NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2734GR

L-BAND DOWN-CONVERTER IC

DESCRIPTION

The μPC2734GR is a silicon monolithic IC designed for L band down-converter. This IC consists of double balanced mixer (DBM), local oscillator, local oscillation buffer amplifier, IF amplifier, buffer amplifier for SAW filter and voltage regulator.

The package is 20-pin SSOP suitable for high-density surface mount.

The μPC2734GR is manufactured using NEC's 20 GHz f_T NESAT™ III silicon bipolar process. This process uses silicon nitride passivation film and gold electrodes. These materials can protect chip surface from external pollution and prevent corrosion/migration. Thus, this IC has excellent performance, uniformity and reliability.

FEATURES

- Wide band operation f_{RF} = 0.9 to 2.1 GHz
- Dual IF outputs for BS and CS Band.
- Single-end push-pull IF amplifier suppresses fluctuation of output impedance.
- Supply voltage : 5 V
- Packaged in 20-pin SSOP suitable for high-density mounting.

★ APPLICATION

- L-Band receiver (0.9 to 2.1 GHz)

ORDERING INFORMATION

Part Number	Package	Supplying Form
μPC2734GR-E1	20-pin Plastic SSOP (5.72mm (225 mil))	Embossed tape 12 mm wide. Pin 1 indicates pull-out direction of tape. Qty 2.5 kp/reel.

Remark To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: μPC2734GR)

Caution electro-static sensitive devices

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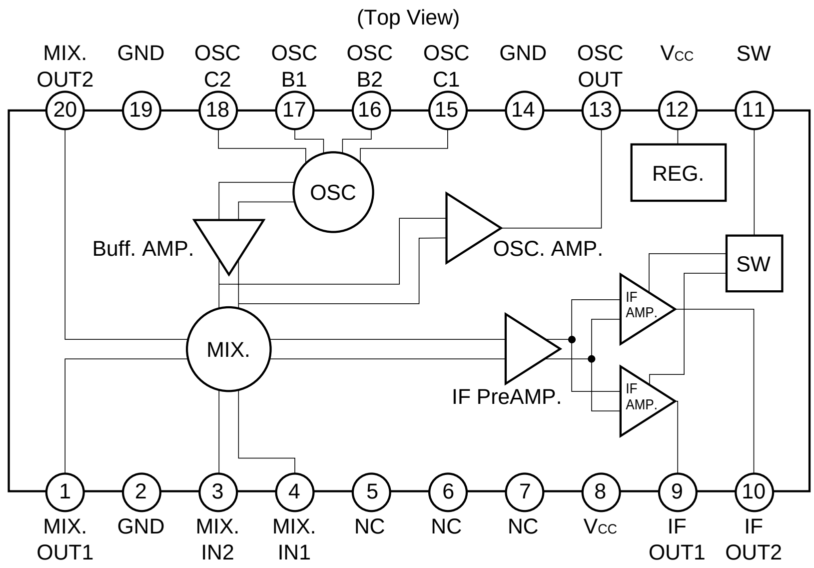
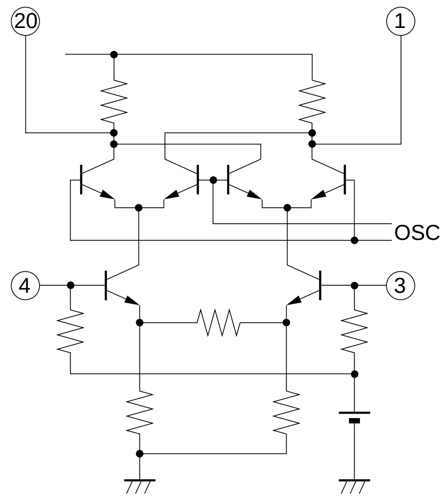
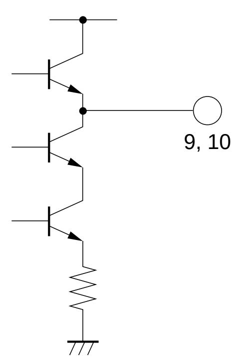
Printed in Japan

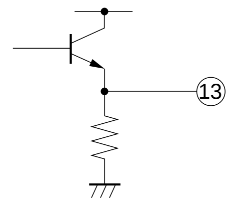
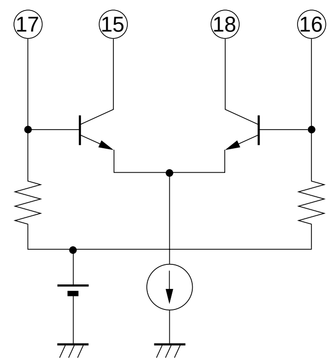
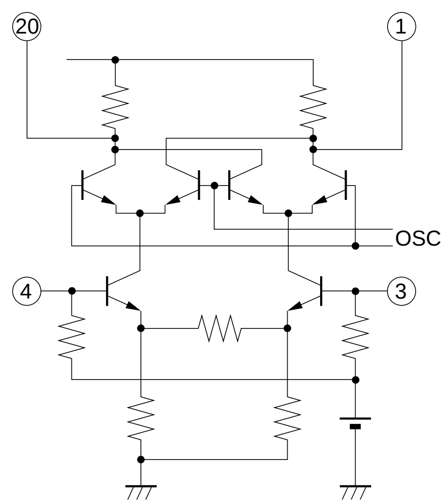
The mark ★ shows major revised points.

INTERNAL BLOCK DIAGRAM AND PIN CONFIGURATION



PIN FUNCTIONS

Pin No.	Pin Name	Pin Voltage TYP. (V)	Function and Explanation	Equivalent Circuit
1	MIX. OUT1	4.2	Mixer output pin for IF band pass filter.	
2	GND	0.0	GND pin of mixer, IF amplifier, and regulator switch.	
3	MIX. IN2	2.4	RF signal input pin. In case of single input, 3 pin or 4 pin should be grounded through capacitor.	
4	MIX. IN1	2.4		
5 6 7	NC	———	Non Connection.	
8	V_{CC}	5.0	Power supply pin of mixer, IF amplifier, and regulator switch.	
9	IF OUT1	3.1	IF output pin. If switch pin is open or less than 2 volt (TYP.), signal comes through.	
10	IF OUT2	3.1	IF output pin. If switch pin is more than 3 volt (TYP.), signal comes through.	
11	SW	2.0	Switching pin of IF output1 or IF output2 pin.	
12	V_{CC}	5.0	Power supply pin of buffer amplifier and oscillator amplifier.	

Pin No.	Pin Name	Pin Voltage TYP. (V)	Function and Explanation	Equivalent Circuit
13	OSC OUT	3.4	Oscillator output pin.	
14	GND	0.0	GND pin of buffer amplifier and oscillator amplifier.	
15	OSC C1	5.0	Loads should be connected to collector pin.	
16	OSC B2	2.9	Base pin of oscillator. Grounded through capacitor.	
17	OSC B1	2.9	Base pin of oscillator. Assemble LC resonator with 18 pin through capacitor to oscillate with active feedback loop.	
18	OSC C2	5.0	Loads should be connected to collector pin.	
19	GND	0.0	GND pin of mixer, IF amplifier, regulator switch.	
20	MIX. OUT2	4.2	Mixer output pin for IF band pass filter.	

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25 °C	6.0	V
Power Dissipation	P_D	T_A = +85 °C Note	430	mW
Operating Ambient Temperature	T_A		–40 to +85	°C
Storage Temperature	T_{stg}		–55 to +150	°C

Note Mounted on 50 × 50 × 1.6 mm double copper epoxy glass board.

RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
Operating Ambient Temperature	T_A	–40	+25	+85	°C

ELECTRICAL CHARACTERISTICS (T_A = +25 °C, V_{CC} = 5 V, Note)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	no input signal	28	40	52	mA
Lower Input Frequency	$f_{RF}1$		–	–	0.9	GHz
Upper Input Frequency	$f_{RF}2$		2.1	–	–	GHz
Conversion Gain 1	CG1	f_{RF} = 0.9 GHz, P_{in} = –30 dBm, f_{IF} = 402.8 MHz	10.0	13.0	16.0	dB
Conversion Gain 2	CG2	f_{RF} = 2.1 GHz, P_{in} = –30 dBm, f_{IF} = 402.8 MHz	7.5	10.5	13.5	dB
Conversion Gain 3	CG3	f_{RF} = 0.9 GHz, P_{in} = –30 dBm, f_{IF} = 479.5 MHz	9.0	12.0	15.0	dB
Conversion Gain 4	CG4	f_{RF} = 2.1 GHz, P_{in} = –30 dBm, f_{IF} = 479.5 MHz	7.0	10.0	13.0	dB
Noise Figure 1	NF1	f_{RF} = 0.9 GHz, f_{IF} = 402.8 MHz	–	9.0	12.0	dB
Noise Figure 2	NF2	f_{RF} = 2.1 GHz, f_{IF} = 402.8 MHz	–	14.0	17.0	dB
Noise Figure 3	NF3	f_{RF} = 0.9 GHz, f_{IF} = 479.5 MHz	–	10.0	13.0	dB
Noise Figure 4	NF4	f_{RF} = 2.1 GHz, f_{IF} = 479.5 MHz	–	15.0	18.0	dB
Saturated Output Power 1	$P_{O(SAT)}1$	f_{RF} = 0.9 GHz, P_{in} = 0 dBm, f_{IF} = 402.8 MHz	1.0	4.0	–	dBm
Saturated Output Power 2	$P_{O(SAT)}2$	f_{RF} = 2.1 GHz, P_{in} = 0 dBm, f_{IF} = 402.8 MHz	1.0	4.0	–	dBm
Saturated Output Power 3	$P_{O(SAT)}3$	f_{RF} = 0.9 GHz, P_{in} = 0 dBm, f_{IF} = 479.5 MHz	0.5	3.5	–	dBm
Saturated Output Power 4	$P_{O(SAT)}4$	f_{RF} = 2.1 GHz, P_{in} = 0 dBm, f_{IF} = 479.5 MHz	0.0	3.0	–	dBm
3rd Order Intermodulation Distortion 1	$IM_3 1$	f_{RF} = 0.9, 0.93 GHz, P_{in} = –25 dBm	–	47	–	dBc
3rd Order Intermodulation Distortion 2	$IM_3 2$	f_{RF} = 2.1, 2.13 GHz, P_{in} = –25 dBm	–	49	–	dBc

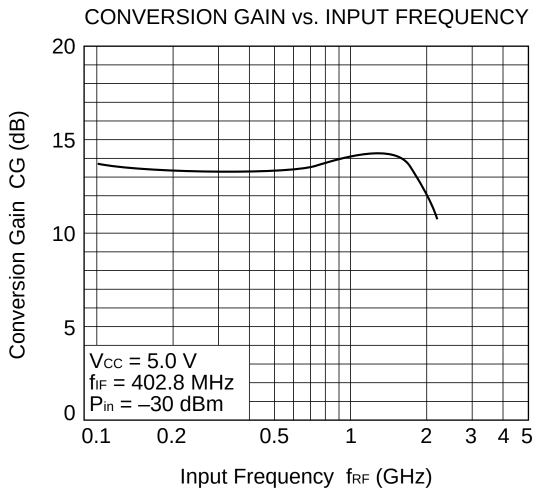
Note By measurement circuit

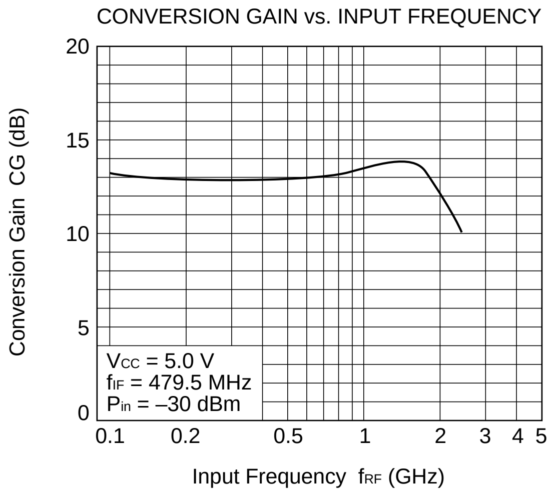
STANDARD CHARACTERISTICS (REFERENCE VALUES) (T_A = +25 °C, V_{CC} = 5 V, Note)

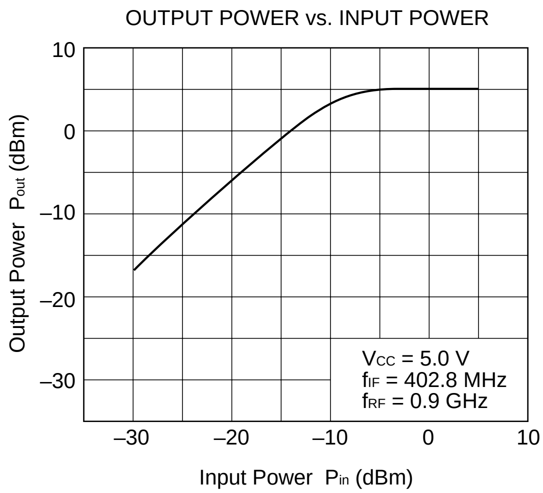
Parameter	Symbol	Test Conditions	Reference Values			Unit
			MIN.	TYP.	MAX.	
Lower Input Frequency	$f_{RF}1$		–	–	0.9	GHz
Upper Input Frequency	$f_{RF}2$		2.1	–	–	GHz
Conversion Gain 1	CG1	f_{RF} = 0.9 GHz, P_{in} = –30 dBm, f_{IF} = 402.8 MHz	–	14.0	–	dB
Conversion Gain 2	CG2	f_{RF} = 2.1 GHz, P_{in} = –30 dBm, f_{IF} = 402.8 MHz	–	14.5	–	dB
Conversion Gain 3	CG3	f_{RF} = 0.9 GHz, P_{in} = –30 dBm, f_{IF} = 479.5 MHz	–	13.5	–	dB
Conversion Gain 4	CG4	f_{RF} = 2.1 GHz, P_{in} = –30 dBm, f_{IF} = 479.5 MHz	–	14.0	–	dB
Noise Figure 1	NF1	f_{RF} = 0.9 GHz, P_{in} = –30 dBm, f_{IF} = 402.8 MHz	–	9.7	–	dB
Noise Figure 2	NF2	f_{RF} = 2.1 GHz, P_{in} = –30 dBm, f_{IF} = 402.8 MHz	–	11.0	–	dB
Noise Figure 3	NF3	f_{RF} = 0.9 GHz, P_{in} = –30 dBm, f_{IF} = 479.5 MHz	–	9.7	–	dB
Noise Figure 4	NF4	f_{RF} = 2.1 GHz, P_{in} = –30 dBm, f_{IF} = 479.5 MHz	–	11.0	–	dB
Saturated Output Power 1	$P_{O(SAT)}1$	f_{RF} = 0.9 GHz, P_{in} = 0 dBm, f_{IF} = 402.8 MHz	–	5.0	–	dBm
Saturated Output Power 2	$P_{O(SAT)}2$	f_{RF} = 2.1 GHz, P_{in} = 0 dBm, f_{IF} = 402.8 MHz	–	5.0	–	dBm
Saturated Output Power 3	$P_{O(SAT)}3$	f_{RF} = 0.9 GHz, P_{in} = 0 dBm, f_{IF} = 479.5 MHz	–	4.0	–	dBm
Saturated Output Power 4	$P_{O(SAT)}4$	f_{RF} = 2.1 GHz, P_{in} = 0 dBm, f_{IF} = 479.5 MHz	–	5.5	–	dBm
3rd Order Intermodulation Distortion 1	$IM_3 1$	f_{RF} = 0.9, 0.93 GHz, P_{in} = –25 dBm	–	44	–	dBc
3rd Order Intermodulation Distortion 2	$IM_3 2$	f_{RF} = 2.1, 2.13 GHz, P_{in} = –25 dBm	–	43	–	dBc

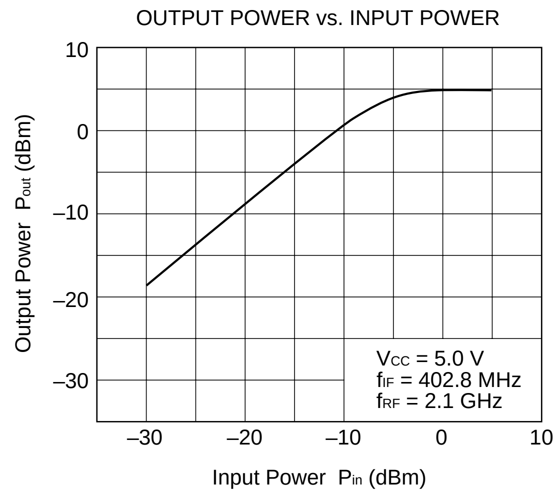
Note By application circuit

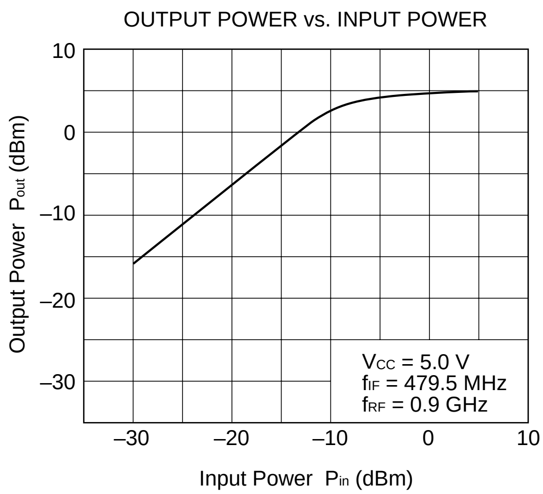
TYPICAL CHARACTERISTICS (T_A = +25 °C) – on Measurement Circuit –

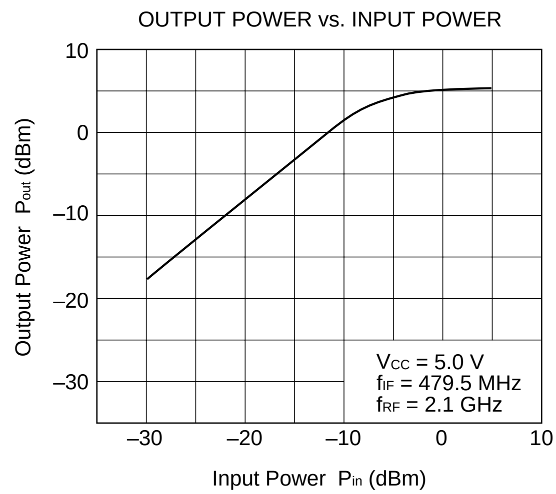




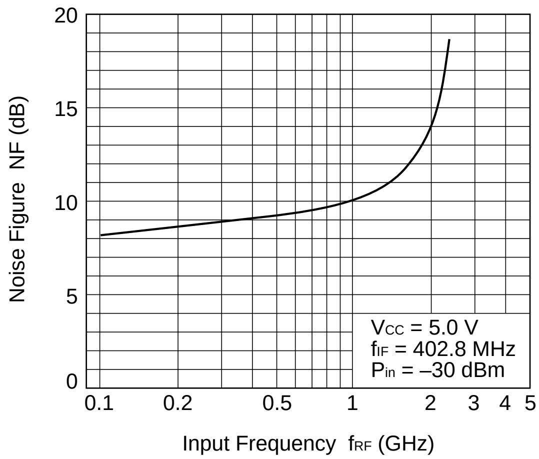




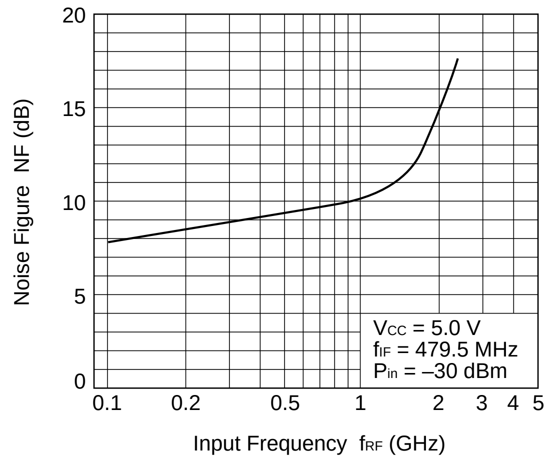




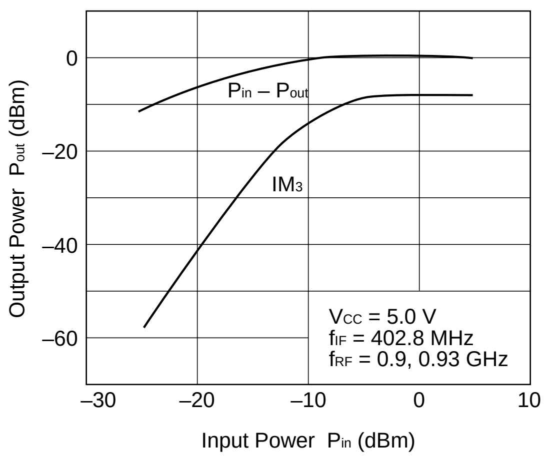
NOISE FIGURE vs. INPUT FREQUENCY



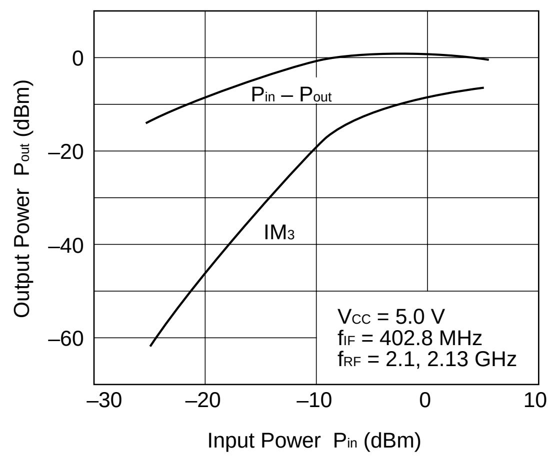
NOISE FIGURE vs. INPUT FREQUENCY



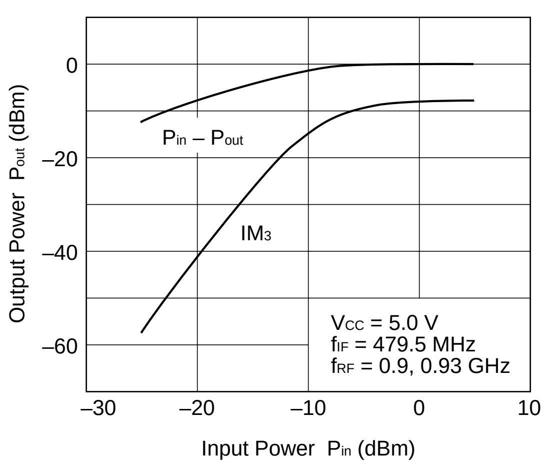
OUTPUT POWER vs. INPUT POWER



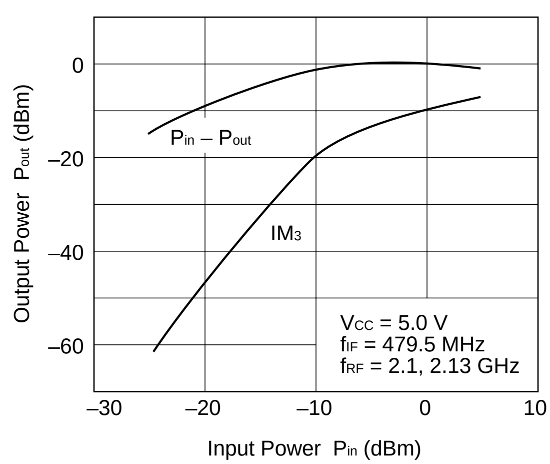
OUTPUT POWER vs. INPUT POWER



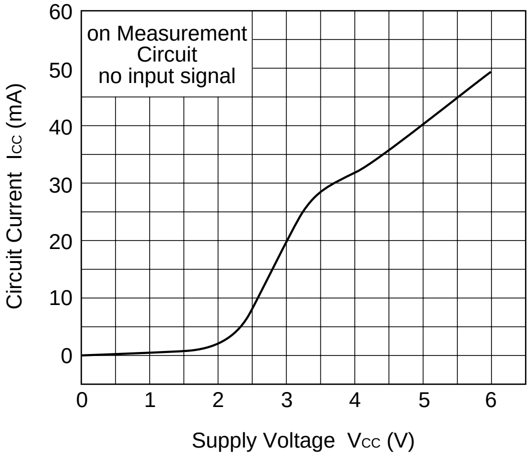
OUTPUT POWER vs. INPUT POWER



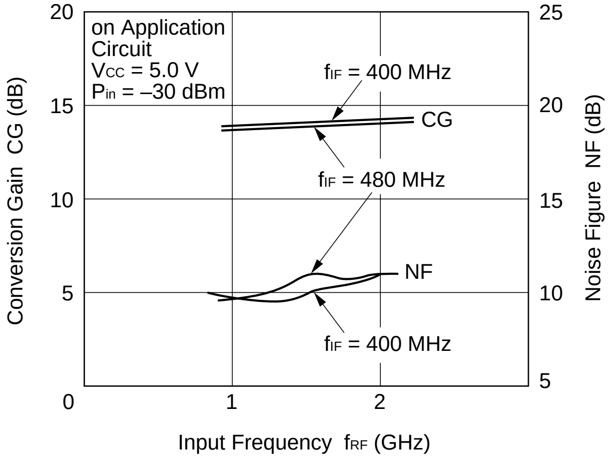
OUTPUT POWER vs. INPUT POWER



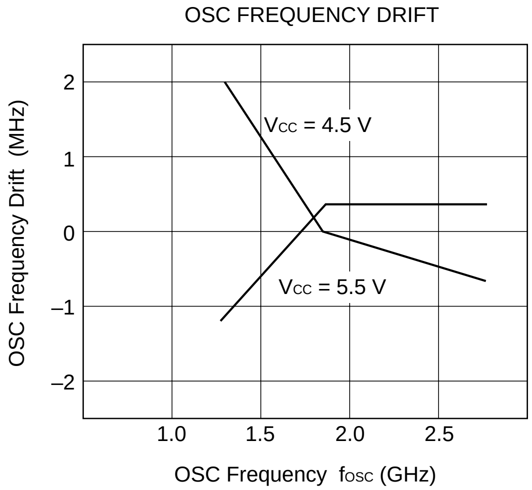
CIRCUIT CURRENT vs. SUPPLY VOLTAGE

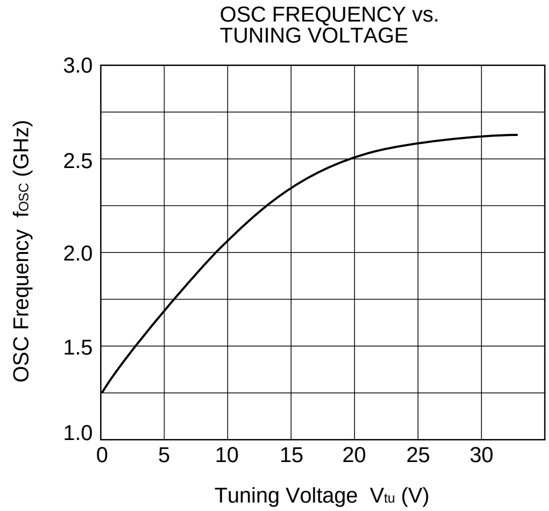


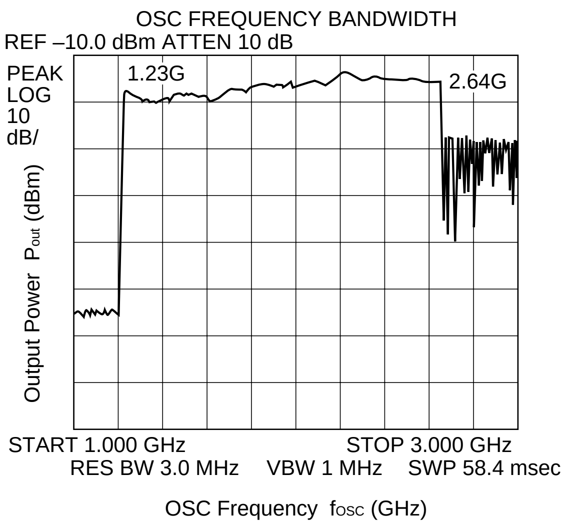
CONVERSION GAIN AND NOISE FIGURE vs. INPUT FREQUENCY



STANDARD CHARACTERISTICS (T_A = +25 °C) – on Application Circuit –

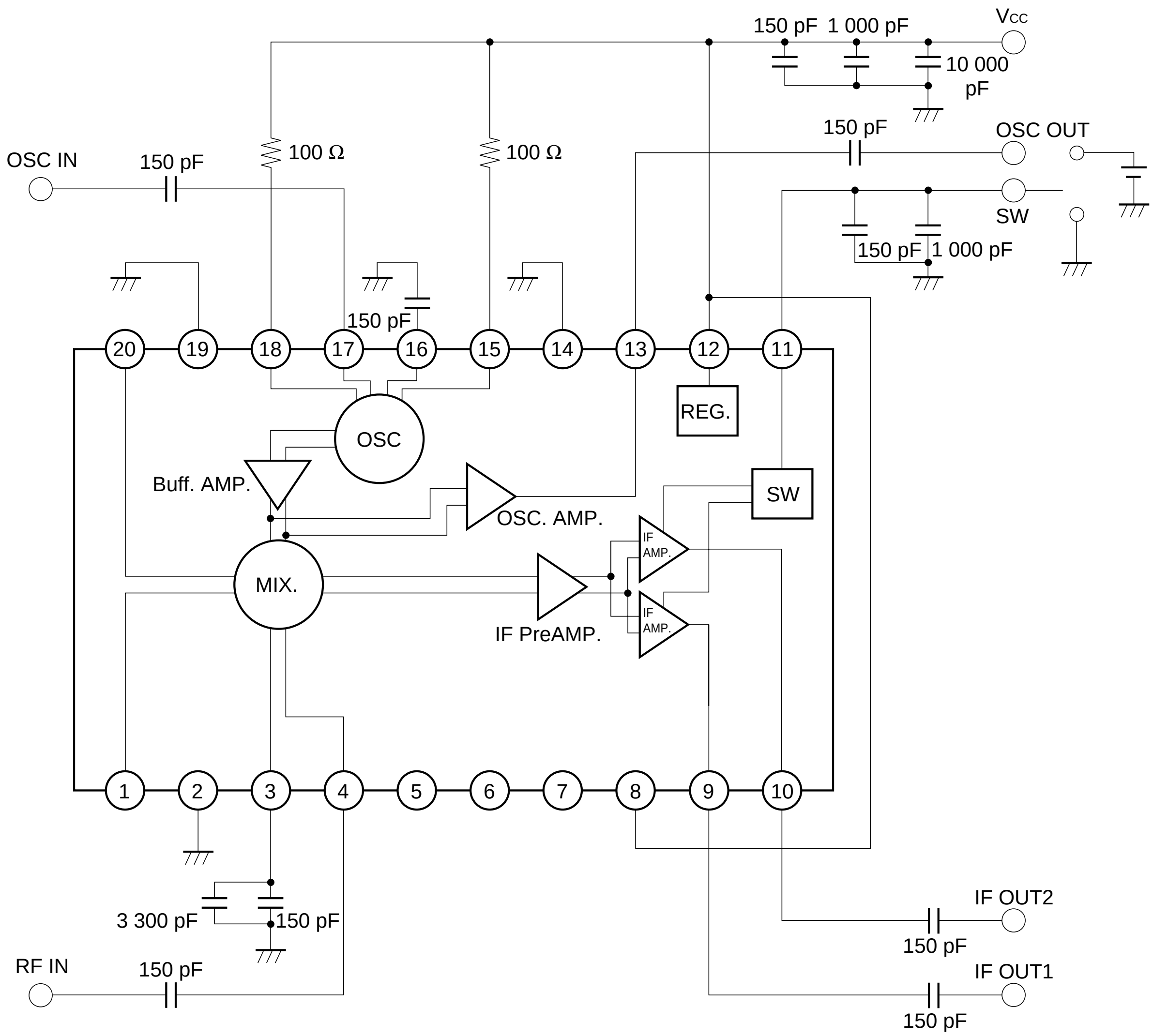




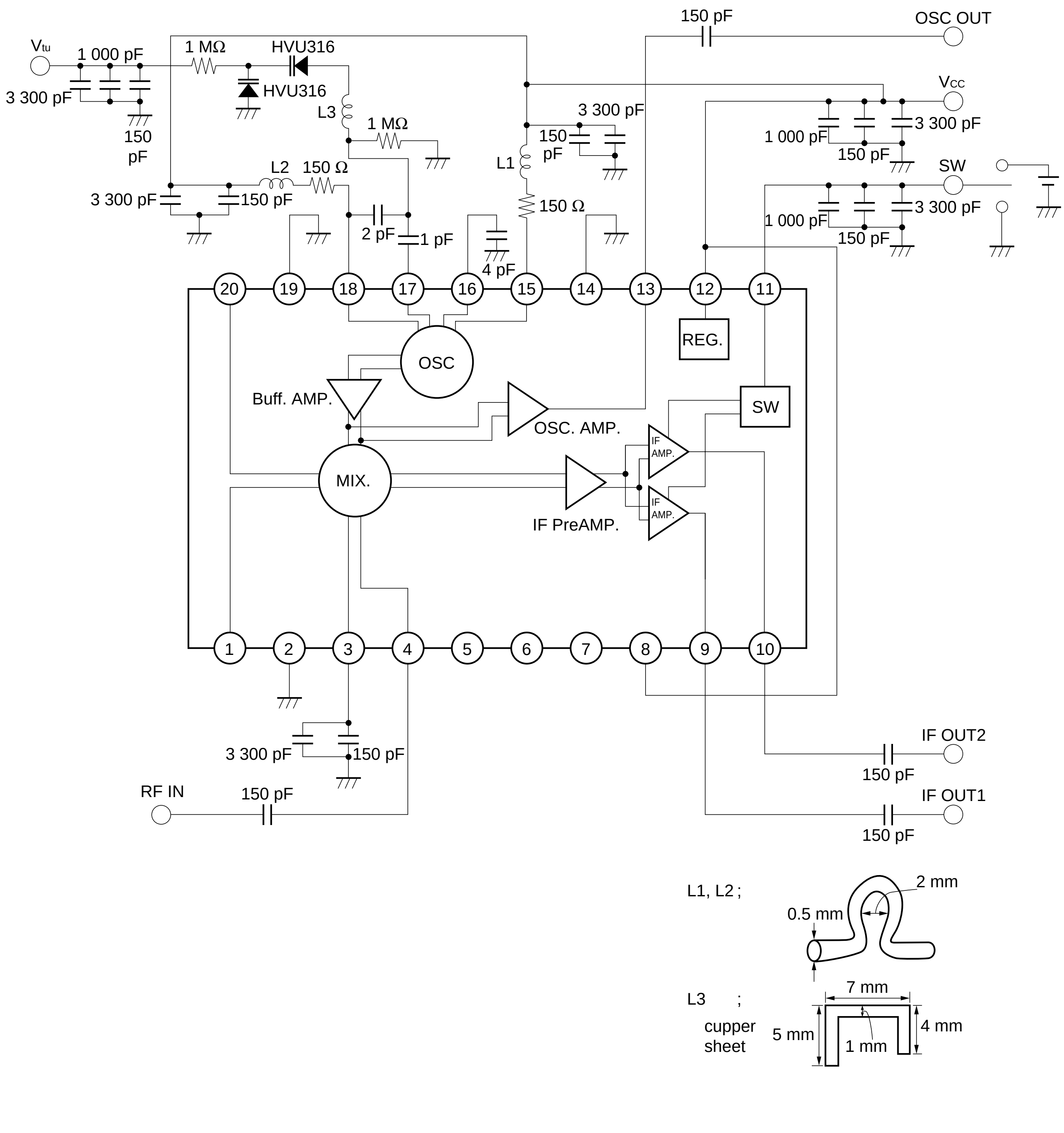


Remark The graphs indicate nominal characteristics.

MEASUREMENT CIRCUIT

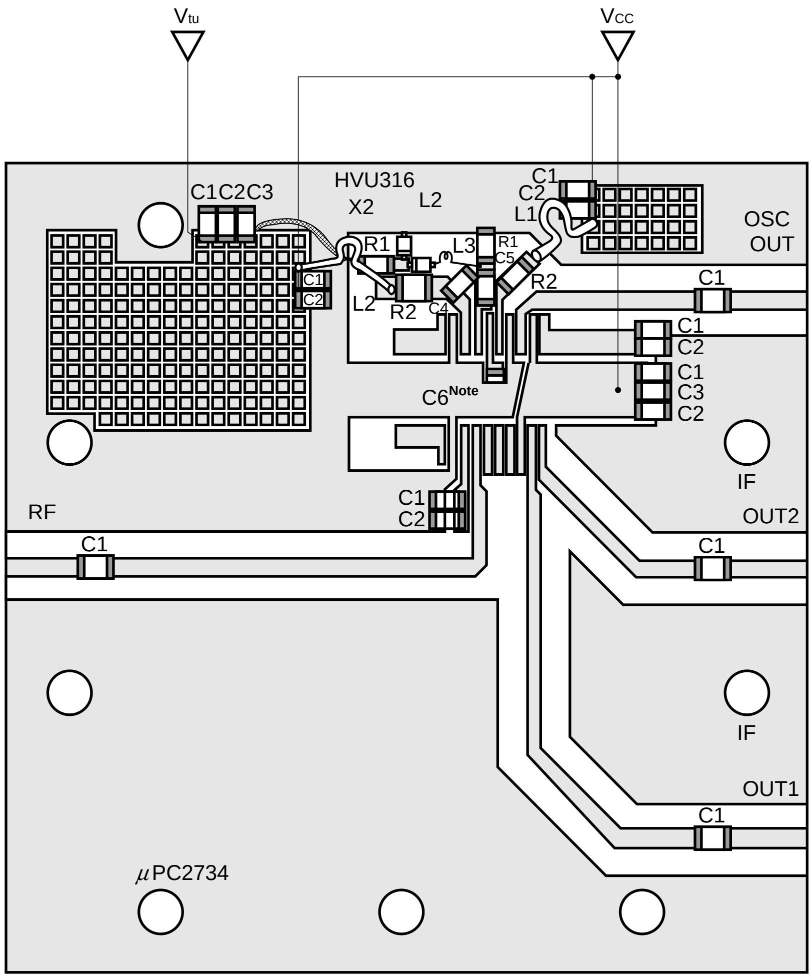


APPLICATION CIRCUIT EXAMPLE



The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

Illustration of the application circuit assembled on evaluation board



C1 : 150pF

C2 : 3 300pF

C3 : 1 000pF

C4 : 2pF

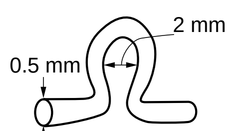
C5 : 1pF

C6 : 4pF **Note** assembled on the back side

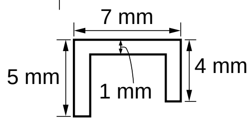
R1 : 1MΩ

R2 : 150Ω

L1, L2 :

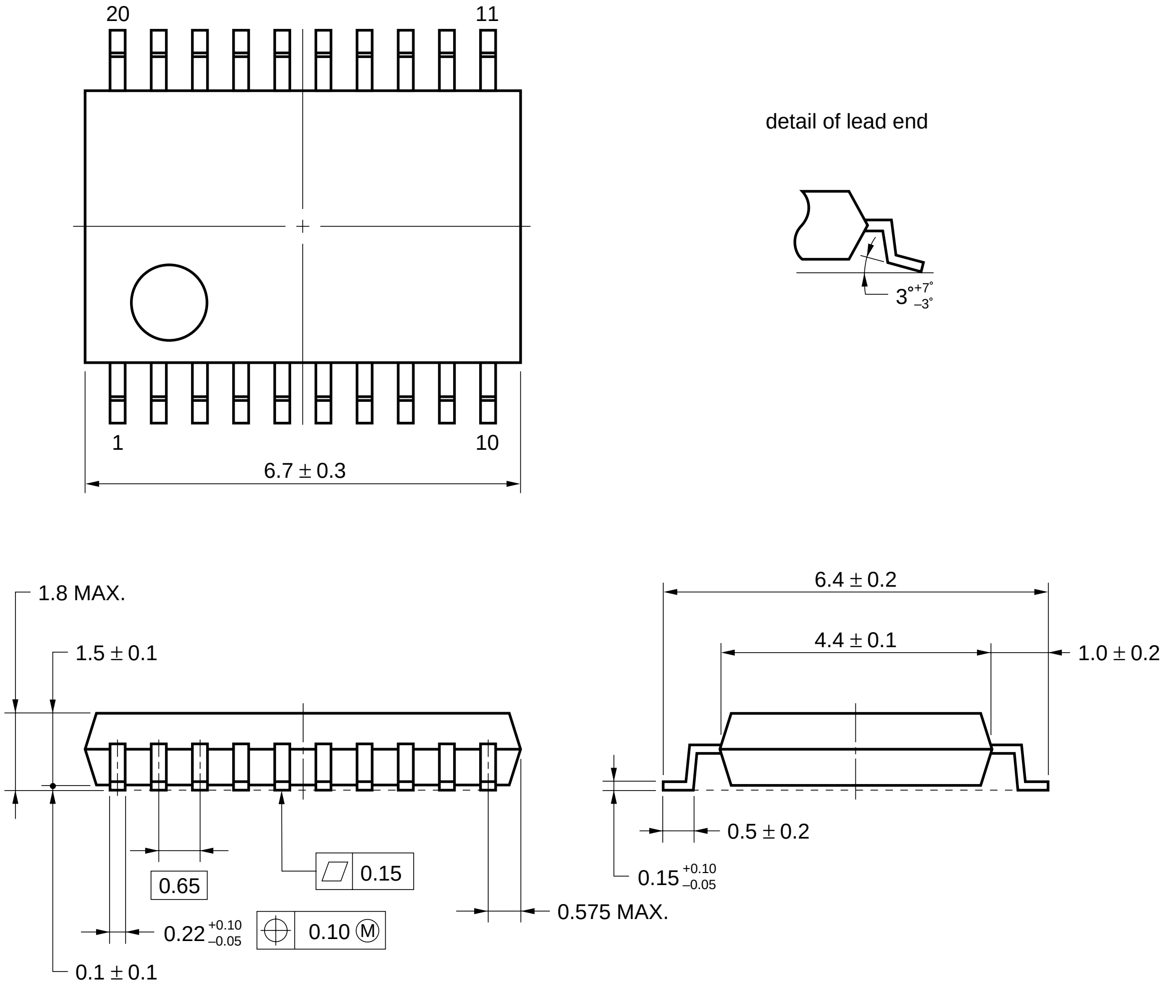


L3 :
cupper sheet



★ PACKAGE DIMENSIONS

20 PIN PLASTIC SSOP (5.72 mm(225)) (UNIT: mm)



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

RECOMMENDED SOLDERING CONDITIONS

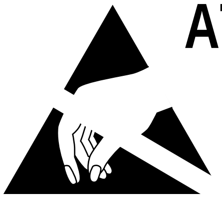
This product should be soldered under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235°C or below Time: 30 seconds or less (at 210°C) Count: 3, Exposure limit: None[Note]	IR35-00-3
VPS	Package peak temperature: 215°C or below Time: 40 seconds or less (at 200°C) Count: 3, Exposure limit: None[Note]	VP15-00-3
Wave Soldering	Soldering bath temperature: 260°C or below Time: 10 seconds or less Count: 1, Exposure limit: None[Note]	WS60-00-1
Partial Heating	Pin temperature: 300°C Time: 3 seconds or less (per side of device) Exposure limit: None[Note]	–

Note After opening the dry pack, keep it in a place below 25°C and 65% RH for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).



ATTENTION

OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

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M7 98.8