Test Report

BLDC+LED Display+IR Fan Controller YT91003NH7+YTM32U067S24 FL 36W 24V1.5A

Features

- PSR isolation HPF system constant voltage current limiting output.
- AC Line Over Voltage Protection,the overvoltage protection point is configurable, supporting a maximum of 325Vac.
- Driver output open circuit, short circuit, a cycle by a cycle to limit the current protection.
- PCB integrated molding, high production efficiency, low cost.
- 7-speed wind speed control.
  Main PCB supports 433MHz remote control or IR remote control.
- External infrared signal receiver and RGB lamp bead small board
-Supports audio and visual prompts, buzzer and RGB indicator lights.
-MCU integrates carrier and comparator, and the current sampling difference signal is directly input without bias voltage.
-Support single resistor/triple resistor sampling optional.
-Control mode: torque control, limited power, limited speed, positive and negative electronic brake.
-Complete protection functions: over voltage, under voltage, over current, blocking, phase deficiency, internal power supply monitoring and protection.

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Contents

1 Specification

1.1 Input Spec

- Input Voltage: 110-300 Vac
- Input Frequency: 47-63 Hz
- Input Power:38W(380 RPM)

1.2 Output Spec

- Output Voltage: 24V
- Output Current:1.50A

2 Assessment Result

2.1 Behavior of Electricity @ 230Vac input and full load output

-Constant pressure accuracy:±4%

- Efficiency: ≥0.87%
- Power Factor: >0.95

-THD <10%@full load

-No load power: ≦ 500mW@ 230V

2.2 Defensive Function

-Over power Protection:OK

-Open Circuit Protection:OK

-Short Circuit Protection:OK

-Power overrun protection:OK

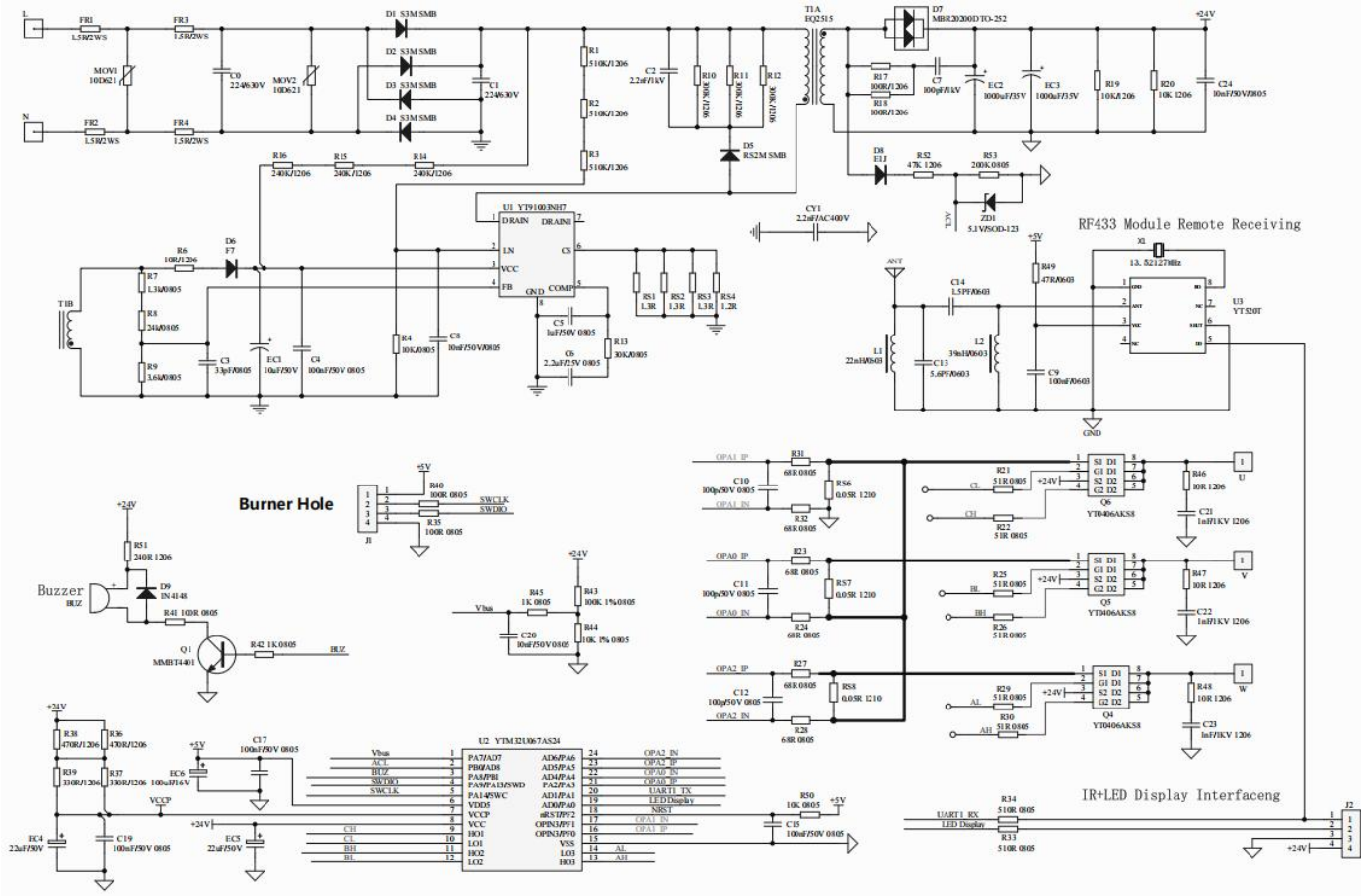
-Speed limit protection:OK

-Motor lock protection:OK

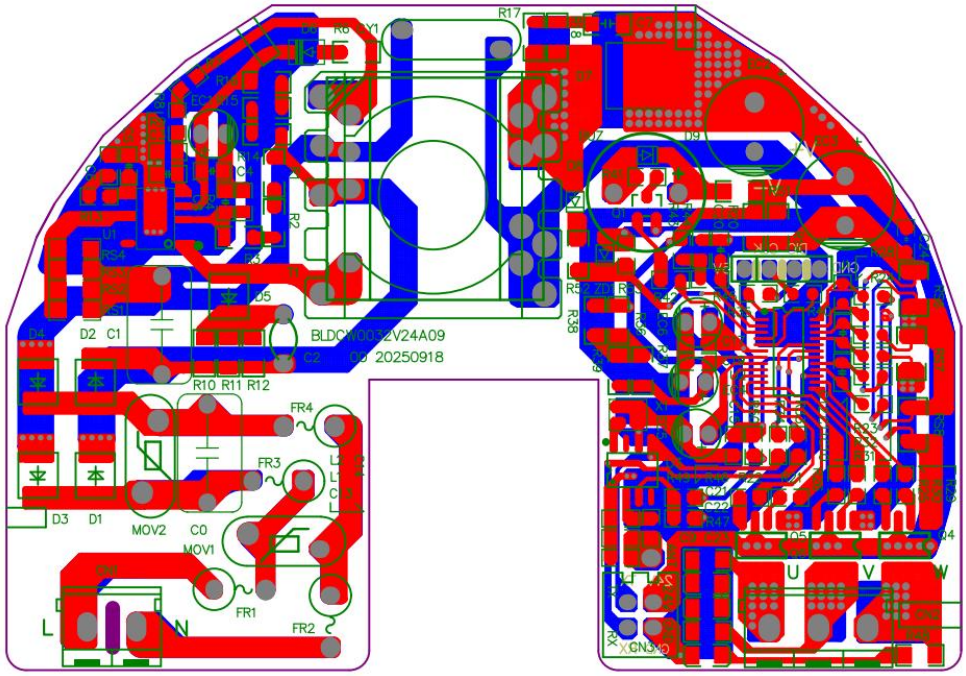
-Surge Level: 4kV

3 LED Driver Data

3.1 Schematic Diagra



3.2 PCB Layout



3.3.BOM-List

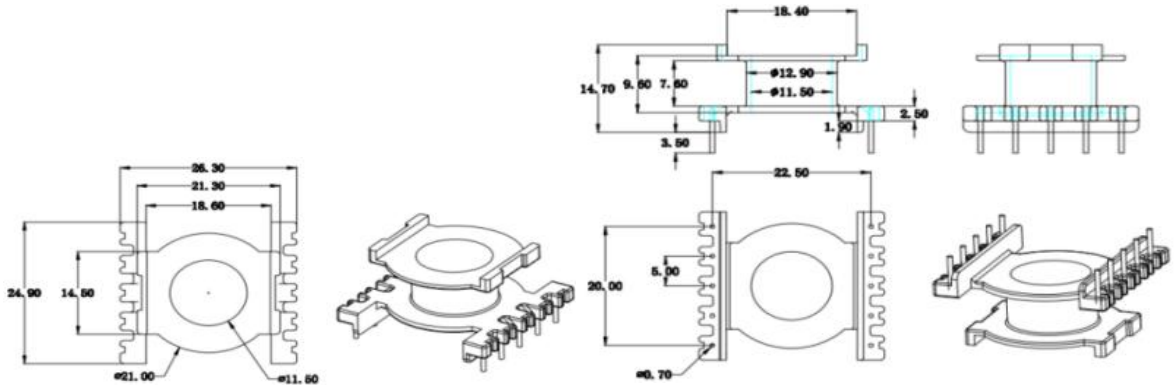
Type	NO.	Name	Specification Description	Designator	Qty.	Unit
SMD Components(Red glue process)	1	Driver PCB	BLDCW0032V24A09-00 Driver PCB_FR-4 Dual panel_2 Pcs_panel size:202*77.5_Board Size:97*67.5_T=1.6mm_OSP silk-screen_Green oil and white characters_CU=25um_Through		1/2	pcs
	2	SMD Diode	SMD Diode_S3M_SMB_1000V_3A_84mil_Passement_RoHS	D1,D2,D3,D4	4	pcs
	3	SMD Diode	SMD Diode_RS2M_SMB_1000V_2A_60mil_Passement_RoHS	D5	1	pcs
	4	SMD Diode	SMD FRD_F7_SOD-123FL_1000V_1A_46mil_TP_RoHS	D6	1	pcs
	5	SMD Schottky Diodes	SMD Schottky Diodes_MBR20200CS_TO-252_200V_20A_102Mil_Passement_RoHS	D7	1	pcs
	6	SMD Diode	SMD fast recovery diode_E1J_SOD-123FL_600V_1A_46mil_Passement_RoHS	D8	1	pcs
	7	SMD Diode	SMD Diode_1N4148_SOD-123_100V_150mA_26mil_Passement_RoHS	D9	1	pcs
	8	SMD Votage-regulator	SMD Voltage-regulator_BZT52C5V1_5.1V_SOD-123_500mW_±5%_33mil_Passemen_RoHS/MM1Z5V1	ZD1	1	pcs
	9	SMD Capacitor	SMD Capacitor_C0G_0805_50V_33pF±10%_RoHS	C3	1	pcs
	10	SMD Capacitor	SMD Capacitor_X7R_0805_50V_100nF±10%_RoHS	C4,C15,C17,C19	4	pcs
	11	SMD Capacitor	SMD Capacitor_X7R_0805_50V_1uF±10%_RoHS	C5	1	pcs
	12	SMD Capacitor	SMD Capacitor_X7R_0805_25V_2.2uF±10%_RoHS	C6	1	pcs
	13	SMD Capacitor	SMD Capacitor_X7R_1206_1kV_100pF±10%_RoHS	C7	1	pcs
	14	SMD Capacitor	SMD Capacitor_X7R_0805_50V_10nF±10%_RoHS	C8,C20,C24	3	pcs
	15	SMD Capacitor	SMD Capacitor_X7R_0603_50V_100nF±10%_RoHS	C9	1	pcs
	16	SMD Capacitor	SMD Capacitor_X7R_0805_50V_100pF±10%_RoHS	C10,C11,C12	3	pcs
	17	SMD Capacitor	SMD Capacitor_X7R_0603_50V_5.6pF±5%_RoHS	C13	1	pcs
	18	SMD Capacitor	SMD Capacitor_X7R_0603_50V_1.5pF±5%_RoHS	C14	1	pcs
	19	SMD Capacitor	SMD Capacitor_X7R_1206_1kV_1nF±10%_RoHS	C21,C22,C23	3	pcs
	20	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_510k±1%_RoHS	R1,R2,R3	3	pcs
	21	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_10k±1%_RoHS	R4	1	pcs
	22	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_10Ω±5%_RoHS	R6,R46,R47,R48	4	pcs
	23	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_1.3k±1%_RoHS	R7	1	pcs
	24	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_24k±1%_RoHS	R8	1	pcs
	25	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_3.6k±1%_RoHS	R9	1	pcs
	26	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_300k±5%_RoHS	R10,R11,R12	3	pcs
	27	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_30k±5%_RoHS	R13	1	pcs
	28	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_240k±5%_RoHS	R14,R15,R16	3	pcs
	29	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_100Ω±5%_RoHS	R17,R18	2	pcs
	30	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_10k±5%_RoHS	R19,R20	2	pcs
	31	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_51Ω±5%_RoHS	R21,R22,R25, R26,R29.R30	6	pcs
	32	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_68Ω±5%_RoHS	R23,R24,R27, R28,R31,R32	6	pcs
	33	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_510Ω±5%_RoHS	R33,R34	2	pcs
	34	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_100Ω±5%_RoHS	R35,R40,R41	3	pcs
	35	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_470Ω±5%_RoHS	R36,R38	2	pcs
	36	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_330Ω±5%_RoHS	R37,R39	2	pcs
	37	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_1k±5%_RoHS	R42,R45	2	pcs
	38	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_100k±1%_RoHS	R43	1	pcs
	39	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_10k±1%_RoHS	R44	1	pcs
	40	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_47Ω±5%_RoHS	R49	1	pcs
	41	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_10k±5%_RoHS	R50	1	pcs
	42	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_240Ω±5%_RoHS	R51	1	pcs
	43	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_47k±5%_RoHS	R52	1	pcs
	44	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_200k±5%_RoHS	R53	1	pcs
	45	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_1.3Ω±1%_RoHS	RS1,RS2,RS3	3	pcs
	46	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_1.2Ω±1%_RoHS	RS4	1	pcs
	47	SMD Resistor	SMD Resistor_TF_1210_1/2W_200V_0.05Ω±1%_RoHS	RS6,RS7,RS8	3	pcs
	48	SMT Inductor	SMT Inductor_0603_22nH±0.3nH_RoHS	L1	1	pcs
	49	SMT Inductor	SMT Inductor_0603_39nH±0.3nH_RoHS	L2	1	pcs

	50	SMD Crystal Oscillator	SMD Crystal Oscillator_FXTAL433.92_13.52127MHz_SMD3225-4P_RoHS	X1	1	pcs
	51	SMD BJT	SMD BJT_MMBT4401_NPN_Vceo:40V_600mA_SOT-23_Passement	Q1	1	pcs
	52	SMD MOS	SMD MOS_YT0406AKS8_SOP8_Passement	Q4,Q5,Q6	3	pcs
	53	SMD IC	SMD IC_YT91003NH7_HSOP-7_Passement	U1	1	pcs
	54	SMD Microcontroller	SMD Microcontroller_YTM32U067AS24_SSOP24_Passement	U2	1	pcs
	55	SMD IC	SMD IC_YT520T_SOP-8_Passement	U3	1	pcs
DIP Components	1	FUSE Resistor	Wire-wound fuse resistance_KNP_1.5Ω_±5%_2WS_Pin CP wire diameter 0.55mm_Alloyed wire_B52_Passement_Surge3.5kV_RoHS	FR1,FR2,FR3, FR4	4	pcs
	2	Varistor	Varistor_10D621KJ_570-650V_ High Joule _125° _P=7.5mm_Pin length: 3.5mm_RoHS(silver electrode)	MOV1,MOV2	2	pcs
	3	Film Capacitor	Film Capacitor_CBB22_630V_220nF_S3.5_P10_RoHS	C0,C1	2	pcs
	4	Poly.CAP	Poly.CAP_1000V_2.2nF±10%_P5_S3.5_RoHS	C2	1	pcs
	5	Y1-Safety Cap	Y1-Safety Cap_400V_2.2nF±20%_P10_S3.5_RoHS	CY1	1	pcs
	6	E-Cap	ELEC-CAP_Φ5*11_50V_10μF_105℃_8000h_S3.5_RoHS	EC1	1	pcs
	7	E-Cap	ELEC-CAP_Φ10*20_35V_1000μF_105℃_6000h_S3.5_high frequency low resistance_RoHS	EC2,EC3	2	pcs
	8	E-Cap	ELEC-CAP_Φ5*9_50V_22μF_105℃_6000h_S4.0_RoHS	EC4,CE5	2	pcs
	9	E-Cap	E-Cap_Φ5*11_16V_100μF±20%_105℃_8000h_S4.0_RoHS	CE6	1	pcs
	10	Transformer	Transformer_EQ2515_L_D5+5_F0.4mH_28T(233)D54_11T(255)D10976_9T(125)D12_18T(233)D43_S3.5_PC40_Isolation	T1	1	pcs
	11	Buzzer	Passive electromagnetic buzzer_HN-1212-140R_2KHZ_Voltage:24-30V(30VMax)_Internal resistance 140±2Ω_Size:9*11.8_P6.5mm_(string of 240 Ohm resistance)_Foot length:3.5mm	BUZ	1	pcs
	12	Receiving Wire	Receiving Wire_Spring wire_Black rubber spiral_14 turns_Wire Diameter Outer diameter ¢1.0mm_One end stripped 4mm_the other end not stripped_433MHZ_Copper	ANT	1	pcs
	13	Input terminal	Connector terminal_GH0126-212-2P_300V_10A_Pin Distance 5 mm_Pin 3.7mm_Green with card slot_UL94 V-0_RoHS	CN1	1	pcs
	14	Output terminal	Connector terminal_GH0126-312-3P_300V_10A_Pin Distance 5 mm_Pin 3.7mm_Green with card slot_UL94 V-0_RoHS	CN2	1	pcs
	15	Output terminal	Connector termina_XHD2.5A_2X2P Straight pin_P2.5mm_S3.4_RoHS	CN3	1	pcs

3.4 Transformer

- Iron Core：EQ2515 PC40 AE=95mm²

- Bobbin: Vertical EQ2515 skeleton(5+5P)bakelite



- Windings：

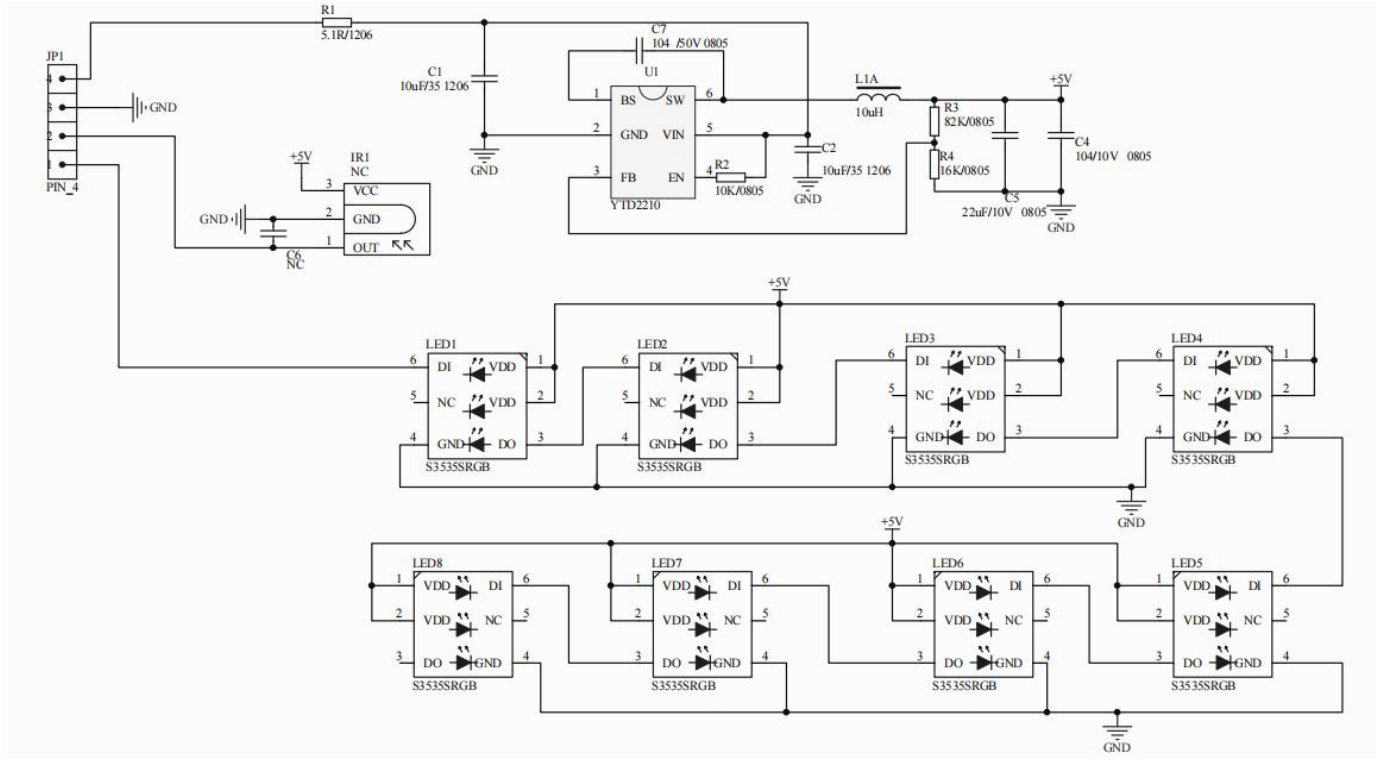
Windings requirements:							
NO.	**Winding**	**Start(PIN)**	**End(PIN)**	**Turns(Ts)**	**Wire Diameter(mm)**	**Winding method**	**Remark**
1)	Np1	5	4	28ts	Φ0.33mm*2P	Flat and tight，Two-layer winding	2EUW copper wire
2)	Myra tape	/	/	2ts	According to bobbin	/	/
3)	NS	10/9	7/6	11ts	Φ0.55mm *2P	Flat and tight，Two-layer winding	TEX-E
4)	Myra tape	/	/	2ts	According to bobbin	/	/
5)	Nvcc	1	2	9ts	Φ0.25mm*2P	Flat and tight，One layer winding	2EUW copper wire
5)	Myra tape	/	/	2ts	According to bobbin	/	/
7)	Np2	4	3	18ts	Φ0.33mm*2P	Flat and tight，Two-layer winding	2EUW copper wire
8)	Myra tape			2ts	According to bobbin	/	/
9)	Blank below						

- Key Point:

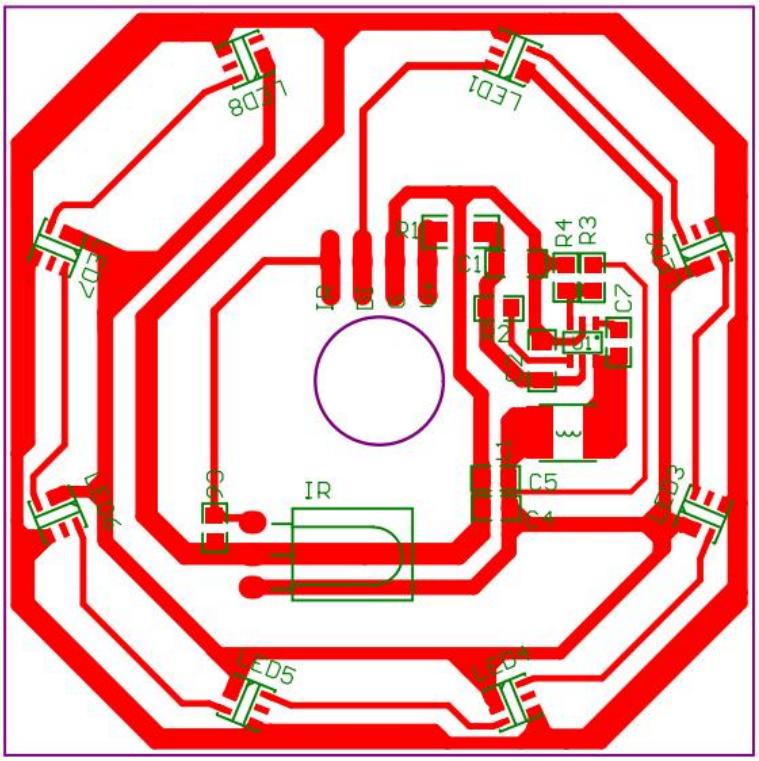
1. Inductance value-Lp=0.40mH±5% for P3-P1. (Test conditions: 1V,10kHz).
2. Leakage inductance of P3-P1<20uH. (Test conditions: 1V,10kHz).
3. Other Requirements：
   1). Reserved Pins of Bobbin: Remove Pin8， cut off 2/3 of pin4 after wrapping，Keep other pins;
   2). Removed Pins of Bobbin：NA
   3). The transformer shall be immersed for 2H and baked for 2H to ensure that no magnetic core loosens and falls off.
   4). Keep the tin surface on the PIN pin to a minimum.
   5).The densely wound wire in the middle of the Nvcc windin

4 LED Display+IR Data

4.1 Schematic Diagram



4.2 PCB Layout

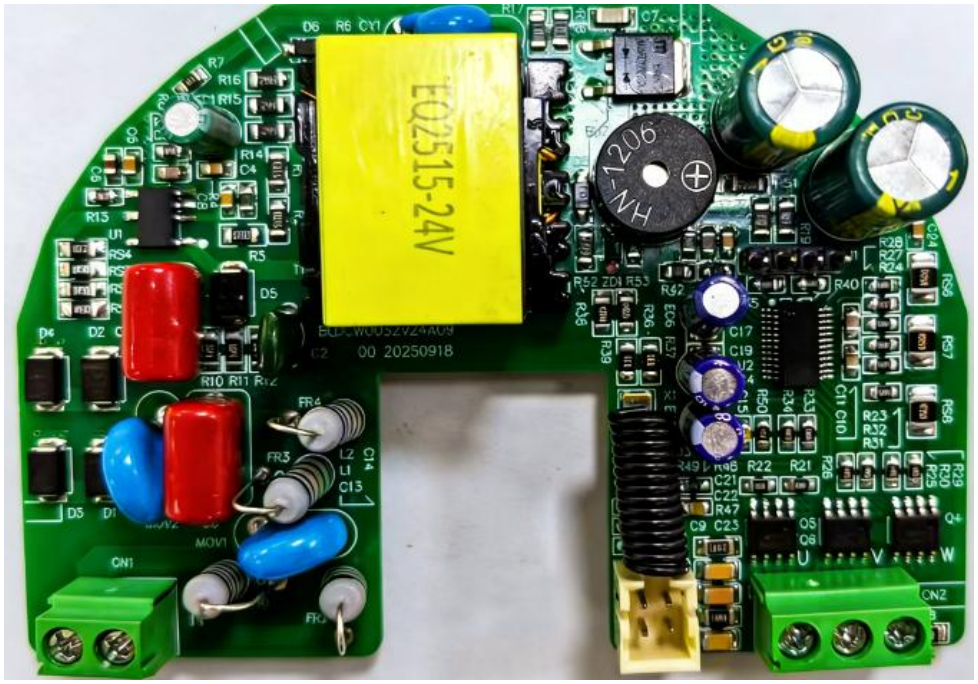


4.3 LED+IR Display BOM List

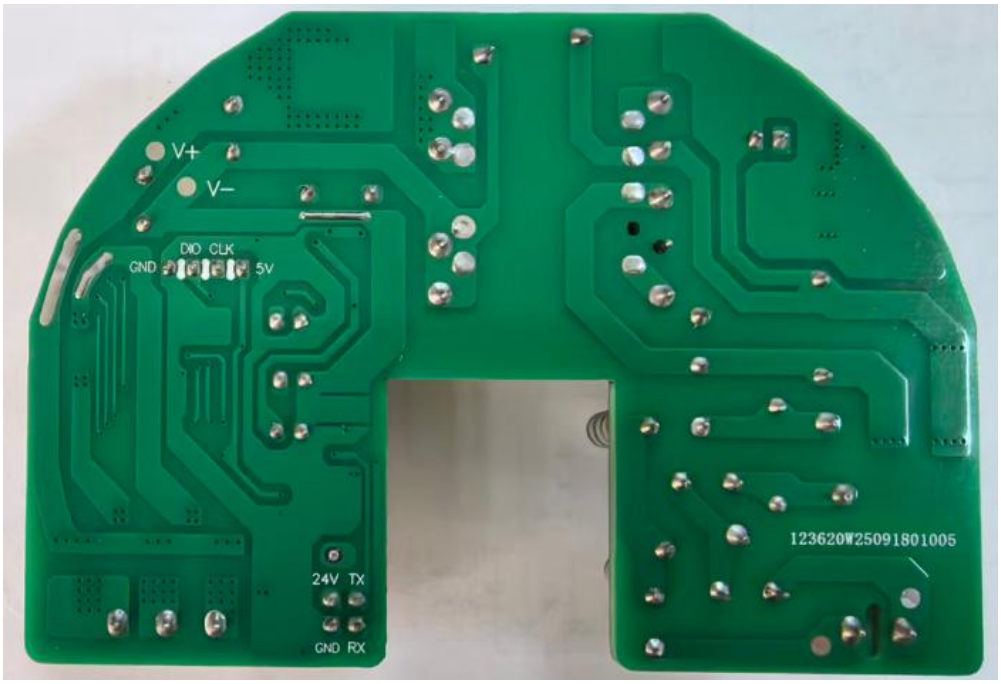
Type	NO.	Name	Specification Description	Designator	Qty.	Unit
SMD Components	1	Driver PCB	BUCK CV-FLZS-00 Driver PCB_8 Pieces_234*127*1.6mm_FR-3 or CEM-1 Dual panel_OSP silk-screen_Green oil and white characters_CU=25um		1/8	pcs
	2	SMD LED	SMD LED_S3535SRGB0406-S3_3535_RGB_Passement_RoHS	LED1,LED2, LED3,LED4, LED5,LED6, LED7,LED8	8	pcs
	3	SMD Capacitor	SMD Capacitor_X7R_1206_35V_10uF±10%_RoHS	C1,C2	2	pcs
	4	SMD Capacitor	SMD Capacitor_X7R_0805_50V_100nF±10%_RoHS	C4,C7	2	pcs
	5	SMD Capacitor	SMD Capacitor_X7R_0805_10V_22uF±10%_RoHS	C5	1	pcs
	6	SMD Capacitor	NC	C6	0	pcs
	7	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_5.1Ω±5%_RoHS	R1	1	pcs
	8	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_10k±5%_RoHS	R2	1	pcs
	9	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_82k±1%_RoHS	R3	1	pcs
	10	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_16k±1%_RoHS	R4	1	pcs
	11	SMD Lnductor	SMD Lnductor_4030S100MT_SMD 4*4_ 10uH±20%_2.4A_Passement_RoHS	L1	1	pcs
	12	SMD IRM	NC	IR	0	pcs
	13	SMD IC	SMD IC_YTD2210T6 _SOT23-6_Passement_RoHS	U1	1	pcs
DIP Components	1	Terminal Line	Terminal Line_XHD2.5-2*02Y_2X2P_P2.5mm_1007-26AWG_200mm_ RBYW_RoHS	/	1	pcs

5 BLDC Driver Picture and Size

- L*W: 97×67.5mm



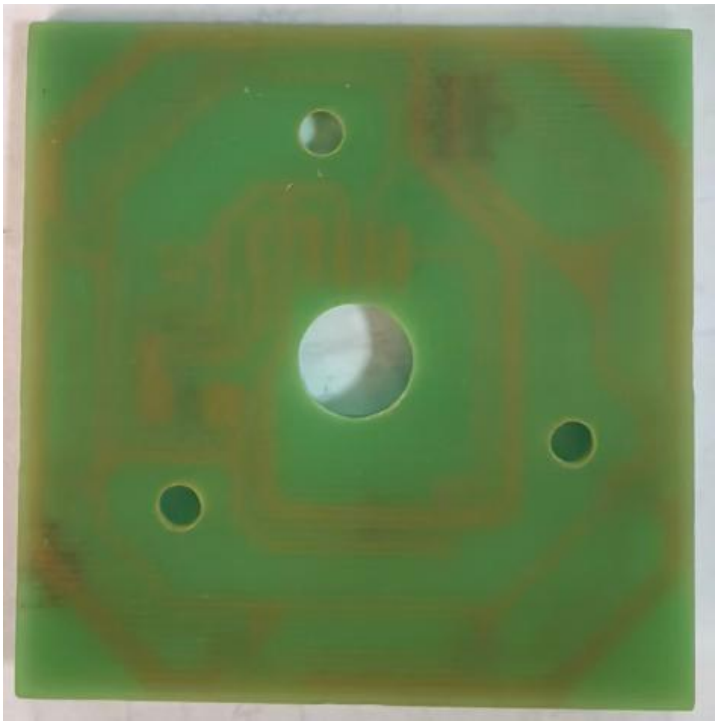
Top view



Bottom view

- L*W: 59.5×59.5mm

Top view

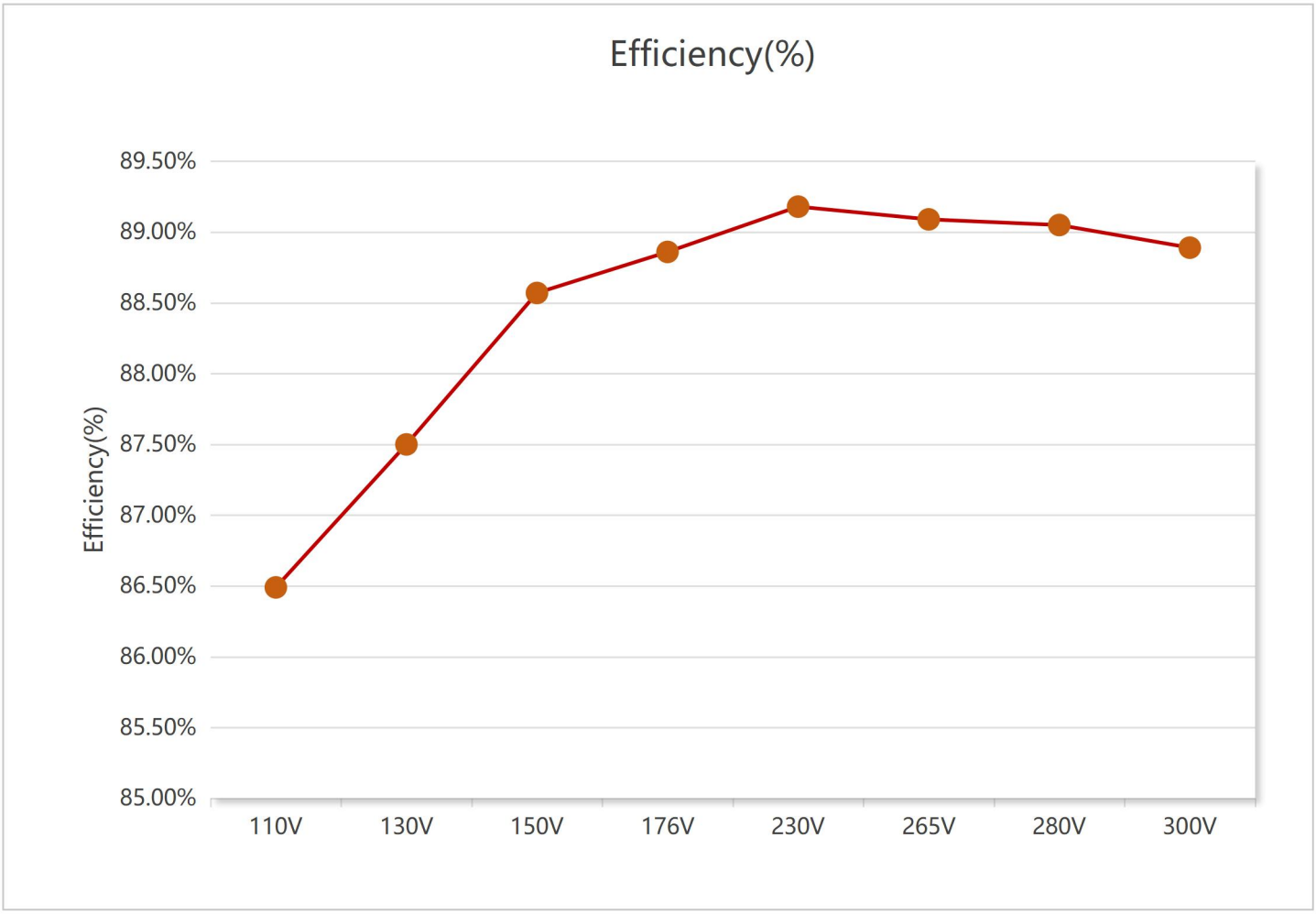


Bottom view

6 Detail Test Data

6.1 Test conditions: CV Mode

Vin（AC）	Hz	Iin（A）	Pin(W)	PF	Vout(V)	Iout(A)	Pout(W)	Efficiency(%)	THD
110V	60	0.378	41.41	0.998	23.98	1.50	35.90	86.49%	2.66%
130V	60	0.216	41.43	0.998	24.02	1.50	35.90	87.50%	3.78%
150V	50	0.273	41.10	0.9976	24.02	1.50	35.97	88.57%	4.75%
176V	50	0.232	40.90	0.994	24.02	1.50	35.99	88.86%	3.74%
230V	50	0.179	40.78	0.9814	24.03	1.50	36.01	89.18%	4.85%
265V	50	0.158	40.83	0.974	24.04	1.50	36.02	89.09%	5.34%
280V	50	0.150	40.85	0.968	24.04	1.50	36.02	89.05%	5.79%
300V	50	0.142	40.91	0.958	24.04	1.50	36.01	88.89%	6.90%
Note1.:The output voltage test is the driving board terminal voltage									



6.2 Output Voltage at no load

Vin(ac)	110V	130V	150V	176V	230V	265V	280V	300V
Output Voltage	24.66	24.66	24.65	24.64	24.61	24.59	24.49	24.46

Note1.:The output voltage test is the driving board terminal voltage

6.3 OCP Current Test

Vin(ac)	110V	130V	150V	176V	230V	265V	280V	300V
OCP(A)	2.01	2.06	2.20	2.20	2.14	2.13	2.05	2.03

Note1.:OCP passing point:1.59-1.64 times

6.4 Standby power at no load

Vin(ac)	110V	130V	150V	176V	230V	265V	280V	300V
Pin(W)	0.254	0.283	0.300	0.389	0.532	0.601	0.672	0.756

7 Temperature test @ Vout=24V 1.5A （Unit：29.4℃）

Vin (ac)	IC (U1)	Rectifier Diode (D2)	MUR20200 (D7)	Transformer Wire (T1)	FUSE Resistor (FR1)	Electrolytic Capacitor (EC1)	Electrolytic Capacitor (EC2)
110V	91.9	83.6	91.4	89.5	85.9	69.2	68.7
150V	78.1	69.5	89.9	86.3	61,8	59.9	67.5
176V	74.3	64.8	89.5	85.7	53.7	57.1	76.1
230V	73.1	61.1	90.0	86.5	47.9	55.3	76.2
265V	74.5	59.1	90.3	87.8	44.7	54.6	67.5
280V	75.6	59.0	90.8	88.4	44.4	54.8	67.8
300V	77.1	59.0	91.2	89.3	44.2	54.9	68.1

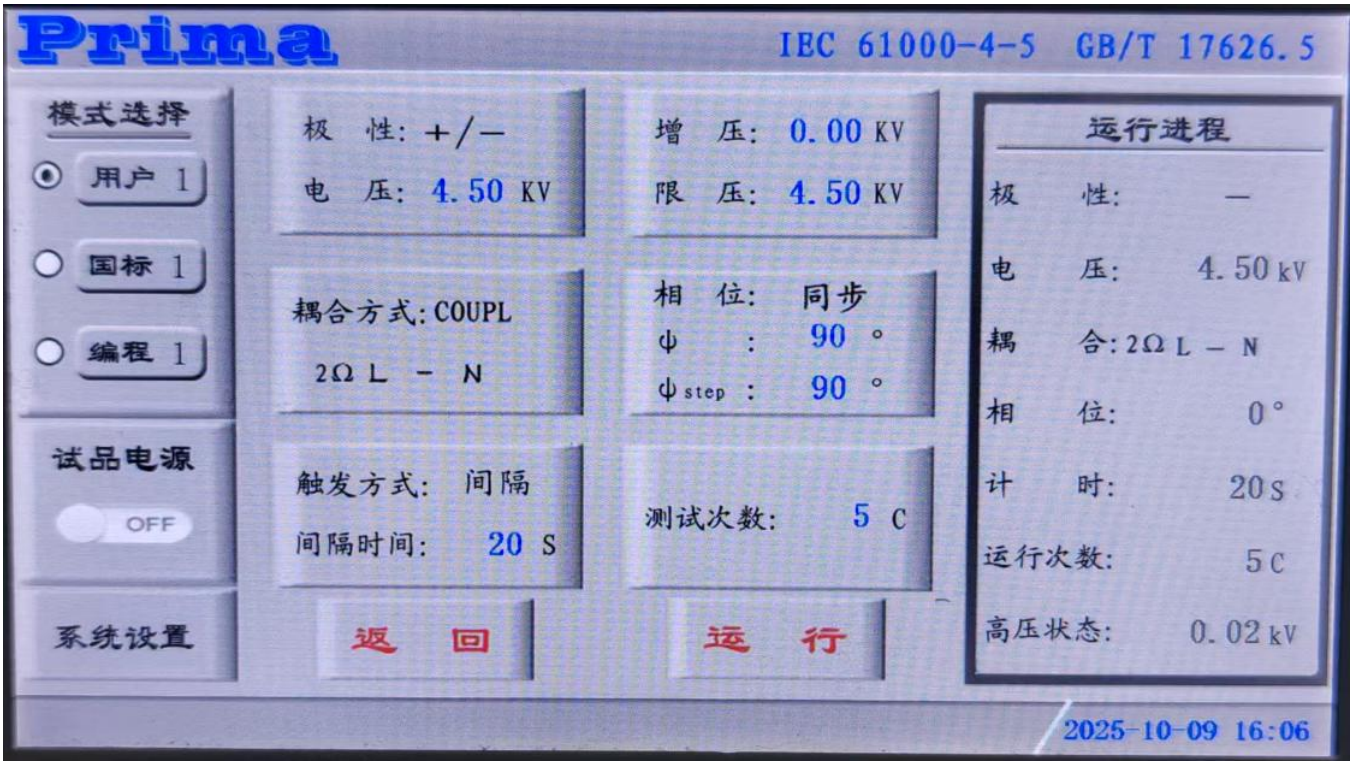
Note1.The above data are measured when the bare drive is placed at the ambient temperature of 29.4℃.

8 Reliability Test

8.1 Open Circuit Protection: OK

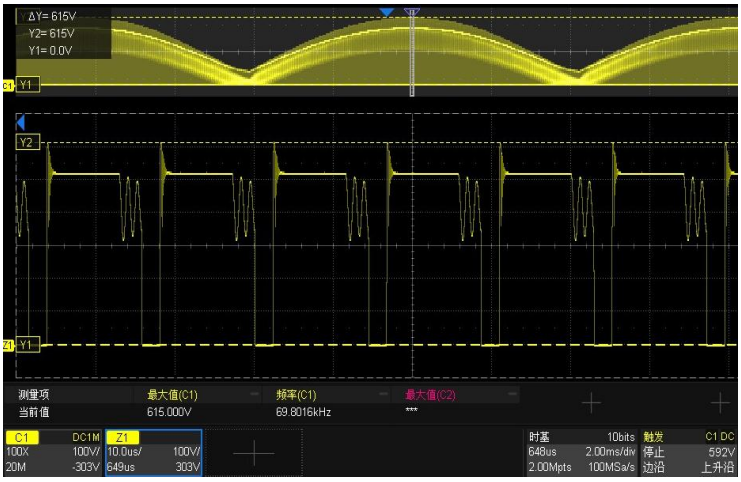
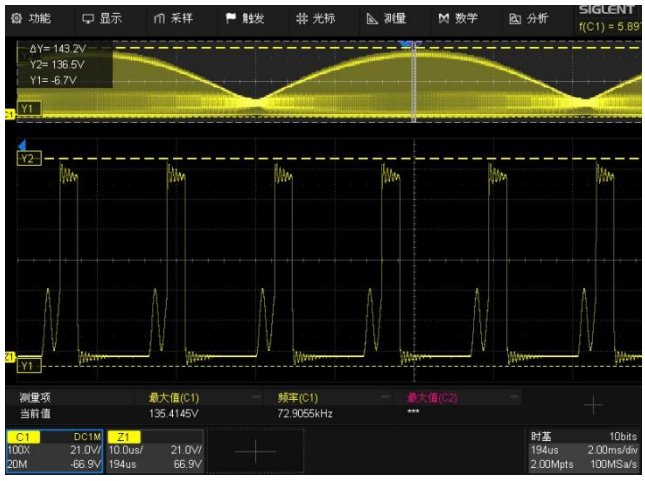
8.2 Short Circuit Protection: OK

8.3 Surge Capability: 5 counts of **4.5 kV** for each ± polarity and 0, 90, 180 and 270 phase

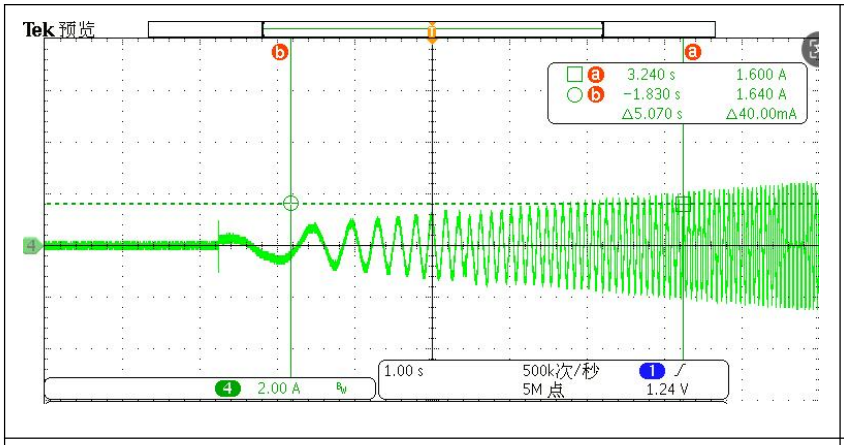
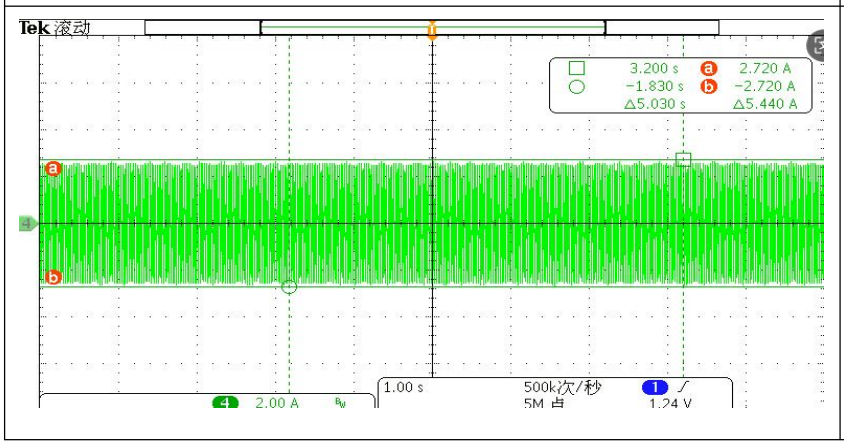


8.4 Component stress Test

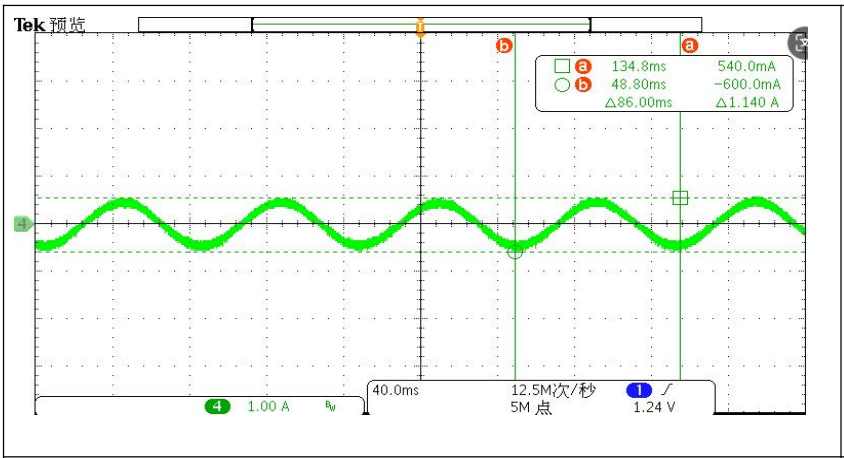
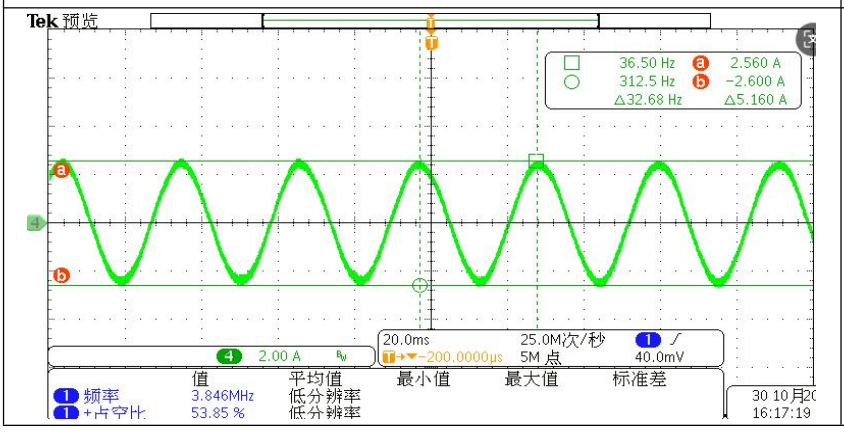
CH1:V_{DS} (YT91003N), CH3: V_D（MUR20200）

	
1#：Vin=300Vac,DC=24V 1.5A,V_{DS}≈615V	2#：Vin=300Vac,DC=24V 1.5A,V_D≈143.2V

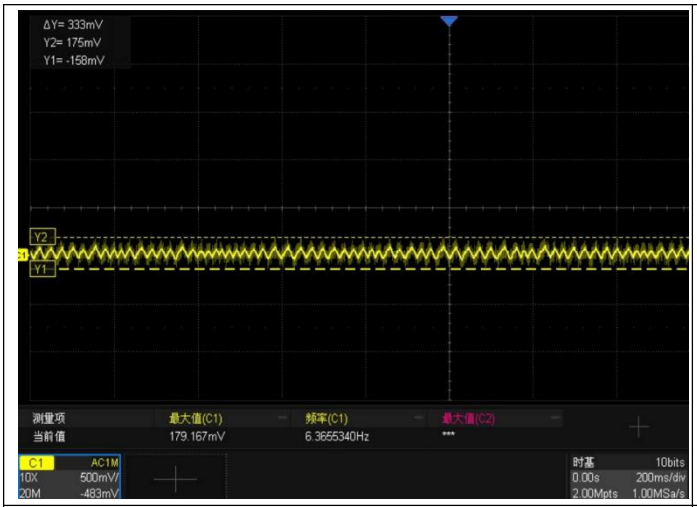
8.5 Starting and braking waveforms

	Motor Starting Waveform
	Motor Boost Mode Waveform

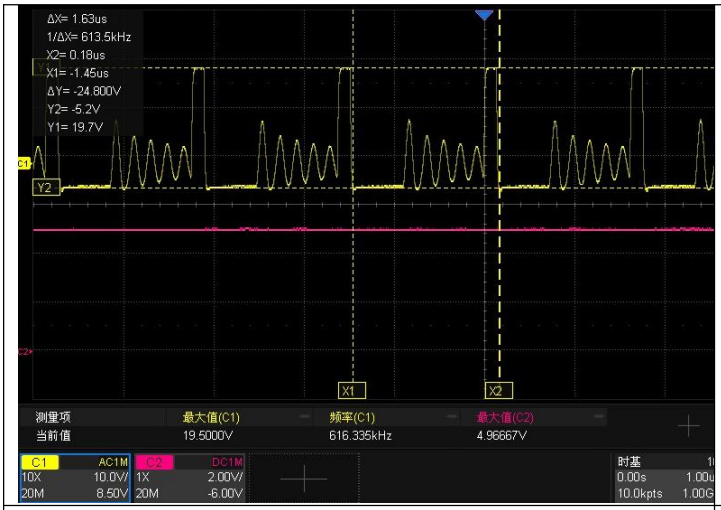
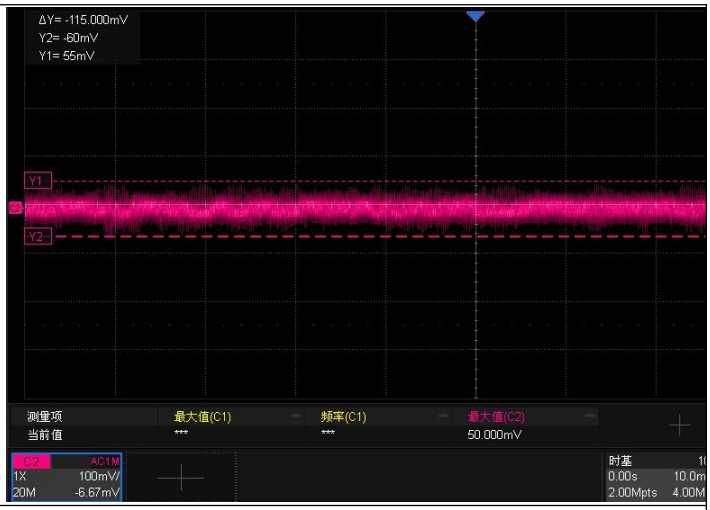
8.6 Fan file number waveform

	First- gear 150RPM current waveform
	Five-speed 350RPM current waveform

8.7 Output Ripple voltage

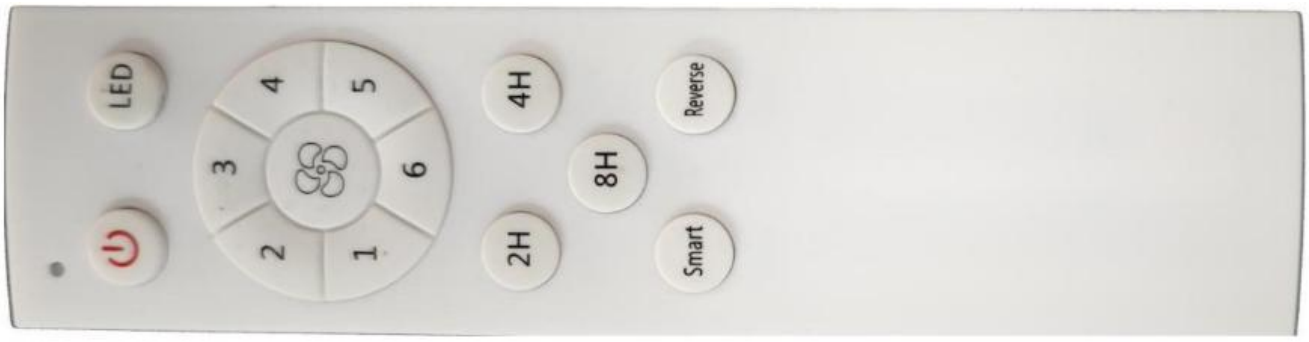
	
Typical Ripple Voltage of V_{OUT}=24V, I_{OUT}=0A@230V_{ac} NO load (Power frequency rippie)	Typical Ripple Voltage of V_{OUT}=24V, I_{OUT}=1.25A@230V_{ac} FULL load (Power frequency rippie)

8.8 IR+LED Display Board Testing Data

	
Test YTD2210 @ 24V Input Waveform, CH1: SW Pin Switch Waveform and Frequency, F=613.5KHz CH2: Load LED Indicator Light Output Voltage, Vo=4.96VDC	Typical Ripple Voltage of Vo=4.96VDC I_{OUT}=100mA@Input24VDC Ripple Noise115mV (DC/DCDC/DC High-Frequency Ripple Test)

9 IR Remote Control Function Description

Function Key	Description	Decision to go ahead
Speed1 to 6	The BLDC controller has a speed control feature that allows you to set the fan speed from 1 to 6 steps. We can achieve the uniform speed. Step 1- 150 RPM - 1 LED Glow Step 2- 185 RPM - 2 LED Glow Step 3- 220 RPM - 3 LED Glow Step 4- 250 RPM - 4 LED Glow Step 5- 295 RPM - 5 LED Glow Step 6- 320 RPM - 6 LED Glow	The constant speed mode or constant power mode can be set as required; The program will light up the corresponding number of LEDs according to the Step; The LED color can be set, tentatively blue;
Boost Mode	The Boost Mode allows the fan to operate beyond the power set by the button, i.e., the rated speed or power, 7 LED Glow.	Yes, the maximum speed or power can be set
Reverse Mode	The reverse control feature allows you to run the fan in either direction. When Reverse button is pressed, the fan will run in reverse at speed step 4. The maximum speed in reverse mode will be limited to 250 rpm, and the step 5, 6 & Boost buttons will be inactive, but buttons of steps 1 to 4 will be active.Press again	Yes, as described; the Reverse Mode function can be customized as required;
Timer 2/4/8 Hours	When the corresponding timer button is pressed, the fan enters the timing state, and after the corresponding set time, the fan	Yes, ok as stated
LED Mode	Turn on or off the LED indicator mode; this function is defined as sleep mode.	Yes, ok as stated
Smart Mode	In Smart mode, the fan will decrease by 30 RPM every hour from the current gear until the speed reaches Gear 1. During this period, the LEDs will light up the corresponding number according to the speed change.	Yes, ok as stated
Toggle Switch Mode	In this mode, we can control the fan speed by toggling the main wall switch in a time interval of 1 second repeatedly, to get the desired speed. This is intended to be used, when the remote is not handy,and you still want to adjust the speed. The fan when initially switched on it will run at previously Bset speed.(When we are doing 1. Toggling 3 times, then the speed 2 is activated, 2. Toggling 4 times, then the speed 4 is activated, 3. Toggling 5 times, then the speed 7 is activated).	Yes, ok as stated
Startup Time	The startup time of the fan should be ≤ 25 seconds under both no-load and full-load conditions.	Yes, ok as stated



10 Affix

10.1 Affix1 Schematics

10.2 Affix2 BOM

10.3 Affix3 PCB

10.4 Affix4 Transformer specification

10.5 Affix5 IC Data shee

Version History

Version	Date	Description
A0	Sep. 2025	Draft
A1	Oct.2025	Release
A2	Dec.2025	Operating Instructions