

AN-SL2001-02

- Laser TOF Measurement Systems
- LIDAR Array
- Range Finding
- 3D Mapping
- ADAS

Safety Warning

This device is capable of driving laser diodes to generate high power optical pulses. Such pulses are capable of causing PERMANENT VISION DAMAGE AND BLINDNESS as well as additional injury or property damage. Laser diodes emit light that may be outside of the users' visual range which can cause PERMANENT VISION DAMAGE AND BLINDNESS as well as additional injury or property damage. Users are fully responsible for following proper laser safety procedures to prevent injury or damage. We recommend the use of Laser Eye Safety Goggles for all testing.

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Board Pictures

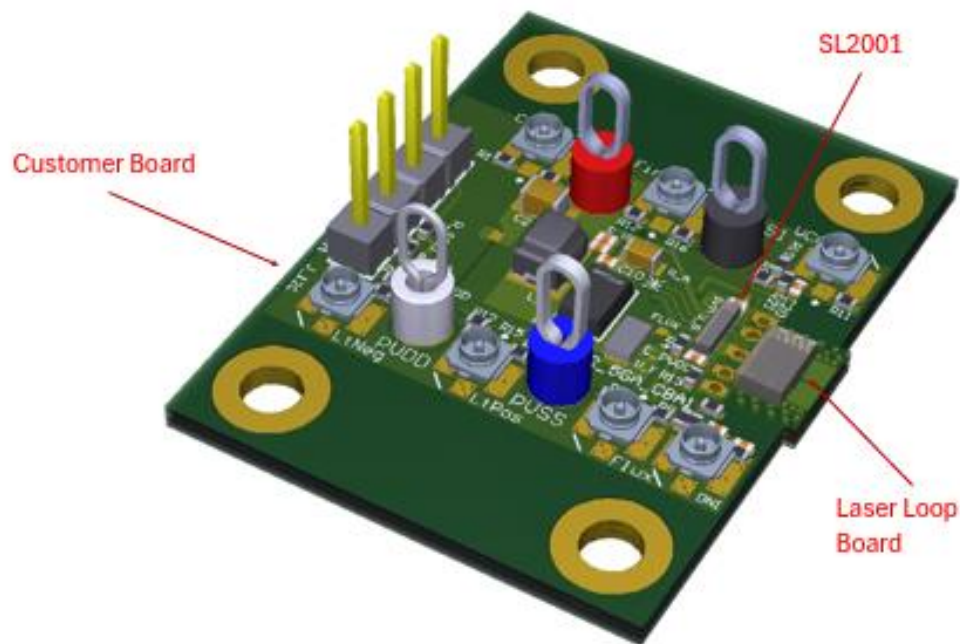


Figure 2. 3-D Picture of the Board

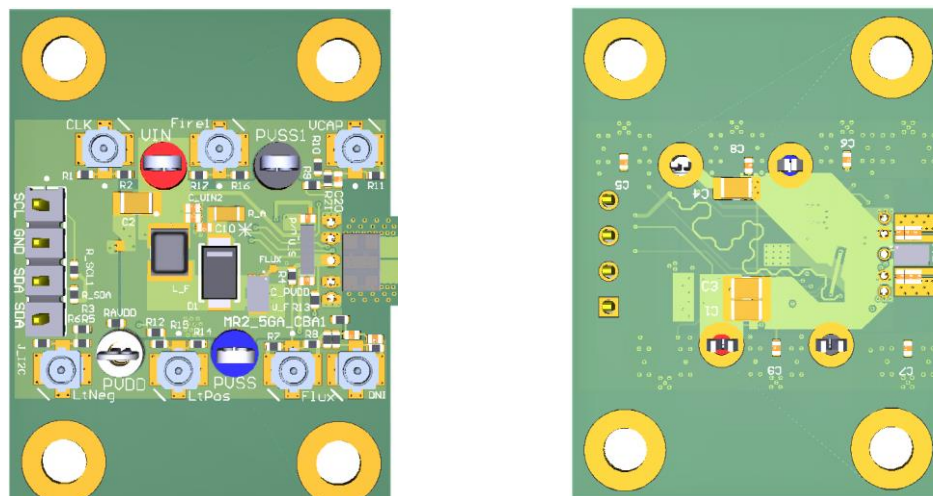
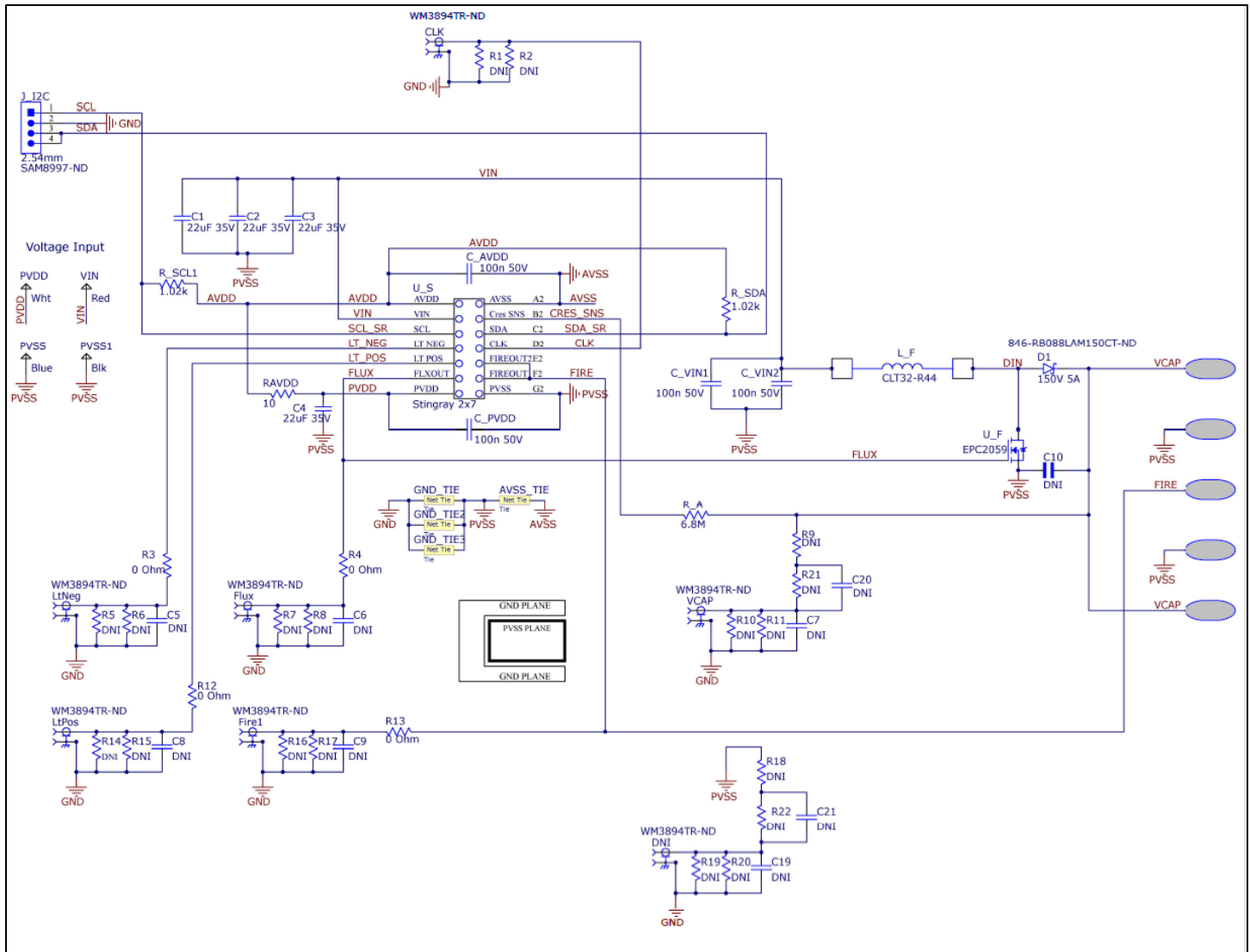


Figure 3. Top and Bottom View

Figures 4 and 5 show the schematics of the Customer Board and Laser Loop Board



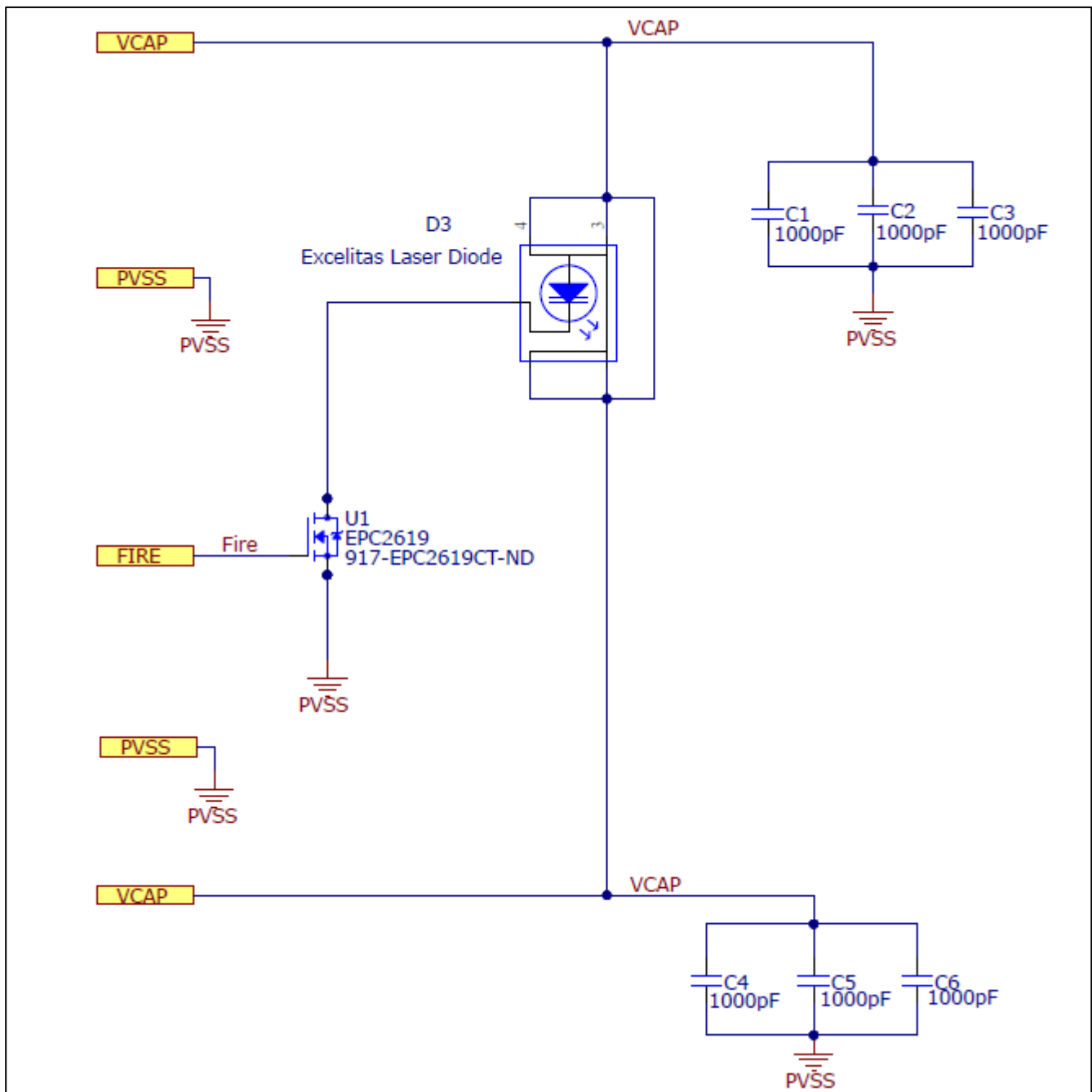


Figure 5: Schematic of the Laser Loop Board (M3)

Figures 6 and 7 show the layouts of the Customer Board (6 layers) and the Laser Loop Board (2-layers), respectively.

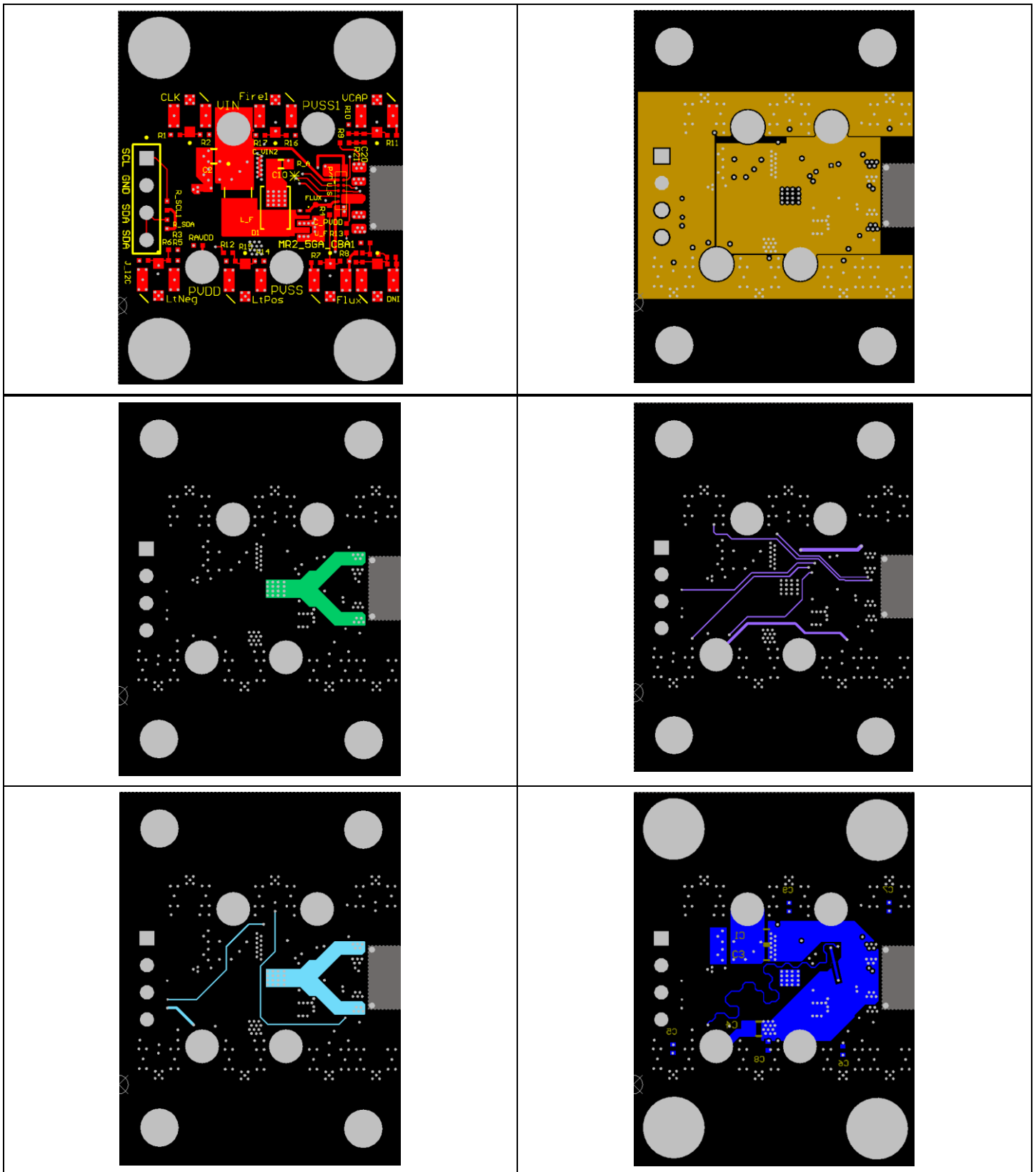


Figure 6: Layout of the customer board (6-layers)

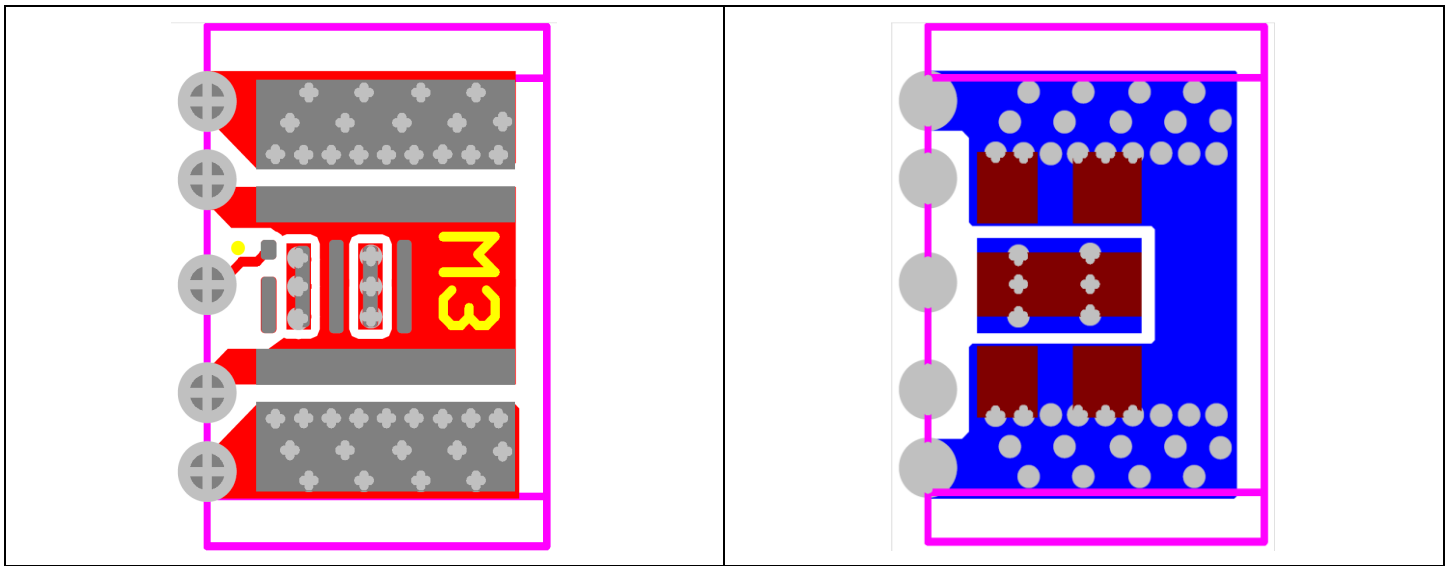


Figure 7: Layout of the Laser Loop Board (2-layers)

Bill of Materials (BOM)

MR2_5GA_CBA1 BOM				
Designator	Description	MFR P/N	MFR Name	Quantity
C1, C2, C3, C4	CAP CER 22UF 35V X5R 0805	C2012X5R1V22M125AC	TDK Corporation	4
CLK, Fire1, Flux, LtNeg, LtPos, VCAP, CATH	CONN UMC RCPT STR 50 OHM SMD	0734120114	Molex	7
C_AVDD, C_VIN1, C_VIN2	CAP CER 0.1UF 50V X7R 0402	C1005X7R1H104K050BB	TDK Corporation	3
C_PVDD	CAP CER 0.1UF 25V X5R 0201	02013D104KAT2A	Kyocera AVX	1
D1	DIODE SCHOTTKY 150V 5A PMDTM	RB088LAM150TR	Rohm Semiconductor	1
J_I2C	CONN HEADER VERT 4POS 2.54MM	TSW-104-07-F-S	Samtec Inc	1
L_F	440 nH Shielded Molded Inductor 10.1 A 7.6mOhm 4-SMD	CLT32-R44	EPCOS-TDK Electronics	1
VIN	PC TEST POINT MULTIPURPOSE RED	5010	Keystone Electronics	1
PVDD	PC TEST POINT MULTIPURPOSE WHITE	5012	Keystone Electronics	1
PVSS	PC TEST POINT MULTIPURPOSE BLUE	5127	Keystone Electronics	1
PVSS1	PC TEST POINT MULTIPURPOSE BLACK	5011	Keystone Electronics	1
RAVDD	RES 10 OHM 1% 1/16W 0402	RC0402FR-0710RL	Yageo	1
R_A	Thick Film Resistors - SMD 0603 6.8Mohm 1% Anti Surge AEC-Q200	ESR03EZPF6804	Rohm Semiconductor	1
R_SCL1, R_SDA	RES 1K OHM 5% 1/16W 0402	RC0402JR-071KL	Yageo	2
R3, R4, R9, R12, R13, R18, R21, R22	RES 0 OHM JUMPER 1/16W 0402	RC0402JR-070RL	Yageo	8
U_F	TRANS GAN 170V DIE .009OHM	EPC2059	EPC	1
U_S	Integrated Resonant Mode Laser Diode Drive System	SL2001	Silanna	1
C5, C6, C7, C8, C9, C19, C20, C21		DNI		0
C10		DNI		0
R1, R2, R5, R6, R7, R8, R10, R11, R14, R15, R16, R17, R19, R20		DNI		0
M3 Laser Loop Board BOM				
Designator	Description	MFR P/N	MFR Name	Quantity
C1, C2, C3, C4, C5, C6	CAP CER 1000PF 100V C0G/NP0 0402	GRM1555C2A102GE01D	Murata Electronics	6
U1	TRANS GAN 100V .0042 OHM 6LGA	EPC2619	EPC	1
D3	905nm 1x4 SMD Pulsed Laser Diode Array	TPGAD1S11A-4A	Excelitas	1

Table 2: Bill of Materials

Test Setup

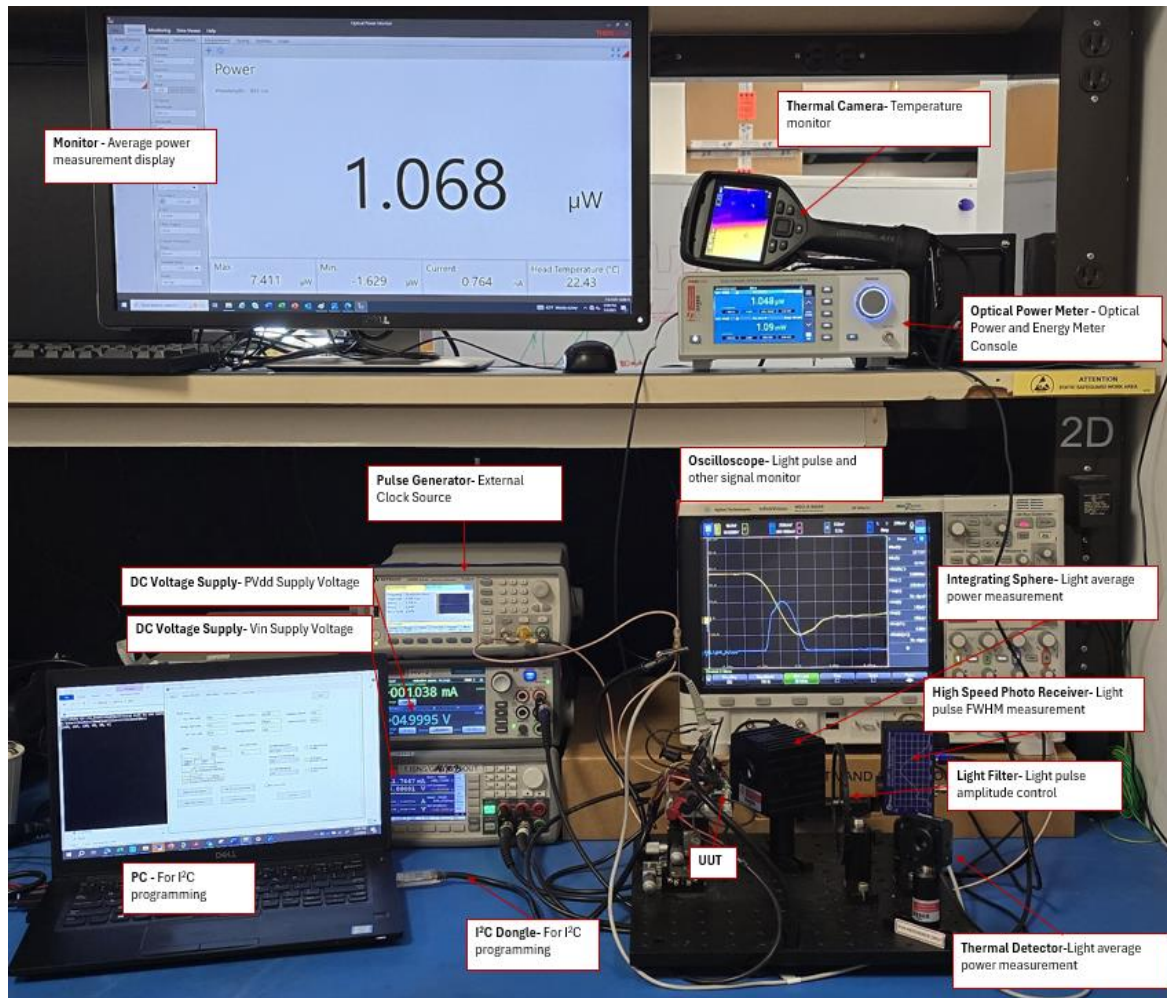


Figure 8. Test Set-up

Equipment	Description/Model/Setting
Oscilloscope	Agilent Technologies MSO-x 6004 Data Acquisition Setting: Averaging 1024 ; 6GHz ; 10.0Gsa/s
Oscilloscope Probe	Agilent N2894A
Optical Power Meter	Thorlabs PM5020
Integrating Sphere	Thorlabs S142C
Optical Receiver	iCHaus iC212NST High-Speed Photo Receiver
Pulse Generator	Keysight 33500B Series Wave Generator
DC Voltage Supply, Vin	Keysight B2912A Precision Source/Measure Unit
DC Voltage Supply, Vdd	Agilent 6613C System DC Power Supply

Table 3: List of Equipment Used

Performance Data

This section provides details about the GUI settings and the corresponding Test Results from the evaluation board. This section is divided into two sub-sections. The first section provides the performance data for the default settings that are stored in the MTP registers of the IC, and the second section provides the performance data for the optimized settings of this particular type of evaluation board.

Performance Data using Default Settings

The SL2001 on this evaluation board is preprogrammed with MTP (multi-time programmable) memory that is common to all evaluation boards. Below is the performance data from the board with the default timing setting at 5V input voltage.

Test Condition	
Vin	5.00 V
Clock	10KHz
Vdd	5.00 V
Test Data	
PlightPeak	399.6W
FWHM	4.3 ns
chrgr η	69.3%
Total Elec η	25.6%
Total Light η	6.8%
Total Pdis	247 mW

Table 4: Summary of Test Result (Default Setting)

I2C Communicator

Setup RES Load Calculator Timing Calibration Multi Comm NVM Comm Fault Config

Save

Timing Setup

Flux Time code: 0xe5 Estimated TFlux(ns) = 904.74 Estimated I Peak(A) = 10.281

Charge Time code: 0xe0 Estimated TCharge(ns) = 799.893 Estimated Vcap(V) = 88.184

Fire Time code: 0x78 Estimated TFire(ns) = 3.692 Laser Loop Component V rating(V) = 100

Vin(V): 5

Fluxing Inductor(nH): 440

Cres Value (nF): 6

Flux Ref Voltage(V): Vin5Vrange

Charge Ref Voltage(V): 1.25

Fire Ref Voltage(V): 1.25

2x TFlux generator current

2x TCharge generator current

2x TFire generator current

Read from last session

set Tfire by system input

Read from registers

WriteI2C

☐ Duty Cycle mode

Figure 8: Timing Calibration Initial Readout

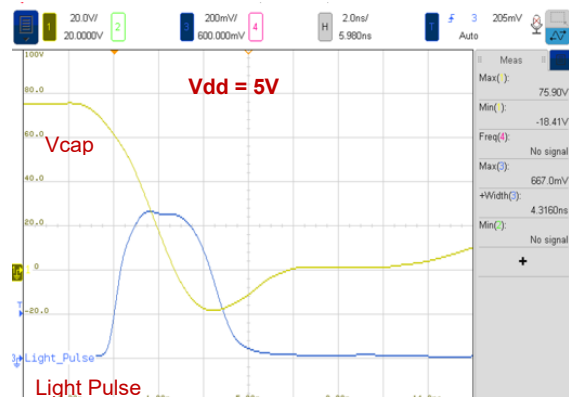


Figure 9: Vcap and Light Pulse Curve (Default)

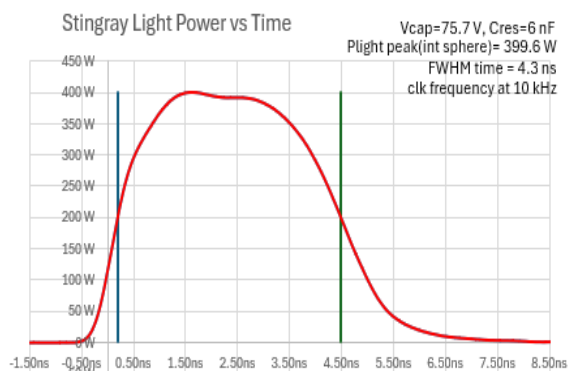


Figure 10: Light Peak Power vs Time Curve (Default)

Performance Data using Optimized Setting for 400W Peak Power with 3ns FWHM Light Pulse

SL2001 GUI can be used to program the settings to achieve 400W Light peak power with 3ns FWHM pulse. Refer to AN-SL2001-01 (GUI) Application Note on how to use the I2C GUI. Below is the optimized data at different Vin conditions.

NOTE: While all settings of the SL2001 can be changed during operation, care must be taken to not accidentally apply damaging voltages to the board components; therefore, we recommend that the external clock input to the evaluation board be paused prior to changing the Flux Time Code and/or Vin voltage (for example, changing from Vin = 5V settings to Vin = 12V settings). We recommend that the clock is paused, then the Flux Time Code is changed, and the Vin voltage is changed. Only after then, the external clock input to the board is restarted.

Test Condition				
Vdd	5.50 V			
Clock	10KHz			
* Fire Pulse width	2.9 ns			
Test Data				
Vin	5V	3.25 V	12.00 V	24.00 V
**Vcap before Firing	80.00 V	70.00 V	80.00 V	80.00 V
PlightPeak	467.2 W	464.7 W	468.9 W	466.8 W
FWHM	2.6 ns	2.4 ns	2.6 ns	2.7 ns
chrgr η	67.80%	65.60%	68.70%	54.00%
Total Elec η	20.60%	22.50%	21.50%	22.00%
Total Light η	5.20%	5.60%	5.60%	5.80%
Total Pdis	278.0 mW	228.00 mW	264.00 mW	258.00 mW

* Fire Pulse width is trimmed via I2C

** Desired Vcap before firing is achieved by trimming Flux Pulse width via I2C and slightly adjusting Vin

Table 5: Test Data Summary 400W

Before making any changes to the pulse width settings, it is recommended to set the fault thresholds by setting the Fault Config sheet in the GUI as shown in Figure 11 below.

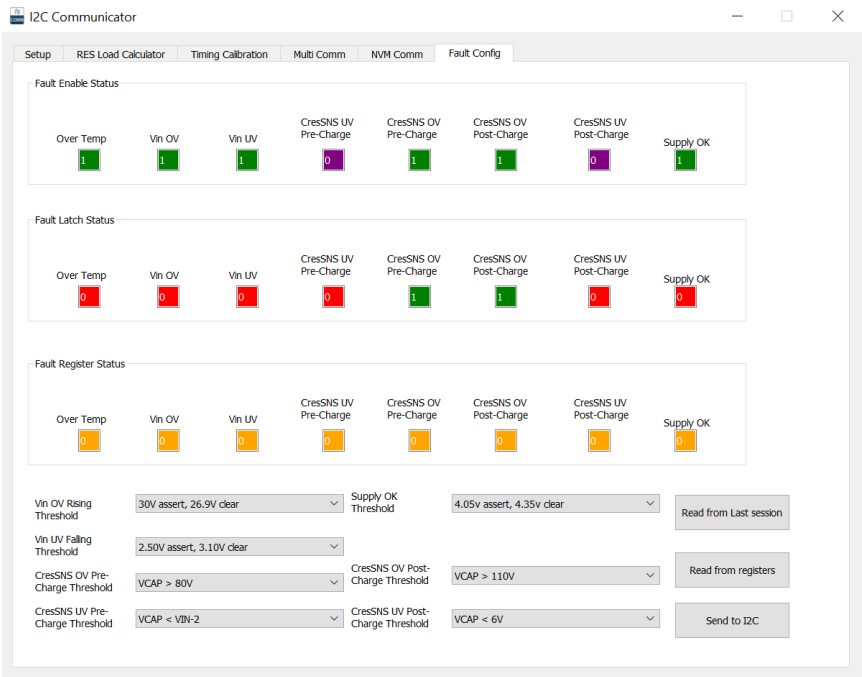


Figure 11: Fault Config Set-up

Vin = 5V

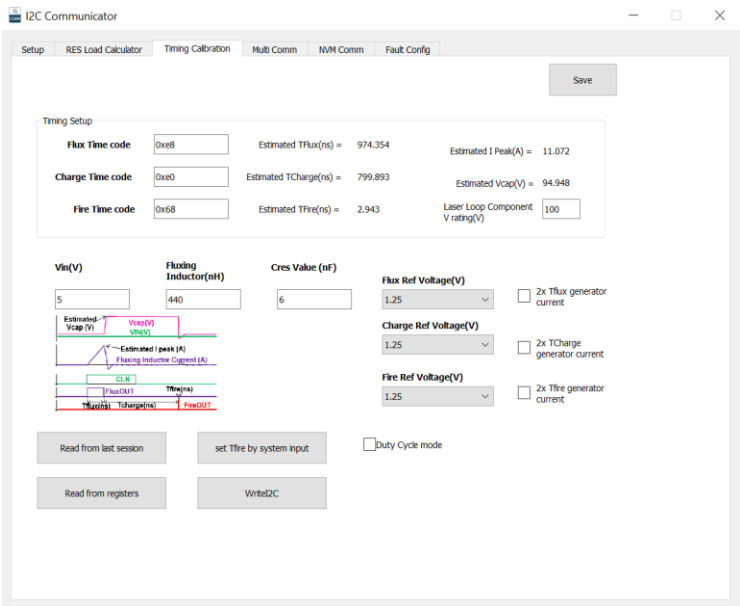


Figure 12: Timing Calib Setting 5V Vin and 400W Peak Power

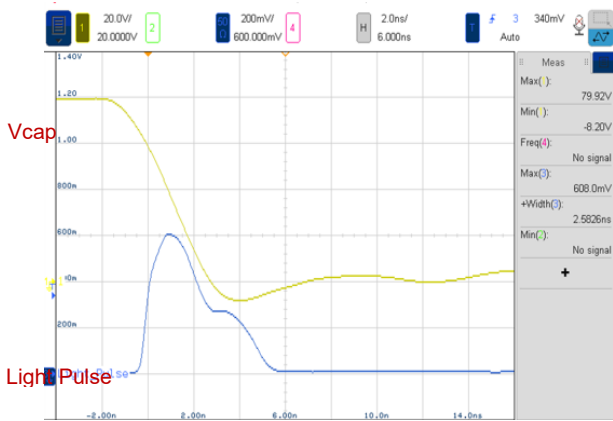


Figure 13: Vcap and Light Pulse (5V Vin and 400W)

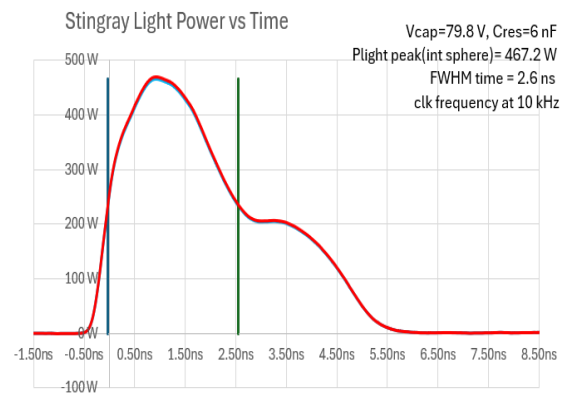


Figure 14: Peak Power vs Time (5V Vin/ 400W)

Vin = 3.25V

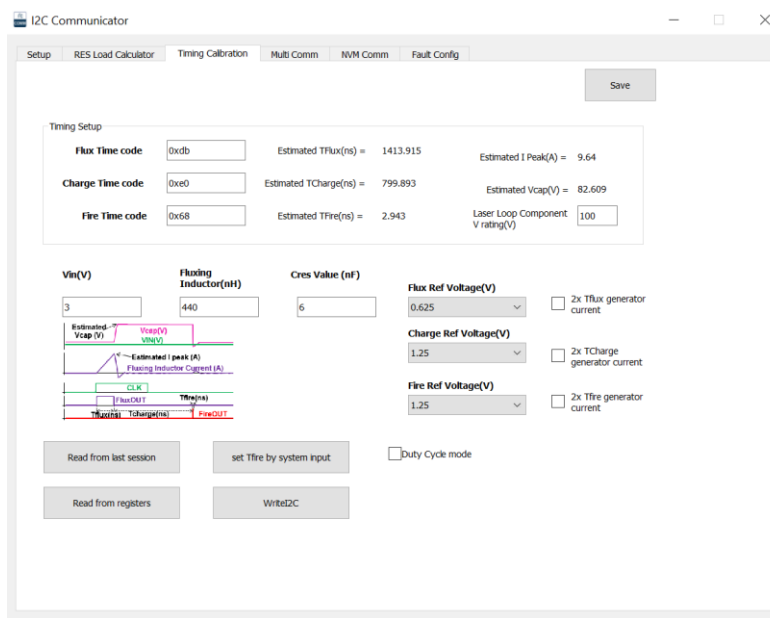


Figure 15: Timing Calib Setting 3.25V Vin and 400W Peak Power

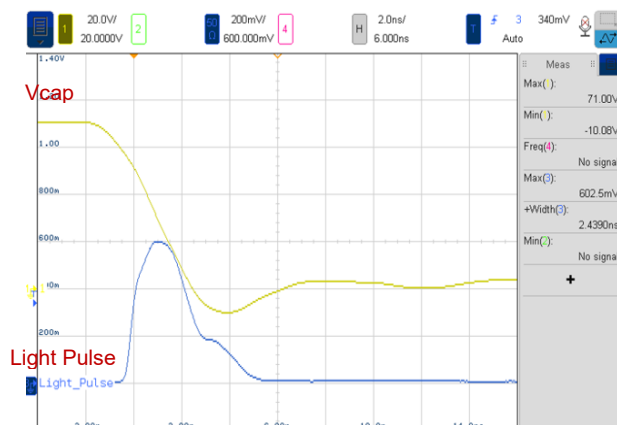


Figure 16: Vcap and Light Pulse (3V Vin and 400W)

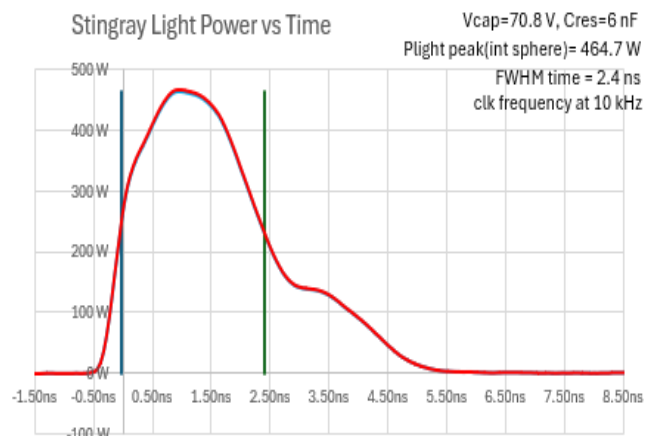


Figure 17: Peak Power vs Time (3V Vin/ 400W)

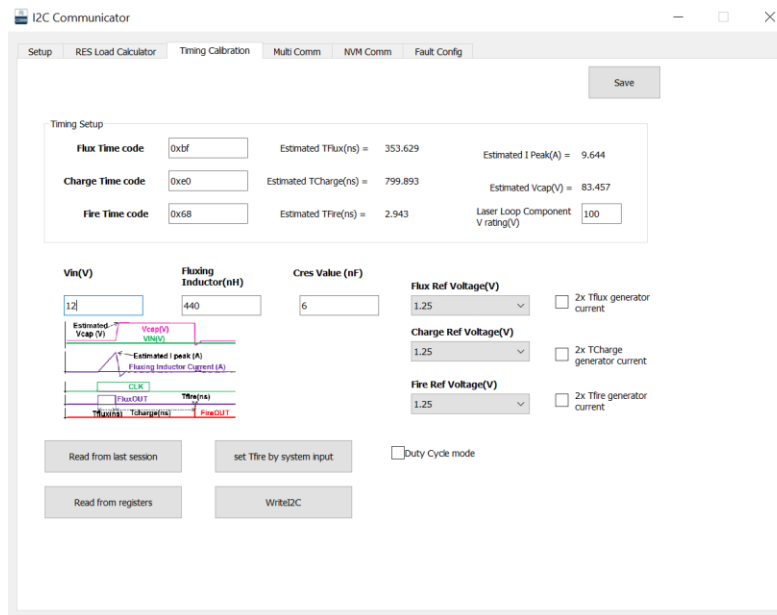
$V_{in} = 12.0V$


Figure 18: Timing Calib Setting 12V Vin and 400W Peak Power

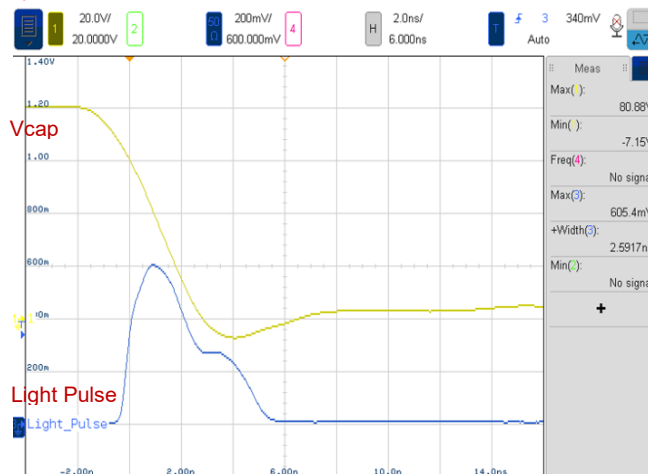


Figure 19: Vcap and Light Pulse (12V Vin and 400W)

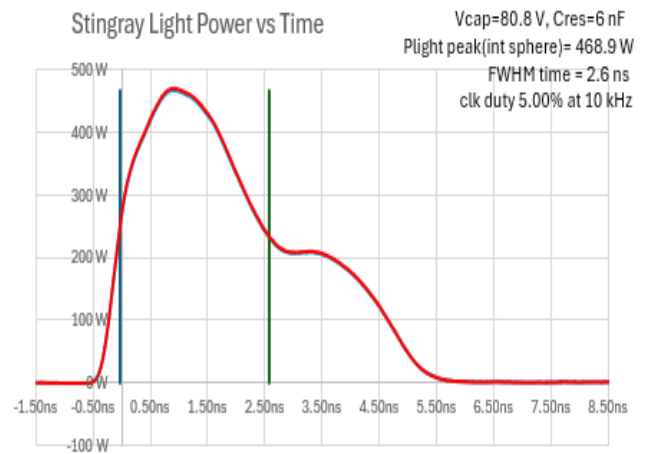


Figure 20: Peak Power vs Time (12V Vin/ 400W)

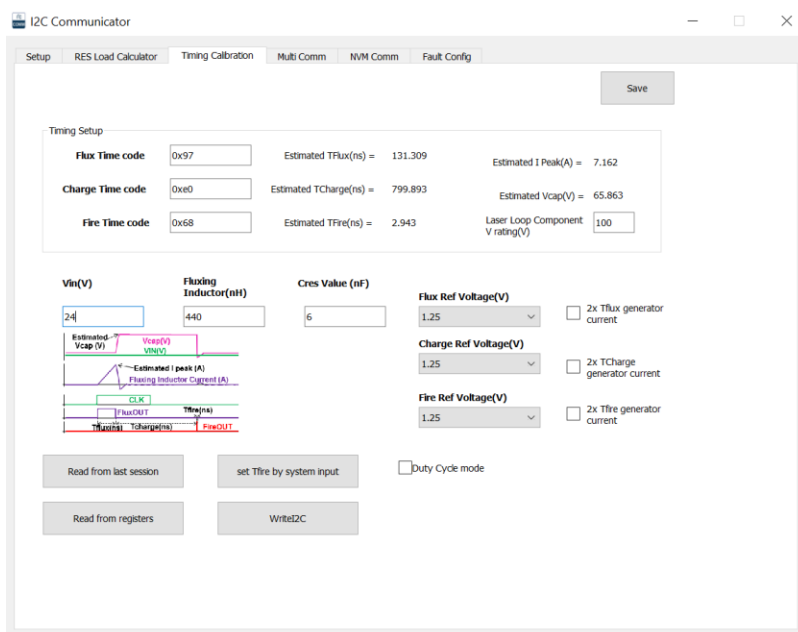
$V_{in} = 24.0V$


Figure 21: Timing Calib Setting 24V Vin and 400W Peak Power

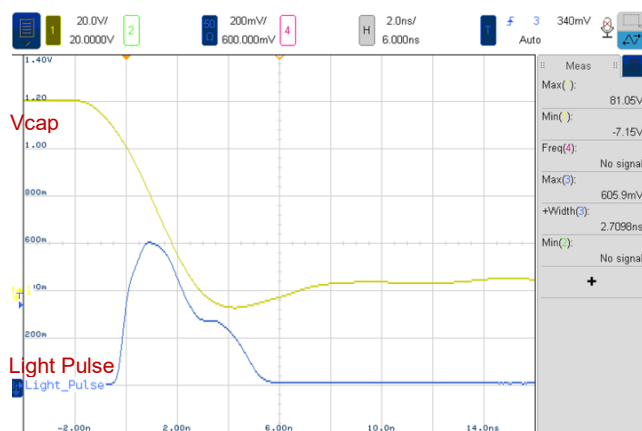


Figure 22: Vcap and Light Pulse (24V Vin and 400W)

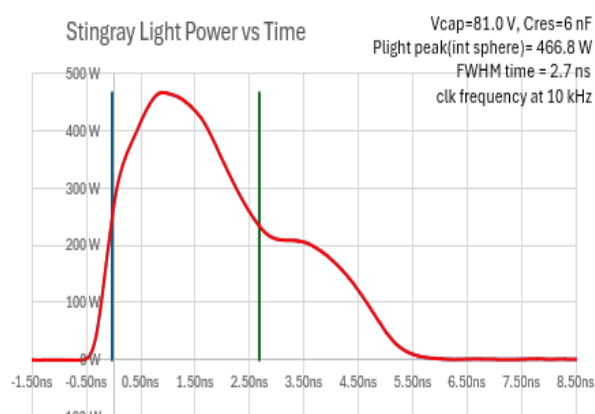


Figure 23: Peak Power vs Time (24V Vin/ 400W)

Summary and Conclusions

This application note provides detailed description of the 400W EEL Load Evaluation Board using SL2001, including the test results for various GUI settings. Silanna's Application and Marketing team would encourage the customers to go through this Application Note and try duplicating at least some of the tests shown here, to ensure the board is functioning properly. This will also familiarize the user with the evaluation board hardware and the GUI software. In case of any questions or concerns, please contact Silanna Semiconductor's Application team (bcabico@silanna.com).

Revision History

Revision	Date	Author	Note
0.1	21 Mar 2025	BGC	Draft release.
1.0	26 Aug 2025	BGC/ AZ	Updated Board Pictures (Fig 2 and 3) to reflect latest Customer board MR2_5GA_CBA1 Updated Schematics and Layout (Fig 4 and Fig 6) to reflect latest Customer Board MR2_5GA_CBA1 Updated Bill of Materials Updated Test Setup (Fig 8) Updated Performance Data Section Added Summary and Conclusions Document Control Release