# Si4836-DEMO

## Si4836 DEMO BOARD USER'S GUIDE

## 1. Features

- ATAD (analog tune and analog display) AM/FM/SW radio
- Worldwide FM band support from 64–109 MHz with 5 bands, see Table 1
- Worldwide AM band support from 504–1750 kHz with 5 bands, see Table 1
- Worldwide SW band support 2.3–28.5 MHz with 18 wide bands or 18 narrow bands, see Table 1
- Twelve positions band switch for selecting different band according to the target market
- Two AAA battery operations with working voltage down to 2.0 V
- Economical potentiometer for frequency tuning replaces more expensive variable capacitor (PVC)
- Potentiometer volume control
- Push button Bass/Treble control
- FM 50 µs or 75 µs de-emphasis
- SW Wideband/Narrow-band selection via a slide switch

### Table 1. Si4836 Band Sequence Definition

| Band Name | Band Frequency Range | De-emphasis (FM) Channel Space (AM) | Note |
|---|---|---|---|
| FM1 | 87–108 MHz | 50 µs | |
| FM2 | 87–108 MHz | 50 µs | |
| FM3 | 87–108 MHz | 75 µs | Demo Board Default |
| FM4 | 87–108 MHz | 75 µs | |
| FM5 | 86.5–109 MHz | 50 µs | |
| FM6 | 86.5–109 MHz | 50 µs | |
| FM7 | 87.3–108.25 MHz | 50 µs | |
| FM8 | 87.3–108.25 MHz | 50 µs | |
| FM9 | 87.3–108.25 MHz | 75 µs | |
| FM10 | 87.3–108.25 MHz | 75 µs | |
| FM11 | 76–90 MHz | 50 µs | |
| FM12 | 76–90 MHz | 50 µs | |
| FM13 | 64–87 MHz | 50 µs | |
| FM14 | 64–87 MHz | 50 µs | |
| FM15 | 76–108 MHz | 50 µs | |
| FM16 | 76–108 MHz | 50 µs | |
| FM17 | 64–108 MHz | 50 µs | Demo Board Default |
| FM18 | 64–108 MHz | 50 µs | |
| AM1 | 520–1710 kHz | 10k | Demo Board Default |

# Si4836-DEMO

Table 1. Si4836 Band Sequence Definition

| Band Name | Band Frequency Range | | De-emphasis (FM) Channel Space (AM) | Note |
|---|---|---|---|---|
| AM2 | 522–1620 kHz | | 9k | Demo Board Default |
| AM3 | 504–1665 kHz | | 9k | |
| AM4 | 522–1728 kHz / 520–1730 kHz | | 9k / 10k | |
| AM5 | 510–1750 kHz | | 10k | |
| SW1 | SW Wide Band | SW Narrow Band | | |
| | 2.3–10.0 MHz | 2.30–2.49 MHz | | |
| SW2 | 3.2–7.6 MHz | 3.20–3.40 MHz | | Demo Board Default |
| SW3 | 3.2–10.0 MHz | 3.90–4.00 MHz | | Demo Board Default |
| SW4 | 3.7–12.5 MHz | 4.75–5.06 MHz | | |
| SW5 | 3.9–7.5 MHz | 5.6–6.4 MHz | | |
| SW6 | 5.6–22 MHz | 5.95–6.2 MHz | | |
| SW7 | 5.8–12.1 MHz | 6.8–7.6 MHz | | |
| SW8 | 5.9–9.50 MHz | 7.1–7.6 MHz | | |
| SW9 | 5.9–18.0 MHz | 9.2–10 MHz | | Demo Board Default |
| SW10 | 7.0–16.0 MHz | 11.45–12.25 MHz | | Demo Board Default |
| SW11 | 7.0–23.0 MHz | 11.6 –12.2 MHz | | Demo Board Default |
| SW12 | 9.0–16.0 MHz | 13.4–14.2 MHz | | |
| SW13 | 9.0–22.0 MHz | 13.57–13.87 MHz | | Demo Board Default |
| SW14 | 9.5–18.0 MHz | 15–15.9 MHz | | Demo Board Default |
| SW15 | 10.0–16.0 MHz | 17.1–18 MHz | | |
| SW16 | 10.0–22.0 MHz | 17.48–17.9 MHz | | Demo Board Default |
| SW17 | 13.0–18.0 MHz | 21.2–22 MHz | | |
| SW18 | 18.0–28.5 MHz | 21.45 –21.85 MHz | | |

## 2. Overview

This user's guide describes the operation of the Skyworks Solutions Si4836-DEMO board rev1.1, Nov 20, 2012. The Skyworks Solutions Si4836-DEMO board is designed with the 16-pin SOIC packaged Si4836 chip, the revolutionary single chip AM/FM/SW receiver that integrates everything from antenna input to audio output and allows use of common and economical potentiometers to do the frequency tuning. It provides a complete portable analog tune analog display AM/FM/SW radio design. The Si4836-DEMO is designed with 1-layer PCB, allowing the lowest cost without sacrificing the RF performance. The demo board works with two AAA batteries and working voltage down to 2.0 V.

## 3. Description

Figure 1 and Figure 2 shows the physical layout of the board with key components indicated.
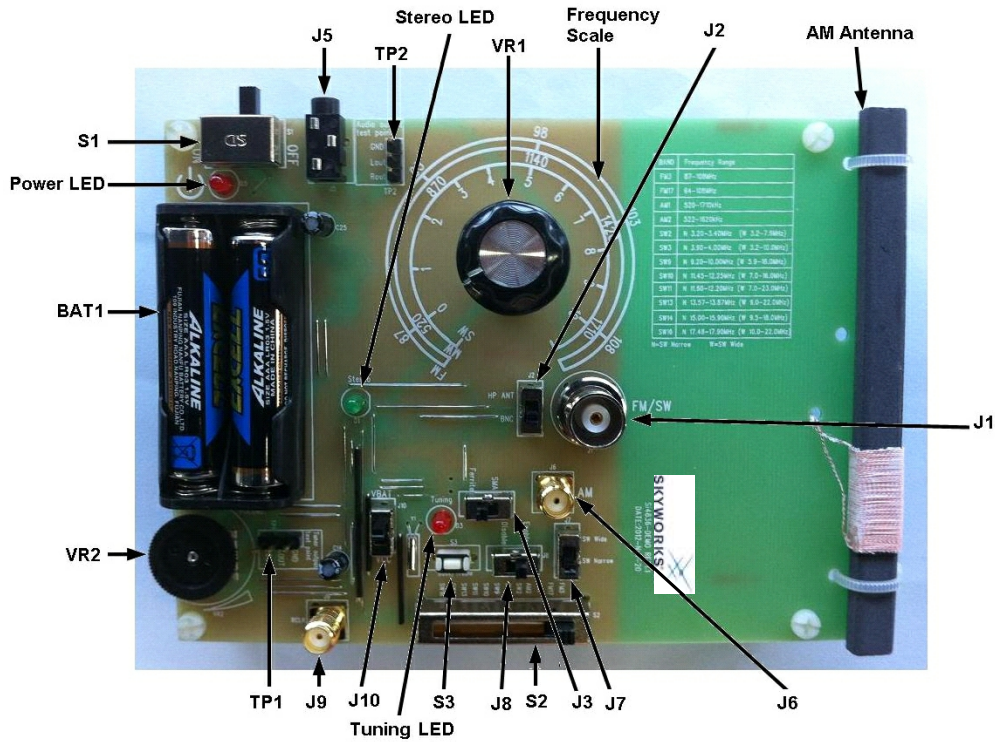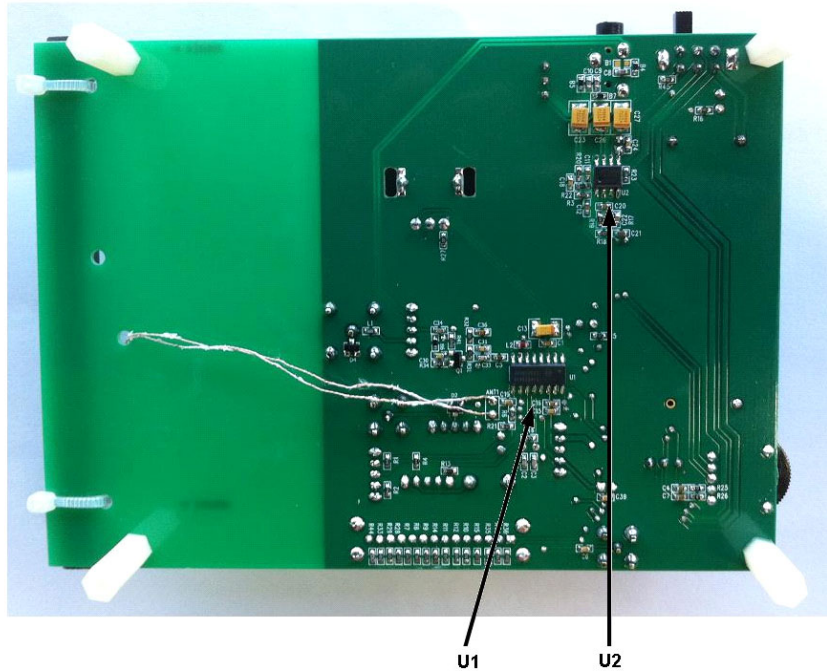


**Figure 1. Si4836-DEMO Board Top Side**



**Figure 2. Si4836-DEMO Board Bottom Side**

# Si4836-DEMO

**Power:**

BAT1: 2 cells AAA battery holder
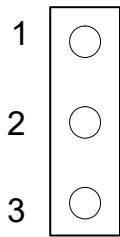
S1: Power on / off

**Audio Connectors:**

J5: Stereo audio headphone output

**Antenna Selections:**

AM antenna: Ferrite stick antenna for AM
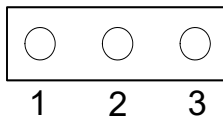
J1: BNC connector for FM/ SW conductive testing or FM whip antenna

J2: FM antenna selector

```
1  ◯
2  ◯
3  ◯
```

1-2: HP ANT (J5)
2-3: BNC (J1)

J6: SMA connector for AM conductive testing

J3: AM antenna selector

```
◯   ◯   ◯
1   2   3
```

1-2: AM Ferrite Antenna
2-3: SMA (J6)

**Audio Output Test Point:**

For the general specification test, TP2 is the recommended audio signal test point. The audio test instrument should be connected to TP2 to get more accurate test results. J5 can also be used as an audio test point, but the test results may not be entirely accurate under some circumstances.

```
3  ◯   GND
2  ◯   Lout
1  ◯   Rout
```

**Si4836-DEMO**
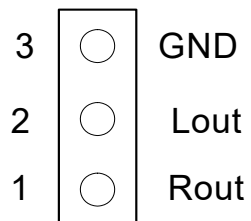
**Tuner Output Test Point:**

For the tuner specification test, TP1 is the recommended tuner output test point. The audio test instrument should be connected to TP1 to get accurate test results.
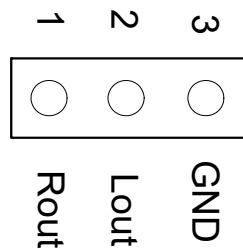


**Main Components:**

U1: Skyworks Solutions Si4836 AM/FM/SW ATAD receiver

U2: Audio amplifier

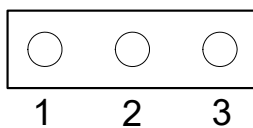Frequency scale: The analog display for tuning frequency

**Control Interface:**

VR1: Frequency tuning wheel.

VR2: Volume control wheel

J9: SMA connector for external RCLK

S3: The push button for bass/treble control

J8: The bass/treble function enable/disable selector



1-2: Disable
2-3: Enable

J7: SW Wideband/Narrow-band selector
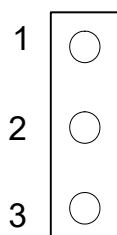


1-2: SW Wideband
2-3: SW Narrow-band

J10: Tuner VDD connector (connect tuner Pin14 VDD to VBAT or VCC)

```
1  ○
2  ○
3  ○
```
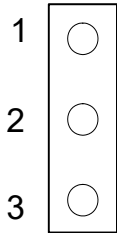
1-2: VBAT
2-3: VCC

S2: Band switch for FM, AM, and SW

```
○  ○  ○  ○  ○  ○  ○  ○  ○  ○  ○  ○
1  2  3  4  5  6  7  8  9  10 11 12
```
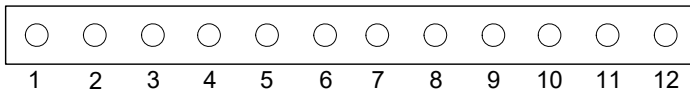
1: FM3 (87–108 MHz)

2: FM17 (64–108 MHz)

3: AM1 (520–1710 kHz)

4: AM2 (522–1620 kHz)

5: SW2 (N 3.2–3.4 MHz) (W 3.2–7.6 MHz)

6: SW3 (N 3.9–4.0 MHz) (W 3.2–10.0 MHz)

7: SW9 (N 9.2–10.0 MHz) (W 5.9–18.0 MHz)

8: SW10 (N 11.45–12.25 MHz) (W 7.0–16.0 MHz)

9: SW11 (N 11.6 –12.2 MHz) (W 7.0–23.0 MHz)

10: SW13 (N 13.57–13.87 MHz) (W 9.0–22.0 MHz)

11: SW14 (N 15.0–15.9 MHz) (W 9.5–18.0 MHz)

12: SW16 (N 17.48 –17.9 MHz) (W 10.0–22.0 MHz)

**Note:** N = SW Narrow-band, W = SW Wideband

# 4. Operation

S4836-DEMO board, a complete analog tune and analog display radio, is very easy to operate:

1. Switch the SW Wideband/Narrow-band selector J7 to the desired SW Wideband or Narrow-band.
2. Switch the tuner VDD connector J10 to the desired VABT or VCC.
3. Switch the bass/treble function enable/disable selector J8 to the desired Disable or Enable.
4. Put two AAA batteries into the battery compartment.
5. Switch the power switch S1 to the ON position. The board will power up to a radio band according to the position of the band switch.
6. Change the band switch S2 to the desired band.
7. Rotate the tuning wheel VR1 and find the desired frequency.
8. Rotate the volume control wheel VR2 to get a comfortable volume.

**Note:** For FM listening, the earphone cable must be connected to the board when J2 is set to "HP ANT" or an external antenna must be connected to the BNC connector when J2 is set to "BNC".

For AM listening, the ferrite antenna must be connected to the board and the J3 is set to "Ferrite" before Turning on the radio or band switching to AM.

# Si4836-DEMO

## 5. Bill of Materials

- ATAD AM/FM/SW receiver IC Si4836 with external 32.768 kHz crystal oscillator support
- LM4910 Audio amplifier IC
- See Table 2 for details

**Table 2. Si4836-DEMO Board rev1.1 Bill of Materials**

| Item | Qty | Reference | Description | Value |
|------|-----|-----------|-------------|-------|
| 1 | 6 | C1 C6 C16 C19 C24 C39 | CAP,SM,0603,X7R | 0.1 µ |
| 2 | 3 | C23 C26 C27 | CAP,SM,1210,X7R | 220 µ |
| 3 | 1 | C13 | CAP,SM,1210,X7R | 47 µ |
| 4 | 2 | C14 C25 | Electrolytic capacitor | 100 µ/4 V |
| 5 | 2 | C2 C3 | CAP,SM,0603,X7R | 22p |
| 6 | 2 | C30 C31 | CAP,SM,0603,X7R | 33n |
| 7 | 1 | C33 | CAP,SM,0603,X7R | 10p |
| 8 | 1 | C34 | CAP,SM,0603,X7R | 33p |
| 9 | 4 | C4 C7 C12 C21 | CAP,SM,0603,X7R | 10u |
| 10 | 1 | C15 | CAP,SM,0603,X7R | 4.7 µ |
| 11 | 2 | C5 C36 | CAP,SM,0603,X7R | 0.47 µ |
| 12 | 2 | C8 C10 | CAP,SM,0603,X7R | 100p |
| 13 | 2 | C11 C20 | CAP,SM,0603,X7R | 150p |
| 14 | 2 | C18 C22 | CAP,SM,0603,X7R | 330p |
| 15 | 2 | R25 R26 | RES,SM,0603 | 0R |
| 16 | 2 | R17 R22 | RES,SM,0603 | 12k |
| 17 | 1 | R27 | RES,SM,0603 | 100R |
| 18 | 1 | R31 | RES,SM,0603 | 1k |
| 19 | 1 | R32 | RES,SM,0603 | 10R |
| 20 | 1 | R41 | RES,SM,0603 | 120k |
| 21 | 2 | R3 R18 | RES,SM,0603 | 2.2k |
| 22 | 4 | R5 R16 R21 R45 | RES,SM,0603 | 200R |
| 23 | 3 | R6 R23 R34 | RES,SM,0603 | 100k |
| 24 | 2 | R19 R20 | RES,SM,0603 | 6.8k |
| 25 | 4 | R1 R2 R4 R13 | RES,SM,0603 | 56k |
| 26 | 1 | R46 | RES,SM,0603 | 4.7M |
| 27 | 1 | R36 | RES,SM,0603,Tolerance ±1% | 33k |
| 28 | 1 | R29 | RES,SM,0603,Tolerance ±1% | 140k |

**Table 2. Si4836-DEMO Board rev1.1 Bill of Materials (Continued)**

| Item | Qty | Reference | Description | Value |
|------|-----|-----------|-------------|-------|
| 29 | 1 | R43 | RES,SM,0603,Tolerance ±1% | 40k |
| 30 | 1 | R44 | RES,SM,0603,Tolerance ±1% | 47k |
| 31 | 5 | R7 R9 R11 R12 R15 | RES,SM,0603,Tolerance ±1% | 10k |
| 32 | 1 | R8 | RES,SM,0603,Tolerance ±1% | 50k |
| 33 | 4 | R10 R28 R33 R35 | RES,SM,0603,Tolerance ±1% | 20k |
| 34 | 1 | R14 | RES,SM,0603,Tolerance ±1% | 60k |
| 35 | 1 | L1 | RES,SM,0603 | 0R |
| 36 | 1 | L2 | Inductor 270nH | 270 nH |
| 37 | 4 | B4 B5 B6 B7 | FERRITE BEAD,SM,0603 | 2.5k/100M |
| 38 | 1 | B1 | FERRITE BEAD,SM,0603 | NP |
| 39 | 1 | VR1 | 100k,±10%,Variable resistor(POT) | 100k |
| 40 | 1 | VR2 | 10k,±20%,Variable resistor(POT) | 10k |
| 41 | 1 | U1 | SI4836,SOIC16 | Si4836 |
| 42 | 1 | U2 | LM4910MA,SO8 | LM4910MA |
| 43 | 3 | D1 D3 D5 | LED | LED |
| 44 | 2 | D2 D4 | DIODE,SM,ESD,SOT23 | BAV99 |
| 45 | 1 | Q1 | TRANSISTOR NPN SOT23 | 2SC9018 |
| 46 | 1 | Y1 | CRYSTAL | 32.768 kHz |
| 47 | 1 | J1 | BNC VERTICAL | BNC For FM/SW testing |
| 48 | 2 | J6 J9 | SMA VERTICAL | |
| 49 | 5 | J2 J3 J7 J8 J10 | Single pole two throw switch | |
| 50 | 1 | J5 | earphone jack | |
| 51 | 1 | S1 | Two pole two throw switch | |
| 52 | 1 | S2 | Single pole twelve throw switch | |
| 53 | 1 | S3 | Push button | |
| 54 | 1 | ANT1 | AW ferrite stick antenna | 220 µH |
| 55 | 1 | BAT1 | BATTERY BOX,AAA*2 SIZE | |
| 56 | 2 | TP1 TP2 | CONN,TH,1x3,HDR | CONN,TH,1x3,HDR |

# Si4836-DEMO

## 6. Schematic and Gerber

**Figure 3. Si4836-DEMO Board Rev 1.1 Schematic**
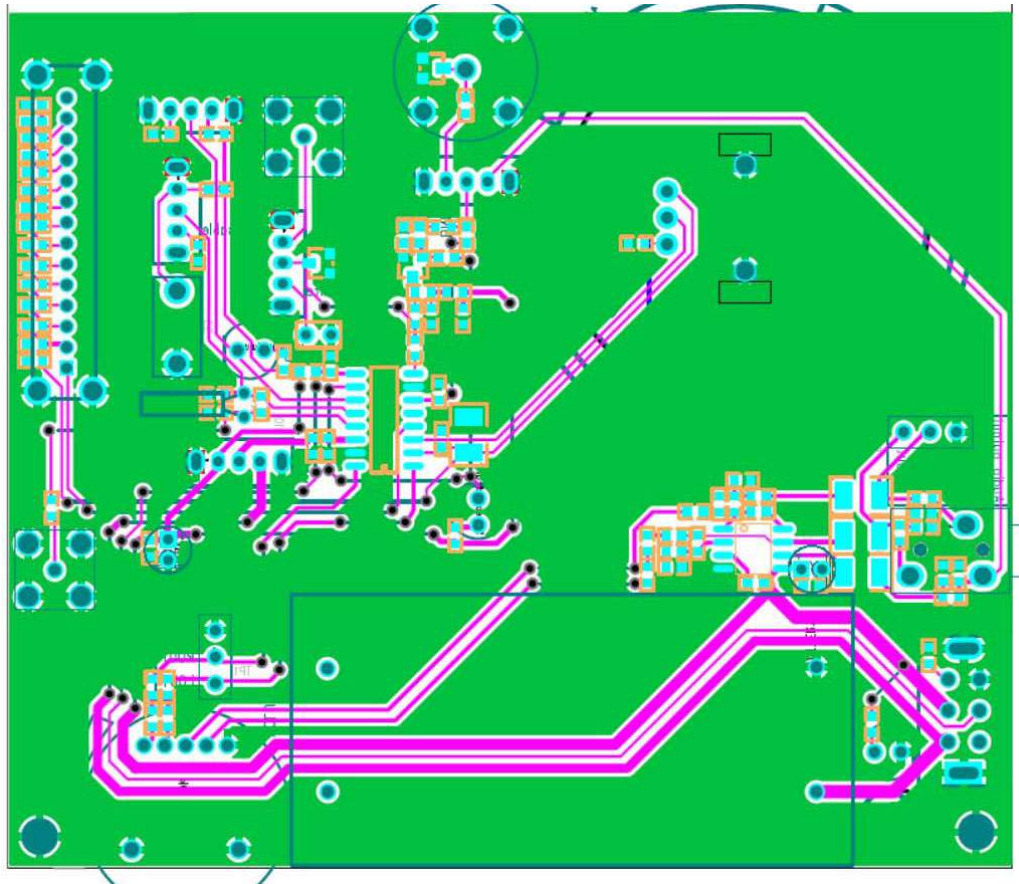
**Figure 4. Si4836-DEMO Board Gerber Rev 1.1**

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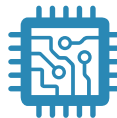
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