User's Guide

TLV3604EVM

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ABSTRACT

The TLV3604EVM is an evaluation board designed to evaluate the high speed TLV3604 comparator. The TLV3604EVM has layout options intended to make it simple to evaluate timing performance with different measurement tools. The output of the TLV3604 is designed for low voltage differential signals (LVDS), which provide high speed signals to interconnect devices such as FPGAs with minimal power dissipation.

Table of Contents

List of Figures

List of Tables

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1 Introduction

The TLV3604EVM is an evaluation board designed to evaluate the high speed TLV3604 comparator. The TLV3604EVM has layout options intended to make it simple to evaluate timing performance with different measurement tools. The output of the TLV3604 is designed for low voltage differential signals (LVDS), which provide high speed signals to interconnect devices such as FPGAs with minimal power dissipation.

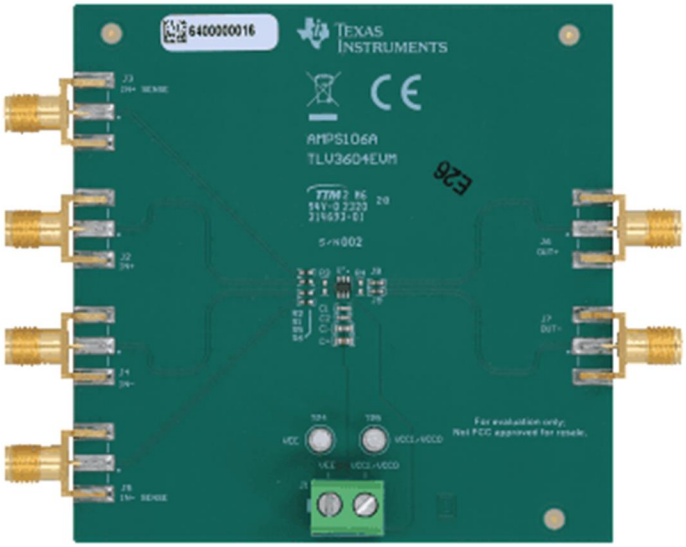

Figure 1-1. TLV3604EVM Board Top View

2 Features

- Low Propagation Delay: 800 ps
- Low Overdrive Dispersion: 450 ps
- High Toggle Frequency: 1.5 GHz/3.0 Gbps
- Narrow Pulse Width Detection Capability: 600ps
- LVDS Output
- Low Input Offset Voltage: +/-5mV
- 6-pin SC-70 Package

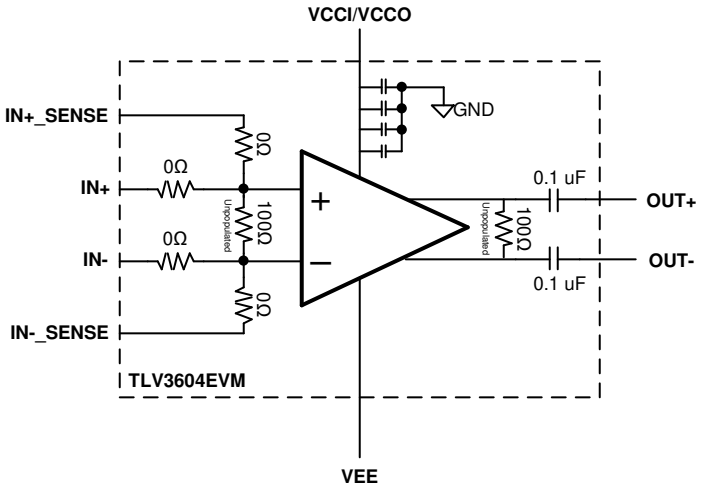

Figure 2-1. Block Diagram

3 EVM Specifications

- Supply Range: +2.4 V to +5.5 V (Single Supply Only)
- Input Common Mode Range: (Vee -200 mV) to (VCCI/VCCO + 200 mV)

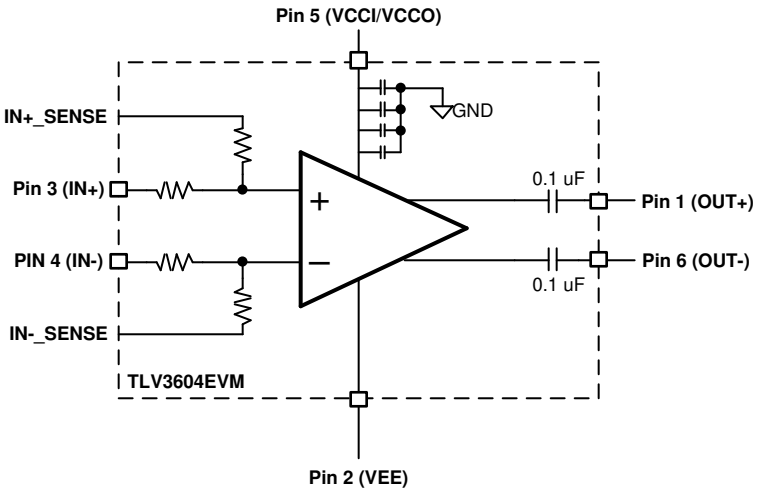

Figure 3-1. TLV3604EVM Pin Assignments

4 Recommended Equipment

- Power Supply
- High Speed Functional Generator with dual outputs
  - Fast rise/fall time recommended (≤ 500ps)
- High Speed Oscilliscope with 50Ω terminations
  - Differential probes with built in 100Ω terminations can be used to terminate the output properly
- SMA Cables/adapters
  - Be sure to have matched length cables for IN+, IN-, IN+SENSE, IN-SENSE, OUTP, and OUTN

5 Quick Start Procedure

Note

DO NOT TURN ON POWER SUPPLY UNTIL ALL CONNECTIONS TO THE DEVICE ARE MADE TO THE BOARD.

1. Set VCCI/VCCO Power Supply to 3.3V and disable the power supply output
2. Connect positive terminal supply to TP5, and negative terminal to TP4
3. Ensure that cables connecting to IN+, IN-, IN+SENSE, IN-SENSE, OUT+, and OUT- are matched length and impedance. Perform any deskewing if necessary.
4. Set the function generator to produce a square wave output with 100mVpp at 50MHz, with a DC offset of 1.65V. Disable the signal generator output. Connect the output to IN+.
5. If available, use the second channel on the function generator to create a complementary signal to the one created in step 3. Disable the signal generator output. Connect the output to IN-.
6. If a second channel or another function generator is not available, use a power supply set to 1.65V. Disable the output and connect to IN-. An adapter to connect the SMA connector on the board may be needed.
7. Connect OUTP and OUTN to a 50Ω terminated scope. Alternatively, use a differential probe with a 100Ω termination and connect to the oscilloscope.
8. Connect IN+SENSE and IN-SENSE to a 50Ω terminated scope channel.
9. Enable the power supply and the signal generator.
10. Verify the supply current is < 17.5mA
11. Monitor and verify the inputs from IN+SENSE and IN-SENSE
12. Monitor and verify the outputs for OUT+ and OUT-

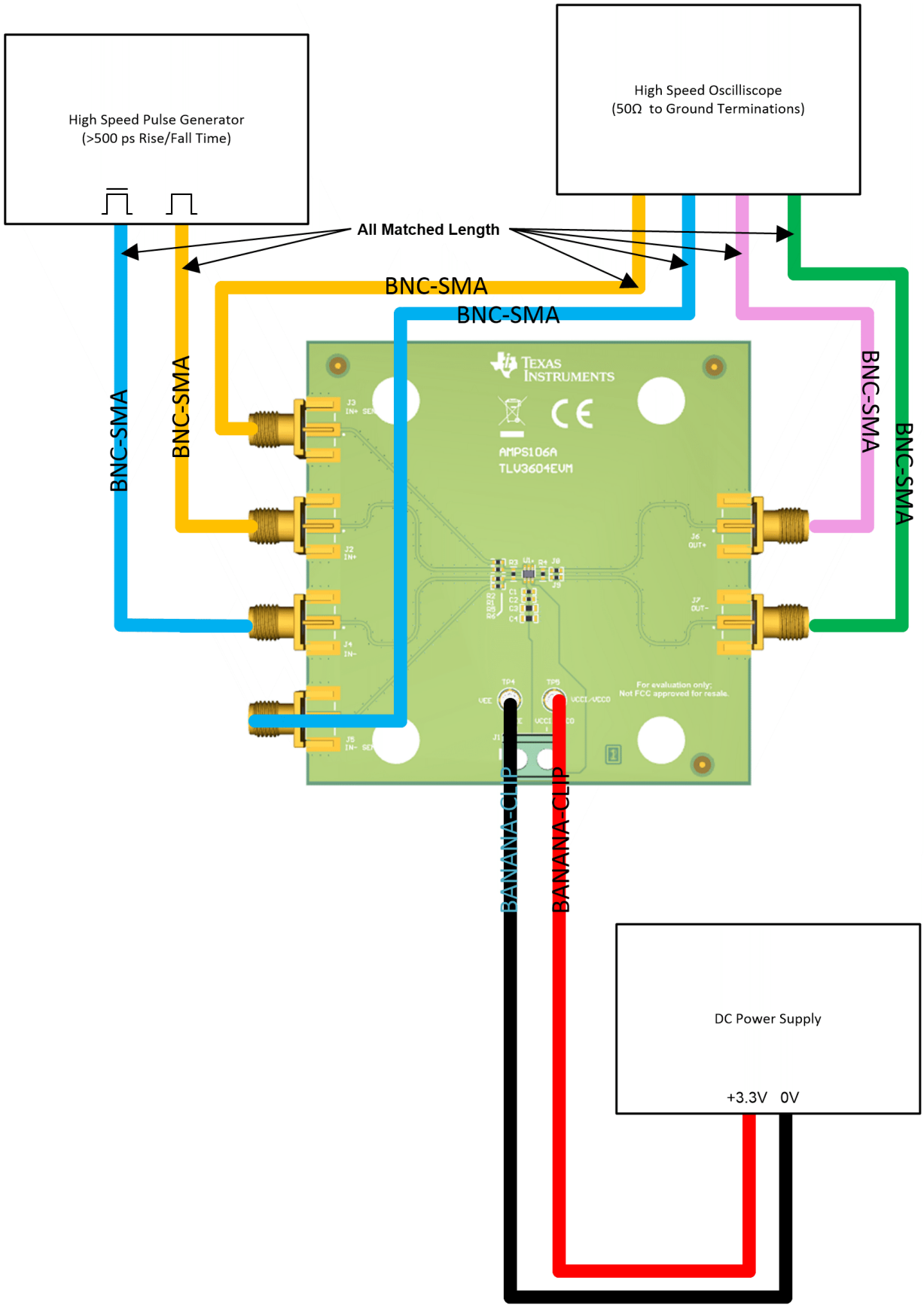

Figure 5-1. TLV3604 EVM Quick Start Setup

Next is a scopeshot capture of the inputs and outputs described in the quick start procedure. Here, the propagation delay between IN+ and OUTP/OUTN is measured by taking the time delta between when IN+ and IN- cross, and when OUT+ and OUT- cross. The low to high propagation delay in the figure below was calculated to be 682 ps.

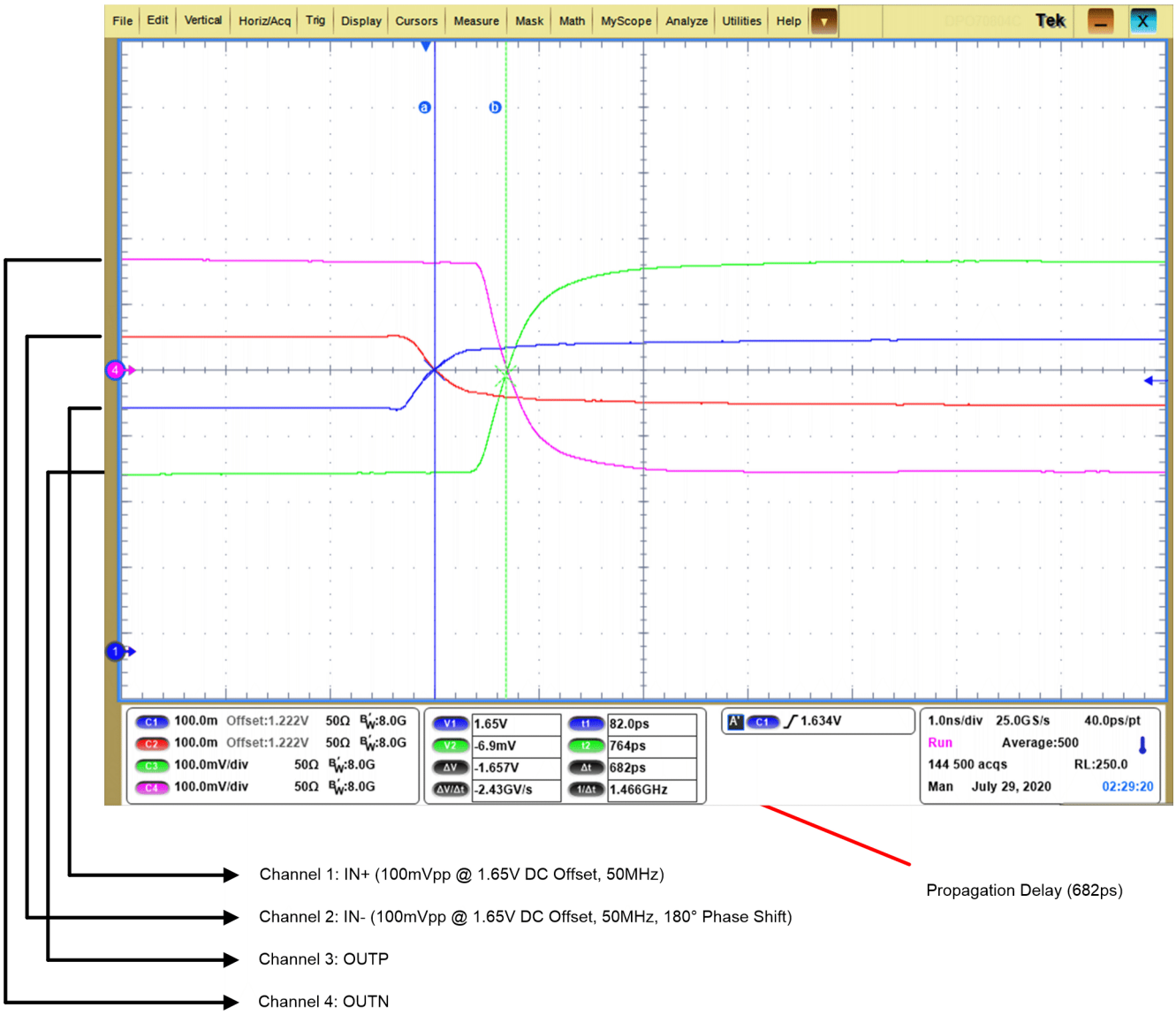

Figure 5-2. Quick Start Example

6 Board Setup

6.1 Supply Voltage

The TLV3604EVM operates from +2.4V to +5.5V. Connect VCCI and VEE using TP5 and TP4 respectively. Alternatively, J1 can also be used.

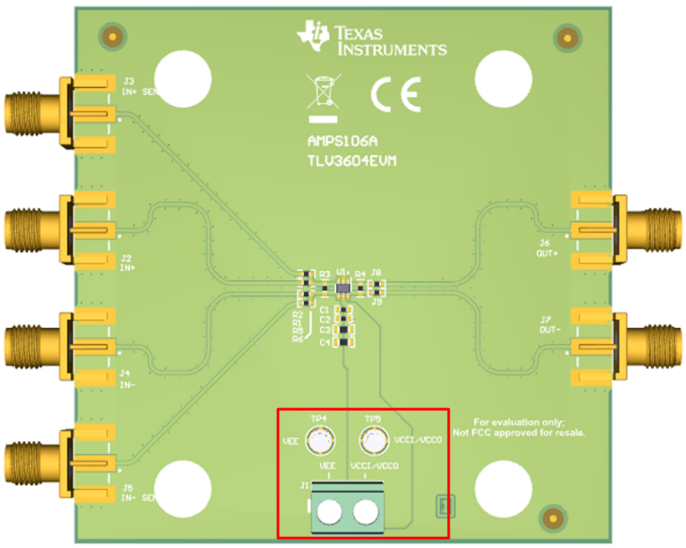

Figure 6-1. TLV3604EVM Supply Voltage Connection

6.2 Inputs

Resistors R1, R2, R5, and R6 are all 0 ohm resistors. The input terminals (IN+ and IN-) have corresponding sense lines so that the inputs to the device can be terminated on the lines with 50 ohms to an oscilloscope. This allows the input signals to be observed with minimal loading and distortion. If the input signal to the device does not need to be evaluated on an oscilloscope, R5 and R6 can be uninstalled and left open.

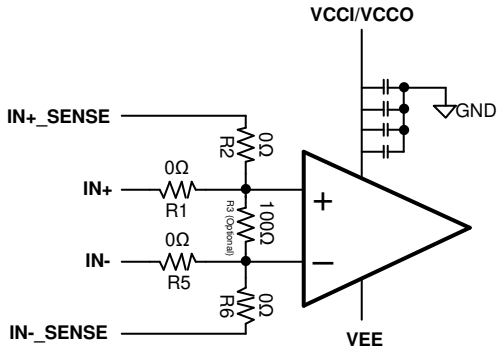

Figure 6-2. Input Side Schematic

The TLV3604EVM has an optional resistor pad on the input (R3) side of the device meant for a 100 Ω resistor. R3 is only needed if applying an unterminated LVDS signal to the board, otherwise it can be left uninstalled.

6.3 Outputs

R4 is only needed if it is preferred to measure the LVDS output directly across the component, or if the board is being used to feed directly to the inputs of another interconnect device such as an FPGA. Otherwise it can be left uninstalled.

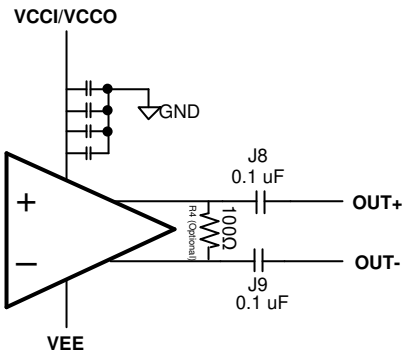

Figure 6-3. Output Side Schematic

J8 and J9 are installed with 0.1 uF capacitors. If probes are unavailable to measure the LVDS output across R4 or with a differential probe, these capacitors allow for the AC portion of the signal to be seen on a 50 Ω terminated scope. If equipment is available to measure the LVDS output with a respect to R4 or with a differential probe, then J8 and J9 can be replaced with 0 Ω resistors to keep the DC integrity of the output signal.

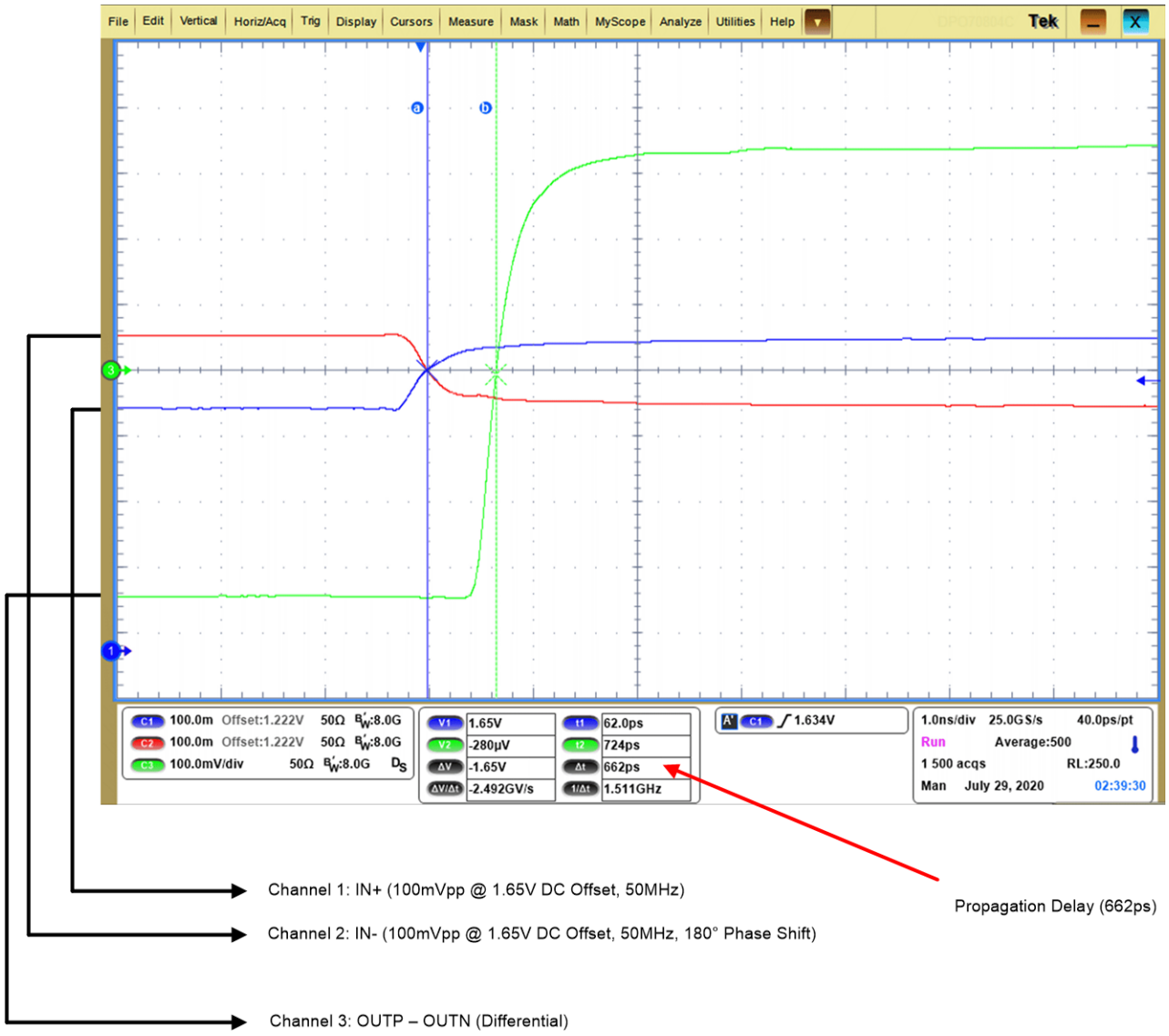

Figure 6-4. Differential Output of TLV3604EVM

7 Layout Guidelines

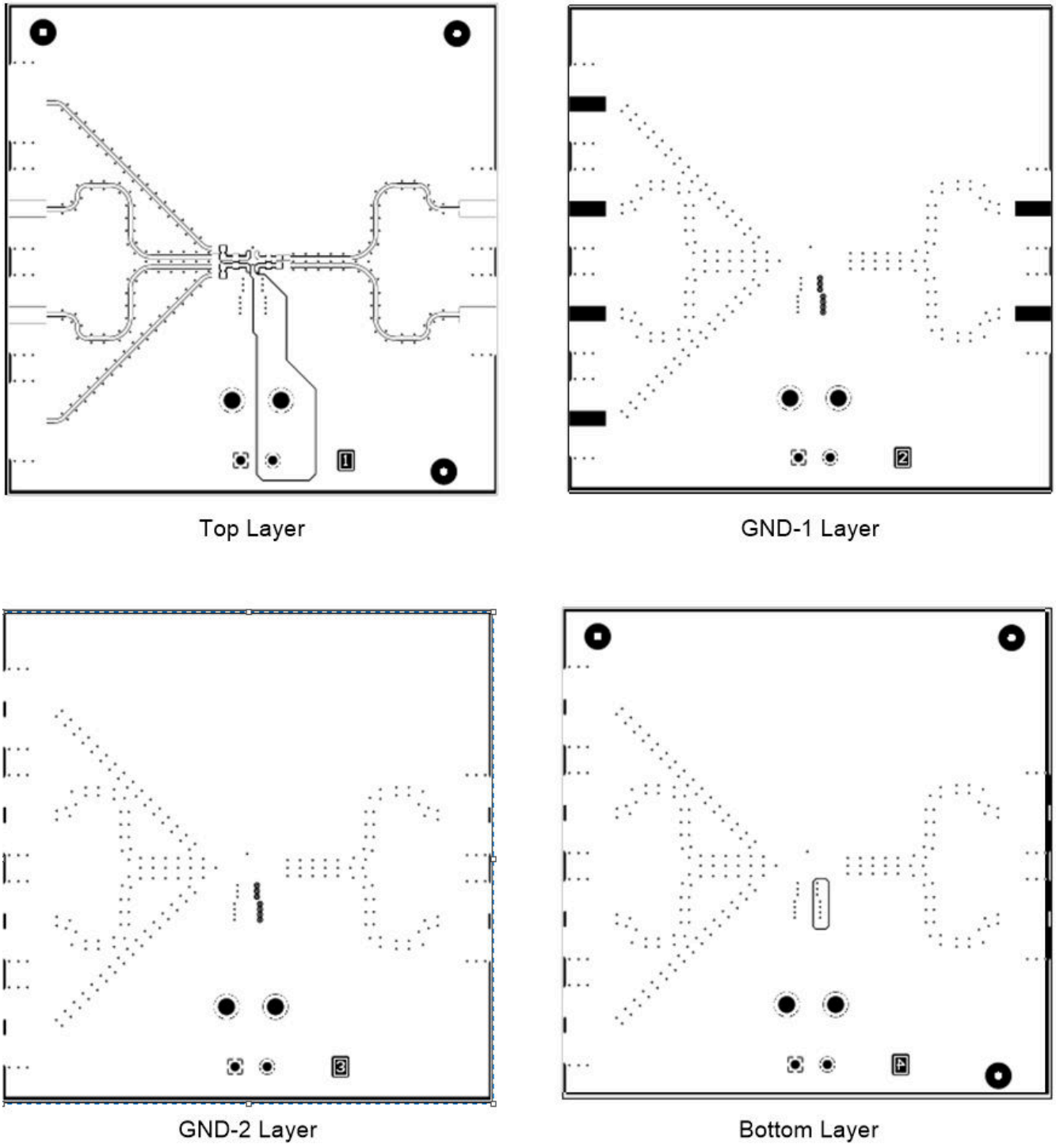

Figure 7-1. Layers

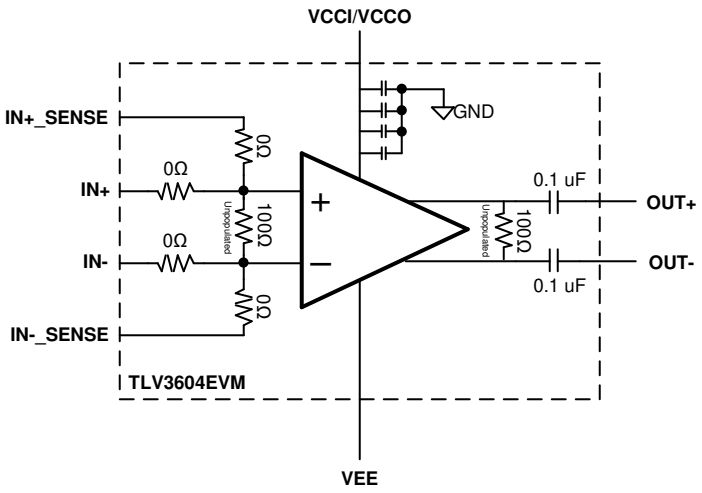

Figure 7-2. Block Diagram

8 Schematic

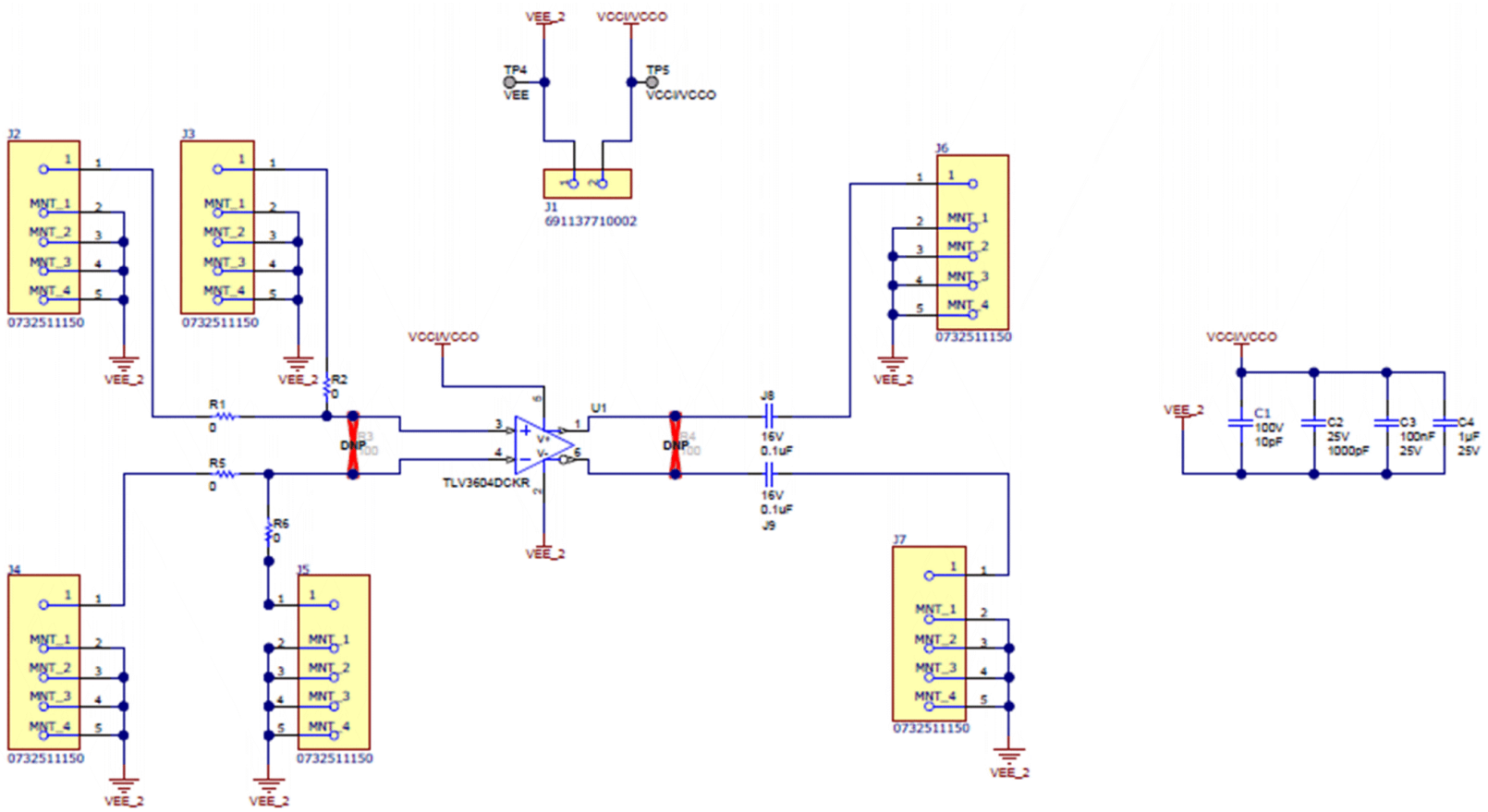

Figure 8-1. TLV3604 EVM Schematic

9 Bill of Materials

Table 9-1. BOM

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
C1	1		CAP 0402 10pF 5% C0G 100V 30ppm	0402 (1005M)	GRT1555C2A100JA02D	Murata
C2	1	1000pF	CAP, CERM, 1000 pF, 25 V,+/- 5%, C0G/NP0, 0402	0402	C0402C102J3GACTU	Kemet
C3	1	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 5%, X7R, 0603	0603	C0603C104J3RACTU	Kemet
C4	1	1uF	CAP, CERM, 1 uF, 25 V, +/- 10%, X7R, 0603	0603	C0603C105K3RACTU	Kemet
FID1, FID2, FID3, FID4, FID5, FID6	6		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
H3, H4, H7, H8	4		Bumpon, Cylindrical, 0.312 X 0.200, Black	Black Bumpon	SJ61A1	3M
J1	1		TERM BLK 2POS SIDE ENTRY 5MM PCB	HDR2	691137710002	Würth Elektronik
J2, J3, J4, J5, J6, J7	6		SMA Connector Receptacle, Female Socket 50Ohm Board Edge, End Launch Solder		0732511150	Molex Inc
J8, J9	2	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	0402	C0402C104K4RACAUTO	Kemet
R1, R2, R5, R6	4	0	RES, 0, 0%, 0.2 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0EDHP	Vishay-Dale
TP4, TP5	2		Terminal, Turret, TH, Triple	Keystone1598-2	1598-2	Keystone
U1	1		1ns High-Speed Comparator with LVDS Outputs, DCK0006A (SOT-SC70-6)	DCK0006A	TLV3604DCKR	Texas Instruments
R3, R4	0	100	RES, 100, 0.1%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	MCS0402MD1000BE100	Vishay/Beyschlag

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