

AKC6952 stereo FM / TV / MW / LW PVC / PVR radio tuner

Device Overview

AKC6952 Integrated FM radio complete / The television audio / AM / long wave receiver function, including input from the antenna to the stereo audio output of all modules. Chip supports worldwide FM / TV sound / long wave / MW / SW bands.

application

- Desktop radios, portable radios
- Clock radios
- Boom boxes

Package

- TSSOP28 Package

Features

- Support worldwide FM bands (64 ~ 108 MHz)
- stand by TV1 audio(56.25 ~ 91.75 MHz)
- stand by TV2 audio(174.75 ~ 222.25 MHz)
- Support wave band in the world (520 ~ 1730 KHz)
- Worldwide support long-wave bands (150 ~ 285 KHz)
- It supports a wide supply voltage range: 2.0V ~ 4.5V
- stand by 32.768KHz Passive crystal
- Integrated audio amplifier (maximum power differential 0.5W)
- One kind of de-emphasis mode: 50us
- Support tuning lamp function
- stand by PVR with PVC Transfer station
- Audio inverted output
- Support for stereo line input
- Internal integrated PLL
- Intelligent frequency control
- AGC
- Precise digital demodulation
- Smart mute function
- MW Precise tuning adaptive front end
- integrated LDO
- According to the battery voltage, automatically adjust the volume
- Pb-free / RoHS compliant
- Support adjust the volume potentiometer
- In addition to the volume control potentiometer as well as 4 File preset volume gain

Pin

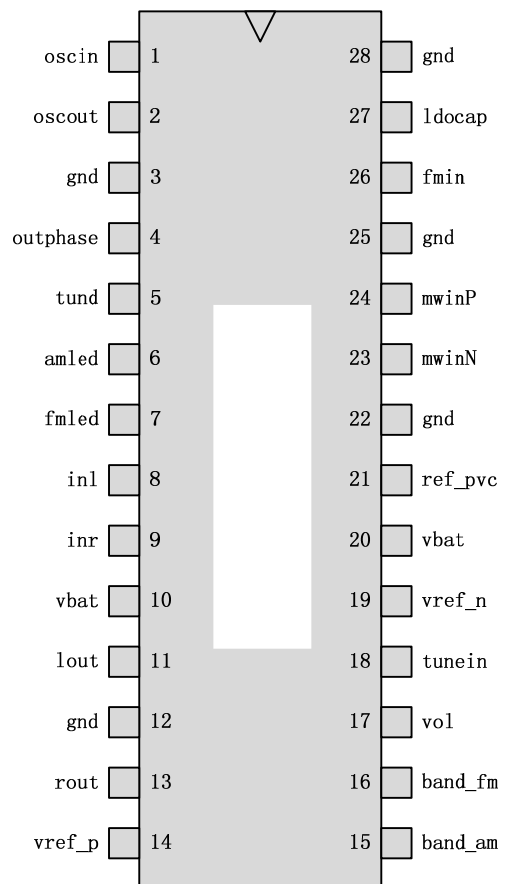


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1 Technical Specifications

1.1 Limit indicator

Table 1. Limit indicator

parameter	Symbols or test strips Item	Min	Typ	Max	unit
Power supply	VBAT	- 0.5	-	5.8	V
I2C interface input voltage	SCLK, SDIO	- 0.3	VBAT	VBAT + 0.3	V
Operating temperature		- 40	-	85	° C
Storage temperature		- 55	-	150	° C
The maximum signal reception				0.8	Vpk
Pin antistatic			2		KV

Beyond the limits of the conditions listed above, it can cause permanent damage or deterioration indicator device.

1.2 Recommended operating conditions

Table 2. Recommended operating conditions

parameter	Symbols or test conditions	Minimum	Typical	Max	unit
Power supply	VBAT	2	3.3	4.5	V
Input digital signal low threshold	SCLK, SDIO			0.3 * VBAT	V
Input digital signal high threshold	SCLK, SDIO	0.7 * VBAT			
Low threshold output digital signal	SDIO, TUND			0.2 * VBAT	V
High threshold output digital signal	SDIO, TUND	0.8 * VBAT			V
Operating temperature		- 40	-	85	° C

1.3 DC Characteristics

(VBAT = 3V, VIO = 3 V, TA = 25 ° C, The other is the default, unless otherwise noted)

Table 3. DC Characteristics

parameter	Symbols or test conditions	Min	Typ	Max	Units
FM mode					
Drive external audio amplifier	Maximum volume, is not connected speakers or headphones		25	26	mA
Built-in audio amplifier driving	Maximum volume, is not connected speakers or headphones		28	29	mA
TV Sound Mode					
Drive external audio amplifier	Maximum volume, is not connected speakers or headphones		25	26	mA
Built-in audio amplifier driving	Maximum volume, is not connected speakers or headphones		28	29	mA
AM mode					
Drive external audio amplifier	Maximum volume, is not connected speakers or headphones		twenty three	twenty four	mA
Built-in audio amplifier driving	Maximum volume, is not connected speakers or headphones		26	27	mA
Shortwave mode					
Drive external audio amplifier	Maximum volume, is not connected speakers or headphones		twenty three	twenty four	mA
Built-in audio amplifier driving	Maximum volume, is not connected speakers or headphones		26	27	mA

1.4 Reception characteristics

(VBAT = 3V, TA = 25 ° C, The other is the default, unless otherwise noted)

1.4.1 FM and television sound reception characteristics

Table 4. FM reception characteristics

parameter name	symbol	Test Conditions	Typical minimum value	maximum value	unit	
FM Frequency Range	FM fr	More than the total FM band coverage	64	-	108	MHz
TV1 Frequency Range	TV1 fr		56.25	-	91.75	MHz
TV2 Frequency Range	TV2 fr		174.25	-	222.25	MHz
Low noise amplifier input resistor	Zin		-	200	-	ohm
LNA input capacitance	Cin		-	2	-	pF
Practical sensitivity	Sen	Mod = 22.5K Ref out SINAD = 30dB	-	7	-	dBuV
Best signal to noise ratio	SNR	URF = 1mV Ref out Mod = 22.5K	-	50	-	dB
Stereo lighting sensitivity		Mod = 75K pilot & stereo	-	twenty three	-	dBuV
Stereo separation		URF = 1mV Mod = 75K Pilot & Stereo	-	31	-	dB
Image Rejection	IMR	Mod = 22.5K IMR = RF + 2 * IF SNR = 30dB	-	43	-	dB
300K Adjacent Channel selectivity ACS _{300K}		Mod = 22.5K +/-300K SNR = 30dB	-	NA	-	
Spurious suppression		Mod = 22.5K ± 1MHz SNR = 30dB	-	60	-	dB
AM suppression		URF = 1mV FM mod = 22.5K AM mod = 30%	-	50	-	dB
Left and right channel amplitude balance		URF = 1mV Mod = 22.5K Ref out	-	0.1	-	dB
Audio Frequency Response		URF = 1mV Mod = 22.5K 50uS De loss = 6dB	125	-	4500	Hz
Distortion	THD	URF = 1mV Mod = 22.5K Ref out Vdd = 3V	-	0.6	-	%
The maximum distortion	THD _{max}	URF = 1mV Mod = 22.5K Max out Vdd = 3V	-	20	-	%
Strong signal distortion		URF = 100mV Mod = 75K Ref output	-	4	-	%
22.5K Maximum power		Vdd = 3.6V Urf = 1mV Mod = 22.5K Max out	-	50	-	mW
75K Maximum power		Vdd = 3.6V Urf = 1mV Mod = 75K Max out	-	600	-	mW
The audio output common mode	Vcm		-	VDD / 2	-	V
Station search time			-	40	-	ms / chan
boot time			-	1	-	ses
The minimum operating voltage	MinV		-	2	-	V

1.4.2 Medium wave and long wave reception characteristics

Table 5. Polish and Long wave reception characteristics

parameter name	symbol	Test Conditions	Typical minimum value	maximum value	unit	
LW Frequency Range	LW fr		150	-	285	KHz
MW Frequency Range	MW fr		510	-	1710	KHz
Practical sensitivity	Sen	Long bar magnet 80mm Lind = 350uH ~ 450uH SNR = 20dB	-	82	-	dBuV
Signal to Noise Ratio	SNR	Mod = 30% Urf = 100dBuV	-	40	-	dB
Adjacent Channel selectivity	ACS	Mod = 30% ADJ = RF +/- 10KHz SINAD = 20dB	-	40	-	dB
30% The maximum volume output		VDD = 3.6V Mod = 30% Max vol	-	50	-	mW

80% The maximum volume output		VDD = 3.6V Mod = 80% Max vol	-	380	- mW	
Audio Frequency Response		Urf = 100dBuV Mod = 30% Loss = 6dB	50	-	4000	Hz
Distortion	THD	Urf = 100dBuV Mod = 30% Ref out	-	1.2	-%	
Image Rejection	IMR	Mod = 30% Fimr = Frf + 2 * IF SINAD = 20dB	-	50	-	dB
Best signal to noise ratio			-	49	-	dB
The maximum random noise		Max Vol Mod = off	-	30	- mV	
LNA input impedance	Zin		-	> 1M	-	ohm
Output common mode	Vcm		-	VDD / 2	-	V
Zapping time			-	35	-	us / chan
boot time			-	1	-	S

1.5 Crystal property requirements

Table 7. Passive crystal properties

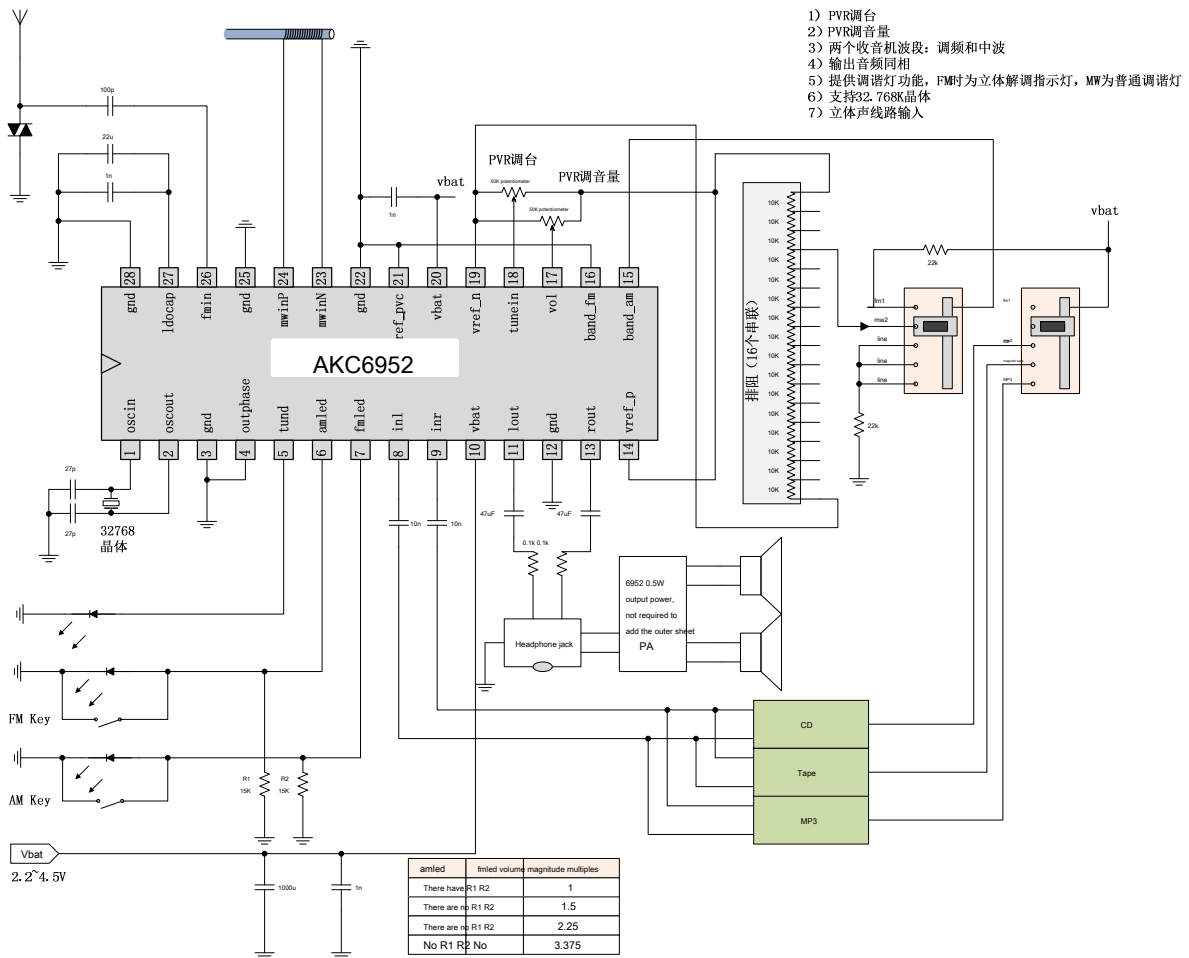
parameter name	symbol	Test Conditions	Typical	minimum value	maximum value	unit
32.768KHz Passive crystal	ESR				100	KΩ
Series resonant impedance						
Crystal frequency deviation			--100	0	100	ppm

Table 8. The active reference clock characteristics

parameter name	symbol	Test Conditions	Typical	minimum value	maximum value	unit
Rms jitter		Audio output SINAD more than the 40dB			2	ns
Low voltage input reference clock		Support sine and square wave	-0.1		0.4	V
A high voltage input reference clock		Support sine and square wave	1.2		1.8	V
Clock frequency deviation			--100	0	100	ppm

2 Application Circuit

Here is a two-band BoomBox Radio Schematic:



3 Pin definitions

3.1 AKC6952 Pin definitions

Table 11. Pin Description

Pin name	explanation	
1	oscin	Bonding or passive 32.768K 12MHz crystal to ground, or receive an external clock reference signal
2	oscout	Passive other end connected to the crystal, when connected to an external clock, this pin floating
3	gnd	Close to ground
4	outphase	Output phase control, when the output of the inverter floating or connected high, for pushing a speaker; then low or ground, the output of inphase
5	tund	Indicator lamp or stereo demodulation tuning pins, directly to the LED to ground; when the pin is left floating or connected outphase high, this pin is always tuning indicator; When the pin is ground or outphase low, the FM stereo demodulation mode of the indicator pin is, where the rest of the tuning indicator;
6	amled	AM and FM mode lamp connected normally open key to ground, while the pin is pre-adjusted to a volume input pin
7	fmled	AM and FM mode lamp connected normally open key to ground, while the pin is pre-adjusted to a volume input pin

8	inl	External audio signal input L, proposes to add blocking capacitor 1uF
9	inr	External audio input signal R, proposes to add blocking capacitor 1uF
10	vbat	Then the power pins need to pay attention to the nearest ground 0.1uF decoupling capacitance to ground
11	lout	Left channel audio output
12	gnd	Close to ground
13	rou	Right channel audio output
14	vref_p	Precision 1.5V reference output pin
15	band_am	AM band mode control pins, different bands corresponding to different voltages;
16	band_fm	FM band mode control pins, different voltages corresponding to the different wavelength bands;
17	vol	Variable volume potentiometer connected end, the fixed end of a potentiometer directly connected to VREF, and the other end through a resistor to ground. The resistance ratio of the resistor and potentiometer as 1: 2
18	tunein	PVR transfer station control pins, different voltages corresponding to the number of stations
19	vref_n	Precision 0.5V reference output pin
20	vbat	Then the power pins need to pay attention to the nearest ground 0.1uF decoupling capacitance to ground
twenty one	ref_pvc	A secured end of the differential PVC
twenty two	gnd	Close to ground
twenty three	mwinN	MW and LW differential input signal
twenty four	mwinP	
25	gnd	Close to ground
26	fmin	FM radio frequency signal input terminal, note add blocking capacitor, 100pF recommendations
27	ldocap	Internal LDO output pin, nearest the need decoupling capacitors, recommendations 47uF
28	gnd	Close to ground

4 Receiving TV sound

TV sound fundamental difference with the general FM stations that sound is an odd multiple of 50KHz. Here are a few national television with audio points:

Table 13. TV with audio point

National television channel 1 (MHz)	TV channel 2 (MHz)		TV Channel 3 (MHz)		TV Channel 4 (MHz)		TV Channel 5 (MHz)		TV Channel 6 (MHz)				
	Video	audio	video	audio	video	audio	video	audio	video	audio			
							China 49.75	56.25	57.75	64.25	65.75	72.25	77.25
							83.75	85.25	91.75	168.25	174.75		
United States			55.25	59.75	61.25	65.75	67.25	71.75	77.25	81.75	83.25	87.75	
Australia	57.25	62.75	64.25	69.75	86.25	91.75	95.25						
new Zealand	45.25	50.75	55.25	60.75	62.25	67.75	75.25	180.75	182.25	187.75	189.25	194.75	
Indonesia	48.25	53.75	55.25	60.75	62.25	67.75	75.25	180.75	182.75	187.75	189.25	194.75	Italy
	53.75	59.25	62.25	67.75	82.25	87.75	175.25	180.75	183.25	188.75	192.25	197.75	
CCIR 4	41.25	46.75	48.25	53.75	55.25	60.75	62.25						
								67.75	175.25	180.75	182.25	187.75	

5 how to use line in Features

band_am pin to the ground.

6 Pre-tune volume

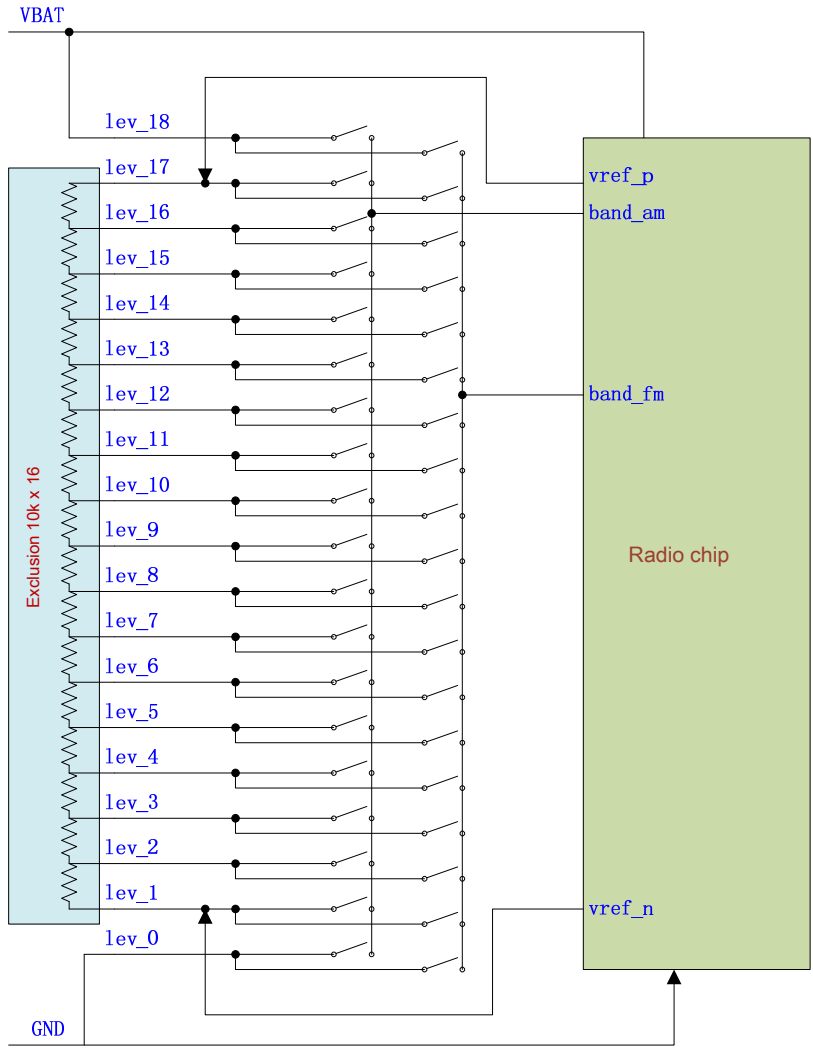
To solve the problem of different volume applications, the chip pre-set volume level of the fourth speed, the gain level is switched on if there is a detection instant fmled amled and to decide the 15K resistor, the chip once the work up, the resistance here any resurgence is not a role.

amled	fmled	Volume amplitude magnification
There 15K resistor to ground	There 15K resistor to ground	1
There 15K resistor to ground	no	1.5
no	There 15K resistor to ground	2.25
no	no	3.375

7 How to configure band and mode of operation

There are two modes of operation of the chip patterns and band, on this issue are discussed below:

Embodiment 1: Operating modes are determined mode button, working with a specific band determined band_am and band_fm pin, and this mode of operation requires band_am band_fm can not be grounded. DETAILED operating band in this manner there are respectively connected to the above voltage band_am band_fm and decision, the chip 19 is designed voltage level, the following table and the correspondence between the voltage level of the band:

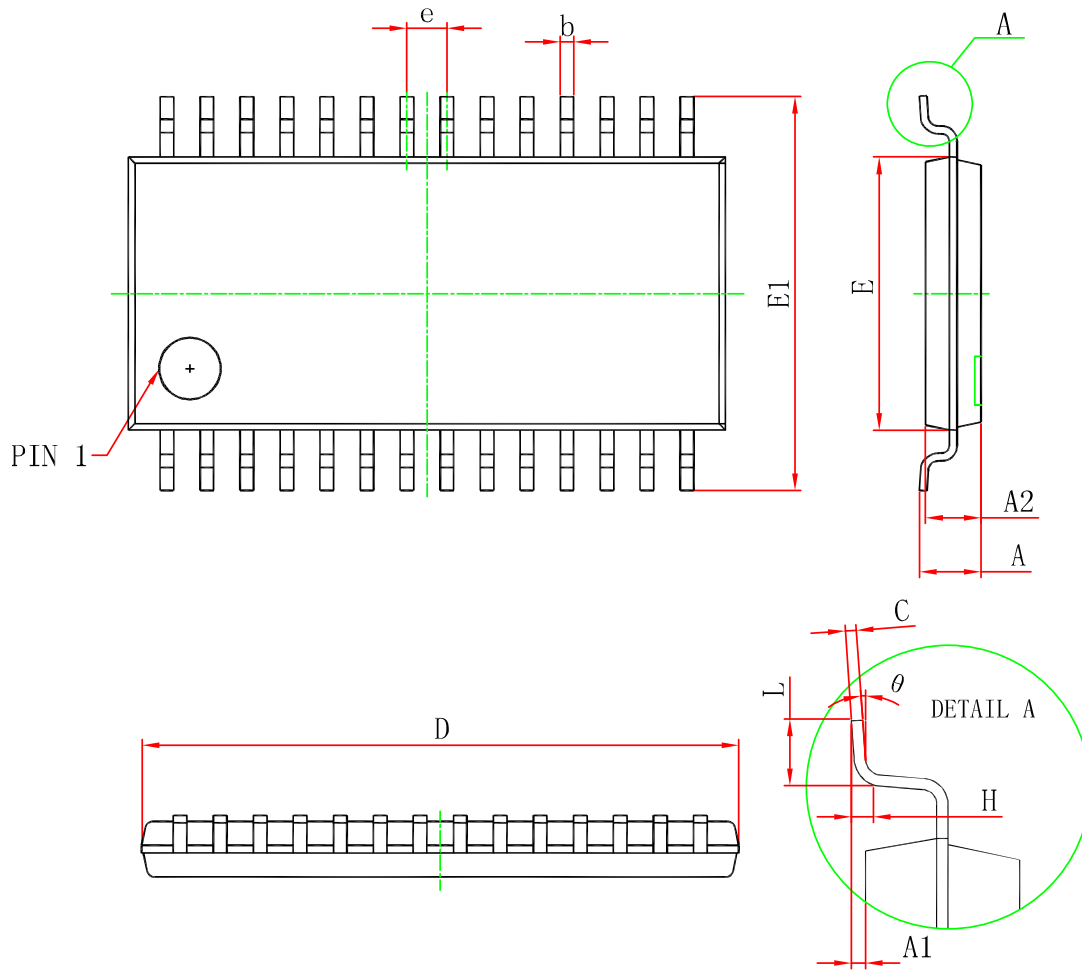


电压等级	band_am		band_fm	
lev_18	MW3	0.52M ~ 1.71M, 5K channel number, 10K station search	FM2	~ 108M
	MW2	0.522M ~ 1.62M, 3K channel number, 9K station search	way	~ 108M
lev_16	MW4	0.52M ~ 1.73M, 5K channel number, 10K station search	FM3	70M ~ 93M
lev_15	MW1	0.52M ~ 1.71M, 5K channel number, 5K station search	FM4	76M ~ 90M
lev_14	LW	0.15M ~ 0.285M, 3K channel number, 3K station search	FM5	64M ~ 88M 76M
lev_13	Retention	level retention of SW	TV1	56.25M ~ 91.75M 87M
lev_12	Retention	SW reserved for grade level to grade	TV2	174.75M ~ 222.25M
lev_11	Retention	level retention of SW	FM6	87.3M ~ 108.2M
lev_10	Retention	Reserved for the grade level of SW	FM7	86.5M ~ 109M
lev_9	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_8	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_7	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_6	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_5	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_4	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_3	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_2	Retention	Reserved for the grade level of SW	FM1	87M ~ 108M
lev_1	Retention	SW reserved for grade level to grade	FM3	87M ~ 108M
lev_0	line in mode		2 FM1	

Mode 2: Work mode and working bands all have band_am decision, this mode requires band_fm to the ground. The following table is a correspondence relationship with the voltage level of the band in this manner band_am contact:

电压等级	band_am	
lev_18	FM1	87M ~ 108M
	FM3	70M ~ 93M
lev_16	TV1	56.25M ~ 91.75M
lev_15	TV2	174.75M ~ 222.25M
lev_14	reserved	0.522M ~ 1.62M, 3K channel number, 9K station search
lev_13	Retention	Voltage level is reserved for a short
lev_12	Retention	Voltage level is reserved for a short
lev_11	Retention	of the short retention shortwave
lev_10	Retention	Voltage level is reserved for a short
lev_9	Retention	Voltage level is reserved for a short
lev_8	Retention	Voltage level is reserved for a short
lev_7	Retention	Voltage level is reserved for a short
lev_6	Retention	Voltage level is reserved for a short
lev_5	Retention	Voltage level is reserved for a short
lev_4	Retention	Voltage level is reserved for a short
lev_3	MW2	Voltage level is reserved for a short
lev_2	Retention	Voltage level is reserved for a short
lev_1	Retention	Reserved voltage level to the voltage level
lev_0	line in mode	

8 TSSOP 28 Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
D	9.600	9.800	0.378	0.386
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
A		.1001		0.340
A2	0.800	1.000	0.031	0.039
A1	0.020	0.150	0.001	0.006
e L	0.65 (BSC)		0.026 (BSC)	
	0.500	0.700	0.02	0.028
H	0.25 (TYP)		0.01 (TYP)	
θ	1	7°	1	7°

