Si501/2/3/4-EVB User's Guide

Description

The Silicon Laboratories Si501-2-3-4-EVB is a USB plug-in board that allows for evaluation of the Si50x family of CMEMS oscillators. The Si501-2-3-4-EVB comes completely assembled, tested, and populated with one Si504 device and three empty expansion sites.

Features

- Easy evaluation of Silicon Laboratories' Si501/2/3/4 CMEMS oscillators
- Windows-compatible control software–Si50x CMEMS Oscillator EVB GUI
- Powered by USB port
- Retains device configuration in FLASH for testing over temperature when not connected to USB
- SMA connectors for output clock connection to external test equipment or target systems
- Test points for direct measurement of device supply current
- On-board voltage regulator with jumper selectable operation of 1.8, 2.5, or 3.3 V

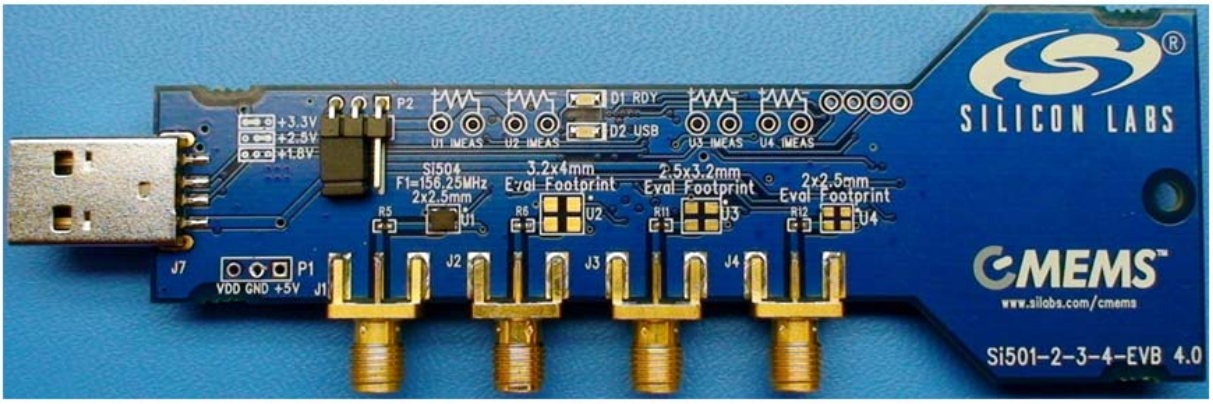


Figure 1. Si501-2-3-4-EVB Front Side View

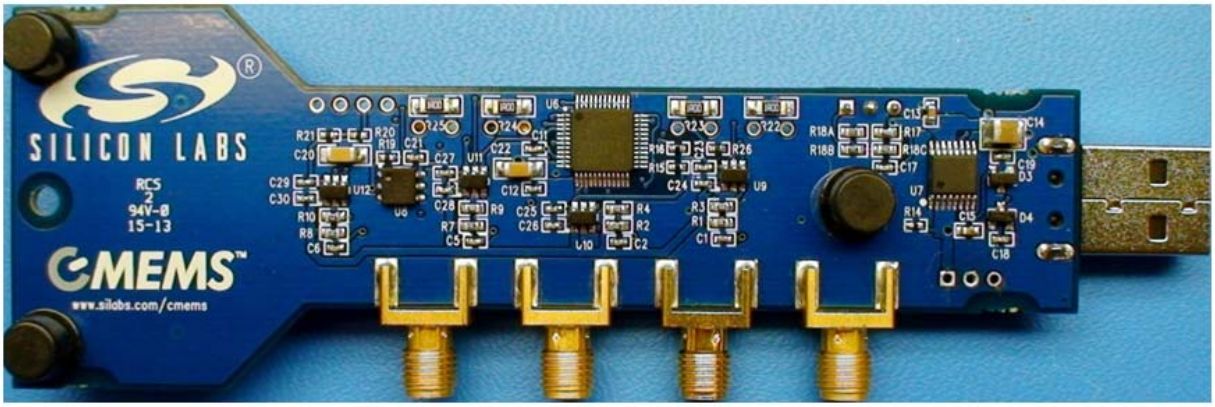
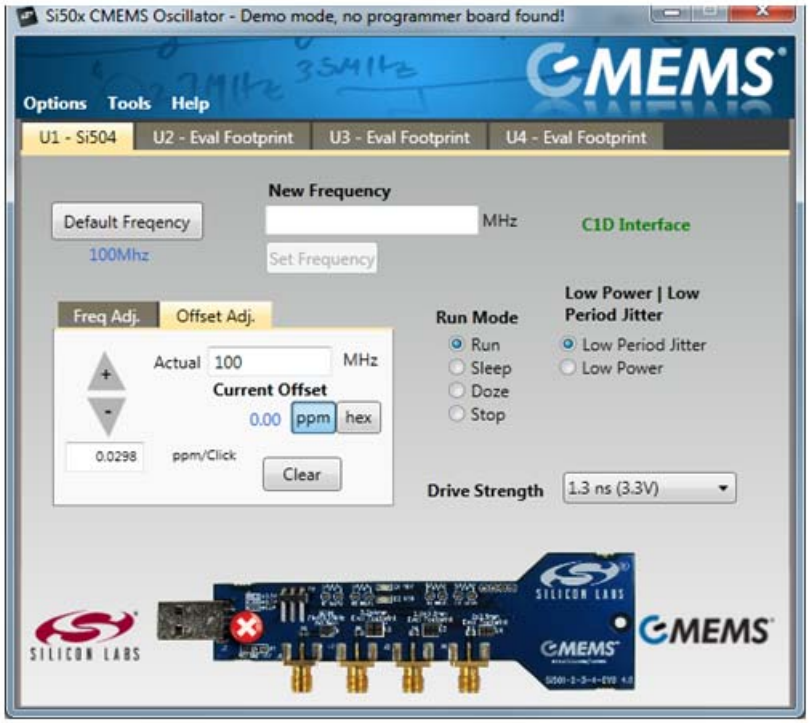


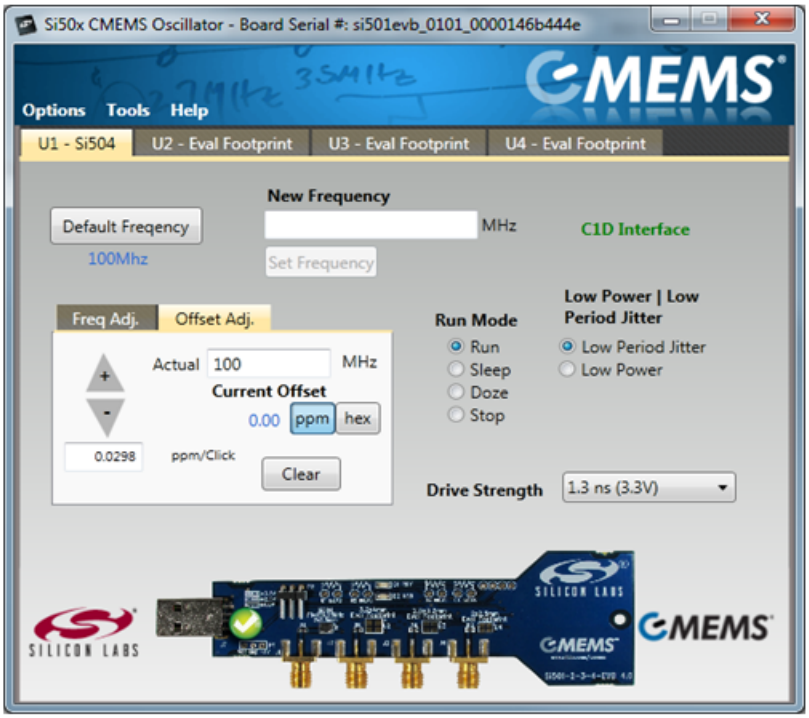
Figure 2. Si501-2-3-4-EVB Rear Side View

1. Quick Start

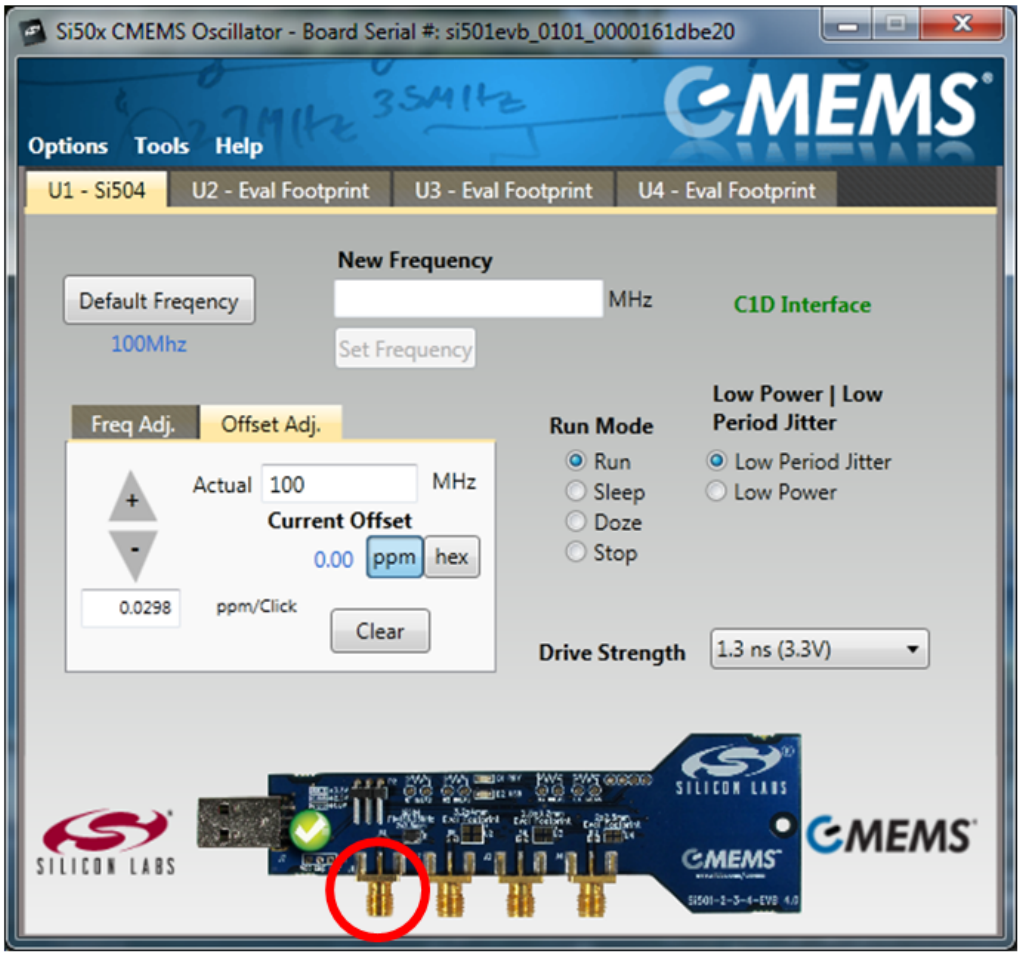
1. Install the Si50x EVB GUI software by downloading it from www.silabs.com/Si501-2-3-4-EVB
2. Launch the Si50x EVB GUI software. The following screen should appear on your desktop:



3. Insert the Si501-2-3-4-EVB board into an unused USB port. You should now see same screen as before, but with a green "check" next to EVB board graphic. EVB is now recognized by GUI software.



4. Default frequency clock of 100 MHz should now be output from SMA "J1" circled below.



5. To change the output frequency, enter a desired frequency in "New Frequency" field and press "Set Frequency" button.
6. The Si504 can be placed in any supported Run Mode or Power/Jitter mode by pressing the appropriate radio buttons. The GUI will automatically update the device.
7. The Freq Adj and Offset Adj tabs are for utilizing the frequency offset feature of the Si504. Use the Offset Adj tab to enter an offset in terms of PPM. Use the Freq Adj tab to enter an offset in terms of desired frequency.

1.1. EVB GUI Quick Start Guide

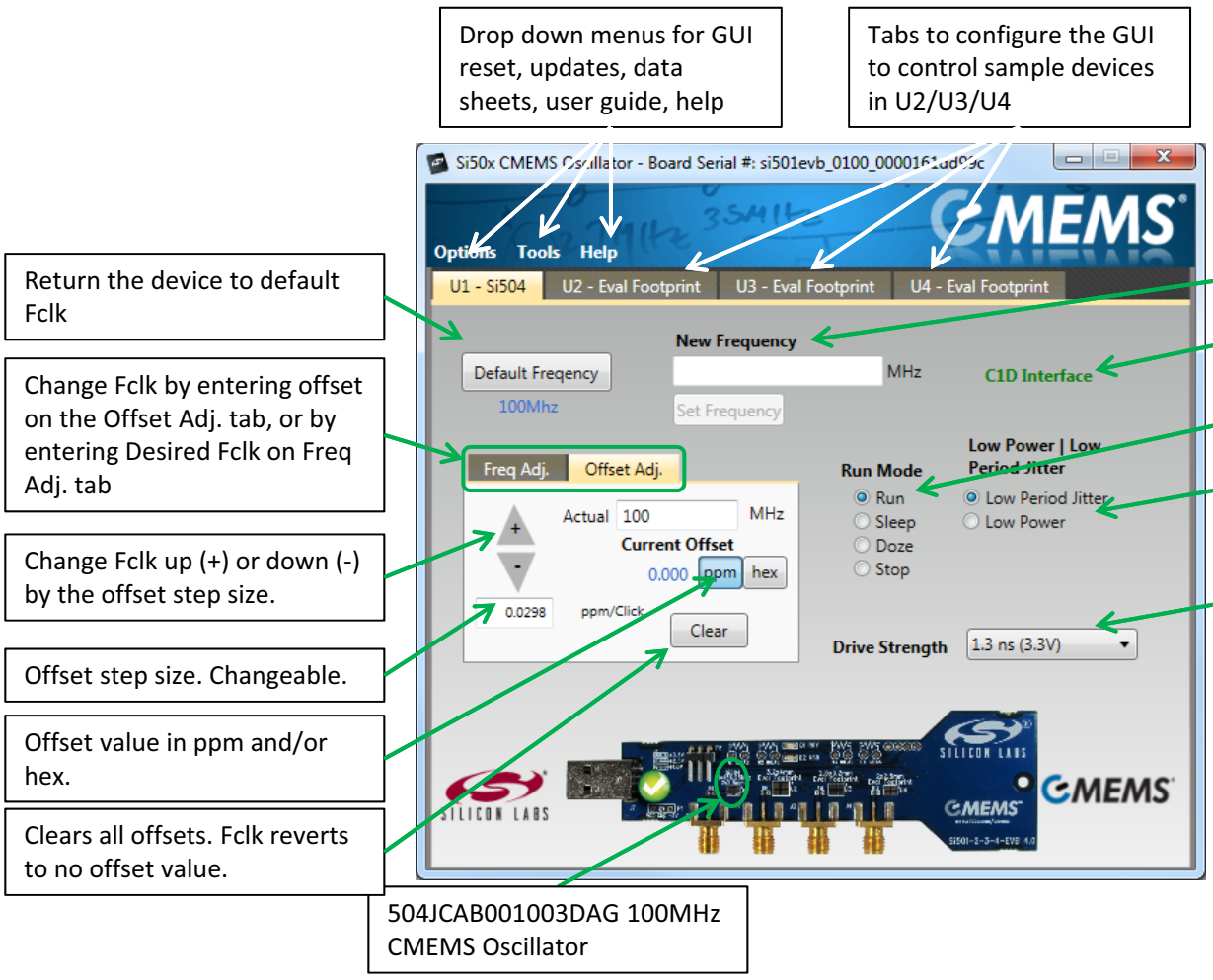


Figure 3. Main Screen

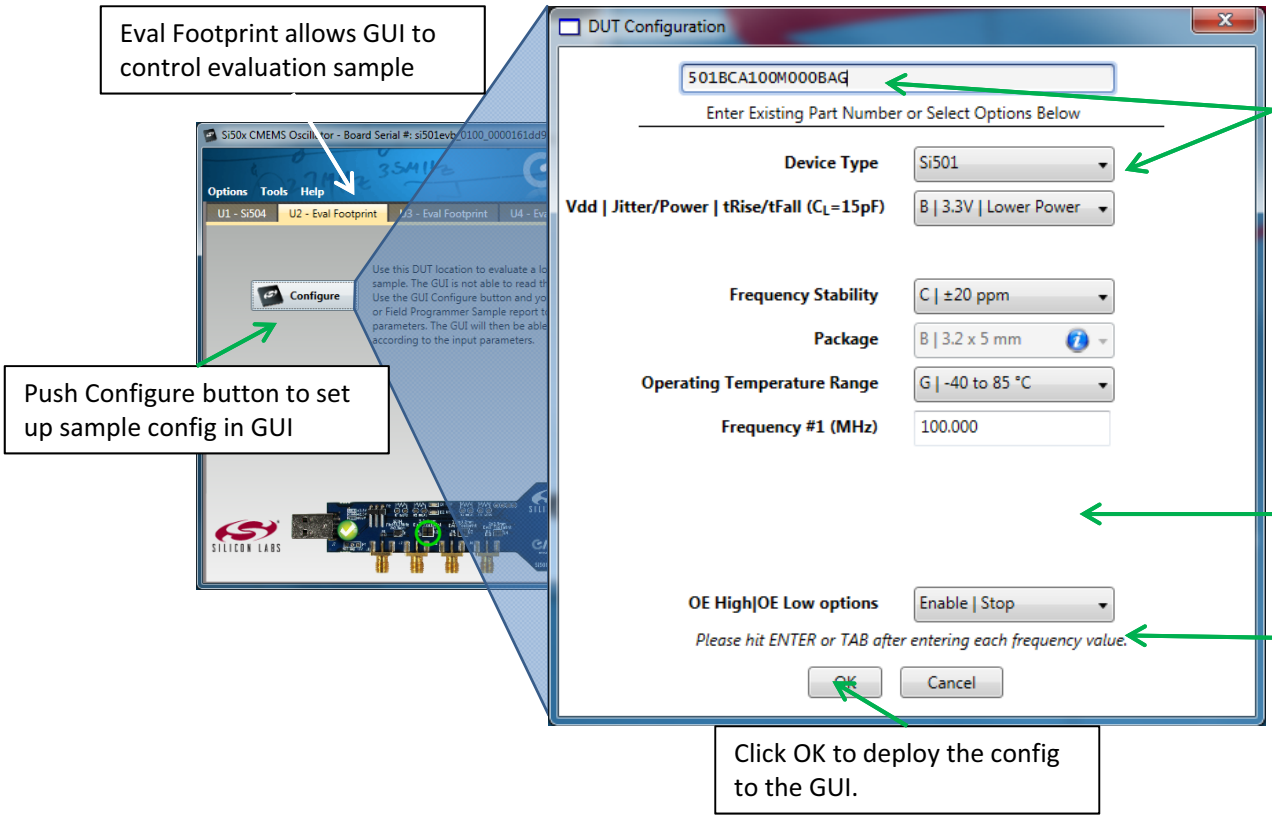


Figure 4. Eval Config Screen

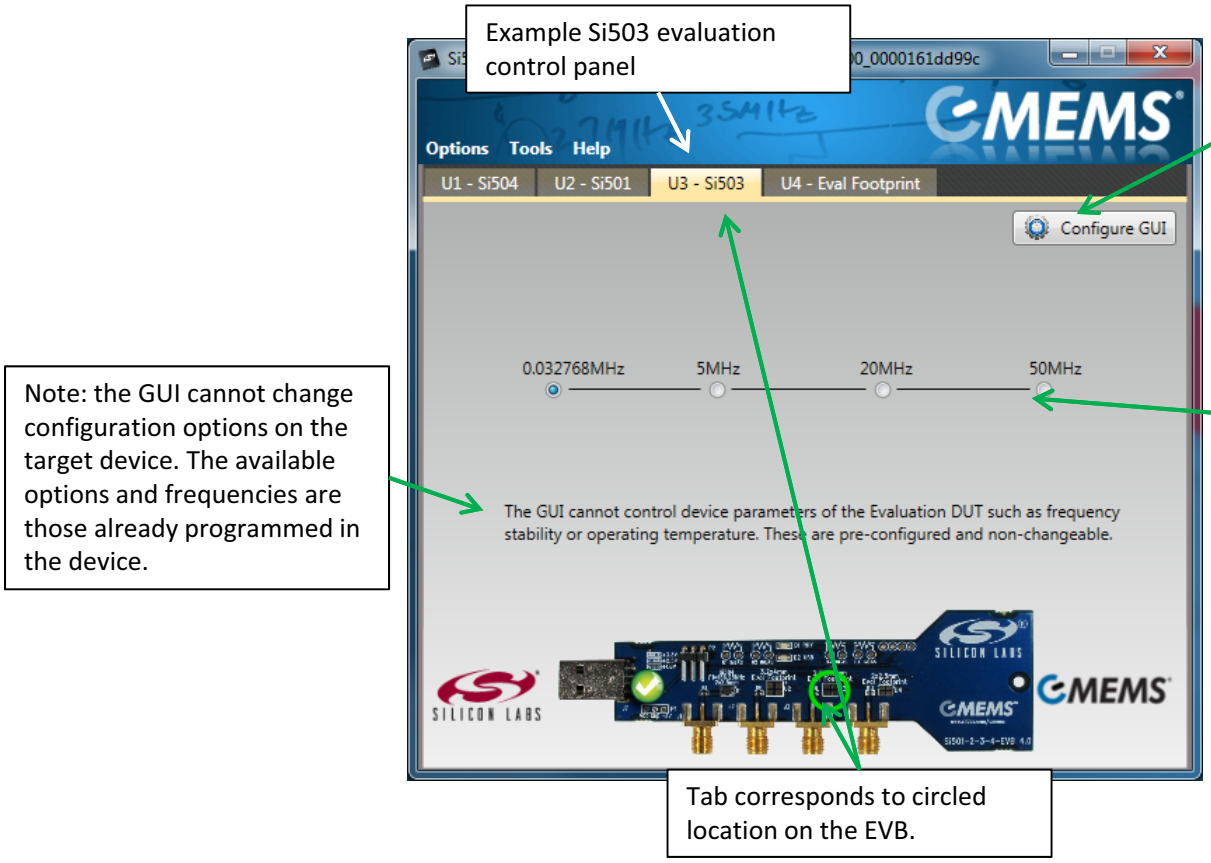


Figure 5. Eval Screen

Table 1. Quick Start Drop Down Menus

Drop Down Menu	Selection	Function
Options	Return GUI to Default	Resets GUI completely to original settings. Clears all Eval Footprint settings and U1 504 settings.
	Exit	Exits GUI.
Tools	Check for EVB SW Update	Checks www.silabs.com for any available GUI updates.
	Check for EVB FW Update	Checks www.silabs.com for any available FW updates for the EVB MCU.
	Advanced → Update FW	Updates EVB FW with file saved to hard drive.
	Save EVB Configuration	Stores current EVB configuration to MCU FW. This is useful for temperature testing without USB connection.
	Open EVB Configuration	Find EVB configuration file on hard drive and load it to the GUI / EVB.
	Return EVB to Default	Returns EVB FW to default settings.
Help	User's Guide	Opens User's Guide pdf.
	Device Data Sheet	Opens latest device data sheet. Later revisions of the data sheet are loaded with new GUI SW updates.
	GUI Software Version	Provides the GUI SW version number.
	EVB Firmware Version	Provides the EVB FW version number.

2. MCU

The Silicon Laboratories MCU, P/N C8051F380, is mounted on the back side of the board at U6. The MCU provides the following functions:

- Supports USB communication to host PC
- Supports single-wire communication (C1) to the DUT on behalf of the host PC per the EVB GUI Software
- Supplies 3.3 V to peripheral ICs (the serial number generator and the C1 voltage level shifter)

3. Power Supply

The Si501/2/3/4-EVB can be powered from USB or from an external voltage supply. This is to support temperature testing without a USB connection. The power supply consists of a Maxim MAX8869 adjustable voltage regulator that steps down the USB +5 V or an external +5V power supply to one of a selectable 1.8, 2.5, or 3.3 V. VDD selection is made via jumper P2. The supply voltage for all the device sites, both Si504 and eval sites, can be adjusted to one of three settings: 3.3 V, 2.5gV, or 1.8 V by jumper P2. (Note that all four locations share the same supply voltage, so any supply voltage change will affect all devices at sites U1, U2, U3, and U4.) The default setting, connecting pins 2 and 3 as shown above, is 3.3 V. Moving the jumper to connect pins 1 and 2 results in 2.5 V. Removing the jumper altogether will result in 1.8 V supply voltage. The voltage regulator may be bypassed by connecting VDD directly to the VDD P1 connection point.

4. LEDs

Two green indicator LEDs are driven by the on-board MCU. A "Ready" LED (D1) is illuminated to indicate the EVB is recognized by the EVB GUI software and ready for use. A "USB" LED (D2) is illuminated whenever USB communications are actively in progress.

5. Current Sense Resistor

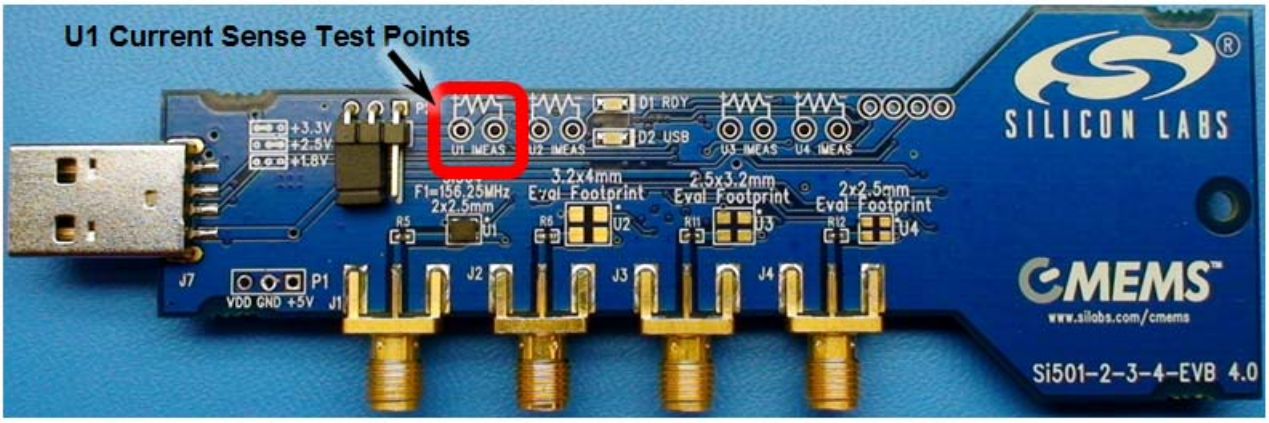


Figure 6. Current Sense Resistor Location

Each device site has a 1.0 Ω resistor in series with the VDD supply of that device. Both sides of that resistor are connected to a set of test points. This test point pair can be used to measure the voltage across that supply resistor, which indicates the supply current consumed by the respective device.

6. Outputs

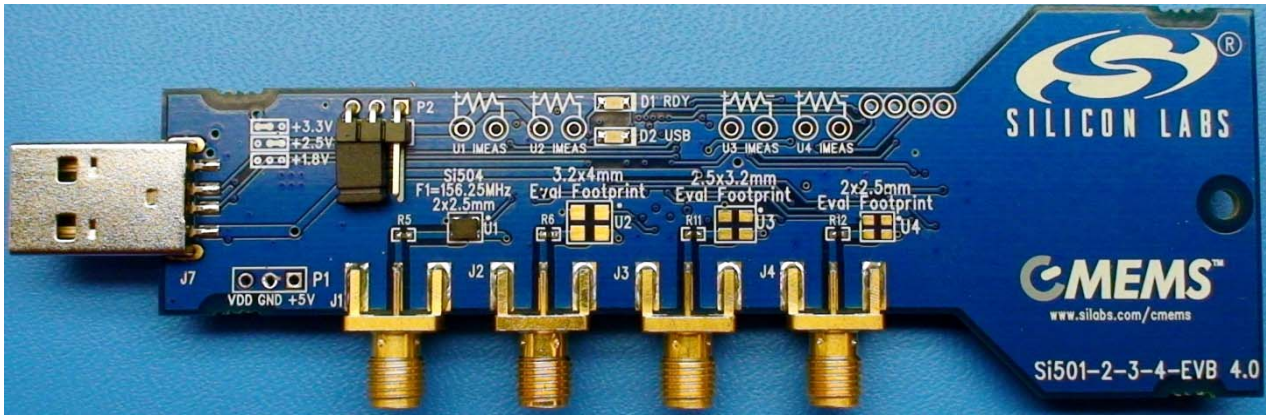


Figure 7. SMA Outputs

Each device site output is connected to a SMA connector through a series resistor. J1 is the SMA connector output of the on-board Si504, with J2 through J4 corresponding to evaluation sites U2 through U4.

7. Schematics

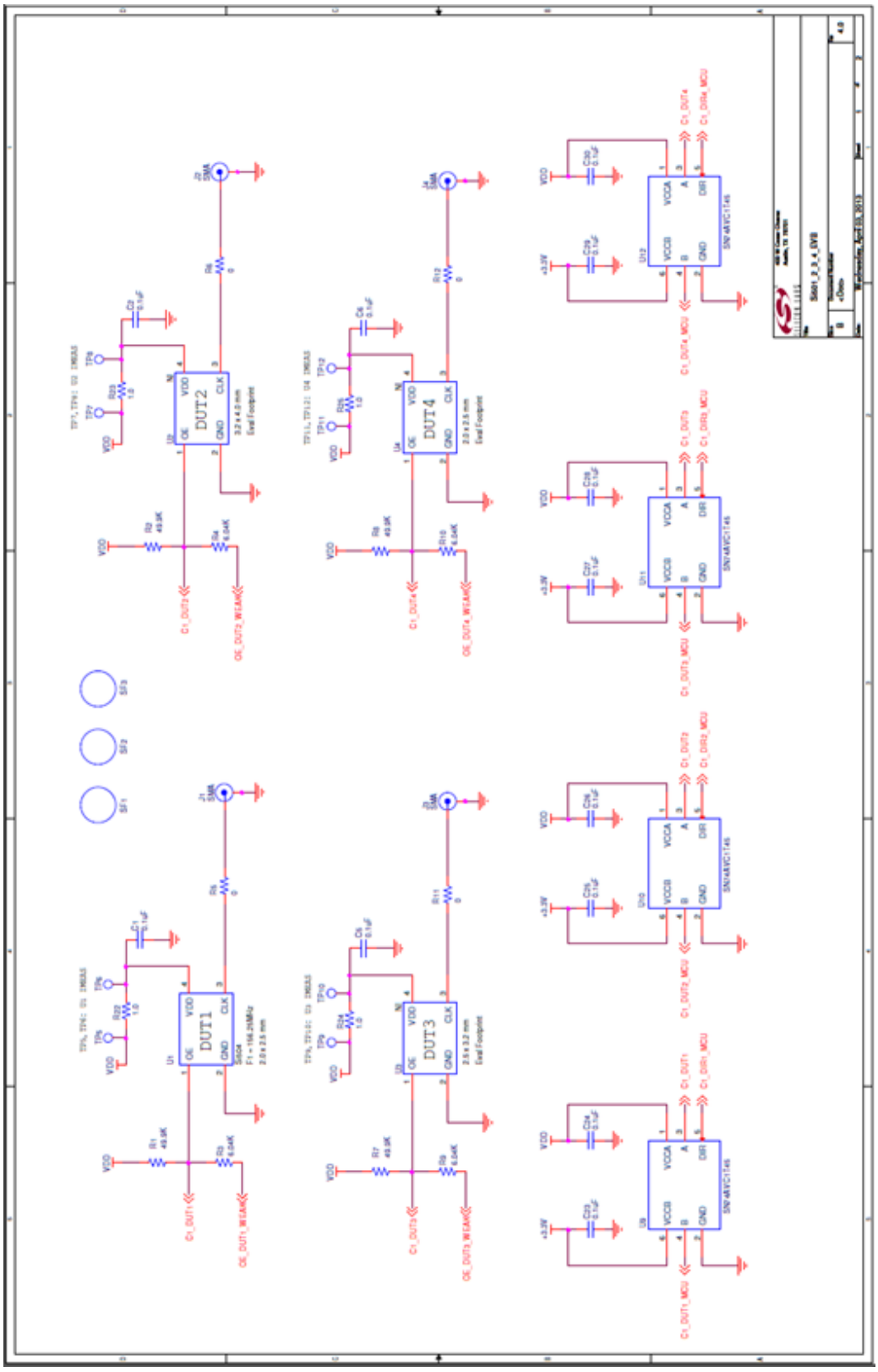


Figure 8. Si501/2/3/4 Schematic (1 of 2)

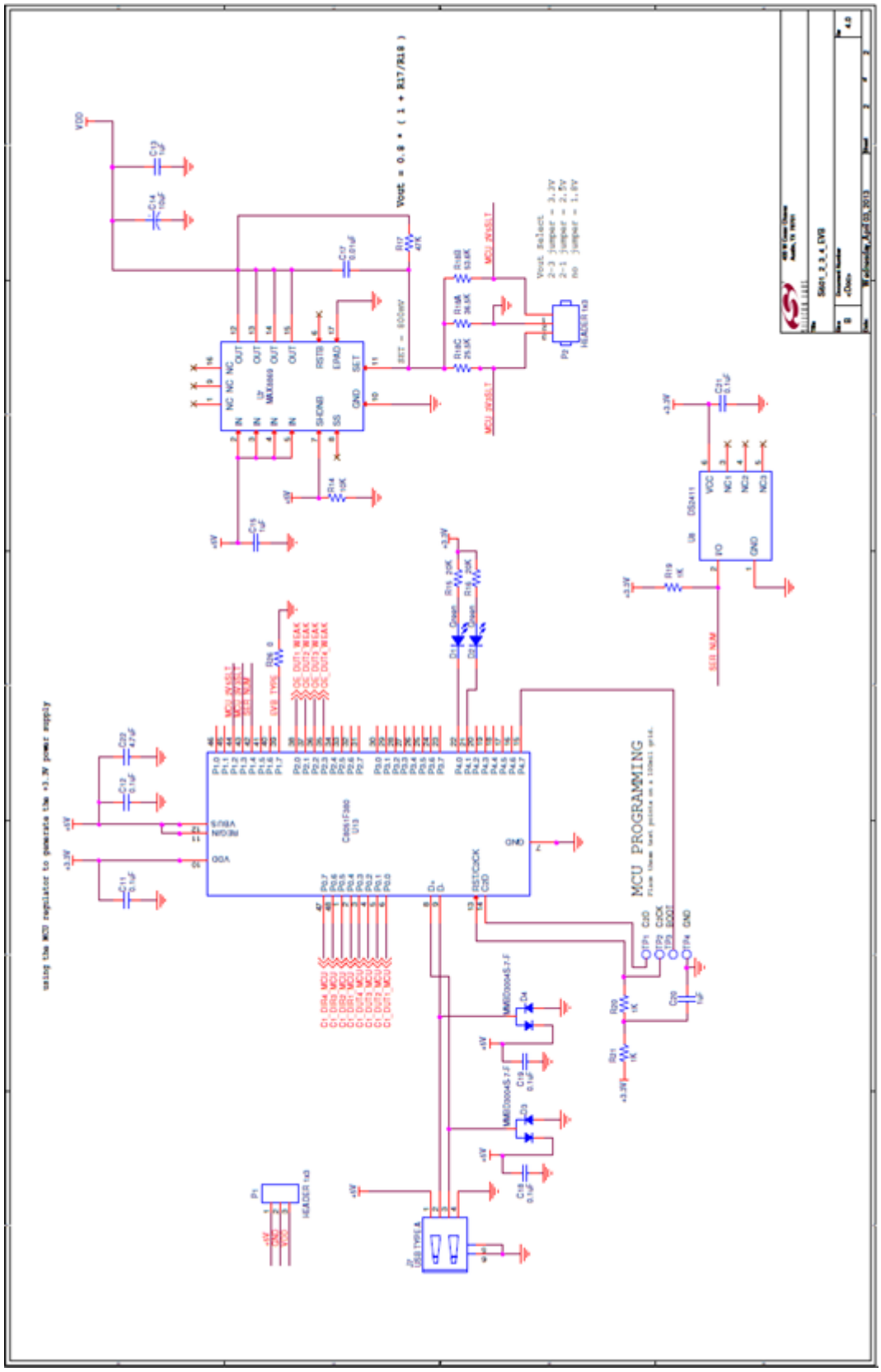


Figure 9. Si501/2/3/4 Schematic (2 of 2)

8. Bill of Materials

Table 2. Si501-2-3-4-EVB Rev 4.0

NI	Qty	Reference	Value	Rating	Volt	Tol	Type	PCB_Footprint	Manufa
	17	C1 C2 C5 C6 C11 C12 C18 C19 C21 C23 C24 C25 C26 C27 C28 C29 C30	0.1 µF		10V	±10%	X7R	C0402|C0402L	C0402X7
	2	C13 C15	1 µF		10V	±10%	X7R	C0603	C0603X7
	1	C14	10 µF		25V	±20%	X7R	C1210	C1210 1
	1	C17	0.01 µF		10V	±20%	X7R	C0402	C0402 1
	1	C20	1 µF		25V	±10%	X7R	C1206	C1206X7
	1	C22	4.7 µF		10V	±20%	X7R	C1206	C1206 4
	2	D1 D2	Green	20mA	3.4V		SMT, Chip-LED	LED-HSMX-C170	HSM
	2	D3 D4	MMBD3004S-7-F	225mA	300V		Dual	SOT23-AKC	MMBD3
	4	J1 J2 J3 J4	SMA				SMA	SMA-EDGE-3	142-0
	1	J7	USB TYPE A				USB	USB_A_RA_SMT	4803
	1	P2	HEADER 1x3				Header	CONN1X3-MRA	TSW-103
	4	R1 R2 R7 R8	49.9K	1/16W		±1%	ThickFilm	R0603	CR0603-
	1	R14	10K	1/16W		±5%	ThickFilm	R0402	CR0402
	2	R15 R16	20K	1/16W		±1%	ThickFilm	R0402	CR0402-
	1	R17	47K	1/16W		±1%	ThickFilm	R0603	CR0603-
	1	R18A	36.5K	1/16W		±1%	ThickFilm	R0603	CR0603-
	1	R18B	53.6K	1/10W		±1%	ThickFilm	R0603	CR0603-

Table 2. Si501-2-3-4-EVB Rev 4.0 (Continued)

NI	Qty	Reference	Value	Rating	Volt	Tol	Type	PCB_Footprint	Manufa
	1	R18C	25.5K	1/16W		±1%	ThickFilm	R0603	CR0603-
	3	R19 R20 R21	1K	1/16W		±5%	ThickFilm	R0402	CR0402
	4	R22 R23 R24 R25	1.0	1/4W		±5%	ThickFilm	R1206	CR1206
	4	R3 R4 R9 R10	6.04K	1/16W		±1%	ThickFilm	R0603	CR0603-
	5	R5 R6 R11 R12 R26	0	1A			ThickFilm	R0402|R0402L	CR0402
	3	SF1 SF2 SF3	BUMPER					RUBBER_-FOOT_SMALL	SJ
	1	U1	100 MHz				MEMS	OSC4N2.0X2.5	504JCAE
	1	U13	C8051F380				MCU	QFP48N9X9P0.5	CF380-F
	1	U7	MAX8869	1A			LDO	TSSOP16N6.5P0.65E	MAX88
	1	U8	DS2411					SOJ6N4.45P1.27	DS2
	4	U9 U10 U11 U12	SN74AVC1T45		1.2-3.6V			SOT6N2.8P0.95	SN74AV
Not Installed Components									
NI	**Qty**	**Reference**	**Value**	**Rating**	**Volt**	**Tol**	**Type**	**PCB_Footprint**	**Manufa**
NI	1	P1	HEADER 1x3				Header	CONN-1X3	TSW-1
NI	12	TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8 TP9 TP10 TP11 TP12	WHITE				Loop	TESTPOINT	151-2
NI	1	U2	xxMHz				MEMS	OSC4N3.2X5.0	
NI	1	U3	xxMHz				MEMS	OSC4N3.2X2.5	
NI	1	U4	xxMHz				MEMS	OSC4N2.0X2.5	

9. Layout

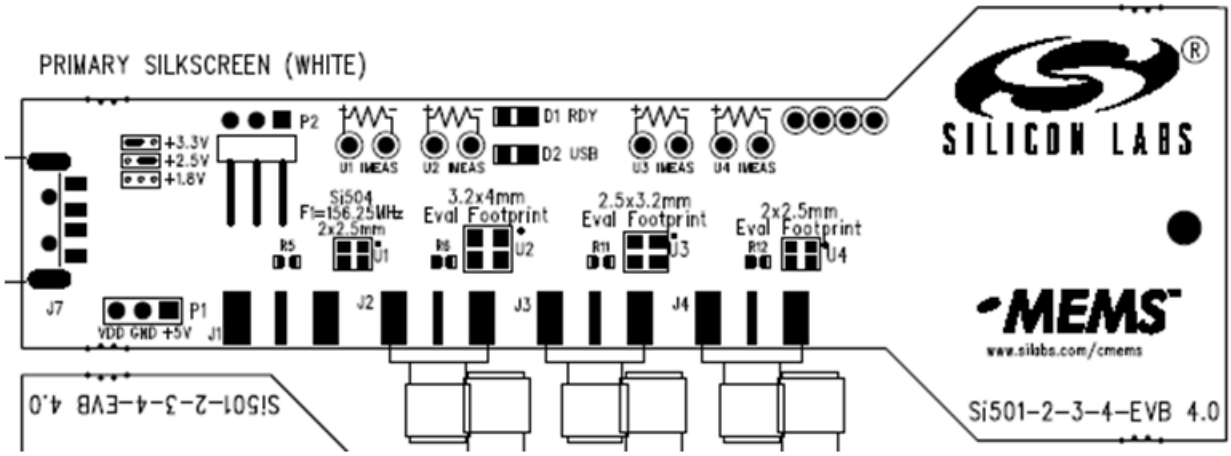


Figure 10. Front Side Assembly

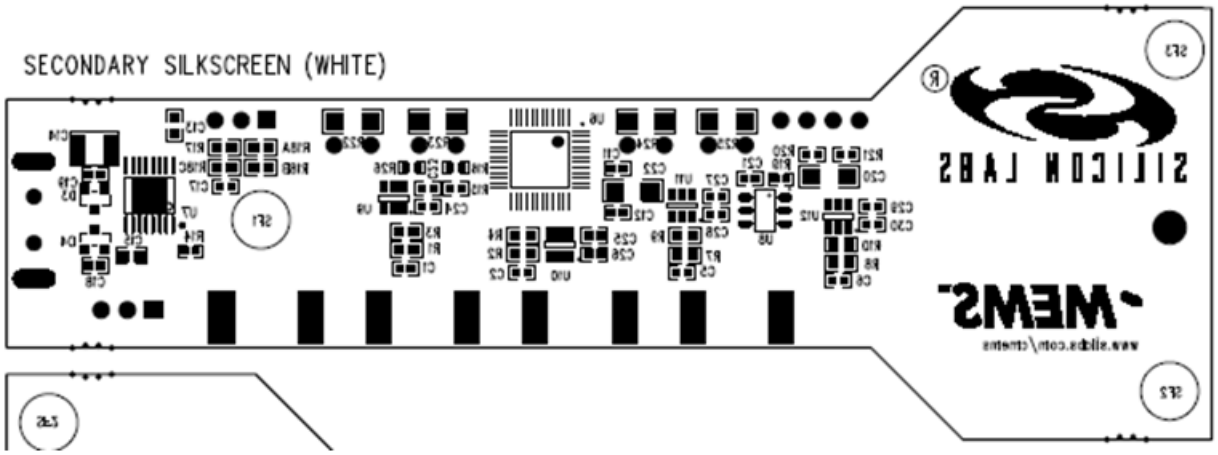


Figure 11. Rear Side Assembly

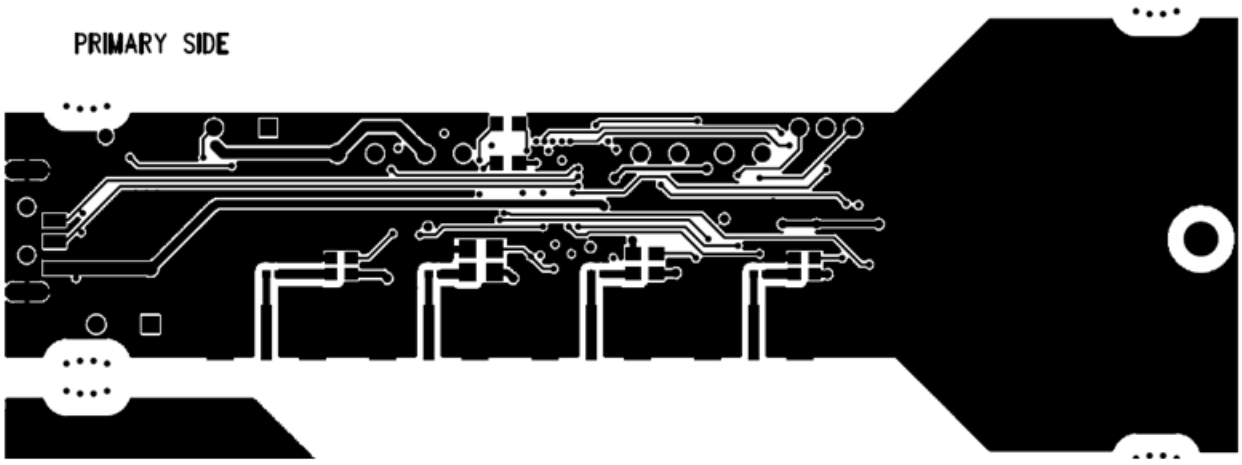


Figure 12. Front Side (Layer 1)

Figure 13. Front Side Inner Layer 1

Figure 14. Front Side Inner Layer 2

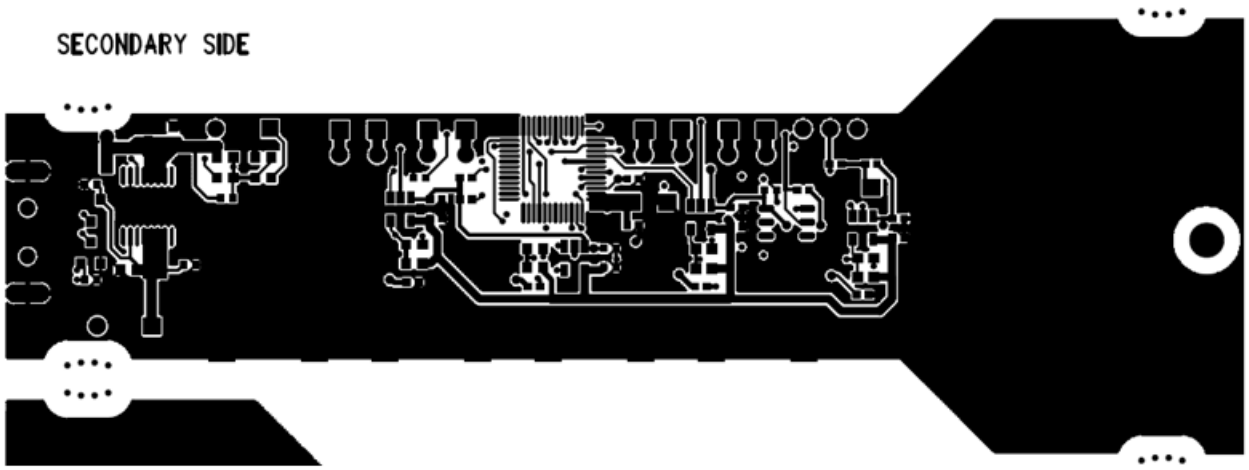
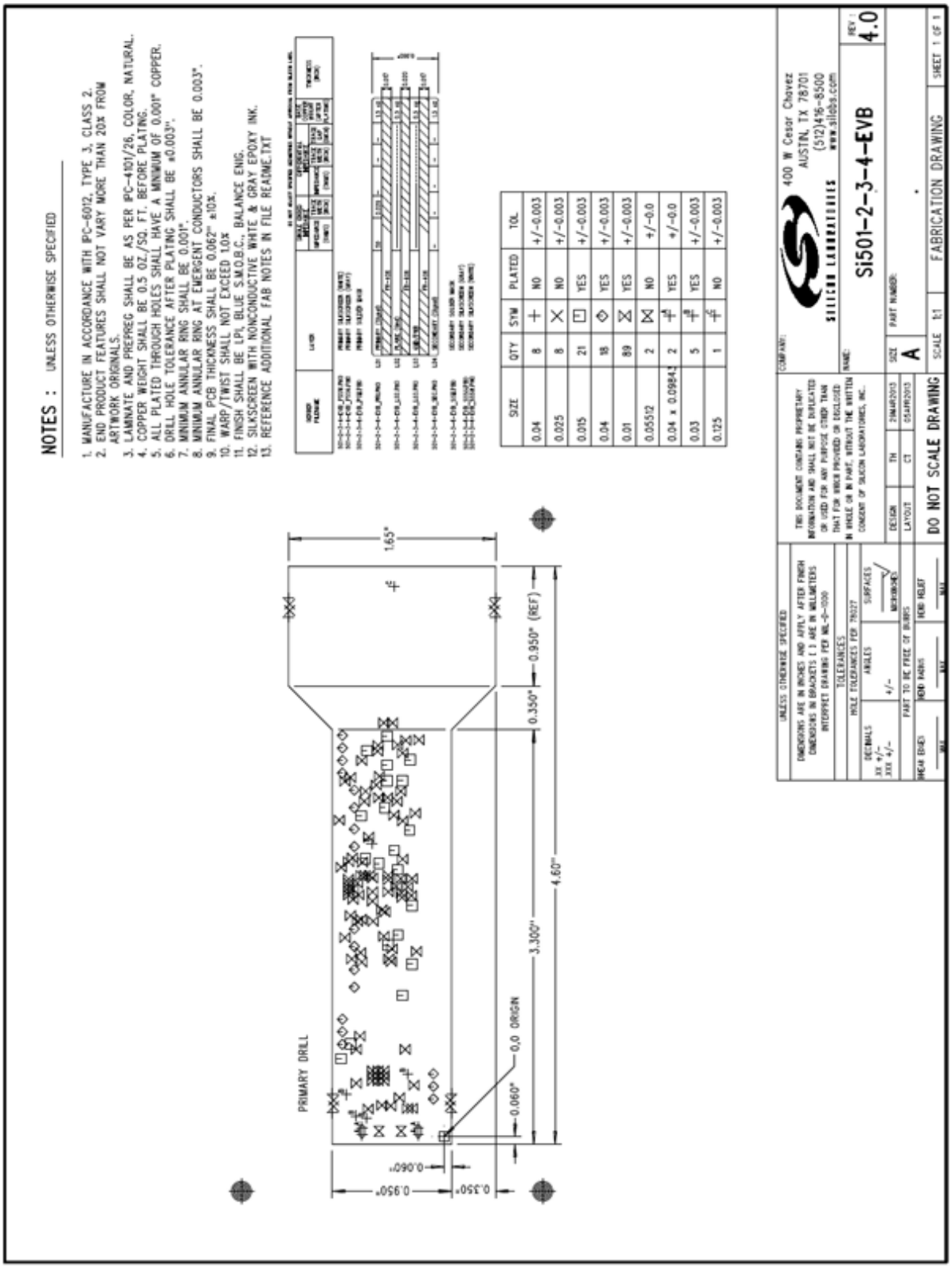


Figure 15. Rear Side

10. Fabrication Drawing



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