HA16846T

Low Voltage High Performance IF-IC for Digital Mobile-phone

The HA16846T is a high performance IF system incorporating a wide bandwidth mixer and limitter amp, and will function down to 2.7 V. Received Signal Strength Indicator (RSSI) is fast and compensated for temperature.

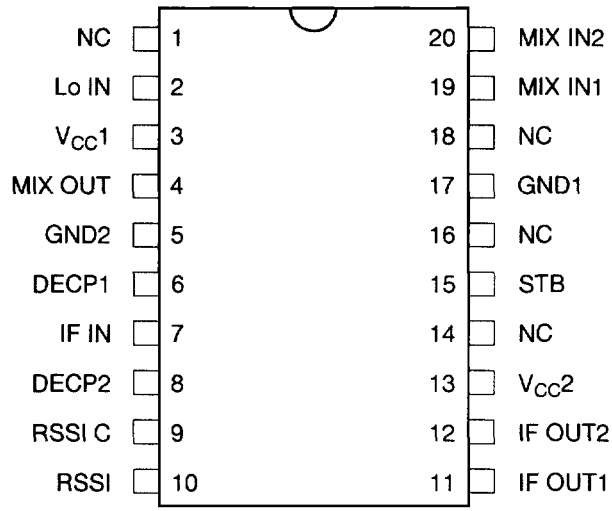
Features

- 300 MHz wide bandwidth mixer
- 30 MHz wide bandwidth limitter amp
- Temperature compensated fast RSSI
- Low power consumption: 5.8 mA Typ at 3 V
- Stand-by mode (I_{CC} = 0 µA Typ)
- Function down to 2.7 V
- Surface-mounted small outline package
  : TSSOP-20 (TTP-20DA)

Functions

- Wide bandwidth mixer
- Wide bandwidth limitter amp
- Received Signal Strength Indicator (RSSI)
- Differential output stage
- RSSI buffer amp
- Stand-by mode

Pin Arrangement



(Top view)

Pin Description

Pin No.	Symbol	Description
1	NC	No connection pin
2	Lo IN	Input pin for local frequency
3	$V_{CC}1$	Power supply
4	MIX OUT	Mixer output
5	GND2	Ground
6	DECP1	DC feedback decoupling
7	IF IN	Input pin to IF amp
8	DECP2	DC feedback decoupling
9	RSSI C	Detection pin for RSSI
10	RSSI	RSSI output
11	IF OUT1	Defferential output pin for IF
12	IF OUT2	Defferential output pin for IF
13	$V_{CC}2$	Power supply
14	NC	No connection pin
15	STB	Control pin for stand-by
16	NC	No connection pin
17	GND1	Ground
18	NC	No connection pin
19	MIX IN1	Defferential input pin for mixer
20	MIX IN2	RF input pin to mixer

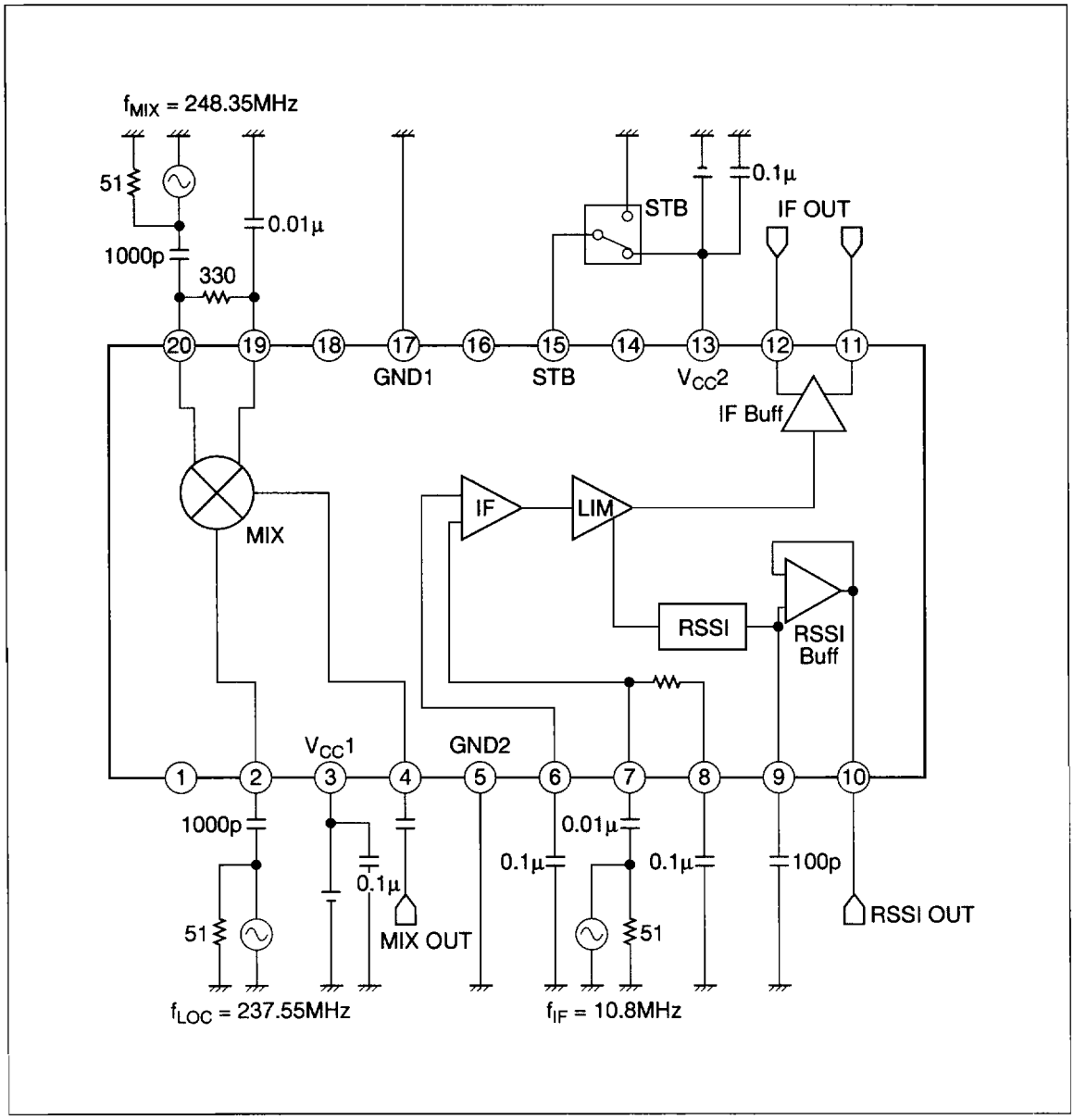
Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	7	V
Power dissipation	P_T	300	mW
Operating temperature	Topr	–20 to +70	°C
Storage temperature	Tstg	–55 to +125	°C

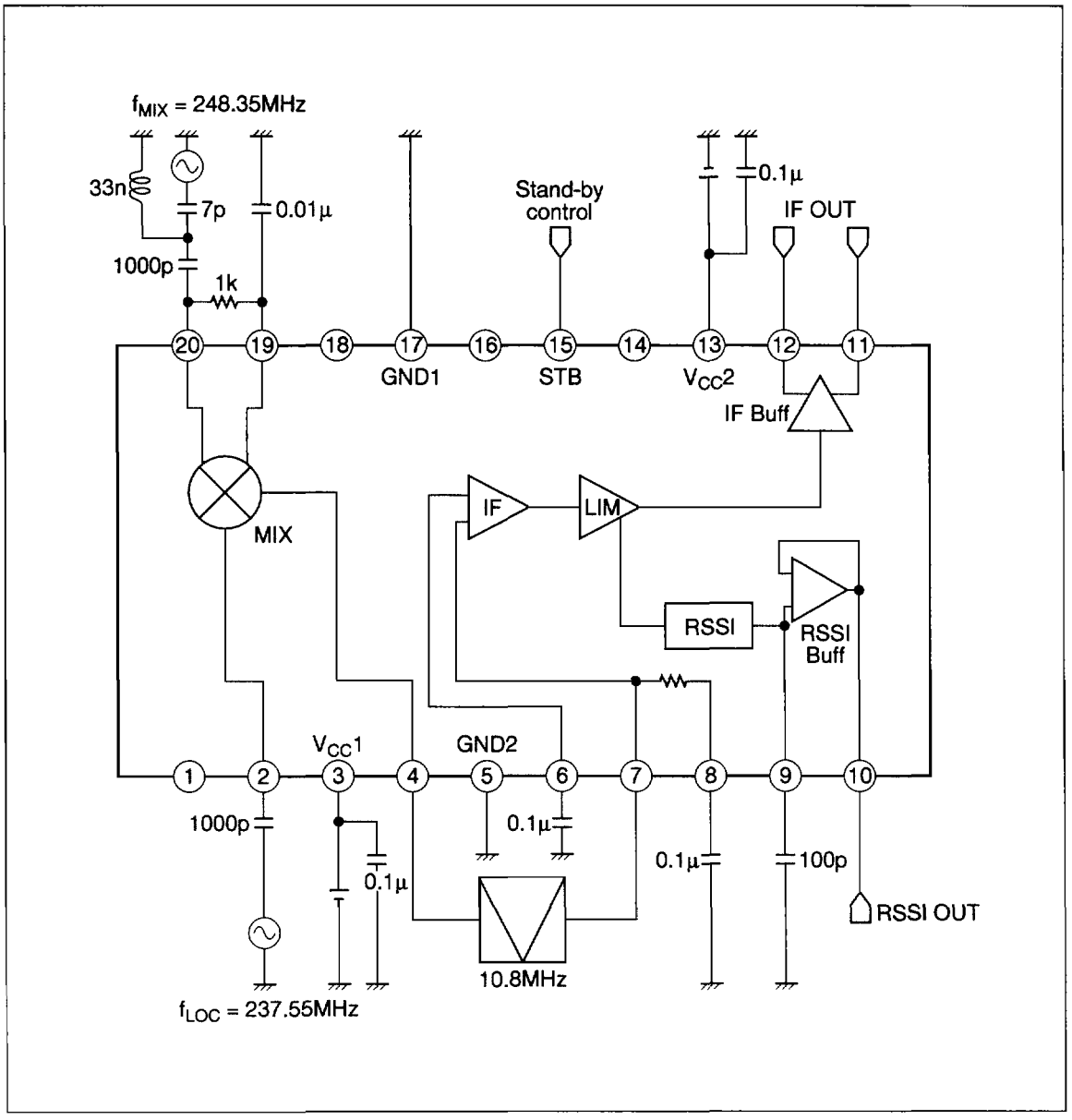
Electrical Characteristics (V_{CC} = 3 V, Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Quiescent current	I_{CC}	—	5.8	9	mA	No signal
Current at stand-by mode	I_{ST}	—	0	10	µA	Pin 15 = 0V
Conversion gain	G_{VMIX}	19	22	25	dB	f_{MIX} = 248.35 MHz
Third-order intercept point	IP_3	8	12	—	dBm	at mixer output
Mixer output resistance	Z_{OMIX}	—	380	—	Ω	
Mixer noise figure	NF_{MIX}	—	7	—	dB	
IF gain	G_{VIF}	—	80	—	dB	f_{IF} = 10.8 MHz
IF output level	V_{OIF}	0.3	0.5	0.7	V_{P-P}	f_{IF} = 10.8 MHz
IF output duty	Duty	40	50	60	%	
IF input resistance	Z_{INIF}	231	330	429	Ω	
RSSI output1	V_{RSSI1}	—	0.15	0.55	V	No signal
RSSI output2	V_{RSSI2}	0.3	0.5	0.7	V	V_{IN} = –60 dBm
RSSI output3	V_{RSSI3}	1.4	1.7	2.0	V	V_{IN} = –10 dBm
RSSI dynamic range	D_R	—	80	—	dB	
Input H voltage for stand-by pin	V_{IH}	1.8	—	—	V	Operation
Input L voltage for stand-by pin	V_{IL}	—	—	0.8	V	Stand-by
Input H current for stand-by pin	I_{IH}	—	40	60	µA	V_{IH} = 2 V
Input L current for stand-by pin	I_{IL}	—	0	10	µA	V_{IL} = 0 V

Test Circuit



Circuit Example



Function Descriptions

2nd Mixer

The HA16846T incorporate a mixer with 300 MHz bandwidth. Please insert a desirable resistance between pin 19 and pin 20. Pin 19 is connected to Vref (1.1 V). Mixer NF is 7 dB Typ. It is suitable for conversion gain to supply local frequency at −10 dBm to mixer.

IF Limitter Amp, IF Buffer

IF limitter amp is directly connected with IF buffer in IC and take off external parts. Bandwidth is 30 MHz and gain is 80 dB. Output level at IF buffer is 0.5 V_{P-P} Typ, so it is easy to design interface. Equivalent circuit of this output stage is shown at fig. 1. The I_{OSINK} is 300 μA Typ.

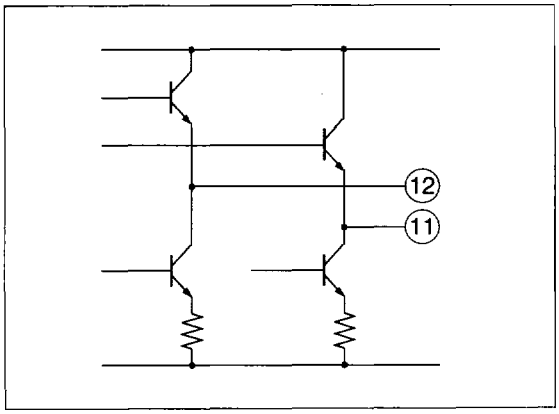


Fig. 1 Equivalent circuit for output stage

RSSI

RSSI is compensated for temperature. The dynamic range is over 80 dB and good at linearity. Resistance at pin 9 is 73.5 kΩ Typ. This resistance and capacitance between pin 9 and GND are reference to RSSI rise time, so it is suitable to select capacitance of about 100 pF.

Stand-by

A circuit for stand-by terminal is shown at fig. 2. Quiescent current (I_{CC}) is 0 μA Typ at $V_{15} \leq 0.8$ V. At $V_{CC} \geq V_{15} \geq 2$ V, change to operating mode. Then I_{IH} is indicated at below equation.

$$I_{IH} = \frac{V_{15} - 2V_F}{17k}$$

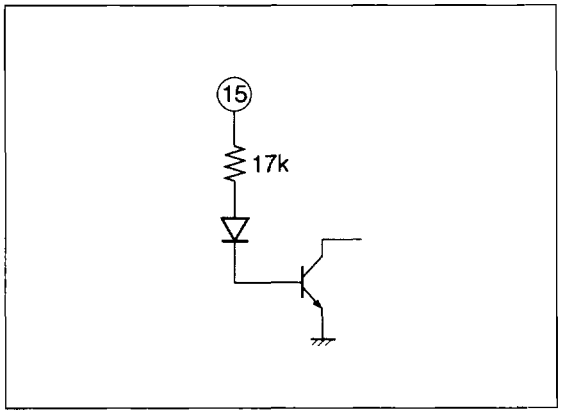
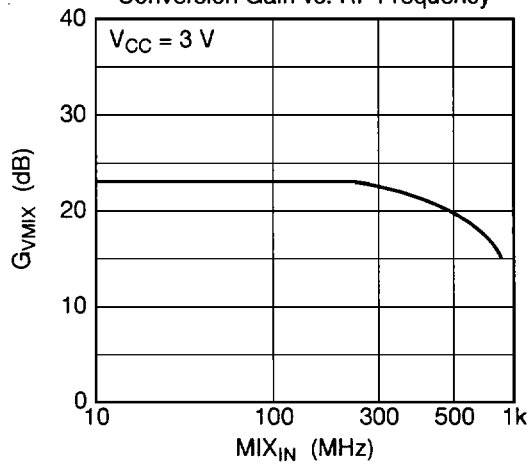


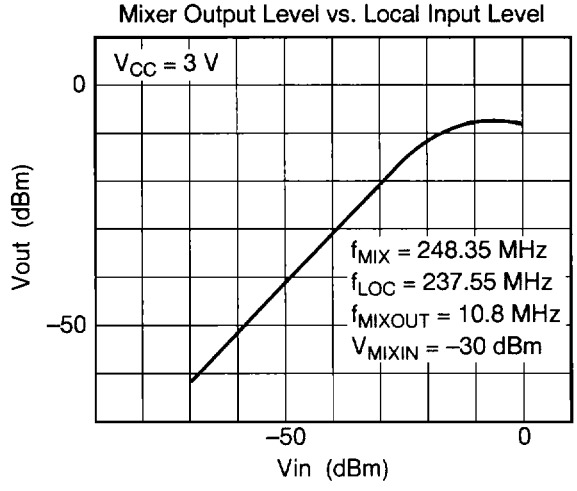
Fig. 2 Stand-by pin (pin 15)

Main Characteristics

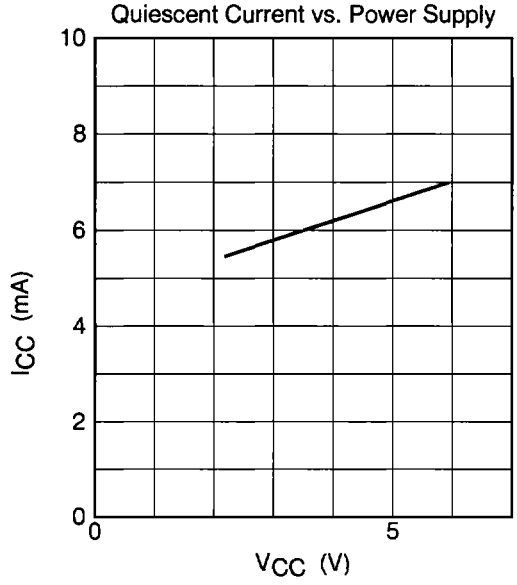
Conversion Gain vs. RF Frequency



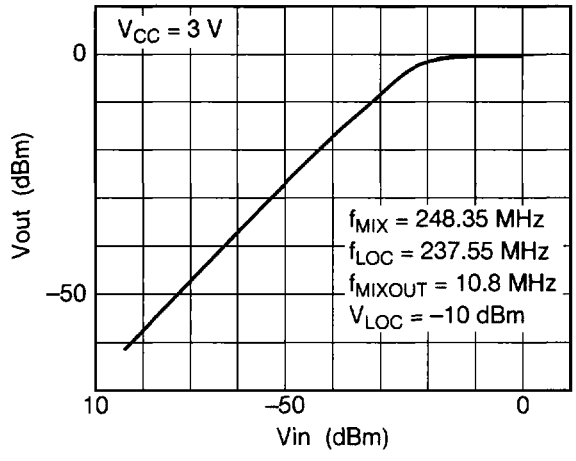
Mixer Output Level vs. Local Input Level



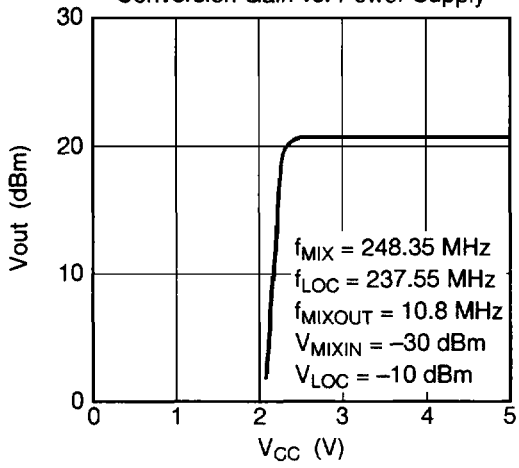
Quiescent Current vs. Power Supply



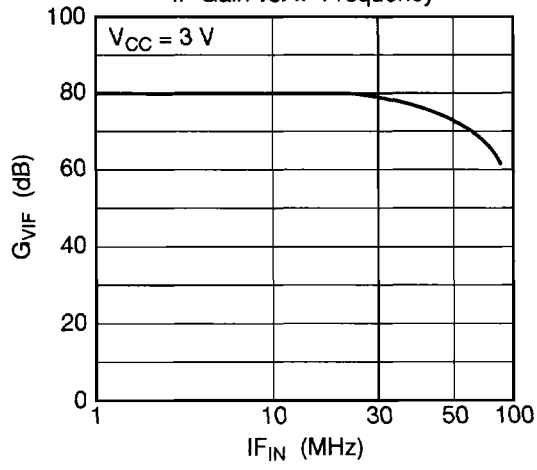
Mixer Output Level vs. Mixer Input Level

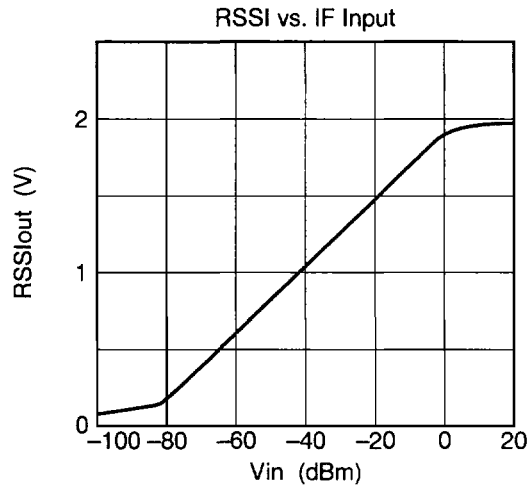


Conversion Gain vs. Power Supply



IF Gain vs. IF Frequency




RSSI vs. IF Input
RSSIout (V)
2
1
0
–100
–80
–60
–40
–20
0
20
Vin (dBm)