fLoin
(at VCC = 2.7 V, TA = +25 °C)



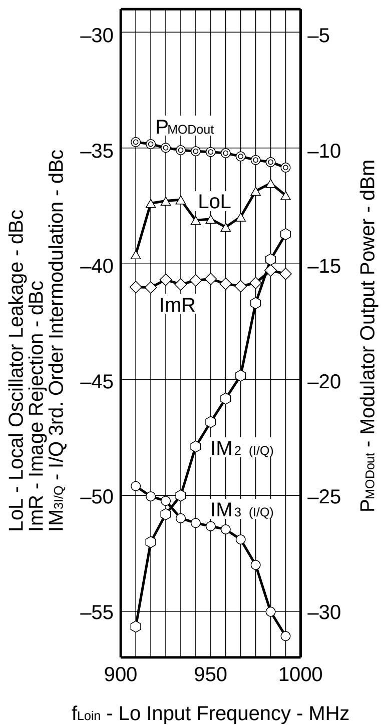
PMODout, LoL, ImR, IM3I/Q vs fLoin
(at VCC = 3.0 V, TA = +25 °C)



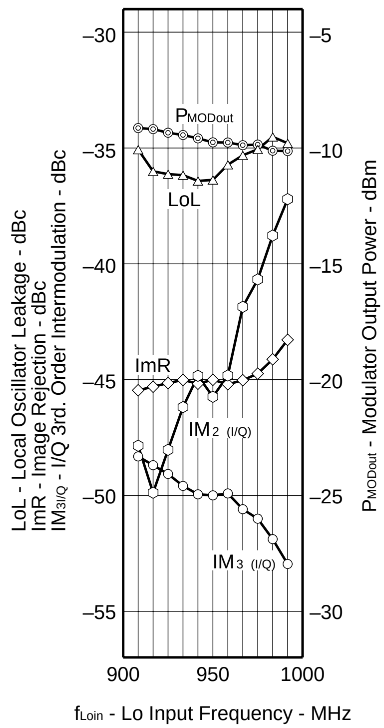
PMODout, LoL, ImR, IM3I/Q vs fLoin
(at VCC =3.6 V, TA = +25 °C)



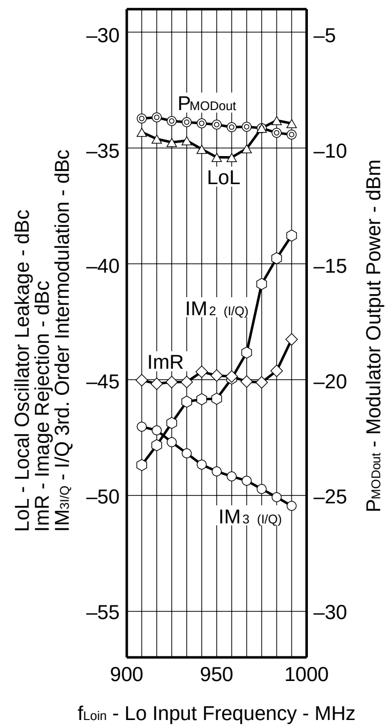
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs f_{Loin} (at V_{CC} = 2.7 V, T_A = +80 °C)



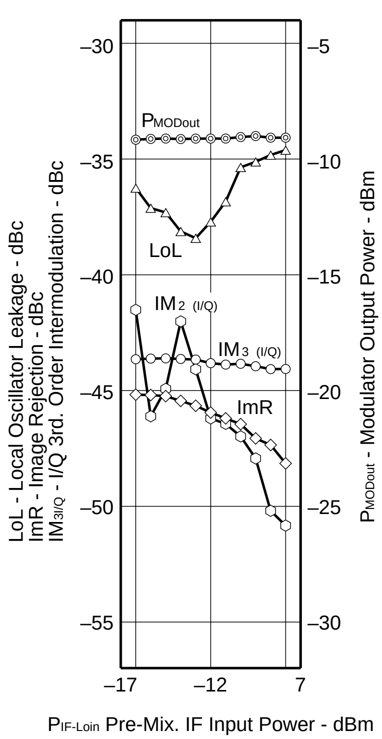
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs f_{Loin} (at V_{CC} = 3.0 V, T_A = +80 °C)



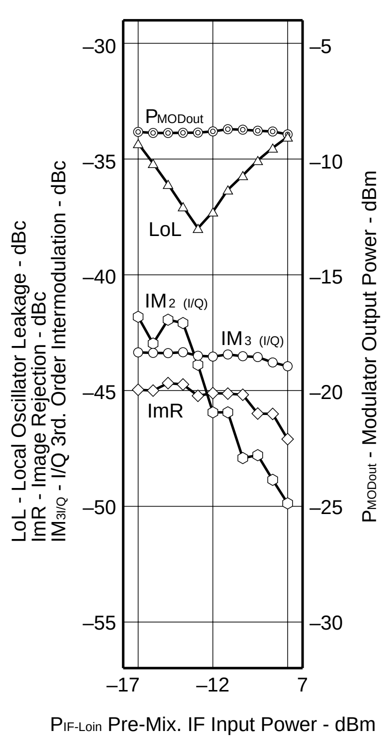
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs f_{Loin} (at V_{CC} = 3.6 V, T_A = +80 °C)



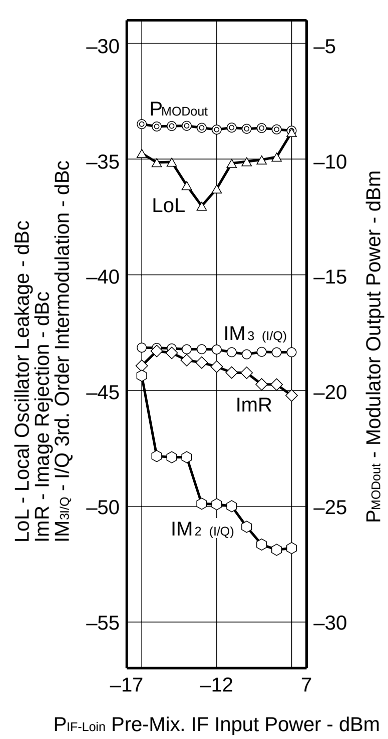
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$ (at V_{CC} = 2.7 V, T_A = –30 °C)



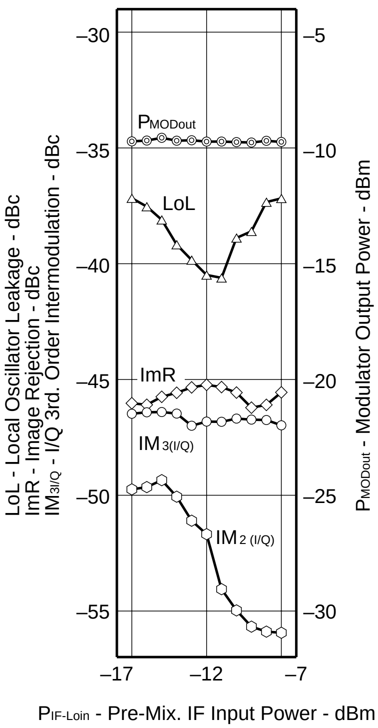
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$ (at V_{CC} = 3.0 V, T_A = –30 °C)



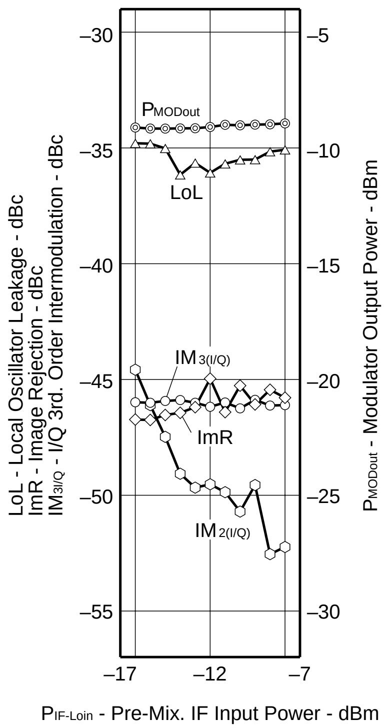
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$ (at V_{CC} = 3.6 V, T_A = –30 °C)



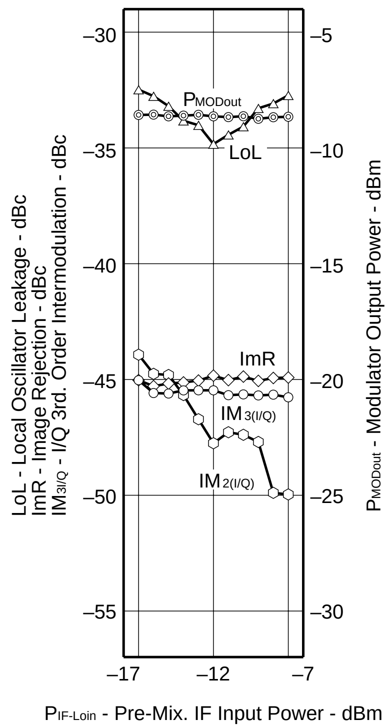
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = +25 °C)



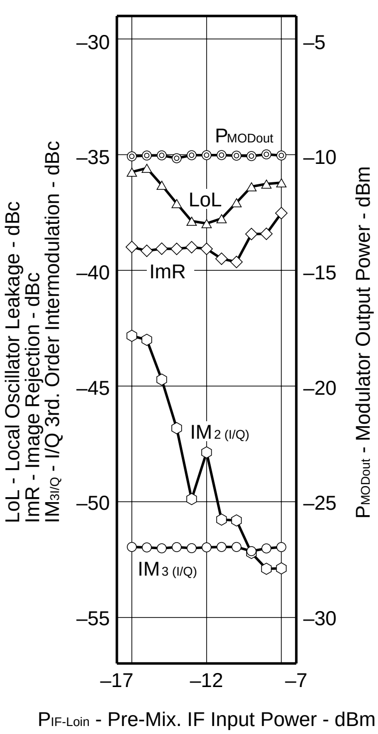
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$
(at V_{CC} =3.0 V, T_A = +25 °C)



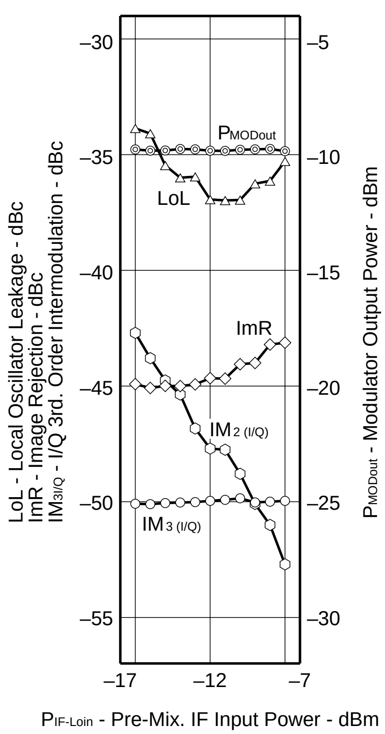
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$
(at V_{CC} =3.6 V, T_A = +25 °C)



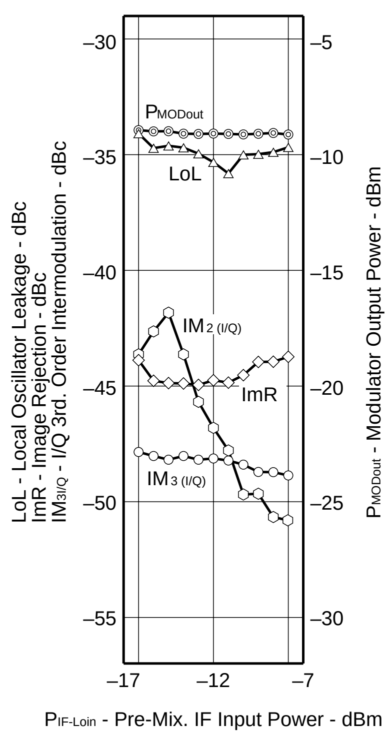
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = +80 °C)



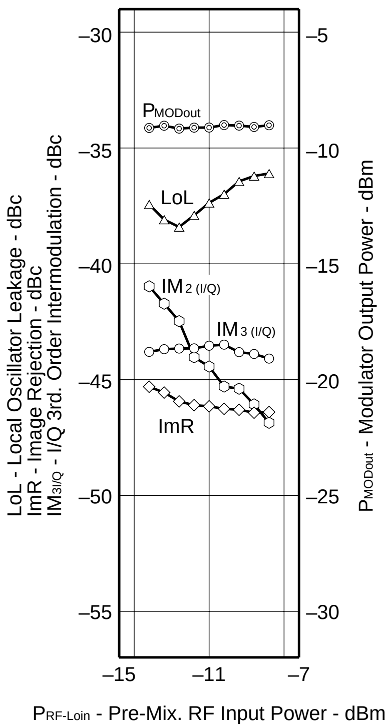
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$
(at V_{CC} =3.0 V, T_A = +80 °C)



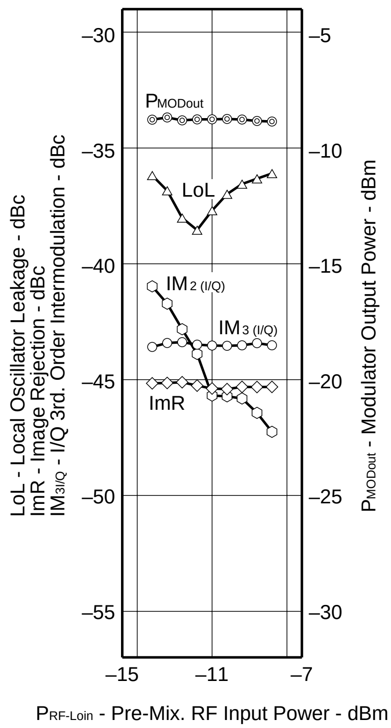
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{IF\text{-}Loin}$
(at V_{CC} =3.6 V, T_A = +80 °C)



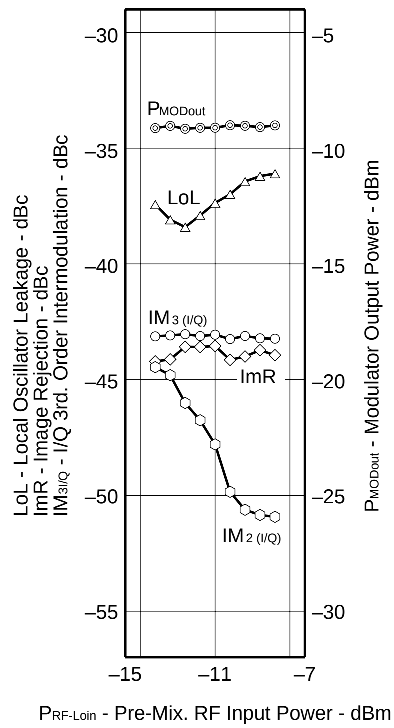
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = –30 °C)



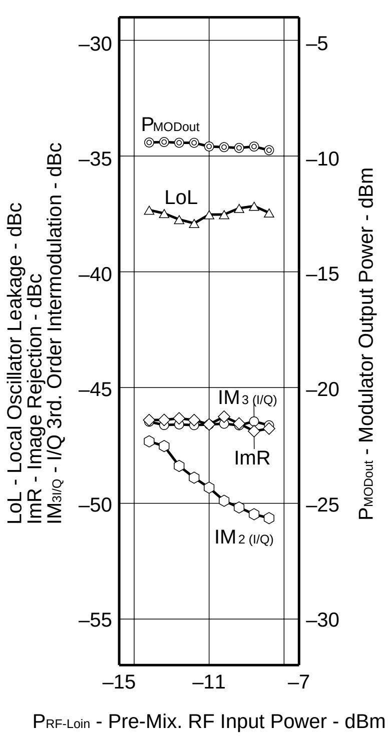
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = –30 °C)



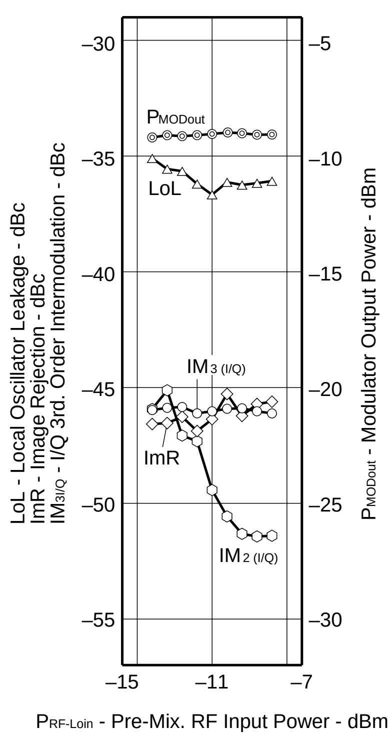
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = –30 °C)



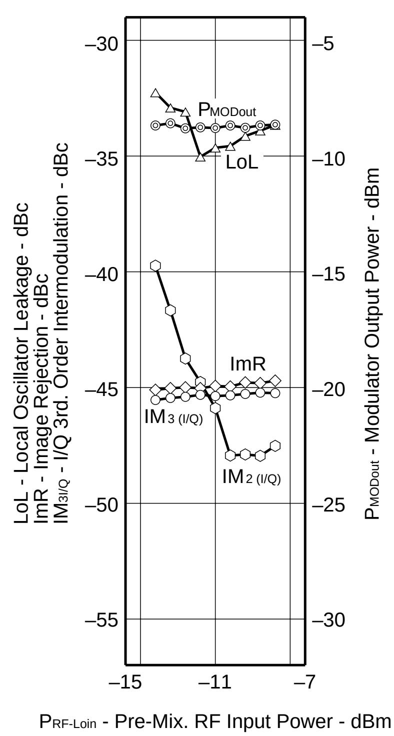
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = +25 °C)



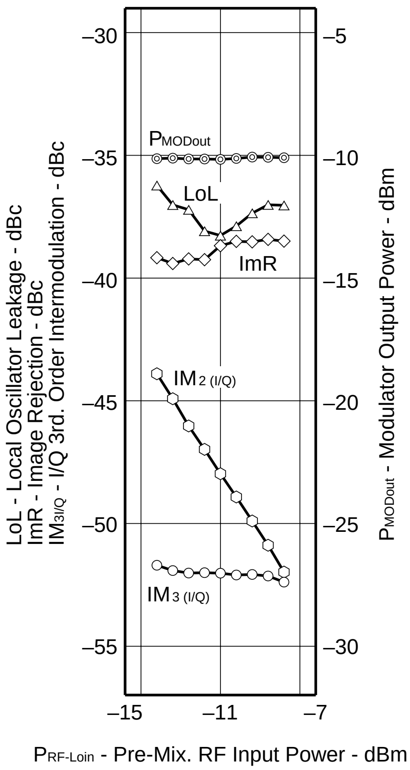
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = +25 °C)



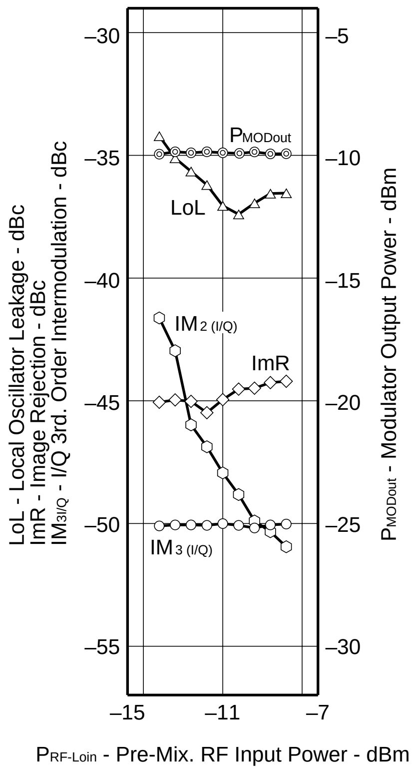
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = +25 °C)



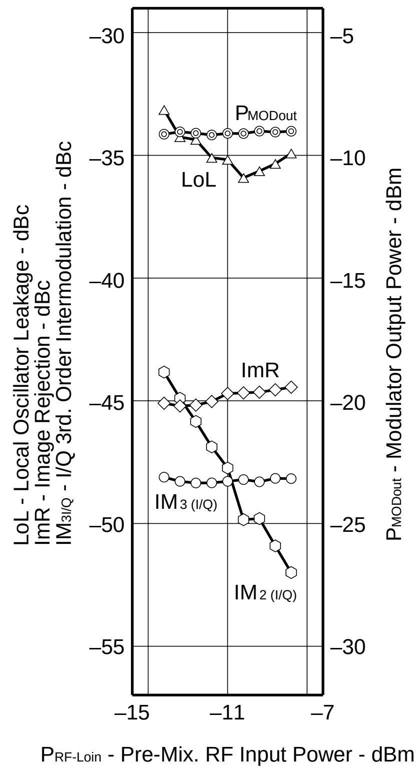
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF-Loin}$
(at V_{CC} = 2.7 V, T_A = +80 °C)



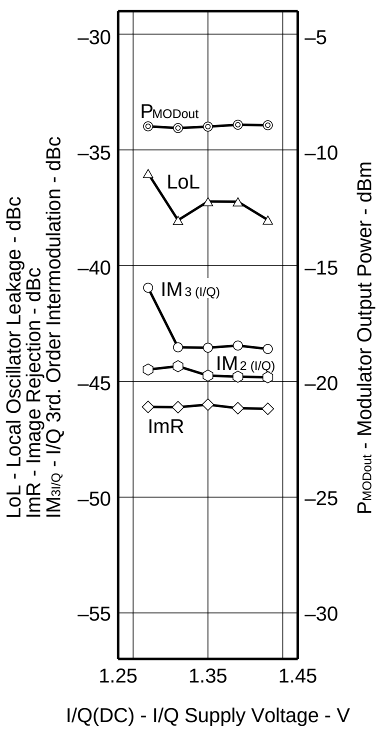
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF-Loin}$
(at V_{CC} = 3.0 V, T_A = +80 °C)



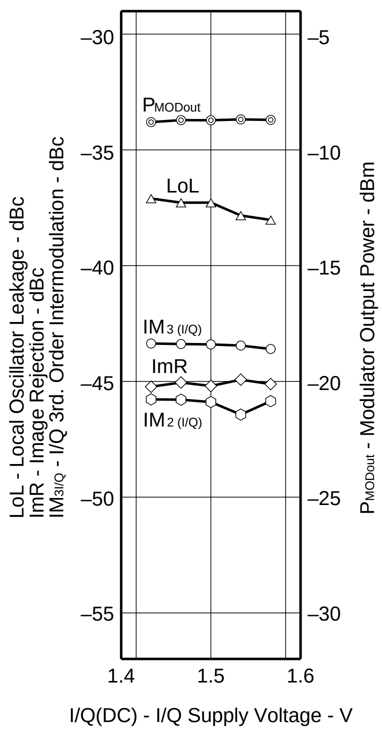
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs $P_{RF-Loin}$
(at V_{CC} = 3.6 V, T_A = +80 °C)



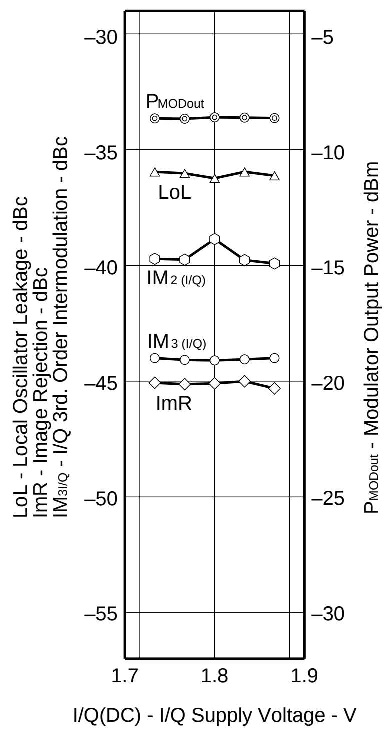
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs I/Q(DC)
(at V_{CC} = 2.7 V, T_A = –30 °C)



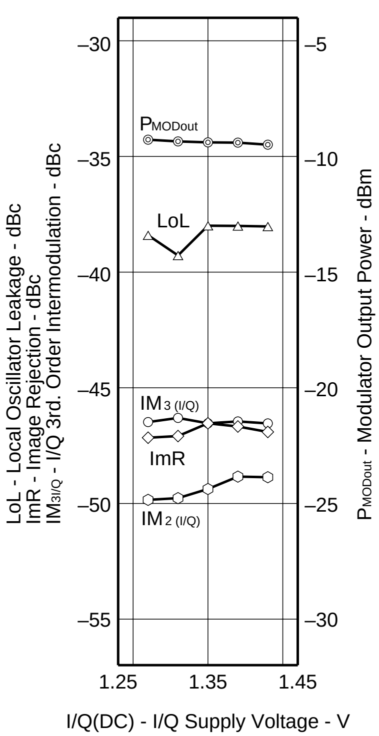
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs I/Q(DC)
(at V_{CC} = 3.0 V, T_A = –30 °C)



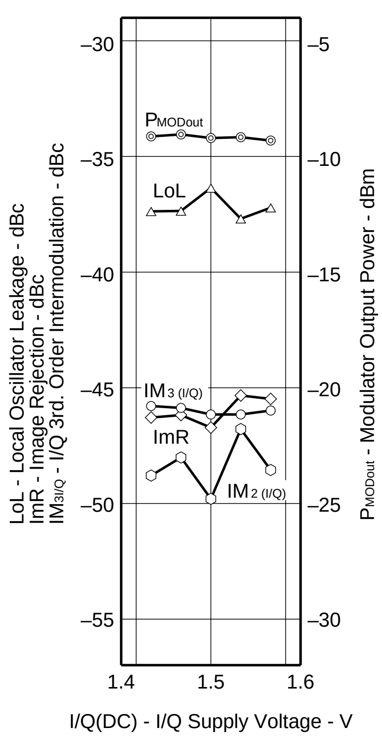
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs I/Q(DC)
(at V_{CC} = 3.6 V, T_A = –30 °C)



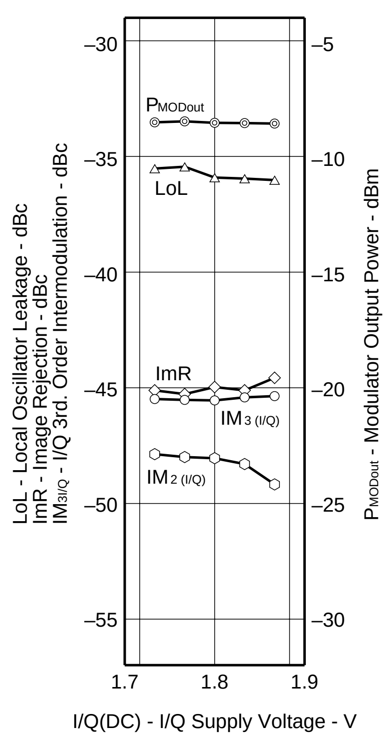
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs I/Q(DC)
(at V_{CC} = 2.7 V, T_A = +25 °C)



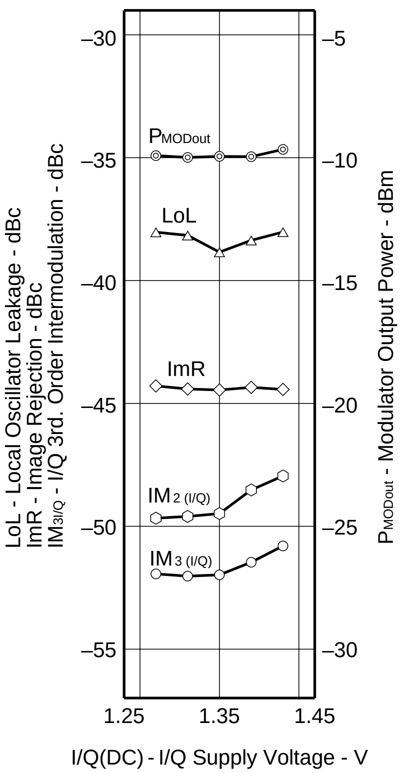
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs I/Q(DC)
(at V_{CC} = 3.0 V, T_A = +25 °C)



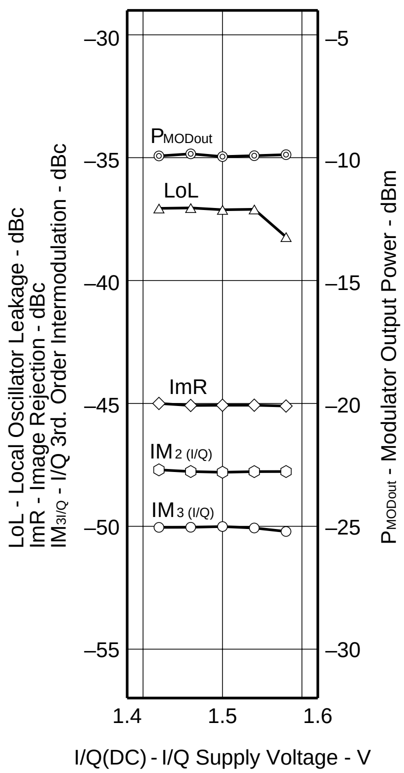
P_{MODout}, LoL, ImR, $IM_{3I/Q}$ vs I/Q(DC)
(at V_{CC} = 3.6 V, T_A = +25 °C)



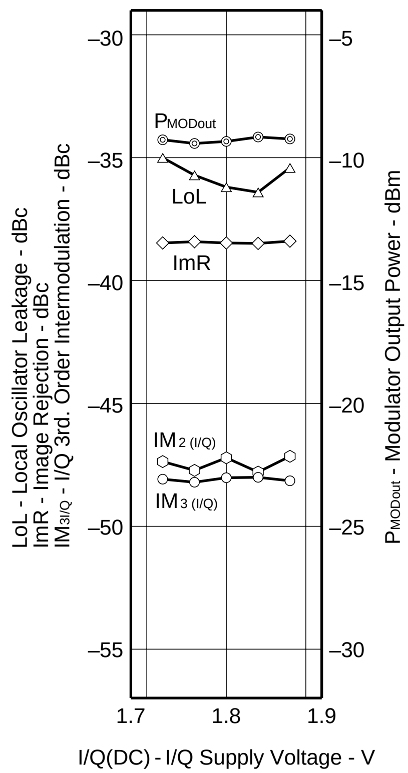
PMODout, LoL, ImR, IM3I/Q vs I/Q(DC)
(at VCC = 2.7 V, TA = +80 °C)



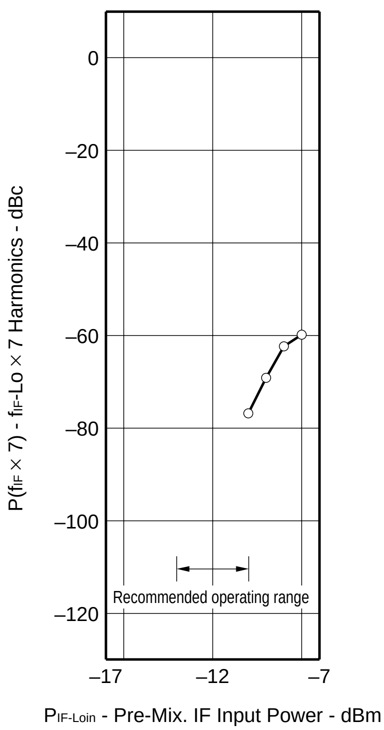
PMODout, LoL, ImR, IM3I/Q vs I/Q(DC)
(at VCC = 3.0 V, TA = +80 °C)



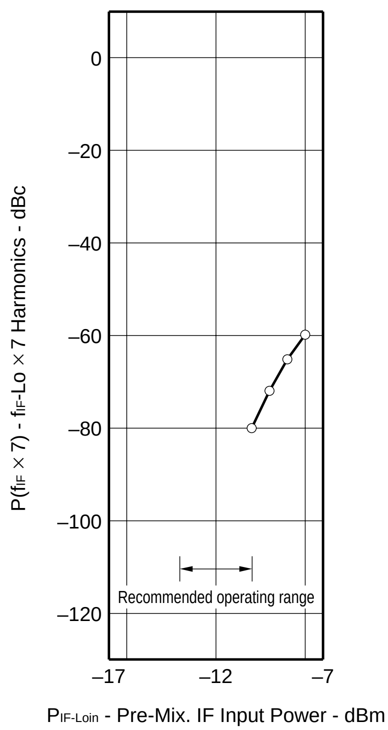
PMODout, LoL, ImR, IM3I/Q vs I/Q(DC)
(at VCC = 3.6 V, TA = +80 °C)



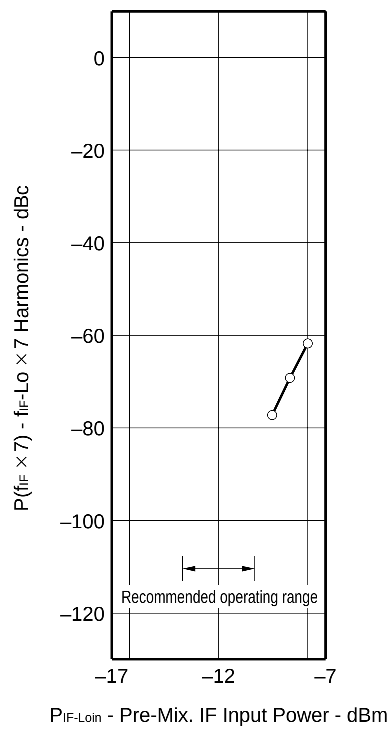
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = –30 °C)



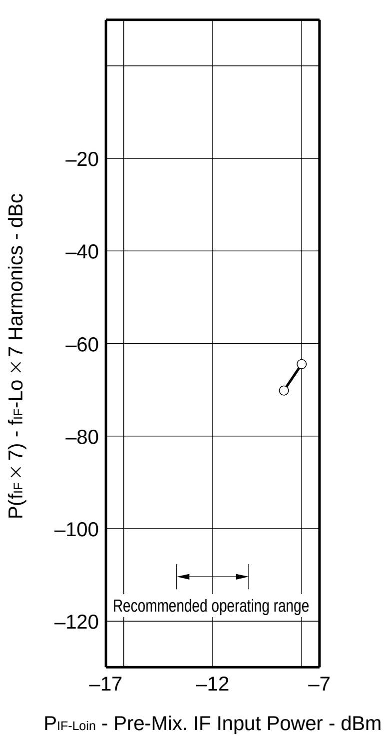
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = –30 °C)



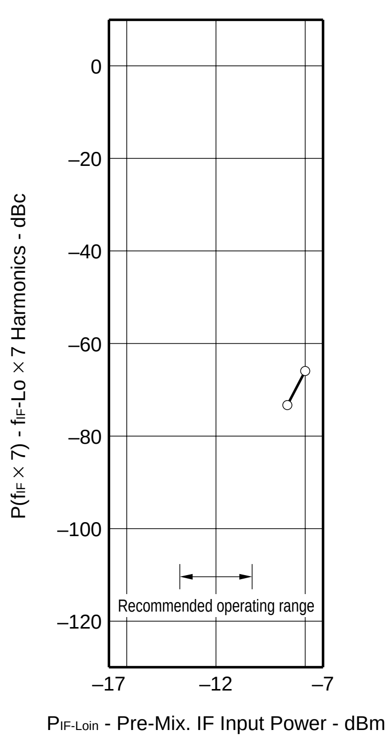
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = –30 °C)



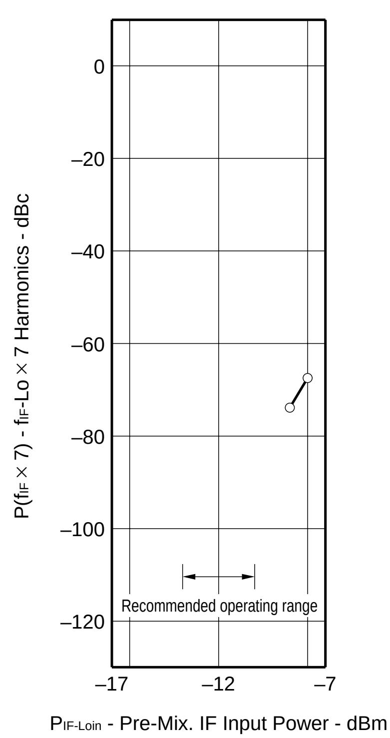
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = +25 °C)



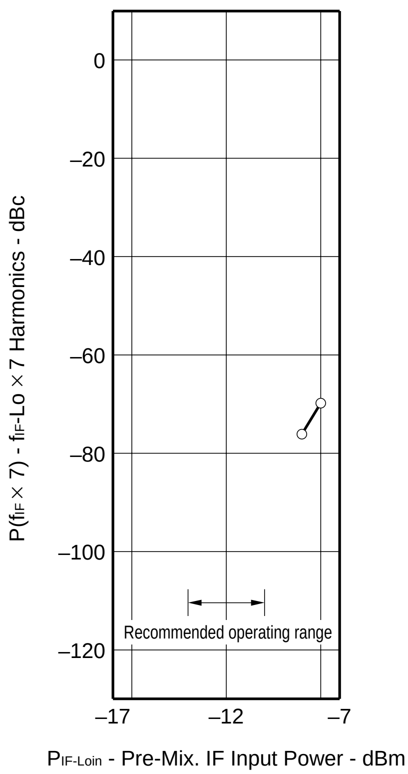
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = +25 °C)



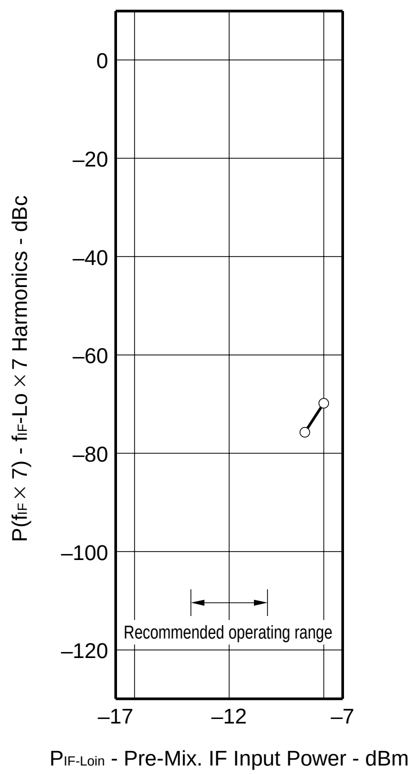
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = +25 °C)



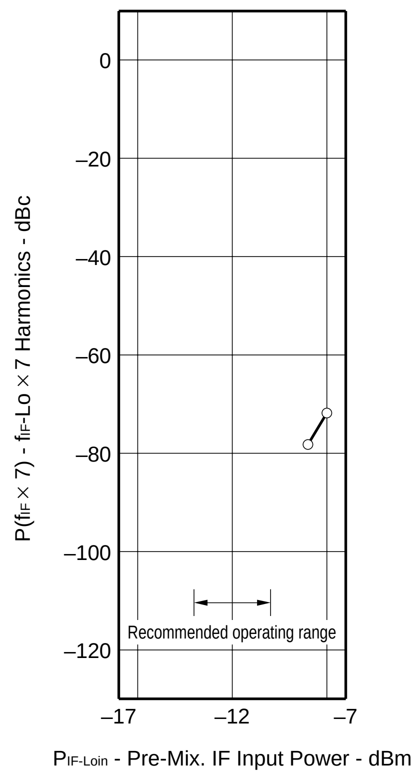
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = +80 °C)



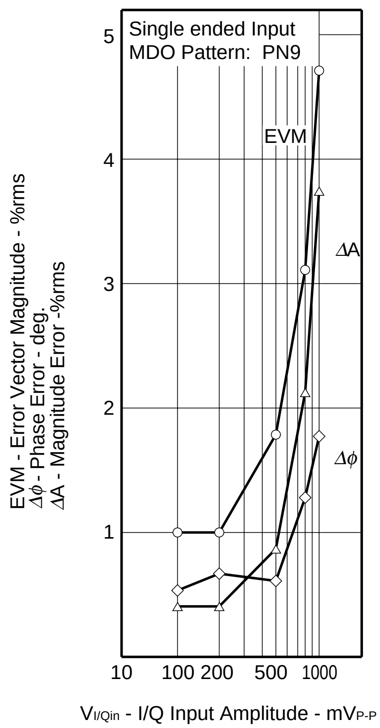
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = +80 °C)



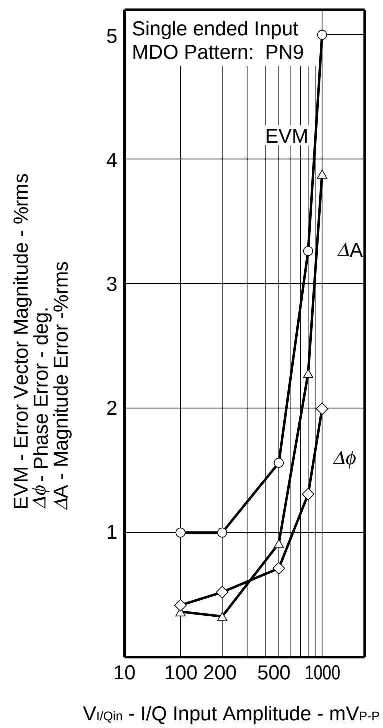
$P(f_{IF} \times 7)$ vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = +80 °C)



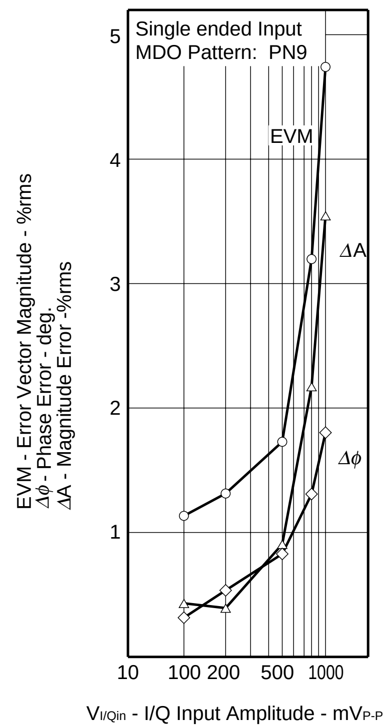
EVM, Δϕ, ΔA vs $V_{I/Qin}$
(at V_{CC} = 2.7 V)



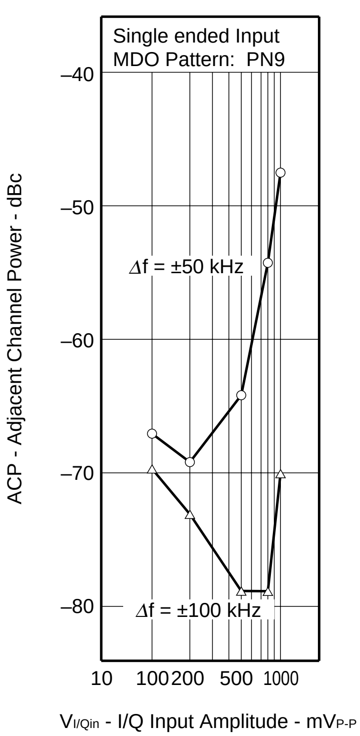
EVM, Δϕ, ΔA vs $V_{I/Qin}$
(at V_{CC} = 3.0 V)



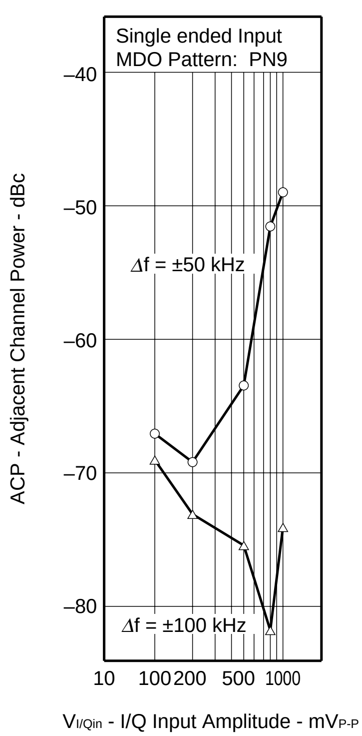
EVM, Δϕ, ΔA vs $V_{I/Qin}$
(at V_{CC} = 3.6 V)



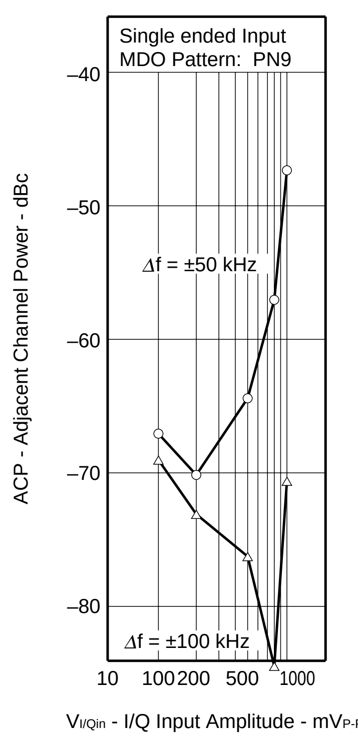
ACP vs $V_{I/Qin}$
(at V_{CC} = 2.7 V)



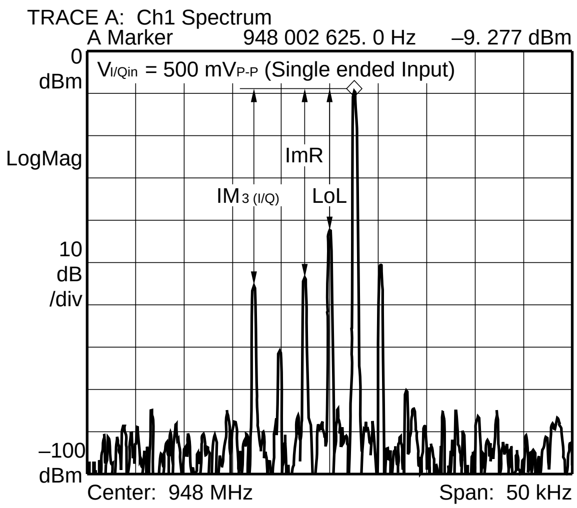
ACP vs $V_{I/Qin}$
(at V_{CC} = 3.0 V)



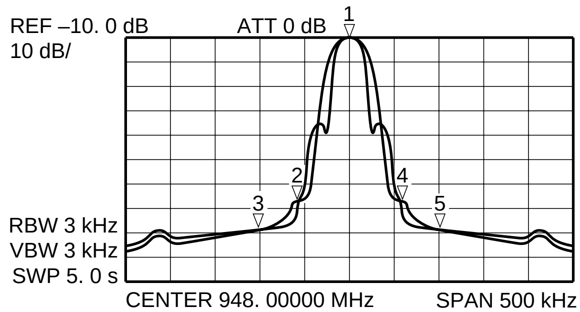
ACP vs $V_{I/Qin}$
(at V_{CC} = 3.6 V)



TYPICAL SINE WAVE MODULATION OUTPUT SPECTRUM
<PDC> 42kbps, RNYQ α = 0.5, MOD Pattern [000]



TYPICAL π/4DQPSK MODULATION OUTPUT SPECTRUM
<PDC> 42kbps, RNYQ α = 0.5, MOD Pattern [PN9]

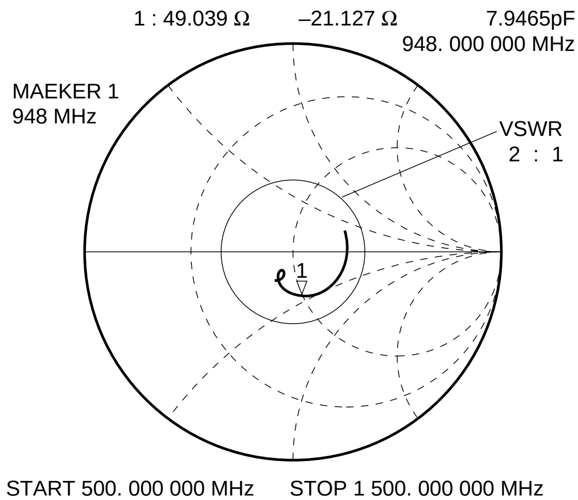


*** Multi Marker List ***

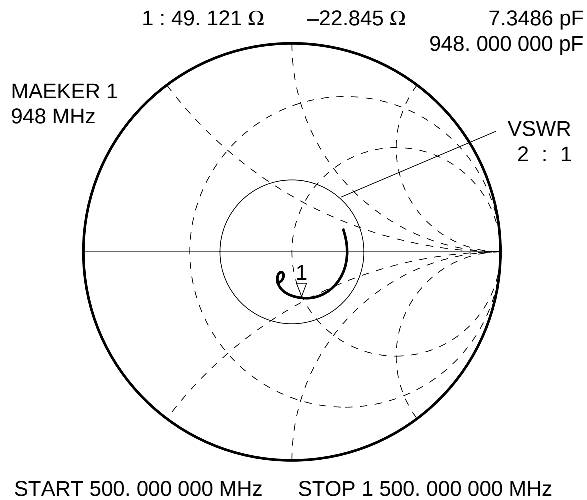
No. 1:	0 Hz	0. 00 dB
No. 2:	–50. 0 kHz	–64. 50 dB
No. 3:	–100. 0 kHz	–77. 00 dB
No. 4:	50. 0 kHz	–64. 75 dB
No. 5:	100. 0 kHz	–77. 00 dB

MOD OUTPUT (15 pin) IMPEDANCE

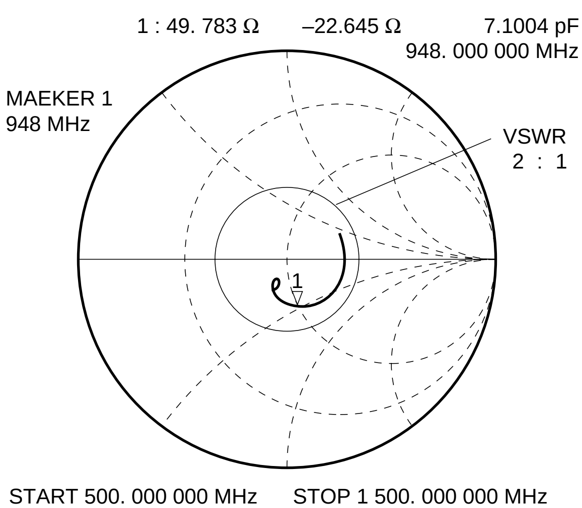
$V_{CC} = V_{PS} = 2.7$ V



$V_{CC} = V_{PS} = 3.0$ V

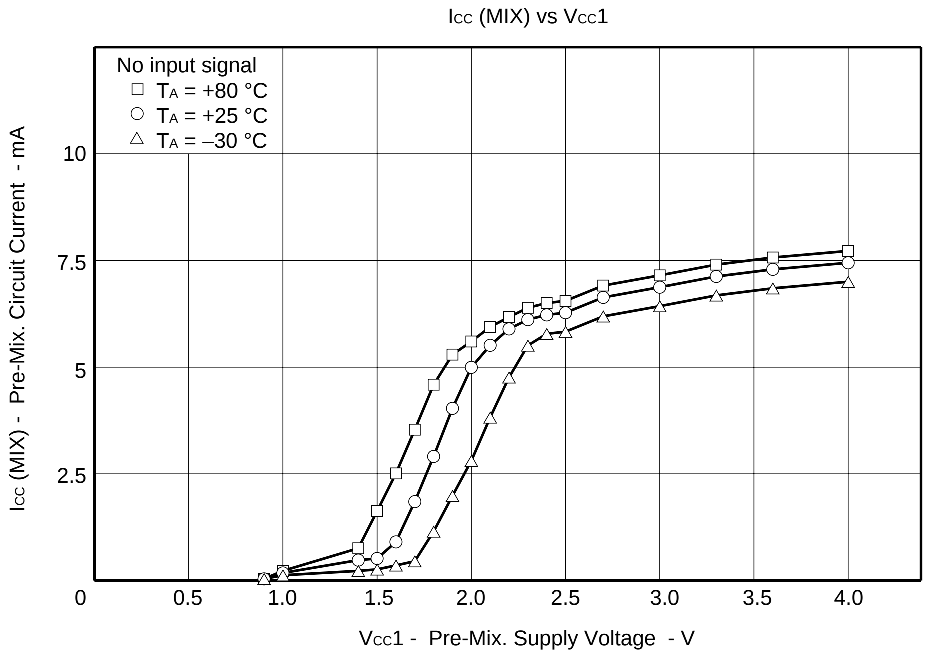


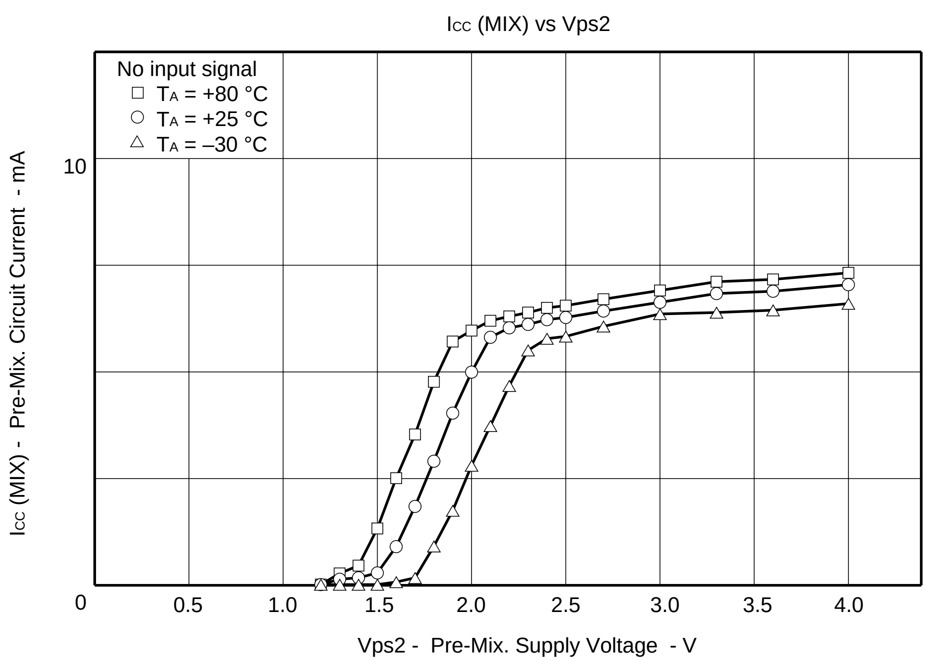
$V_{CC} = V_{PS} = 3.6$ V



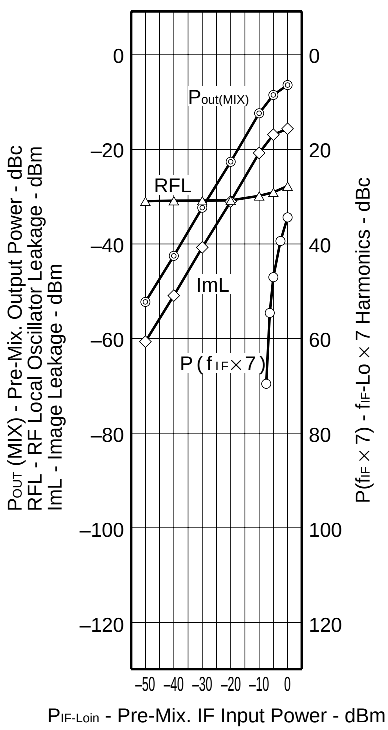
STANDARD TYPICAL CHARACTERISTICS <Pre-Mixer>

Test Circuit 3, T_A = +25 °C, $V_{CC}1$ = 3.0 V, Vps2 = 3.0 V, f_{IFin} = 135 MHz, P_{IFin} = –12 dBm, f_{RFin} = 813 MHz, P_{RFin} = –11 dBm, f_{MIXout} = 948 MHz

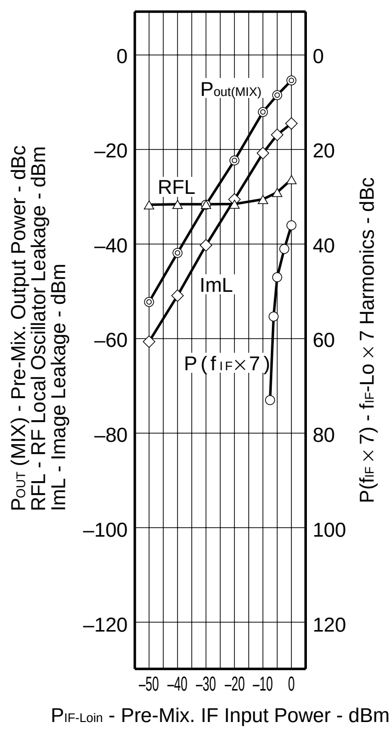




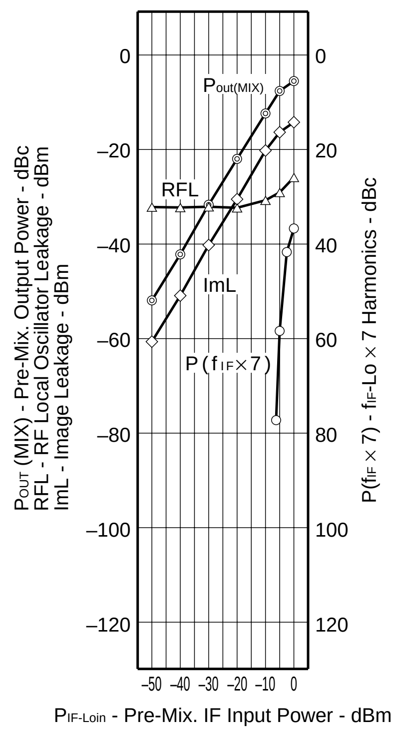
Pout (MIX), RFL, ImL, P(fIF × 7)
vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = –30 °C)



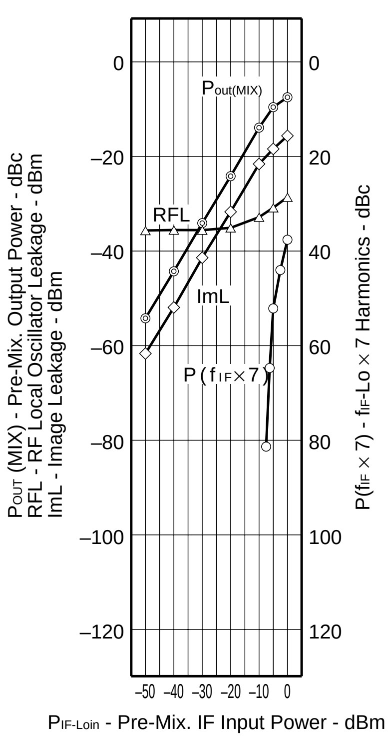
Pout (MIX), RFL, ImL, P(fIF × 7)
vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = –30 °C)



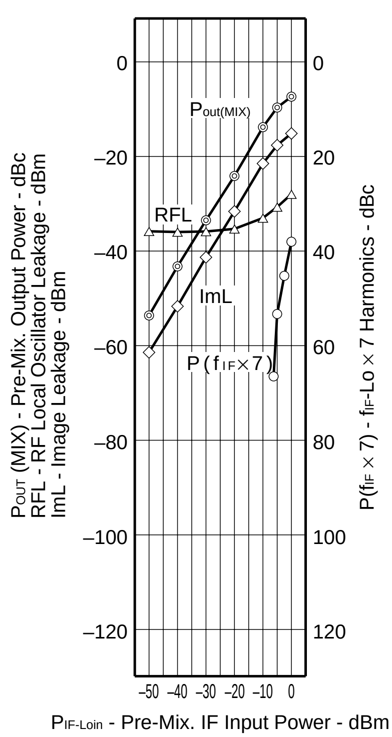
Pout (MIX), RFL, ImL, P(fIF × 7)
vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = –30 °C)



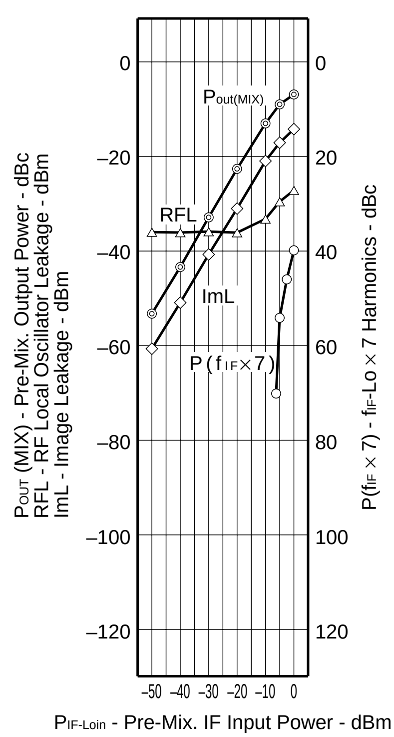
Pout (MIX), RFL, ImL, P(fIF × 7)
vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = +25 °C)



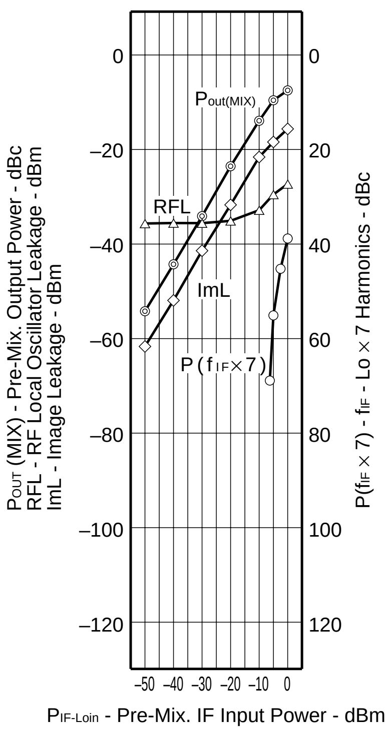
Pout (MIX), RFL, ImL, P(fIF × 7)
vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = +25 °C)



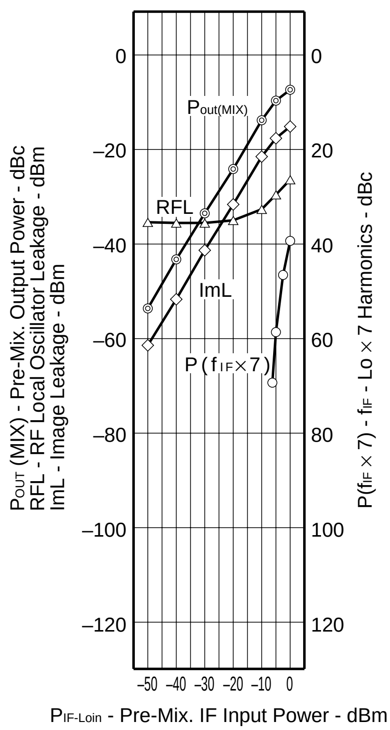
Pout (MIX), RFL, ImL, P(fIF × 7)
vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = +25 °C)



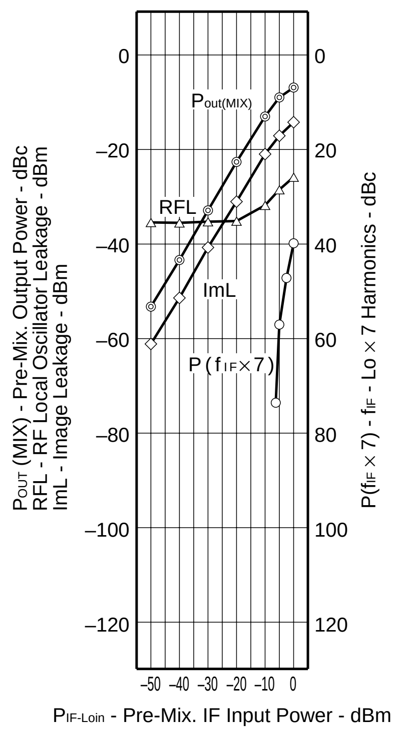
Pout (MIX), RFL, ImL, P(f_{IF} × 7) vs $P_{IF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = +80 °C)



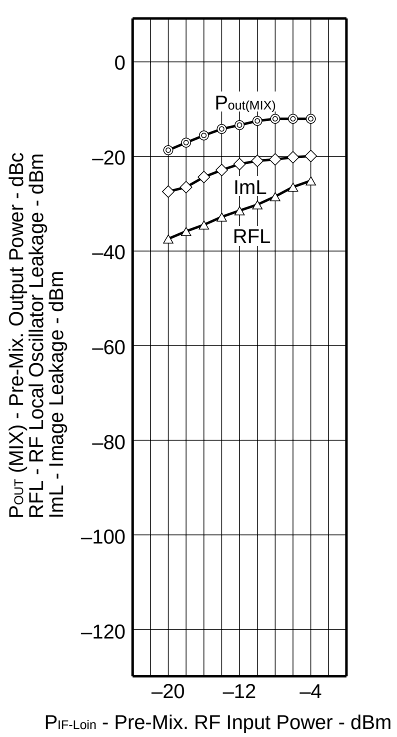
Pout (MIX), RFL, ImL, P(f_{IF} × 7) vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = +80 °C)



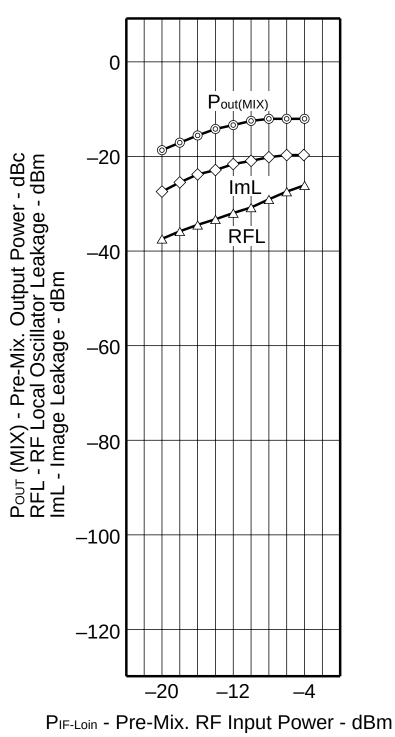
Pout (MIX), RFL, ImL, P(f_{IF} × 7) vs $P_{IF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = +80 °C)



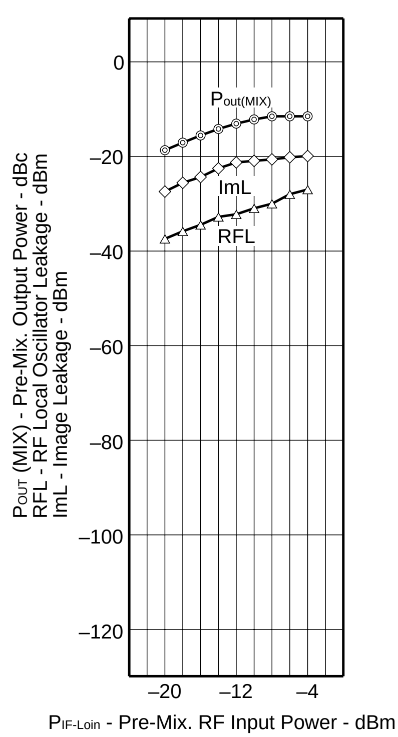
Pout (MIX), RFL, ImL vs $P_{RF\text{-}Loin}$
(at V_{CC} = 2.7 V, T_A = –30 °C)



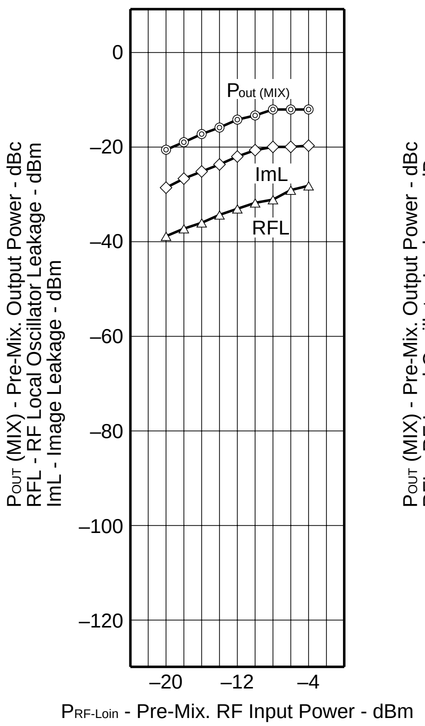
Pout (MIX), RFL, ImL vs $P_{RF\text{-}Loin}$
(at V_{CC} = 3.0 V, T_A = –30 °C)



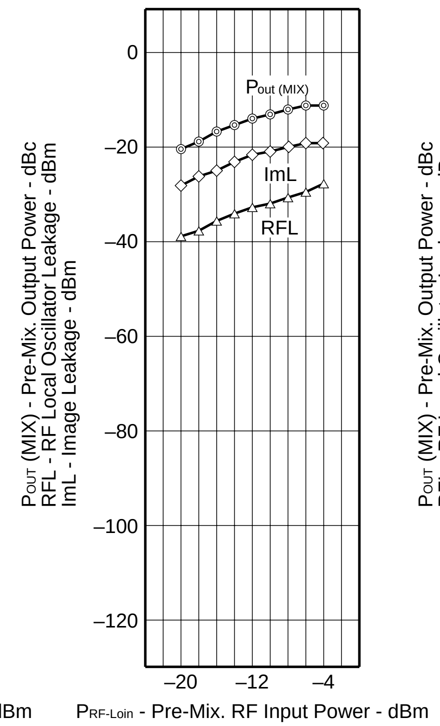
Pout (MIX), RFL, ImL vs $P_{RF\text{-}Loin}$
(at V_{CC} = 3.6 V, T_A = –30 °C)



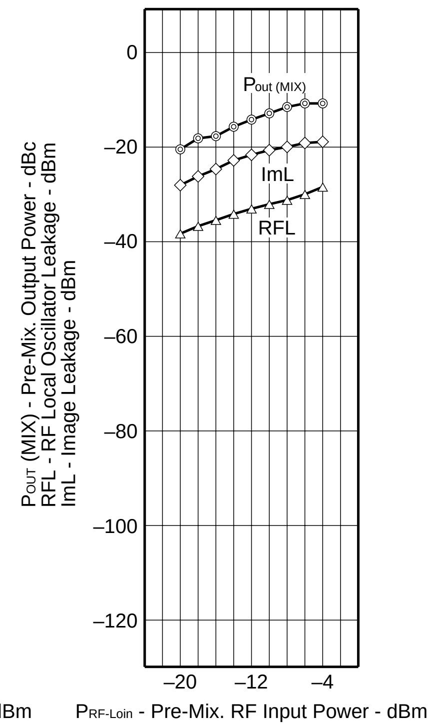
Pout (MIX), RFL, ImL
vs $P_{RF-Loin}$
(at V_{CC} = 2.7 V, T_A = +25 °C)



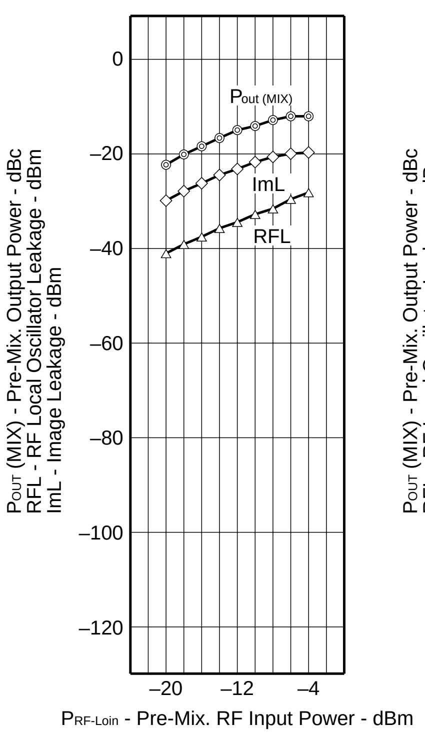
Pout (MIX), RFL, ImL
vs $P_{RF-Loin}$
(at V_{CC} = 3.0 V, T_A = +25 °C)



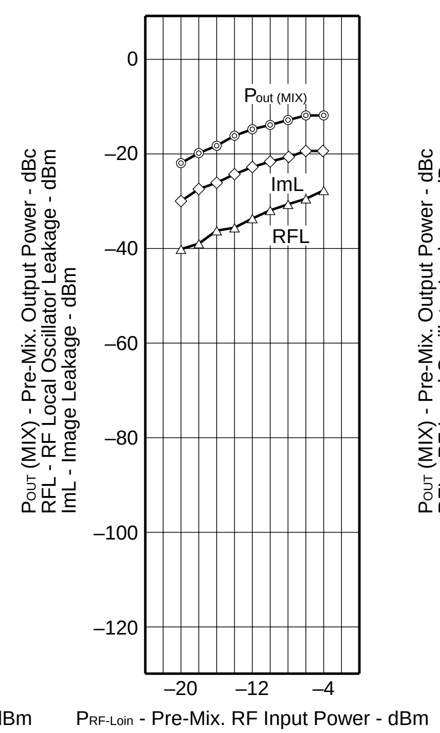
Pout (MIX), RFL, ImL
vs $P_{RF-Loin}$
(at V_{CC} = 3.6 V, T_A = +25 °C)



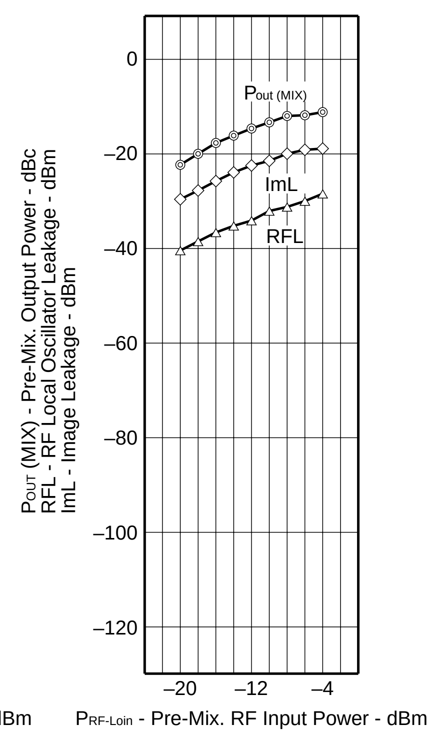
Pout (MIX), RFL, ImL
vs $P_{RF-Loin}$
(at V_{CC} = 2.7 V, T_A = +80 °C)



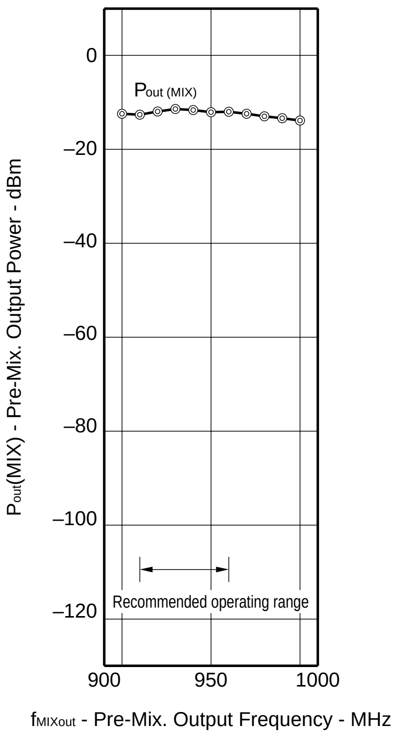
Pout (MIX), RFL, ImL
vs $P_{RF-Loin}$
(at V_{CC} = 3.0 V, T_A = +80 °C)



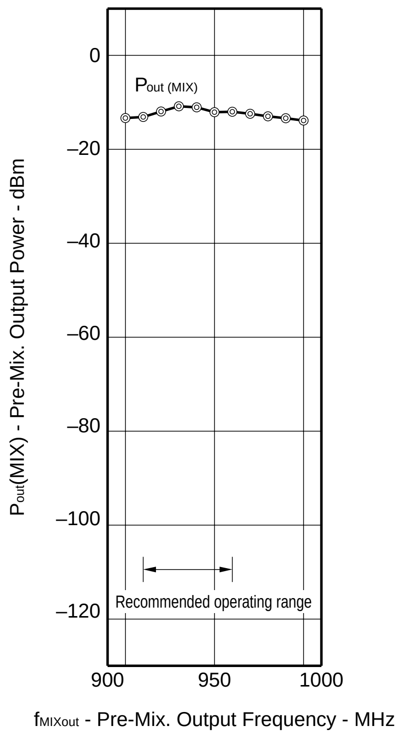
Pout (MIX), RFL, ImL
vs $P_{RF-Loin}$
(at V_{CC} = 3.6 V, T_A = +80 °C)



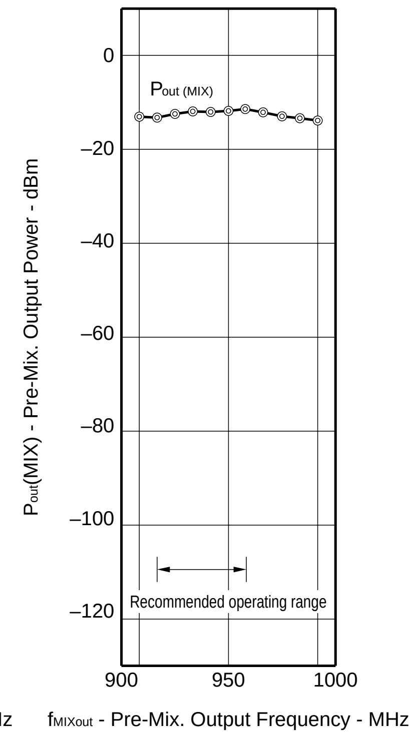
P_{out}(MIX) vs f_{MIXout}
(at V_{CC} = 2.7 V, T_A = –30 °C)



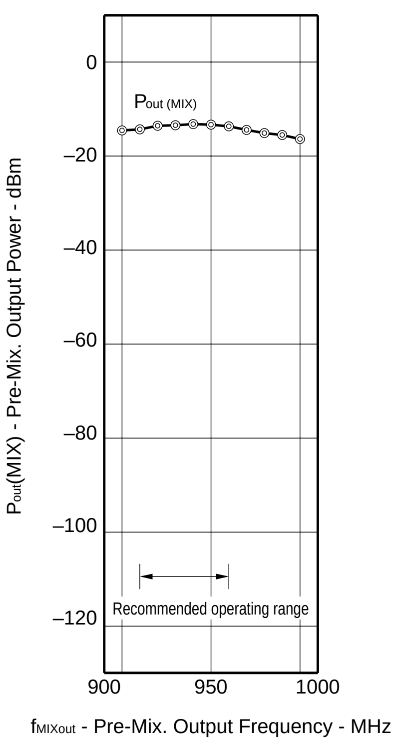
P_{out}(MIX) vs f_{MIXout}
(at V_{CC} = 3.0 V, T_A = –30 °C)



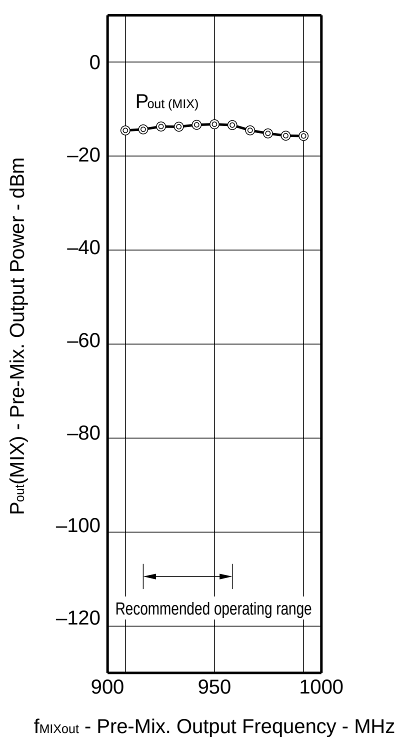
P_{out}(MIX) vs f_{MIXout}
(at V_{CC} = 3.6 V, T_A = –30 °C)



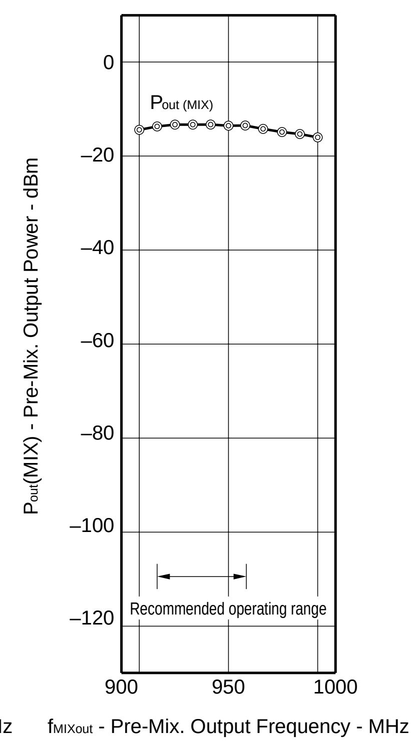
P_{out}(MIX) vs f_{MIXout}
(at V_{CC} = 2.7 V, T_A = +25 °C)

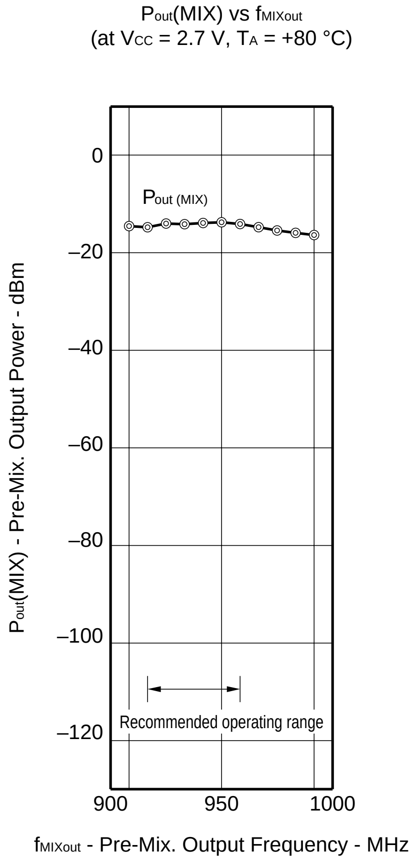


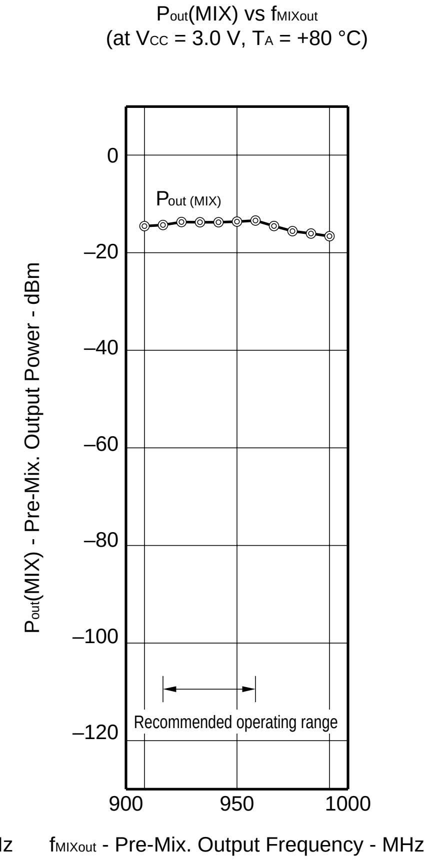
P_{out}(MIX) vs f_{MIXout}
(at V_{CC} = 3.0 V, T_A = +25 °C)

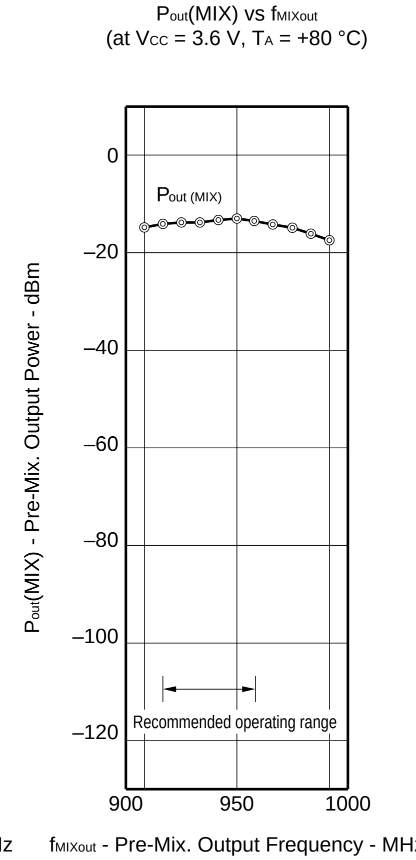


P_{out}(MIX) vs f_{MIXout}
(at V_{CC} = 3.6 V, T_A = +25 °C)

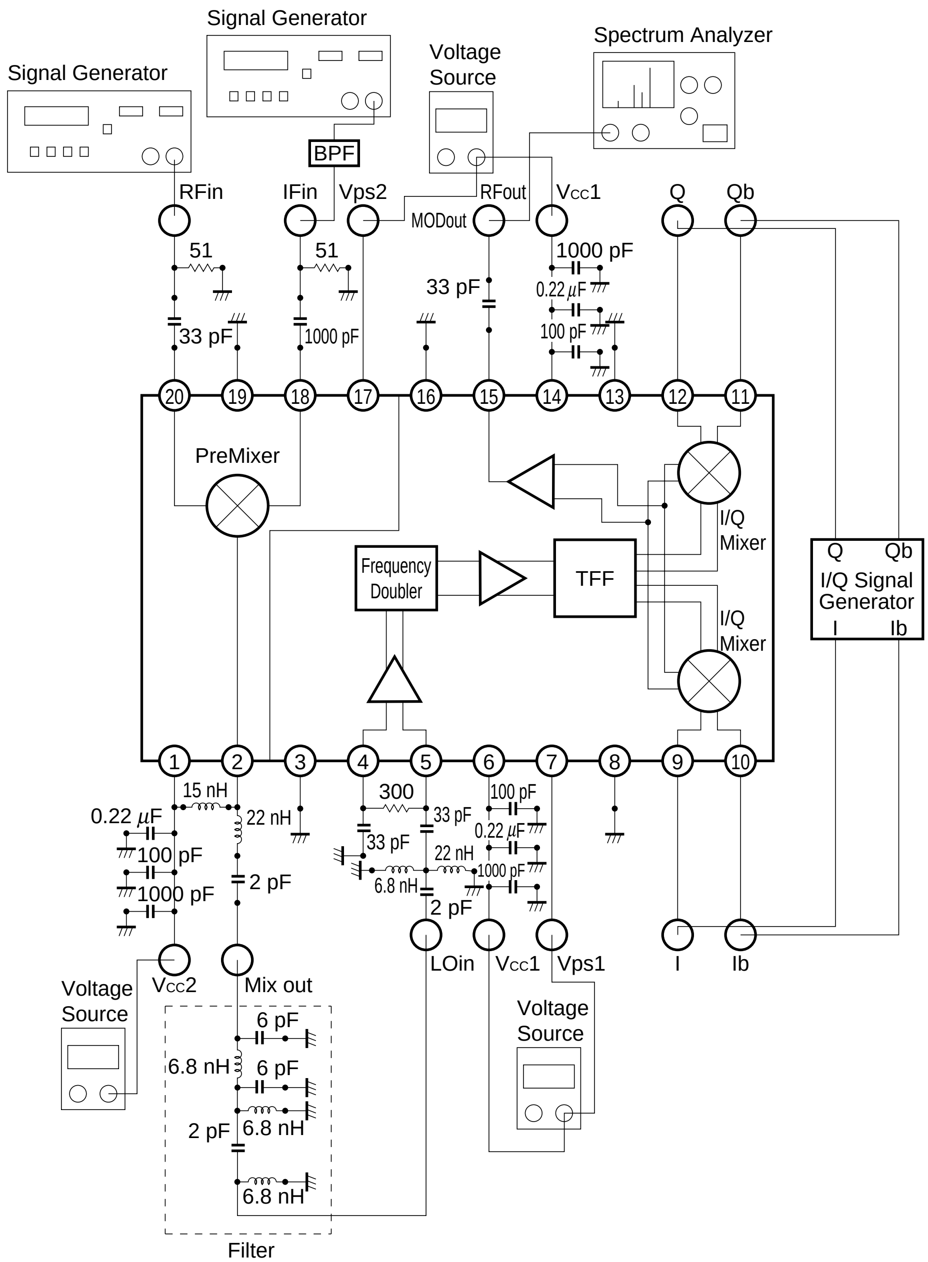



Pout(MIX) vs fMIXout
(at VCC = 2.7 V, TA = +80 °C)
Pout(MIX) - Pre-Mix. Output Power - dBm
Pout (MIX)
0
–20
–40
–60
–80
–100
–120
Recommended operating range
900
950
1000
fMIXout - Pre-Mix. Output Frequency - MHz

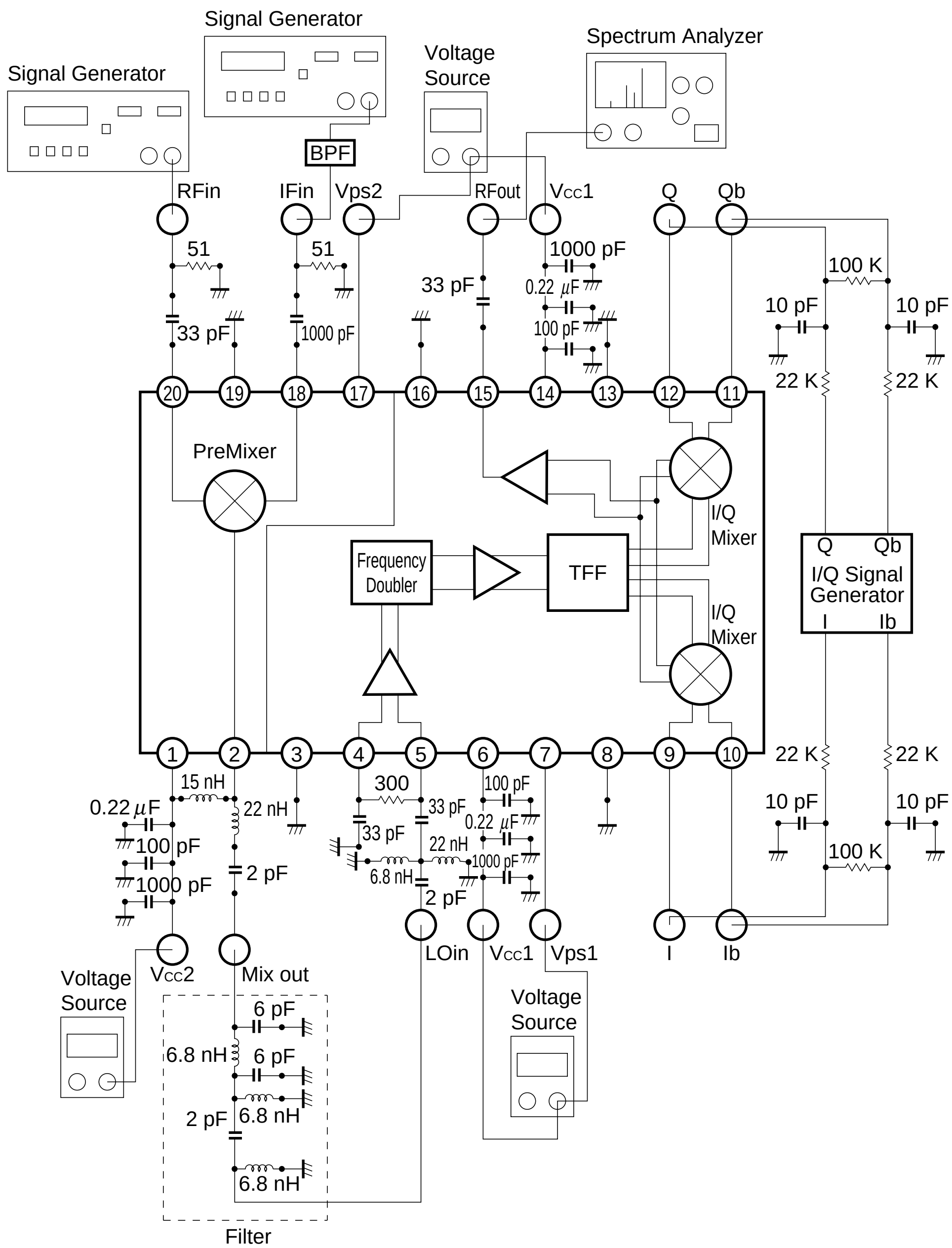

Pout(MIX) vs fMIXout
(at VCC = 3.0 V, TA = +80 °C)
Pout(MIX) - Pre-Mix. Output Power - dBm
Pout (MIX)
0
–20
–40
–60
–80
–100
–120
Recommended operating range
900
950
1000
fMIXout - Pre-Mix. Output Frequency - MHz


Pout(MIX) vs fMIXout
(at VCC = 3.6 V, TA = +80 °C)
Pout(MIX) - Pre-Mix. Output Power - dBm
Pout (MIX)
0
–20
–40
–60
–80
–100
–120
Recommended operating range
900
950
1000
fMIXout - Pre-Mix. Output Frequency - MHz

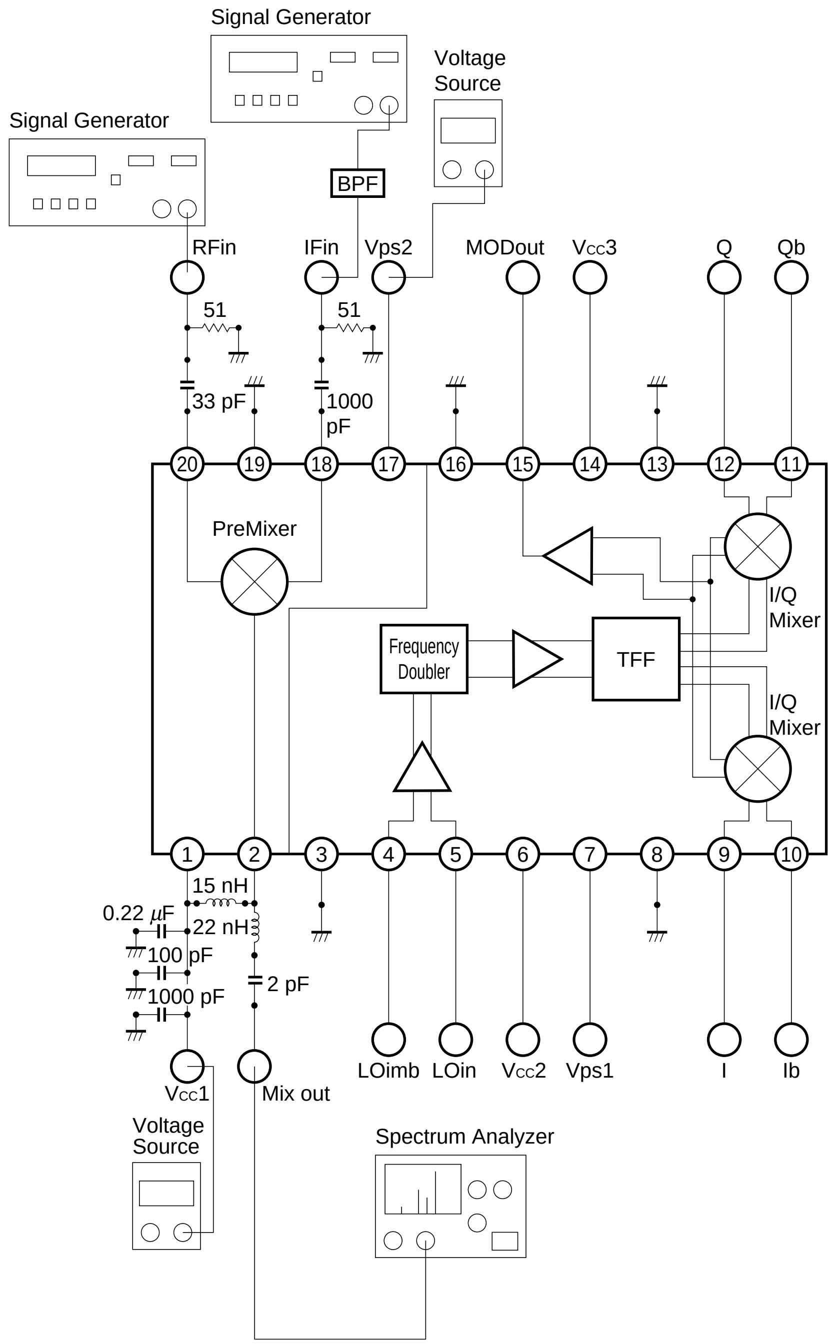
TEST CIRCUIT 1 (Modulator+Pre-Mixer / In case of $V_{I/Qin}$ is single ended input)



TEST CIRCUIT 2 (Modulator+Pre-Mixer / In case of $V_{I/Qin}$ is differential input)



TEST CIRCUIT 3 (Pre-Mixer)



APPLICATION CIRCUIT EXAMPLE

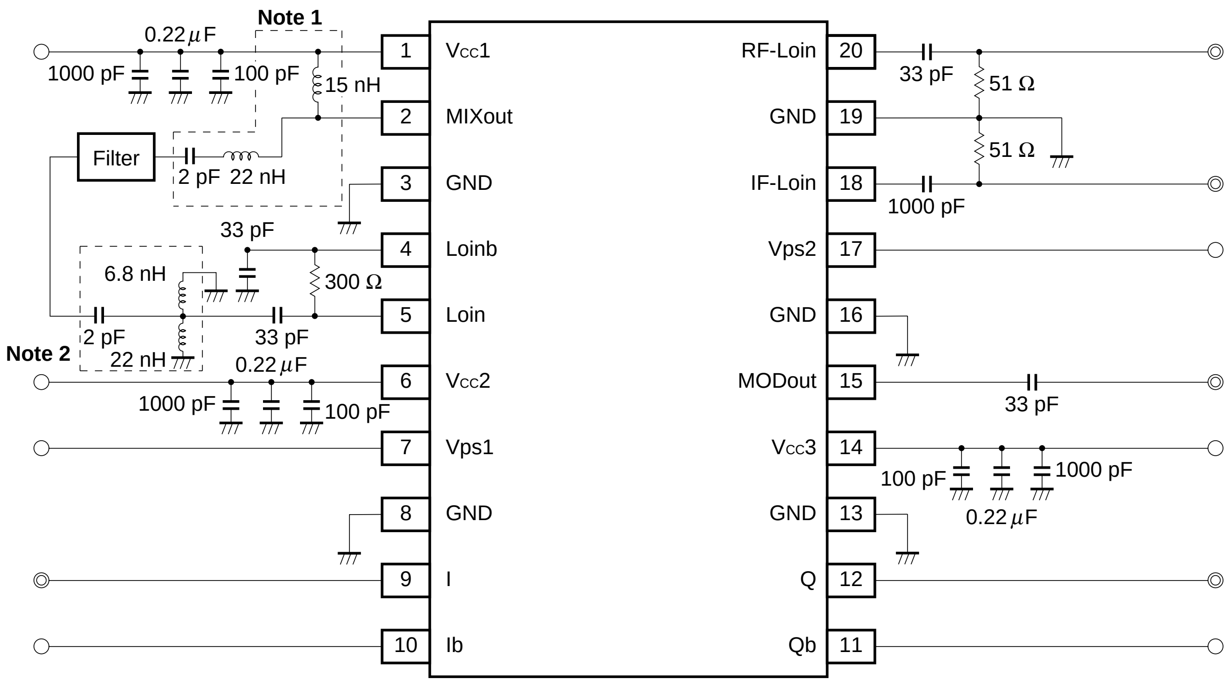
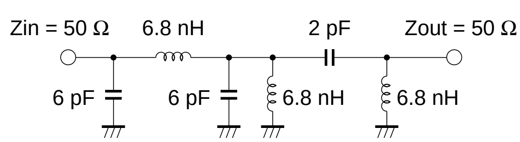


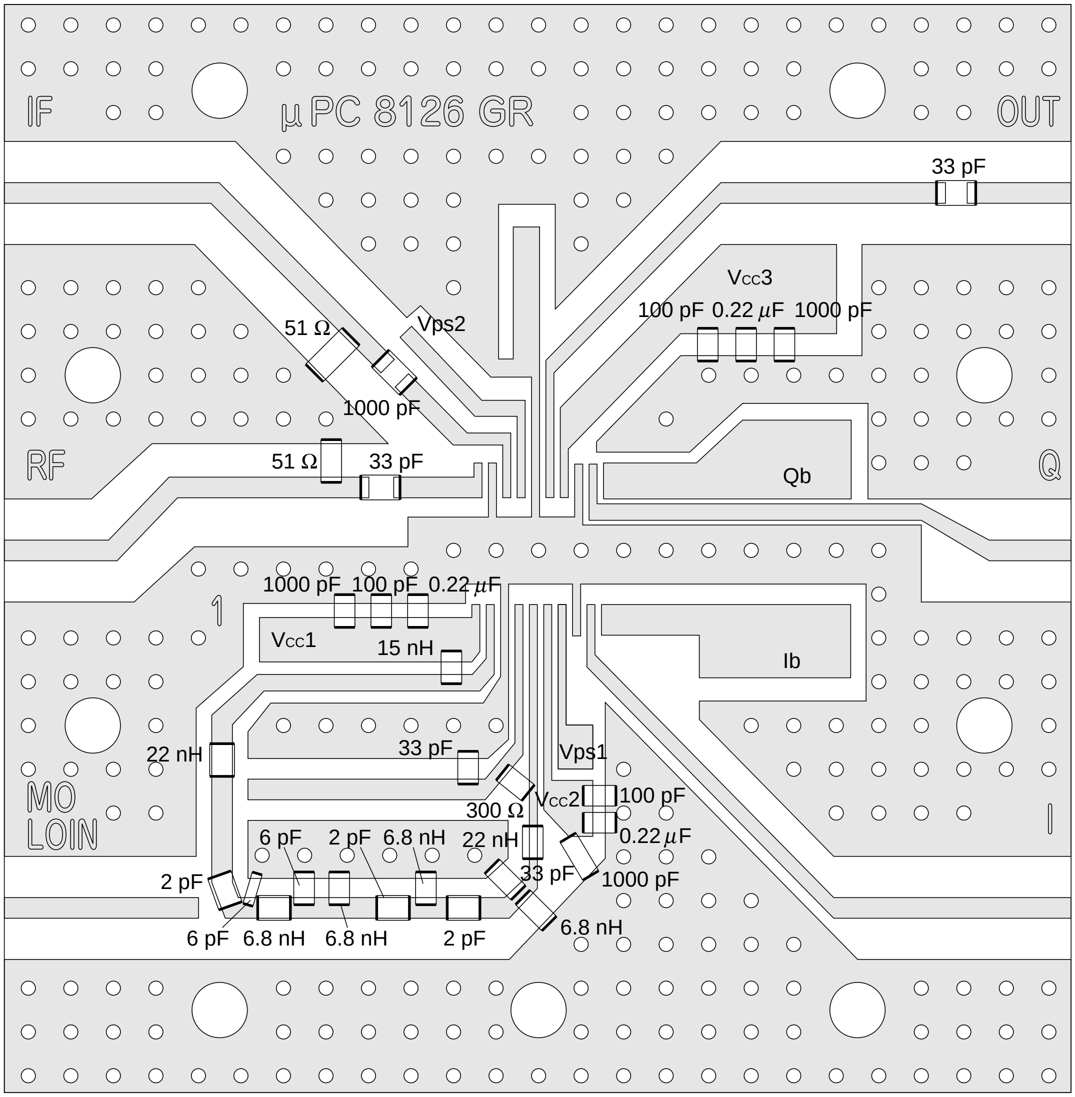
TABLE 1 : Example of filter connect between pin2 and pin5

Kind of filter	BPF	
Circuit		fo = 948 MHz Insertion Loss = 3.5 dB

Notes 1. 50 Ω matching circuit at fMIXout = 948 MHz.
In case of using NEC's evaluation board.

2. 50 Ω matching circuit at fLoin = 948 MHz.
In case of using NEC's evaluation board.

EXAMPLE OF TEST CIRCUIT 1 ASSEMBLED ON EVALUATION BOARD

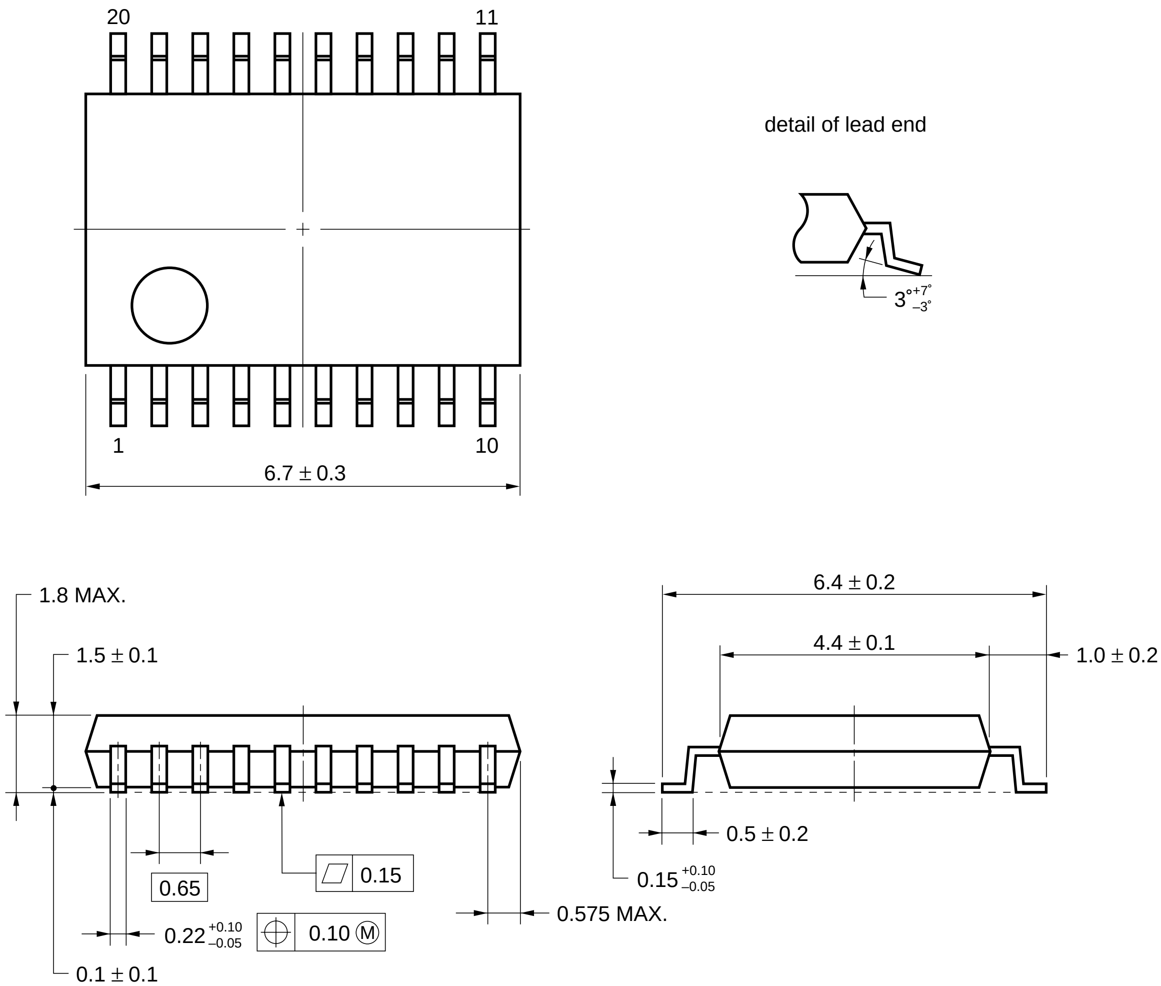


Notes **1.** Double-sided patterning with 35 mm thick copper on polyhimid board.
2. GND pattern on backside.
3. solder coating over patterns.
4. ○, ◯ indicate through-holes.

NOTICE The test circuits and board pattern on data sheet are for performance evaluation use only. In case of actual design-in, matching circuit should be determined using S-parameter of desired frequency in accordance to actual mounting pattern.

PACKAGE DIMENSIONS

★ **20 PIN PLASTIC SSOP (225 mil) (UNIT: mm)**



NOTE Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

NOTE ON CORRECT USE

(1) Observe precautions for handling because of electrostatic sensitive devices.
(2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation).
(3) Keep the track length of the ground pins as short as possible.
(4) Connect a bypass capacitor (e.x. 1 000 pF) to the V_{CC} pin.

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered in the following recommended conditions. Other soldering method and conditions than the recommended conditions are to be consulted with sales representatives.

μPC8126GR

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature: 235 °C or below, Reflow time: 30 seconds or below (210 °C or higher) Number of reflow process: 2, Exposure limit[Note]: None	IR35-00-2
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher) Number of reflow process: 2, Exposure limit[Note]: None	VP15-00-2
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below, Number of flow process: 1, Exposure limit[Note]: None	WS60-00-1
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 3 seconds/pin or below, Exposure limit[Note]: None	

Note Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Caution Apply only a single process at once, except for ''Partial heating method''.
For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).

[MEMO]