



Monolithic Dial-Tuned Broadcast Global AM/FM Receiver  
FM/LW/MW/SW

Radio-on-a-Chip™  
**KT0936M (B9)**

#### • Features

Single-chip solution with global wavebands  
Built-in MCU

#### Potentiometer tuning support

#### Supports all world-wide used bands

FM—32MHz - 110MHz

LW—150KHz - 520KHz

MW—500KHz - 1750KHz

SW—1.75MHz - 32MHz

#### High sensitivity

FM— 1.6  $\mu$  V<sub>emf</sub>

LW— 16  $\mu$  V<sub>emf</sub>

MW—16  $\mu$  V<sub>emf</sub>

SW— 13  $\mu$  V<sub>emf</sub>

#### High fidelity

Signal to noise ratio (FM/AM): 58 dB/55 dB  
(without filter), total harmonic distortion: 0.3%

#### Low power consumption

Typical operating current: 29 mA

#### Integrated tuning indicator function

Adjustable sensitivity and hysteresis

Silent tuning

Automatic volume mute when the quality of the received signal decreases

#### Low operating voltage

2.1 V ... 3.6 V, powered by two AAA batteries

#### Built-in crystal oscillator

Supports 32.768 kHz and 38 kHz crystals,

Supports flexible reference clock from 30 kHz to 40 MHz in 1 Hz steps

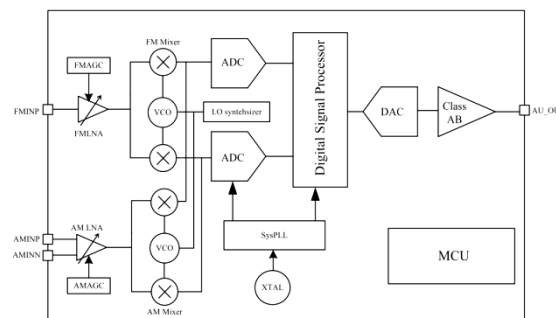
#### RoHS compliant

#### Used in

Portable radios, clock radios, mini stereos, amateur radios and other radio applications with manual tuning

#### Version V2.2

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KT0936M System Diagram

#### General description

**KT0936M** is Quantum's third-generation patented product Microelectronics. It is a fully integrated FM and AM radio signal receiver in the VHF, DV, SV and HF bands, which supports potentiometer tuning. Its main features include: a familiar tuning feel comparable to analog solutions; tuning indicator function (while the indication is not mandatory); improved EMI and EMC electromagnetic compatibility parameters; significantly more balanced sensitivity curves in each band.

Finally, more effectively suppressed interference allows for more flexible antenna placement, especially for AM ranges.

By utilizing advanced architecture, **the KT0936M provides** an excellent user experience, including high sensitivity, high signal-to-noise ratio, low distortion, and high interference rejection capabilities.

**The KT0936M** requires only a few external components, including a tuning potentiometer for manual control, eliminating the need for an external controller (MCU). **The KT0936M** can operate completely standalone, but with an external EEPROM connected, it can also meet other individual customer application requirements.

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## 1. Electrical properties

**Table 1:** Operating conditions

| Parameter                    | Symbol | Test condition  | Min. | Type. | Max. | Unit |
|------------------------------|--------|-----------------|------|-------|------|------|
| Supply voltage               | AVDD   | to analog earth | 2.1  | 3.3   | 3.6  | V    |
| Digital power supply voltage | DVDD   | to analog earth | 2.1  | 3.3   | 3.6  | V    |
| Ambient temperature          | Ta     |                 | -30  | 25    | 70   | °C   |

**Table 2:** Maximum nominal parameters

| Parameter                                                                                                                                                                                                                                                                                       | Symbol          | Type.                           | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------|------|
| Supply Voltage                                                                                                                                                                                                                                                                                  | AVDD            | -0.5 to 3.9                     | V    |
| Supply Voltage of digital Inputs/Outputs                                                                                                                                                                                                                                                        | DVDD            | -0.5 to 3.9                     | V    |
| Input Current                                                                                                                                                                                                                                                                                   | I <sub>IN</sub> | 10                              | mA   |
| Input Voltage                                                                                                                                                                                                                                                                                   | IN              | -0.3 to (V <sub>IO</sub> + 0.3) | V    |
| Entry level high-end                                                                                                                                                                                                                                                                            | RF              | 0.7                             | V    |
| Comment:<br>1. Exceeding the maximum ratings listed above may damage the device.<br>2. The operating limits of the function should be in accordance with the specified data sheet. Long-term exceeding of the operating conditions may affect the reliability of the equipment.<br>3. SPAN pin. |                 |                                 |      |

**Table 3:** DC characteristics

(Unless otherwise noted, Ta = -30...70 °C , AVDD = DVDD = 2.1V to 3.6V)

| Parameter         | Symbol  | Test conditions | Min. | Type. | Max. | Unit |
|-------------------|---------|-----------------|------|-------|------|------|
| Operating current | FM mode | I <sub>FM</sub> | -    | 30    | -    | mA   |
|                   | MW mode | I <sub>MW</sub> | -    | 29    | -    | mA   |
|                   | SW mode | I <sub>SW</sub> | -    | 29    | -    | mA   |

**Table 4:** FM reception characteristics

(Unless otherwise noted, Ta = -30...70 °C , AVDD = DVDD = 2.1V to 3.6V)

| Parameter                                                                   | Symbol           | Test conditions                       | Min. | Type.  | Max. | Unit                 |
|-----------------------------------------------------------------------------|------------------|---------------------------------------|------|--------|------|----------------------|
| FM frequency range                                                          | F <sub>rx</sub>  |                                       | 32   |        | 110  | MHz                  |
| Sensitivity <sup>1,2,3</sup>                                                | SEN              | For distance (S+N)/N=26dB             |      | 1.6    | 2    | μV <sub>emf</sub>    |
| Input referred 3 <sup>rd</sup> Order Intermodulation Product <sup>4,5</sup> | IIP <sub>3</sub> | Intermodulation 3 <sup>rd</sup> order |      | 85     |      | dB μV <sub>emf</sub> |
| Adjacent channels Selectivity                                               |                  | ± 200 kHz                             | 40   |        | 51   | dB                   |
| Non-adjac. chan. selectivity                                                |                  | ± 400 kHz                             | 50   |        | 70   | dB                   |
| Image Rejection Ratio                                                       |                  |                                       |      | 43     |      | dB                   |
| AM suppression                                                              |                  |                                       |      | 50     |      | dB                   |
| Reference clock frequency                                                   | RCLK             |                                       | 30   | 32,768 | 40   | kHz                  |
| Clock frequency stability <sup>8</sup>                                      |                  |                                       | -100 |        | +100 | ppm                  |
| Audio amplitude <sup>1,2,4,6,7</sup>                                        |                  | Load 32 Ω                             |      | 345    |      | mV <sub>RMS</sub>    |
| Audio Frequency range <sup>1,2,4</sup>                                      |                  | ± 3dB                                 | 30   |        | 15k  | Hz                   |
| Signal to noise ratio <sup>1,2,3,4</sup>                                    |                  | Mono, w/o weighting filter            | 55   | 58     |      | dB                   |
| Total distortion <sup>1,2,4,6</sup>                                         | THD              | 3 <sup>rd</sup> order                 |      | 0.3    |      | %                    |
| De-emphasis (time constant)                                                 |                  | DE=0                                  |      | 75     |      | μs                   |
|                                                                             |                  | DE=1                                  |      | 50     |      |                      |
| Audio Comm. Mode Voltage                                                    |                  |                                       | 0.85 | 1.35   | 1.6  | IN                   |
| Recommended Output load                                                     | R <sub>L</sub>   | mono                                  |      | 32     |      | Ω                    |
| Power-Up Time                                                               |                  |                                       | 200  |        | 600  | ms                   |

Comment:

1.  $F_{MOD} = 1 \text{ kHz}$ , de-emphasis  $75 \mu\text{s}$
2. MONO = 1
3.  $\Delta F = 22.5 \text{ kHz}$
4.  $V_{EMF} = 1 \text{ mV}$ ,  $F_{RX} = 32 \text{ MHz} \dots 110 \text{ MHz}$
5. RFAGCD = 1
6.  $\Delta F = 75 \text{ kHz}$
7. VOLUME<4:0> = 11111
8. The reference clock signal is discontinuous; Please see the application notes.
9.  $\Delta F = 75 \text{ kHz}$

**Table 5: MW AM receiver characteristics**

(Unless otherwise noted,  $T_a = -30 \dots 70 \text{ }^\circ\text{C}$ ,  $AVDD = DVDD = 2.1\text{V to }3.6\text{V}$ )

| Parameter                                                                       | Symbol   | Test conditions            | Min. | Type. | Max. | Unit                |
|---------------------------------------------------------------------------------|----------|----------------------------|------|-------|------|---------------------|
| Frequency range MW                                                              | $F_{RX}$ |                            | 500  |       | 1750 | kHz                 |
| Sensitivity <sup>1,2</sup>                                                      | SEN      | (S+N)/N=20dB               |      | 16    |      | $\mu\text{V}_{emf}$ |
| Output level <sup>1,3,4,5</sup>                                                 |          | Load $32 \Omega$           |      | 360   |      | $\text{mV}_{RMS}$   |
| Signal to noise ratio <sup>1,2,3,4</sup>                                        | SNR      | Mono, w/o weighting filter |      | 55    | 62   | dB                  |
| Total distortion <sup>1,2,4</sup>                                               | THD      |                            |      | 0.3   | 0.6  | %                   |
| Antenna coil inductance                                                         | L        |                            | 360  |       | 620  | $\mu\text{H}$       |
| Notebook:                                                                       |          |                            |      |       |      |                     |
| 1. $F_{MOD} = 1 \text{ kHz}$                                                    |          |                            |      |       |      |                     |
| 2. Modulation index 30%                                                         |          |                            |      |       |      |                     |
| 3. $V_{EMF} = 1 \text{ mV}$ , $F_{RX} = 500 \text{ kHz} \dots 1750 \text{ kHz}$ |          |                            |      |       |      |                     |
| 4. VOLUME<4:0> = 11111;                                                         |          |                            |      |       |      |                     |

**Table 6: LW AM receiver characteristics**

(Unless otherwise noted,  $T_a = -30 \dots 70 \text{ }^\circ\text{C}$ ,  $AVDD = DVDD = 2.1\text{V to }3.6\text{V}$ )

| Parameter                                                                      | Symbol   | Test conditions       | Min. | Type. | Max. | Unit                |
|--------------------------------------------------------------------------------|----------|-----------------------|------|-------|------|---------------------|
| Frequency range LW                                                             | $F_{RX}$ |                       | 150  |       | 520  | kHz                 |
| Sensitivity <sup>1,2</sup>                                                     | DREAM    | (S+N)/N=20dB          |      | 16    |      | $\mu\text{V}_{emf}$ |
| Output level <sup>1,3,4,5</sup>                                                |          | Load $32 \Omega$      |      | 360   |      | $\text{mV}_{RMS}$   |
| Signal to noise ratio <sup>1,2,3,4</sup>                                       | SNR      | Mono, no filter       |      | 55    | 62   | dB                  |
| Total distortion <sup>1,2,4</sup>                                              | THD      | 3 <sup>rd</sup> order |      | 0.3   | 0.6  | %                   |
| Antenna coil inductance                                                        | L        |                       | 4.1  |       | 7    | mH                  |
| Note:                                                                          |          |                       |      |       |      |                     |
| 1. $F_{MOD} = 1 \text{ kHz}$                                                   |          |                       |      |       |      |                     |
| 2. Modulation index 30%                                                        |          |                       |      |       |      |                     |
| 3. $V_{EMF} = 1 \text{ mV}$ , $F_{RX} = 150 \text{ kHz} \dots 520 \text{ kHz}$ |          |                       |      |       |      |                     |
| 4. VOLUME<4:0> = 11111                                                         |          |                       |      |       |      |                     |
| 5. Modulation index is 80%                                                     |          |                       |      |       |      |                     |

**Table 7: SW AM receiver characteristics (KV)**

(Unless otherwise noted,  $T_a = -30 \dots 70 \text{ }^\circ\text{C}$ ,  $AVDD = DVDD = 2.1\text{V to }3.6\text{V}$ )

| Parameter                                | Symbol   | Test conditions  | Min. | Type. | Max. | Unit                |
|------------------------------------------|----------|------------------|------|-------|------|---------------------|
| SW frequency range                       | $F_{RX}$ |                  | 1.75 |       | 32   | MHz                 |
| Sensitivity <sup>1,2,3</sup>             | SEN      | (S+N)/N = 20dB   |      | 13    |      | $\mu\text{V}_{emf}$ |
| Output level <sup>2,4,5,6</sup>          |          | Load $32 \Omega$ |      | 360   |      | $\text{mV}_{RMS}$   |
| Signal to noise ratio <sup>2,3,4,5</sup> | SNR      | Mono, no filter  |      | 55    | 62   | dB                  |
| Total distortion <sup>3,4,5</sup>        | THD      |                  |      | 0.3   | 0.6  | %                   |
| Comment:                                 |          |                  |      |       |      |                     |
| 1. external LNA                          |          |                  |      |       |      |                     |
| 2. $F_{MOD} = 1 \text{ kHz}$             |          |                  |      |       |      |                     |

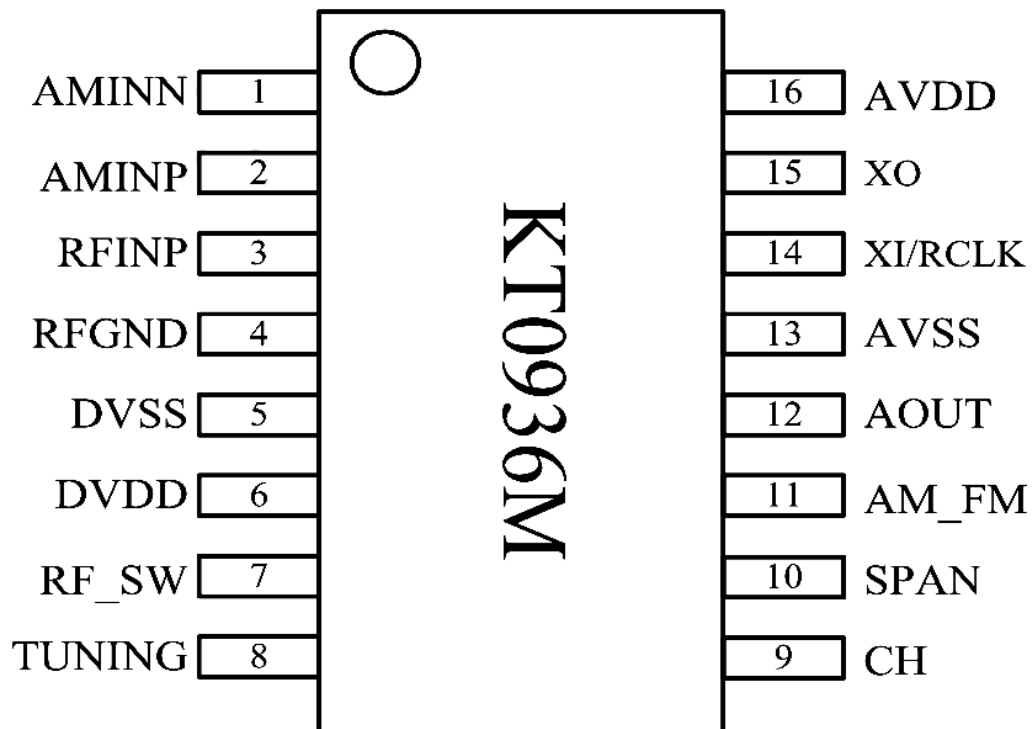


3. Modulation index 30%
4.  $V_{EMF} = 1 \text{ mV}$  ,  $F_{RX} = 500 \text{ kHz} \dots 1750 \text{ kHz}$
5. VOLUME<4:0> = 11111;
6. Modulation index is 80%

## 2. Pin descriptions

**Table 8** : Pin descriptions

| Pin number | Name    | I/O (Input/Output)                           | Description                                                                                                                        |
|------------|---------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1          | AMINN   | Input                                        | Negative Input of the MW and LW analog antenna coil                                                                                |
| 2          | AMINP   | Input                                        | Positive Input of the MW and LW analog antenna coil                                                                                |
| 3          | RFINP   | Input                                        | Input for VHF FM antenna and HF antenna                                                                                            |
| 4          | RFGND   | RF ground                                    | RF ground                                                                                                                          |
| 5          | DVSS    | digital earth                                | Digital Earth                                                                                                                      |
| 6          | DVDD    | Digital power supply                         | Powering digital circuits                                                                                                          |
| 7          | RF_SW   | Digital I/O<br><i>Internal pull - up 47k</i> | 1. Control of switching of RF circuits AM/FM<br>2. Data pin for EEPROM ( pull - up 47k built-in)                                   |
| 8          | TUNING  | Digital Output                               | Tunning-in (Signal Lock) Indicator                                                                                                 |
| 9          | CH      | Analog Input                                 | For the frequency selector potentiometer runner                                                                                    |
| 10         | SPAN    | Analog Input                                 | To select the band and its range                                                                                                   |
| 11         | AM_FM   | Digital I/O<br><i>Internal pull - up 47k</i> | 1. mute effects<br>2. Switching bands using buttons<br>3. Band switching with a switch<br>4. clock pin for external EEPROM (CLK_E) |
| 12         | AOUT    | Analog Output                                | Audio Signal Output                                                                                                                |
| 13         | AVSS    | Analog Ground                                | Audio Signal GND                                                                                                                   |
| 14         | XI/RCLK | Analog I/O                                   | Crystal                                                                                                                            |
| 15         | XO      | Analog I/O                                   | Crystal                                                                                                                            |
| 16         | AVDD    | Analog power supply                          | Powering analog circuits                                                                                                           |



**Figure 1:** KT0936M Pin assignment (Top view)



### 3. Function description

#### 3.1. Overview

The KT0936M is a single-chip, full-band FM/LW/MW/SW radio receiver solution. It eliminates the need for complicated peripheral circuitry and is widely configurable for custom designs.

#### 3.2. FM receiver

**KT0936M** FM receiver is based on a mass-produced third-generation radio chip from KT Micro .

**The KT0936M** does not require external filters or frequency selection circuits. Its architecture includes a fully integrated low-noise amplifier, automatic gain control (AGC), a series of high-performance A/D converters, high-performance analog and digital filters, and an integrated low-noise voltage-controlled oscillator (VCO) with automatic tuning. **The KT0936M** also includes a highly stable class AB operational amplifier, so in some applications it does not require a power audio amplifier.

#### 3.3. AM receiver

**KT0936M** AM receiver supports long, medium and short wave bands (LW, MW and SW).

For long wave (LW) receiver, it supports one configurable band and one fixed long wave band in the frequency range of 150 kHz to 520 kHz. Its receiver provides accurate and automatic antenna tuning in the frequency range of 150 kHz to 520 kHz without the need for manual adjustment. The inductance of the ferrite antenna winding can be between 4.1 mH and 7 mH .

For the medium wave (MW) receiver, it supports two configurable bands and two fixed bands in the frequency range of 500 kHz to 1750 kHz. Its medium wave receiver provides accurate and automatic antenna tuning in the frequency range of 500 kHz to 1750 kHz without manual adjustment. The inductance of the ferrite antenna winding can be between 360  $\mu$ H and 620  $\mu$ H .

For shortwave (SW) receiver, it supports 14 freely configurable bands and 36 fixed shortwave bands in the frequency range from 1.75 MHz to 32 MHz. The AM receiver bandwidth filter can be configured from 1.2 kHz to 6 kHz using the FLT\_SEL<2:0> register to meet different customer needs.

#### 3.4. Band selection

**KT0936M** supports 4 FM bands, 4 medium wave (MW) bands, 2 long wave (LW) bands and 50 short wave (SW) bands. The FM receiver covers the frequency range from 32 MHz to 110 MHz. The frequency ranges of the FM1 and FM2 bands can be set using the registers FMi\_LOW\_CHAN<11:0> and FMi\_CHAN\_NUM<11:0>, where i=1 or 2.

FMi\_LOW\_CHAN<11:0> is used to set the starting frequency of the band and FMi\_CHAN\_NUM<11:0> is used to set the number of channels in the band (the value of this register is the total number of channels minus 1).

**The KT0936M** supports 3 different FM tuning steps: 50 kHz, 100 kHz and 200 kHz. This can be achieved using a separate configuration register FMi\_SPACE<1:0> (where i=1 or 2).

FM3 and FM4 have fixed frequency ranges and steps and cannot be configured even with EEPROM.

The MW frequency range can be set using the MWi\_LOW\_CHAN<10:0> and MWi\_CHAN\_NUM<11:0> registers, while the MW channel step can be set to 1 kHz, 9 kHz, or 10 kHz using the separate MWi\_SPACE<1:0> register (where i=1 or 2).

MWi\_LOW\_CHAN<10:0> is used to set the starting frequency of the medium wave band and MWi\_CHAN\_NUM<11:0> is used to set the number of stations in the band (the value of this register is the total number of stations minus 1).

MW3 and MW4 are fixed frequency ranges and steps and cannot be configured using EEPROM.

The frequency range of the LW2 longwave band can be set using the MW2\_LOW\_CHAN<10:0> and MW2\_CHAN\_NUM<11:0> registers, and the LW2 channel step can be set to 1 kHz, 9 kHz, or 10 kHz using the separate MW2\_SPACE<1:0> register.

*Please note that if MW2\_LOW\_CHAN<10:0> and MW2\_CHAN\_NUM<11:0> are configured as LW band range, MW2 band should be avoided.*

The SW1-SW14 frequency ranges in the shortwave (SW) band can be configured by setting the SWi\_LOW\_CHAN<14:0> and SWi\_CHAN\_NUM<11:0> registers (where i=1, 2, ..., 14) and the channel step can be set to 1 kHz, 5 kHz, 9 kHz or 10 kHz using the SW\_SPACE<1:0> configuration register.

However, bands SW15-SW50 have a fixed frequency range and cannot be configured using EEPROM.

**Table 9:** Overview of default band configurations

|      | Without EEPROM                       |           |        |                                 |           |        |
|------|--------------------------------------|-----------|--------|---------------------------------|-----------|--------|
|      | Original noise reduction (AM_FM = H) |           |        | New noise reduction (AM_FM = L) |           |        |
|      | Beginning                            | End       | Step   | Beginning                       | End       | Step   |
| FM1  | 87MHz                                | 108.5MHz  | 50KHz  | 87MHz                           | 108.5MHz  | 50KHz  |
| FM2  | 75.5MHz                              | 108.5MHz  | 100KHz | 75.5MHz                         | 108.5MHz  | 100KHz |
| FM3  | 63.5MHz                              | 108.5MHz  | 100KHz | 63,5MHz                         | 108,5MHz  | 100KHz |
| FM4  | 69,5MHz                              | 108,5MHz  | 100KHz | 69,5MHz                         | 108,5MHz  | 100KHz |
| MW1  | 513KHz                               | 1629KHz   | 1KHz   | 513KHz                          | 1629KHz   | 9KHz   |
| MW2  | 513 kHz                              | 1719 kHz  | 1 kHz  | 513 kHz                         | 1719 kHz  | 9 kHz  |
| MW3  | 510 kHz                              | 1630 kHz  | 10 kHz | 510 kHz                         | 1630 kHz  | 10 kHz |
| MW4  | 510 kHz                              | 1720 kHz  | 10 kHz | 510 kHz                         | 1720 kHz  | 10 kHz |
| LW1  | 150 kHz                              | 282 kHz   | 1 kHz  | 150 kHz                         | 282 kHz   | 1 kHz  |
| LW2  | 150 kHz                              | 516 kHz   | 1 kHz  | 150 kHz                         | 516 kHz   | 1 kHz  |
| SW1  | 2.95 MHz                             | 13.05 MHz | 5 kHz  | 2.95 MHz                        | 13.05 MHz | 5 kHz  |
| SW2  | 12,95 MHz                            | 23,05 MHz | 5 kHz  | 12,95 MHz                       | 23,05 MHz | 5 kHz  |
| SW3  | 7,95 MHz                             | 18,05 MHz | 5 kHz  | 7,95 MHz                        | 18,05 MHz | 5 kHz  |
| SW4  | 2,2 MHz                              | 3,5 MHz   | 5 kHz  | 2,2 MHz                         | 3,5 MHz   | 5 kHz  |
| SW5  | 3,5 MHz                              | 4,25 MHz  | 5 kHz  | 3,5 MHz                         | 4,25 MHz  | 5 kHz  |
| SW6  | 4,3 MHz                              | 5,6 MHz   | 5 kHz  | 4,3 MHz                         | 5,6 MHz   | 5 kHz  |
| SW7  | 5,55 MHz                             | 6,6 MHz   | 5 kHz  | 5,55 MHz                        | 6,6 MHz   | 5 kHz  |
| SW8  | 6,78 MHz                             | 7,8 MHz   | 5 kHz  | 6,78 MHz                        | 7,8 MHz   | 5 kHz  |
| SW9  | 9,15 MHz                             | 10,3 MHz  | 5 kHz  | 9,15 MHz                        | 10,3 MHz  | 5 kHz  |
| SW10 | 11,1 MHz                             | 12,4 MHz  | 5 kHz  | 11,1 MHz                        | 12,4 MHz  | 5 kHz  |
| SW11 | 13 MHz                               | 14,3 MHz  | 5 kHz  | 13 MHz                          | 14,3 MHz  | 5 kHz  |
| SW12 | 14,85 MHz                            | 16 MHz    | 5 kHz  | 14,85 MHz                       | 16 MHz    | 5 kHz  |
| SW13 | 17,05 MHz                            | 18,3 MHz  | 5 kHz  | 17,05 MHz                       | 18,3 MHz  | 5 kHz  |
| SW14 | 21,15 MHz                            | 22,3 MHz  | 5 kHz  | 21,15 MHz                       | 22,3 MHz  | 5 kHz  |
| SW15 | 2,25 MHz                             | 10,05 MHz | 5 kHz  | 2,25 MHz                        | 10,05 MHz | 5 kHz  |
| SW16 | 2,3 MHz                              | 2,49 MHz  | 5 kHz  | 2,3 MHz                         | 2,49 MHz  | 5 kHz  |
| SW17 | 3,2 MHz                              | 7,6 MHz   | 5 kHz  | 3,2 MHz                         | 7,6 MHz   | 5 kHz  |
| SW18 | 3,2 MHz                              | 3,4 MHz   | 5 kHz  | 3,2 MHz                         | 3,4 MHz   | 5 kHz  |
| SW19 | 3,15 MHz                             | 10,05 MHz | 5 kHz  | 3,15 MHz                        | 10,05 MHz | 5 kHz  |
| SW20 | 3.9MHz                               | 4MHz      | 5KHz   | 3.9MHz                          | 4MHz      | 5KHz   |

|      |          |          |      |          |          |      |
|------|----------|----------|------|----------|----------|------|
| SW21 | 3.65MHz  | 12.55MHz | 5KHz | 3.65MHz  | 12.55MHz | 5KHz |
| SW22 | 4.75MHz  | 5.06MHz  | 5KHz | 4.75MHz  | 5.06MHz  | 5KHz |
| SW23 | 3.9MHz   | 7.5MHz   | 5KHz | 3.9MHz   | 7.5MHz   | 5KHz |
| SW24 | 5.6MHz   | 6.4MHz   | 5KHz | 5.6MHz   | 6.4MHz   | 5KHz |
| SW25 | 5.55MHz  | 22.05MHz | 5KHz | 5.55MHz  | 22.05MHz | 5KHz |
| SW26 | 5.95MHz  | 6.2MHz   | 5KHz | 5.95MHz  | 6.2MHz   | 5KHz |
| SW27 | 5.75MHz  | 12.15MHz | 5KHz | 5.95MHz  | 6.2MHz   | 5KHz |
| SW28 | 6.8MHz   | 7.6MHz   | 5KHz | 6.8MHz   | 7.6MHz   | 5KHz |
| SW29 | 5.9MHz   | 9.5MHz   | 5KHz | 5.9MHz   | 9.5MHz   | 5KHz |
| SW30 | 7.1MHz   | 7.6MHz   | 5KHz | 7.1MHz   | 7.6MHz   | 5KHz |
| SW31 | 5.85MHz  | 18.05MHz | 5KHz | 5.85MHz  | 18.05MHz | 5KHz |
| SW32 | 9.2MHz   | 10MHz    | 5KHz | 9.2MHz   | 10MHz    | 5KHz |
| SW33 | 6.95MHz  | 16.05MHz | 5KHz | 9.2MHz   | 10MHz    | 5KHz |
| SW34 | 11.45MHz | 12.25MHz | 5KHz | 11.45MHz | 12.25MHz | 5KHz |
| SW35 | 6.95MHz  | 23.05MHz | 5KHz | 6.95MHz  | 23.05MHz | 5KHz |
| SW36 | 11.6MHz  | 12.2MHz  | 5KHz | 11.6MHz  | 12.2MHz  | 5KHz |
| SW37 | 8.95MHz  | 16.05MHz | 5KHz | 11.6MHz  | 12.2MHz  | 5KHz |
| SW38 | 13.4MHz  | 14.2MHz  | 5KHz | 13.4MHz  | 14.2MHz  | 5KHz |
| SW39 | 8.95MHz  | 22.05MHz | 5KHz | 8.95MHz  | 22.05MHz | 5KHz |
| SW40 | 13.57MHz | 13.87MHz | 5KHz | 13.57MHz | 13.87MHz | 5KHz |
| SW41 | 9.45MHz  | 18.05MHz | 5KHz | 9.45MHz  | 18.05MHz | 5KHz |
| SW42 | 15MHz    | 15.9MHz  | 5KHz | 15MHz    | 15.9MHz  | 5KHz |
| SW43 | 9.95MHz  | 16.05MHz | 5KHz | 9.95MHz  | 16.05MHz | 5KHz |
| SW44 | 17.1MHz  | 18MHz    | 5KHz | 17.1MHz  | 18MHz    | 5KHz |
| SW45 | 9.95MHz  | 22.05MHz | 5KHz | 9.95MHz  | 22.05MHz | 5KHz |
| SW46 | 17.48MHz | 17.9MHz  | 5KHz | 17.48MHz | 17.9MHz  | 5KHz |
| SW47 | 12.95MHz | 18.05MHz | 5KHz | 12.95MHz | 18.05MHz | 5KHz |
| SW48 | 21.2MHz  | 22MHz    | 5KHz | 21.2MHz  | 22MHz    | 5KHz |
| SW49 | 17.95MHz | 28.55MHz | 5KHz | 17.95MHz | 28.55MHz | 5KHz |
| SW50 | 21.45MHz | 21.85MHz | 5KHz | 21.45MHz | 21.85MHz | 5KHz |

**Table 10:** List of EEPROM compatible bands

| zone | Available EEPROM (note 3) |                     |                     |
|------|---------------------------|---------------------|---------------------|
|      | Initial frequency         | End frequency       | Tuning step         |
| FM1  | Compatible                | Compatible          | Compatible          |
| FM2  | Compatible                | Compatible          | Compatible          |
| FM3  | 63.5MHz                   | 108.5 MHz           | 100 kHz             |
| FM4  | 69.5MHz                   | 108.5 MHz           | 100 kHz             |
| MW1  | 4. Compatible             | 5. Compatible       | 6. Compatible       |
| MW2  | Compatible                | Compatible          | Compatible          |
| MW3  | 510 kHz                   | 1630 kHz            | 10 kHz              |
| MW4  | 510 kHz                   | 1720 kHz            | 10 kHz              |
| LW1  | 150 kHz                   | 282 kHz             | 1 kHz               |
| LW2  | Compatible (note 1)       | Compatible (note 1) | Compatible (note 1) |
| SW1  | Configurable              | Configurable        | Configurable        |
| SW2  | Configurable              | Configurable        | Configurable        |

| zone | Initial frequency | End frequency | Tuning step         |
|------|-------------------|---------------|---------------------|
| SW3  | Compatible        | Compatible    | Compatible          |
| SW4  | Compatible        | Compatible    | Compatible          |
| SW5  | Compatible        | Compatible    | Compatible          |
| SW6  | Compatible        | Compatible    | Compatible          |
| SW7  | Compatible        | Compatible    | Compatible          |
| SW8  | Compatible        | Compatible    | Compatible          |
| SW9  | Compatible        | Compatible    | Compatible          |
| SW10 | Compatible        | Compatible    | Compatible          |
| SW11 | Compatible        | Compatible    | Compatible          |
| SW12 | Compatible        | Compatible    | Compatible          |
| SW13 | Compatible        | Compatible    | Compatible          |
| SW14 | Compatible        | Compatible    | Compatible          |
| SW15 | 2.25MHz           | 10.05MHz      | Compatible (Note 2) |
| SW16 | 2.3MHz            | 2.49MHz       | Compatible (Note 2) |
| SW17 | 3.2MHz            | 7.6MHz        | Compatible (Note 2) |
| SW18 | 3.2MHz            | 3.4MHz        | Available (Note 2)  |
| SW19 | 3.15MHz           | 10.05MHz      | Available (Note 2)  |
| SW20 | 3.9MHz            | 4MHz          | Available (Note 2)  |
| SW21 | 3.65MHz           | 12.55MHz      | Available (Note 2)  |
| SW22 | 4.75MHz           | 5.06MHz       | Available (Note 2)  |
| SW23 | 3.9MHz            | 7.5MHz        | Available (Note 2)  |
| SW24 | 5.6MHz            | 6.4MHz        | Available (Note 2)  |
| SW25 | 5.55MHz           | 22.05 MHz     | Available (Note 2)  |
| SW26 | 5.95MHz           | 6.2MHz        | Available (Note 2)  |
| SW27 | 5.75MHz           | 12.15MHz      | Available (Note 2)  |
| SW28 | 6.8MHz            | 7.6MHz        | Available (Note 2)  |
| SW29 | 5.9MHz            | 9.5MHz        | Available (Note 2)  |
| SW30 | 7.1MHz            | 7.6MHz        | Available (Note 2)  |
| SW31 | 5.85MHz           | 18.05MHz      | Available (Note 2)  |
| SW32 | 9.2MHz            | 10MHz         | Available (Note 2)  |
| SW33 | 6.95MHz           | 16.05MHz      | Available (Note 2)  |
| SW34 | 11.45MHz          | 12.25MHz      | Available (Note 2)  |
| SW35 | 6.95MHz           | 23.05MHz      | Available (Note 2)  |
| SW36 | 11.6MHz           | 12.2MHz       | Available (Note 2)  |
| SW37 | 8.95MHz           | 16.05MHz      | Available (Note 2)  |
| SW38 | 13.4MHz           | 14.2MHz       | Available (Note 2)  |
| SW39 | 8.95MHz           | 22.05 MHz     | Available (Note 2)  |
| SW40 | 13.57MHz          | 13.87MHz      | Available (Note 2)  |
| SW41 | 9.45MHz           | 18.05MHz      | Available (Note 2)  |
| SW42 | 15MHz             | 15.9MHz       | Available (Note 2)  |
| SW43 | 9.95MHz           | 16.05MHz      | Available (Note 2)  |
| SW44 | 17.1MHz           | 18MHz         | Available (Note 2)  |
| SW45 | 9.95MHz           | 22.05 MHz     | Available (Note 2)  |
| SW46 | 17.48MHz          | 17.9MHz       | Available (Note 2)  |
| SW47 | 12.95MHz          | 18.05MHz      | Compatible (Note 2) |
| SW48 | 21.2MHz           | 22MHz         | Compatible (Note 2) |
| SW49 | 17.95MHz          | 28.55MHz      | Compatible (Note 2) |
| SW50 | 21.45MHz          | 21.85MHz      | Compatible (Note 2) |

**Note 1:** The LW2 band range is determined by the corresponding MW2 registers. When using LW2, one of these two (LW2 and MW2) must be selected.

**Note 2:** SW bands can be overwritten if EEPROM is available (50 shortwave bands share one band step). However, if overwritten to a step other than 5kHz, the end frequencies of the SW15-SW50 bands will change (the total number remains the same).

**Note 3:** Without using an external EEPROM and with the AM\_FM pin connected to a low level, the new noise reduction effect is applied; with the AM\_FM pin connected to a high level, the original noise reduction effect is applied.

*When using an external EEPROM, the noise reduction effect depends on the register configuration .*

### 3.5. Crystal oscillator and reference clock signal

The **KT0936M** contains a low-frequency crystal oscillator circuit that supports crystals at 32.768 kHz or 38 kHz. By setting the RCLK\_EN register to 1 and configuring the FPDF<19:0> registers to the frequency of the external reference clock signal, **the KT0936M can** use an external reference clock signal at CMOS levels. The FPDF<19:0> registers represent frequency values in units of 1/16 Hz. Table 11 provides some examples to clearly illustrate the use of these bits.

**Table 11:** Examples of using different crystals or reference clock signals

|                           | RCLK_EN | FPDF<19:16> | FPDF<15:0> | DIVIDERP<10:0> | DIVIDERN<10:0> |
|---------------------------|---------|-------------|------------|----------------|----------------|
| Crystal 32768Hz           | 0       | 0x08        | 0x0000     | 0x0001         | 0x029C         |
| Crystal 38 kHz            | 0       | 0x09        | 0x4700     | 0x0001         | 0x0240         |
| Reference clock 32768Hz   | 1       | 0x08        | 0x0000     | 0x0001         | 0x029C         |
| Reference clock 75 kHz    | 1       | 0x09        | 0x27C0     | 0x0002         | 0x0247         |
| Reference clock 4.2336MHz | 1       | 0x07        | 0x5499     | 0x008D         | 0x02D9         |
| Reference clock 12MHz     | 1       | 0x07        | 0xD000     | 0x0177         | 0x02AC         |
| Reference clock 24 MHz    | 1       | 0x07        | 0xD000     | 0x02EE         | 0x02AC         |
| Reference clock 40MHz     | 1       | 0x07        | 0xD000     | 0x04E2         | 0x02AC         |

### 3.6. Using Knob Mode to Control Channels and Bands

The **KT0936M** supports a unique knob mode, the application circuit of which is shown in **Figure 4** .

The knob function of **the KT0936M** is implemented by connecting the sliding contact of a variable resistor to a pin on the chip. The built-in A/D converter of **the KT0936M** can measure the resistance ratio of the variable resistor contact and map the result to control parameters for adjusting the channel frequency and bandwidth.

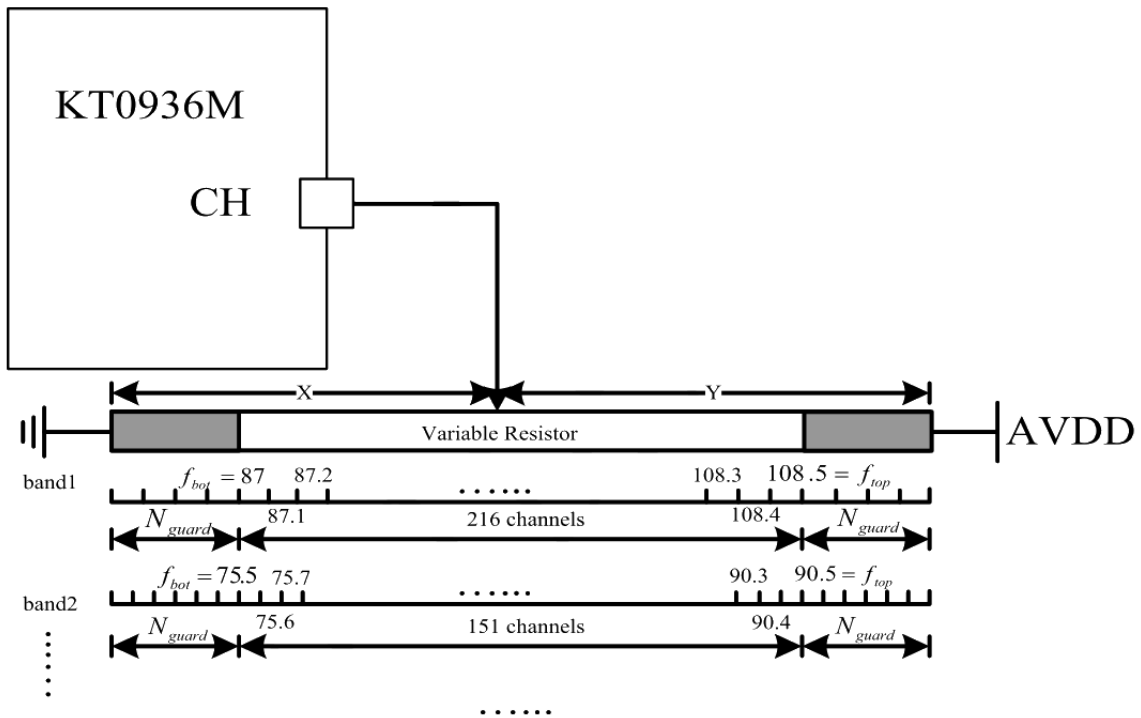
Setting the CH\_PIN<1:0> register to 2b'10 switches the channel controller to knob mode, as shown in Figure 2. If the sliding contact of the variable resistor is in the white area, the frequency of the received channel can be calculated using the following formula:

$$f_{tune} = \frac{X}{X+Y} (f_{top} - f_{bot} + 2 \times N_{guard} \times f_{step}) - N_{guard} \times f_{step} + f_{bot}$$

Here **step<f>** is the channel step that can be set by the 'FM1\_SPACE<1:0>', 'FM2\_SPACE<1:0>', 'MW1\_SPACE<1:0>', 'MW2\_SPACE<1:0>' and 'SW\_SPACE<1:0>' registers.

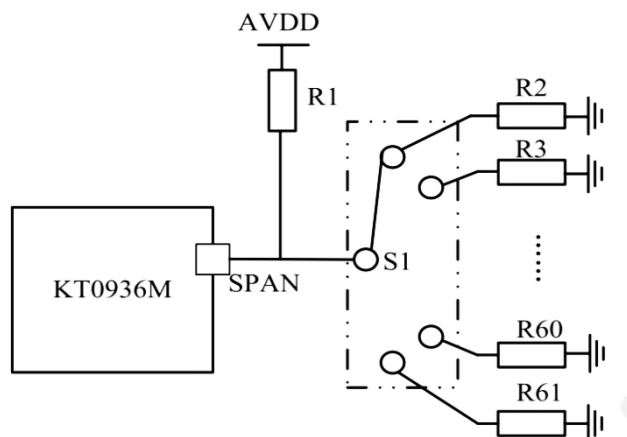
**top<f>** is the upper frequency limit for this band, **bot<f>** is the lower frequency limit for this band, and **guard <N>** is a protection parameter set so that the potentiometer does not reach its two end points for mechanical reasons, thus preventing the reception of out-of-band stations.

The **guard <N>** parameter for each band can be set individually using the following registers: 'FM1\_GUARD<7:0>', 'FM2\_GUARD<7:0>', 'MW1\_GUARD<7:0>', 'MW2\_GUARD<7:0>' and 'SW\_GUARD<7:0>'. When the slider is set to the gray area, the receiving frequency will be maintained at the upper or lower frequency limit. It should be noted that the GUARD values for MW3, MW4, SW15-50 and LW1 are all fixed at 5 and cannot be adjusted. The GUARD value for LW2 is determined by the MW2\_GUARD<7:0> parameter.



**Figure 2:** CH pin configured for manual rotary tuning.

In rotary mode, band switching of the **KT0936M** can be achieved by setting the SPAN\_PIN<1:0> register to 2b'10. The application circuit is shown in Figure 3. The selection of band resistors is given in Table 12.



**Figure 3:** SPAN pin configured for band switching function

The recommended band resistor R1 for **KT0936M(B9)** is 10 kOhm with an accuracy of 1%. The values of resistors R2~R61 are given in Table 12.

**Table 12:** Overview of band resistors

| Band | resistance ( 1% ) |
|------|-------------------|
| FM1  | 63.4 $\Omega$     |
| FM2  | 237 $\Omega$      |
| FM3  | 412 $\Omega$      |
| FM4  | 604 $\Omega$      |
| MW1  | 787 $\Omega$      |
| MW2  | 1 k $\Omega$      |
| MW3  | 1.18 k $\Omega$   |
| MW4  | 1.4 k $\Omega$    |
| LW1  | 1.62 k $\Omega$   |
| LW2  | 1.87 k $\Omega$   |
| SW1  | 2.1 k $\Omega$    |
| SW2  | 2.37 k $\Omega$   |
| SW3  | 2.61 k $\Omega$   |
| SW4  | 2.87 k $\Omega$   |
| SW5  | 3.16 k $\Omega$   |
| SW6  | 3.48 k $\Omega$   |
| SW7  | 3.74 k $\Omega$   |
| SW8  | 4.12 k $\Omega$   |
| SW9  | 4.42 k $\Omega$   |
| SW10 | 4.75 k $\Omega$   |
| SW11 | 5.23 k $\Omega$   |
| SW12 | 5.62 k $\Omega$   |
| SW13 | 6.04 k $\Omega$   |
| SW14 | 6.49 k $\Omega$   |
| SW15 | 6.81 k $\Omega$   |
| SW16 | 7.32 k $\Omega$   |
| SW17 | 7.87 k $\Omega$   |
| SW18 | 8.45 k $\Omega$   |
| SW19 | 9.09 k $\Omega$   |
| SW20 | 9.76 k $\Omega$   |
| SW21 | 10.2 k $\Omega$   |
| SW22 | 11 k $\Omega$     |
| SW23 | 11.8 k $\Omega$   |
| SW24 | 12.7 k $\Omega$   |
| SW25 | 13.7 k $\Omega$   |

| Band | Resistance (1%) |
|------|-----------------|
| SW26 | 14.7 kΩ         |
| SW27 | 15.4 kΩ         |
| SW28 | 16.9 kΩ         |
| SW29 | 17.8 kΩ         |
| SW30 | 19.1 kΩ         |
| SW31 | 21 kΩ           |
| SW32 | 22.6 kΩ         |
| SW33 | 24.3 kΩ         |
| SW34 | 26.7 kΩ         |
| SW35 | 28.7 kΩ         |
| SW36 | 31.6 kΩ         |
| SW37 | 34.8 kΩ         |
| SW38 | 38.3 kΩ         |
| SW39 | 42.2 kΩ         |
| SW40 | 47.5 kΩ         |
| SW41 | 53.6 kΩ         |
| SW42 | 61.9 kΩ         |
| SW43 | 71.5 kΩ         |
| SW44 | 84.5 kΩ         |
| SW45 | 102 kΩ          |
| SW46 | 127 kΩ          |
| SW47 | 169 kΩ          |
| SW48 | 243 kΩ          |
| SW49 | 422 kΩ          |
| SW50 | 1000 kΩ         |

### 3.7. Pin AM\_FM

The AM\_FM pin on **the KT0936M** has four functions: switching softmute effects , switching bands using buttons or switches, and accessing an external EEPROM.

**Function 1:** When no external EEPROM is connected, this pin is used to switch the softmute effect . When the AM\_FM pin is high (with built-in 47kOhm pull - up resistor ), **the KT0936M** works with the original softmute effect ; when it is low, it works with the new softmute effect .

**Function 2:** If the AM\_FM\_PIN<2:0> register is set to 1, the AM\_FM pin requires an external button to switch bands. Each chip switches between FM1 band and full band once with a negative pulse (the band is determined by the SPAN voltage pin). The initial value at first power-up is determined by the value of the ONLY\_FM1\_DIS register. When switching bands using the button, the **KT0936M chip writes** the current band state back to the ONLY\_FM1\_DIS register in the EEPROM.

**Function 3:** If the AM\_FM\_PIN<2:0> register is set to 2, the AM\_FM pin requires an external switch to switch bands. A low switch activates the FM1 band, while a high switch determines the band based on the voltage on the SPAN pin (any of the 60 bands can be used).

**Function 4:** When an external EEPROM is used, it functions as a clock pin. This mode does not require any configuration; the chip automatically switches to this mode when powered on, and after reading data from the EEPROM, it automatically switches back to the mode set by the AM\_FM\_PIN<2:0> register. If it is necessary to write back to the EEPROM to save the current working state, the **KT0936M chip** automatically switches to the clock pin function for operation with the EEPROM. When completed, it automatically switches back to the mode set by the AM\_FM\_PIN<2:0> register. If an external EEPROM is connected and the AM\_FM\_PIN<2:0> register (this is the default function) is not modified, the softmute effect will take effect according to the EEPROM configuration. This pin is used as the SCL pin only when an external EEPROM is connected.



### 3.8. RF\_SW pin

**Function 1:** RF circuit switching control pin. It is low in shortwave mode, high in other modes. Users can control the switching of external RF circuits by the voltage on this pin.

**Function 2:** Used as a data pin when an external EEPROM is connected. This mode does not require configuration; the chip automatically switches to this mode after power-on, and automatically returns to *function 1* after reading data from the EEPROM. If it is necessary to write back to the EEPROM the current operating state, **the KT0936M** will also automatically switch to the data pin function for EEPROM operation, and automatically switch back to *function 1* when completed.

### 3.9. Chip settings

The **KT0936M** uses a 2-wire interface as a MASTER, which can read the contents previously stored in an external EEPROM (e.g. 24C02) during power-on initialization. After power-on, **the KT0936M** reads all the data stored in the EEPROM and writes it to the internal registers. The register relationship between the 24C02 and the KT0936M is shown in Table 13. The user must set the EEPROM device address to 8b'1010 000x (R/W bit). The RF\_SW pin of **the KT0936M** is connected to the SDA pin of the EEPROM, and the AM\_FM pin is connected to the SCL pin of the EEPROM. When switching bands using the push button mode, the **KT0936M** writes the current band state back to the ONLY\_FM1\_DIS register in the EEPROM to remember the state.

**Table 13:** Register relationship between **24C02** and **KT0936M**

| <b>24LC02</b> |       | <b>KT0936M</b> |       |
|---------------|-------|----------------|-------|
| Address       | Bits  | Address        | Bits  |
| 0x00          | D7:D0 | 0x00           | D7:D0 |
| 0x01          | D7:D0 | 0x01           | D7:D0 |
| 0x02          | D7:D0 | 0x02           | D7:D0 |
| 0x03          | D7:D0 | 0x03           | D7:D0 |
| ...           | ...   | ...            | ...   |
| ...           | ...   | ...            | ...   |
| 0xFE          | D7:D0 | 0xFE           | D7:D0 |
| 0xFF          | D7:D0 | 0xFF           | D7:D0 |

### 3.10. Register table

#### 3.10.1. PLLCFG0 (Address 0x04)

| Bit | Bit name       | Read/Write mode | Default value | Function description        |
|-----|----------------|-----------------|---------------|-----------------------------|
| 7:3 | Reserved bits  | R               | 0000_0        | Reserved bits               |
| 2:0 | DIVIDERP<10:8> | RW              | 000           | PLL P divider configuration |

#### 3.10.2. PLLCFG1 (Address 0x05)

| Bit | Bit name      | Read/Write mode | Default value | Function description        |
|-----|---------------|-----------------|---------------|-----------------------------|
| 7:0 | DIVIDERP<7:0> | RW              | 0x01          | PLL P divider configuration |

#### 3.10.3. PLLCFG2 (Address 0x06)

| Bit | Bit name       | Read/Write mode | Default value | Function description        |
|-----|----------------|-----------------|---------------|-----------------------------|
| 7:3 | Reserved bits  | RW              | 0000_0        | Reserved bits               |
| 2:0 | DIVIDERN<10:8> | RW              | 010           | PLL N divider configuration |

#### 3.10.4. PLLCFG3 (Address 0x07)

| Bit | Bit name      | Read/Write mode | Default value | Function description        |
|-----|---------------|-----------------|---------------|-----------------------------|
| 7:0 | DIVIDERN<7:0> | RW              | 0x9C          | PLL N divider configuration |

#### 3.10.5. SYSCLK\_CFG0 (Address 0x08)

| Bit | Bit name      | Read/Write mode | Default value | Function description                                                                         |
|-----|---------------|-----------------|---------------|----------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits | RW              | 0000          | Reserved bits                                                                                |
| 3:0 | FPPD<19:16>   | RW              | 1000          | Frequency for phase detector<br>FPPD<19:0> = external clock or<br>RCLK/DIVIDERP*16 frequency |

#### 3.10.6. SYSCLK\_CFG1 (Address 0x09)

| Bit | Bit name   | Read/Write mode | Default value | Function description                                                                         |
|-----|------------|-----------------|---------------|----------------------------------------------------------------------------------------------|
| 7:0 | FPPD<15:8> | RW              | 0x00          | Frequency for phase detector<br>FPPD<19:0> = external clock or<br>RCLK/DIVIDERP*16 frequency |

#### 3.10.7. SYSCLK\_CFG2 (Address 0x0A)

| Bit | Bit name  | Read/Write mode | Default value | Function description                                                                         |
|-----|-----------|-----------------|---------------|----------------------------------------------------------------------------------------------|
| 7:0 | FPPD<7:0> | RW              | 0x00          | Frequency for phase detector<br>FPPD<19:0> = external clock or<br>RCLK/DIVIDERP*16 frequency |

#### 3.10.8. XTALCFG (Address 0x0D)

| Bit | Bit name      | Read/Write mode | Default value | Function description                                                                         |
|-----|---------------|-----------------|---------------|----------------------------------------------------------------------------------------------|
| 7:5 | Reserved bits | RW              | 110           | Reserved bits                                                                                |
| 3:0 | FPPD<19:16>   | RW              | 1000          | Frequency for phase detector<br>FPPD<19:0> = external clock or<br>RCLK/DIVIDERP*16 frequency |

| Bit | Bit name     | Read/Write mode | Default value | Function description                                                       |
|-----|--------------|-----------------|---------------|----------------------------------------------------------------------------|
| 4   | RCLK_EN      | RW              | 0             | Reference clock enable bit:<br>0 = Crystal<br>1 = External reference clock |
| 3:0 | Reserved bit | RW              | 0011          | Reserved bit                                                               |

**3.10.9. RXCFG1 (Address 0x000F)**

| Bit | Bit name     | Read/Write mode | Default value | Function description                                                                                                                           |
|-----|--------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:5 | Reserved bit | R               | 000           | Reserved bit                                                                                                                                   |
| 4:0 | VOLUME<4:0>  | RW              | 1_1111        | Volume control bit:<br>B'11111 = 0dB<br>B'11110 = -2Db<br>B'11101 = -4dB<br>.....<br>B'00010 = -58dB<br>B'00001 = -60dB<br>B'00000 = sound off |

**3.10.10. BANDCFG2 (Address 0x18)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                                                                                                                   |
|-----|----------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 7:6 | FM2_SPACE<1:0> | RW              | 01            | Bits for selecting FM band step 2:<br>B'00 = 200 kHz (USA, Europe)<br>B'01 = 100 kHz (Europe, Japan)<br>B'10 = 50 kHz<br>B'11 = 50 kHz |
| 5:4 | FM1_SPACE<1:0> | RW              | 10            | Bits for selecting FM band step 1:<br>B'00 = 200 kHz (USA, Europe)<br>B'01 = 100 kHz (Europe, Japan)<br>B'10 = 50 kHz<br>B'11 = 50 kHz |
| 3:2 | MW2_SPACE<1:0> | RW              | 00            | Bits for selecting the MW 2 and LW 2 band step: B'00 = 1 kHz<br>B'01 = 9 kHz<br>B'10 = 10 kHz<br>B'11 = 10 kHz                         |
| 1:0 | MW1_SPACE<1:0> | RW              | 00            | MW band step selection bit 1:<br>B'00 = 1 kHz<br>B'01 = 9 kHz<br>B'10 = 10 kHz<br>B'11 = 10 kHz                                        |

**3.10.11. BANDCFG3 (Address 0x19)**

| Bit | Bit name      | Read/Write mode | Default value | Function description                                                                         |
|-----|---------------|-----------------|---------------|----------------------------------------------------------------------------------------------|
| 7:2 | Reserved bits | RW              | 0010_11       | Reserved bits                                                                                |
| 1:0 | SW_SPACE<1:0> | RW              | 01            | SW band step selection bit:<br>B'00 = 1 kHz<br>B'01 = 5 kHz<br>B'10 = 9 kHz<br>B'11 = 10 kHz |

**3.10.12. SOUNDCFG (Address 0x28)**

| Bit | Bit name     | Read/Write mode | Default value | Function description                                                                                             |
|-----|--------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------|
| 7:6 | Reserved bit | R               | 00            | Reserved bit                                                                                                     |
| 5:4 | BASS<1:0>    | RW              | 00            | Subwoofer gain selection Bit:<br>B'00 = Bypass<br>B'01 = 9.4 dB@70Hz<br>B'10 = 13.3dB@70Hz<br>B'11 = 18.2dB@70Hz |
| 3:0 | Reserved bit | RW              | 0001          | Reserved bit                                                                                                     |

**3.10.13. DSPCFG0 (Address 0x2A)**

| Bit | Bit name      | Read/Write mode | Default value | Function description                                                                                                                                          |
|-----|---------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit  | RW              | 1             | Reserved bit                                                                                                                                                  |
| 6:4 | FM_GAIN<2:0>  | RW              | 100           | FM audio gain control:<br>B'000 = 0dB<br>B'001 = 3.5dB<br>B'010 = 6dB<br>B'011 = 9.5dB<br>B'100 = -2.5dB<br>B'101 = -3.66dB<br>B'110 = -6dB<br>B'111 = -8.5dB |
| 3   | Reserved bits | RW              | 0000          | Reserved bits                                                                                                                                                 |

**3.10.14. DSPCFG6 (Address 0x30)**

| Bit | Bit name          | Read/Write mode | Default value | Function description                                                                                                                                            |
|-----|-------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:5 | Reserved bits     | RW              | 101           | Reserved bits                                                                                                                                                   |
| 4:0 | FM_RSSI_BIAS<4:0> | RW              | 0_0000        | FM RSSI Offset:<br>B'10000 = -16dB<br>B'10001 = -15dB<br>.....<br>B'11110 = -2dB<br>B'11111 = -1dB<br>B'00000 = 0dB<br>B'00001 = 1dB<br>.....<br>B'01111 = 15dB |

**3.10.15. SW\_CFG0 (Address 0x38)**

| Bit | Bit name      | Read/Write mode | Default value | Function description                                                                                                                                                                  |
|-----|---------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits | RW              | 0101          | Reserved bits                                                                                                                                                                         |
| 3:0 | SW_GAIN<2:0>  | RW              | 0100          | KV/SW audio gain control:<br>B'0000 = 6dB<br>B'0001 = 3dB<br>B'0010 = 0dB<br>B'0011 = -3dB<br>B'0100 = -6dB<br>B'0101 = -9dB<br>B'0110 = -12 dB<br>B'0111 = -15 dB<br>B'1000 = -18 dB |

**3.10.16. AMDSP7 (Address 0x39)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                                                                                                                                                                                                                                                                                                                        |
|-----|----------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits  | RW              | 0101          | Reserved bits                                                                                                                                                                                                                                                                                                                               |
| 3:0 | SW_VOLUME<3:0> | RW              | 1010          | KV/SW audio volume control:<br>4'b1111= 0dB<br>4'b1110=-0.5dB<br>4'b1101=-1.0dB<br>4'b1100=-1.5dB<br>4'b1011=-2.0dB<br>4'b1010=-2.5dB<br>4'b1001=-3.0dB<br>4'b1000=-3.5dB<br>4'b0111=-4.0dB<br>4'b0110=-4.5dB<br>4'b0101 = -5.0 dB<br>4'b0100 = -5.5 dB<br>4'b0011 = -6.0 dB<br>4'b0010 = -6.5 dB<br>4'b0001 = -7.0 dB<br>4'b0000 = -7.5 dB |

**3.10.17. ANACFG (Address 0x4E)**

| Bit | Bit name        | Read/Write mode | Default value | Function description                                                                                                                                                     |
|-----|-----------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:6 | Reserved bits   | RW              | 00            | Reserved bits                                                                                                                                                            |
| 5:4 | DEPOP_TC<1:0>   | RW              | 11            | Mute duration after power on (against bullying):<br>B'00 = 250 ms<br>B'01 = 500ms<br>B'10 = 750 ms<br>B'11 = 1 second                                                    |
| 3   | Reserved bits   | RW              | 0             | Reserved bits                                                                                                                                                            |
| 2:0 | AUDV_DCLVL<2:0> | RW              | 010           | Audio Output quiescent voltage control :<br>B'000=0.85V<br>B'001=0.91 V<br>B'010= 1.05 V<br>B'011= 1.15 V<br>B'100= 1.20 V<br>B'101=1.35 V<br>B'110=1.50V<br>B'111=1.60V |

**3.10.18. GPIOCFG0 (Address 0x4F)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                                                                                                                                                                                                                                                                                        |
|-----|----------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit   | RW              | 1             | Reserved bit                                                                                                                                                                                                                                                                                                |
| 6:4 | AM_FM_PIN<2:0> | RW              | 011           | AM_FM pin function:<br>B'000 = Reserved<br>B'001 = band selection control with buttons<br>B'010 = band selection by switch<br>Softmute switching (When using EEPROM, even if this register is B'011, the softmute effect will still be reflected according to the EEPROM configuration)<br>Other = Reserved |
| 3:0 | Reserved bits  | R               | 1010          | Reserved bits                                                                                                                                                                                                                                                                                               |

**3.10.19. GPIOCFG2 (Address 0x51)**

| Bit | Bit name      | Read/Write mode | Default value | Function description                                                                                                                  |
|-----|---------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 7:6 | Reserved bits | RW              | 00            | Reserved bits                                                                                                                         |
| 5:4 | SPAN_PIN<1:0> | RW              | 10            | Controlling the SPAN pin function:<br>B'00 = Reserved<br>B'01 = Reserved<br>B'10 = Voltage control range selection<br>B'11 = Reserved |
| 3:2 | Reserved bits | RW              | 00            | Reserved bits                                                                                                                         |
| 1:0 | CH_PIN<1:0>   | RW              | 10            | Control of CH pin function:<br>B'00 = high impedance<br>B'01 = Reserved<br>B'10 = Frequency control potentiometer<br>B'11 = Reserved  |

**3.10.20. AMDSP0 (Address 0x62)**

| Bit | Bit name      | Read/Write mode | Default value | Function description                                                                                                                                                                   |
|-----|---------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | MW_GAIN<3:0>  | RW              | 0100          | MW/LW and FM/MW gain control:<br>B'0000 = 6dB<br>B'0001 = 3dB<br>B'0010 = 0dB<br>B'0011 = -3dB<br>B'0100 = -6dB<br>B'0101 = -9dB<br>B'0110 = -12dB<br>B'0111 = -15dB<br>B'1000 = -18dB |
| 3   | Reserved bits | R               | 0             | Reserved bits                                                                                                                                                                          |
| 2:0 | FLT_SEL<2:0>  | RW              | 001           | AM filter bandwidth:<br>B'000=1.2kHz<br>B'001=2.4kHz<br>B'010=3.6 kHz<br>B'011=4.8kHz<br>B'100=6.0 kHz                                                                                 |

**3.10.21. AMDSP1 (Address 0x63)**

| Bit | Bit name          | Read/Write mode | Default value | Function description                                                                                                                                            |
|-----|-------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:5 | Reserved bits     | R               | 000           | Reserved bits                                                                                                                                                   |
| 4:0 | AM_RSSI_BIAS<4:0> | RW              | 0_0000        | AM RSSI Offset:<br>B'10000 = -16dB<br>B'10001 = -15dB<br>.....<br>B'11110 = -2dB<br>B'11111 = -1dB<br>B'00000 = 0dB<br>B'00001 = 1dB<br>.....<br>B'01111 = 15dB |

**3.10.22. AMDSP7 (Address 0x69)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                                                                                                                                                                                                                                                                                                            |
|-----|----------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits  | RW              | 1000          | Reserved bits                                                                                                                                                                                                                                                                                                                   |
| 3:0 | MW_VOLUME<3:0> | RW              | 1010          | MW and LW volume:<br>4'b1111= 0dB<br>4'b1110=-0.5dB<br>4'b1101=-1.0dB<br>4'b1100= -1.5dB<br>4'b1011= -2.0dB<br>4'b1010= -2.5dB<br>4'b1001= -3.0dB<br>4'b1000= -3.5dB<br>4'b0111=-4.0dB<br>4'b0110= -4.5dB<br>4'b0101= -5.0 dB<br>4'b0100= -5.5 dB<br>4'b0011= -6.0 dB<br>4'b0010=-6.5 dB<br>4'b0001=-7.0 dB<br>4'b0000= -7.5 dB |

**3.10.23. GUARD0 (Address 0x6F)**

| Bit | Bit name        | Read/Write mode | Default value | Function description           |
|-----|-----------------|-----------------|---------------|--------------------------------|
| 7:4 | Reserved bits   | R               | 0000          | Reserved bits                  |
| 3:0 | SPAN_GUARD<3:0> | RW              | 0000          | Potentiometer protection range |

**3.10.24. GUARD0 (Address 0x70)**

| Bit | Bit name      | Read/Write mode | Default value | Function description           |
|-----|---------------|-----------------|---------------|--------------------------------|
| 7:0 | SW_GUARD<3:0> | RW              | 0000_1010     | Potentiometer protection range |

**3.10.25. FMCHAN0 (Address 0x88)**

| Bit | Bit name     | Read/Write mode | Default value | Function description                                                                                                                                                                                            |
|-----|--------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit | RW              | 0             | Reserved bit                                                                                                                                                                                                    |
| 6   | ONLY_FM1_DIS | RW              | 0             | When the AM_FM pin is operating in the button band switching mode (function 2), it serves as a bit for selecting the FM1 band or the entire band:<br>0 = FM1 band<br>1 = Full band (determined by the SPAN pin) |
| 5:0 | Reserved bit | RW              | 00_0110       | Reserved bit                                                                                                                                                                                                    |

**3.10.26. FM1\_LOW\_CHAN0 (Address 0x90)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                       |
|-----|------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                                              |
| 3:0 | FM1_LOW_CHAN<br><11:8> | RW              | 0110          | Lower frequency of FM band 1, in units of 50 kHz, default value is 87 MHz (0x06CC). The value of this register should be in the range of 32 MHz (0x280) to 110 MHz (0x898) |

**3.10.27. FM1\_LOW\_CHAN1 (Address 0x91)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                       |
|-----|-----------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | FM1_LOW_CHAN<br><7:0> | RW              | 0xCC          | Lower frequency of FM band 1, in units of 50 kHz, default value is 87 MHz (0x06CC). The value of this register should be in the range of 32 MHz (0x280) to 110 MHz (0x898) |
|     |                       |                 |               |                                                                                                                                                                            |

**3.10.28. FM1\_CHAN\_NUM0 (Address 0x92)**

| Bit | Bit name           | Read/Write mode | Default value | Function description                                                                                                                                         |
|-----|--------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits      | R               | 0000          | Reserved bits                                                                                                                                                |
| 3:0 | FM1_CHAN_NUM<11:8> | RW              | 0001          | The number of frequencies in FM band 1 is FM1_CHAN_NUM<11:0> + 1. If FM1_CHAN_NUM<11:0> is set to 0, it means that there is only one frequency in this band. |

**3.10.29. FM1\_CHAN\_NUM1 (Address 0x93)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                    |
|-----|-----------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | FM1_CHAN_NUM<br><7:0> | RW              | 0xAE          | The number of frequencies in the FM1 band is FM1_CHAN_NUM<11:0> + 1. If FM1_CHAN_NUM<11:0> is set to 0, it means that this band has only one frequency. |

**3.10.30. FM2\_LOW\_CHAN0 (Address 0x94)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                             |
|-----|------------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                                    |
| 3:0 | FM2_LOW_CHAN<br><11:8> | RW              | 0101          | Lower frequency of FM band 2 at 50 kHz, default value is 75.5 MHz (0x05E6). The value of this register should be in the range of 32MHz (0x280) to 110MHz (0x898) |



**3.10.31. FM2\_LOW\_CHAN1 (Address 0x95)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                              |
|-----|-----------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | FM2_LOW_CHAN<br><7:0> | RW              | 0xE6          | The lowest frequency of FM band 2 in 50 kHz units, the default value is 75.5 MHz (0x05E6). The value of this register should be in the range of 32 MHz (0x280) to 110 MHz (0x898) |

**3.10.32. FM2\_CHAN\_NUM0 (Address 0x96)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                         |
|-----|------------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | B'0000        | Reserved bits                                                                                                                                                |
| 3:0 | FM2_CHAN_NUM<br><11:8> | RW              | B'0001        | The number of frequencies in FM band 2 is FM2_CHAN_NUM<11:0> + 1. If FM2_CHAN_NUM<11:0> is set to 0, it means that there is only one frequency in this band. |

**3.10.33. FM2\_CHAN\_NUM1 (Address 0x97)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                        |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | FM2_CHAN_NUM<br><7:0> | RW              | 0x4A          | The number of frequencies in FM band 2 is FM2_CHAN_NUM<11:0> + 1. If FM2_CHAN_NUM<11:0> is set to 0, it means that there is only one frequency in this band |

**3.10.34. MW1\_LOW\_CHAN0 (Address 0x98)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                                     |
|-----|------------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:3 | Reserved bits          | R               | 0000_0        | Reserved bits                                                                                                                                                                            |
| 2:0 | MW1_LOW_CHAN<br><10:8> | RW              | 010           | The lowest frequency of the MW1 band, in units of 1 kHz, the default value is 513 kHz (0x0201). The value of this register should be in the range of 500 kHz (0x1F4) to 1750 kHz (0x6D6) |

**3.10.35. MW1\_LOW\_CHAN1 (Address 0x99)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                              |
|-----|-----------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | MW1_LOW_CHAN<br><7:0> | RW              | 0x01          | The lowest frequency of MW band 1 in 1 kHz units, the default value is 513 kHz (0x0201). The value of this register should be in the range of 500 kHz (0x1F4) to 1750 kHz (0x6D6) |

**3.10.36. MW1\_CHAN\_NUM0 (Address 0x9A)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                       |
|-----|------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:3 | Reserved bits          | R               | 0000_0        | Reserved bits                                                                                                                                                              |
| 2:0 | MW1_CHAN_NUM<br><10:8> | RW              | 100           | Number of frequency points in the medium wave band MW 1. MW1_CHAN_NUM<10:0> + 1. If MW1_CHAN_NUM<10:0> is set to 0, it means that there is only one frequency in this band |

**3.10.37. MW1\_CHAN\_NUM1 (Address 0x9B)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                         |
|-----|-----------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | MW1_CHAN_NUM<br><7:0> | RW              | 0x5C          | The number of frequencies in MW band 1 is MW1_CHAN_NUM<10:0> + 1. If MW1_CHAN_NUM<10:0> is set to 0, it means that there is only one frequency in this band. |

**3.10.38. MW2\_LOW\_CHAN0 (Address 0x9C)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                                              |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:3 | Reserved bits          | R               | 0000_0        | Reserved bits                                                                                                                                                                                     |
| 2:0 | MW2_LOW_CHAN<br><10:8> | RW              | 010           | The lowest frequency for MW band 2 and LW band 2 in 1 kHz units. The default value is 513 kHz (0x0201). The value of this register should be in the range of 500 kHz (0x1F4) to 1750 kHz (0x6D6). |

**3.10.39. MW2\_LOW\_CHAN1 (Address 0x9D)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                               |
|-----|-----------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | MW2_LOW_CHAN<br><7:0> | RW              | 0x01          | The lowest frequency for MW band 2 and LW band 2, in 1 kHz units. The default value is 513 kHz (0x0201). The value of this register should be in the range of 500 kHz (0x1F4) to 1750 kHz (0x6D6). |

**3.10.40. MW2\_CHAN\_NUM0 (Address 0x9E)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                              |
|-----|------------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:3 | Reserved bits          | R               | 0000_0        | Reserved bits                                                                                                                                                                     |
| 2:0 | MW2_CHAN_NUM<br><10:8> | RW              | 100           | The number of frequency points in MW2 band and LW2 band is MW2_CHAN_NUM<10:0>+1. If MW2_CHAN_NUM<10:0> is set to 0, it means that there is only one frequency point in this band. |

**3.10.41. MW2\_CHAN\_NUM1 (Address 0x9F)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                              |
|-----|-----------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | MW2_CHAN_NUM<br><7:0> | RW              | 0xB6          | The number of frequency points in the MW2 band and LW2 band. The number is MW2_CHAN_NUM<10:0>+1. If MW2_CHAN_NUM<10:0> is set to 0, it means that there is only one frequency point in this band. |

**3.10.42. GUARD2 (Address 0xA0)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                            |
|-----|----------------|-----------------|---------------|-------------------------------------------------|
| 7:0 | FM1_GUARD<7:0> | RW              | 0x00          | FM band tuning potentiometer protection range 1 |

**3.10.43. GUARD3 (Address 0xA1)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                            |
|-----|----------------|-----------------|---------------|-------------------------------------------------|
| 7:0 | FM2_GUARD<7:0> | RW              | 0x00          | FM band tuning potentiometer protection range 2 |

**3.10.44. GUARD4 (Address 0xA2)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                            |
|-----|----------------|-----------------|---------------|-------------------------------------------------|
| 7:0 | MW1_GUARD<7:0> | RW              | 0x00          | MW band tuning potentiometer protection range 1 |

**3.10.45. GUARD5 (Address 0xA3)**

| Bit | Bit name       | Read/Write mode | Default value | Function description                                          |
|-----|----------------|-----------------|---------------|---------------------------------------------------------------|
| 7:0 | MW2_GUARD<7:0> | RW              | 0x00          | tuning potentiometer protection range for MW 2 and LW 2 bands |

**3.10.46. SW1\_LOW\_CHAN0 (Address 0xA4)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                 |
|-----|------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                         |
| 6:0 | SW1_LOW_CHAN<br><14:8> | RW              | B'000_1011    | Lower frequency of SW1 band, in 1 kHz, default value is 2.95 MHz (0x0BB8). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.47. SW1\_LOW\_CHAN1 (Address 0xA5)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                  |
|-----|-----------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW1_LOW_CHAN<br><7:0> | RW              | 0x86          | The lowest frequency of SW 1 band, in 1 kHz units, the default value is 2.95 MHz (0x0BB8). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00). |

**3.10.48. SW2\_LOW\_CHAN0 (Address 0xA6)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                           |
|-----|------------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                                   |
| 6:0 | SW2_LOW_CHAN<br><14:8> | RW              | B'011_0010    | The lowest frequency of SW 2 band, in 1 kHz, default value is 12.95 MHz (0x32C8). The value of this register should be in the range of 1.75 MHz (0x06D6) to 1.75 MHz (0x7D00). |

**3.10.49. SW2\_LOW\_CHAN1 (Address 0xA7)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                   |
|-----|-----------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW2_LOW_CHAN<br><7:0> | RW              | 0x96          | The lowest frequency of SW 2 band in 1 kHz units, the default value is 12.95 MHz (0x32C8). The value of this register should be in the range of 1.75 MHz (0x06D6) to 1.75 MHz (0x7D00) |

**3.10.50. SW3\_LOW\_CHAN0 (Address 0xA8)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                            |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                                    |
| 6:0 | SW3_LOW_CHAN<br><14:8> | RW              | B'001_1111    | The lowest frequency of SW 3 band, in 1 kHz, the default value is 7.95 MHz (0x1F40). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00). |

**3.10.51. SW3\_LOW\_CHAN1 (Address 0xA9)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW3_LOW_CHAN<br><7:0> | RW              | 0x0E          | The lowest frequency of SW 3 band in 1 kHz units, the default value is 7.95 MHz (0x1F40). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.52. SW4\_LOW\_CHAN0 (Address 0xAA)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                                |
|-----|------------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bits          | R               | B'0           | Reserved bits                                                                                                                                                                       |
| 6:0 | SW4_LOW_CHAN<br><14:8> | RW              | B'000_1000    | The lowest frequency of SW 4 band in 1 kHz units, the default value is 2.2 MHz (0x0898). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00). |

**3.10.53. SW4\_LOW\_CHAN1 (Address 0xAB)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW4_LOW_CHAN<br><7:0> | RW              | 0x98          | The lowest frequency of SW 4 band in 1 kHz units, the default value is 2.2 MHz (0x0898). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00). |

**3.10.54. SW5\_LOW\_CHAN0 (Address 0xAC)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                                |
|-----|------------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                                        |
| 6:0 | SW5_LOW_CHAN<br><14:8> | RW              | B'000_1011    | The lowest frequency of SW 5 band, in 1 kHz units, the default value is 3.5 MHz (0x0DAC). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.55. SW5\_LOW\_CHAN1 (Address 0xAD)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW5_LOW_CHAN<br><7:0> | RW              | 0xAC          | The lowest frequency of SW 5 band, in 1 kHz units, the default value is 3.5 MHz (0x0DAC). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.56. SW6\_LOW\_CHAN0 (Address 0xAE)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                               |
|-----|------------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                                       |
| 6:0 | SW6_LOW_CHAN<br><14:8> | RW              | B'001_0000    | The lowest frequency of SW 6 band in 1 kHz units, the default value is 4.3 MHz (0x10CC). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.57. SW6\_LOW\_CHAN1 (Address 0xAF)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                               |
|-----|-----------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW6_LOW_CHAN<br><7:0> | RW              | 0xCC          | The lowest frequency of SW 6 band in 1 kHz units, the default value is 4.3 MHz (0x10CC). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.58. SW7\_LOW\_CHAN0 (Address 0xB0)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                           |
|-----|------------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                                   |
| 6:0 | SW7_LOW_CHAN<br><14:8> | RW              | B'001_0101    | The lowest frequency of SW 7 band, in 1 kHz, the default value is 5.55 MHz (0x15AE). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.59. SW7\_LOW\_CHAN1 (Address 0xB1)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                 |
|-----|-----------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW7_LOW_CHAN<br><7:0> | RW              | 0xAE          | The lowest frequency of SW 7 band, in 1 kHz units, the default value is 5.55 MHz (0x15AE). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.60. SW8\_LOW\_CHAN0 (Address 0xB2)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                           |
|-----|------------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                                   |
| 6:0 | SW8_LOW_CHAN<br><14:8> | RW              | B'001_1010    | The lowest frequency of SW 8 band, in 1 kHz, the default value is 6.78 MHz (0x1A7C). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.61. SW8\_LOW\_CHAN1 (Address 0xB3)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW8_LOW_CHAN<br><7:0> | RW              | 0x7C          | The lowest frequency of SW 8 band in 1 kHz units, the default value is 6.78 MHz (0x1A7C). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.62. SW9\_LOW\_CHAN0 (Address 0xB4)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                           |
|-----|------------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit           | R               | B'0           | Reserved bit                                                                                                                                                                   |
| 6:0 | SW9_LOW_CHAN<br><14:8> | RW              | B'010_0011    | The lowest frequency of SW 9 band, in 1 kHz, the default value is 9.15 MHz (0x23BE). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.63. SW9\_LOW\_CHAN1 (Address 0xB5)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                                |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW9_LOW_CHAN<br><7:0> | RW              | 0xBE          | The lowest frequency of SW 9 band in 1 kHz units, the default value is 9.15 MHz (0x23BE). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.64. SW10\_LOW\_CHAN0 (Address 0xB6)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                                                   |
|-----|-------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit            | R               | B'0           | Reserved bit                                                                                                                                                                           |
| 6:0 | SW10_LOW_CHAN<br><14:8> | RW              | B'010_1011    | The lowest frequency of SW 10 band, in 1 kHz units, the default value is 11.1 MHz (0x2B5C). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00). |

**3.10.65. SW10\_LOW\_CHAN1 (Address 0xB7)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                                  |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW10_LOW_CHAN<br><7:0> | RW              | 0x5C          | The lowest frequency of SW 10 band, in 1 kHz units, the default value is 11.1 MHz (0x2B5C). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.66. SW11\_LOW\_CHAN0 (Address 0xB8)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                                               |
|-----|-------------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit            | R               | B'0           | Reserved bit                                                                                                                                                                       |
| 6:0 | SW11_LOW_CHAN<br><14:8> | RW              | B'011_0010    | The lowest frequency of SW 11 band in 1 kHz units, the default value is 13 MHz (0x32C8). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.67. SW11\_LOW\_CHAN1 (Address 0xB9)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                               |
|-----|------------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW11_LOW_CHAN<br><7:0> | RW              | 0xC8          | The lowest frequency of SW 11 band in 1 kHz units, the default value is 13 MHz (0x32C8). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.68. SW12\_LOW\_CHAN0 (Address 0xBA)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                                             |
|-----|-------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit            | R               | B'0           | Reserved bit                                                                                                                                                                     |
| 6:0 | SW12_LOW_CHAN<br><14:8> | RW              | B'011_1010    | The lowest frequency of SW 12 band, in 1 kHz, the default value is 14.85 MHz (0x3A02). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.69. SW12\_LOW\_CHAN1 (Address 0xBB)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                                  |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW12_LOW_CHAN<br><7:0> | RW              | 0x02          | The lowest frequency of SW 12 band in 1 kHz units, the default value is 14.85 MHz (0x3A02). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.70. SW13\_LOW\_CHAN0 (Address 0xBC)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                                             |
|-----|-------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit            | R               | B'0           | Reserved bit                                                                                                                                                                     |
| 6:0 | SW13_LOW_CHAN<br><14:8> | RW              | B'100_0010    | The lowest frequency of SW 13 band, in 1 kHz, the default value is 17.05 MHz (0x429A). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.71. SW13\_LOW\_CHAN1 (Address 0xBD)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                             |
|-----|------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW13_LOW_CHAN<br><7:0> | RW              | 0x9A          | The lowest frequency of SW 13 band, in 1 kHz, the default value is 17.05 MHz (0x429A). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.72. SW14\_LOW\_CHAN0 (Address 0xBE)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                                             |
|-----|-------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Reserved bit            | R               | B'0           | Reserved bit                                                                                                                                                                     |
| 6:0 | SW14_LOW_CHAN<br><14:8> | RW              | B'101_0010    | The lowest frequency of SW 14 band, in 1 kHz, the default value is 21.15 MHz (0x529E). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.73. SW14\_LOW\_CHAN1 (Address 0xBF)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                                  |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW14_LOW_CHAN<br><7:0> | RW              | 0x9E          | The lowest frequency of SW 14 band in 1 kHz units, the default value is 21.15 MHz (0x529E). The value of this register should be in the range of 1.75 MHz (0x06D6) to 32 MHz (0x7D00) |

**3.10.74. SW1\_CHAN\_NUM0 (Address 0xC0)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                            |
|-----|------------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                                   |
| 3:0 | SW1_CHAN_NUM<br><11:8> | RW              | 0111          | The number of frequency points in SW band 1 is SW1_CHAN_NUM<11:0>+1. SW1_CHAN_NUM<11:0> is set to 0, which means that the subband has only one frequency point. |



**3.10.75. SW1\_CHAN\_NUM1 (Address 0xC1)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                               |
|-----|-----------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW1_CHAN_NUM<br><7:0> | RW              | 0xD0          | The number of frequencies in SW 1 band is SW1_CHAN_NUM<11:0>+1. SW1_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.76. SW2\_CHAN\_NUM0 (Address 0xC2)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                       |
|-----|------------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                              |
| 3:0 | SW2_CHAN_NUM<br><11:8> | RW              | 0111          | The number of frequencies in SW 2 band is SW2_CHAN_NUM<11:0>+1. SW2_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency in this band. |

**3.10.77. SW2\_CHAN\_NUM1 (Address 0xC3)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                      |
|-----|-----------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW2_CHAN_NUM<br><7:0> | RW              | 0xD0          | The number of frequencies in the SW 2 band is SW2_CHAN_NUM<11:0>+1. SW2_CHAN_NUM<11:0> is set to 0, which means there is only one frequency in this band. |

**3.10.78. SW3\_CHAN\_NUM0 (Address 0xC4)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                               |
|-----|------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                      |
| 3:0 | SW3_CHAN_NUM<br><11:8> | RW              | 0111          | The number of frequencies in SW band 3 is SW3_CHAN_NUM<11:0>+1. SW3_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.79. SW3\_CHAN\_NUM1 (Address 0xC5)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                       |
|-----|-----------------------|-----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW3_CHAN_NUM<br><7:0> | RW              | 0xD0          | The number of frequencies in SW band 3 is SW3_CHAN_NUM<11:0>+1. SW3_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency in this band. |

**3.10.80. SW4\_CHAN\_NUM0 (Address 0xC6)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                               |
|-----|------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                      |
| 3:0 | SW4_CHAN_NUM<br><11:8> | RW              | 0001          | The number of frequencies in SW band 4 is SW4_CHAN_NUM<11:0>+1. SW4_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.81. SW4\_CHAN\_NUM1 (Address 0xC7)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                               |
|-----|-----------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW4_CHAN_NUM<br><7:0> | RW              | 0x04          | The number of frequencies in SW band 4 is SW4_CHAN_NUM<11:0>+1. SW4_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.82. SW5\_CHAN\_NUM0 (Address 0xC8)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                  |
|-----|------------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                                         |
| 3:0 | SW5_CHAN_NUM<br><11:8> | RW              | 0000          | The number of frequency points in SW band 5 is SW5_CHAN_NUM<11:0>+1. SW5_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency point in this band. |

**3.10.83. SW5\_CHAN\_NUM1 (Address 0xC9)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                  |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW5_CHAN_NUM<br><7:0> | RW              | 0x96          | The number of frequencies in the SW5 band is SW5_CHAN_NUM<11:0>+1. SW5_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.84. SW6\_CHAN\_NUM0 (Address 0xCA)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                               |
|-----|------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                      |
| 3:0 | SW6_CHAN_NUM<br><11:8> | RW              | 0001          | The number of frequencies in SW band 6 is SW6_CHAN_NUM<11:0>+1. SW6_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.85. SW6\_CHAN\_NUM1 (Address 0xCB)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                               |
|-----|-----------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW6_CHAN_NUM<br><7:0> | RW              | 0x04          | The number of frequencies in SW band 6 is SW6_CHAN_NUM<11:0>+1. SW6_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.86. SW7\_CHAN\_NUM0 (Address 0xCC)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                            |
|-----|------------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                                   |
| 3:0 | SW7_CHAN_NUM<br><11:8> | RW              | 0000          | The number of frequency points in SW band 7 is SW7_CHAN_NUM<11:0> + 1. SW7_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency point. |

**3.10.87. SW7\_CHAN\_NUM1 (Address 0xCD)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                                    |
|-----|-----------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW7_CHAN_NUM<br><7:0> | RW              | 0xD2          | The number of frequency points in SW band 7 is SW7_CHAN_NUM<11:0> + 1. SW7_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency point in this band. |

**3.10.88. SW8\_CHAN\_NUM0 (Address 0xCE)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                                    |
|-----|------------------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits          | R               | 0000          | Reserved bits                                                                                                                                                           |
| 3:0 | SW8_CHAN_NUM<br><11:8> | RW              | 0000          | The number of frequency points in SW band 8 is SW8_CHAN_NUM<11:0> + 1. SW8_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency point in this band. |

**3.10.89. SW8\_CHAN\_NUM1 (Address 0xCF)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                               |
|-----|-----------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW8_CHAN_NUM<br><7:0> | RW              | 0xCC          | The number of frequencies in SW band 8 is SW8_CHAN_NUM<11:0> + 1. SW8_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency point in this band. |

**3.10.90. SW9\_CHAN\_NUM0 (Address 0xD0)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                            |
|-----|------------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bit           | R               | 0000          | Reserved bit                                                                                                                                                    |
| 3:0 | SW9_CHAN_NUM<br><11:8> | RW              | 0000          | The number of frequency points in SW band 9 is SW9_CHAN_NUM<11:0> + 1. SW9_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency point. |

**3.10.91. SW9\_CHAN\_NUM1 (Address 0xD1)**

| Bit | Bit name              | Read/Write mode | Default value | Function description                                                                                                                                            |
|-----|-----------------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW9_CHAN_NUM<br><7:0> | RW              | 0xE6          | The number of frequency points in SW band 9 is SW9_CHAN_NUM<11:0> + 1. SW9_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency point. |

**3.10.92. SW10\_CHAN\_NUM0 (Address 0xD2)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                                       |
|-----|-------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits           | R               | 0000          | Reserved bits                                                                                                                                                              |
| 3:0 | SW10_CHAN_NUM<br><11:8> | RW              | 0001          | The number of frequency points in SW band 10 is SW10_CHAN_NUM<11:0> + 1. SW10_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency point in this band. |

**3.10.93. SW10\_CHAN\_NUM1 (Address 0xD3)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                    |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW10_CHAN_NUM<br><7:0> | RW              | 0x04          | The number of frequencies in SW band 10 is SW10_CHAN_NUM<11:0> + 1. SW10_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.94. SW11\_CHAN\_NUM0 (Address 0xD4)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                    |
|-----|-------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits           | R               | 0000          | Reserved bits                                                                                                                                           |
| 3:0 | SW11_CHAN_NUM<br><11:8> | RW              | 0001          | The number of frequencies in SW band 11 is SW11_CHAN_NUM<11:0> + 1. SW11_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.95. SW11\_CHAN\_NUM1 (Address 0xD5)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                    |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW11_CHAN_NUM<br><7:0> | RW              | 0x04          | The number of frequencies in SW band 11 is SW11_CHAN_NUM<11:0> + 1. SW11_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.96. SW12\_CHAN\_NUM0 (Address 0xD6)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                                       |
|-----|-------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits           | R               | 0000          | Reserved bits                                                                                                                                                              |
| 3:0 | SW12_CHAN_NUM<br><11:8> | RW              | 0000          | The number of frequency points in SW band 12 is SW12_CHAN_NUM<11:0> + 1. SW12_CHAN_NUM<11:0> is set to 0, which means that there is only one frequency point in this band. |

**3.10.97. SW12\_CHAN\_NUM1 (Address 0xD7)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                               |
|-----|------------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW12_CHAN_NUM<br><7:0> | RW              | 0xE6          | The number of frequency points in SW band 12 is SW12_CHAN_NUM<11:0> + 1. SW12_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency point. |

**3.10.98. SW13\_CHAN\_NUM0 (Address 0xD8)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                               |
|-----|-------------------------|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits           | R               | 0000          | Reserved bits                                                                                                                                                      |
| 3:0 | SW13_CHAN_NUM<br><11:8> | RW              | 0000          | The number of frequency points in SW band 13 is SW13_CHAN_NUM<11:0> + 1. SW13_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency point. |

**3.10.99. SW13\_CHAN\_NUM1 (Address 0xD9)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                    |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW13_CHAN_NUM<br><7:0> | RW              | 0xFA          | The number of frequencies in SW band 13 is SW13_CHAN_NUM<11:0> + 1. SW13_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

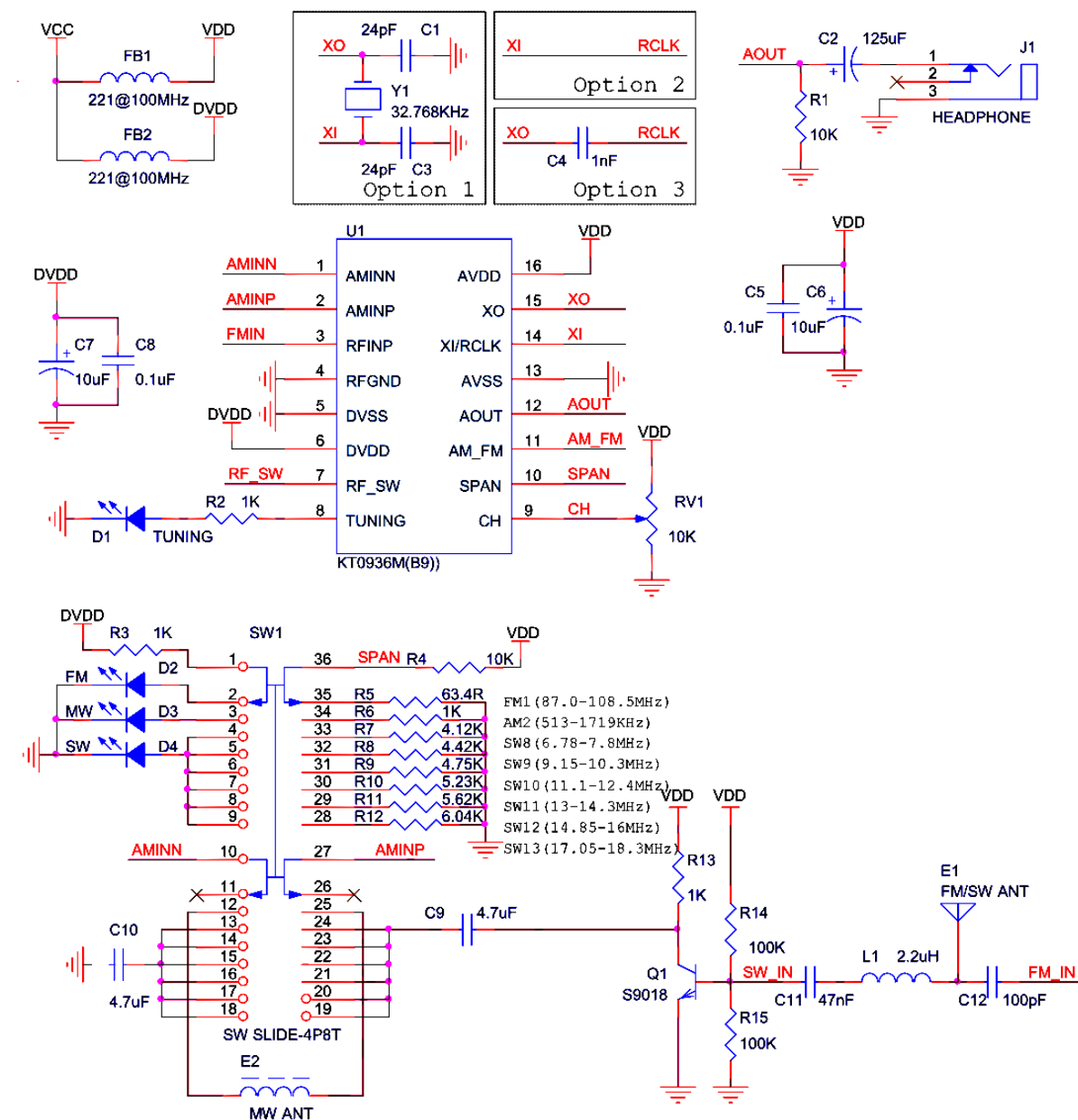
**3.10.100. SW14\_CHAN\_NUM0 (Address 0xDA)**

| Bit | Bit name                | Read/Write mode | Default value | Function description                                                                                                                                    |
|-----|-------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:4 | Reserved bits           | R               | 0000          | Reserved bits                                                                                                                                           |
| 3:0 | SW14_CHAN_NUM<br><11:8> | RW              | 0000          | The number of frequencies in SW band 14 is SW14_CHAN_NUM<11:0> + 1. SW14_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

**3.10.101. SW14\_CHAN\_NUM1 (Address 0xDB)**

| Bit | Bit name               | Read/Write mode | Default value | Function description                                                                                                                                    |
|-----|------------------------|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7:0 | SW14_CHAN_NUM<br><7:0> | RW              | 0xE6          | The number of frequencies in SW band 14 is SW14_CHAN_NUM<11:0> + 1. SW14_CHAN_NUM<11:0> is set to 0, which means that this band has only one frequency. |

## 4. Typical Application Circuit

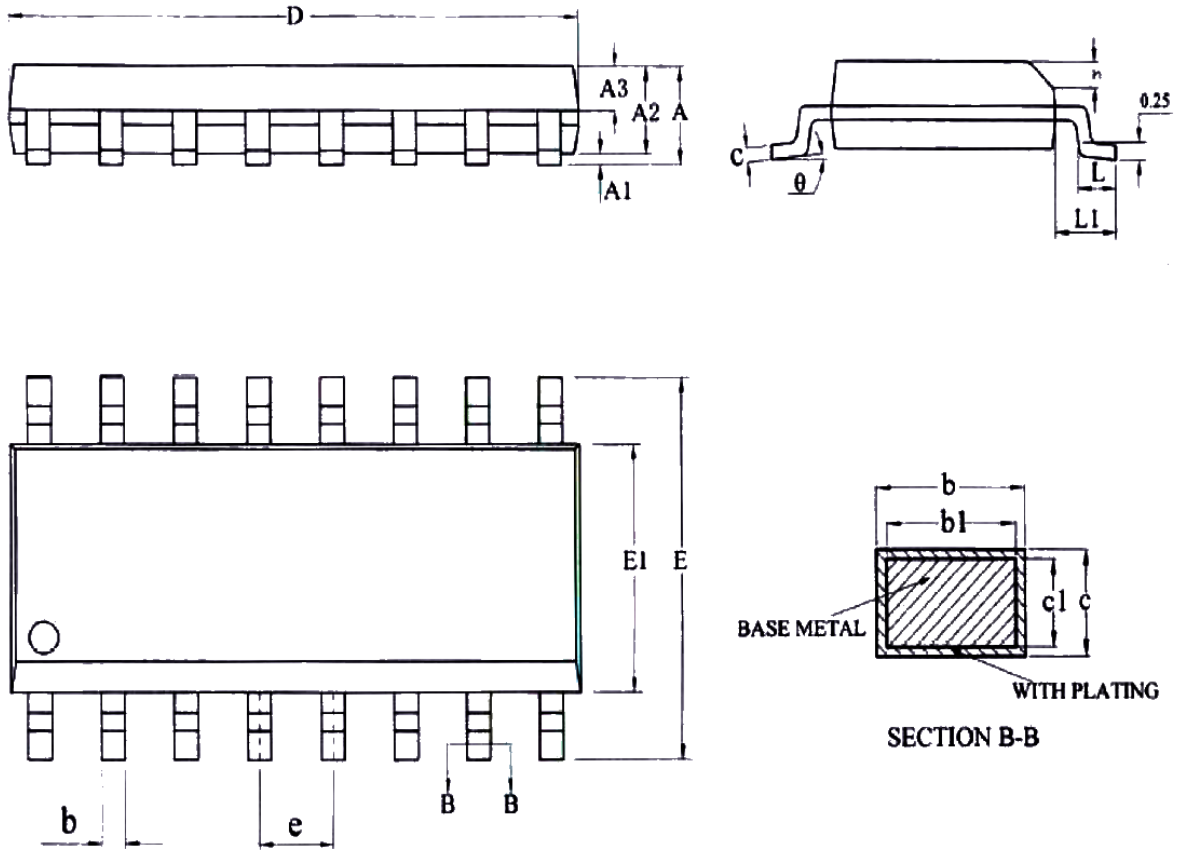


**Figure 4: Typical application circuit**

| Component | Description                                 | Value       |
|-----------|---------------------------------------------|-------------|
| C1, C3    | Crystal oscillator capacitor                | 24 pF       |
| C6, C7    | Electrolytic capacitor                      | 10 $\mu$ F  |
| C5, C8    | Non-inductive blocking capacitor            | 100nF       |
| C4        | Ceramic coupling capacitor                  | 1 nF        |
| C2        | Electrolytic capacitor                      | 125 $\mu$ F |
| C9, C10   | Ceramic capacitor                           | 4.7 $\mu$ F |
| C11       | Ceramic capacitor                           | 47 nF       |
| D1        | LED indication of tuned carrier             |             |
| D2        | LED indication of FM band                   |             |
| D3        | LED indication of the MW (medium wave) band |             |
| D4        | LED indication of SW (shortwave) bands      |             |

| Component   | Description                            | Value                |
|-------------|----------------------------------------|----------------------|
| E1          | Antenna for VHF-FM or shortwave (SW)   |                      |
| E2          | Ferrite antenna for medium waves       | 420 $\mu$ H          |
| J1          | Headphone jack connector               |                      |
| FB1, FB2    | Ferrite bead, choke                    | 220 $\mu$ H          |
| L1          | Shortwave (SW) Input filter coil       | 2.2 $\mu$ H          |
| Q1          | Low noise amplifier for shortwave (SW) | S9018                |
| RV1         | Tuning potentiometer                   | 10k $\Omega$         |
| RV2         | Volume potentiometer                   | 10k $\Omega$         |
| R1          | Resistor                               | 10k $\Omega$         |
| R2, R3, R13 | Resistor                               | 1 k $\Omega$         |
| R4          | Band selection resistor                | 10k $\Omega$ / 1 %   |
| R5          | Band selection resistor                | 63.4k $\Omega$ / 1 % |
| R6          | Band selection resistor                | 1 k $\Omega$ / 1%    |
| R7          | Band selection resistor                | 4.12 k $\Omega$ / 1% |
| R8          | Band selection resistor                | 4.42 k $\Omega$ / 1% |
| R9          | Band selection resistor                | 4.75 k $\Omega$ / 1% |
| R10         | Band selection resistor                | 5.23 k $\Omega$ / 1% |
| R11         | Band selection resistor                | 5.62 k $\Omega$ / 1% |
| R12         | Band selection resistor                | 6.04 k $\Omega$ / 1% |
| R14, R15    | Resistor                               | 100 k $\Omega$       |
| SW1         | Band switch: 4 sections of 8 positions |                      |
| U1          | FM/LW/MW/SW receiver circuit           | KT0936M(B9)          |
| Y1          | Crystal                                | 32.768 kHz           |

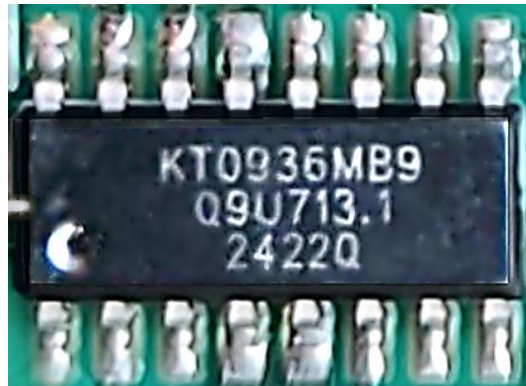
## 8. Package Outline



| Symbol | Dimension |      |      | Symbol | Dimension |          |       |
|--------|-----------|------|------|--------|-----------|----------|-------|
|        | Min.      | Typ. | Max  |        | Min.      | Typ.     | Max   |
| A      |           |      | 1,75 | D      | 9,70      | 9,90     | 10,10 |
| A1     | 0,10      |      | 0,25 | E      | 5,80      | 6,00     | 6,20  |
| A2     | 1,30      | 1,40 | 1,50 | E1     | 3,70      | 3,90     | 4,10  |
| A3     | 0,60      | 0,65 | 0,70 | e      |           | 1,27 BSC |       |
| b      | 0.39      |      | 0.48 | h      | 0.25      |          | 0.50  |
| b1     | 0.38      | 0.41 | 0.43 | L      | 0.50      |          | 0.80  |
| C      | 0.21      |      | 0.26 | L1     |           | 1.05 BSC |       |
| C1     | 0.19      | 0.20 | 0.21 | θ      | 0         |          | 8°    |



## 9. Chip Marking



| Marking method | laser                    |           |
|----------------|--------------------------|-----------|
| Line 1         | Type designation         | KT0936MB9 |
| Line 2         | Version and batch number | Q9U713.1  |
| Line 3         | Year of manufacture      | 2024      |
|                | Production week          | 22. KT    |
|                | Production code          | Q         |

**10. Ordering information**

| Type        | Description                                                                      | Housing          | Minimum order quantity |
|-------------|----------------------------------------------------------------------------------|------------------|------------------------|
| KT0936M(B9) | Fully integrated third generation receiver for all global VHF-FM/LW/MW/HF bands. | SOP16, lead-free | 3000 pcs               |

## **11. Version history**

V1.0 First release

V1.1 Register table modification

V2.0 Modification for KT0936M(9A).

V2.1 Modified the descriptions of the RF\_SW and AM\_FM pins in section 2 and the description of the AM\_FM pin function in section 6.3. Modified the description of the register 0x88. The name of the register ONLY\_FM\_DIS has been changed to ONLY\_FM1\_DIS.

V2.2 Modification for KT0936M(B9). Modification of AM\_FM pin descriptions in section 2, section 3.4 and section 6.3. Modification of tables 9, 10, 12 and figure 3. Modification of register 0x4F description. Modification of bandpass resistor values in typical application circuits. Addition of instructions for screen printing of packaging.

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