

## Si53301/4 EVALUATION BOARD USER'S GUIDE

### Description

The Si53301/4-EVB is used for evaluation of the Si533xx family of low-jitter clock buffers/level translators. As shipped from the factory, this evaluation board has the Si53301 device installed. The entire Si533xx family of buffers use the same input circuits and output drivers, and all have the same jitter specifications. Thus, this evaluation board can be used to evaluate any Si533xx device. The Si53301 provides pin-selectable clock output signal format, drive strength control, optional clock division, and per-bank output enable. The Si53304 provides pin-selectable clock output signal format, drive strength control, and individual output enable pins for each clock output.

### EVB Features

Features of this evaluation board include:

- Power supply connections for VDD, VDDOA and VDDOB, GND
- Jumpers for selection of output signal format, output enable, input clock select and output divider
- Jumpers to allow self biasing of CMOS single-ended inputs
- SMA connectors for easy access to test and evaluate the Si53301

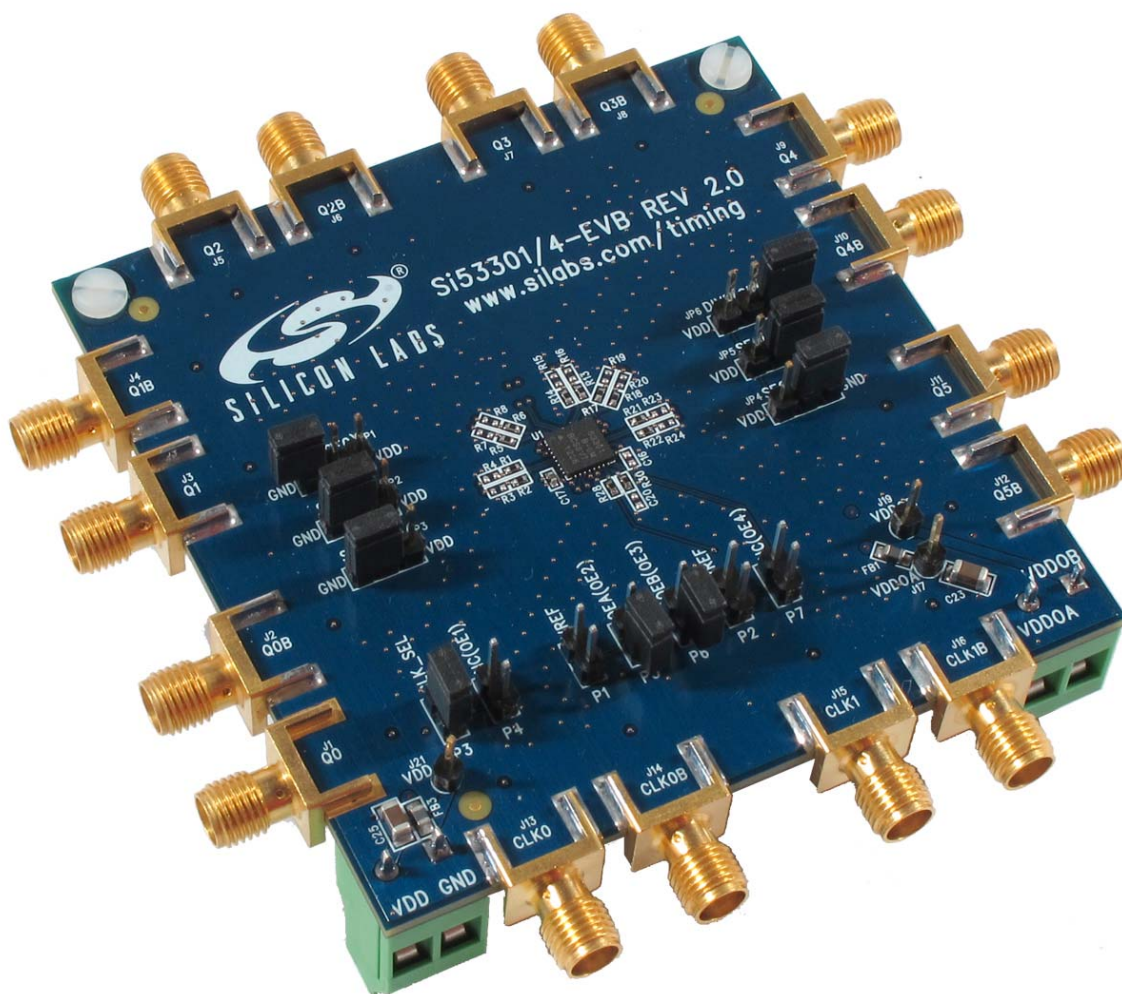


Figure 1. Si53301/4 Evaluation Board

# Si53301/4-EVB

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## 1. Supply Voltage

Three supply voltages are required: VDD, VDDOA, and VDDOB. These supply voltages are applied at the two bottom corners of the evaluation board via J18 and J20, which are located on the bottom side of the evaluation board and function as standoffs as well as inputs for the supply voltages. Note that the J18 and J20 have silkscreen on the top side of the evaluation board that identifies the J18 and J20 inputs. VDD powers the input buffers, mux, and dividers. VDDOA and VDDOB provide power for the output drivers on CLK0,1,2 and CLK3,4,5, respectively. The three input power supply voltages should all have a common external ground. A separate ground wire should be run from the common power ground to the ground on both J18 and J20. VDD, VDDOA, and VDDOB can be 1.8 V  $\pm$ 5%, 2.5 V  $\pm$ 5%, or 3.3 V  $\pm$ 10%. VDDOA,B need to be set according to the output driver format as shown in Table 1.

## 2. Clock Inputs

This evaluation board accepts differential clock inputs on SMA connectors labeled CLK0,CLK0B as well as CLK1,CLK1B. A single-ended CMOS input with the same voltage swing as the VDD voltage may also be applied to either CLK0 and/or CLK1. See “4.4. Jumpers P1 and P2” for more information. The clock input that is active is selected by JP1, which controls the CLK\_SEL input pin 8.

## 3. Clock Outputs

Six clock outputs are present at the SMA connectors labeled Q0, 1, 2, 3, 4, 5. As built and delivered, the evaluation board will support differential outputs that are LVDS, CML, or low-power LVPECL without any component changes. Standard LVPECL and HCSL outputs require output resistor and/or capacitor changes. See the table in Figure 3 for these changes.

## 4. Jumpers

This evaluation board can be used to evaluate a Si53301 or Si53304; however, the Si53301 is installed on the evaluation board. Refer to Figures 1, 2, and 3 and Tables 1 and 2 as needed for the following discussion about the jumpers. Many of the inputs are shown on the evaluation board silkscreen and schematic with dual names, such as name1(name2), where name1 is the input pin name for the Si53301 and name2 is the input pin name for the Si53304. In two cases, the input pin of the Si53301 is a no-connect (NC) when the Si53304 is a functional input.

### 4.1. Jumpers JP2 and JP3

Jumpers JP2 and JP3 set the level to SFOUTA1 and SFOUTA0 on input pins 2 and 3, respectively. Jumpers JP4 and JP5 set the level to SFOUTB1 and SFOUTB0 on input pins 22 and 23, respectively. These inputs have three valid input levels: Ground, VDD, and Open. See Table 1.

### 4.2. Jumpers JP1 and JP6

For the Si53301 device, Jumpers JP1 and JP6 control the output dividers for bank A (Q0,1,2) and bank B (Q3,4,5), respectively. For the Si53304 device, Jumpers JP1 and JP6 control the enabling of output clocks Q1 and Q5, respectively. See Table 2 for the settings of these jumpers.

### 4.3. Jumpers P3, P4, P5, P6, and P7

For the Si53301, these jumpers control CLK\_SEL, OEA, and OEB. OEA is the enable for output clocks Q0,1,2, and OEB is the enable for output clocks Q3,4,5. For the Si53304, these jumpers control CLK\_SEL, OE1, OE2, OE3, and OE4. See Table 3 for more information.

### 4.4. Jumpers P1 and P2

Jumpers P1 and P2 should be left open unless a single-ended input is applied to the CLK0 or CLK1 input. When a jumper is placed across P1 (P2), the voltage from the VREF pin 17 is applied to the CLK0B (CLK1B) input pin so that a CMOS input with a voltage swing of VDD (pin7) volts can be applied to the CLK0 (CLK1) pin. In addition, some resistor and capacitor changes (described in the Figure 3 schematic near P1 and P2) must be made to the evaluation board.

Table 1. JP2, JP3, JP4, and JP5 Output Signal Format

| SFOUTX1 <sup>1</sup> | SFOUTX0 <sup>1</sup> | VDDOX = 3.3 V        | VDDOX = 2.5 V        | VDDOX = 1.8 V        |
|----------------------|----------------------|----------------------|----------------------|----------------------|
| Open <sup>2</sup>    | Open <sup>2</sup>    | LVPECL               | LVPECL               | N/A                  |
| Ground               | Ground               | LVDS                 | LVDS                 | LVDS                 |
| Ground               | VDD                  | LVC MOS, 24 mA drive | LVC MOS, 18 mA drive | LVC MOS, 12 mA drive |
| VDD                  | Ground               | LVC MOS, 18 mA drive | LVC MOS, 12 mA drive | LVC MOS, 9 mA drive  |
| VDD                  | VDD                  | LVC MOS, 12 mA drive | LVC MOS, 9 mA drive  | LVC MOS, 6 mA drive  |
| Open <sup>2</sup>    | Ground               | LVC MOS, 6 mA drive  | LVC MOS, 4 mA drive  | LVC MOS, 2 mA drive  |
| Open <sup>2</sup>    | VDD                  | LVPECL Low power     | LVPECL Low power     | N/A                  |
| Ground               | Open <sup>2</sup>    | CML                  | CML                  | CML                  |
| VDD                  | Open <sup>2</sup>    | HCSL                 | HCSL                 | HCSL                 |

**Notes:**

1. Ground means short center pin to ground pin. VDD means short center pin to VDD pin. Open means leave center pin open.
2. SFOUTX are three-level input pins.

Table 2. Jumper Selections for JP1,6

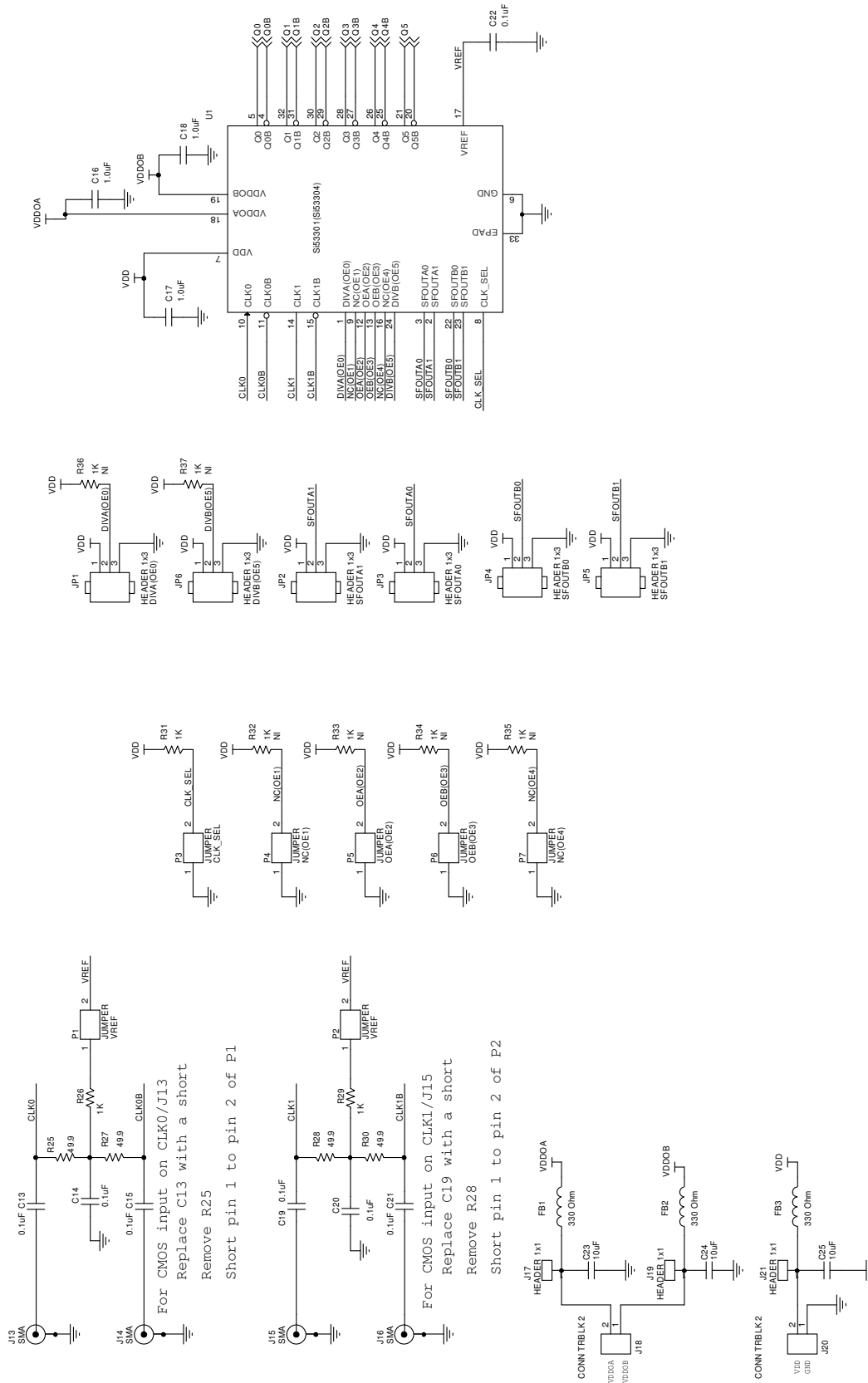
| Signal*   | Jumper | Si53301         |      |     | Si53304         |            |            |
|-----------|--------|-----------------|------|-----|-----------------|------------|------------|
|           |        | Jumper Position |      |     | Jumper Position |            |            |
|           |        | Ground          | Open | VDD | Ground          | Open       | VDD        |
| DIVA(OE1) | JP1    | /2              | /1   | /4  | Q1 Disabled     | Q1 Enabled | Q1 Enabled |
| DIVB(OE5) | JP6    | /2              | /1   | /4  | Q5 Disabled     | Q5 Enabled | Q5 Enabled |

**\*Note:** The signal name in parentheses applies to the Si53304 device, which is not installed from the factory.

Table 3. Jumper Selections for P3,4,5,6,7

| Signal*  | Jumper | Si53301         |                | Si53304         |               |
|----------|--------|-----------------|----------------|-----------------|---------------|
|          |        | Jumper Position |                | Jumper Position |               |
|          |        | Shorted         | Open           | Shorted         | Open          |
| CLK_SEL  | P3     | CLK0 Selected   | CLK1 Selected  | CLK0 Selected   | CLK1 Selected |
| NC(OE1)  | P4     | NA              | NA             | Q1 Disabled     | Q1 Enabled    |
| OEA(OE2) | P5     | Q0,1,2 Disabled | Q0,1,2 Enabled | Q2 Disabled     | Q2 Enabled    |
| OEB(OE3) | P6     | Q3,4,5 Disabled | Q3,4,5 Enabled | Q3 Disabled     | Q3 Enabled    |
| NC(OE4)  | P7     | NA              | NA             | Q4 Disabled     | Q4 Enabled    |

**\*Note:** The signal name in parentheses applies to the Si53304 device, which is not installed from the factory.



All resistors on this page are located very close to the Si533xx device, caps are located very close to the SMA's

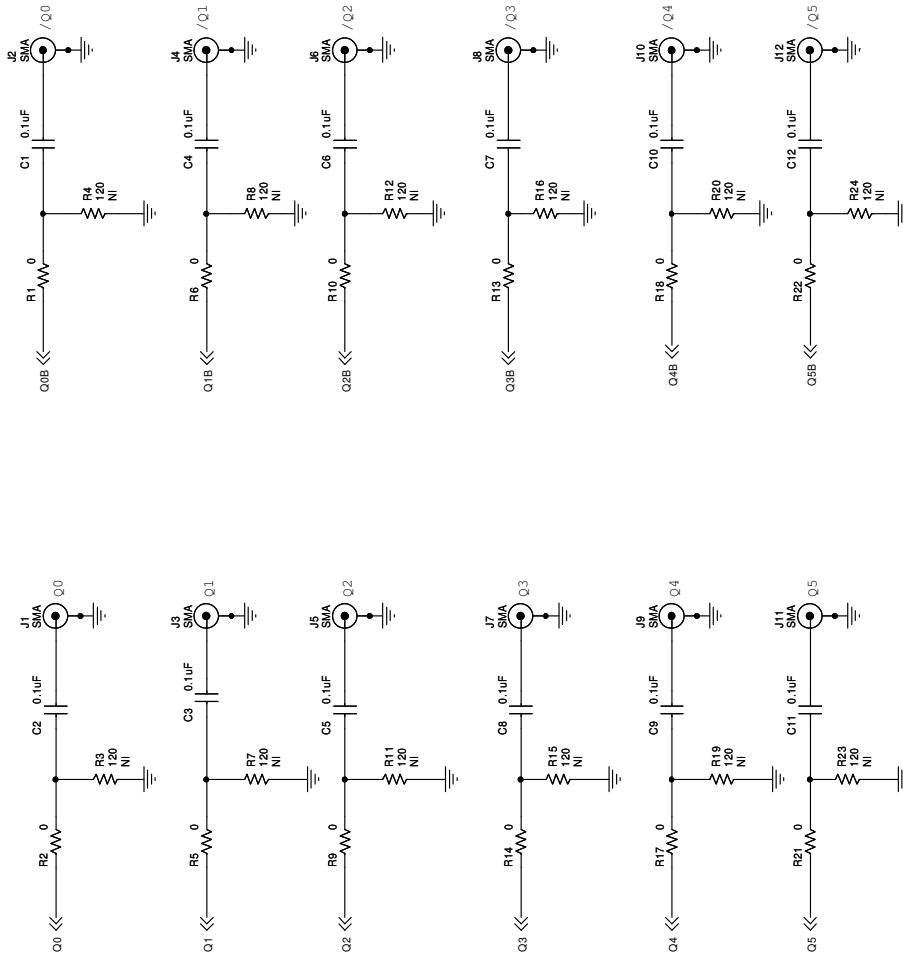


Figure 3. Schematic Outputs

| Component Configurations For Various Output Formats |   |   |  |
|---|---|---|--|
| Output Format                                       | C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12 | R1, R2, R5, R6, R9, R10, R13, R14, R17, R18, R21, R22 | R3, R4, R7, R8, R11, R12, R15, R16, R19, R20, R23, R24 |
| HCSL SAME BD  | 0 OHMS  | 0   | NP   |
| HCSL ADD-IN   | 0 OHMS  | 42.2  | 86.6   |
| LOW POWER LVPECL                                    | 0.1 uF  | 0   | NP   |
| STANDARD LVPECL                                     | 0.1 uF  | 0   | See note   |
| LVDS AC/DC  | 0.1 uF/0 ohms                                     | 0   | NP   |
| CML   | 0.1 uF  | 0   | NP   |
| CMOS  | 0 OHMS  | 0   | NP   |

Note : 90 for VDD = 2.5V; 120 for VDD = 3.3V

# Si53301/4-EVB

## 5. Bill of Materials

Table 4. Si53301/4-EVB Bill of Materials

| Qty | Ref  | Value          | Rating  | Voltage | Tol       | Type       | PCB Footprint   | Mfr Part #       | Mfr                |
|-----|--|----------------|---------|---------|-----------|------------|-----------------|------------------|--------------------|
| 19  | C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C19, C20, C21, C22 | 0.1 $\mu$ F    |         | 10 V    | $\pm$ 10% | X7R        | C0402           | C0402X7R100-104K | Venkel             |
| 3   | C16, C17, C18  | 1.0 $\mu$ F    |         | 6.3 V   | $\pm$ 10% | X5R        | C0402           | C0402X5R6R3-105K | Venkel             |
| 3   | C23, C24, C25  | 10 $\mu$ F     |         | 10 V    | $\pm$ 20% | X7R        | C1206           | C1206X7R100-106M | Venkel             |
| 3   | FB1, FB2, FB3  | 330 $\Omega$   | 1500 mA |         |           | SMT        | L0805           | BLM21PG331SN1    | MuRata             |
| 16  | J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16                | SMA            |         |         |           | SMA        | SMA-EDGE-3      | 142-0701-801     | Johnson Components |
| 3   | J17, J19, J21  | Header 1x1     |         |         |           | Header     | CONN-1X1        | TSW-101-14-T-S   | Samtec             |
| 2   | J18, J20   | CONN TRBLK 2   | 24 A    |         |           | Term Blk   | CONN-TB-1711026 | 1711026          | Phoenix Contact    |
| 6   | JP1, JP2, JP3, JP4, JP5, JP6   | Header 1x3     |         |         |           | Header     | CONN-1X3        | TSW-103-07-T-S   | Samtec             |
| 9   | JS1, JS2, JS3, JS4, JS5, JS6, JS7, JS8, JS9  | Jumper Shunt   |         |         |           | Shunt      | N/A             | SNT-100-BK-T     | Samtec             |
| 2   | MH1, MH2   | Screw/Standoff |         |         |           | HDW        | MH-125NP        | NSS-4-4-01/2399  | Various            |
| 7   | P1, P2, P3, P4, P5, P6, P7   | Jumper         |         |         |           | Header     | CONN1X2         | TSW-102-07-L-S   | Samtec             |
| 12  | R1, R2, R5, R6, R9, R10, R13, R14, R17, R18, R21, R22                                | 0              | 1 A     |         |           | Thick-Film | R0402           | CR0402-16W-000   | Venkel             |
| 4   | R25, R27, R28, R30   | 49.9 $\Omega$  | 1/16 W  |         | $\pm$ 1%  | Thick-Film | R0402           | CR0402-16W-49R9F | Venkel             |
| 3   | R26, R29, R31  | 1 k $\Omega$   | 1/16 W  |         | $\pm$ 5%  | Thick-Film | R0402           | CR0402-16W-102J  | Venkel             |
| 1   | U1   | Si53301        |         |         |           | Timing     | QFN32M5X5 P0.5  | Si53301-A-GM     | SiLabs             |

Table 4. Si53301/4-EVB Bill of Materials (Continued)

| Qty                             | Ref  | Value        | Rating | Voltage | Tol       | Type       | PCB Footprint | Mfr Part #       | Mfr    |
|---------------------------------|--|--------------|--------|---------|-----------|------------|---------------|------------------|--------|
| <b>Not-Installed Components</b> |  |              |        |         |           |            |               |                  |        |
| 12                              | R3, R4, R7, R8, R11, R12, R15, R16, R19, R20, R23, R24 | 120 $\Omega$ | 1/16 W |         | $\pm 1\%$ | Thick-Film | R0402         | CR0402-16W-1200F | Venkel |
| 6                               | R32, R33, R34, R35, R36, R37                           | 1 k $\Omega$ | 1/16 W |         | $\pm 5\%$ | Thick-Film | R0402         | CR0402-16W-102J  | Venkel |

## DOCUMENT CHANGE LIST

### Revision 0.1 to Revision 0.3

- Comprehensive rewrite of previous revision.



**NOTES:**

## CONTACT INFORMATION

Silicon Laboratories Inc.  
400 West Cesar Chavez  
Austin, TX 78701  
Tel: 1+(512) 416-8500  
Fax: 1+(512) 416-9669  
Toll Free: 1+(877) 444-3032

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

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