User's Guide
SLLU175–December 2012

SN55LVCP22EVM-CVAL User's Guide

This user's guide describes the SN55LVCP22-CVAL evaluation module (EVM). The SN55LVCP22EVM-CVAL highlights the high-speed performance and functionality of the SN55LVCP22 2x2 crosspoint switch. This guide contains the EVM schematic, bill of materials, assembly drawing, and board layouts.

Contents

1 Introduction

The SN55LVCP22 (LVDS output) is a high-speed 2x2 crosspoint switch. The four different functions that this crosspoint provides are shown in Figure 1. The functions are selected via pins SEL0 and SEL1. Control pins EN0 and EN1 enable or disable the outputs. The receiver has a wide input common-mode voltage range with an ability to accept LVDS, LVPECL and CML signaling levels.

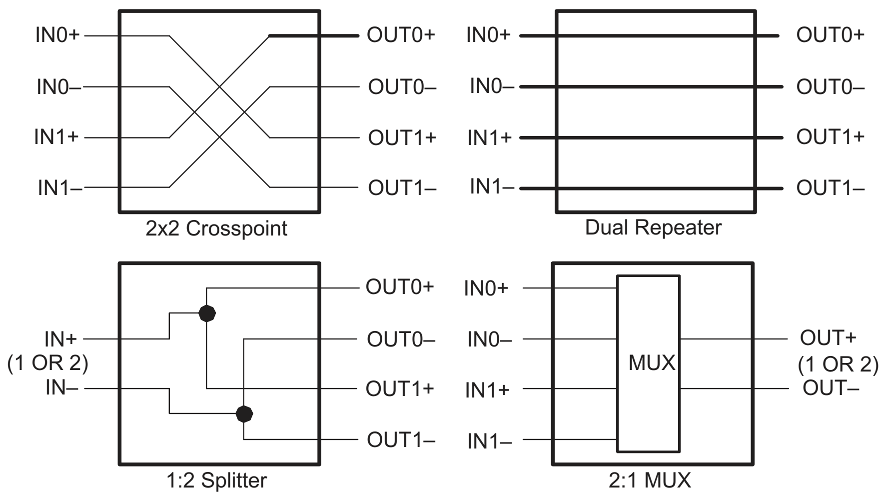

Figure 1. SN55LVCP22 Functional Configurations

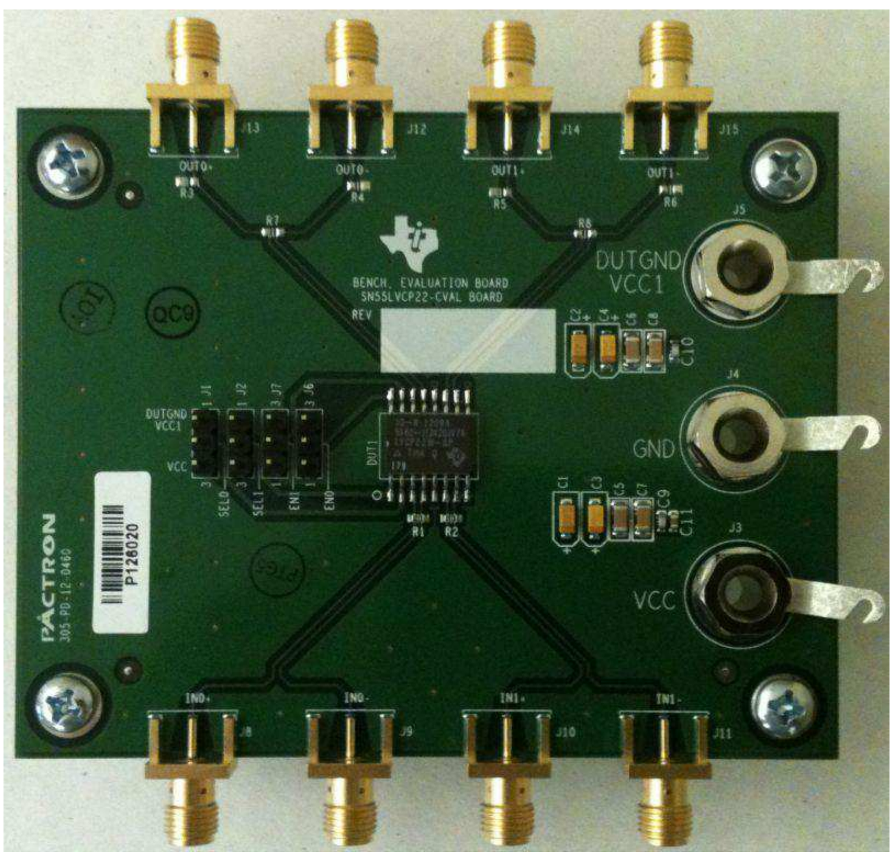

Figure 2. SN55LVCP22EVM-CVAL

1.1 Signal Paths

The signal paths on this EVM include 8 edge-launch SMA connectors (J8-J16) for high-speed data transmission, 2 jumpers for active switch logic control, 2 jumpers (J6 and J7) for enabling and disabling the outputs, and three banana jacks (J3, J4, J5) for power and ground connections. Note GND is tied to VCC01 to allow for proper common mode termination to 50-Ω loads. See Figure 10.

2 Setup and Equipment Required

The output characteristics of the SN55LVCP22 are specified in the TIA/EIA-644 standard. LVDS drivers nominally provide a 350-mV differential signal, with a 1.25-V offset from ground. These levels are attained when driving a 100-Ω differential line-termination test load. This requirement includes the effects of up to 32 standard receivers with their ground reference up to 1 V different from that of the driver. This common-mode loading limitation of LVDS drivers affects how they are observed and much of the test setup that follows.

The EVM is designed to support the SN55LVCP22 LVDS output device. By using the three power jacks (J3, J4, J5), as well as installing termination resistors (R3-R8 and R11-R16), different methods of termination and probing can be used to evaluate the device output characteristics. The typical setup for the SN55LVCP22 is shown in Figure 3.

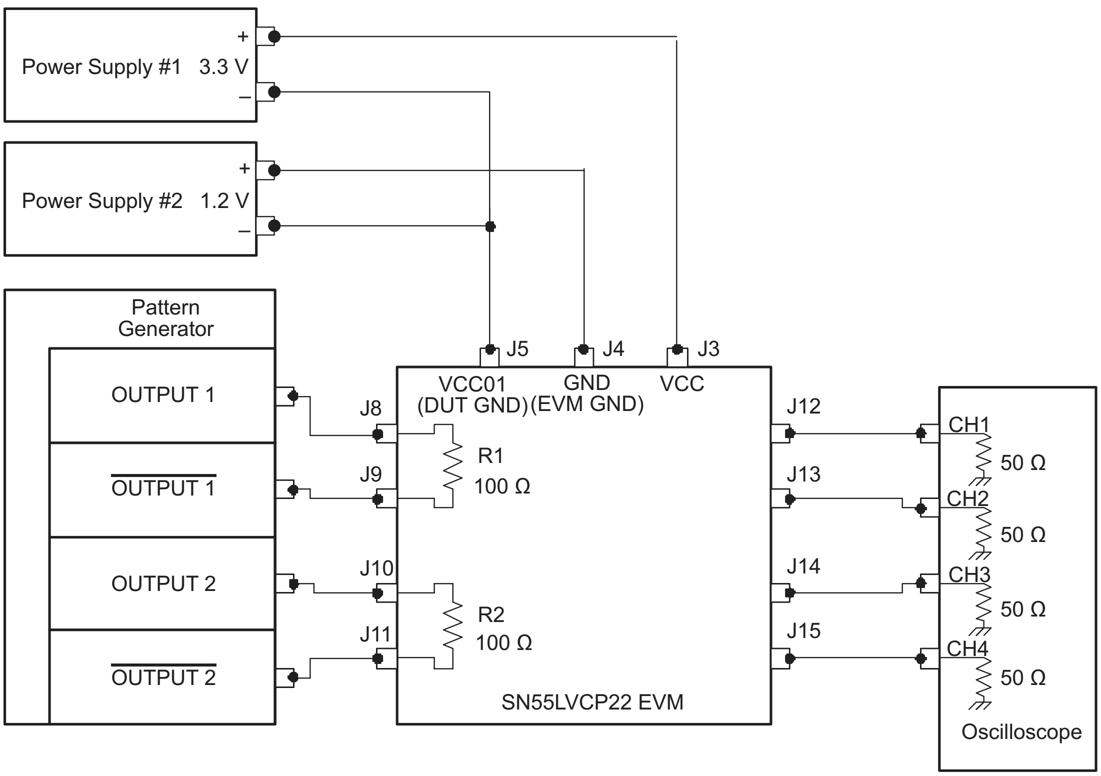

Figure 3. EVM Power Connections for SN55LVCP22 Evaluation - With LVDS Inputs

2.1 Applying an Input

When using a general-purpose signal generator with 50-Ω output impedance, make sure that the signal levels are between 0 V and 4 V with respect to J5, device under test ground (DUT GND), designated as VCC01.

Inputs should be applied to the SMA connectors J8, J9, J10, and J11. Matched cable lengths must be used when connecting the signal generator to the EVM to avoid inducing skew between the noninverting and inverting inputs. The EVM comes with 100-Ω resistors installed across the differential inputs for LVDS termination. The simple 100-Ω terminations do not provide the necessary termination for LVPECL or CML [(1)] output structures. In order to interface the SN55LVCP22EVM-CVAL with CML or LVPECL drivers, external terminations are required. Figure 4 shows an example termination for LVPECL and CML output structures. Remove resistors R1 and R2 when using the external terminations.

(1) CML is not a standardized physical layer and therefore the output structures and required termination differ from vendor to vendor.

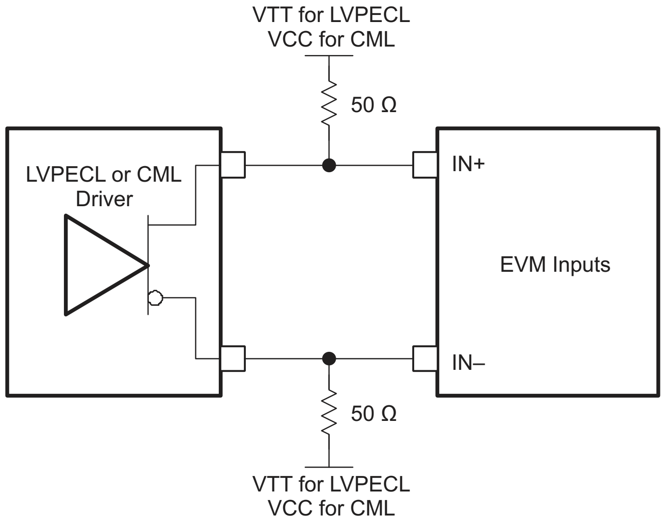

Figure 4. External Termination for Interfacing CML or LVPECL Drivers

The use of external resistors creates a significant stub between the termination and the actual device receivers. The user needs to verify that the transition time of the input signal, coupled with the stub length, does not lead to reflection problems. In normal applications, the termination would be placed as close as possible to the device inputs to minimize reflections.

The control lines SEL0 and SEL1 require LVTTL levels and are stimulated by the VCC power supply, via jumpers J1 and J2. Table 1 shows the different functions and the control line settings for each.

Table 1. Crosspoint Function Table

SEL0	SEL1	OUT0	OUT1	FUNCTION
0	0	IN0	IN0	1:2 Splitter
0	1	IN0	IN1	Repeater
1	0	IN1	IN0	Switch
1	1	IN1	IN1	1:2 Splitter

2.2 Observing an Output

Direct connection to an oscilloscope with 50-Ω internal terminations to ground is accomplished without R3-R8 installed. The outputs are available at J12-J15 for direct connection to oscilloscope inputs. Matched cable lengths must be used when connecting the EVM to a scope to avoid inducing skew between the noninverting (+) and inverting (-) outputs.

The three power jacks (J3, J4, J5) are used to provide power and a ground reference for the EVM. The power connections to the EVM determine the common-mode load to the device. As mentioned earlier, LVDS drivers have limited common-mode driver capability. When connecting the EVM outputs directly to oscilloscope inputs, setting of the oscilloscope common-mode offset voltage is required, as the oscilloscope presents low common-mode load impedance to the device.

Returning to Figure 3, power supply 1 is used to provide the required 3.3 V to the EVM. Power supply 2 is used to offset the EVM ground relative to the DUT ground. The EVM ground is connected to the oscilloscope ground through the returns on SMA connectors J12-J15. With power applied as shown in , the common-mode voltage seen by the SN55LVCP22 is approximately equal to the reference voltage being used inside the device, preventing significant common-mode current to flow. Optimum device setup can be confirmed by adjusting the voltage on power supply 2 until its current is minimized. It is important to note that use of the dual supplies and offsetting the EVM ground relative to the DUT ground are simply steps needed for the test and evaluation of devices. Actual designs include high-impedance receivers, which do not require the setup steps outlined above.

If the outputs are to be evaluated with a high-impedance probe, direct probing on the EVM board is supported via installation of a 50-Ω resistor across the solder pads for R6 and R8, and another 50-Ω resistor across the solder pads for R3 and R5 for DUT1. Or, LVDS outputs can be observed by installing a 100-Ω resistor at R4, R7, R12, or R15. LVPECL outputs can be observed by installing R3, R5, R11, R13, R14, and R16 (49.9-Ω resistors) and setting power supply #2 to 1.3 V (note that power supply #2 must be able to sink current).

2.3 Typical Test Results

Figure 5 shows typical results obtained with the EVM setup. The DUT was configured to send the IN0+/IN0- inputs to the outputs OUT0+/OUT0- and inputs IN1+/IN1- to outputs OUT1+/OUT1- by setting EN0 and EN1 to a high level and by setting SEL0 to GND and SEL1 to VCC. The stimuli were a 2^{15}-1 PRBS to J1 and J2 at 1.3 Gbps, and a 650-MHz clock to J3 and J4.

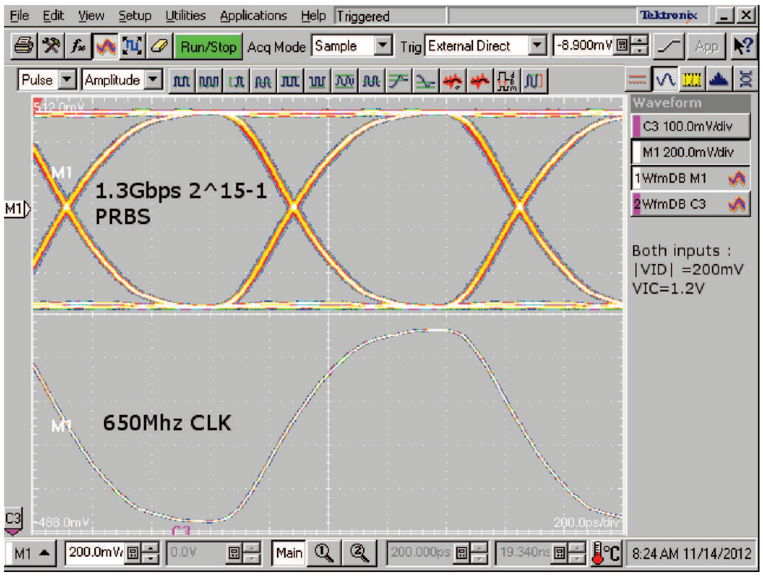

Figure 5. Typical Test Results of the SN55LVCP22EVM-CVAL

3 Board Layout

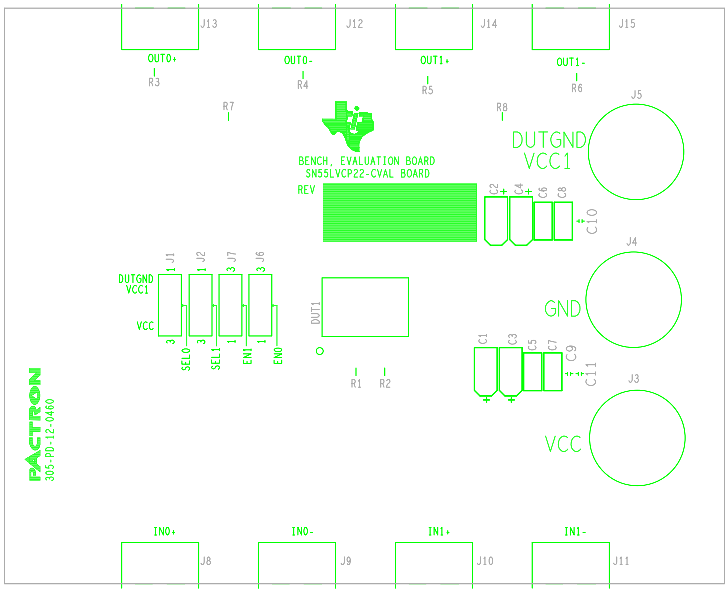

Figure 6. Silk Screen

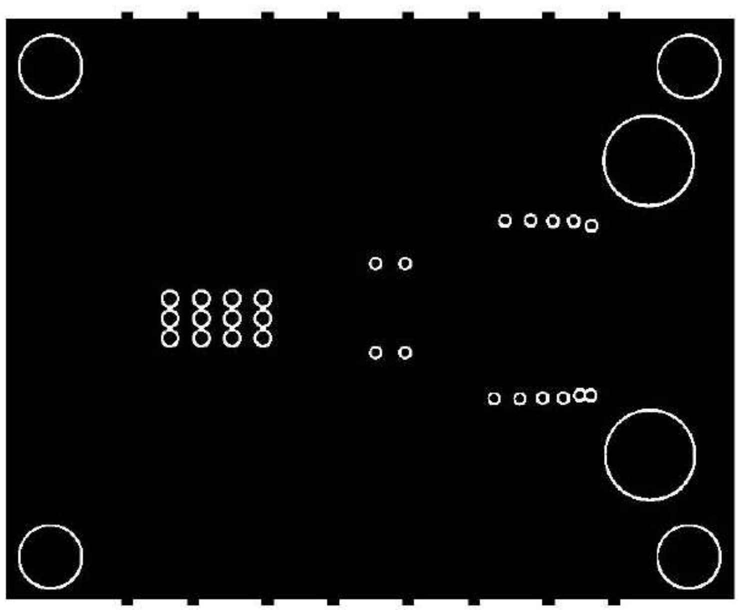

Figure 7. Layer 2 – GND Plane

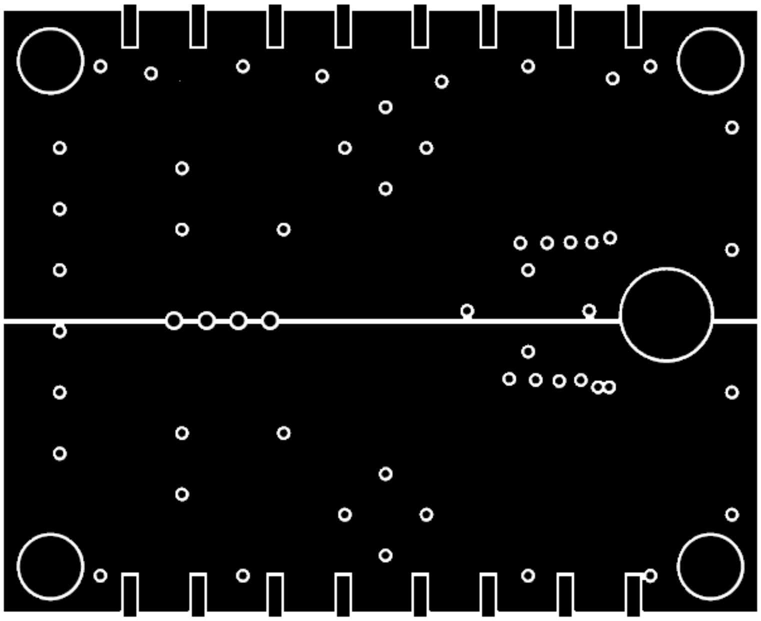

Figure 8. Layer 3 – PWR Plane

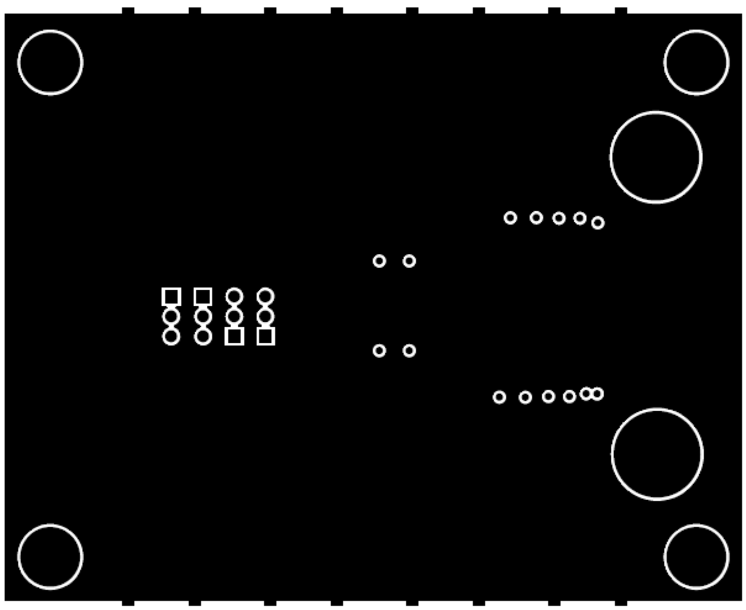

Figure 9. Bottom Layer

4 Schematic and Bill of Materials

The following pages contain the SN55LVCP22EVM-CVAL schematic and bill of materials.

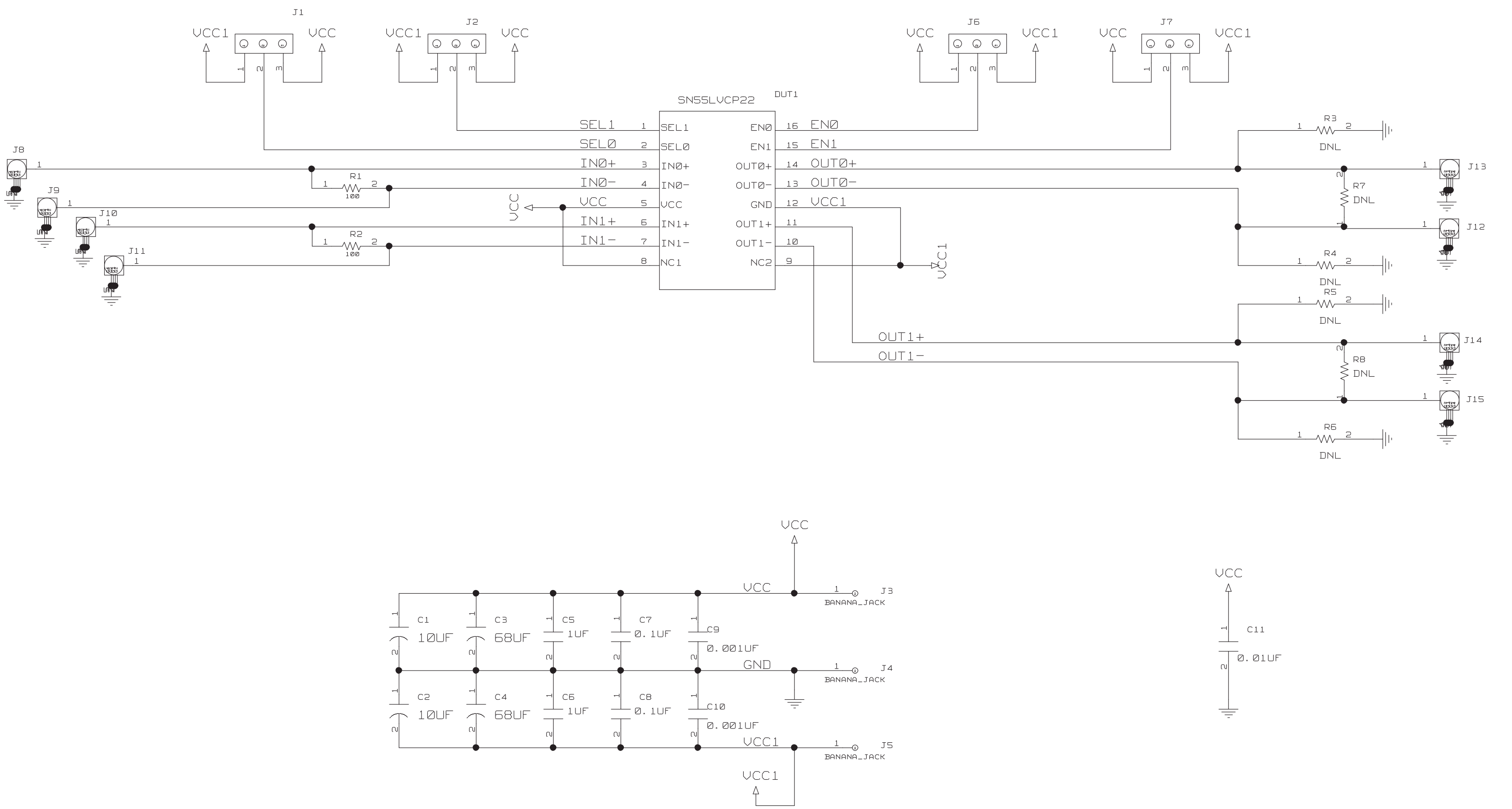

Figure 10. SN55LVCP22EVM-CVAL Schematic

Table 2. SN55LVCP22EVM-CVAL Bill of Materials

Item No.	Qty	Part Name	Designator	Value	JEDEC Type	Manufacturer	Part No.	Description	Comments
1	8	32K145_400L5_ 32K145_400L5	J8-J15	32K145-400L5	32K145_400L5	ROSENBERGER	32K145-400L5	EDGE MOUNT SMA	
2	3	BANANA_RED	J3-J5	101	101_BANANA_ JACK	ABBATRON HH SMITH	101	BANANA JACK, STUD	
3	2	CAPS_0603	C9,C10	0.001UF	C0603	YAGEO	CC0603JRNPO8BN102	CAP CER 1000PF 25V 5% NPO 0603	
4	1	CAPS_0603	C11	0.01UF	C0603	TDK CORP	C1608X7R1C103K	CAP CER 10000PF 16V 10% X7R 0603	
5	2	CAP_1206	C5,C6	1UF	C1206	TDK CORP	C3216X7R1C105K/0.85	CAP CER 1UF 16V 10% X7R 1206	
6	2	CAP_1206	C7,C8	0.1UF	C1206	Kemet	C1206F104K3RACTU	CAP CER 0.1UF 25V 10% X7R 1206	
7	2	CAP_POL_1206	C1,C2	10UF	TANT_A	KEMET	T491A106M016AT	CAP TANT 10UF 16V 20% 1206	
8	2	CAP_POL_1206	C3,C4	68UF	TANT_A	AVX CORP	TLJA686M010R1500	CAP TANT 68UF 10V 20% 1206	
9	4	HDR_1X3- HDR_1X3_100MIL	J1,J2,J6,J7	HDR_1X3_ 100MIL	HDR_1X3_ 100MIL			100 Mil pitch 1X3 Header	Regular 100 mil header
10	2	RES_0603	R1,R2	100	R0603	PANASONIC	ERJ-3GEYJ101V	RES 100 OHM 1/10W 5% 0603 SMD	
11	6	RES_0603	R3-R8	DNL	R0603				DNL
12	1	SN55LVCP22	DUT1	SN55LVCP22	SN55LVCP22_ DUT	TI	SN55LVCP22		Customer Supplied
13	4	Shunt For line item 9				FCI	65474-010	MINI JUMP 2POS .100"	
14	4	Standoff, 4-40 Hex - F/F, 0.50" - ALUM				Keystone Electronics	2203	Standoff, 4-40 Hex - F/F, 0.50" - ALUM	
15	4	Screws, 4-40, Phillips panhead 0.375"- SS				Building Fasteners	PMSSS 440 0038 PH	Nuts for the standoff	

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Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

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3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

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