

# UG246: Si875x-EVB User's Guide

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The Si875x isolated MOSFET driver is ideal for driving power switches used in a wide variety of applications, offering longer service life and dramatically higher reliability compared to common SSRs. The Si875x isolated MOSFET driver utilizes Skyworks' proprietary silicon isolation technology supporting up to 2.5 kVRMS withstand voltage per UL1577 and VDE0884. This technology enables reduced variation with temperature and age, better part-to-part matching, and extremely high reliability. High integration, low propagation delay, small installed size, flexibility, and cost-effectiveness make the Si875x ideal for a wide range of isolated MOSFET gate drive applications. The Si875x evaluation board allows designers to evaluate Skyworks' Si875x family of MOSFET drivers. The boards come populated with either the Si8751 (digital input) or Si8752 (LED emulator input) version of the family. The board includes screw terminals for quick evaluation of the device's key parameters and also includes test points on each of the device's pins to accommodate direct connection to the designer's end system. For more ISOdriver information, visit Skyworks website at [www.skyworksinc.com/Products/Isolation](http://www.skyworksinc.com/Products/Isolation).

## KEY FEATURES OR KEY POINTS

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- Easy to use
- Supports both dc or ac switching
- Jumper selectable power reduction options
- Jumper to evaluate Miller Clamp function
- Digital input or diode emulation options
  - Si8751-KIT (digital input)
  - Si8752-KIT (diode emulation)

## 1. Ordering Guide

**Table 1.1. Si875x Evaluation Board Ordering Guide**

| Ordering Part Number (OPN) | Description                               |
|----------------------------|---|
| SI8751-KIT                 | Si8751 Isolated FET Driver Evaluation Kit |
| SI8752-KIT                 | Si8752 Isolated FET Driver Evaluation Kit |

## 2. Kit Contents

The Si875x Evaluation Kit contains the following items:

- Si875x-based evaluation board shown in the figure below:

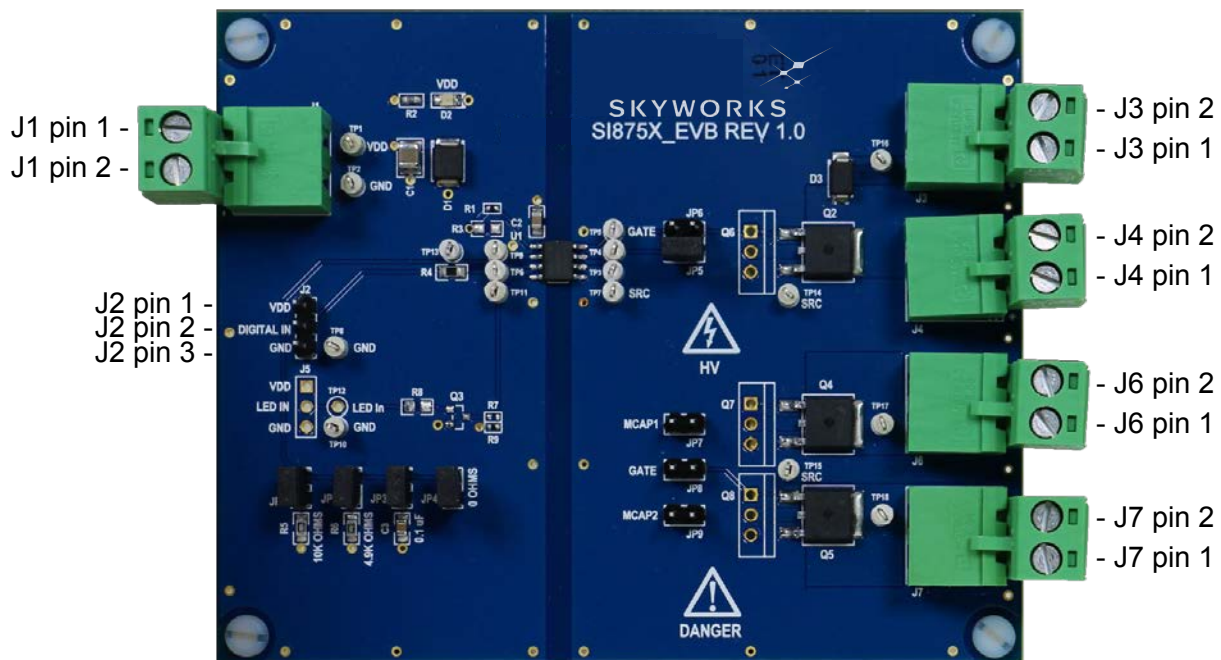


Figure 2.1. Si8751 Evaluation Board

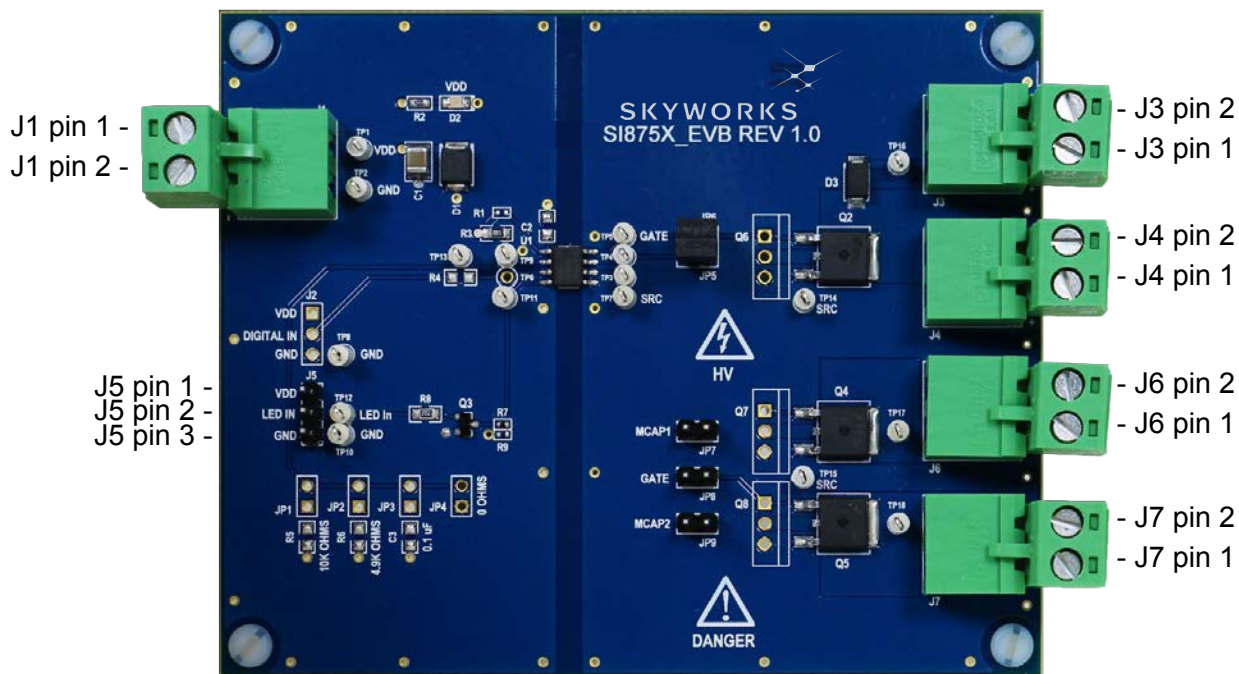


Figure 2.2. Si8752 Evaluation Board

### 3. EVB Test

To run the test, follow the instructions in the following sections.

#### 3.1 Required Equipment

The following equipment is required to demonstrate the evaluation board:

- 1 digital multimeter
- 1 dc power supply: 0 – 5 V
- 1 dc power supply: 0 – 15 V
- 1 1k – 2k 0.25 W resistor
- Assorted cables and leads as necessary to connect equipment to EVB
- Si875x Evaluation Board (board under test)
- Si827x Evaluation Board User's Guide (this document)

#### 3.2 EVB Test

To run the test, follow the instructions in the following sections.

##### 3.2.1 DC Supply Configuration

1. Set the 5 V supply to output 5 VDC.
2. Turn OFF the supply and connect the positive lead to J1 pin 1.
3. Connect the negative lead to J1 pin 2.
4. Set the 15 V supply to output 15 VDC.
5. Turn OFF the supply and connect the positive lead to J3 pin 1.
6. Connect the negative lead to J3 pin 2.
7. Connect the positive lead of the multimeter, and one end of the resistor, to J4 pin 1.
8. Connect the negative lead of the multimeter, and the other end of the resistor, to J4 pin 2.
9. Turn ON the dc power supplies.
10. Ensure that the current draw is less than 25 mA in any of the supplies. If it is larger, this indicates that either the board or Si875x has been damaged or the supply is connected backwards.

##### 3.2.2 Test the Si875x DC Switch

1. Place a shunt between pins 2 and 3 of J2 (Si8751) or J5 (Si8752) and JP6.
2. The multimeter should measure 0 V.
3. Move the shunt from pins 2 and 3 to pins 1 and 2 on J2 (Si8751) or J5 (Si8752).
4. The multimeter should now measure 15 V.
5. Move the shunt back to pins 2 and 3.
6. Turn off the dc supplies.

##### 3.2.3 Test the Si875x AC Switch

1. Move the 15 V supply positive lead to J6 pin 1 and the negative lead to J6 pin 2.
2. Move the multimeter positive lead, and the resistor lead, to J7 pin 1 and the negative lead, and the resistor lead, to J7 pin 2.
3. Move the shunt from JP6 to JP8.
4. Turn on the dc supplies. Again, there should be no current draw greater than 25 mA.
5. The multimeter should measure 0 V.
6. Move the shunt on J2 (Si8751) or J5 (Si8752) from pins 2 and 3 to pins 1 and 2.
7. The multimeter should now measure 15 V.

### 4. Schematics

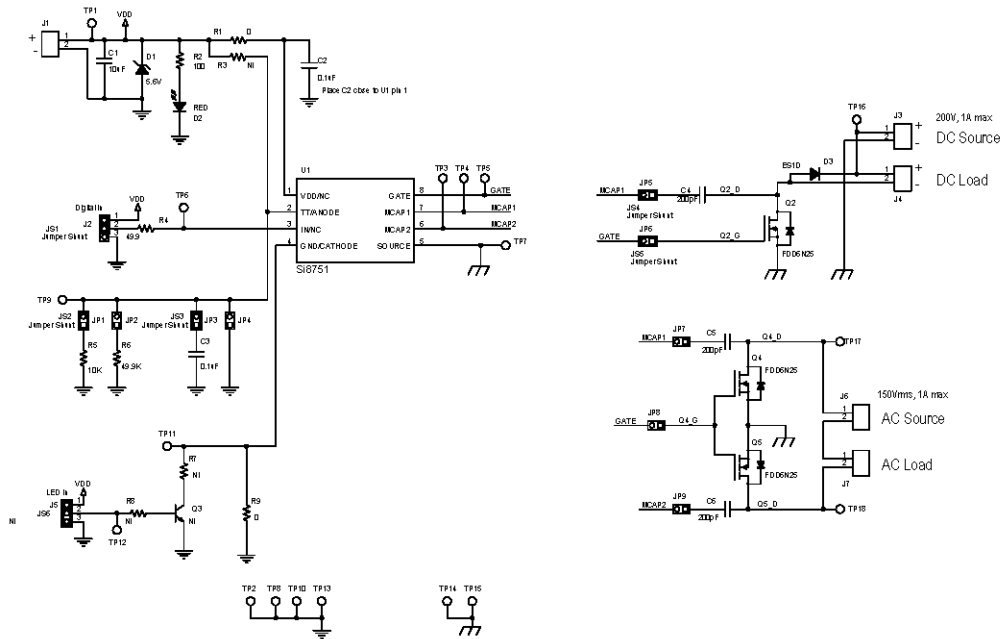


Figure 4.1. Si8751-EVB Schematic

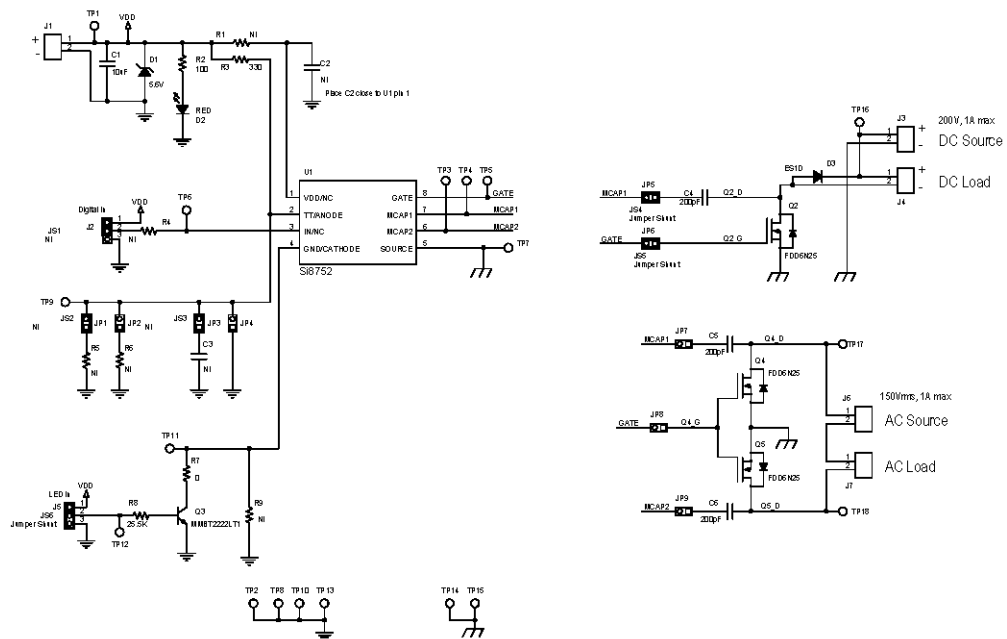


Figure 4.2. Si8752-EVB Schematic

## 5. Layout

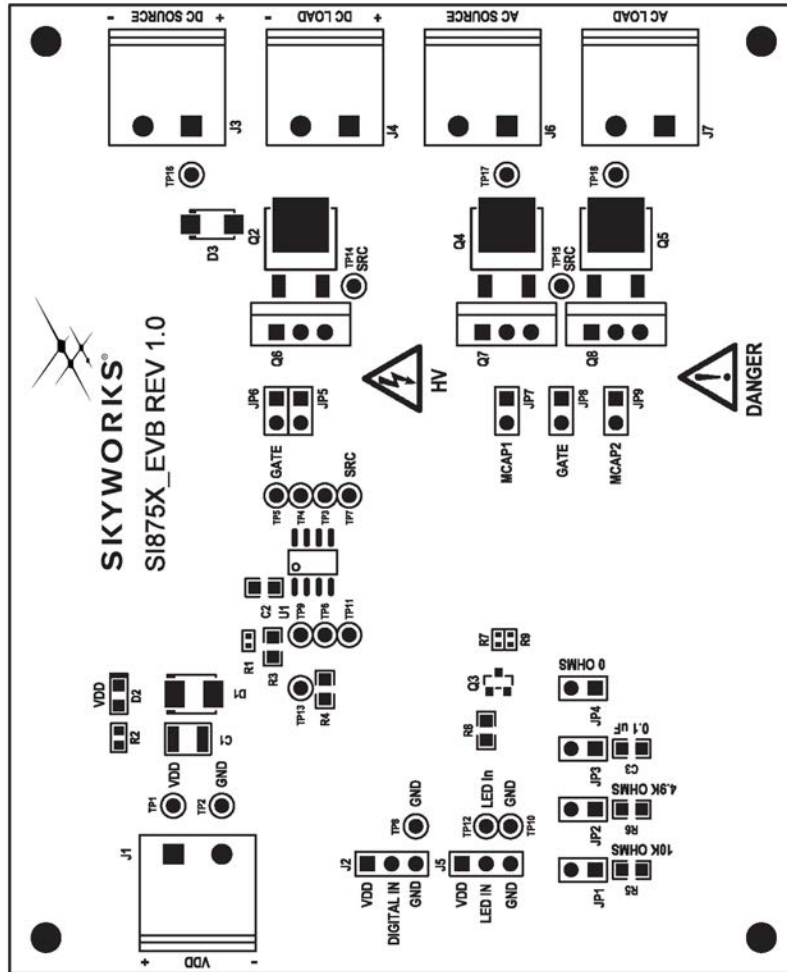


Figure 5.1. Primary Silkscreen

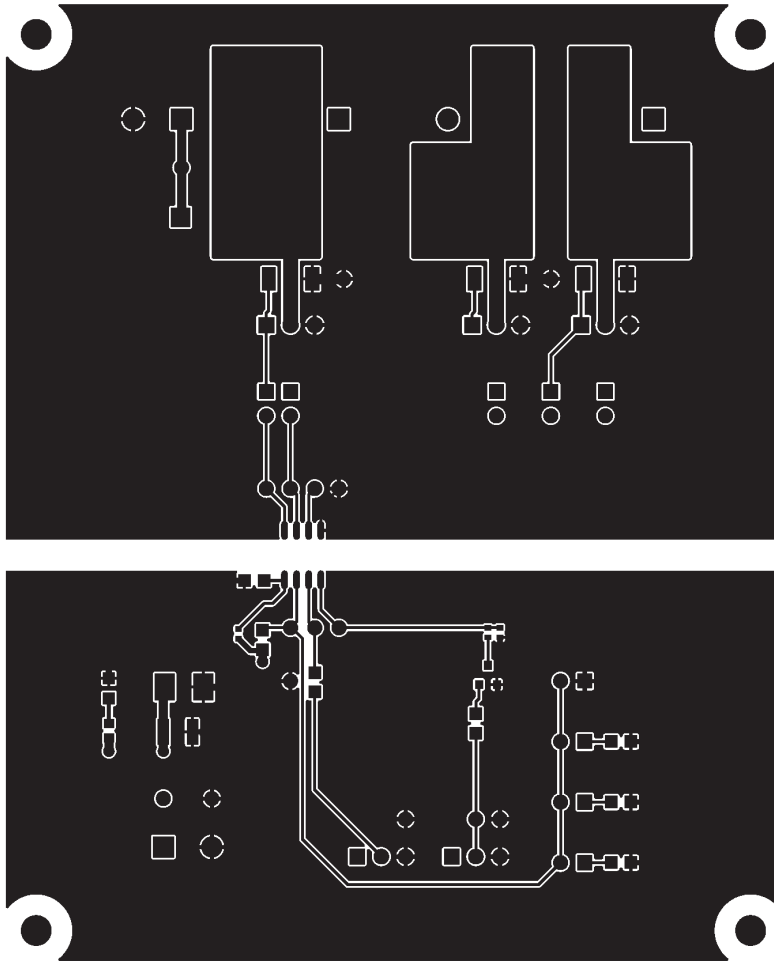


Figure 5.2. Primary Side

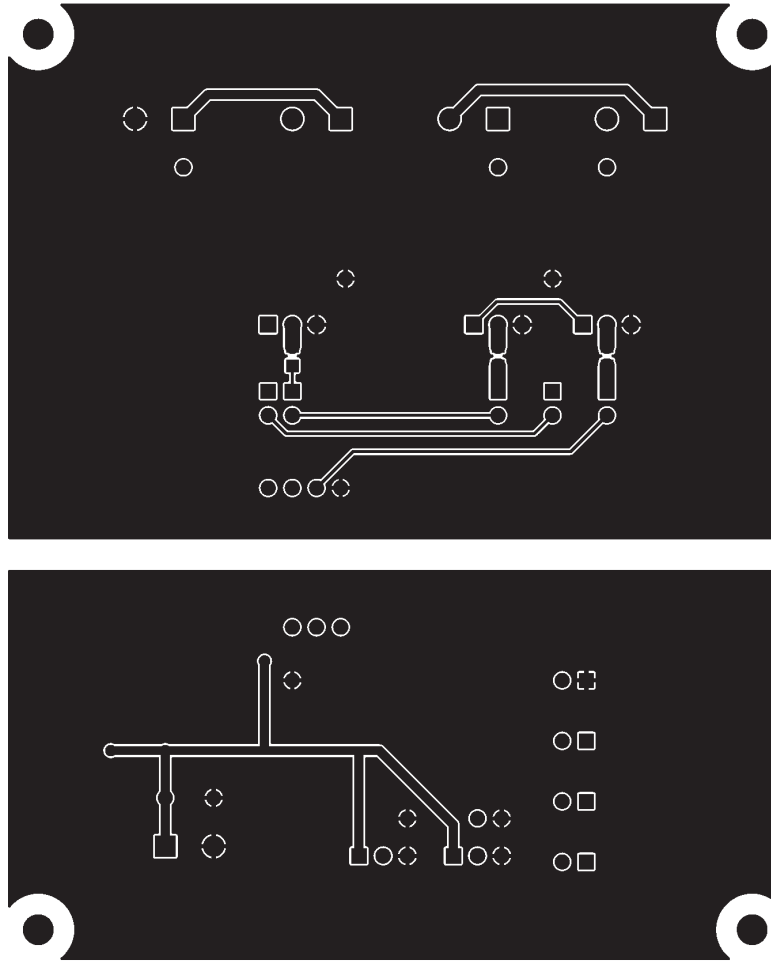


Figure 5.3. Secondary Side



Figure 5.4. Secondary Silkscreen



## 6. Bill of Materials

### Si8751-EVB Bill of Materials

**Table 6.1. Si8751-EVB Bill of Materials**

| Qty | Ref                                 | Value              | Type             | PCB_Footprint   | Manufacturer PN    | Manufacturer         |
|-----|-------------------------------------|--------------------|------------------|-----------------|--------------------|----------------------|
| 1   | C1                                  | 10uF               | X7R              | C1210           | C1210X7R500-106M   | Venkel               |
| 2   | C2 C3                               | 0.1uF              | X7R              | C0805           | C0805X7R101-104K   | Venkel               |
| 3   | C4 C5 C6                            | 200pF              | C0G              | C0805           | C0805C0G500-201K   | Venkel               |
| 1   | D1                                  | 5.6V               | Zener            | DO-214AA        | 1SMB5919BT3        | On Semi              |
| 1   | D2                                  | RED                | SMT, ChipLED     | LED-HSMX-C170   | HSMZ-C170          | Avago Technologies   |
| 1   | D3                                  | ES1D               | Fast             | DO-214AC        | ES1D               | Diodes Inc.          |
| 5   | J1 J3 J4 J6 J7                      | CONN TRBLK 2       | TERM BLK MALE    | CONN-TB-1757242 | 1757242            | PHOENIX CONTACT      |
| 1   | J2                                  | Header 1x3         | Header           | CONN-1X3        | TSW-103-07-G-S     | Samtec               |
| 9   | JP1 JP2 JP3 JP4 JP5 JP6 JP7 JP8 JP9 | JUMPER             | Header           | CONN1X2         | TSW-102-07-T-S     | Samtec               |
| 5   | JP10 JP11 JP12 JP13 JP14            | PLUG               | TERM BLK         |                 | 1757019            | Phoenix Contact      |
| 5   | JS1 JS2 JS3 JS4 JS5                 | Jumper Shunt       | Shunt            | SHUNT           | SNT-100-BK-T       | Samtec               |
| 1   | LB1                                 | OPN: Si8751_EVB    | POLYIMIDE, WHITE | PTL-14-477      | LABEL-Si8751_EVB   | Skyworks             |
| 4   | MH1 MH2 MH3 MH4                     | 4-40               | HDW              | MH-125NP MH-125 | NSS-4-4-01         | Richco Plastic Co    |
| 1   | PCB1                                | Si875x_EVB REV 1.0 | BARE PCB         | N/A             | Si875x_EVB REV 1.0 | Skyworks             |
| 3   | Q2 Q4 Q5                            | FDD6N25            | N-CHNL           | DPAK-G2SD       | FDD6N25            | Fairchild            |
| 2   | R1 R9                               | 0                  | ThickFilm        | R0402 R0402L    | CR0402-16W-000     | Venkel               |
| 1   | R2                                  | 100                | ThickFilm        | R0603 R0603L    | CR0603-10W-1000F   | Venkel               |
| 1   | R4                                  | 49.9               | ThickFilm        | R0805           | CR0805-10W-49R9F   | Venkel               |
| 1   | R5                                  | 10K                | ThickFilm        | R0805           | CR0805-10W-1002F   | Venkel               |
| 1   | R6                                  | 49.9K              | ThickFilm        | R0805           | CR0805-10W-4992F   | Venkel               |
| 4   | SO1 SO2 SO3 SO4                     | STAND-OFF          | HDW              |                 | 1902D              | Keystone Electronics |

| Qty | Ref   | Value  | Type     | PCB_Footprint | Manufacturer PN | Manufacturer |
|-----|---|--------|----------|---------------|-----------------|--------------|
| 17  | TP1 TP2<br>TP3 TP4<br>TP5 TP6<br>TP7 TP8<br>TP9 TP10<br>TP11 TP13<br>TP14 TP15<br>TP16 TP17<br>TP18 | WHITE  | Loop     | TESTPOINT     | 151-201-RC      | Kobiconn     |
| 1   | U1  | Si8751 | Isolator | SO8N6.0P1.27  | Si8751          | Skyworks     |

**Table 6.2. Si8751-EVB Not Installed Components**

| Qty | Reference | Value             | Type      | PCB_Footprint   | ManufacturerPN   | Manufacturer |
|-----|-----------|-------------------|-----------|-----------------|------------------|--------------|
| 1   | J5        | Header<br>1x3     | Header    | CONN-1X3        | TSW-103-07-G-S   | Samtec       |
| 1   | JS6       | Jumper<br>Shunt   | Shunt     | SHUNT           | SNT-100-BK-T     | Samtec       |
| 1   | Q3        | MMBT222<br>2LT1   | NPN       | SOT23-BEC       | MMBT2222LT1      | On Semi      |
| 3   | Q6 Q7 Q8  | IRG4BC10<br>UDPBF | IGBT      | TO-220 TO220-UP | IRG4BC10UDPBF    | IR           |
| 1   | R3        | 330               | ThickFilm | R0805           | CR0805-10W-3300F | Venkel       |
| 1   | R7        | 0                 | ThickFilm | R0402 R0402L    | CR0402-16W-000   | Venkel       |
| 1   | R8        | 25.5K             | ThickFilm | R0805           | CR0805-10W-2552F | Venkel       |
| 1   | TP12      | WHITE             | Loop      | TESTPOINT       | 151-201-RC       | Kobiconn     |

## Si8752-EVB Bill of Materials

Table 6.3. Si8752-EVB Bill of Materials

| Qty | Reference  | Value               | Type             | PCB_Footprint   | ManufacturerPN      | Manufacturer         |
|-----|--|---------------------|------------------|-----------------|---------------------|----------------------|
| 1   | C1   | 10uF                | X7R              | C1210           | C1210X7R500-106M    | Venkel               |
| 3   | C4 C5 C6   | 200pF               | C0G              | C0805           | C0805C0G500-201K    | Venkel               |
| 1   | D1   | 5.6V                | Zener            | DO-214AA        | 1SMB5919BT3         | On Semi              |
| 1   | D2   | RED                 | SMT, ChipLED     | LED-HSMX-C170   | HSMZ-C170           | Avago Technologies   |
| 1   | D3   | ES1D                | Fast             | DO-214AC        | ES1D                | Diodes Inc.          |
| 5   | J1 J3 J4 J6 J7   | CONN TRBLK 2        | TERM BLK MALE    | CONN-TB-1757242 | 1757242             | PHOENIX CONTACT      |
| 1   | J5   | Header 1x3          | Header           | CONN-1X3        | TSW-103-07-G-S      | Samtec               |
| 5   | JP10 JP11 JP12 JP13 JP14   | PLUG                | TERM BLK         |                 | 1757019             | Phoenix Contact      |
| 5   | JP5 JP6 JP7 JP8 JP9  | JUMPER              | Header           | CONN1X2         | TSW-102-07-T-S      | Samtec               |
| 3   | JS4 JS5 JS6  | Jumper Shunt        | Shunt            | SHUNT           | SNT-100-BK-T        | Samtec               |
| 1   | LB1  | OPN: Si8752_EV B    | POLYIMIDE, WHITE | PTL-14-477      | LABEL-Si8752_EV B   | Skyworks             |
| 4   | MH1 MH2 MH3 MH4  | 4-40                | HDW              | MH-125NP MH-125 | NSS-4-4-01          | Richco Plastic Co    |
| 1   | PCB1   | Si875x_EV B REV 1.0 | BARE PCB         | N/A             | Si875x_EV B REV 1.0 | Skyworks             |
| 3   | Q2 Q4 Q5   | FDD6N25             | N-CHNL           | DPAK-G2SD       | FDD6N25             | Fairchild            |
| 1   | Q3   | MMBT222 2LT1        | NPN              | SOT23-BEC       | MMBT2222LT1         | On Semi              |
| 1   | R2   | 100                 | ThickFilm        | R0603 R0603L    | CR0603-10W-1000F    | Venkel               |
| 1   | R3   | 330                 | ThickFilm        | R0805           | CR0805-10W-3300F    | Venkel               |
| 1   | R7   | 0                   | ThickFilm        | R0402 R0402L    | CR0402-16W-000      | Venkel               |
| 1   | R8   | 25.5K               | ThickFilm        | R0805           | CR0805-10W-2552F    | Venkel               |
| 4   | SO1 SO2 SO3 SO4  | STAND-OFF           | HDW              |                 | 1902D               | Keystone Electronics |
| 17  | TP1 TP2 TP3 TP4 TP5 TP7 TP8 TP9 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17 TP18 | WHITE               | Loop             | TESTPOINT       | 151-201-RC          | Kobiconn             |

| Qty | Reference | Value  | Type     | PCB_Footprint | ManufacturerPN | Manufacturer |
|-----|-----------|--------|----------|---------------|----------------|--------------|
| 1   | U1        | Si8752 | Isolator | SO8N6.0P1.27  | Si8752         | Skyworks     |

**Table 6.4. Si8752-EVB Not Installed Components**

| Qty | Reference          | Value             | Type      | PCB_Footprint   | ManufacturerPN   | Manufacturer |
|-----|--------------------|-------------------|-----------|-----------------|------------------|--------------|
| 2   | C2 C3              | 0.1uF             | X7R       | C0805           | C0805X7R101-104K | Venkel       |
| 1   | J2                 | Header<br>1x3     | Header    | CONN-1X3        | TSW-103-07-G-S   | Samtec       |
| 4   | JP1 JP2<br>JP3 JP4 | JUMPER            | Header    | CONN1X2         | TSW-102-07-T-S   | Samtec       |
| 3   | JS1 JS2<br>JS3     | Jumper<br>Shunt   | Shunt     | SHUNT           | SNT-100-BK-T     | Samtec       |
| 3   | Q6 Q7 Q8           | IRG4BC10<br>UDPBF | IGBT      | TO-220 TO220-UP | IRG4BC10UDPBF    | IR           |
| 2   | R1 R9              | 0                 | ThickFilm | R0402 R0402L    | CR0402-16W-000   | Venkel       |
| 1   | R4                 | 49.9              | ThickFilm | R0805           | CR0805-10W-49R9F | Venkel       |
| 1   | R5                 | 10K               | ThickFilm | R0805           | CR0805-10W-1002F | Venkel       |
| 1   | R6                 | 49.9K             | ThickFilm | R0805           | CR0805-10W-4992F | Venkel       |
| 1   | TP6                | WHITE             | Loop      | TESTPOINT       | 151-201-RC       | Kobiconn     |