

# IF detector IC for 900MHz spread spectrum cordless phones

## BH4127FV

The BH4127FV is a mixer, IF amplifier, and FM detector IC developed for use with 900MHz spread spectrum cordless phones

### ●Applications

900MHz spread spectrum cordless phones

### ●Features

- 1) Built-in mixer circuit, IF circuit, RSSI circuit, and FM detector circuit.
- 2) Operates at mixer input frequencies ranging from 20 to 300 MHz.
- 3) Equipped with a battery save function.
- 4) FM detector circuit demodulates up to  $\pm 750\text{kHzdev}$ .
- 5) FM detector circuit demodulates up to 2.6Mbps.

### ●Absolute maximum ratings (Ta = 25°C, with the measurement circuit)

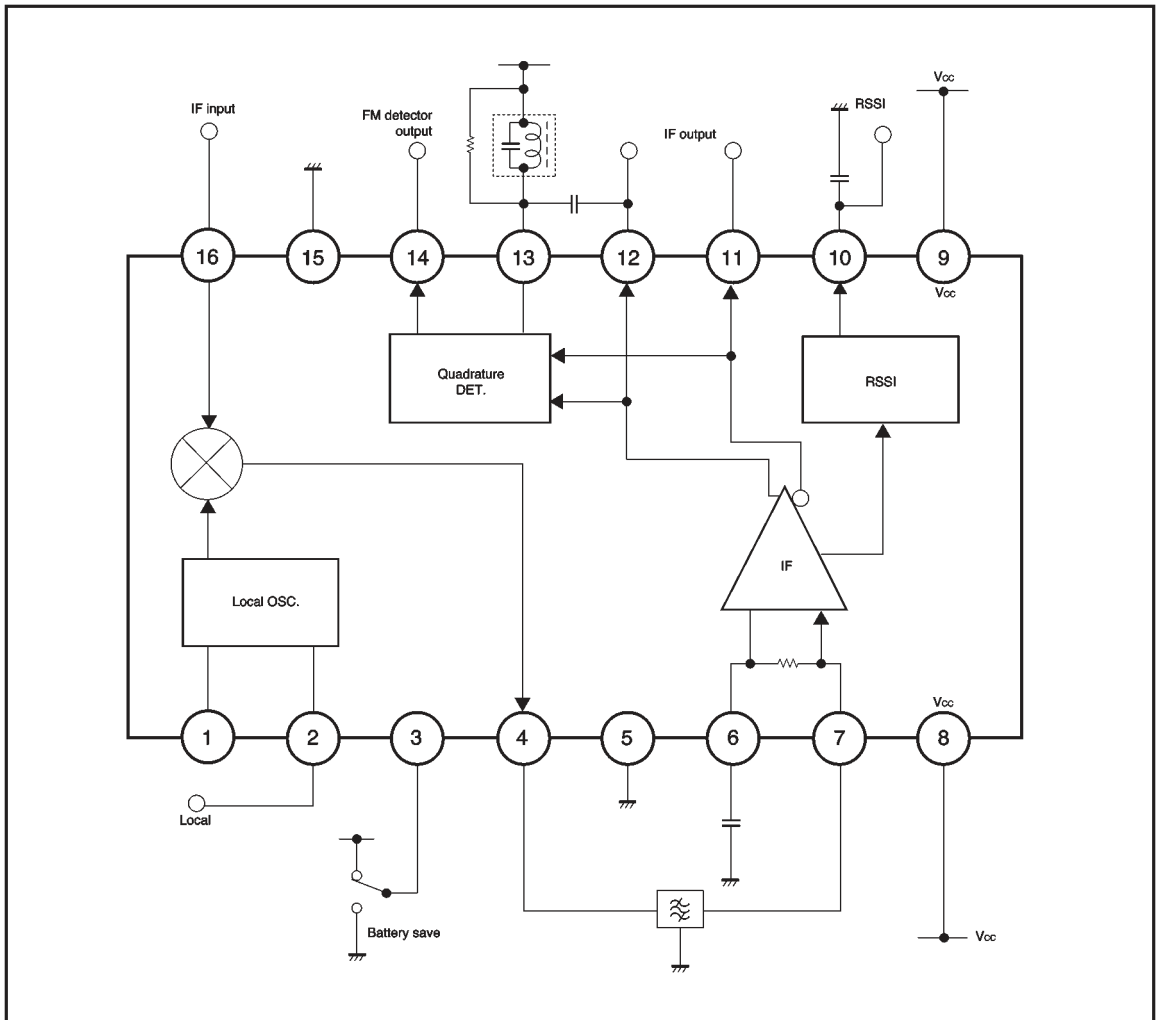
Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	7.0	V
Power dissipation	P <sub>D</sub>	350*	mW
Storage temperature	T <sub>stg</sub>	-55~+125	°C

\* Reduced by 3.5mW for each increase in Ta of 1°C over 25°C.

### ●Recommended operating conditions

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	2.3~5.5	V
Operating temperature	T <sub>opr</sub>	-40~+85	°C

● Block diagram



● Pin descriptions

Pin No.	Function	Internal peripheral circuit	DC voltage (V)
1	Local oscillator pin (base) Connect crystal resonator and capacitor		$V_{CC}-0.6$
2	Local oscillator pin (emitter) Connect crystal resonator or inject from external capacitor		$V_{CC}$
3	Battery save pin Pin 3 voltage $\leq 0.2V$ : Battery save $2V \leq$ pin 3 voltage $\leq V_{CC}$ : Active		—
4	Mixer output pin Connect ceramic filter Output impedance: $330\ \Omega$		$V_{CC}-1.5$
5	Ground pin	GND for IF stage and FM detection stage	GND
6	IF amplifier bypass pin Connect capacitor		$V_{CC}$
7	IF amplifier input pin Connect ceramic filter Input impedance: $330\ \Omega$		$V_{CC}$
8	$V_{CC}$ pin 1	$V_{CC}$ for MIX stage and IF early stage	$V_{CC}$
9	$V_{CC}$ pin 2	$V_{CC}$ for IF later stage and FM detection stage	$V_{CC}$

Pin No.	Function	Internal peripheral circuit	DC voltage (V)
10	RSSI output pin Connect capacitor		0.1
11 12	IF amplifier output pin Pins 11 and 12 are opposite-phase output		Vcc-1
13	Discriminator pin Connect phase shift coil or ceramic discriminator		Vcc
14	FM demodulated signal output pin Output impedance is 360 Ω		0.9
15	Ground pin	GND for MIX stage	GND
16	Mixer pin Connect first IF signal from DC cutoff		1.0

●Electrical characteristics (unless otherwise noted, Ta = 25°C, Vcc = 3.0V)

Signal source: f<sub>IN(MIX)</sub> = 254.4MHz, f<sub>IN(LO)</sub> = 243.2MHz, 100dBμV, f<sub>IN(IF)</sub> = 11.2MHz

AC level to be indicated by termination

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current	I <sub>Q</sub>	4.4	5.5	6.6	mA	With local oscillation OFF
Current during battery save	I <sub>Q(BS)</sub>	—	0	5	μA	—
Battery save function input voltage	V <sub>TH-H</sub>	2	—	V <sub>CC</sub>	V	Active
	V <sub>TH-L</sub>	GND	—	0.2	V	Battery save
〈MIX—oscillator〉						
Mixer operating frequency	f <sub>MIX</sub>	20	—	300	MHz	—
Mixer conversion gain	G <sub>VC</sub>	16	20	24	dB	V <sub>IN(MIX)</sub> = 60dB μV
—1dB compression output level	V <sub>OM</sub>	—	103	—	dB μV	—
3rd order intercept point	IP <sub>3</sub>	—	110	—	dB μV	f <sub>1</sub> = 248.75MHz, f <sub>2</sub> = 249.05MHz
Noise index	NF	—	9.7	—	dB	LC matching input
Mixer input admittance	Y <sub>IN(MIX)</sub>	—	1.25+j7.47	—	ms	f = 250MHz
Mixer output resistance	R <sub>O(MIX)</sub>	—	330	—	Ω	—
Local oscillator operating frequency	f <sub>LO</sub>	20	—	120	MHz	—
Local input level	V <sub>IN(LO)</sub>	95	100	105	dB μV	—
Local input admittance	Y <sub>IN(LO)</sub>	—	1.36+j9.72	—	ms	f = 250MHz
〈IF section〉						
IF operating frequency	f <sub>IF</sub>	4	—	15	MHz	—
IF amplifier gain	G <sub>V</sub>	—	75	—	dB	—
IF input resistance	R <sub>IN(IF)</sub>	—	330	—	Ω	—
IF output level	V <sub>OIF</sub>	0.4	0.5	0.6	V <sub>P-P</sub>	V <sub>IN(IF)</sub> = 80dB μV
IF output duty ratio	D <sub>R</sub>	40	50	60	%	V <sub>IN(IF)</sub> = 80dB μV, C <sub>L</sub> = 10pF
〈RSSI section〉						
Output voltage 1	V <sub>RSSI1</sub>	—	0.15	0.4	V	No input
Output voltage 2	V <sub>RSSI2</sub>	1.0	1.2	1.4	V	V <sub>IN(IF)</sub> = 70dB μV
Output voltage 3	V <sub>RSSI3</sub>	1.8	2.0	2.2	V	V <sub>IN(IF)</sub> = 100dB μV
Dynamic range	D <sub>R</sub>	—	70	—	dB	—
Output resistance	R <sub>O(RSSI)</sub>	12	15	18	kΩ	—
Rise time at power on	T <sub>ON</sub>	—	20	—	μs	C <sub>L</sub> = 100pF, V <sub>IN(MIX)</sub> = 60dB μV
Fall time at power off	T <sub>OFF</sub>	—	5	—	μs	C <sub>L</sub> = 100pF, V <sub>IN(MIX)</sub> = 60dB μV
RSSI rise time	T <sub>R</sub>	—	9	—	μs	C <sub>L</sub> = 100pF, V <sub>IN(MIX)</sub> = 60dB μV
RSSI fall time	T <sub>F</sub>	—	11	—	μs	C <sub>L</sub> = 100pF, V <sub>IN(MIX)</sub> = 60dB μV

Signal source:  $f_{IN(IF)} = 11.2\text{MHz}$ ,  $\Delta f = \pm 100\text{kHz dev}$ ,  $f_m = 1\text{kHz}$

AC level to be indicated by termination

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈Detector section〉						
Detection sensitivity	$S_{DET}$	—	1.243	—	mV / kHz	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
Detection output level	$V_O$	63	87	120	mV <sub>rms</sub>	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
Detection frequency	$f_{DET}$	—	1.3	—	MHz	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
12dB SINAD sensitivity	$S_{(12dB)}$	12	16	20	dB $\mu\text{V}$	
S / N ratio	S / N	—	70	—	dB	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
AM rejection ratio	AMR	—	60	—	dB	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$ , AM=30%

● Measurement circuit

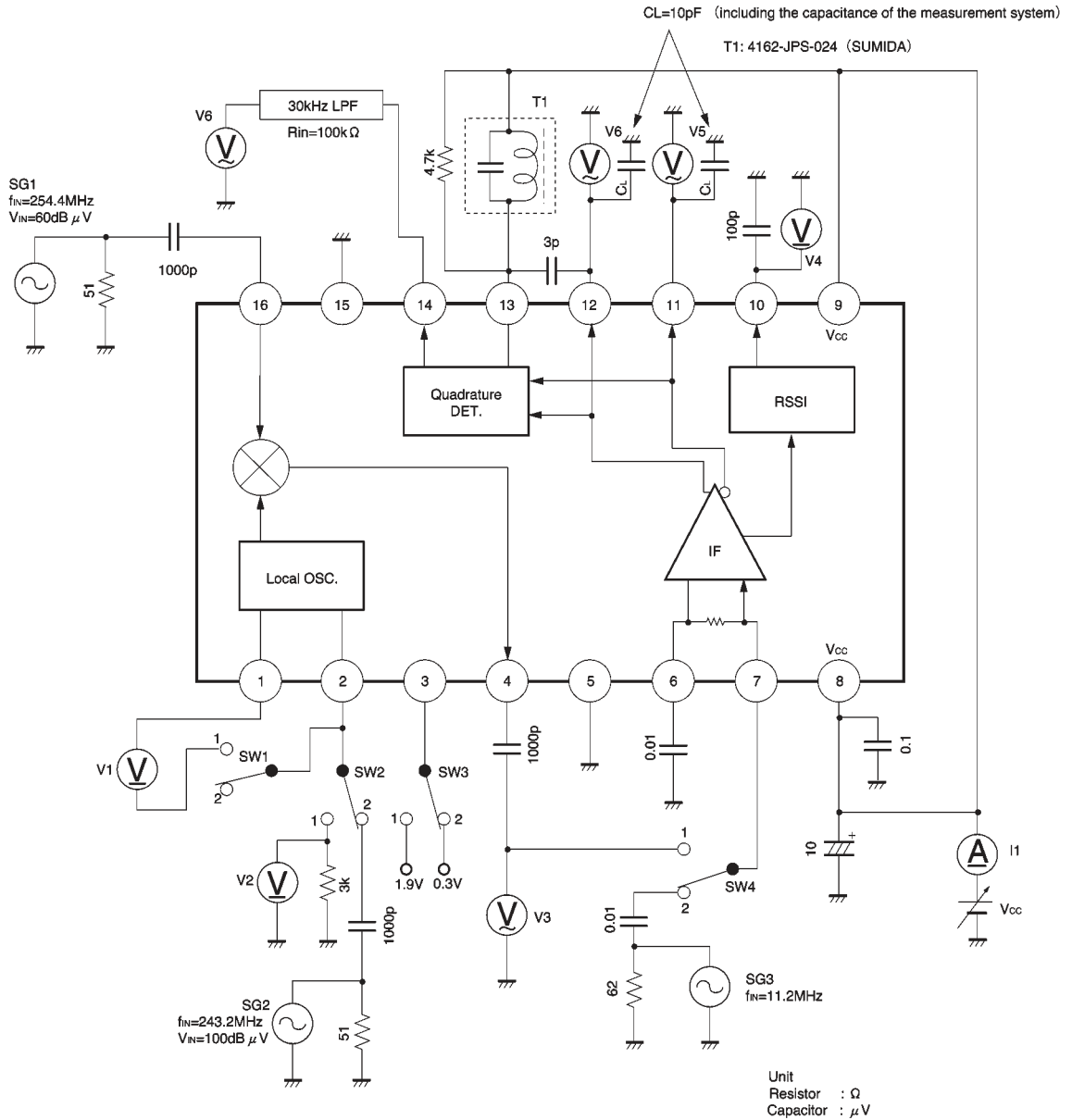


Fig.1

●Application example

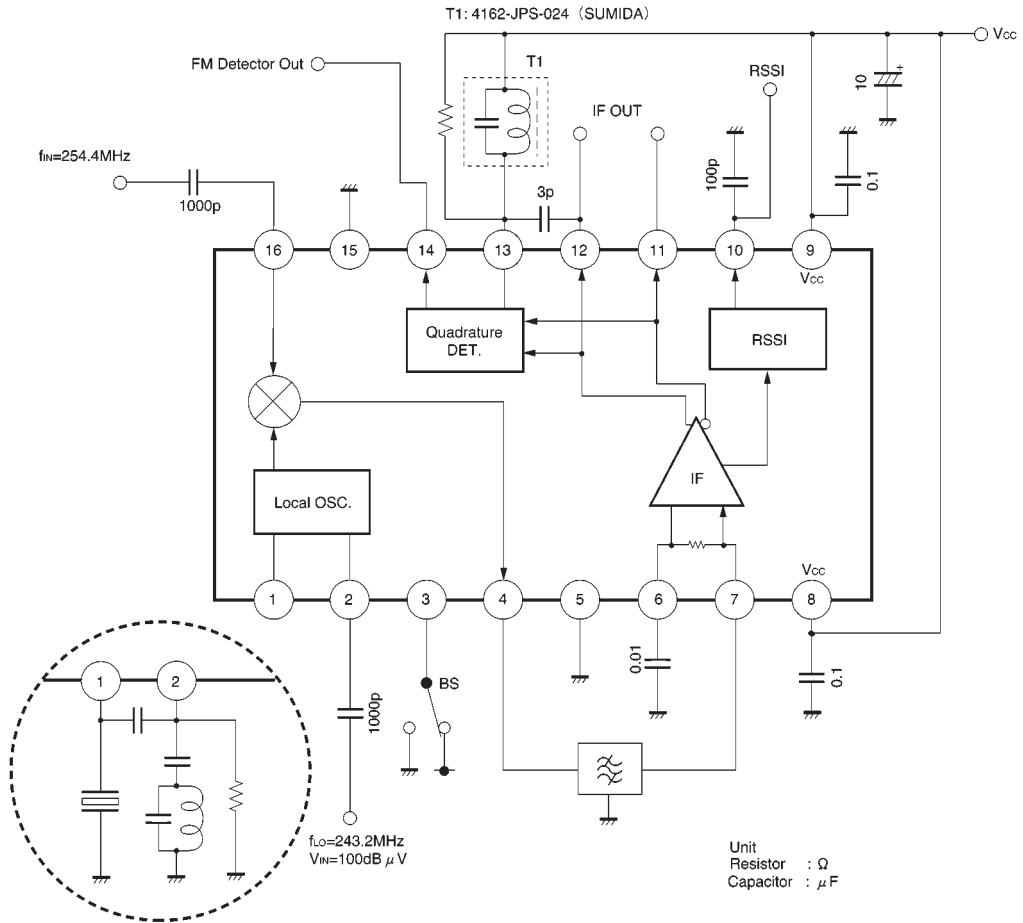
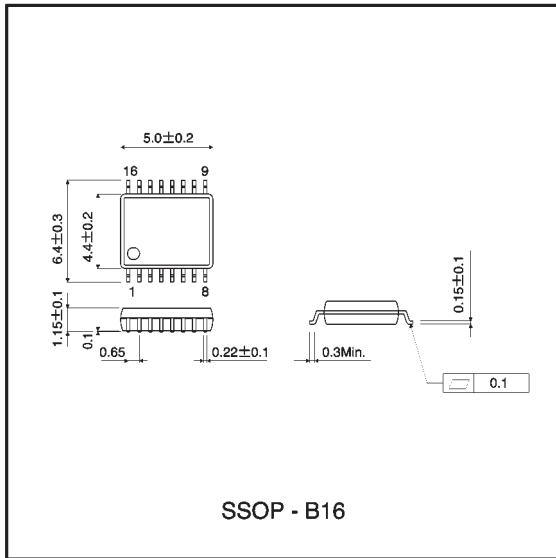


Fig.2



● External dimensions (Units: mm)



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