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.

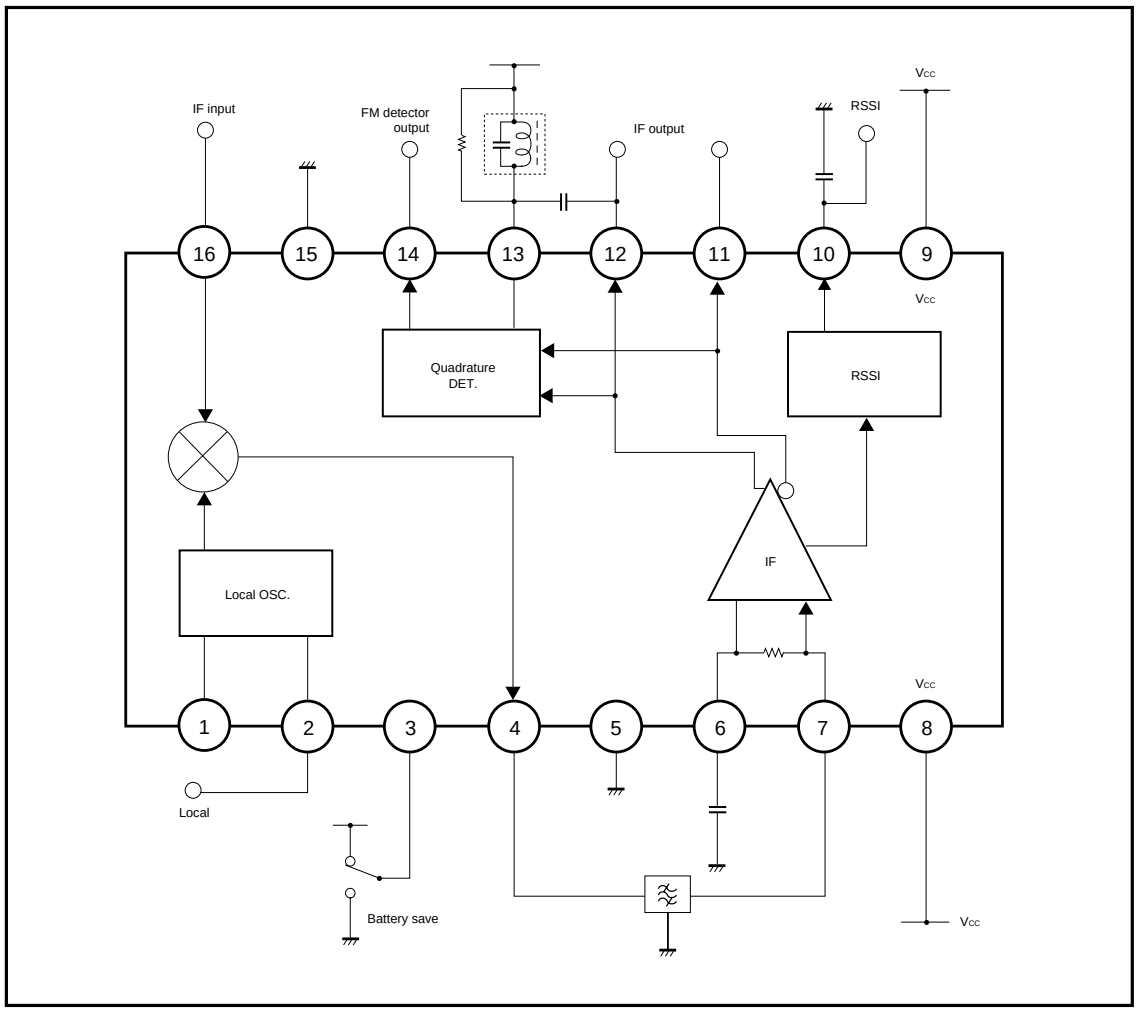
●Applications

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)

●**Block diagram**



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

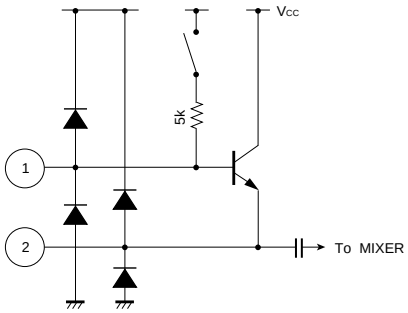
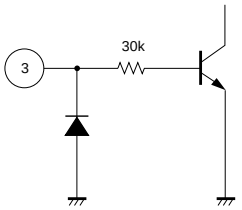
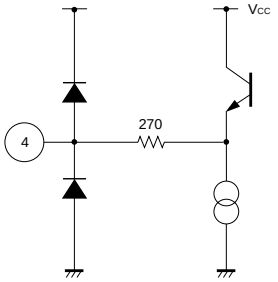
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	7.0	V
Power dissipation	P_D	350 *1	mW
Storage temperature	Tstg	-55~+125	˚C

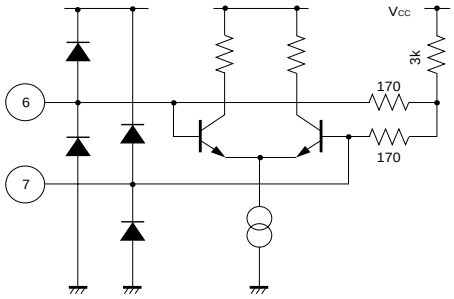
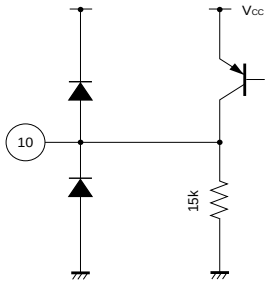
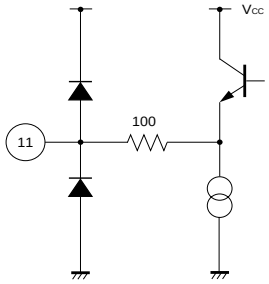
*1 Reduced by 3.5 mW for each increase in Ta of 1˚C over 25˚C.

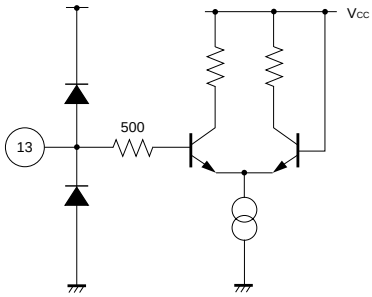
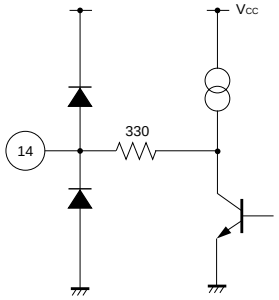
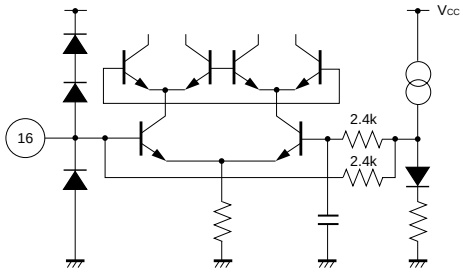
●**Operating range**

Parameter	Symbol	Limits	Unit
Operating power supply voltage	V_{CC}	2.3~5.5	V
Operating temperature	Topr	-40~+85	˚C

●**Pin descriptions**

Pin No.	Function	Internal peripheral circuit	DC voltage(V)
1	Local oscillator pin (base) Connect crystal resonator and capacitor		Vcc - 0.6
2	Local oscillator pin (emitter) Connect capacitor or input local signal from external oscillator		Vcc
3	Battery save pin "Pin 3 voltage" ≤ 0.2 : Battery save 2 V ≤ "Pin 3 voltage" ≤ Vcc : Active		-
4	Mixer output pin Connect ceramic filter Output impedance: 330Ω		Vcc - 1.5
5	GND pin	GND for IF stages and FM detection stages	GND

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

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

●**Electrical characteristics** (unless otherwise noted, Ta=25°C, V_{CC}=3.0V)
Signal source : $f_{IN\ (MIX)}$ = 248.45MHz, $f_{IN\ (LO)}$ = 237.75MHz, 100dBμV
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	μA	
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	$V_{IN\ (MIX)}$ = 60dBμV
-1dB compression output level	V_{OM}	-	103	-	dBμV	
3rd order intercept point	IP3	-	110	-	dBμV	f1=248.75MHz,f2=249.05MHz
Noise figure	NF	-	9.7	-	dB	LC matching input
Mixer input admittance	$Y_{IN\ (MIX)}$	-	1.25+j7.47	-	ms	f=248.45MHz
Mixer output resistance	$R_{O\ (MIX)}$	-	330	-	Ω	
Local oscillator operating frequency	f_{LO}	20	-	120	MHz	
Local input level	$V_{IN\ (LO)}$	95	100	105	dBμV	
Local input admittance	$Y_{IN\ (LO)}$	-	1.36+j9.72	-	ms	f=237.75MHz

Signal source : $f_{IN\ (MIX)}$ = 248.45MHz, $f_{IN\ (LO)}$ = 237.75MHz,100dBμV, $f_{IN\ (IF)}$ = 10.7MHz;
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	-	Ω	
IF output level	V_{OIF}	0.4	0.5	0.6	V_{P-P}	$V_{IN\ (IF)}$ = 80dBμV
IF duty ratio	DR	40	50	60	%	$V_{IN\ (IF)}$ = 80dBμV, C_L = 10pF
〈 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	$V_{IN\ (IF)}$ = 70dBμV
Output voltage 3	V_{RSSI3}	1.8	2.0	2.2	V	$V_{IN\ (IF)}$ = 100dBμV
Dynamic range	DR	-	70	-	dB	
Output resistance	$R_{O\ (RSSI)}$	12	15	18	kΩ	
Rise time at power on	T_{ON}	-	20	-	μs	C_L = 100pF, $V_{IN\ (MIX)}$ = 60dBμV
Fall time at power off	T_{OFF}	-	5	-	μs	C_L = 100pF, $V_{IN\ (MIX)}$ = 60dBμV
RSSI rise time	T_R	-	9	-	μs	C_L = 100pF, $V_{IN\ (MIX)}$ = 60dBμV
RSSI fall time	T_F	-	11	-	μs	C_L = 100pF, $V_{IN\ (MIX)}$ = 60dBμV

Signal source : $f_{IN\ (IF)}$ =10.7MHz, Δf=±10kHz dev, fm=1kHz;
AC level to be indicated by termination

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

●**Measurement circuit**

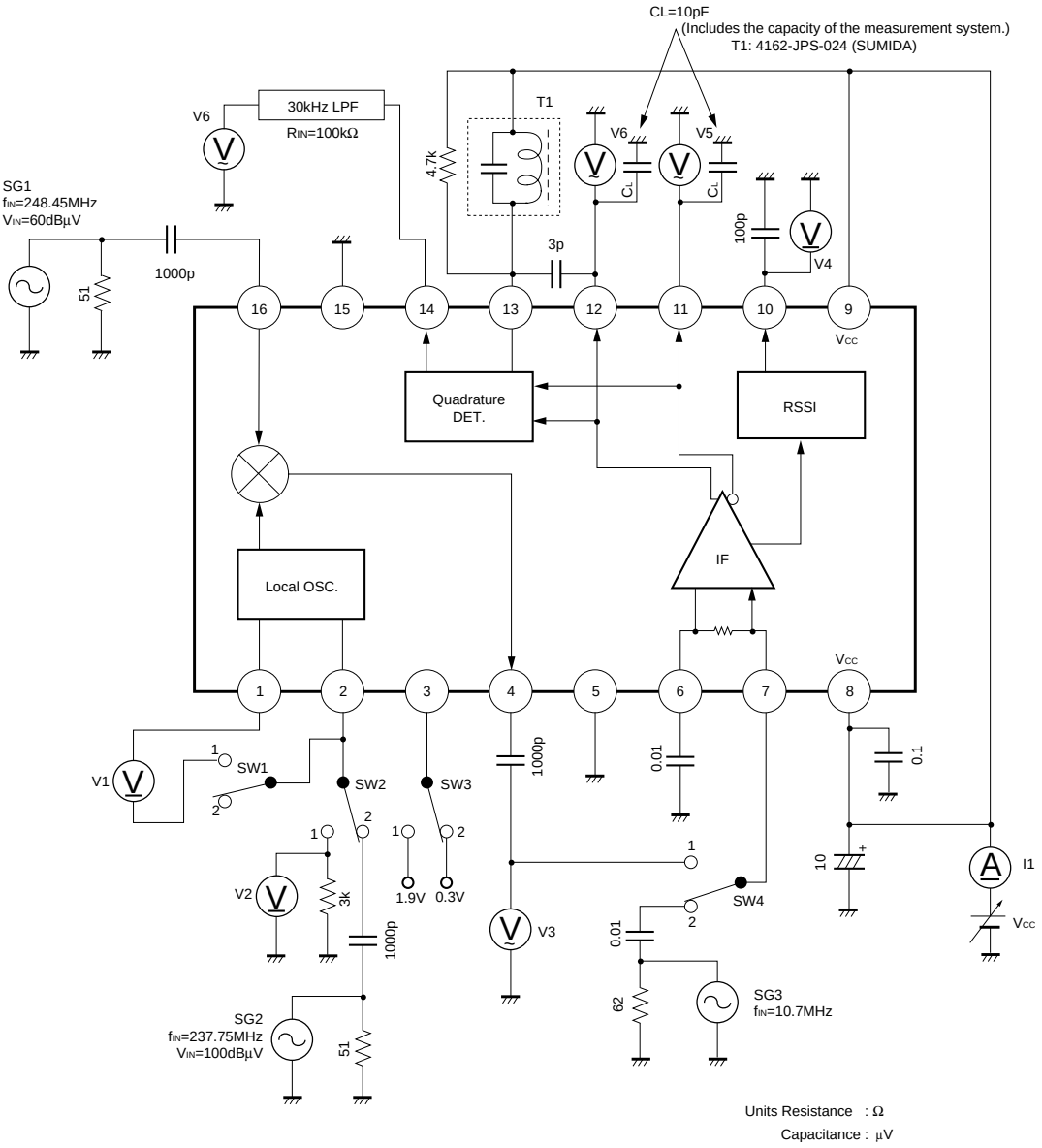


Fig. 1

●**Application example**

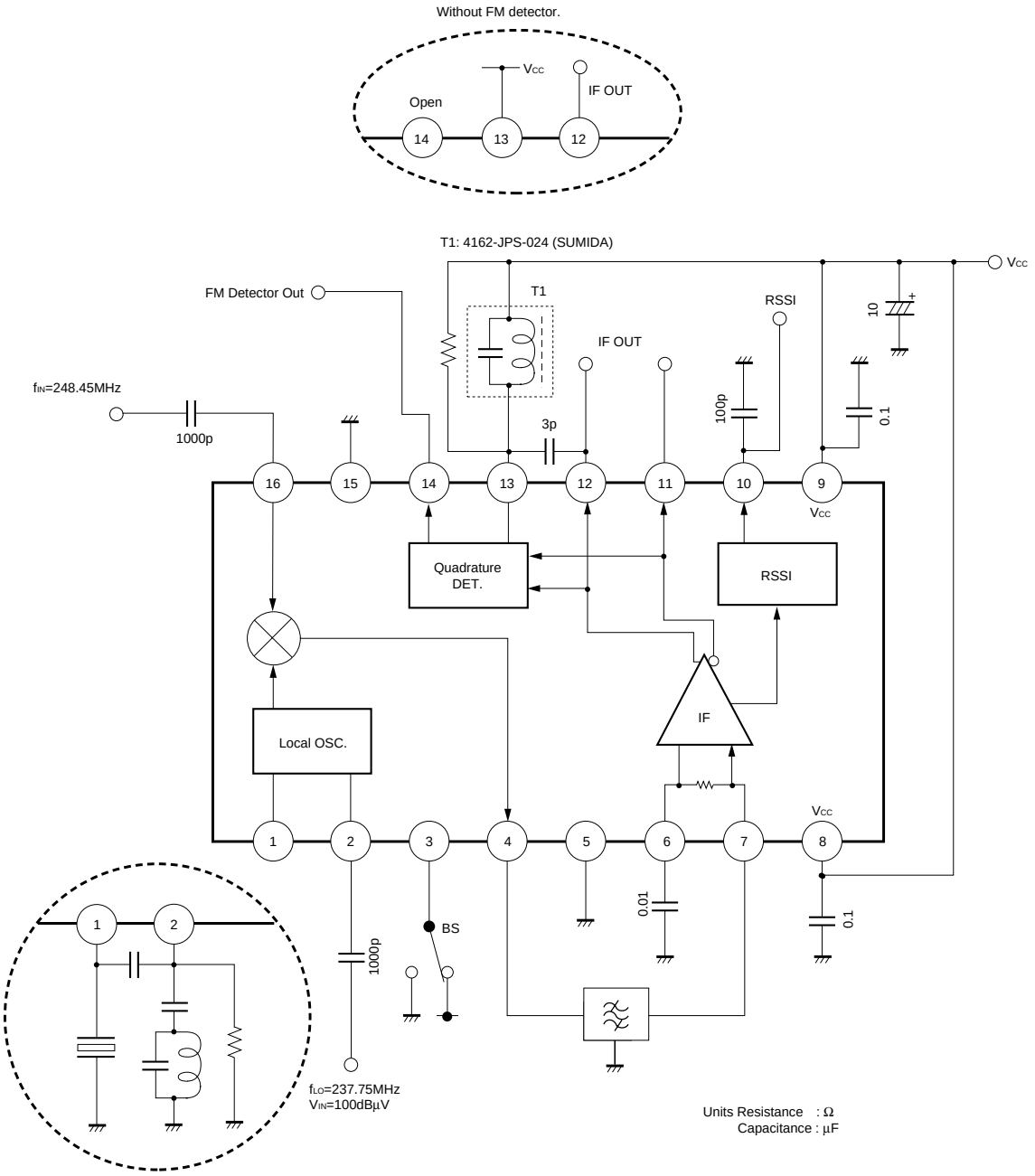
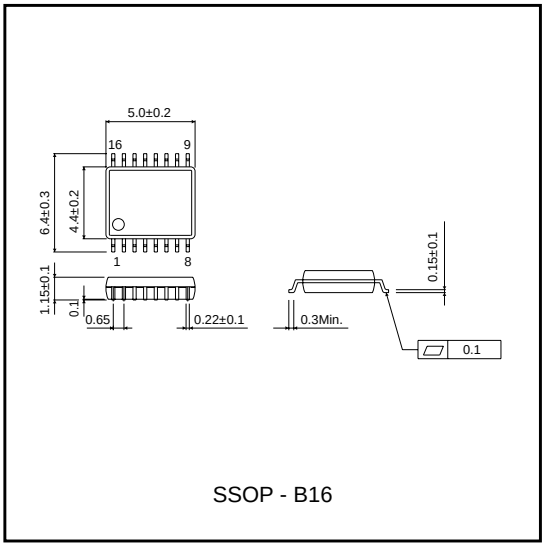


Fig. 2

●**External dimensions** (Units: mm)



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