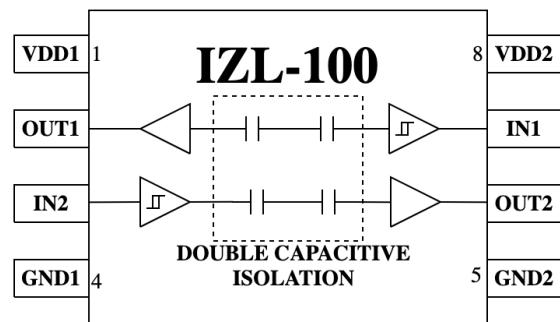


WHITE PAPER

IZL-100 ZVS AUTOMATIC ADAPTABILITY

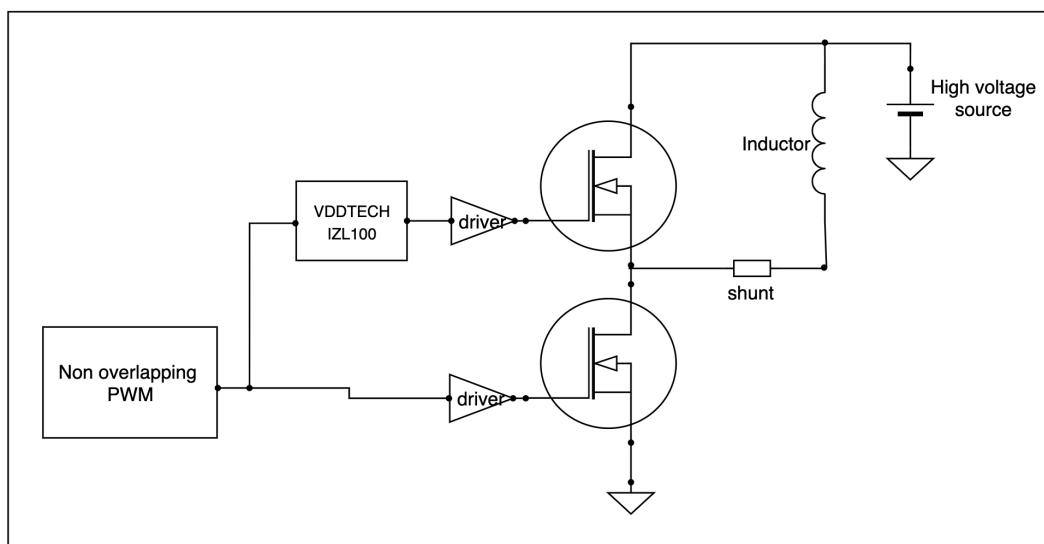
FEATURES

- 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



DESCRIPTION

The IZL-100 Evaluation Board is an open loop Buck converter designed to demonstrate VDDTECH's IZL-100 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 IZL-100 OVERVIEW

Figures ?? and ?? provide an illustration of respectively the pinout and the symbol view of the IZL-100.

The IZL-100 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/ μ 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 IZL-100 features a protection which prevents the output to accidentally toggle if a fast DVDT event (faster than 1KV/ μ sec) occurs. It means that if the input data toggle while a fast DVDT is occurring, the corresponding output won't toggle immediately.

ZVS EVALUATION BOARD

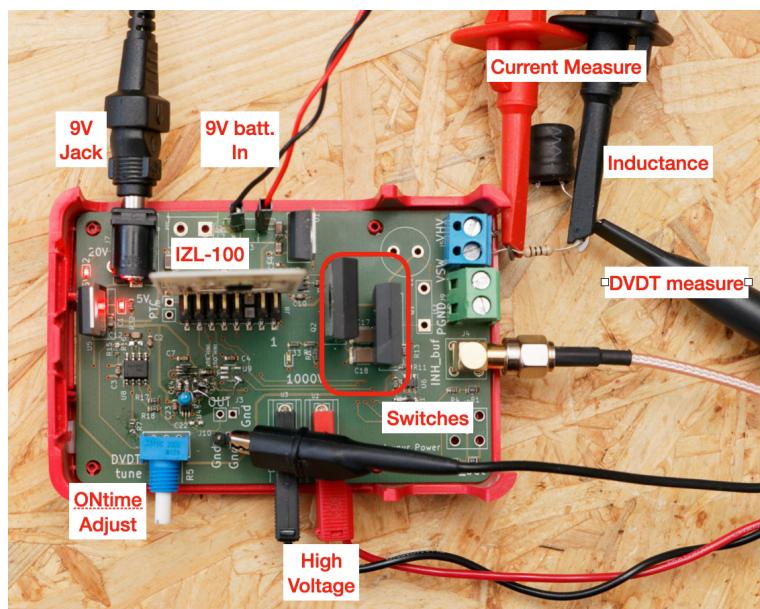


Figure 1: IZL-100 - ZVS evaluation board measurement interface.

OBSERVED SIGNALS AND EXPLANATION

Measurable signals are illustrated in Figure 2. 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 3 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.

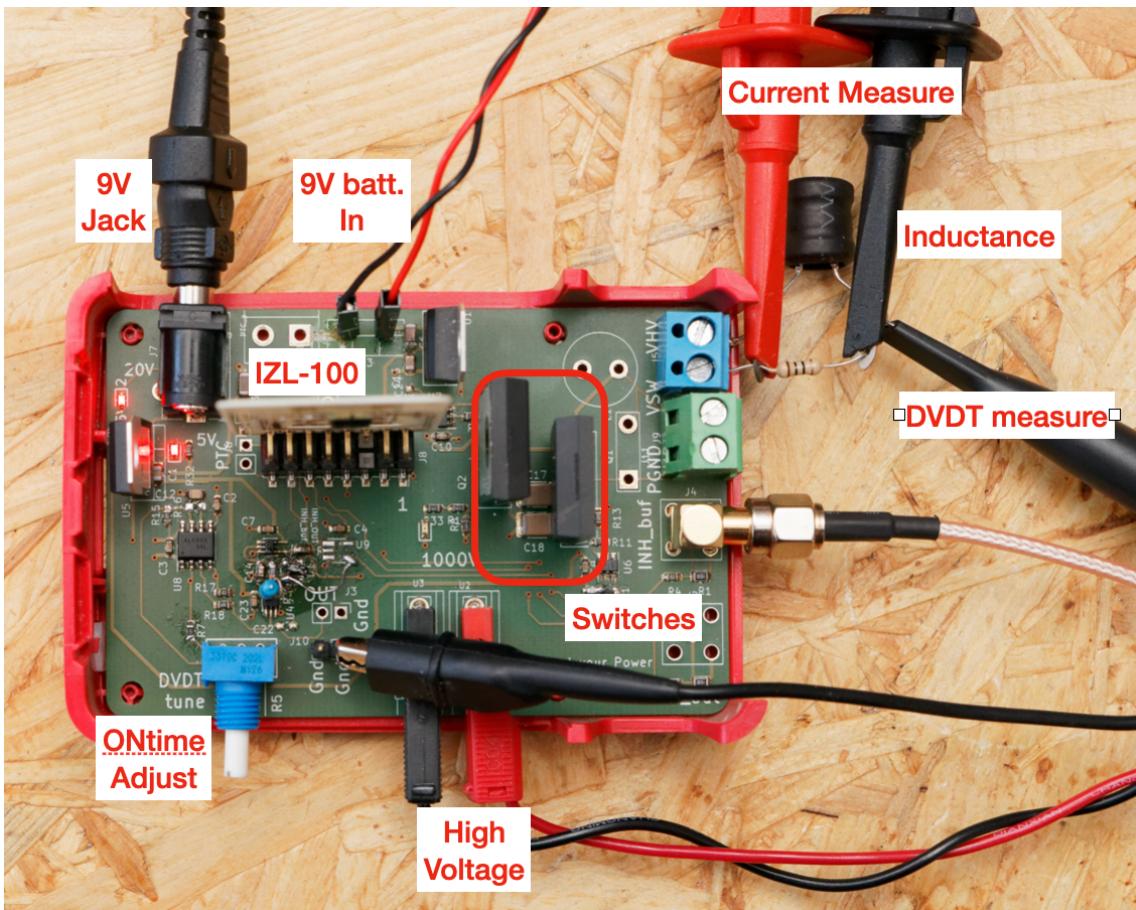


Figure 2: IZL-100 - Evaluation Board: Block view of the available measurements.

Before showing the measurement results, the time diagram of Figure 4 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 IZL-100 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_LS_2 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 ?? 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 illustrates IZL-100 schematic view.

Figure 9 illustrates IZL-100 schematic view.

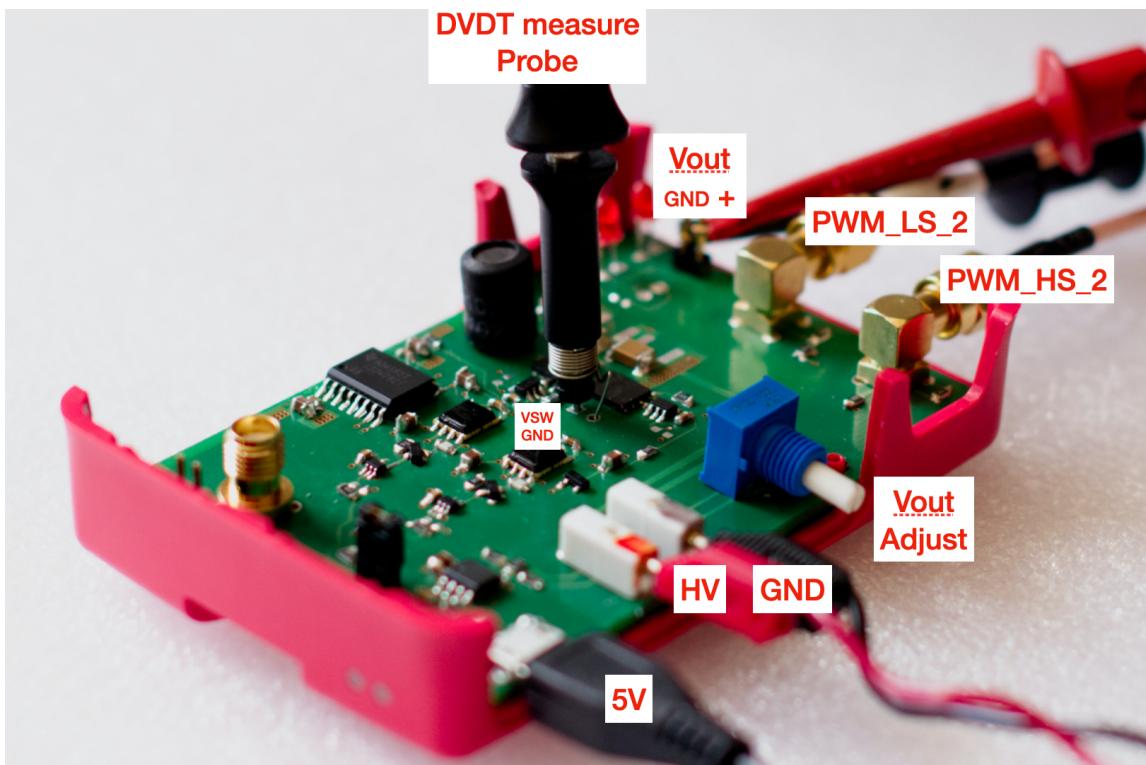


Figure 3: IZL-100 - DVDT practical measurement setup illustration.

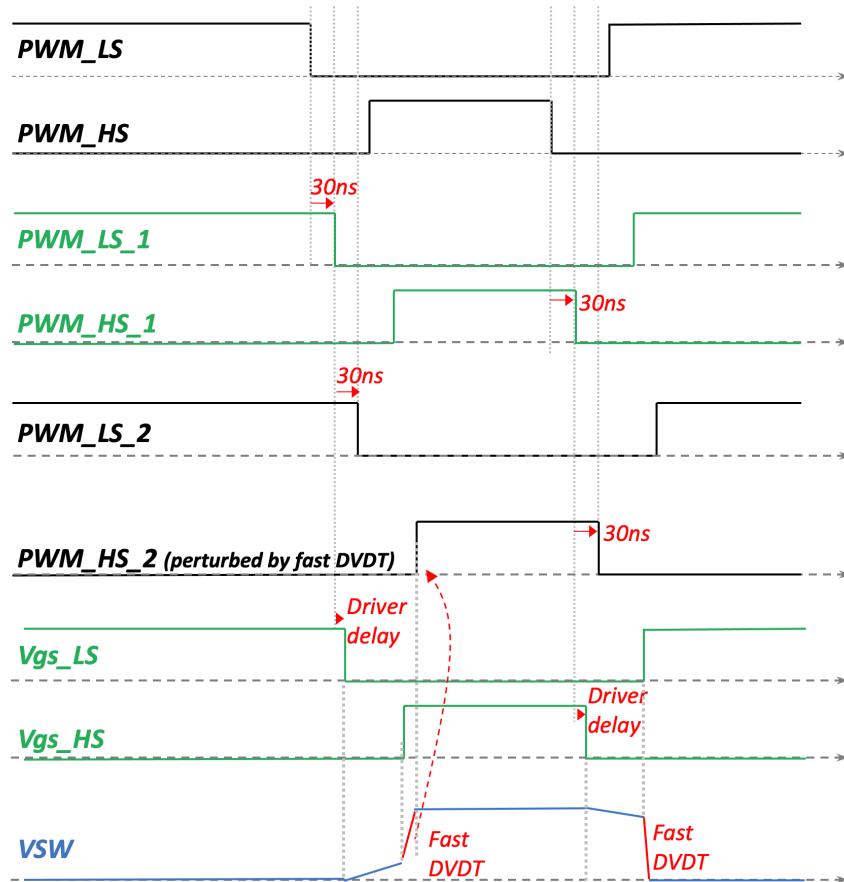


Figure 4: IZL-100 - Evaluation Board: expected main internal signals.

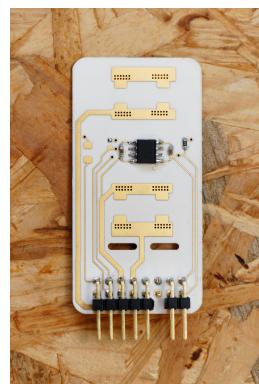


Figure 5: IZL-100 Functional schematic illustration.

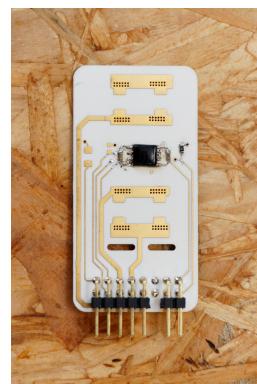


Figure 6: Switching node illustration (yellow): DVDT
= 100KV/ μ s

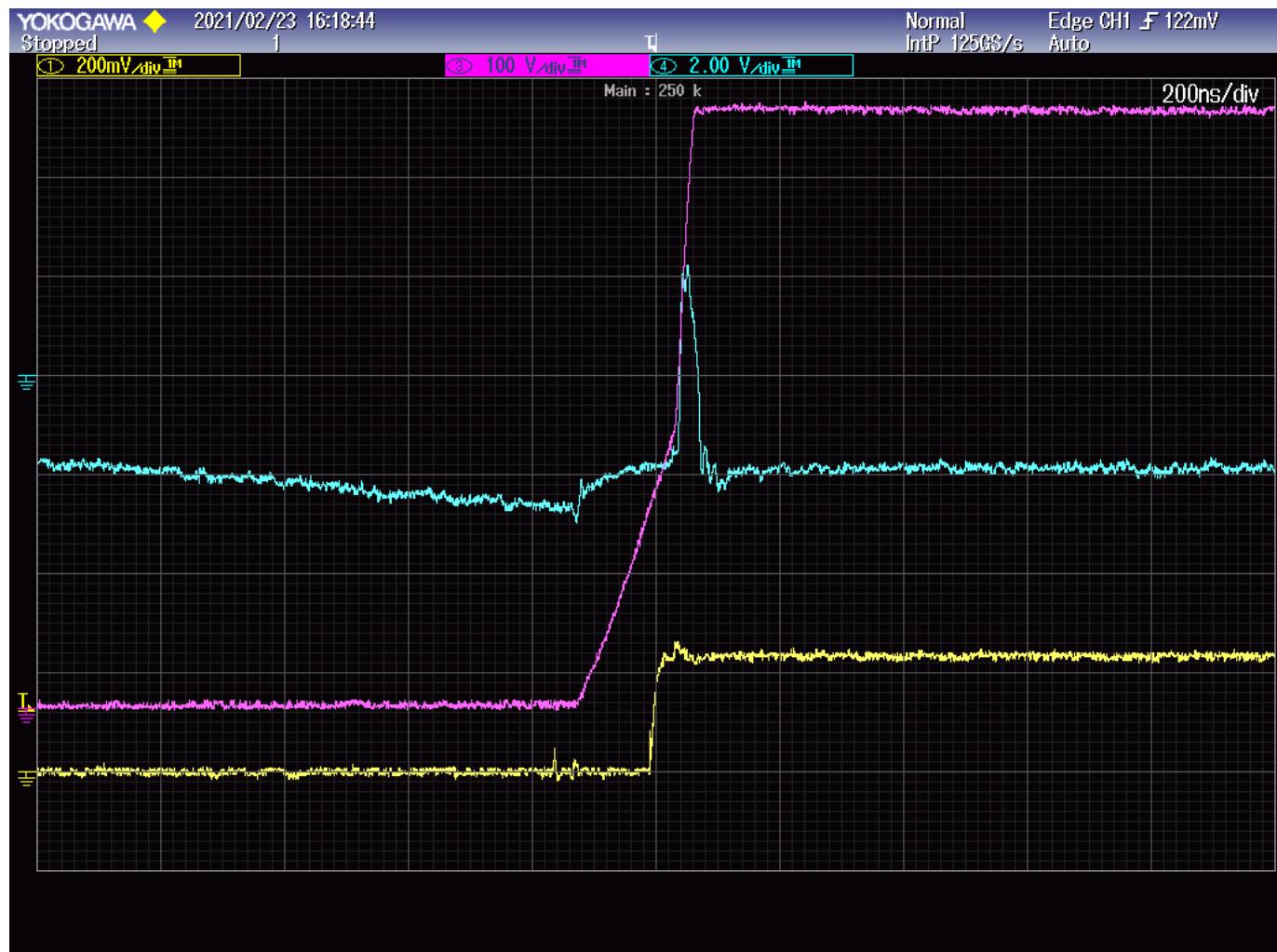


Figure 7: IZL-100 - Schematic view

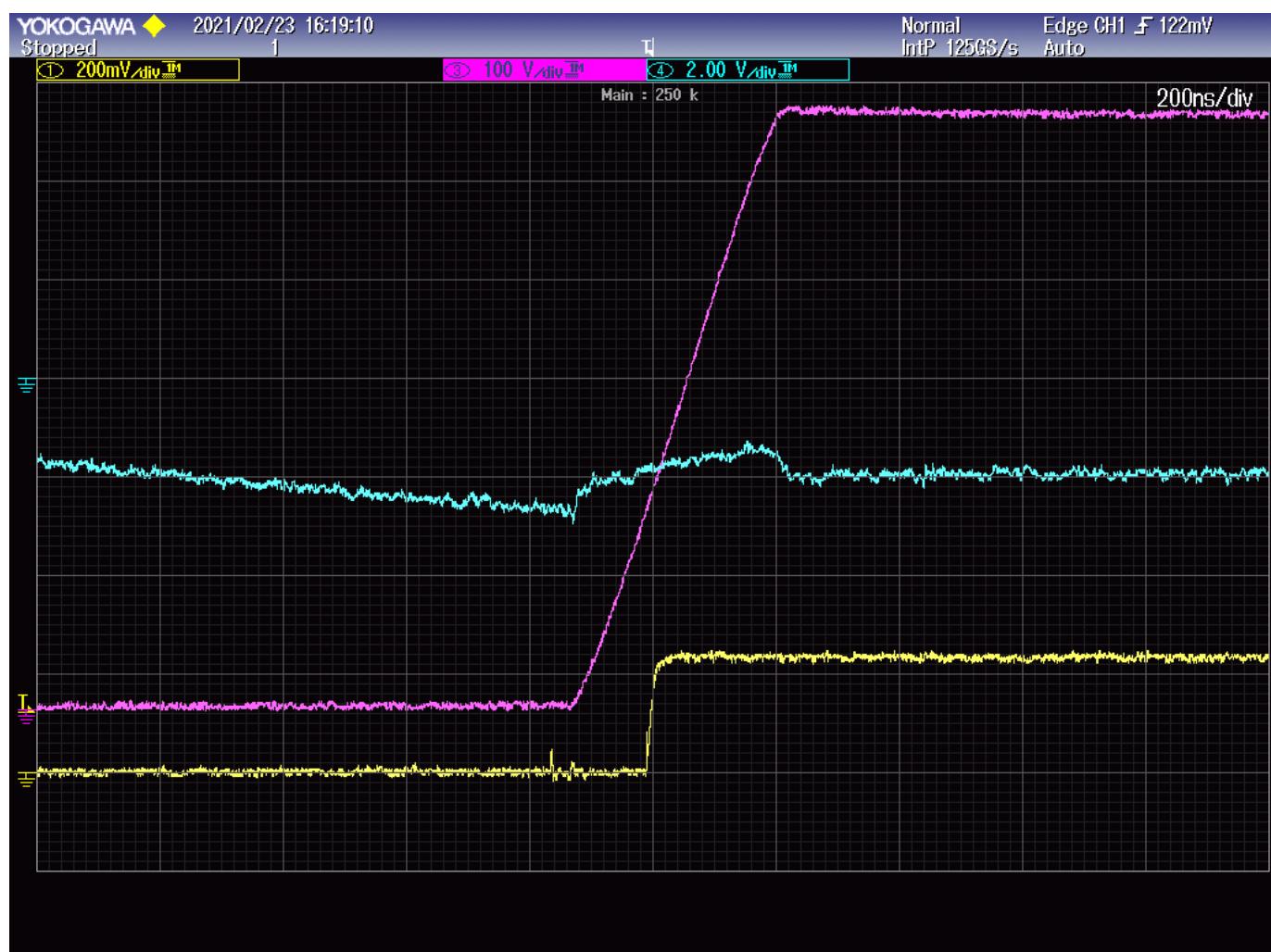


Figure 8: IZL-100 - Schematic view

SCHEMATIC

Figure 9 illustrates IZL-100 schematic view.

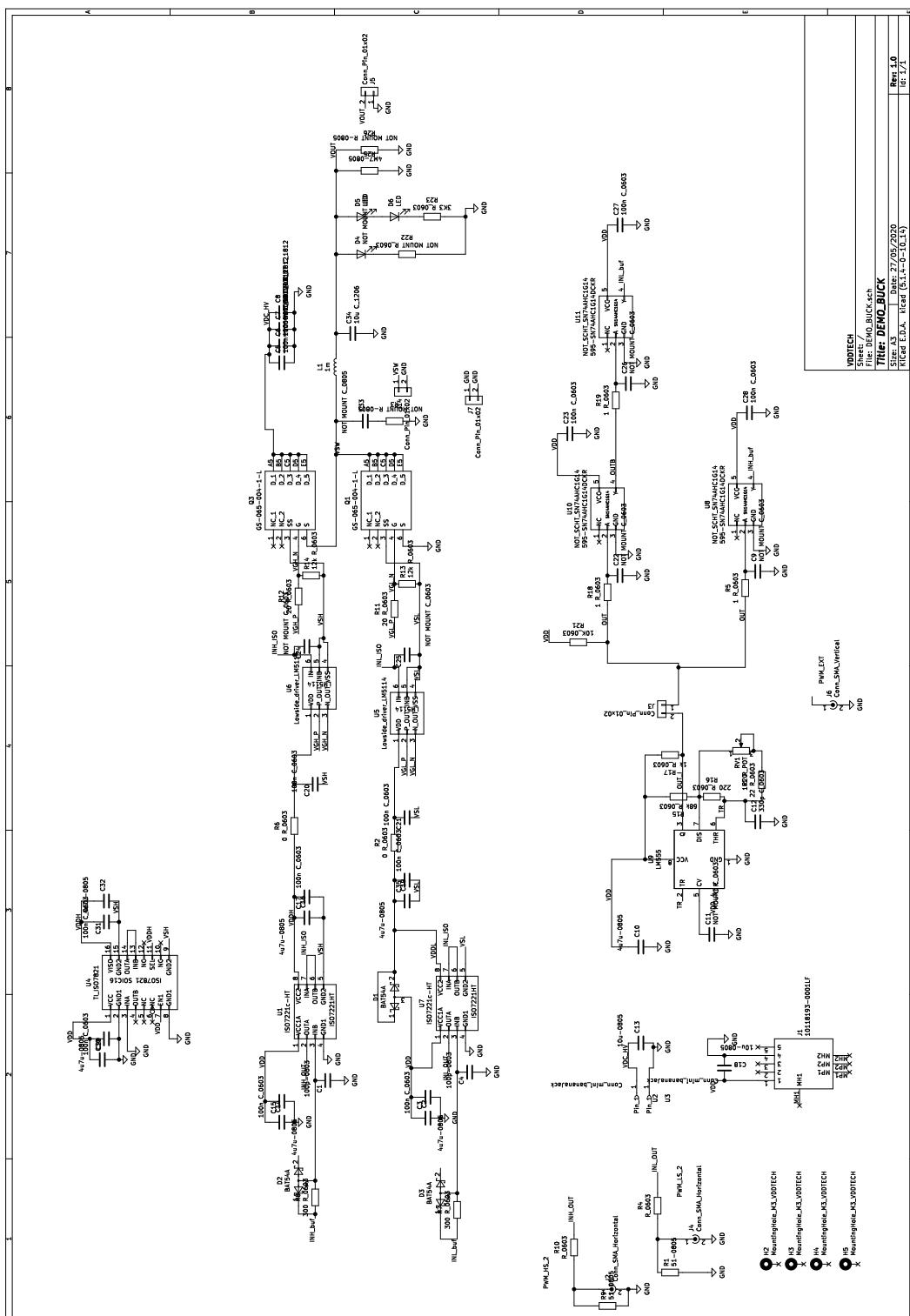


Figure 9: IZL-100 - - Schematic view

ASSEMBLY DRAWING

Figure 10 illustrates IZL-100 assembly view.

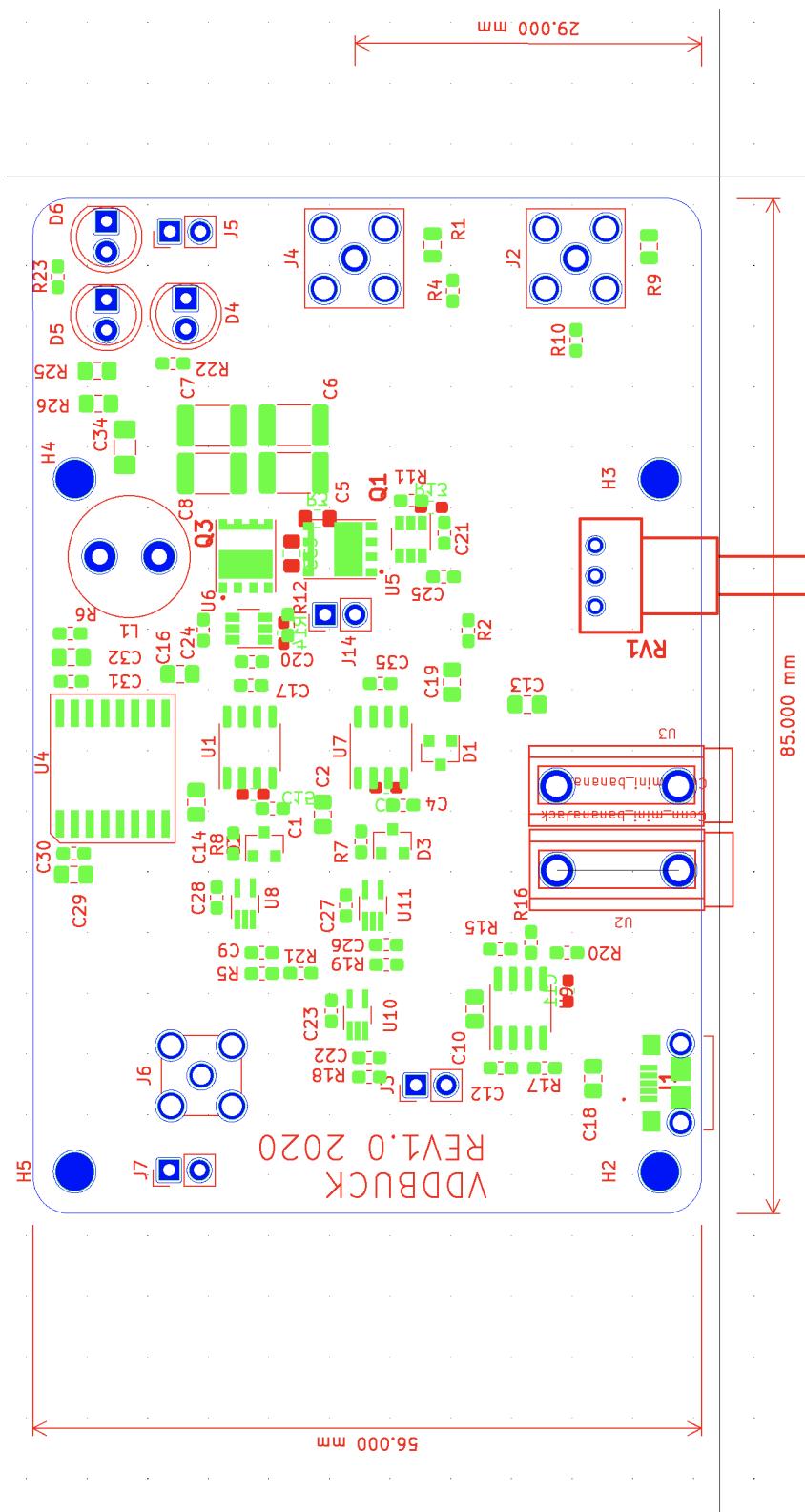


Figure 10: IZL-100 - - assembly view

BILL OF MATERIALS

Figure 11 summarizes IZL-100 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 HORIZ RED TEST	Keystone Electronics	6055
38	1	U3		Test Plugs & Test Jacks UNIV HORIZ 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 11: IZL-100 - Main components references