

# Wide band IF detector for RF remote control units

## BH4126FV

The BH4126FV is an IC equipped with internal mixer, IF amplifier, and FM detector circuits, developed for use with RF remote control units.

### ●Applications

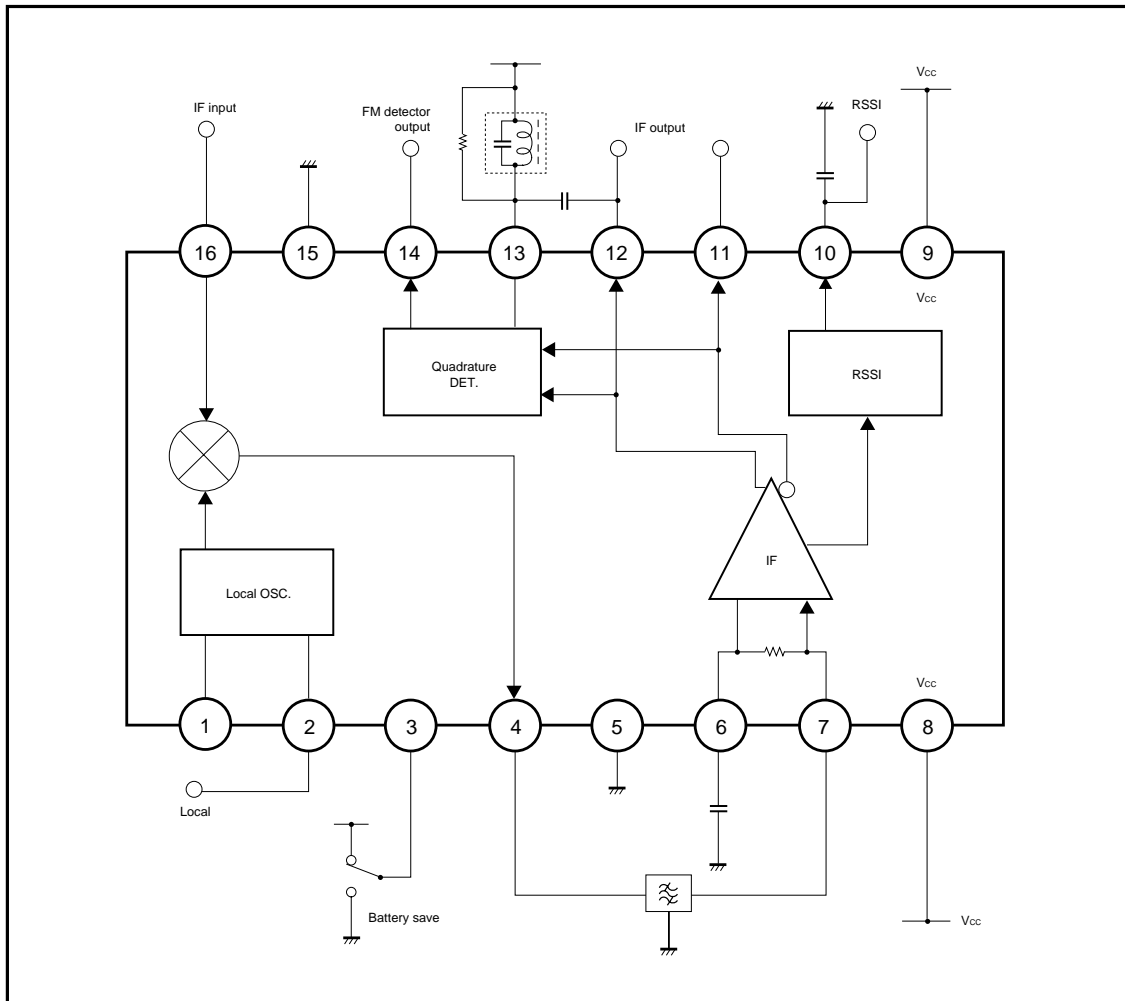
Keyless entry

### ●Features

- 1) Equipped with internal mixer, IF, RSSI, and FM detection circuits.
- 2) Can be operated at mixer input frequencies ranging from 20MHz to 300MHz.
- 3) Equipped with a battery power saving function.
- 4) Fast RSSI response.
- 5) High FM detection sensitivity. (21.2mV / kHz)

## Communication ICs

## ●Block diagram



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

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	7.0	V
Power dissipation	P <sub>D</sub>	350 *1	mW
Storage temperature	T <sub>stg</sub>	-55~+125	°C

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

## ●Operating range

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

## Communication ICs

## ●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 capacitor or input local signal from external oscillator		$V_{CC}$
3	Battery save pin "Pin 3 voltage" $\leq 0.2$ : 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	GND pin	GND for IF stages and FM detection stages	GND

Communication ICs

Pin No.	Function	Internal peripheral circuit	DC voltage (V)
6	IF amplifier bypass pin Connect capacitor		V <sub>CC</sub>
7	IF amplifier input pin Connect ceramic filter Input impedance: 330Ω		V <sub>CC</sub>
8	V <sub>CC</sub> pin 1	V <sub>CC</sub> for MIX stages and IF front stage	V <sub>CC</sub>
9	V <sub>CC</sub> pin 2	V <sub>CC</sub> for IF rear stage and FM detection stage	V <sub>CC</sub>
10	RSSI output pin Connect capacitor		0.1
11 12	IF amplifier output pin Pins 11 and 12 are opposite-phase output		V <sub>CC</sub> - 1

Communication ICs

Pin No.	Function	Internal peripheral circuit	DC voltage(V)
13	Discriminator pin Connect phase shift coil or ceramic discriminator		Vcc
14	FM demodulation signal output pin Output impedance is 360Ω		0.9
15	GND pin	GND for MIX stage	GND
16	Mixer pin Connect first IF signal from DC cutoff		1.0

## Communication ICs

● **Electrical characteristics** (unless otherwise noted,  $T_a=25^\circ\text{C}$ ,  $V_{CC}=3.0\text{V}$ )

Signal source :  $f_{IN(MIX)} = 248.45\text{MHz}$ ,  $f_{IN(LO)} = 237.75\text{MHz}$ ,  $100\text{dB}\mu\text{V}$

AC level to be indicated by termination

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current	$I_Q$	4.4	5.5	6.6	mA	With local oscillation OFF
Battery save quiescent current	$I_Q(BS)$	-	0	5	$\mu\text{A}$	
Battery save function input voltage	$V_{TH-H}$	2	-	$V_{CC}$	V	Active
	$V_{TH-L}$	GND	-	0.2	V	Battery save
〈 MIX - Oscillator section 〉						
Mixer operating frequency	$f_{MIX}$	20	-	300	MHz	
Mixer conversion gain	$G_{VC}$	16	20	24	dB	$V_{IN(MIX)} = 60\text{dB}\mu\text{V}$
-1dB compression output level	$V_{OM}$	-	103	-	$\text{dB}\mu\text{V}$	
3rd order intercept point	IP3	-	110	-	$\text{dB}\mu\text{V}$	$f_1=248.75\text{MHz}, f_2=249.05\text{MHz}$
Noise figure	NF	-	9.7	-	dB	LC matching input
Mixer input admittance	$Y_{IN(MIX)}$	-	$1.25+j7.47$	-	ms	$f=248.45\text{MHz}$
Mixer output resistance	$R_{O(MIX)}$	-	330	-	$\Omega$	
Local oscillator operating frequency	$f_{LO}$	20	-	120	MHz	
Local input level	$V_{IN(LO)}$	95	100	105	$\text{dB}\mu\text{V}$	
Local input admittance	$Y_{IN(LO)}$	-	$1.36+j9.72$	-	ms	$f=237.75\text{MHz}$

## Communication ICs

Signal source :  $f_{IN(MIX)} = 248.45\text{MHz}$ ,  $f_{IN(LO)} = 237.75\text{MHz}$ ,  $100\text{dB}\mu\text{V}$ ,  $f_{IN(IF)} = 10.7\text{MHz}$ ;  
AC level to be indicated by termination

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈 IF section 〉						
IF operating frequency	$f_{IF}$	4	-	15	MHz	
IF amplifier gain	$G_V$	-	75	-	dB	
IF input resistance	$R_{IN(IF)}$	-	330	-	$\Omega$	
IF output level	$V_{OIF}$	0.4	0.5	0.6	$V_{P-P}$	$V_{IN(IF)} = 80\text{dB}\mu\text{V}$
IF duty ratio	DR	40	50	60	%	$V_{IN(IF)} = 80\text{dB}\mu\text{V}$ , $C_L = 10\text{pF}$
〈 RSSI section 〉						
Output voltage 1	$V_{RSSI1}$	-	0.15	0.4	V	No input
Output voltage 2	$V_{RSSI2}$	1.0	1.2	1.4	V	$V_{IN(IF)} = 70\text{dB}\mu\text{V}$
Output voltage 3	$V_{RSSI3}$	1.8	2.0	2.2	V	$V_{IN(IF)} = 100\text{dB}\mu\text{V}$
Dynamic range	DR	-	70	-	dB	
Output resistance	$R_{O(RSSI)}$	12	15	18	$k\Omega$	
Rise time at power on	$T_{ON}$	-	20	-	$\mu\text{s}$	$C_L = 100\text{pF}$ , $V_{IN(MIX)} = 60\text{dB}\mu\text{V}$
Fall time at power off	$T_{OFF}$	-	5	-	$\mu\text{s}$	$C_L = 100\text{pF}$ , $V_{IN(MIX)} = 60\text{dB}\mu\text{V}$
RSSI rise time	$T_R$	-	9	-	$\mu\text{s}$	$C_L = 100\text{pF}$ , $V_{IN(MIX)} = 60\text{dB}\mu\text{V}$
RSSI fall time	$T_F$	-	11	-	$\mu\text{s}$	$C_L = 100\text{pF}$ , $V_{IN(MIX)} = 60\text{dB}\mu\text{V}$

Signal source :  $f_{IN(IF)} = 10.7\text{MHz}$ ,  $\Delta f = \pm 10\text{kHz}$  dev,  $f_m = 1\text{kHz}$ ;  
AC level to be indicated by termination

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈 Detector unit 〉						
Detection sensitivity	$S_{DET}$	-	21.2	-	mV / kHz	$V_{IN(IF)} = 80\text{dB}\mu\text{V}$
Detection output level	$V_O$	110	150	195	mVrms	$V_{IN(IF)} = 80\text{dB}\mu\text{V}$
Detection frequency	$f_{DET}$	-	100	-	kHz	$V_{IN(IF)} = 80\text{dB}\mu\text{V}$
12 dB SINAD sensitivity	$S_{(12dB)}$	12	16	20	$\text{dB}\mu\text{V}$	
S / N ratio	S / N	40	48	-	dB	$V_{IN(IF)} = 80\text{dB}\mu\text{V}$
AM rejection ratio	AMR	-	40	-	dB	$V_{IN(IF)} = 80\text{dB}\mu\text{V}$ , AM = 30%

Communication ICs

● Measurement circuit

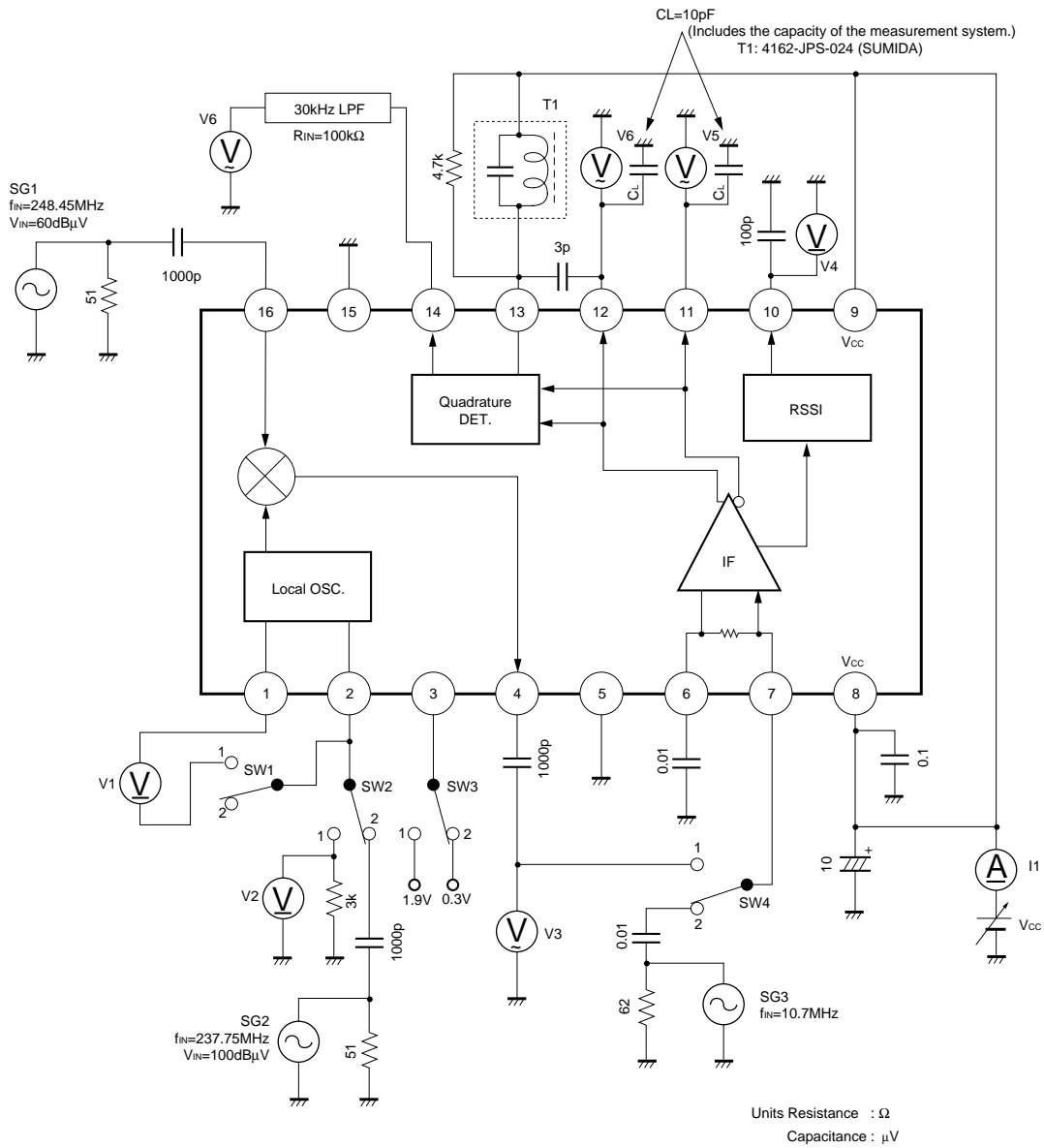


Fig. 1



Communication ICs

●Application example

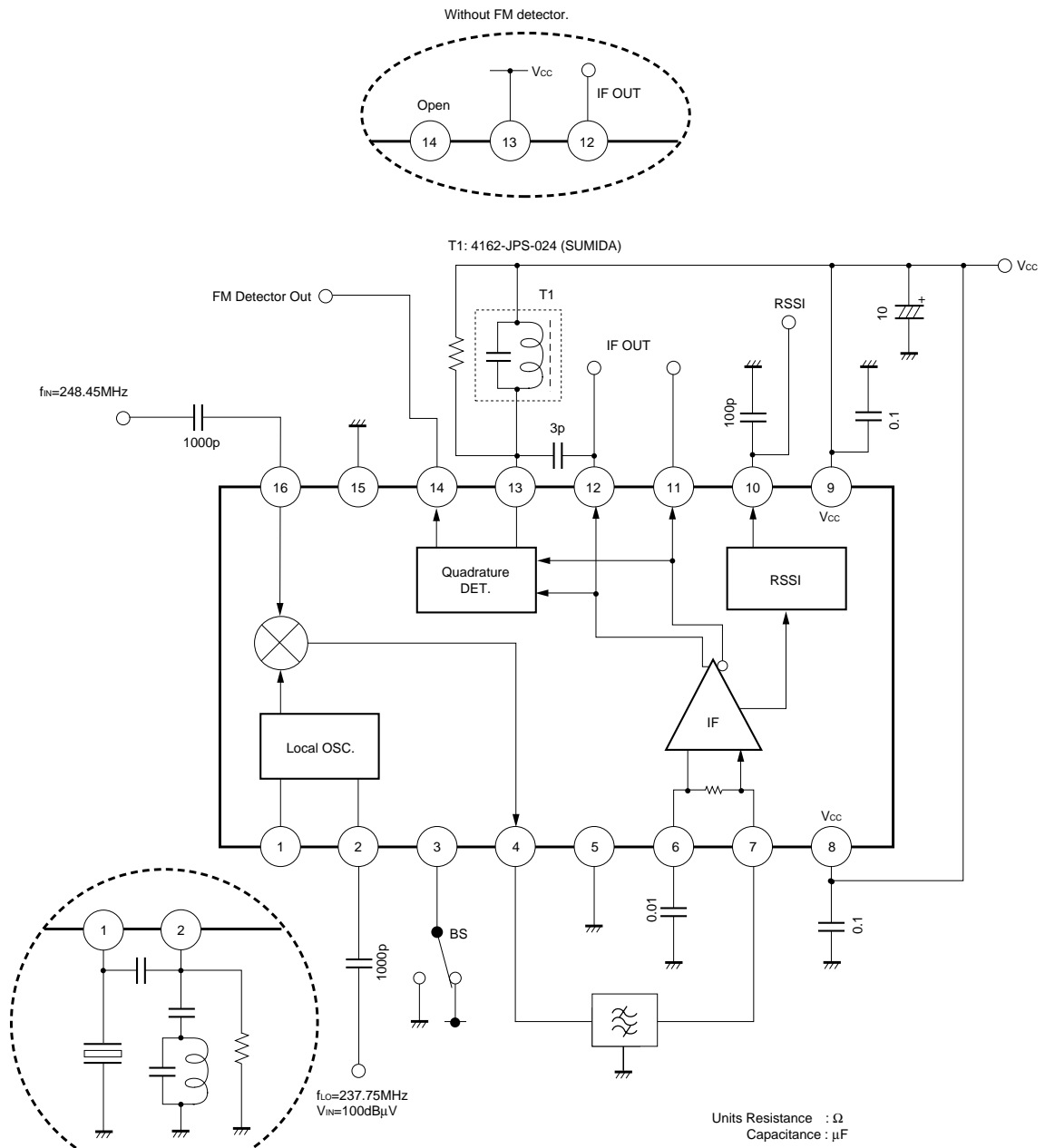
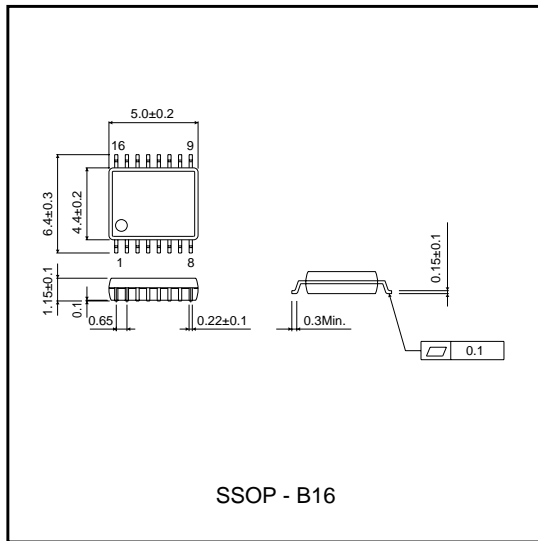


Fig. 2

## Communication ICs

## ● External dimensions (Units: mm)



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