SiT6082EB Evaluation Board User Manual

Contents

1 Introduction

The SiT6082EB evaluation board (EVB) is designed for use with SiTime's XO in the 4-pin, 3.2 x 2.5 mm packages and LVCMOS output type.

The SiT6082EB supports the following products:

Base Part Number	Type	Output frequency	Package
SiT1602	XO	3.57 MHz – 77.76 MHz	3.2 x 2.5 QFN
SiT8008	XO	1 MHz – 110 MHz	3.2 x 2.5 QFN
SiT8009	XO	115 MHz – 137 MHz	3.2 x 2.5 QFN
SiT8918	Automotive & High Temp XO	1 MHz – 110 MHz	3.2 x 2.5 QFN
SiT1602	Automotive & High Temp XO	115 MHz – 137 MHz	3.2 x 2.5 QFN
SiT8920	Automotive & High Temp XO	1 MHz – 110 MHz	3.2 x 2.5 QFN
SiT8921	Automotive & High Temp XO	115 MHz – 137 MHz	3.2 x 2.5 QFN
SiT8924	Automotive & High Temp XO	1 MHz – 110 MHz	3.2 x 2.5 QFN
SiT8925	Automotive & High Temp XO	115 MHz – 137 MHz	3.2 x 2.5 QFN
SiT8944	Endura Automotive & High Temp XO	1 MHz – 110 MHz	3.2 x 2.5 QFN
SiT8945	Endura Automotive & High Temp XO	115 MHz – 137 MHz	3.2 x 2.5 QFN
SiT8208	XO	1 MHz – 80 MHz	3.2 x 2.5 QFN
SiT8209	XO	80 MHz – 220 MHz	3.2 x 2.5 QFN
SiT1618	XO	7.3728 MHz – 48 MHz	3.2 x 2.5 QFN
SiT1625	XO	4 MHz – 125 MHz	3.2 x 2.5 QFN
SiT3807	VCXO	1.544 – 49.152 MHz	3.2 x 2.5 QFN
SiT3808	VCXO	1 MHz – 80 MHz	3.2 x 2.5 QFN
SiT3809	VCXO	80 MHz – 220 MHz	3.2 x 2.5 QFN

Base Part Number	Type	Output frequency	Package
SiT9025	Automotive SSXO	1 MHz – 150 MHz	3.2 x 2.5 QFN
SiT9005	SSXO	1 MHz – 141 MHz	3.2 x 2.5 QFN
SiT9045	Endura SSXO	1 MHz – 150 MHz	3.2 x 2.5 QFN
SiT5000	TCXO	10 MHz – 40 MHz	3.2 x 2.5 QFN
SiT5001	TCXO	1 MHz – 80 MHz	3.2 x 2.5 QFN
SiT5002	TCXO	80 MHz – 220 MHz	3.2 x 2.5 QFN
SiT9003	SSXO	1 MHz – 110 MHz	3.2 x 2.5 QFN
SiT3907	DCXO	1 MHz – 220 MHz	3.2 x 2.5 QFN

EVB Features

- Support for all device configuration modes: XO, SSXO, TCXO
- SMA output for direct connection to measurement equipment
- Probing points for accurate waveform measurement

SiTime typically ships the EVB with the XO/SSXO/TCXO mounted using SiTime recommended reflow profile. The device should only be evaluated in its original soldered down state for best signal integrity and frequency stability. The device performance is not guaranteed if it is de-soldered and then re-soldered either manually or via reflow process.

2 I/O Descriptions

Table 1. SiT6082EB I/O

Connector designator	I/O	Description
P1	**Current measurement**	Two-pin connector for current measurement.
P2	**Power Supply**	Three pin connector for DC power supply and power sensing. **VDD is connected to Pin 1, GND – to Pin2 of P2.** **VDD sense is connected to Pin 3, GND – to Pin2 of P2.**
P3	**Pin 1 access**	A Three-pin header (P3) provides access to the pin 1 of the XO in OE mode, Standby (ST), Spread Disable (SD), Voltage Control (VC) or Digital Control (DC) functionality. In OE/ST mode, pin 1 can be left floating as there is an internal pull-up resistor.
J1	**Output**	Oscillator output can be accessed either using active probe or SMA connector. The test points for active probe are placed closely to the oscillator output for better signal integrity (see Figure A2). Section 3.2 describes in details the recommended measurement configurations.

3 EVB Usage Descriptions

3.1 EVB Configurations

SiT6082EB can be configured to support three configuration modes including XO/TCXO with output enable (OE), XO in Standby (ST), Spread Disabled (SD), Voltage Control (VC) or Digital Control (DC).

Oscillator output can be accessed in several ways listed in Table 2.
Table 2 describes components configuration to support all output configurations.

Table 2. Components configuration to support all output configurations.

Output configuration	R9	C7	R7	R10
Direct	DNP	DNP*	0.1 uF/ 0 Ω	DNP*
Probe	DNP	DNP*	DNP	DNP*

* The value of the load capacitor C7 and load resistor R10 can be adjusted to match the load conditions in the target application. This enables the user to measure waveform characteristics under similar conditions as close to those on the target board as possible.

The test points for active probe are placed closely to the oscillator output for better signal integrity (see Figure A2).

Figure A1 in Appendix A shows the complete electrical schematic of SiT6082EB. Components labeled "DNP" are not assembled.

Shipment Configuration

SiT6082EB is shipped configured for direct output allowing connecting it to the instrument input using 50 Ω coax cable. Details on the board assembly for shipment configuration can be found on the schematic (see Figure A1 in Appendix A).

3.2 Waveform Capturing Using Active Probe

SiTime XO/TCXO is a high-speed logic output device. It is critical that the proper logic and high frequency measurement techniques are used along with the high-quality active probe to ensure best measurement results.

SiTime recommends the following minimum equipment for proper clock waveform measurement.

1) 4 GHz or higher active probe with capacitance <1 pF, such as a Keysight 1134B;
2) Oscilloscope with 4 GHz bandwidth or higher such as a Keysight DSA90604A.

A passive voltage probe should not be used as it adds a high capacitive load to the part and the long ground lead clip is not suitable for high frequency measurement applications. The inductance of the long ground lead coupled with the input capacitance of the probe results in a resonant circuit. The consequence of this resonance results in the distortion of the clock signal. Typical manifestations of this distortion include ringing, overshoot, and undershoot of the clock signal.

Eliminating such distortion requires a probe with the lowest input capacitance and a low inductance ground lead. In addition, SiTime TCXOs are typically configured for fast rise and fall times with 15 pF load. It is therefore critical that the probe tip ground be as short as possible, lowest inductance, and the return path for the ground be located as close as possible to the trace carrying the RF logic signal.

For waveform measurement, it's recommended to remove resistor R7. Please refer to Figure A2 for test point locations on the SiT6082EB. If the soldering probe is used, it is recommended to use C7 capacitor pads or solder it over it if necessary (Figure 1).

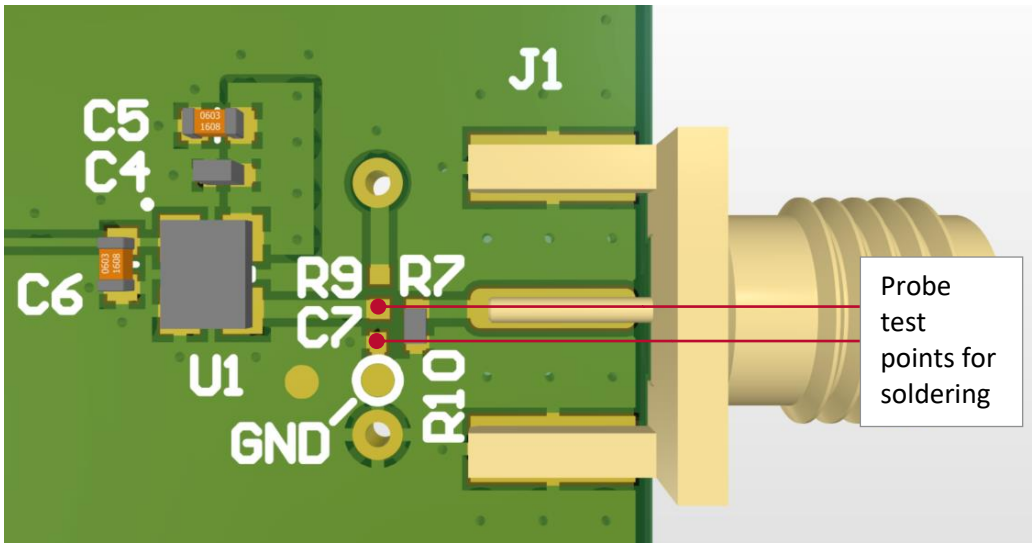

Figure 1: Recommended points for soldering probe head

More details on the SiTime recommendations on the oscillator's output probing can be found in AN10028.

3.3 Measuring Jitter and Phase Noise

For Jitter measurements or phase noise measurements with evaluation boards, SiTime recommends using SMA support Configuration to connect the device output directly to external equipment, such as Time Interval Analyzer (TIA) or high-bandwidth real-time oscilloscope. Jitter measurement technique is described in SiTime AN10007.

The SMA can also be connected through 50 Ω coaxial cable to signal source analyzers or spectrum analyzers to measure phase noise. In such case the use of AC-coupling configuration is recommended because not all measurement instruments can accept DC voltage at their inputs.

3.4 Current Measurement

To measure the current consumption, user need to use ammeter/multi-meter in the power supply circuit. We recommend changing R1 to 1 Ohm. It is recommended to measure the voltage on DUT VDD and adjust for any drop on the DMM to ensure known VDD voltage on the device. VDD adjustment must be completed before every current measurement.

Appendix A

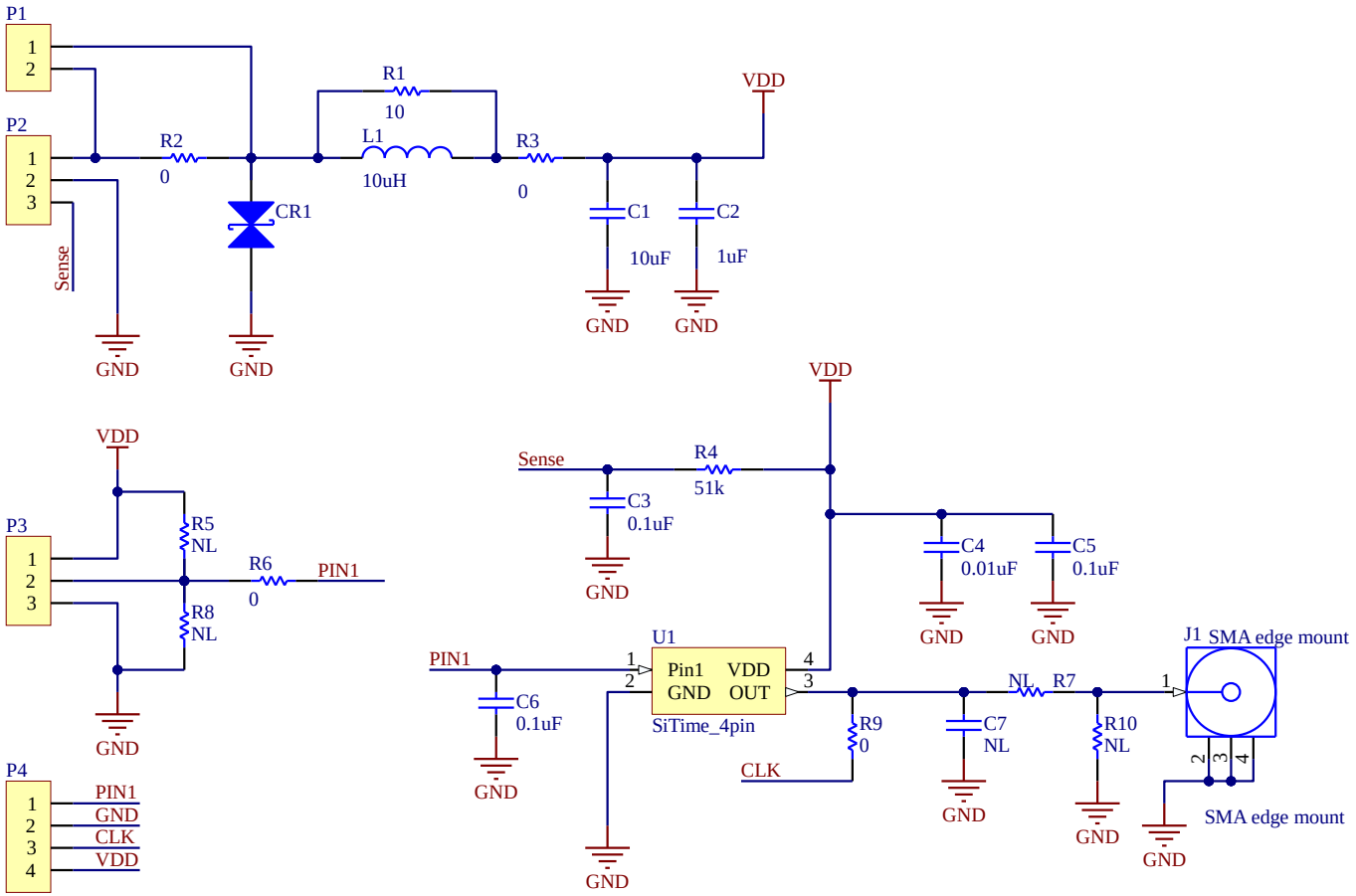

Figure A1: SiT6082EB Electrical Schematics

Table A1: Bill of Materials (BOM)

#	Reference Designators	Description	Qty	SMD component size	Value
1	C1	Capacitors	1	0603	10uF
2	C2	Capacitors	1	0603	1uF
3	C3, C5, C6	Capacitors	3	0603	0.1uF
4	C4	Capacitor	1	0402	0.01uF
5	C7	Capacitor	1	0402	DNP
6	CR1	ESD bidirectional protection diode	1	0603	
7	L1	Inductance	1	0805	10uH
8	R1	Resistors	1	0603	10
9	R2, R3, R6	Resistors	3	0603	0
10	R4	Resistor	1	0603	51k
11	R5, R8	Resistors	2	0603	DNP
12	R7, R10	Resistors	2	0402	DNP
13	R9	Resistors	1	0402	0
14	P1	2-pin header	1	-	-
15	P2, P3	3-pin headers	2	-	-
16	J1	SMA connector	1	-	-
17	U1	SiTime SE oscillator	1	-	-

Table A2: Connectors Digi-Key Part Number

Connectors	Digi-Key part number	Digi-Key part number for mating connector	Digi-Key part number for associated products
Current measurement	WM2744-ND	WM2011-ND	WM1114TR-ND
Power Supply	A30787-ND	A31018-ND	-
Pin 1 access	A30787-ND	A31018-ND	-

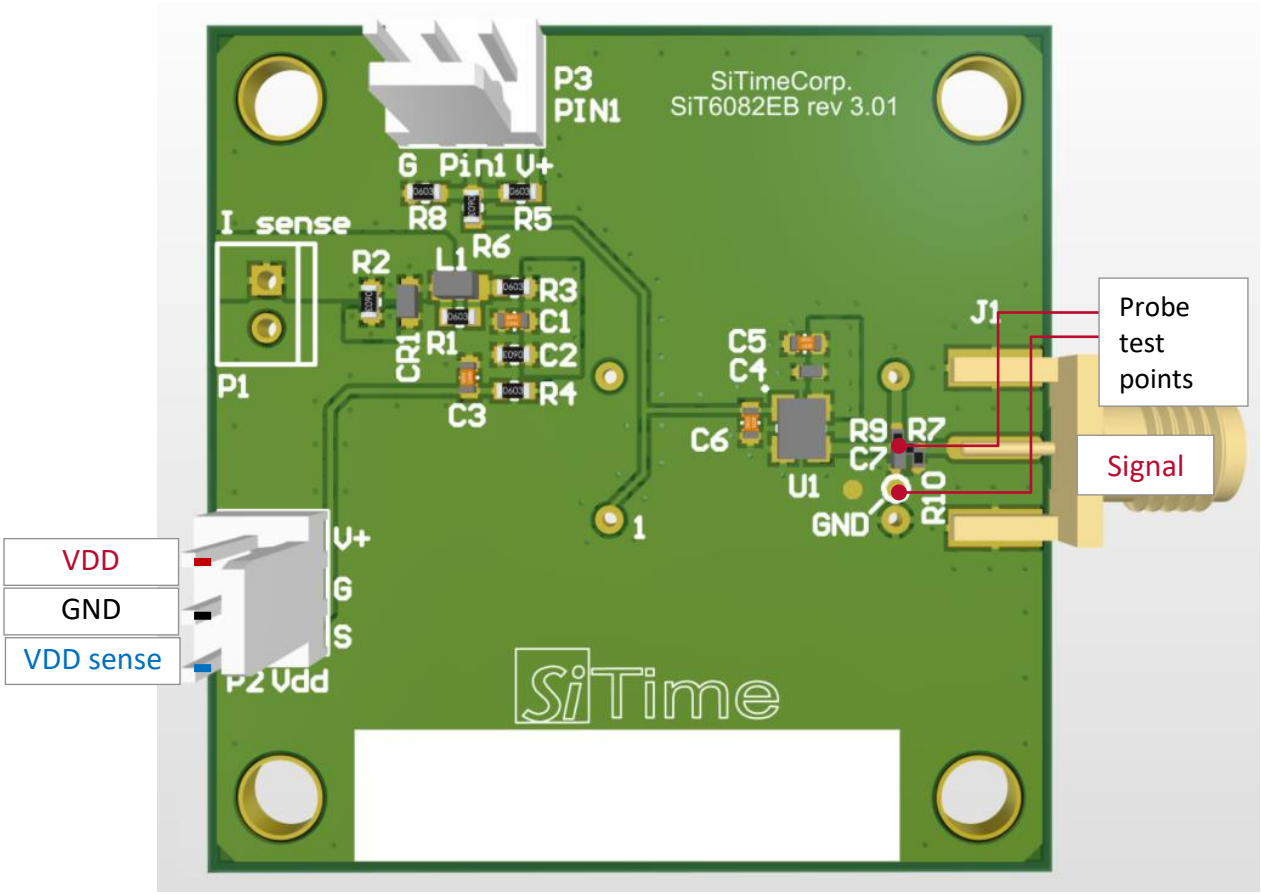

Figure A2: SiT6082EB layout

Table 3: Revision History

Version	Release Date	Change Summary
1.0	14-Sep-2023	Original doc
3.01	29-Nov-2023	New document revision

SiTime Corporation, 5451 Patrick Henry Drive, Santa Clara, CA 95054, USA | **Phone:** +1-408-328-4400 | **Fax:** +1-408-328-4439