SiT6731EB Evaluation Board
User Manual

Contents

1 Introduction

The SiT6731EB evaluation board (EVB) is designed for use with SiTime's Emerald OCXOs in the 10-pin packages. It enables the evaluation of key functionalities of these OCXOs.

EVB Features

- SMA output for direct connection to measurement equipment
- Probing points for accurate waveform measurement
- Provision for future I^2C control interface (connector)
- Connector for current measurement

SiTime typically ships the EVB with the OCXO mounted. The OCXO device should only be evaluated in its original soldered down state for best signal integrity and frequency stability. For best results the device should not be de-soldered and then re-soldered either manually or via reflow process.

2 I/O Descriptions

Table 1. SiT6731EB I/O

I/O	Description
Power	SMA connector (J1) or a two-pin connector (P4) for DC power supply. **VDD is connected to Pin 2, GND – to Pin1 of P4.**
Pin 1 access	SMA connector (J3) provides access to the pin 1 of the OCXO in either OE mode or VCTCXO mode (for future devices with VCTCXO support). In OE mode, pin 1 can be left floating as there is an internal pull-up resistor.
Pin 2 access	A two-pin connector (P5) provides access to the pin 2 of the OCXO.
Frequency control via I^2C	A three-pin header (P1) provides access to I^2C (SDA, SCL) for future I^2C support.
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). The output pin of the oscillator can also be connected to the SMA connector (J2) through the R9 source termination resistor. Section 3.2 describes in details the recommended measurement configurations.
Current Measurement	A two-pin connector (P3) enables measuring the current consumption of the device.
Service connectors	P2 is reserved for SiTime internal use only.

3 EVB Usage Descriptions

3.1 EVB Configurations

SiT6731EB can be configured to support three OCXO configuration modes:

- OCXO with output enable (OE) is currently available
- VCOCXO with analog voltage control – provision for future support
- DCOCXO with I^2C – provision for future support.

Figure A1 in Appendix A shows the complete electrical schematic of SiT6731EB. Components labeled "DNP" are not assembled.

Oscillator output waveform can be measured with an active probe in all configurations. The value of the load capacitor C3 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.

Shipment Configuration

SiT6731EB is shipped without components labeled "DNP" on the schematic (see Figure A1 in Appendix A).

3.2 Waveform Capturing Using Active Probe

SiTime OCXO 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 in order to ensure best measurement results.

SiTime recommends the following minimum equipment for proper clock waveform measurement

1) GHz or higher active probe with capacitance <1 pF, such as an Agilent1134A;
2) Oscilloscope with 4GHz bandwidth or higher such as a 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 OCXOs are typically configured for fast rise and fall times (1 ns or less) 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. Please refer to Figure A2 for test point locations on the SiT6731EB and an example of proper probing.

3.3 Measuring Jitter and Phase Noise

For jitter measurements, make sure that SMA connector and source termination resistor R9 are properly soldered on the EVB. The R9 can be populated using one of the following options:

1) 0Ω resistor. This allows DC coupling the output to 50Ω instruments directly. Note that due to 50Ω loading, the signal swing levels and rise/fall times will be different from those specified in the datasheet.
2) 0.1uF capacitor for AC-coupling to 50Ω instruments.

SMA connector is used to connect directly to the jitter measurement instrument, 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 50Ω 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, remove zero-ohm resistors R3, R4, and connect the DMM or other current measuring device across P3 connector. 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 has to be completed before every current measurement.

Appendix A

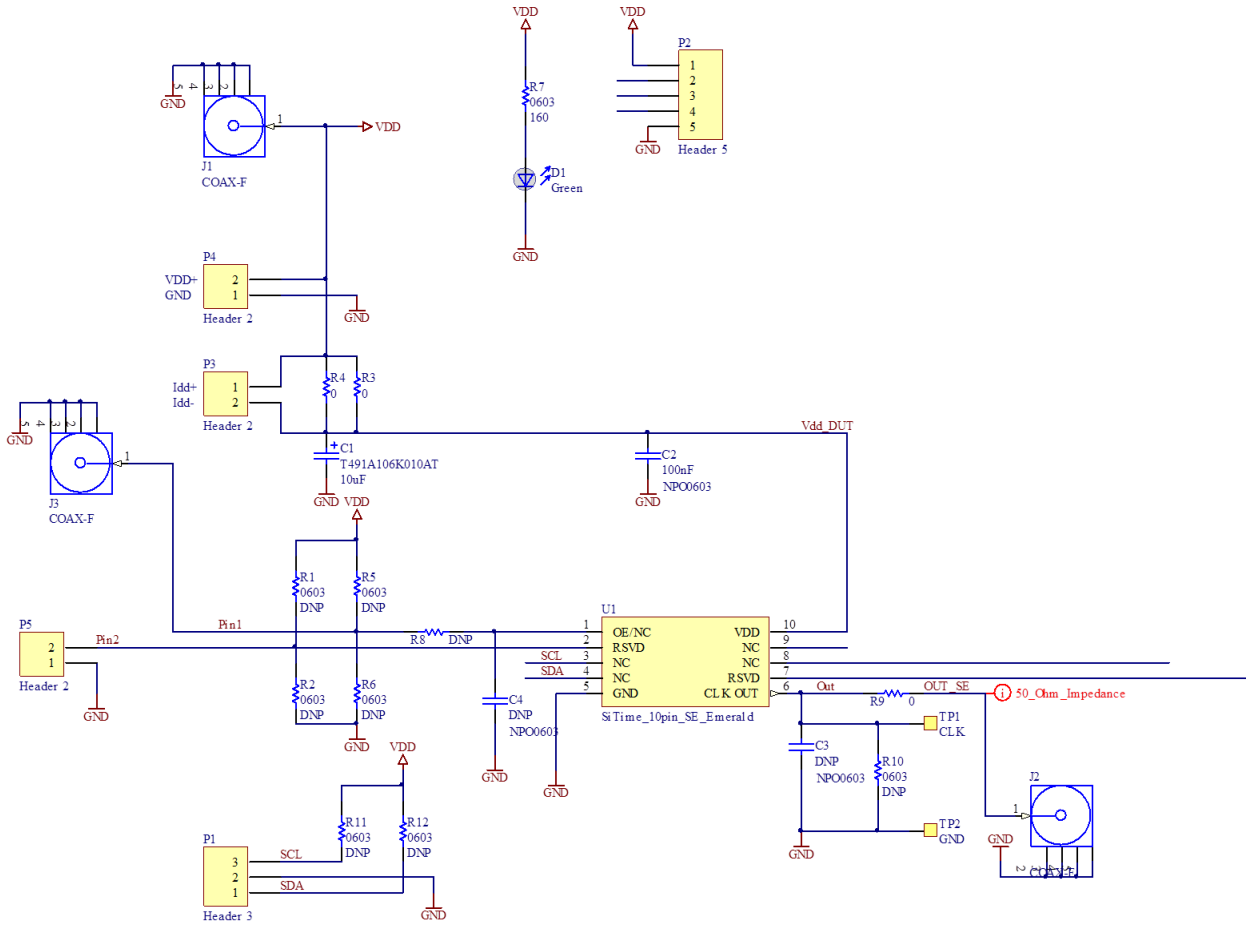

Figure A1. SiT6731EB EVB Electrical schematics

Table A1. Bill of Materials (BOM)

#	Reference Designators	Description	Qty	SMD component size	Value
1	C1	Capacitor	1	Case A	10uF
2	C2	Capacitor	1	0603	0.1uF
3	C3, C4	Capacitors	2	0603	DNP
4	D1	LED	1	0603	Green
5	J1	SMA connector	1	-	DNP
6	J2, J3	SMA connector	2	-	-
7	P1	3-pin header	1	-	-
8	P2	5-pin header	1	-	-
9	P3, P4	2-pin connector	2	-	-
10	P5	2-pin header	1	-	-
11	R1, R2, R5, R6, R10, R11, R12	Resistors	7	0603	DNP
12	R3, R4, R8, R9	Resistors	4	0603	0 Ω
13	R7	Resistor	1	0603	160 Ω

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
Power	WM2744-ND WM5534-ND	WM2011-ND	WM1114-ND
Pin 1 access	WM5534-ND	-	-
Pin 2 access	732-5315-ND		
Frequency control via I^2C	732-5316-ND	-	-
OUT	WM5534-ND	-	-
Current Measurement	WM2744-ND	WM2011-ND	WM1114-ND

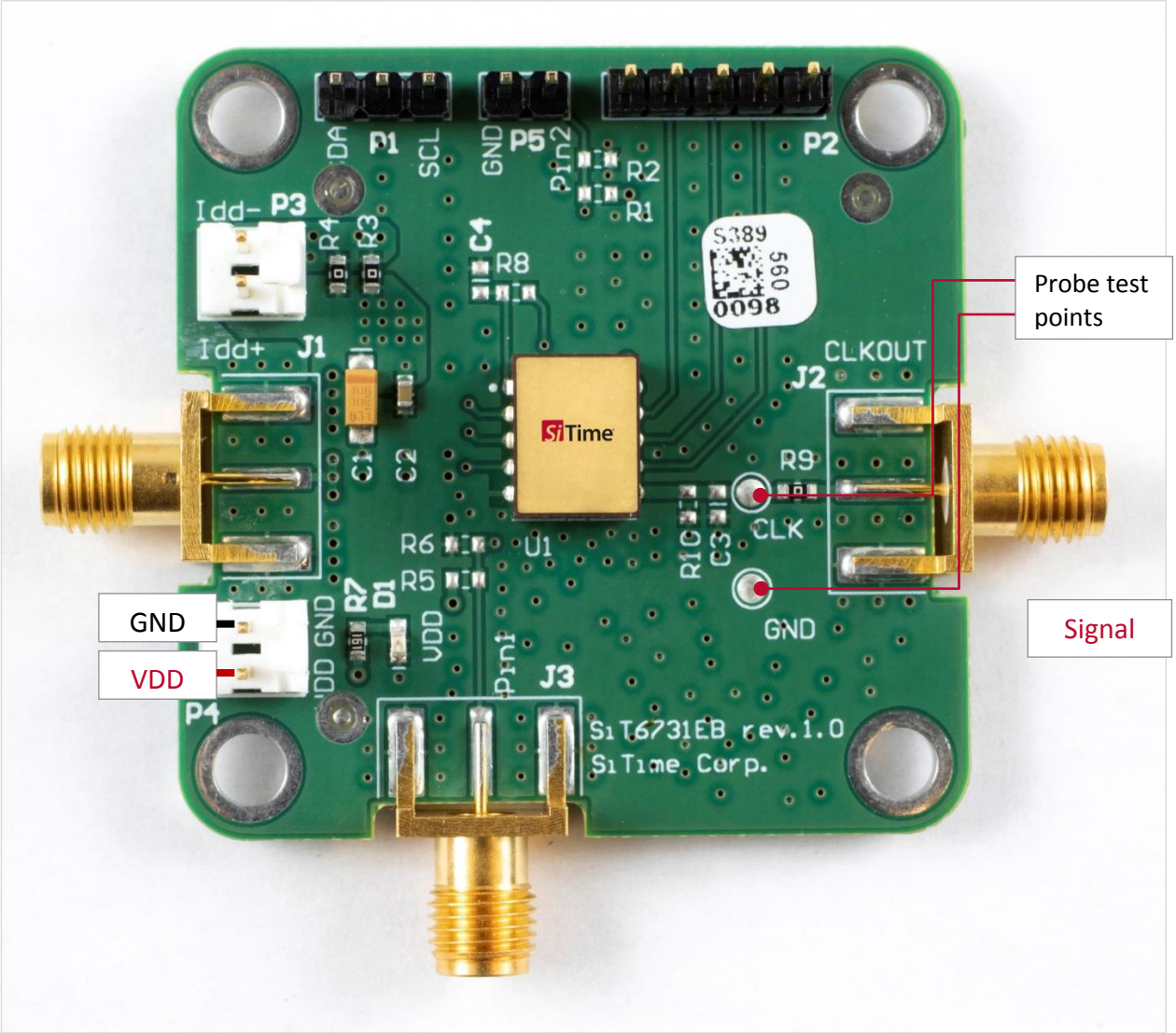

Figure A2. SiT6731EB EVB

Table 2: Revision History

Version	Release Date	Change Summary
1.0	12/13/2018	Original doc

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