

Wide band IF detector for PHS and radio remote control units

BH4126FV

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

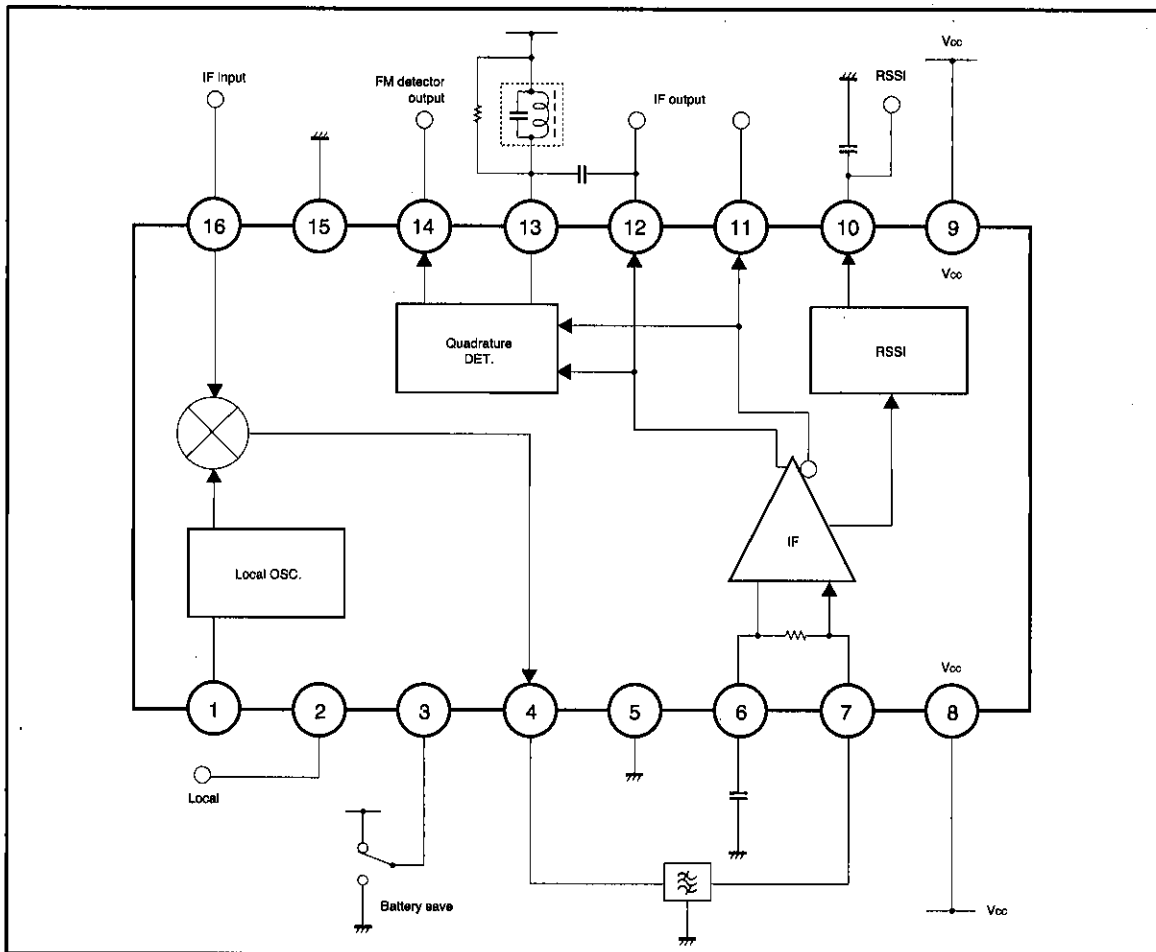
●Applications

PHS systems
Digital cellular phones
Keyless vehicle 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.

●Block diagram



Cellular phones / PHS / Pagers IFs for radio communications

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

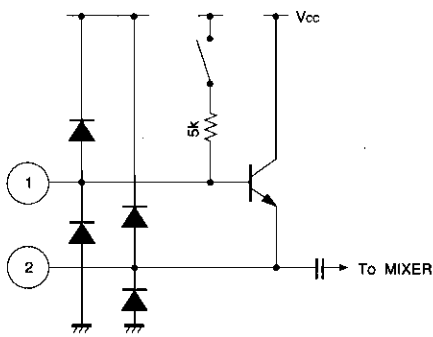
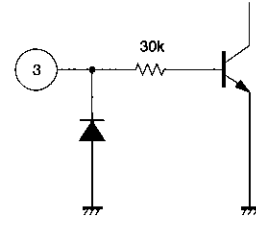
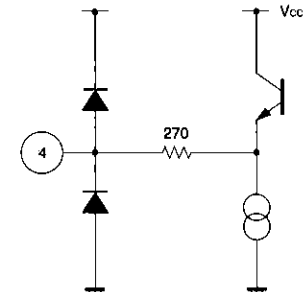
Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	7.0	V
Power dissipation	P _D	350 *1	mW
Storage temperature	T _{stg}	-55~+125	°C

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

●Recommended operating conditions

Parameter	Symbol	Limits	Unit
Operating voltage	V _{CC}	2.3~5.5	V
Operation temperature	T _{opr}	-40~+85	°C

● 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 inject from external oscillator		V_{CC}
3	Battery save pin "Pin 3 voltage" ≤ 0.2 : Battery save $2V \leq$ "Pin 3 voltage" $\leq V_{CC}$: Active		—
4	Mixer output pin Connect ceramic filter Output impedance: 330 Ω		$V_{CC}-1.5$
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		V _{cc}
7	IF amplifier input pin Connect ceramic filter Output impedance: 330 Ω		V _{cc}
8	V _{cc} pin 1	V _{cc} for MIX stages and IF early stage	V _{cc}
9	V _{cc} pin 2	V _{cc} for IF later stage and FM detection stage	V _{cc}
10	RSSI output pin Connect capacitor		0.1
11 12	IF amplifier output pin Pins 11 and 12 are opposite-phase output		V _{cc} -1

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Pin No.	Function	Internal peripheral circuit	DC voltage(V)
13	Discriminator pin Connect phase compensation coil or ceramic discriminator		Vcc
14	FM demodulation signal output pin Output impedance is 360 Ω		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)} = 237.65MHz, 100dB μ 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	μ A	
Battery save input voltage	V _{TH-H}	2	—	V _{CC}	V	Active
	V _{TH-L}	GND	—	0.2	V	Battery save
MIX - Oscillator unit						
Mixer operating frequency	f _{MIX}	20	—	300	MHz	
Mixer conversion gain	G _{VC}	16	20	24	dB	V _{IN (MIX)} = 60dB μ V
-1dB compression output level	V _{OM}	—	103	—	dB μ V	
3rd intercept point	IP ₃	—	110	—	dB μ V	f ₁ =248.75MHz, f ₂ =249.05MHz
Noise index	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	dB μ V	
Local input admittance	Y _{IN (LO)}	—	1.36+j9.72	—	mS	f=237.65MHz

Signal source : $f_{IN(MIX)} = 248.45\text{MHz}$
 $f_{IN(LO)} = 237.65\text{MHz}, 100\text{dB } \mu\text{V}$
 $f_{IN(IF)} = 10.8\text{MHz}$

AC level to be indicated by termination

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
IF unit						
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}	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
IF duty ratio	DR	40	50	60	%	$V_{IN(IF)} = 80\text{dB } \mu\text{V}, C_L = 10\text{pF}$
RSSI unit						
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 Ω	
Rise time at power on	T_{ON}	—	20	—	μsec	$C_L = 100\text{pF}, V_{IN(MIX)} = 60\text{dB } \mu\text{V}$
Fall time at power off	T_{OFF}	—	5	—	μsec	$C_L = 100\text{pF}, V_{IN(MIX)} = 60\text{dB } \mu\text{V}$
RSSI rise time	T_R	—	9	—	μsec	$C_L = 100\text{pF}, V_{IN(MIX)} = 60\text{dB } \mu\text{V}$
RSSI fall time	T_F	—	11	—	μsec	$C_L = 100\text{pF}, V_{IN(MIX)} = 60\text{dB } \mu\text{V}$

Signal source : $f_{IN(IF)} = 10.8\text{MHz}, \Delta f = \pm 10\text{kHz dev}, f_m = 1\text{kHz}$;

AC level to be indicated by termination

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Detector unit (for radio remote control)						
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	mV _{rms}	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
Detection frequency	f_{DET}	—	100	—	kHz	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
12 dB SINAD sensitivity	$S_{(12dB)}$	12	16	20	dB μV	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
S/N ratio	S / N	40	48	—	dB	$V_{IN(IF)} = 80\text{dB } \mu\text{V}$
AM suppression ratio	AMR	—	40	—	dB	$V_{IN(IF)} = 80\text{dB } \mu\text{V}, AM = 30\%$

● Measurement circuit

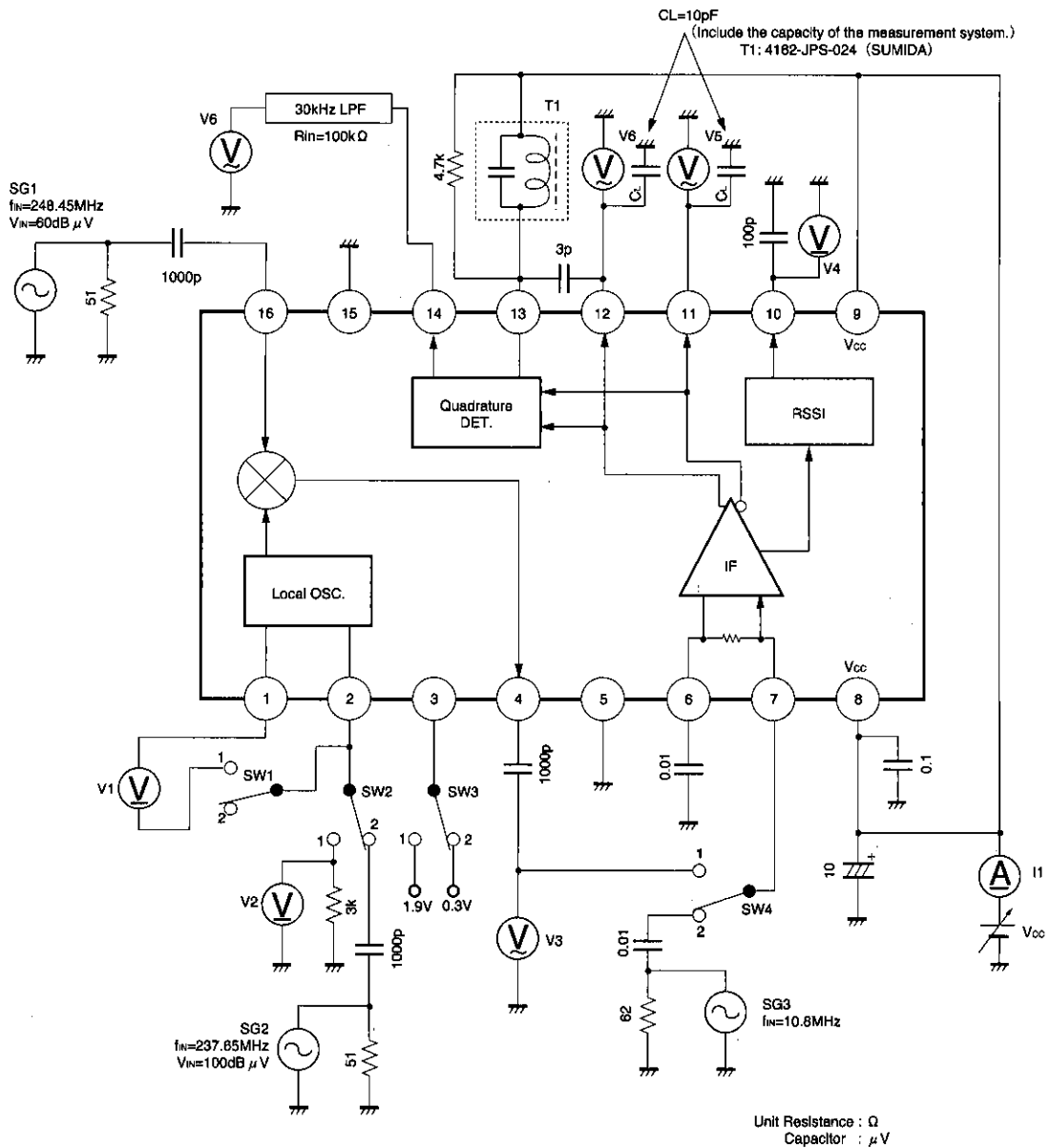


Fig. 1

Cellular phones/PHS/Pagers

●Application example

When not using FM detector.

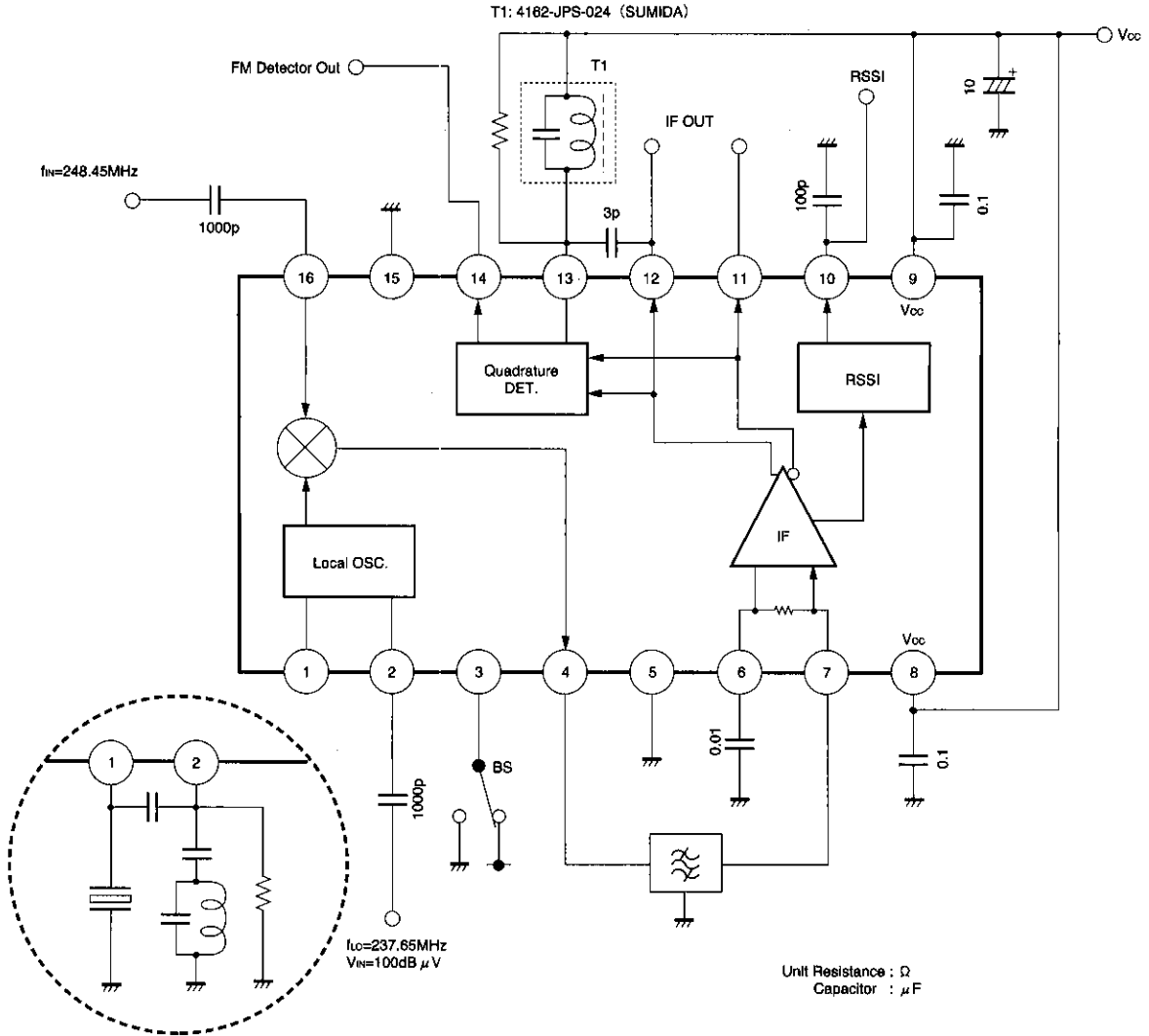
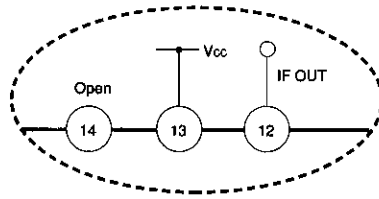
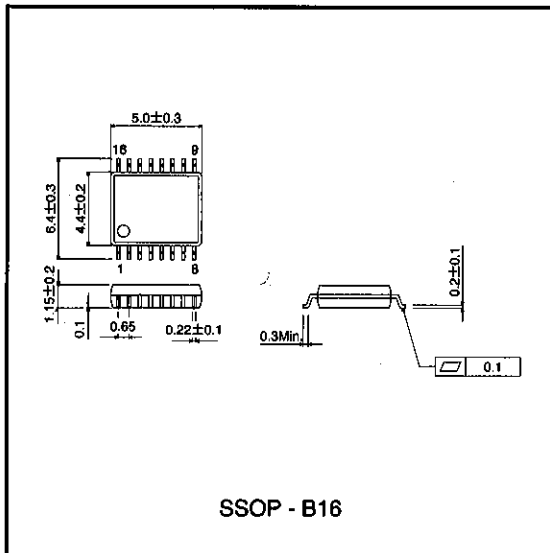


Fig. 2

● External dimensions (Units: mm)



IFs for radio communications

Cellular phones/PHS/Pagers

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