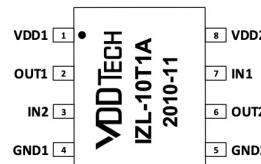


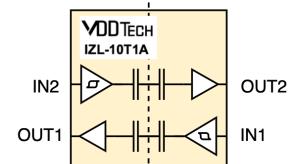
## DIGITAL ISOLATOR EVALUATION BOARD EVB-IZL10T1A

### FEATURES

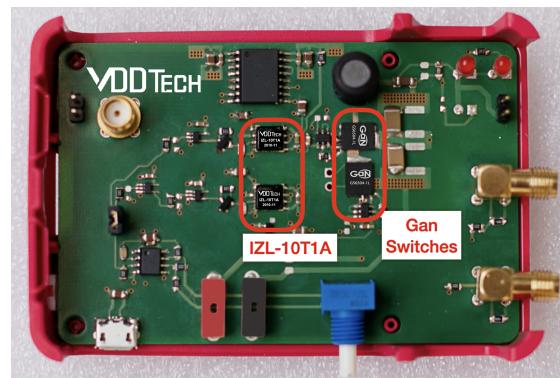
- VDDTECH's IZL-10T1A digital isolator
- 500V to 5V open-loop buck
- Features 650V-3.5A fast GanS switches (GS-065-004-1-L)
- 5V Powered from USB port
- High Voltage (500V) Powered from 2mm jacks
- Buck duty-cycle trim from the Potentiometer
- Digital isolator signals monitoring on RF connectors
- Status LED for output voltage



(a) Digital isolator pinout

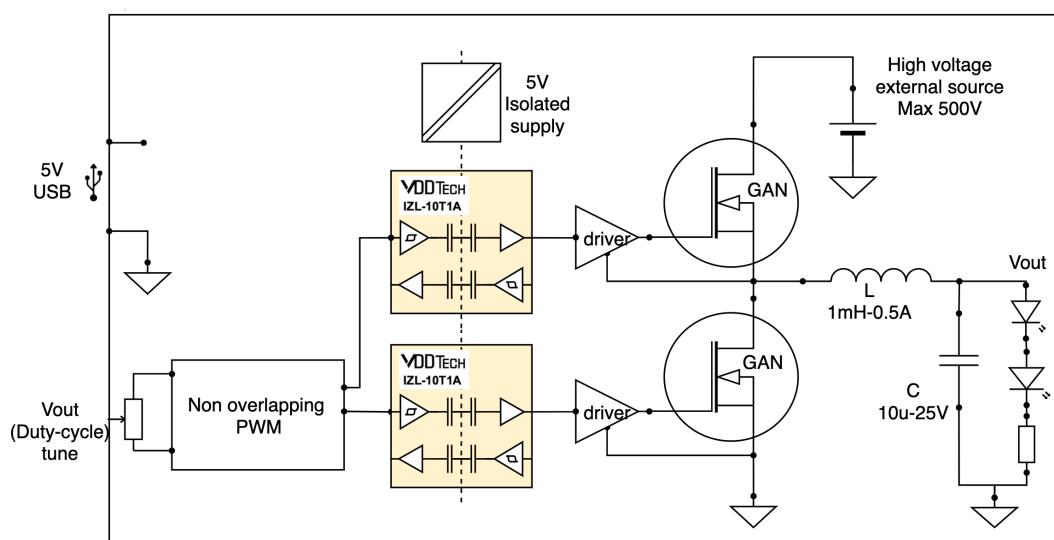


(b) Digital isolator symbol



### DESCRIPTION

The EVB-IZL10T1A Evaluation Board is an open loop Buck converter designed to demonstrate VDDTECH's EVB-IZL10T1A digital isolator capability in terms of CMTI. This Buck converter features state of the art GAN 650V switches which are controlled through VDDTECH's digital isolators.



## VDDTECH'S EVB-IZL10T1A OVERVIEW

Figures 1 and 2 provide an illustration of respectively the pinout and the symbol view of the EVB-IZL10T1A.

The EVB-IZL10T1A is a dual-channel digital isolator. This device has 1 forward and 1 reverse channel. The isolator is based on the integrated VDDTECH's double capacitive isolation barrier, providing galvanic isolation up to 3000 Vpk and sustaining more than 200kV/ $\mu$ s transient immunity. The internal proprietary modulation technique combined with the small isolation capacitance (200fF per channel) provide fast operation (up to 40Mb/s), reduce EMI and self-correct the output state within 250ns in case of corrupted data, always ensuring the proper DC level of the output.

The EVB-IZL10T1A features a protection which prevents the output to accidentally toggle if a fast DVDT event (faster than 1KV/ $\mu$ sec) occurs. It means that if the input data toggle while a fast DVDT is occurring, the corresponding output won't toggle immediately.

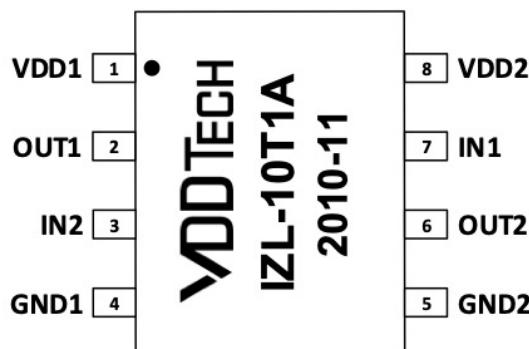


Figure 1: EVB-IZL10T1A - pinout illustration.

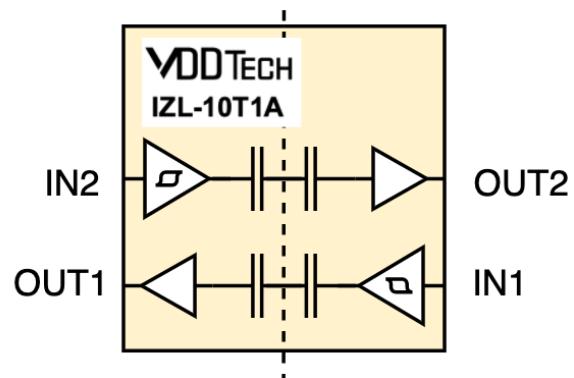


Figure 2: EVB-IZL10T1A - symbol representation.

## EVALUATION BOARD INTERFACES

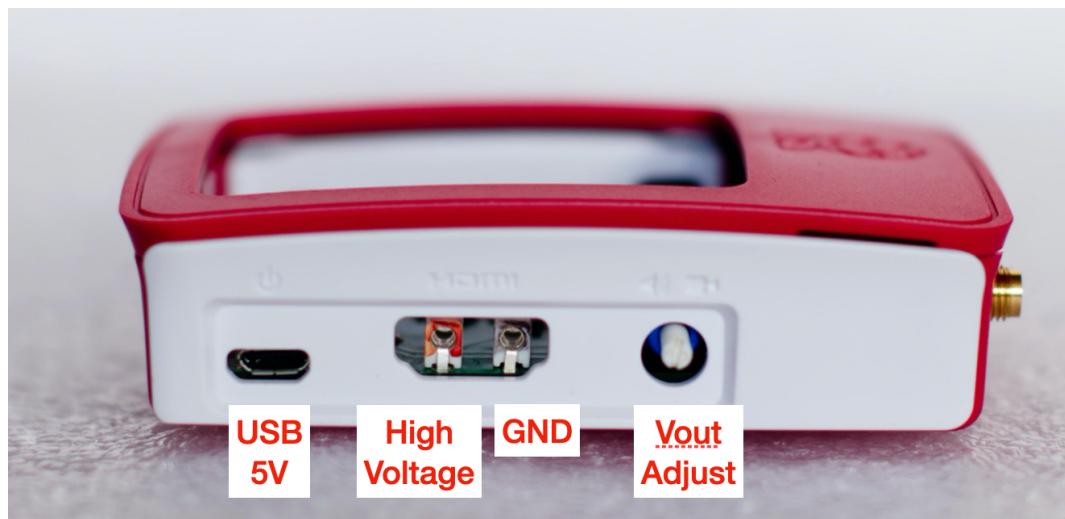


Figure 3: EVB-IZL10T1A - Evaluation board INPUTS interface.

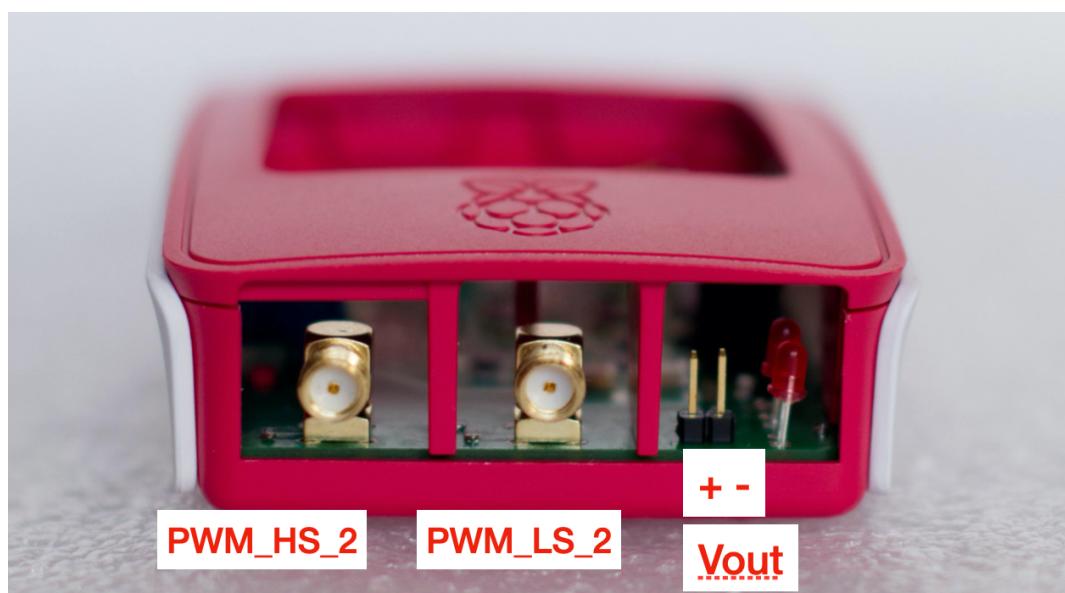


Figure 4: EVB-IZL10T1A - Evaluation board OUTPUTS interface.

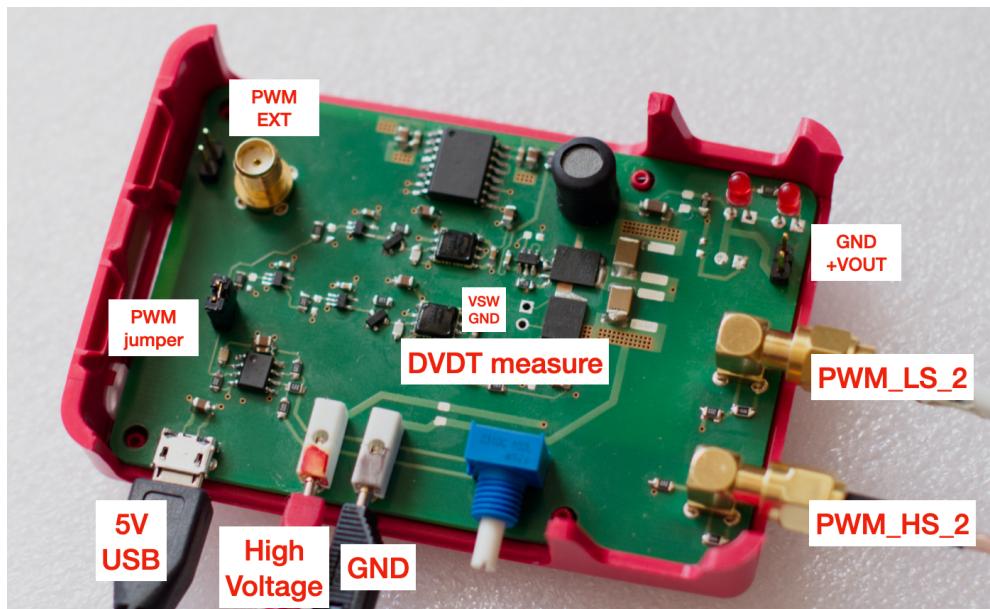


Figure 5: EVB-IZL10T1A - Evaluation board DVDT and VOUT measurement interface.

## 2.1 Interfaces table

Table 1: EVB-IZL10T1A - Interfaces description.

	Interface	Connector	Description
1	USB 5V	female Micro-USB B-type	female Mirco-usb connector for 5V power supply input.
2	High Voltage	2mm female Banana Jacks	Input voltage range [0-550VDC]. nominal Input current < 1mA. <b>Current limit on voltage source should be inferior to 10mA.</b>
3	VOUT adjust	POTENTIOMETER (screw)	Turning this potentiometer can slightly adjust the output voltage by tuning the PWM dutycycle.
4	PWM_HS_2	SMA RF connector	Provides an image of the High side Gate Drive voltage. Signal Amplitude is 200mV. typical frequency=30KHz- 1%Duty-Cycle
5	PWM_LS_2	SMA RF connector	Provides an image of the Low side Gate Drive voltage. Signal Amplitude is 200mV. typical frequency=30KHz- 98.5%Duty-Cycle
6	PWM jumper	Pin Header	Leave Jumper in place to allow internal non-overlapped PWM signal. If open output voltage falls at 0V.
7	PWM EXT	SMA RF connector	WAS used during initial testing. Not connected.
8	DVDT measure	Vias (VSW, GND)	Measuring access to switching node (VSW) for DV/DT measurement. Measurement is illustrated in Figure 9

## OBSERVED SIGNALS AND EXPLANATION

Measurable signals are illustrated in Figure 6. Buck switching node is accessible on two vias located next to the Low-Side GAN. The two RF connectors provide an image (through the second channel of the digital isolators) of the PWM signals sent to the High and the Low side GAN. They are named respectively PWM\_HS\_2 and PWM\_LS\_2. Figure 7 illustrates the measurement setup of the switching node VSW (for DV/DT extraction) and the measurement of the image (PWM\_HS\_2 and PWM\_LS\_2) of input signals of the High-side and Low-Side GAN drivers.

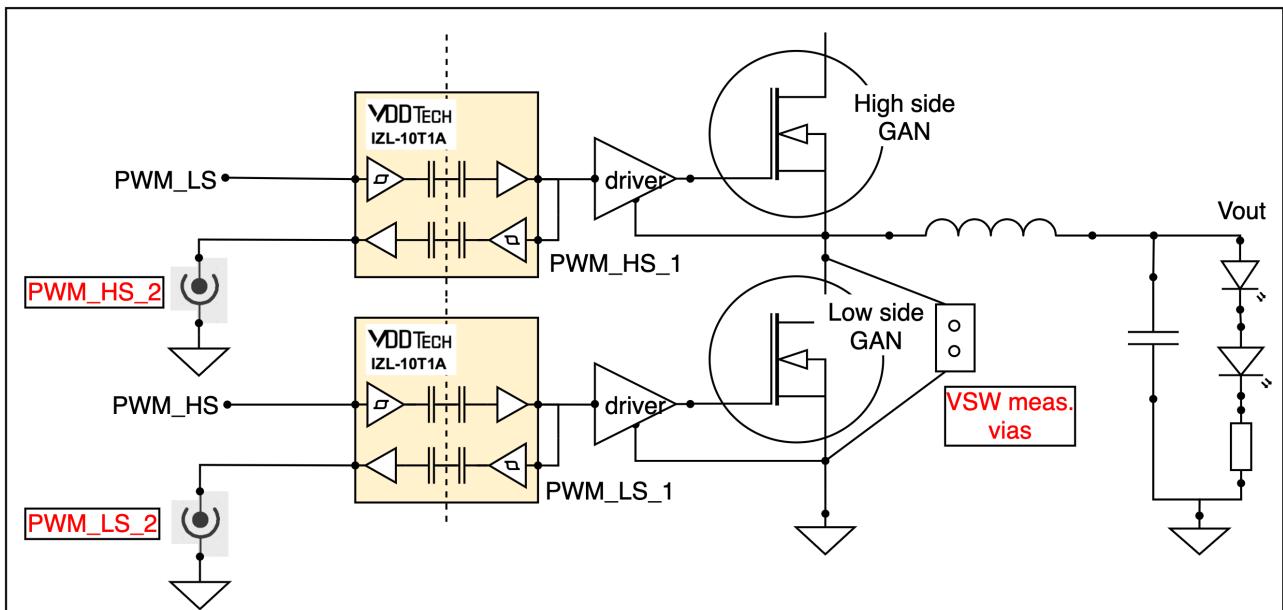


Figure 6: EVB-IZL10T1A - Evaluation Board: Block view of the available measurements.

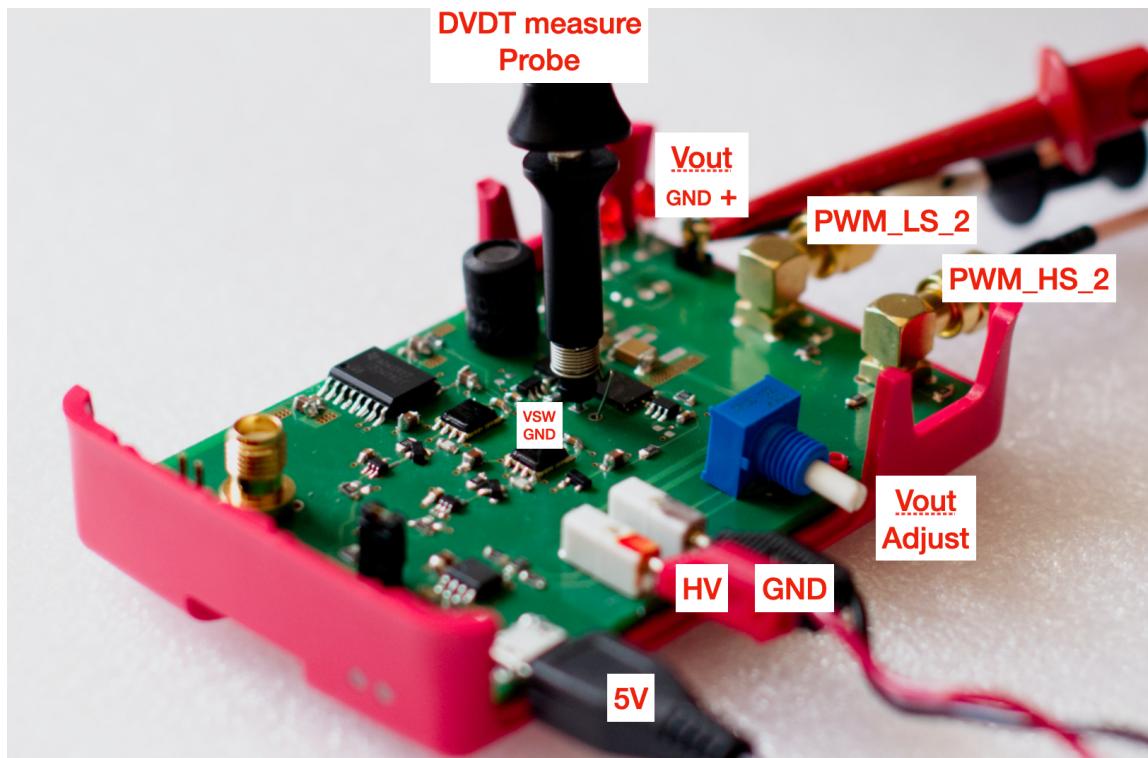


Figure 7: EVB-IZL10T1A - DVDT practical measurement setup illustration.

Before showing the measurement results, the time diagram of Figure 8 sketches the expected main internal signals. Looking for example on PWM\_LS input signal, it generates the PWM\_LS\_1 signal with a typical 30ns delay relative to the forward path of the EVB-IZL10T1A digital isolator. Next, this PWM\_LS\_1 signal goes both to the LS driver (generating VGS\_LS with a small driver delay) and to the reverse digital isolator channel to generate the PWM\_HS\_1 signal. It is this last signal that is measured on a SMA connector of the Eval Board. It is exactly the same logic for the PWM\_HS input signal. However, the rising edge of the VGS\_HS signal generates a fast rising transient on the Buck switching node VSW. If this fast transient occurs while PWM\_HS\_1 just toggled, the digital isolator output PWM\_HS\_2 goes to memory state to avoid wrong toggling during fast DVDT event. This is represented by the unknown state on PWM\_HS\_2 signal on the time diagram. The most important is that internal PWM\_LS\_1 and PWM\_HS\_1 signals are corrects.

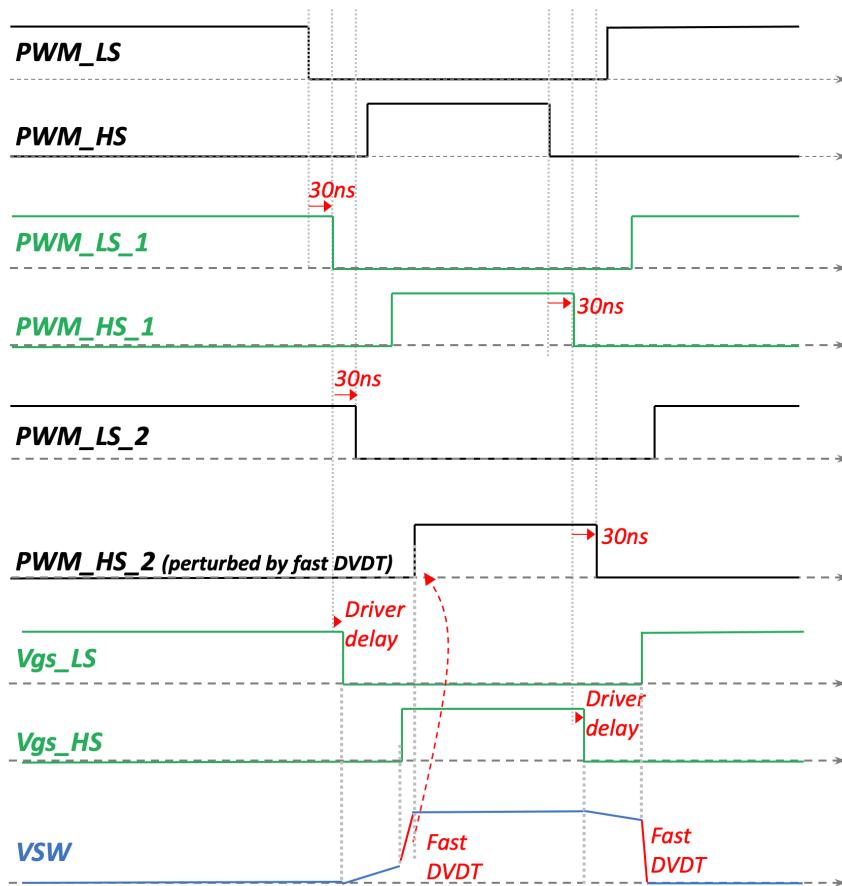


Figure 8: EVB-IZL10T1A - Evaluation Board: expected main internal signals.

Figure 9 is a measurement corresponding to PWM\_LS\_2 (magenta), PWM\_HS\_2 (blue) and VSW (yellow). Measured waveforms are compliant with our previous time diagram. There is also no visible jitter in these measured signals as expected.

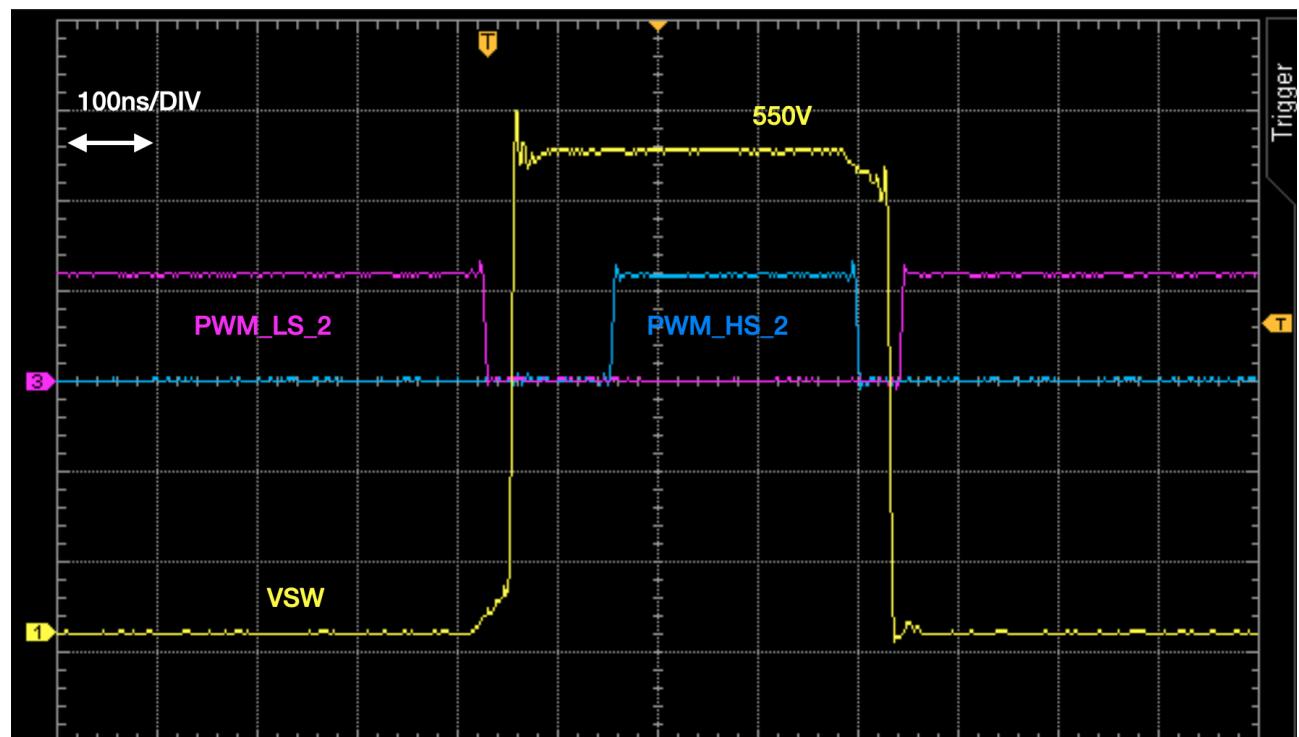


Figure 9: EVB-IZL10T1A - DVDT measurement illustration.

## **SCHEMATIC**

Figure 10 illustrates EVB-IZL10T1A schematic view.

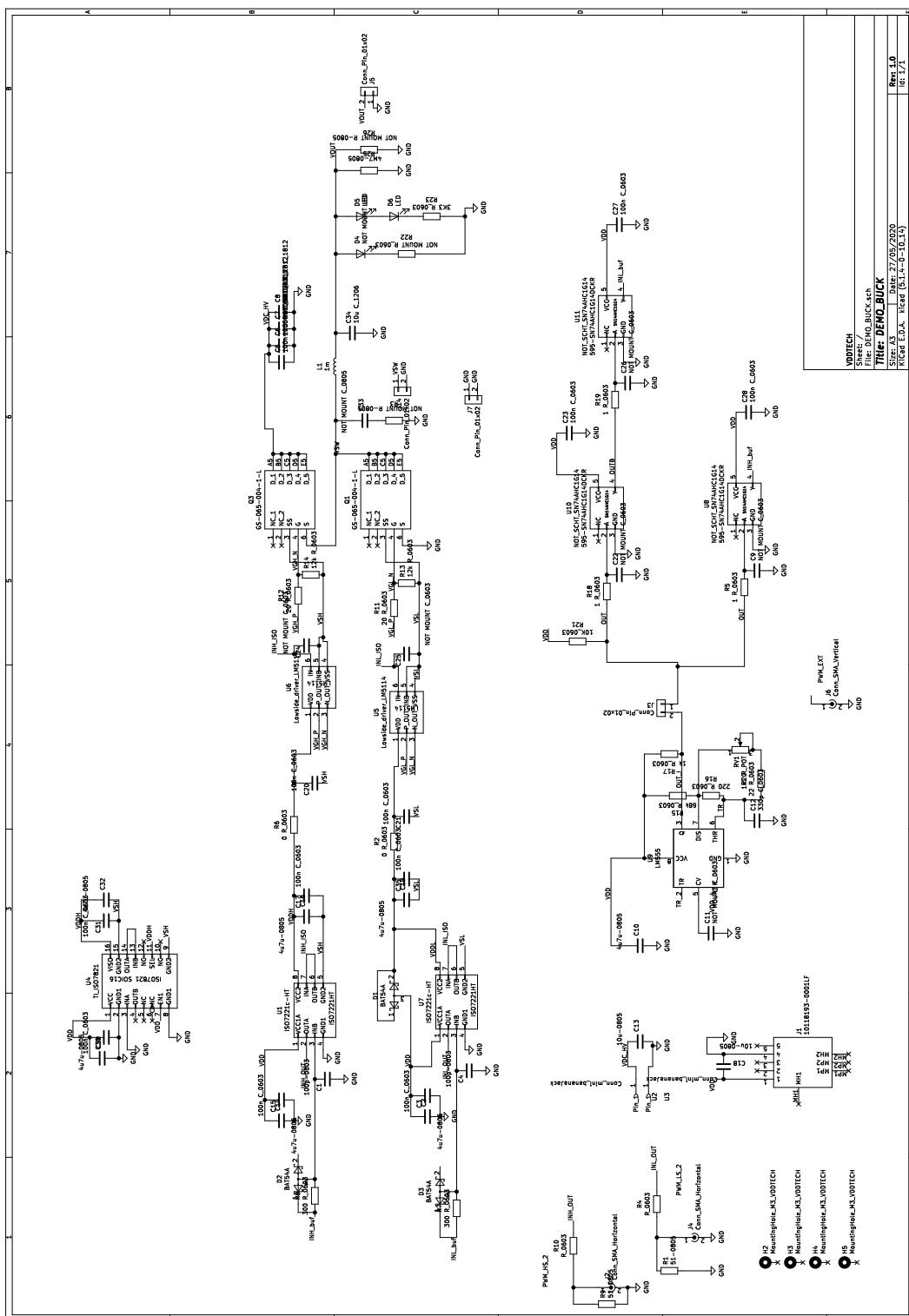


Figure 10: EVB-IZL10T1A - - Schematic view

## LAYOUT

The layout is shown in Figure 11 .

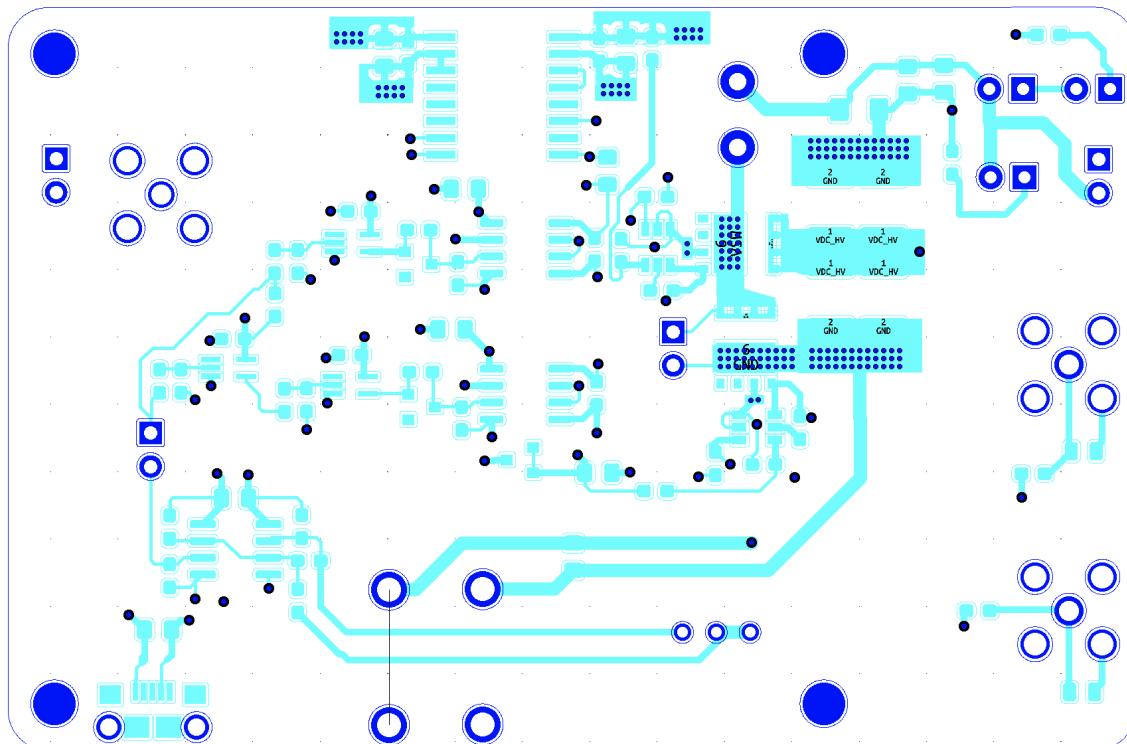


Figure 11: EVB-IZL10T1A- - TOP layer layout view

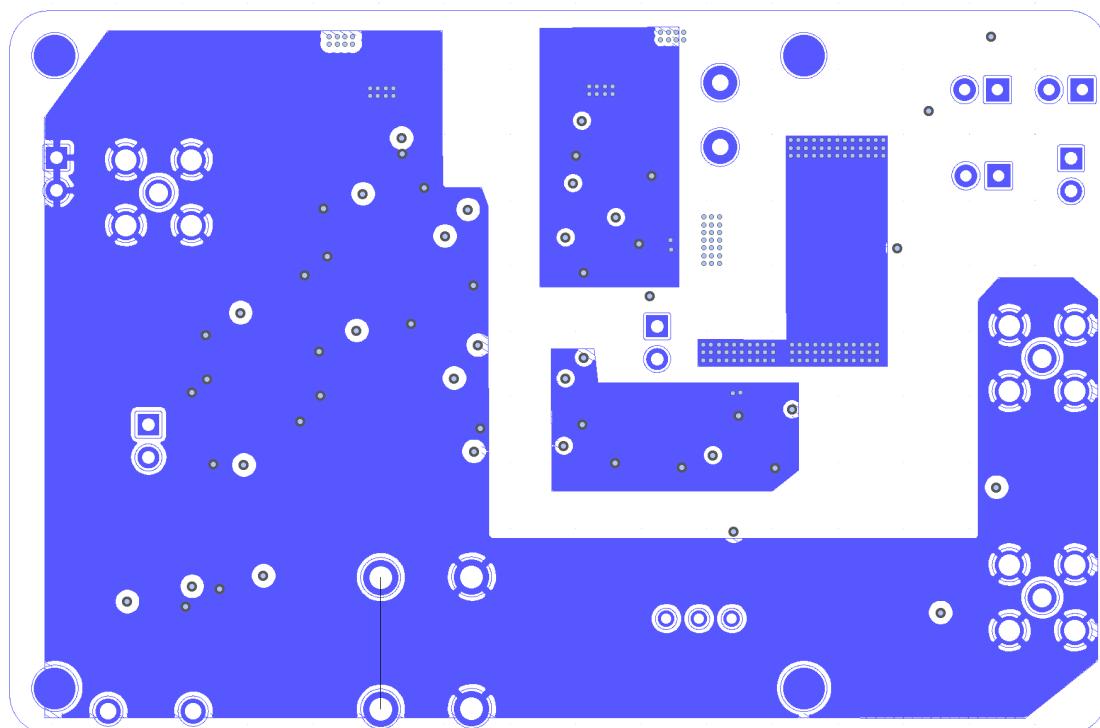


Figure 12: EVB-IZL10T1A- - Copper 2 layout view

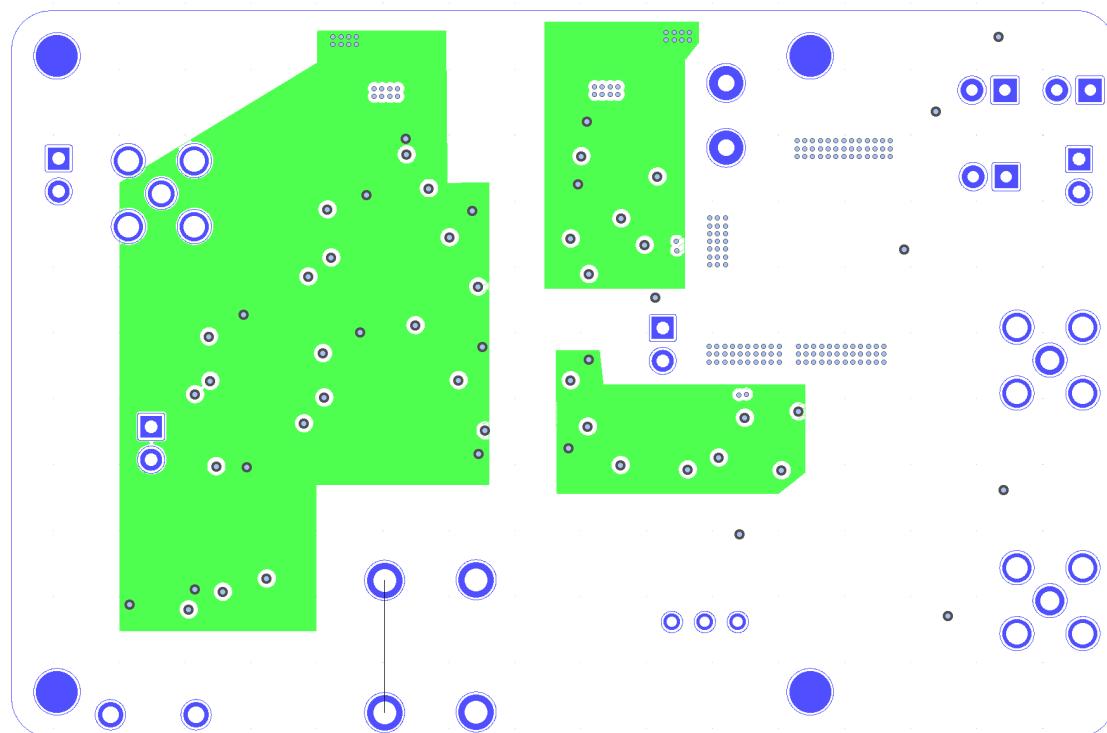


Figure 13: EVB-IZL10T1A - Copper 3 layout view

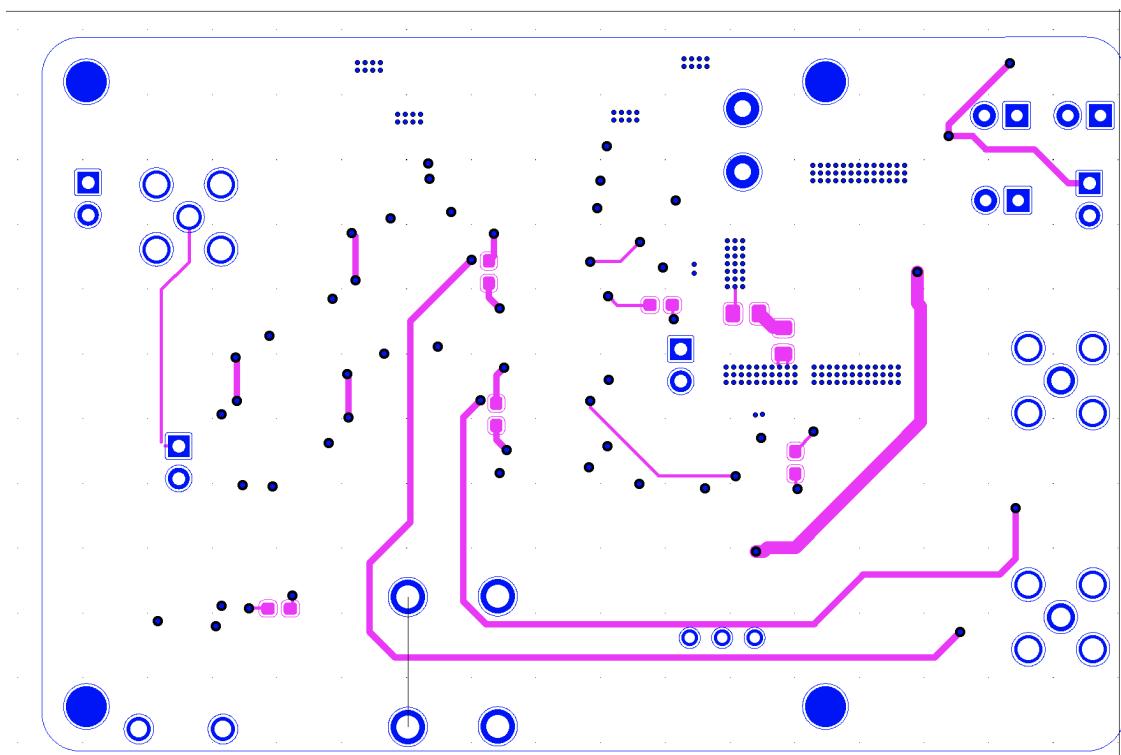


Figure 14: EVB-IZL10T1A - Bottom layer layout view

## ASSEMBLY DRAWING

Figure 15 illustrates EVB-IZL10T1A assembly view.

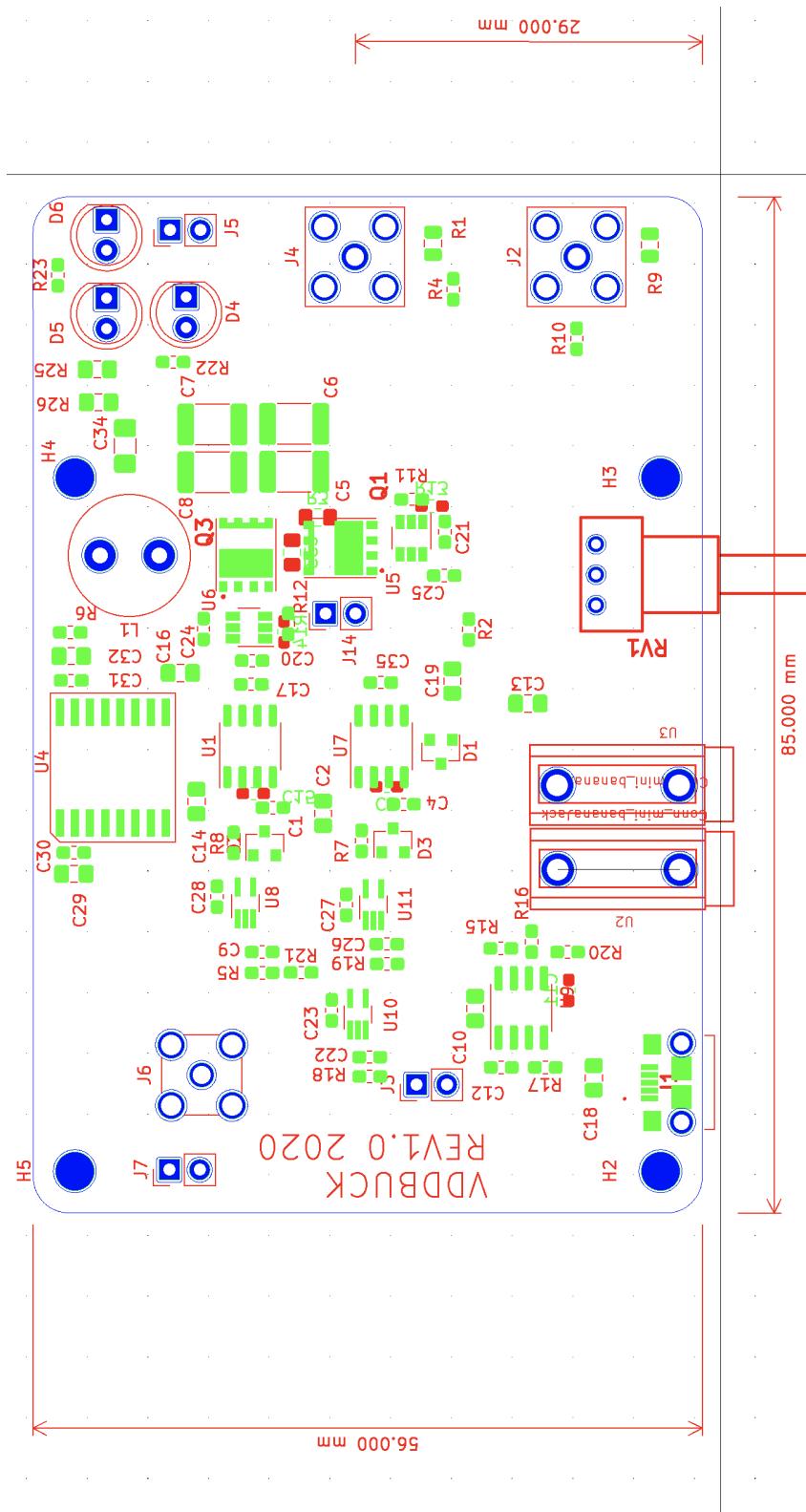


Figure 15: EVB-IZL10T1A - assembly view

## BILL OF MATERIALS

Figure 16 summarizes EVB-IZL10T1A main components references.

Item	Qty	Reference(s)	Value	Description	Manufacturer	manufacturer part number
1	2	C1, C4	100p-0603	X7R 100V		
2	7	C2, C10, C14, C16, C19, C29, C32	4u7u-0805	Multilayer Ceramic Capacitors MLCC - SMD/SMT 0805 50VDC 4.7uF 10% X7R	TDK	C2012X7R1H475K125AC
3	11	C3, C15, C17, C20, C21, C23, C27, C28, C30, C31, C35	100n C_0603	Multilayer Ceramic Capacitors MLCC - SMD/SMT 16V 0.1uF 0603 X7R 10%	KEMET	C0603C104K4RECTU
4	2	C5, C6	100n-1000V C_1812	Multilayer Ceramic Capacitors MLCC - SMD/SMT 1000V .1uF X7R 1812 0.1	KEMET	C1812C104KDRACTU
5	2	C7, C8	NOT MOUNT C_1812			
6	6	C9, C11, C22, C24, C25, C26	NOT MOUNT C_0603			
7	1	C12	100p C_0603			
8	2	C13, C18	10u-0805			
9	1	C33	NOT MOUNT C_0805			
10	1	C34	10u C_1206	Multilayer Ceramic Capacitors MLCC - SMD/SMT 1206 25VDC 10uF 20% X5R AEC-Q200	TAIYO YUDEN	TMK316BJ106MLHT
11	3	D1, D2, D3	BAT54A	Schottky Diodes & Rectifiers Small-Signal Schotky 0.2A 30V	Toshiba	TBAT54A,LM
12	1	D4	NOT MOUNT LED			
13	2	D5, D6	LED	Standard LEDs - Through Hole Red Round	Cree Inc	C503B-RAS-CA0C0AA2
14	1	J1	10118193-0001LF	USB Connectors 5P MICRO USB TYPE B RECEPTACLE W/ PEGS	FCI / Amphenol	10118193-0001LF
15	2	J2, J4	Conn_SMA_Horizontal			
16	4	J3, J5, J7, J14	Conn_Pin_01x02			
17	1	J6	Conn_SMA_Vertical			
18	1	L1	1m	Fixed Inductors 1000uH 10% .51A	Bourns	
19	2	Q1, Q3	GS-065-004-1-L	MOSFET 650V, 3.5A, GaN E-HEMT, 5x6 PDFN, Bottom-side cooled	GAN Systems	GS-065-004-1-L
20	2	R1, R9	51-0805	Thick Film Resistors - SMD 0805 51ohms 5% AEC-Q200		
21	2	R2, R6	0 R_0603		Panasonic	ERJ-T06J510V
22	2	R3, R26	NOT MOUNT R-0805			
23	2	R4, R10	R_0603			
24	3	R5, R18, R19	1 R_0603			
25	2	R7, R8	300 R_0603			
26	2	R11, R12	20 R_0603			
27	2	R13, R14	12k R_0603			
28	1	R15	68k R_0603			
29	1	R16	220 R_0603			
30	1	R17	1k R_0603			
31	1	R20	22 R_0603			
32	1	R22	NOT MOUNT R_0603			
33	1	R23	3K3 R_0603			
34	1	R25	4M7-0805			
35	1	RV1	1k1 R_POT	Potentiometers 9mm 1Kohms Single Cup	Bourns	3310C-001-102L
36	2	U1, U7	IZL-10T1A	3000Vpk, 200kV/μs DUAL-CHANNEL DIGITAL ISOLATOR IZL-10T1A	VDDTECH	IZL-10T1A
37	1	U2	Conn_mini_bananaJack	Test Plugs & Test Jacks UNIV HORZ RED TEST	Keystone Electronics	6055
38	1	U3		Test Plugs & Test Jacks UNIV HORZ BLK TEST	Keystone Electronics	6056
39	1	U4	TI_ISO7821	Digital Isolators	Texas Instruments	ISOW7821DWER
40	2	U5, U6	Lowside_driver_LM5114	Gate Drivers Sgl 7.6A Peak Crnt Low Side Gate Driver	Texas Instruments	LM5114BMF/NOPB
41	3	U8, U10, U11	NOT_SCHT_SN74AHC1G14	Inverters Single Schmitt-Trgr	Texas Instruments	SN74AHC1G14DCKR
42	1	U9	LM555		Texas Instruments	LM555CMX/NOPB

Figure 16: EVB-IZL10T1A - Main components references