User's Guide Latch-up Current Limiter (LCL) ZES744LCL EVM

Abstract

The User's Guide describe the operation of the Latch-up Current Limiter (LCL) ZES44LCL EVM evaluation module. It provides the detail how to setup, configure the Latch-up Current Limiter as designed to monitor the supply current into an electronics system, the LCL disconnects the power to the electronics system when the supply current exceeds a preconfigured threshold. This document applies only to the ZES744LCL EVM.

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1. Introduction

ZES744LCL EVM, Latchup Current Limiter (LCL) is designed based on ECSS-E-ST-20-20C, offering in current limiter switching of the power supply lines to COTS with operating input voltage of 10V to 60V with integrated power transistors that withstand up to 4A of output current, with very low quiescent current at 2mA.

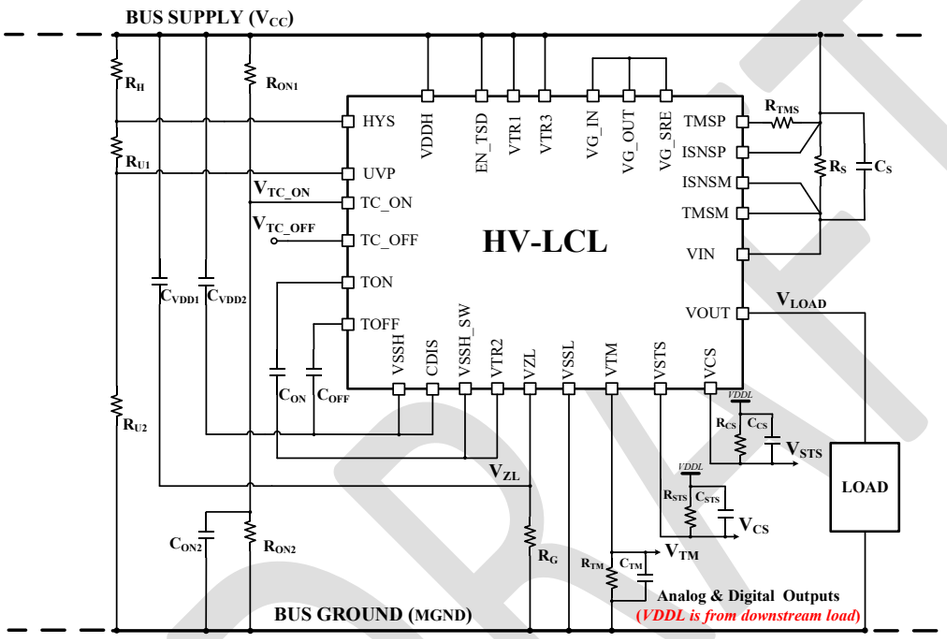
The control system embodies a unique Smart-monitor with two types of operations: Latched or Re-triggerable, with built-in Smart current limitation for repetitive overloads, with Embedded current sense and Digital status for system monitoring.

The ZES744LCL-ST EVM is equipped with the following featured,

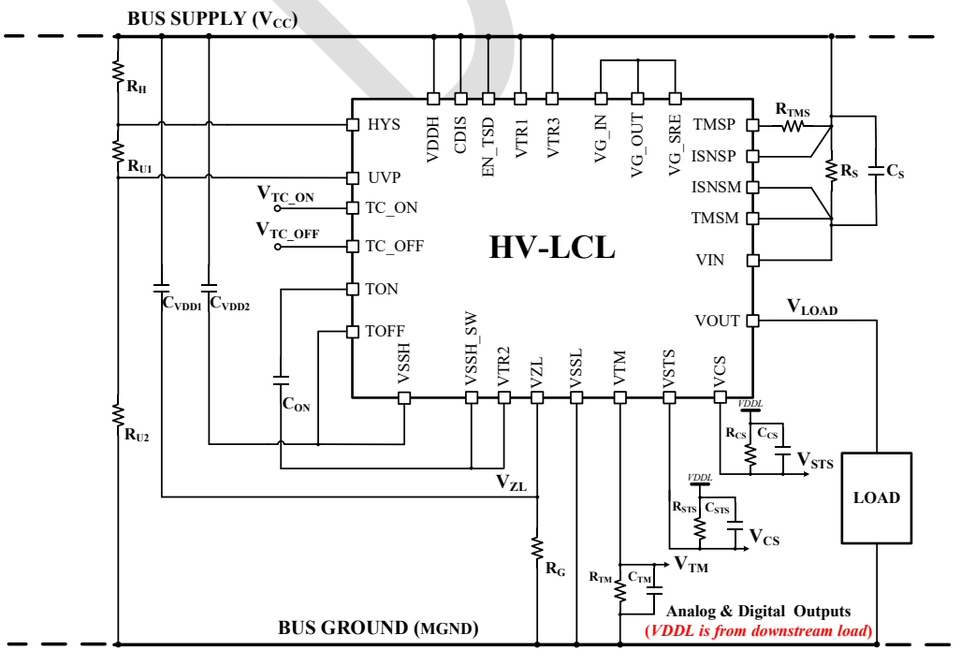
- Configurable trip-off and recovery times
- Configurable undervoltage protection
- Floating ground

2. Typical Application Circuit

2.1 RLCL Configuration (Re-triggerable Mode, 60V ⩾ VCC > 6.2V)



2.2 LCL Configuration (Re-triggerable Mode, 60V ⩾ VCC > 6.2V)



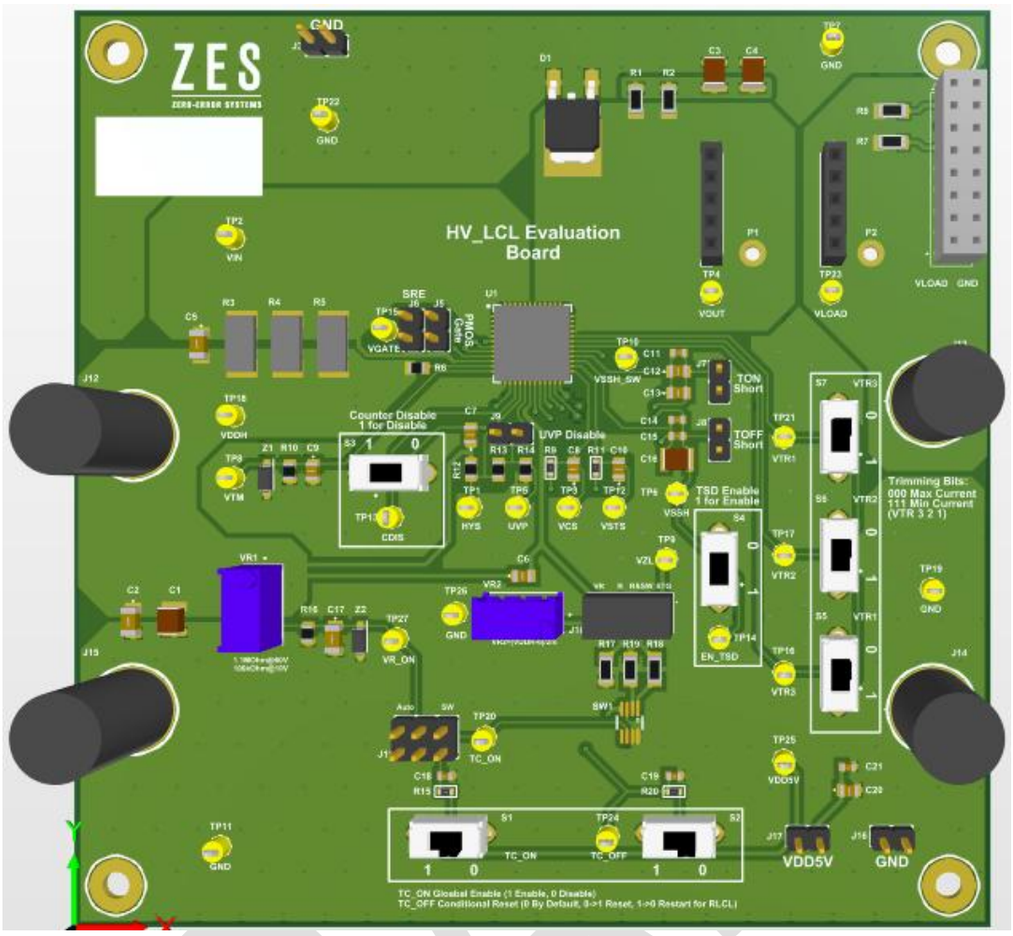
3. ZES744LCL-ST EVM Operational Range, T_A = 25 degC

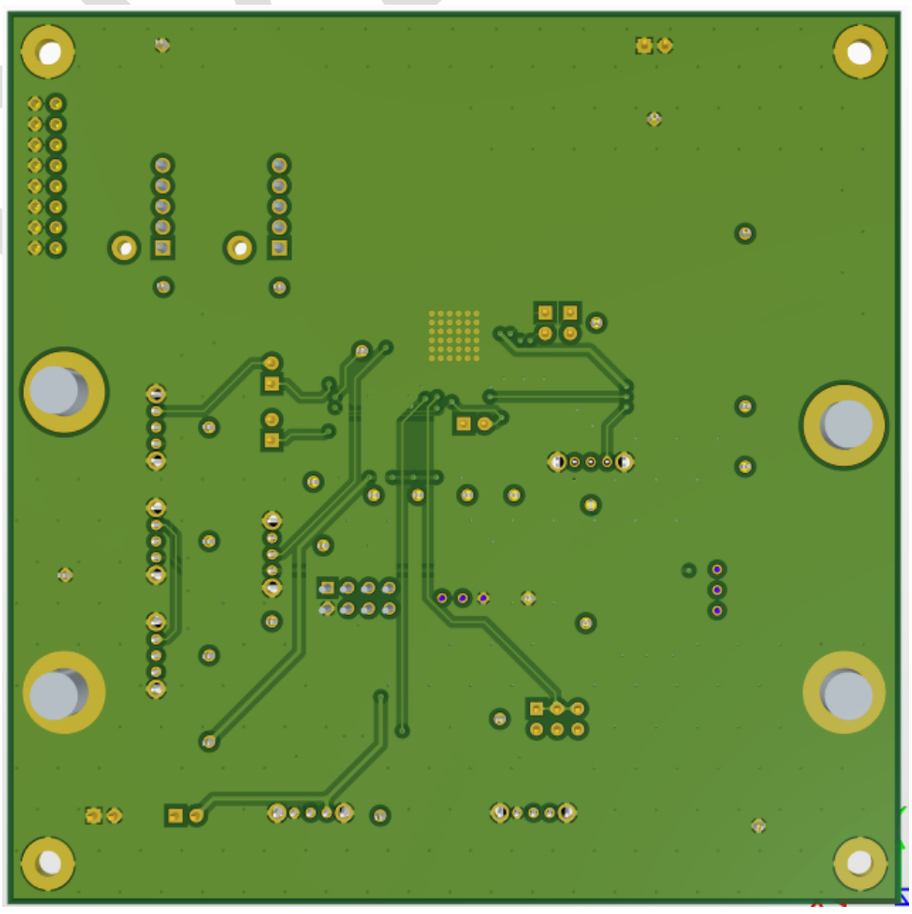
Specification	Test Conditions	Min	Typ	Max	Unit
Power Input Voltage (V_{DDH})		10.0		60.0	V
Input Voltage control circuit (V_{DD5V})			4.5	5.0	V
Output Voltage (V_{OUT})		10.0		60.0	V
Output current (I_{OUT})				4.0	A

Limitation Current (Trip Current) is defined by R_S with the following equation.

$$I_{limitation\ (Trip)} = \frac{100\times10^{-3}\ V}{R_S}\ A$$

4. ZES744LCL EVM Board (Top side and bottom side)



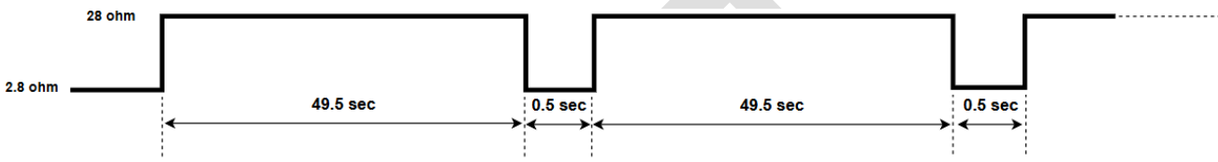


5. List of items Required

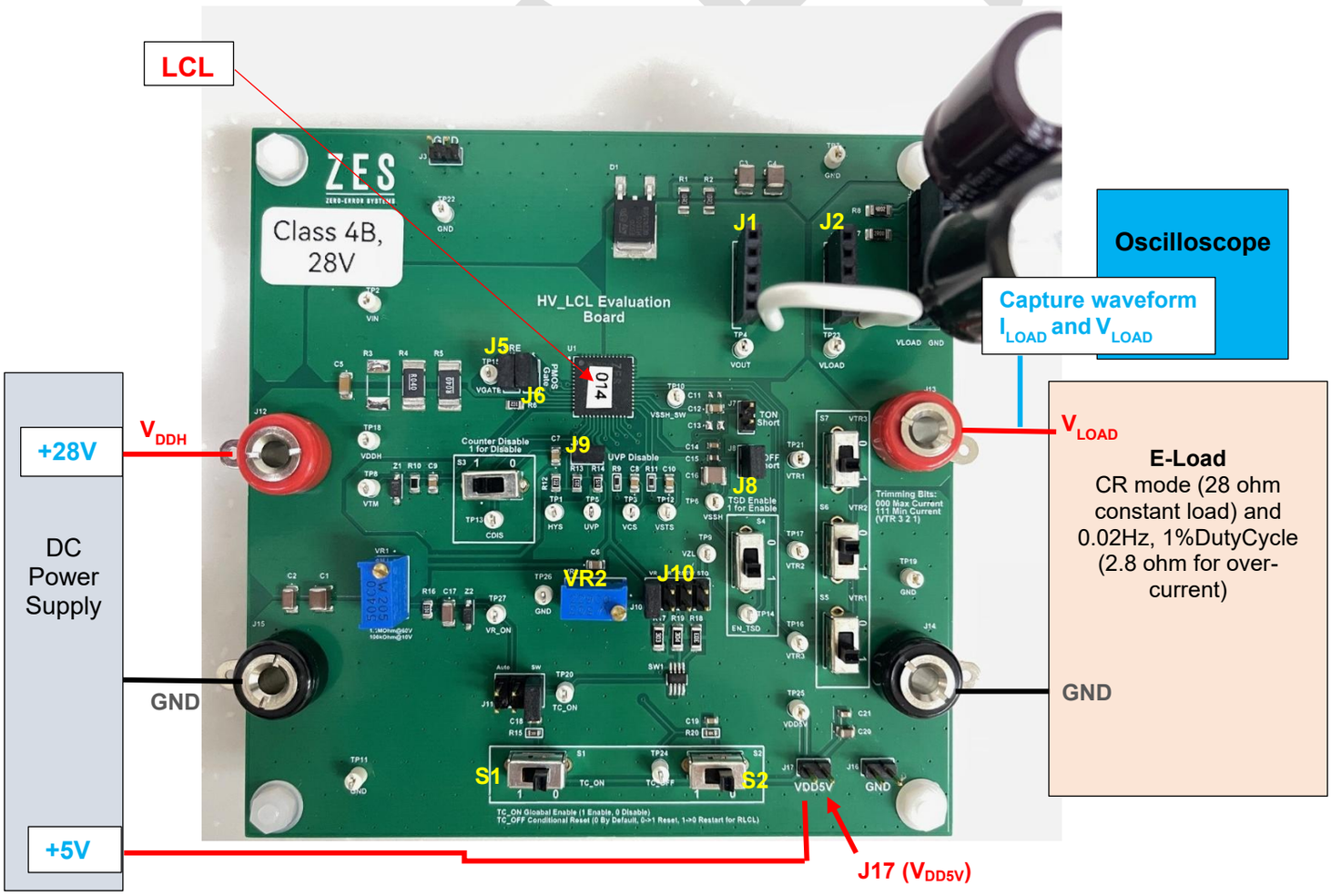
a. DC Power supply
b. Variable "constant resistance" Electronics-load(E-load)
c. Banana plugs cables
d. Oscilloscope
e. Current probe

6. ZES744LCL EVM (strictly for V_{DDH} = 28V only) Set-up connections

a. Ensure VR2 to 10.9k ohm.
b. Ensure there is shunt across J5, J6, J9, **J10 at VR** position.
c. Selection of J8: Shunt is Latched mode/ J8 shunt removed is Re-trigger mode.
d. Ensure switch S1 and S2 are at "0" position before turn on DC supply 28V to **V_{DDH}** and 5V to **V_{DD5V}**.
e. Connect banana cable from DC Power Supply to ZES744LCL EVM **V_{DDH}** and **V_{DD5V}** header-pin (J17).
f. Connect J1 and J2 with a thick wire or inductor as per require.
g. Connect banana cable from ZES744LCL EVM **V_{LOAD}** connector to Electronics load(E-load) constant resistance mode.
h. E-Load to configure to CR mode (28 ohm) at 0.02Hz, 1% (2.8 ohm) duty cycle as per below,



i. After turn on **V_{DDH}** and **V_{DD5V}** then set switch S1 to "1" position.

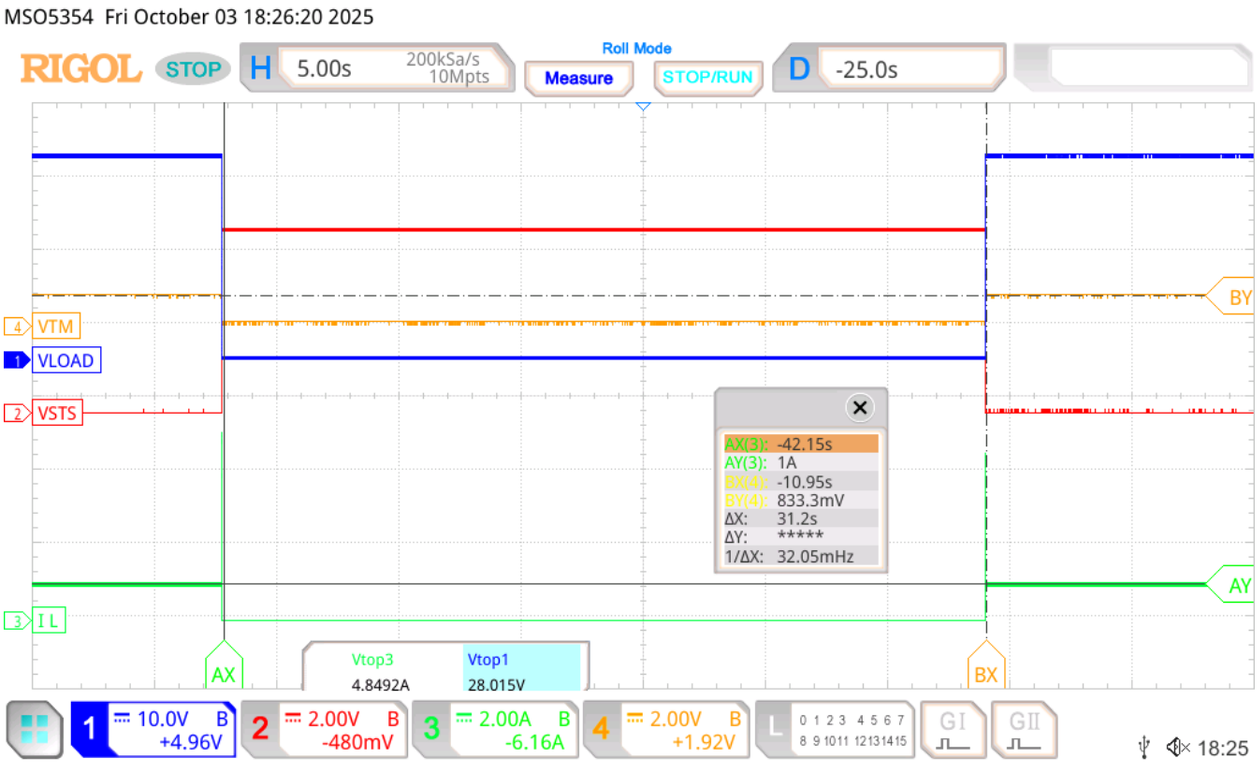


7. Set-up Procedure

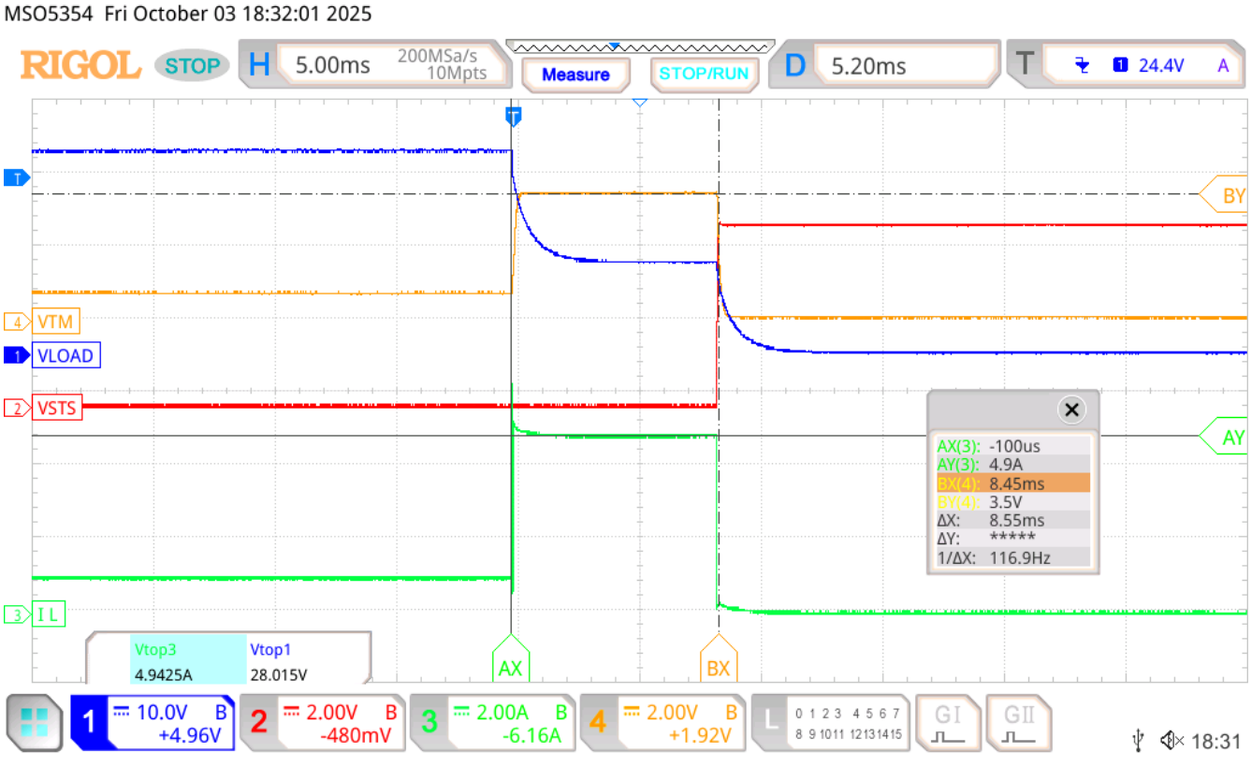
j. With above set-up connections, power on the DC Power supply 28V and 5V to ZES744LCL EVM **V_{DDH} and V_{DD5V}**.
k. Connect oscilloscope and E-load to **V_{LOAD}**, connector and monitor the output.

8. Measuring Output when Over-current

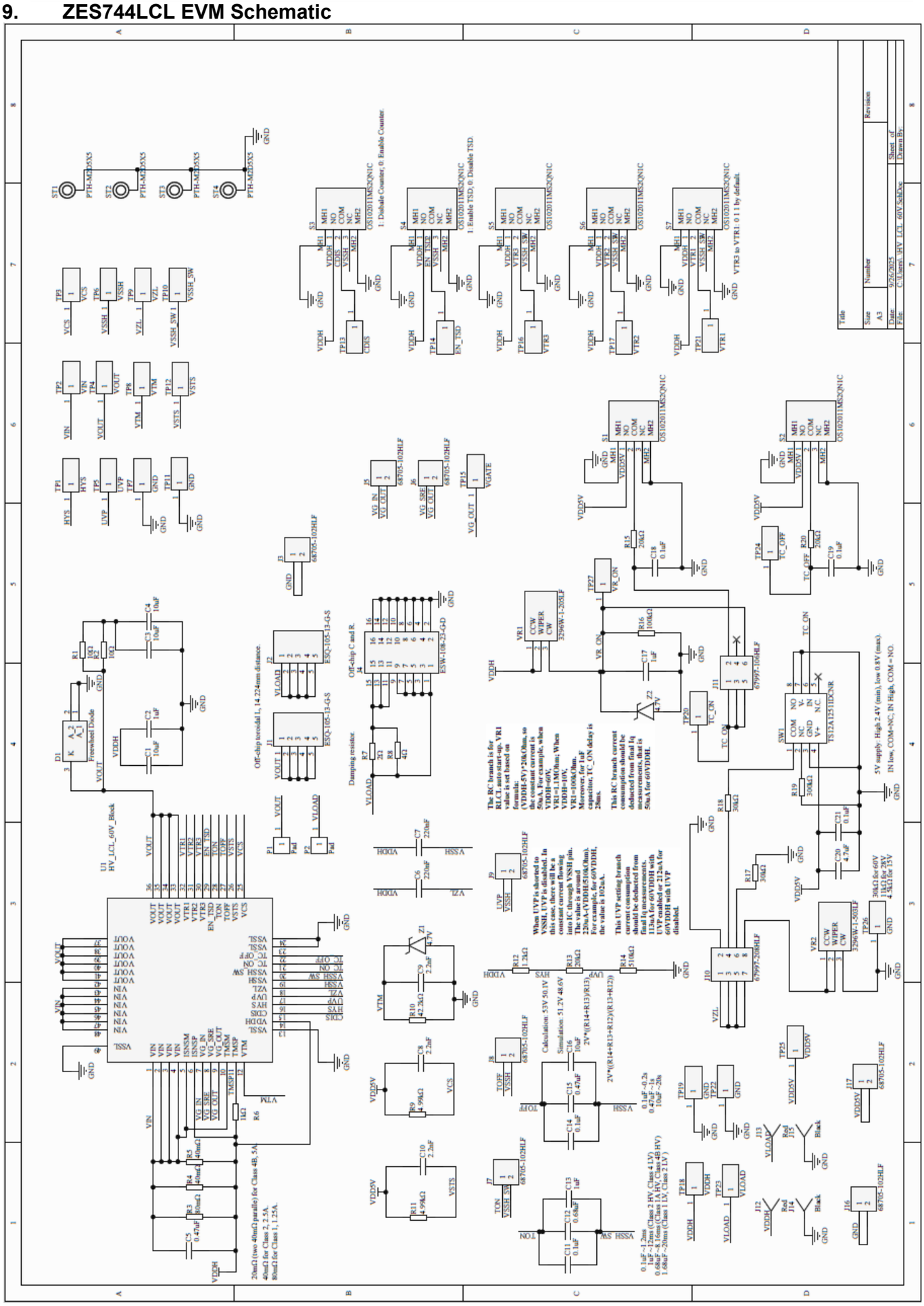
a. ZES744LCL EVM rev1.0 of the output waveforms below with oscilloscope V_{OUT}(Blue), I_{OUT}(Green), V_{CS}(Orange) and V_{STS}(Red).



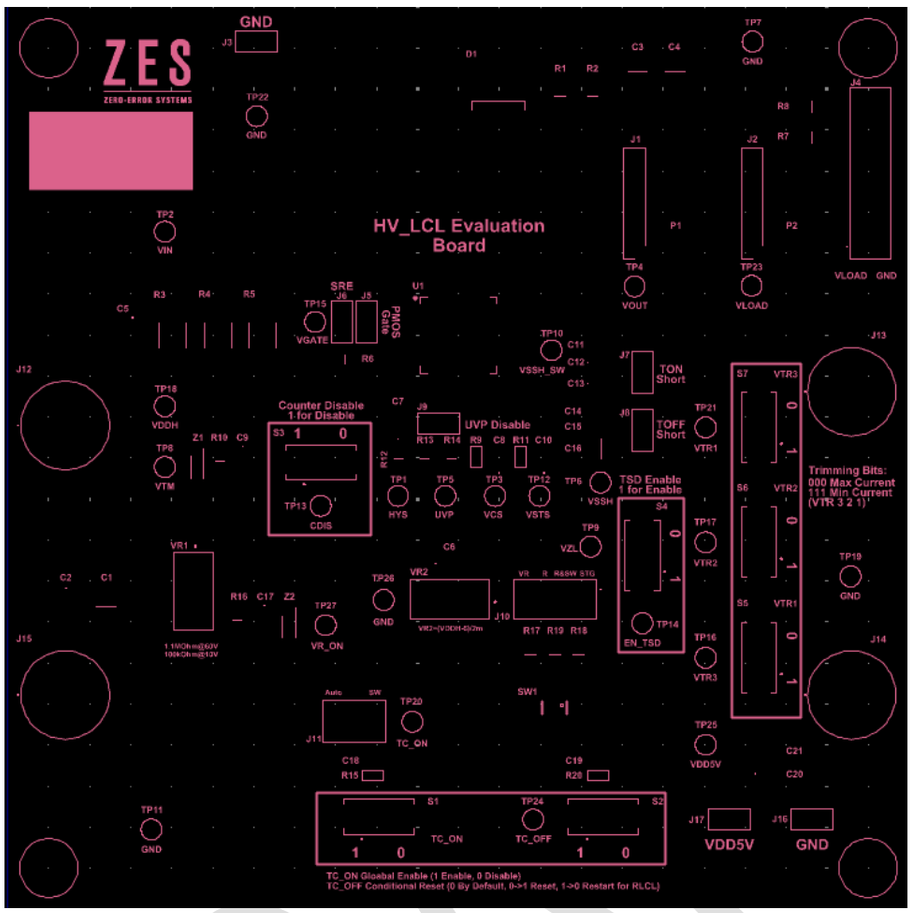
Zoom-in

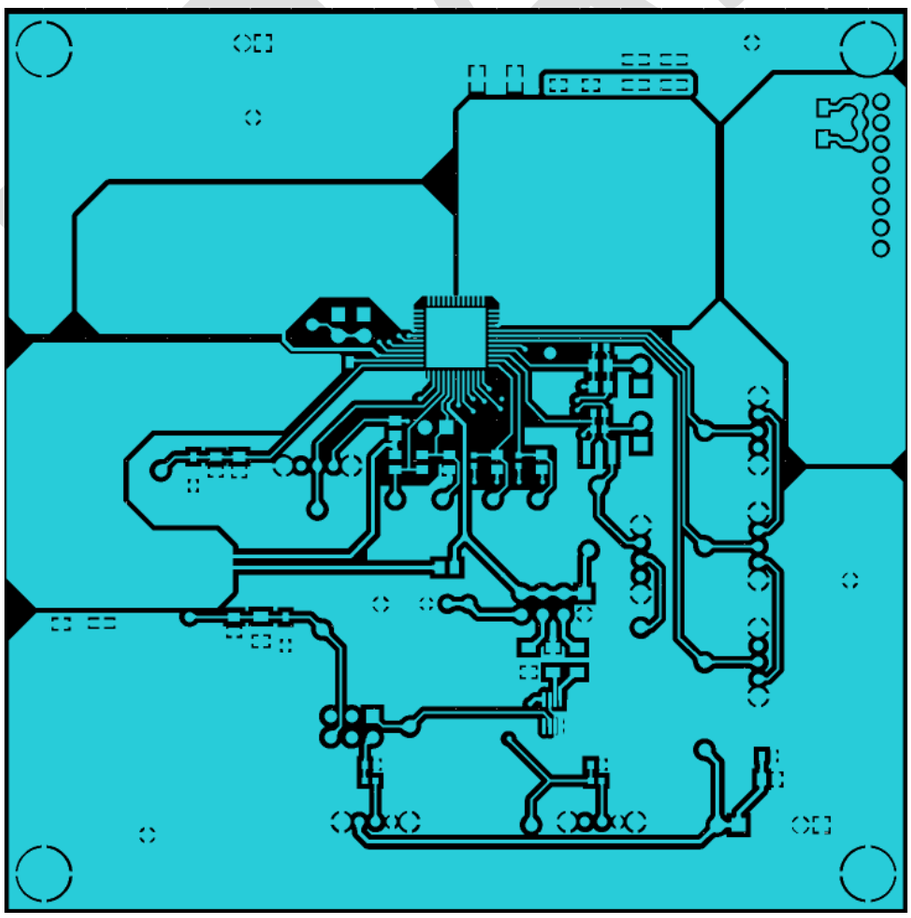


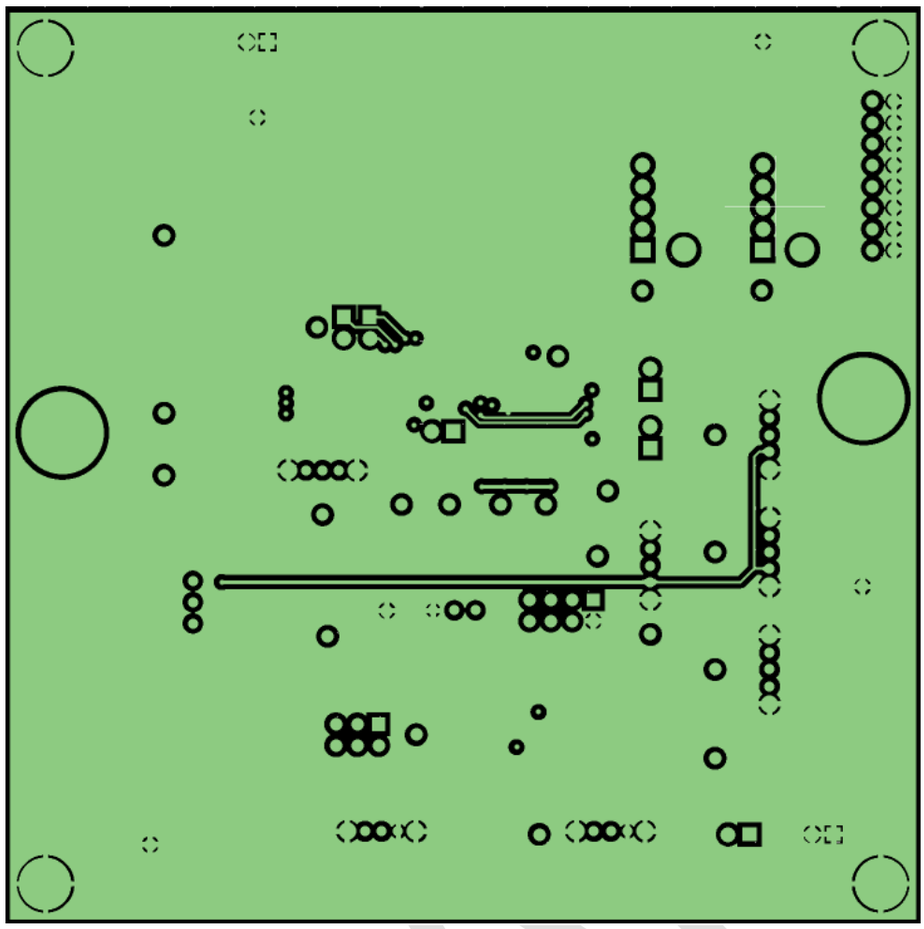
9. ZES744LCL EVM Schematic

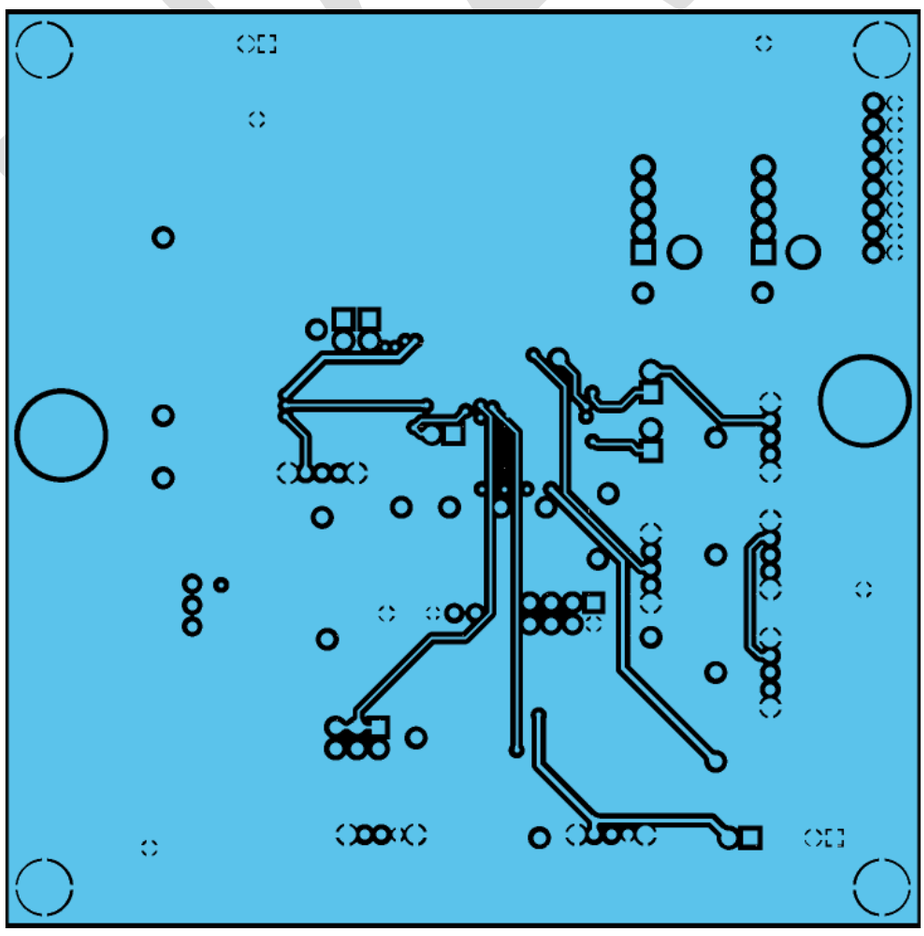


10. ZES744LCL EVM PCB layout









Appendix

Revision History

Revision No.	Notes	Date
Rev 1.0	Preliminary version	Sept, 2025

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