

Wireless Audio Link IC

BH1417F

The BH1417F is a FM stereo transmitter IC that transmits simple configuration. The IC consists of a stereo modulator for generating stereo composite signals and a FM transmitter for broadcasting a FM signal on the air. The stereo modulator generates a composite signal which consists of the MAIN, SUB, and pilot signal from a 38kHz oscillator. The FM transmitter radiates FM wave on the air by modulating the carrier signal with a composite signal. Frequency is set for North America.

●Applications

Wireless speakers, Personal computer(sound board), Game machine, CD changer, Car TV, Car navigation

●Features

- 1) It is possible to improve the timbre because it has the pre-emphasis circuit, limiter circuit, and the low-pass filter circuit.
- 2) Built-in pilot-tone system FM stereo modulator circuit.
- 3) The transmission frequency is stable because it has a PLL system FM transmitter circuit.
- 4) PLL controls data input in parallel (4bits, 14ch for North America).

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

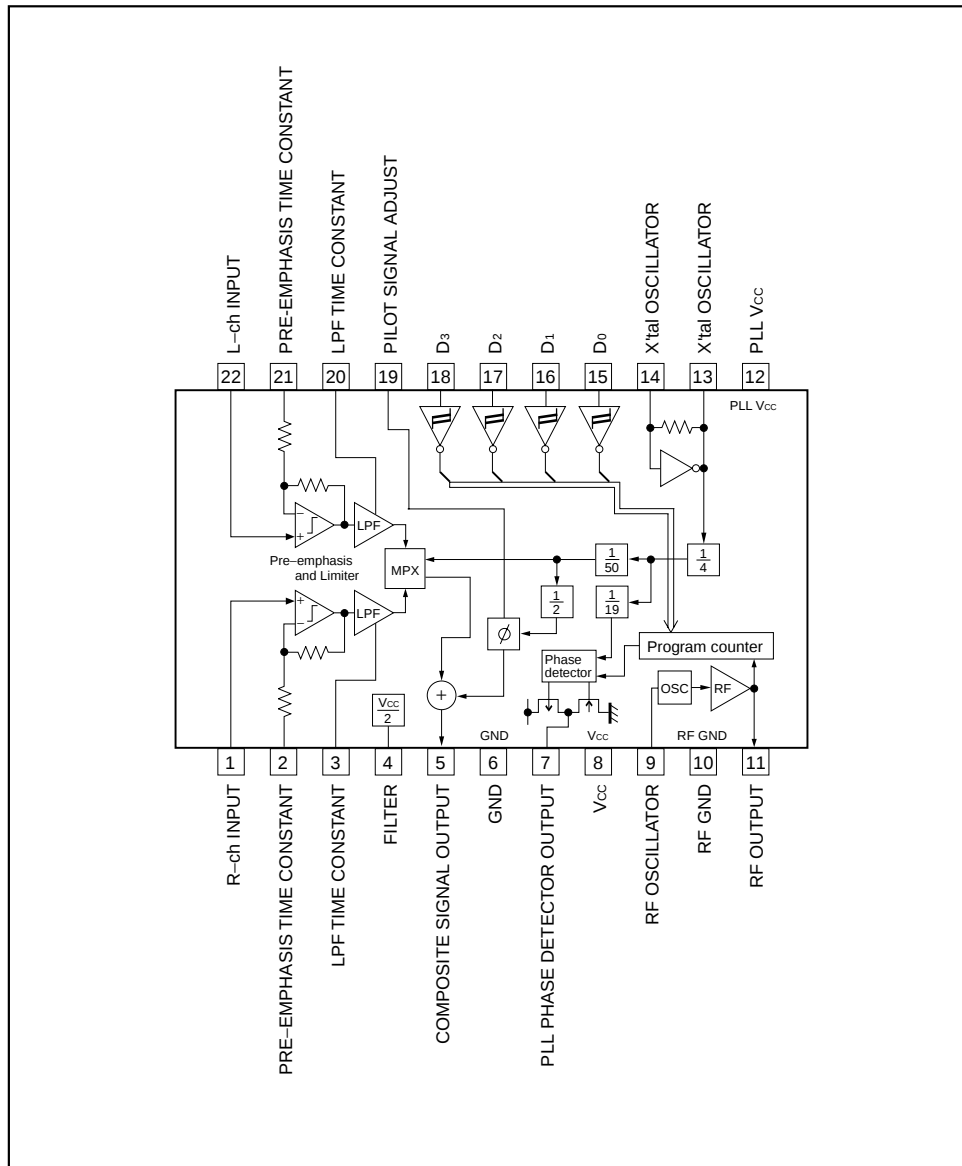
Parameter	Symbol	Limits	Unit	Conditions
Supply voltage	V _{CC}	+7.0	V	Pin8,12
Data input voltage	V _{IN-D}	-0.3~V _{CC} +0.3	V	Pin15,16,17,18
Phase comparator output voltage	V _{OUT-P}	-0.3~V _{CC} +0.3	V	Pin7
Power dissipation	P _d	450*	mW	
Storage temperature	T _{stg}	-55~+125	°C	

* Derating : 4.5mW/°C for operation above Ta=25°C.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Operating supply voltage	V _{CC}	4.0	—	6.0	V	Pin8,12
Operating temperature	T _{opr}	-40	—	+85	°C	
Audio input level	V _{IN-A}	—	—	-10	dBV	Pin1,22
Audio input frequency band	f _{IN-A}	20	—	15k	Hz	Pin1,22
Pre-emphasis time constant set up range	τ _{PRE}	—	—	155	μs	Pin2,21
Transmission frequency(200kHz step)	f _{TX}	87.7 106.7	—	88.9 107.9	MHz	Pin9,11
Control terminal "H" level input voltage	V _{IH}	0.8V _{CC}	—	V _{CC}	V	Pin15,16,17,18
Control terminal "L" level input voltage	V _{IL}	GND	—	0.2V _{CC}	V	Pin15,16,17,18

●Block diagram



Multimedia ICs

●Pin descriptions

Pin No.	Pin descriptions	Equivalent circuit	DC (V)
1	R-ch audio source input terminal It cuts DC with the capacitor and it inputs R-ch audio signal.		$\frac{1}{2}V_{CC}$
22	L-ch audio source input terminal It cuts DC with the capacitor and it inputs L-ch audio signal.		
2,21	Pre-emphasis time constant terminal It connects a capacitor for the time constant of pre-emphasis. $\tau=22.7k\Omega \times C$		$\frac{1}{2}V_{CC}$
3,20	LPF time constant terminal This is 15kHz LPF. It connects a 150pF capacitor.		$\frac{1}{2}V_{CC}$
4	Filter terminal It is a ripple filter for the reference voltage of the audio part.		$\frac{1}{2}V_{CC}$
5	Composite signal output terminal It connects to the FM modulator.		$\frac{1}{2}V_{CC}$
6	GND		GND
7	PLL phase detector output terminal It connects to the PLL LPF circuit.		—
8	Power supply terminal		V_{CC}

Multimedia ICs

Pin No.	Pin descriptions	Equivalent circuit	DC (V)
9	RF oscillator terminal This is the base terminal of the colpitts oscillator. It connects time constant of the oscillation.		$\frac{4}{7}V_{CC}$
10	RF GND	—	GND
11	RF transmission output terminal It connects to the antenna through BPF.		$V_{CC} - 1.9$
12	PLL power supply terminal	—	V_{CC}
13,14	X'tal oscillator terminal It connects a 7.6MHz crystal oscillator.		—
15	Parallel data set up terminal D ₀		—
16	Parallel data set up terminal D ₁		
17	Parallel data set up terminal D ₂		
18	Parallel data set up terminal D ₃		
19	Pilot signal adjust terminal		$\frac{1}{2}V_{CC}$

Multimedia ICs

●Electrical characteristics (Unless otherwise noted, Ta = 25°C, V_{CC} = 5.0V Signal source : f_{IN} = 400Hz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Quiescent current	I _Q	14	20	28	mA		Fig.1
Channel separation	Sep	25	40	—	dB	V _{IN} =-20dBV L→R,R→L	Fig.2
Total harmonic distortion	THD	—	0.1	0.3	%	V _{IN} =-20dBV L+R	Fig.3
Channel balance	C.B	-2	0	+2	dB	V _{IN} =-20dBV L+R	Fig.2
Input output gain	G _v	-2	0	+2	dB	V _{IN} =-20dBV L+R	Fig.3
Pilot modulation rate	M _p	12	15	18	%	V _{IN} =-20dBV,L+R Pin5	Fig.3
Sub carrier rejection ratio	SCR	—	-30	-20	dB	V _{IN} =-20dBV L+R	Fig.3
Pre-emphasis time constant	τ _{PRE}	40	50	60	μs	V _{IN} =-20dBV L+R	Fig.3
Limiter input level	V _{IN(LIM)}	-16	-13	-10	dBV	Output level at 1dB gain compression	Fig.4
LPF cut off frequency	f _{C(LPF)}	12	15	18	kHz	V _O =-3dB Pin2,21 Open	Fig.5
Transmission output level	V _{TX}	96	99	102	dBμV	f _{TX} =107.9MHz	Fig.6
"H" level input current	I _{IH}	—	—	1.0	μA	Pin15,16,17,18 V _{IN} =5V	Fig.7
"L" level input current	I _{IL}	-1.0	—	—	μA	Pin15,16,17,18 V _{IN} =0V	Fig.7
"H" level output voltage	V _{OH}	V _{CC} -1.0	V _{CC} -0.15	—	V	Pin7 I _{OUT} =-1.0mA	Fig.8
"L" level output voltage	V _{OL}	—	0.15	1.0	V	Pin7 I _{OUT} =1.0mA	Fig.8
"off" level leak current1	I _{OFF1}	—	—	100	nA	Pin7 V _{OUT} =5V	Fig.9
"off" level leak current2	I _{OFF2}	-100	—	—	nA	Pin7 V _{OUT} =GND	Fig.9

● Measurement circuits

Quiescent current

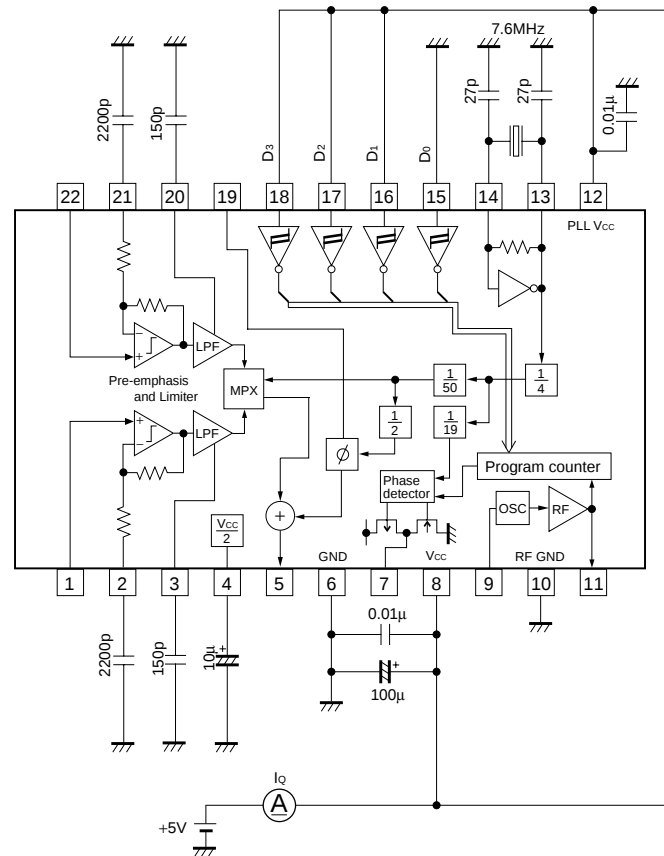


Fig.1

Channel separation
Channel balance

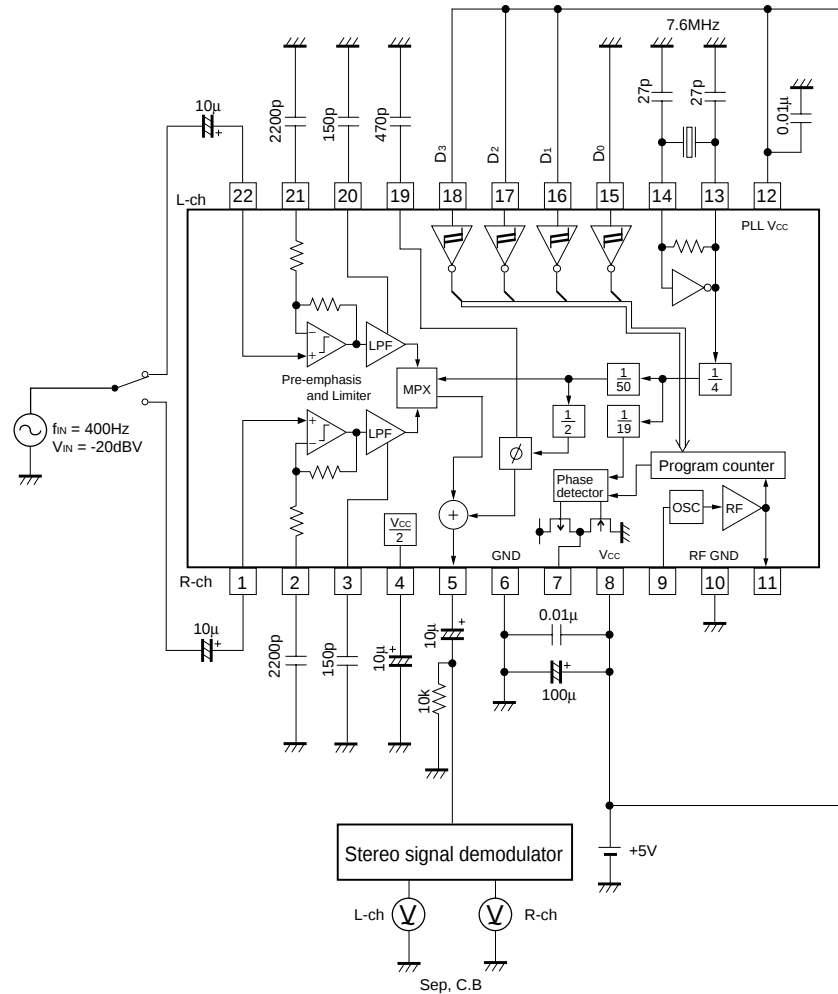


Fig.2

Multimedia ICs

Total harmonic distortion
 Input output gain
 Pilot index of modulation
 Sub carrier rejection ratio
 Pre-emphasis time constant

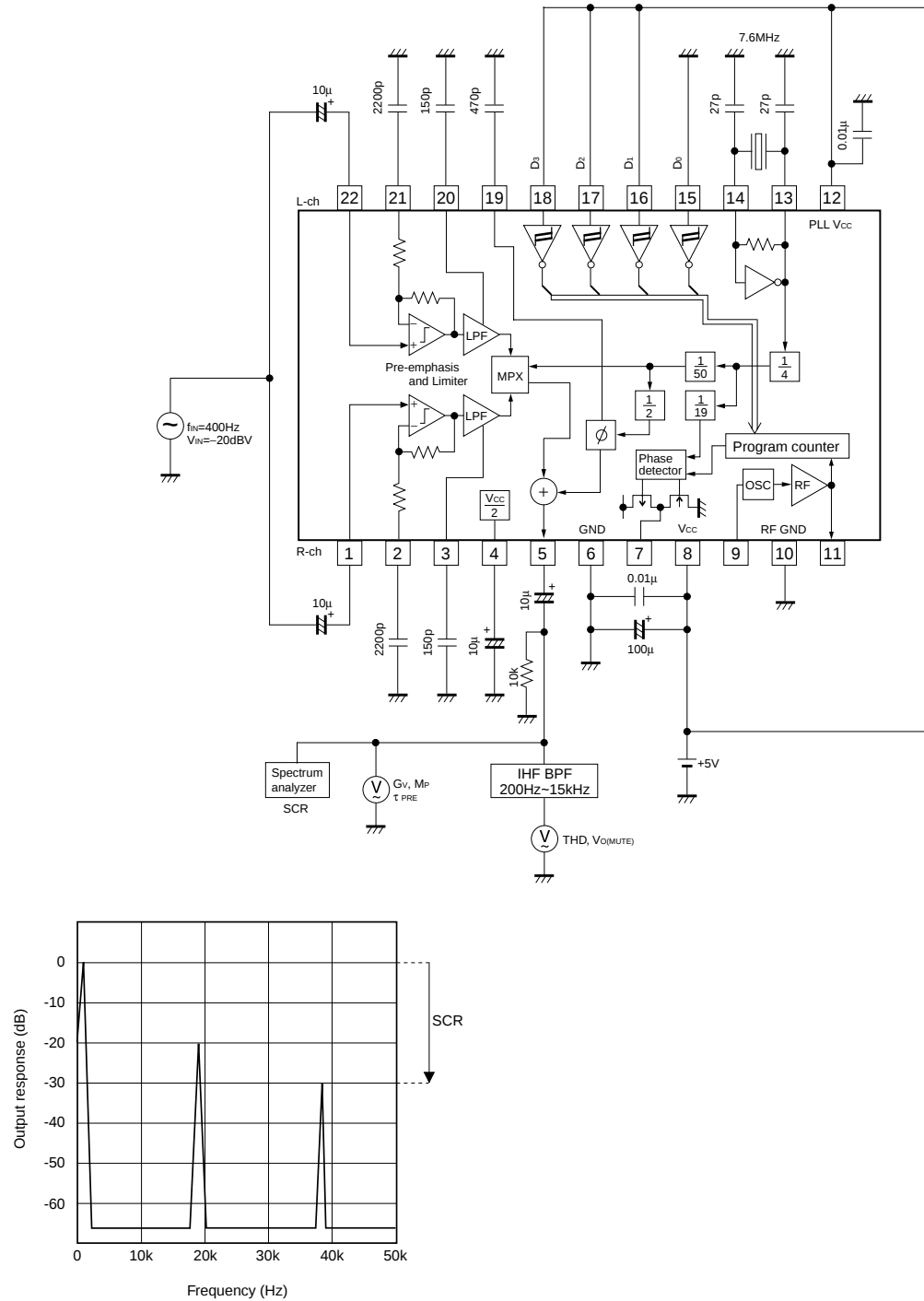


Fig.3

Limiter input level

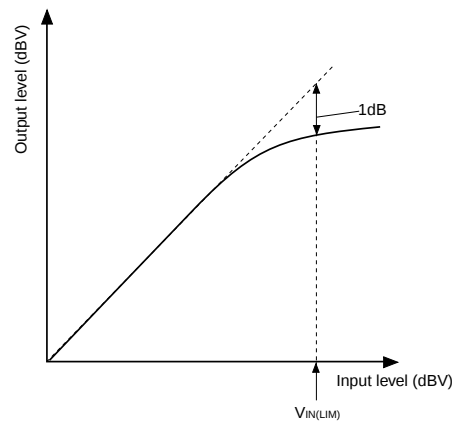
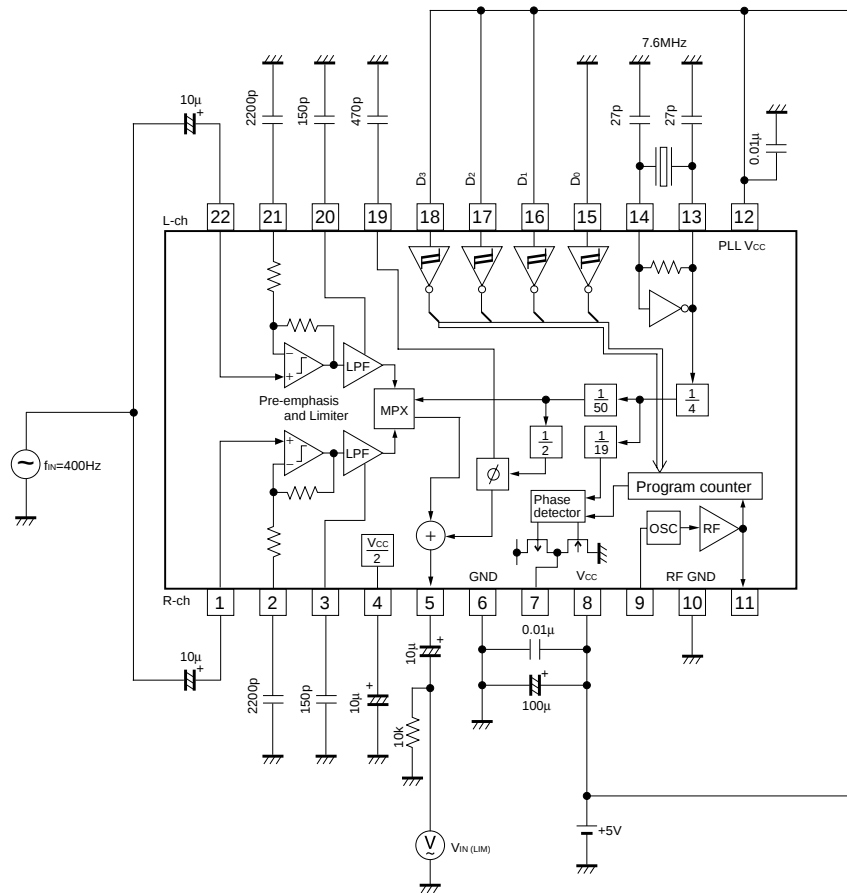


Fig.4

The diagram illustrates a PLL-based FM receiver circuit using the CD4046B IC. The circuit is divided into two main sections: L-ch (Left Channel) and R-ch (Right Channel).

Input and Reference: The L-ch input (pins 22, 21, 20, 19) is connected to a 10μF capacitor and a 150pF capacitor. The R-ch input (pins 1, 2, 3, 4) is connected to a 10μF capacitor and a 150pF capacitor. A 400Hz test signal source (V_{IN} = -20dBV) is connected to the R-ch input. A 7.6MHz reference signal is connected to the PLL V_{CC} pin (pin 12).

PLL and Frequency Synthesis: The PLL (pins 15, 16, 17, 18) is connected to the L-ch input. The PLL output (pin 14) is connected to a 27pF capacitor and a 7.6MHz reference signal. The PLL output is also connected to a 0.01μF capacitor.

Phase Detector and Program Counter: The phase detector (pins 13, 14) is connected to the PLL output. The program counter (pins 10, 11) is connected to the PLL output. The program counter output is connected to a 0.01μF capacitor.

RF and Baseband Processing: The RF input (pins 1, 2) is connected to a 10μF capacitor and a 150pF capacitor. The RF input is also connected to a 10kΩ resistor and a 100μF capacitor. The RF input is connected to the RF GND pin (pin 11). The RF input is also connected to a 10μF capacitor and a 150pF capacitor. The RF input is connected to the RF GND pin (pin 11). The RF input is also connected to a 10μF capacitor and a 150pF capacitor. The RF input is connected to the RF GND pin (pin 11).

Power and Grounding: The circuit is powered by a +5V supply. Grounding is provided for the L-ch (pins 22, 21, 20, 19) and R-ch (pins 1, 2, 3, 4) inputs. The PLL V_{CC} pin (pin 12) is connected to the +5V supply. The RF GND pin (pin 11) is connected to ground.

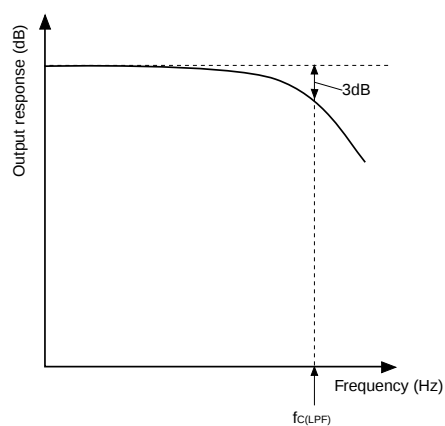


Fig.5

Transmission output level

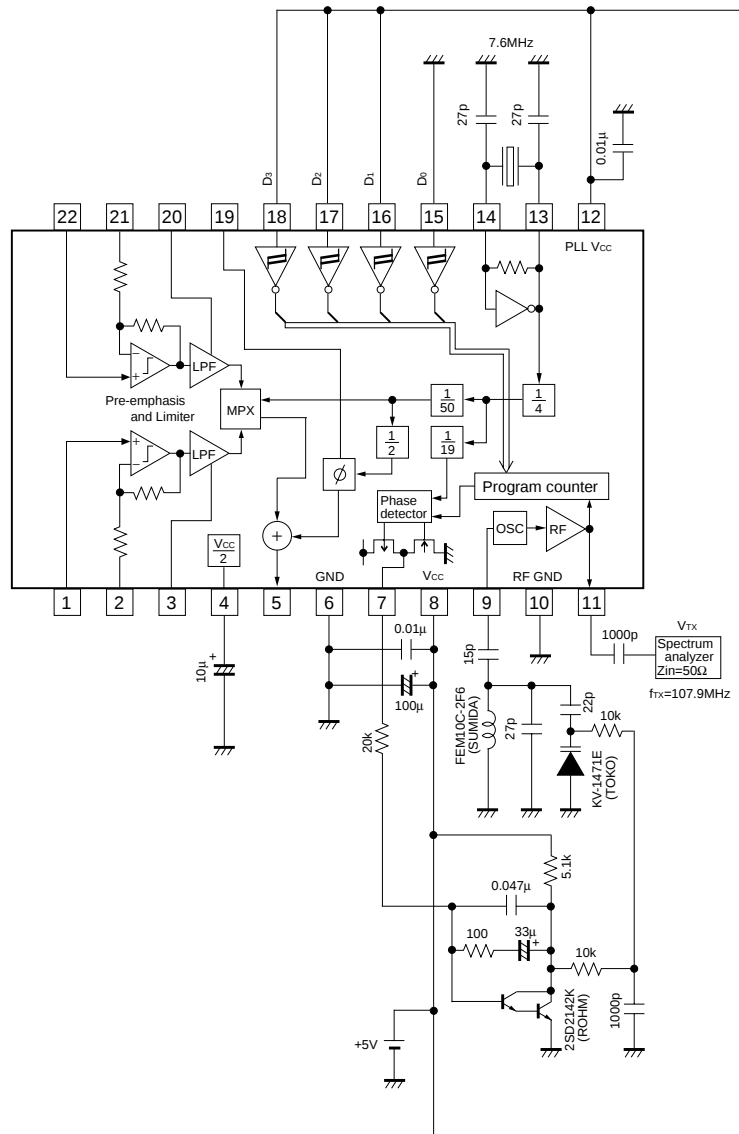


Fig.6

"H" level input current

"L" level input current

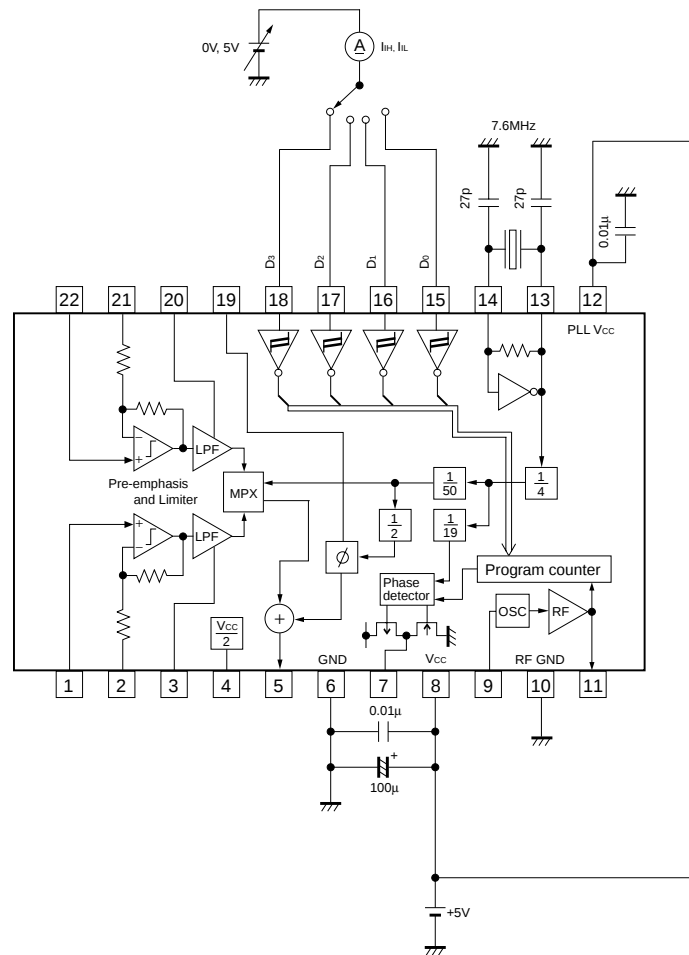


Fig.7

Multimedia ICs

“H” level output voltage

“L” level output voltage

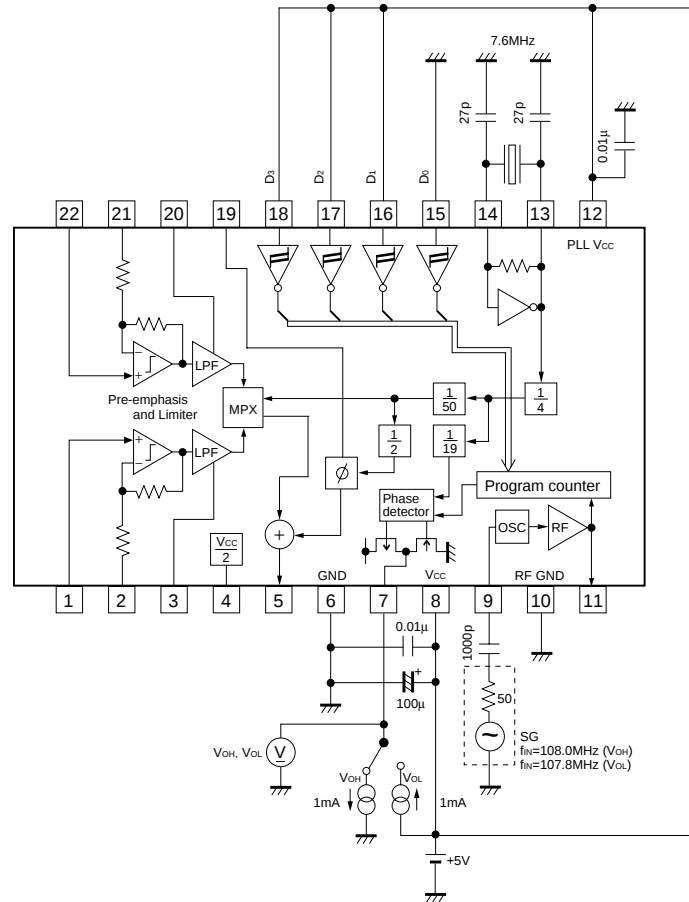


Fig.8

“off” level leak input current

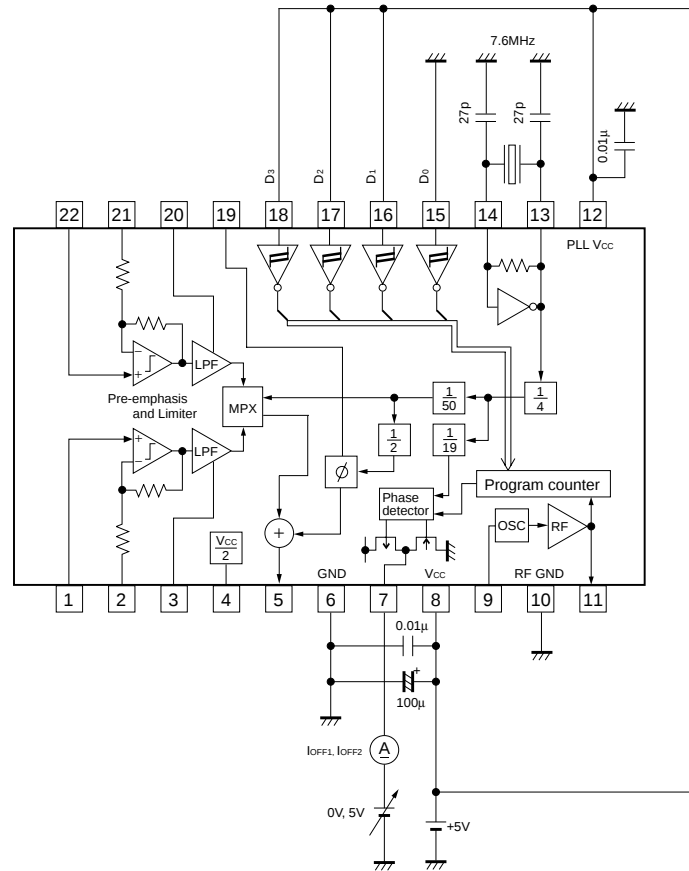


Fig.9

US BAND (88.0MHz~89.2MHz)

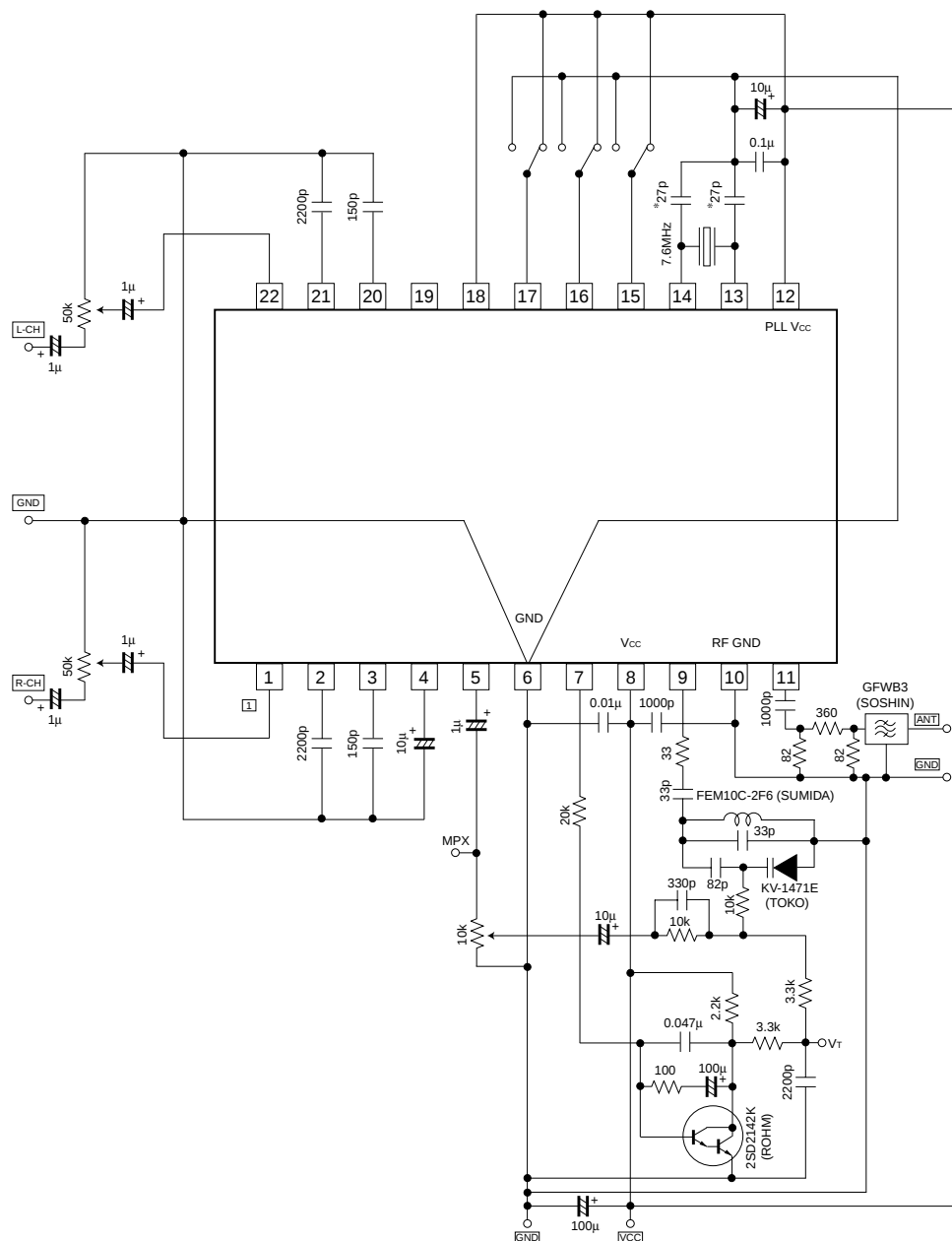


Fig.10

Multimedia ICs

●Circuit operation

Parallel data

Control data				Frequency
D ₀ (Pin15)	D ₁ (Pin16)	D ₂ (Pin17)	D ₃ (Pin18)	
L	L	L	L	87.7MHz
H	L	L	L	87.9MHz
L	H	L	L	88.1MHz
H	H	L	L	88.3MHz
L	L	H	L	88.5MHz
H	L	H	L	88.7MHz
L	H	H	L	88.9MHz
H	H	H	L	PLL stops. Phase comparator terminal supports high impedance.
L	L	L	H	106.7MHz
H	L	L	H	106.9MHz
L	H	L	H	107.1MHz
H	H	L	H	107.3MHz
L	L	H	H	107.5MHz
H	L	H	H	107.7MHz
L	H	H	H	107.9MHz
H	H	H	H	PLL stops. Phase comparator terminal supports high impedance.

●External dimensions (Units : mm)

