

Features

- Primary-Side Regulation (PSR) non-isolated high power factor (HPF) system supports constant voltage and current-limiting output.
- Compatible with Remote Controller Mode and Regulator Mode ; supports automatic switching between remote controller mode and regulator mode.
- Supports 4-speed and 5-speed Regulators.
- Regulator Mode, rated operating voltage: 200Vac~250Vac.
- Regulator Mode enables low-speed level startup under input voltage of 200Vac and above.
- Remote Control Mode supports wide voltage operation in the range of 110Vac~325Vac.
- Control mode: torque control, limited power, limited speed, positive and negative electronic brake.
- Supports RF433 remote control.
- PCB integrated molding, high production efficiency, low cost.
- MCU integrates carrier and comparator, and the current sampling difference signal is directly input without bias voltage.
- 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.
- Complete protection functions: over voltage, under voltage, over current, blocking, phase deficiency, internal power supply monitoring and protection.



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1 Specification

1.1 Input Spec

- Input Voltage: 110-325 Vac
- Input Frequency: 47-63 Hz
- Input Power: 38W(380 RPM)

1.2 Output Spec

- Output Voltage: 24V
- Output Current: 1.5A

2 Assessment Result

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

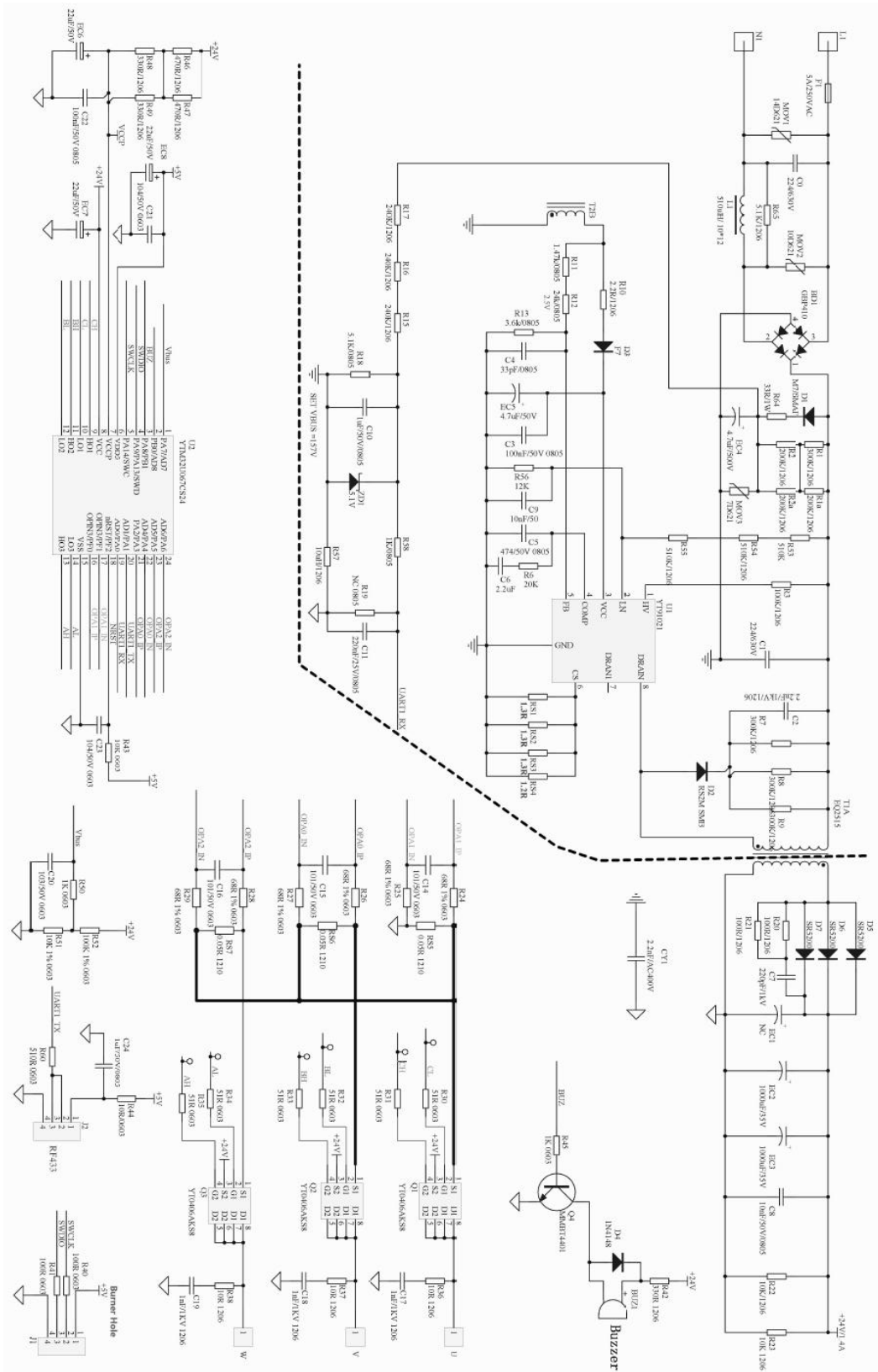
- Constant pressure accuracy: $\pm 4\%$
- Efficiency: $\geq 0.87\%$
- Power Factor: > 0.95
- THD $< 10\%$ @full load
- No load power: $\cong 750\text{mW}$ @ 230V

2.2 Defensive Function

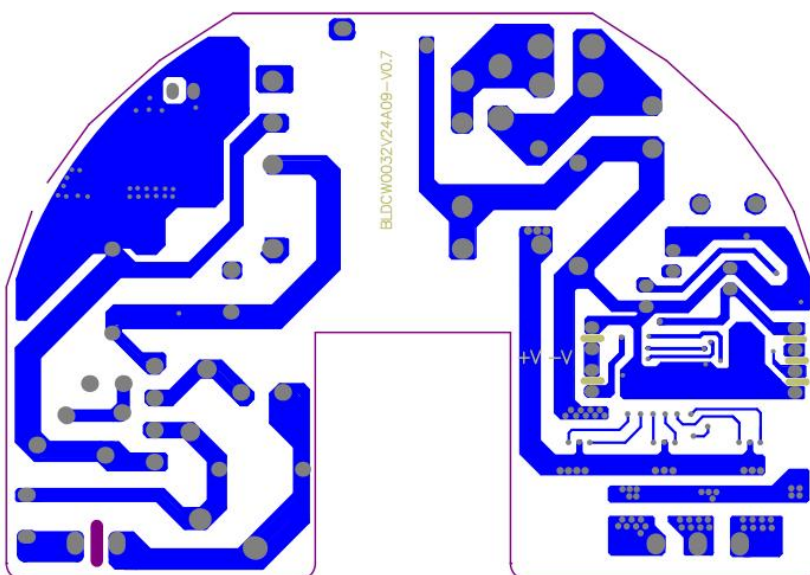
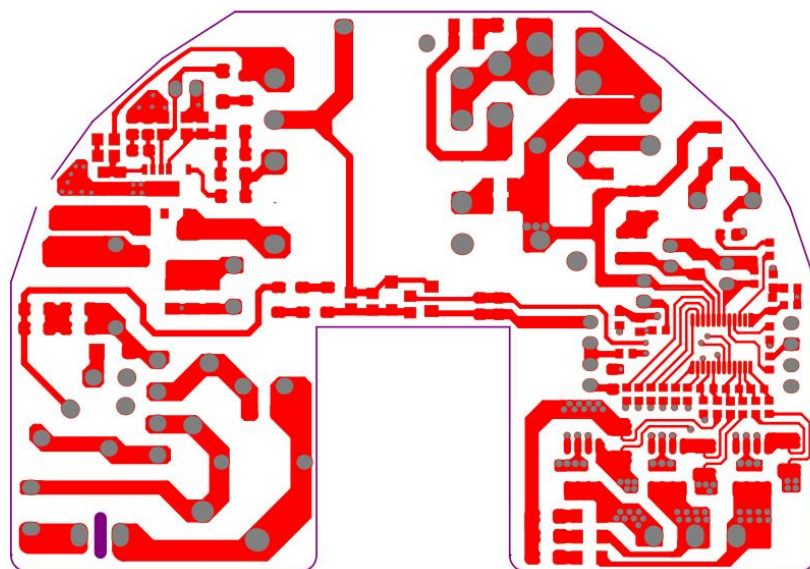
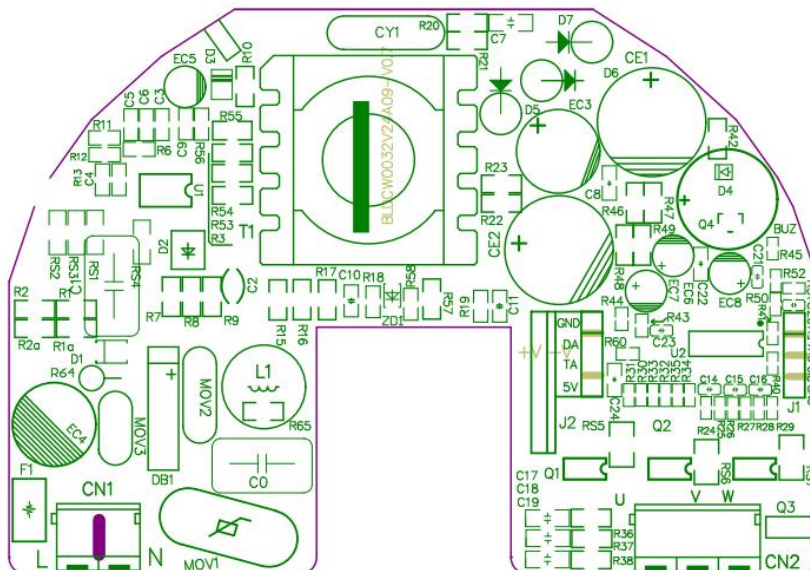
- Over power Protection: OK
- Open Circuit Protection: OK
- Short Circuit Protection: OK
- Power overrun protection: OK
- Speed limit protection: OK
- Motor lock protection: OK
- Surge Level: 4kV

3 LED Driver Data

3.1 Schematic Diagram



3.2 PCB Layout



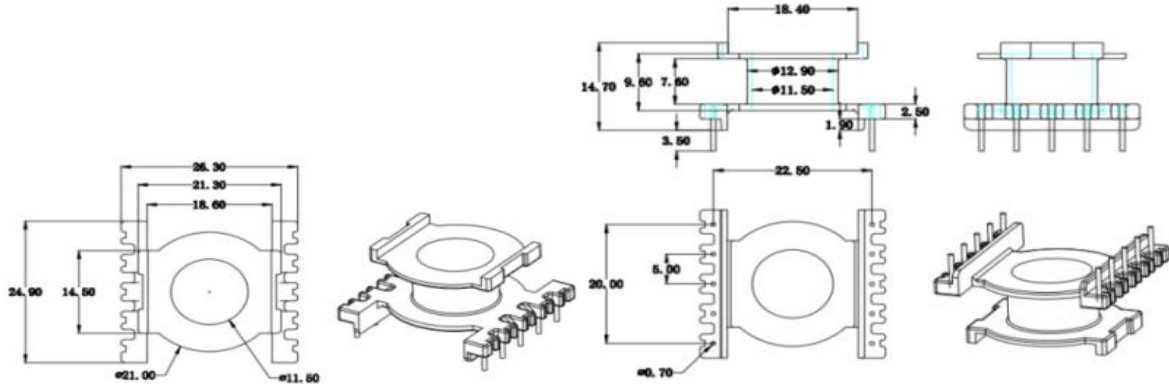
3.3.BOM-List

Type	NO.	Name	Specification Description	Designator	Qty.	Unit
SMD Components(Red glue process)	1	Driver PCB	BLDCW0032V24A09-V0.6 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=35um_Through hole cover oil_94-V0_RoHS		1/2	pcs
	2	SMD Diode	SMD Diode_M7_SMAF_1000V_1A_46mil_Passement_RoHS	D1	1	pcs
	3	SMD Diode	SMD Diode_RS2M_SMB_1000V_2A_60mil_Passement_RoHS	D2	1	pcs
	4	SMD Diode	SMD FRD_F7_SOD-123FL_1000V_1A_46mil_TP_RoHS	D3	1	pcs
	5	SMD Diode	SMD Diode_1N4148_SOD-123_100V_150mA_26mil_Passement_RoHS	D4	1	pcs
	6	SMD Diode	SMD Zener Diode_BZT52C5V1_5.1V_SOD-123_500mW_±5%_33mil_Passement_RoHS	ZD1	1	pcs
	7	SMD Capacitor	SMD Capacitor_X7R_0805_50V_100nF±10%_RoHS	C3,C11,C22	3	pcs
	8	SMD Capacitor	SMD Capacitor_C0G_0805_50V_33pF±10%_RoHS	C4	1	pcs
	9	SMD Capacitor	SMD Capacitor_X7R_0805_50V_220nF±10%_RoHS	C5	1	pcs
	10	SMD Capacitor	SMD Capacitor_X7R_0805_25V_2.2uF±10%_RoHS	C6	1	pcs
	11	SMD Capacitor	SMD Capacitor_X7R_1206_1kV_220pF±10%_RoHS	C7	1	pcs
	12	SMD Capacitor	SMD Capacitor_X7R_0805_50V_10nF±10%_RoHS	C8,C9,R19	3	pcs
	13	SMD Capacitor	SMD Capacitor_X5R_0805_25V_22uF±20%_RoHS	C10	1	pcs
	14	SMD Capacitor	SMD Capacitor_X7R_0603_50V_100pF±10%_RoHS	C14,C15,C16	3	pcs
	15	SMD Capacitor	SMD Capacitor_X7R_1206_1kV_1nF±10%_RoHS	C17,C18,C19	3	pcs
	16	SMD Capacitor	SMD Capacitor_X7R_0603_50V_10nF±10%_RoHS	C20	1	pcs
	17	SMD Capacitor	SMD Capacitor_X7R_0603_50V_100nF±10%_RoHS	C21,C23	2	pcs
	18	SMD Capacitor	SMD Capacitor_X7R_0805_50V_1uF±10%_RoHS	C24	1	pcs
	19	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_300k±5%_RoHS	R1,R1a,R2,R2a,R7,R8,R9	7	pcs
	20	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_100k±5%_RoHS	R3	1	pcs
	21	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_30k±5%_RoHS	R6	1	pcs
	22	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_10Ω±5%_RoHS	R36,R37,R38	3	pcs
	23	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_2.2Ω±5%_RoHS	R10	1	pcs
	24	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_1.47k±1%_RoHS	R11	1	pcs
	25	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_24k±1%_RoHS	R12	1	pcs
	26	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_3.6k±1%_RoHS	R13	1	pcs
	27	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_240k±1%_RoHS	R15,R16,R17	3	pcs
	28	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_5.1k±1%_RoHS	R18	1	pcs
	29	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_100Ω±5%_RoHS	R20,R21	2	pcs
	30	SMD Resistor	NC	R22,R23	0	pcs
	31	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_68Ω±5%_RoHS	R24,R25,R26, R27,R28,R29	6	pcs
	32	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_51Ω±5%_RoHS	R30,R31,R32, R33,R34,R35	6	pcs
	33	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_100Ω±5%_RoHS	R40,R41	2	pcs
	34	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_330Ω±5%_RoHS	R42,R48,R49	3	pcs
	35	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_10k±5%_RoHS	R43	1	pcs

SMD Components(solder paste process)	1	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_10Ω±5%_RoHS	R44	1	pcs
	2	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_1k±5%_RoHS	R45,R50	2	pcs
	3	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_470Ω±5%_RoHS	R46,R47	2	pcs
	4	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_10k±1%_RoHS	R51	1	pcs
	5	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_100k±1%_RoHS	R52	1	pcs
	6	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_510k±1%_RoHS	R53,R54,R55	3	pcs
	7	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_10k±1%_RoHS	R56	1	pcs
	8	SMD Resistor	SMD Resistor_TF_0805_1/8W_150V_1k±5%_RoHS	R58	1	pcs
	9	SMD Resistor	SMD Resistor_TF_0603_1/10W_50V_510Ω±5%_RoHS	R60	1	pcs
	10	SMD Resistor	SMD Resistor_TF_1206_1/8W_150V_4.7k±5%_RoHS	R65	1	pcs
	11	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_1.2Ω±1%_RoHS	RS1	1	pcs
	12	SMD Resistor	SMD Resistor_TF_1206_1/4W_200V_1.3Ω±1%_RoHS	RS2,RS3,RS4	3	pcs
	13	SMD Resistor	SMD Resistor_TF_1210_1/2W_200V_0.05Ω±1%_RoHS	RS5,RS6,RS7	3	pcs
	14	SMD Inductors	SMD Inductors_1206_10uH±10%_25mA Max_DCR <1Ω_RoHS	R57	1	pcs
	15	SMD MOS	SMD MOS_YT0406AKS8_SOP8_Passement_RoHS	Q1,Q2,Q3	3	pcs
	16	SMD BJT	SMD BJT_MMBT4401_NPN_Vceo:40V_600mA_SOT-23_Passement_RoHS	Q4	1	pcs
	17	SMD IC	SMD IC_YT91021NH7_HSOP-7_Passement_RoHS	U1	1	pcs
	18	SMD Microcontroller	SMD Microcontroller_YTM32U067CS24_SSOP24_Passement	U2	1	pcs
DIP Components	1	FUSE	FUSE_8.5*7.6*4_Slow Blowing_T5A_250Vac_P5.08_S3.5_4KV Surge_ROHS	F1	1	pcs
	2	Varistor	Varistor_NDF14D621KJ_High Joule_570-630V_125°_P=7.5mm_Pin length: 3.5mm_RoHS(silver and copper electrode)	MOV1	1	pcs
	3	Varistor	Varistor_NDF10D561KJ_High Joule_575-610V_125°_P=7.5mm_S3.5mm_RoHS(silver electrode)	MOV2	1	pcs
	4	KNP-Resistor	Wire-wound resistance_KNP_47Ω_±5%_1WS_Pin CP wire diameter 0.55mm_Alloyed wire_B52_Passement_Surge2kV_RoHS	R64	1	pcs
	5	Film Capacitor	Film Capacitor_CBB22_630V_220nF_S3.5_P10_RoHS	C0,C1	2	pcs
	6	Poly.CAP	Poly.CAP_1000V_2.2nF±10%_P5_S3.5_RoHS	C2	1	pcs
	7	Y1-Safety Cap	Y1-Safety Cap_400V_2.2nF±20%_P10_S3.5_RoHS	CY1	1	pcs
	8	E-Cap	NC	CE1	1	pcs
	9	E-Cap	ELEC-CAP_Φ10*20_35V_1000μF_105°C_6000h_S3.5_high frequency low resistance_RoHS	CE2,EC3	2	pcs
	10	E-Cap	ELEC-CAP_Φ10*13_500V_4.7μF_105°C_5000h_S3.5_RoHS	EC4	1	pcs
	11	E-Cap	ELEC-CAP_Φ5*11_50V_4.7μF_105°C_8000h_S3.5_RoHS	EC5	1	pcs
	12	E-Cap	ELEC-CAP_Φ5*11_50V_22μF_105°C_6000h_S3.5_high frequency low resistance_RoHS	EC6,CE7,EC8	3	pcs
	13	Schottky Diodes	Schottky Diodes_SR5200_DO-27_200V_5A_68Mil_Passement_RoHS	D5,D6,D7	3	pcs
	14	Bridge Rectifiers	Bridge Rectifiers_GBP410_GBP_1kV_4A_84mil_RoHS	BD1	1	pcs
	15	I-shaped inductor	I-shaped inductor_Φ8*10_560uH±5%_0.25 Bare Copper Wire_RoHS	L1	1	pcs
	16	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
	17	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
	18	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
	19	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
	1	Remote Control	RF433 Receiving module_YT520T-V0.1	J2	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						

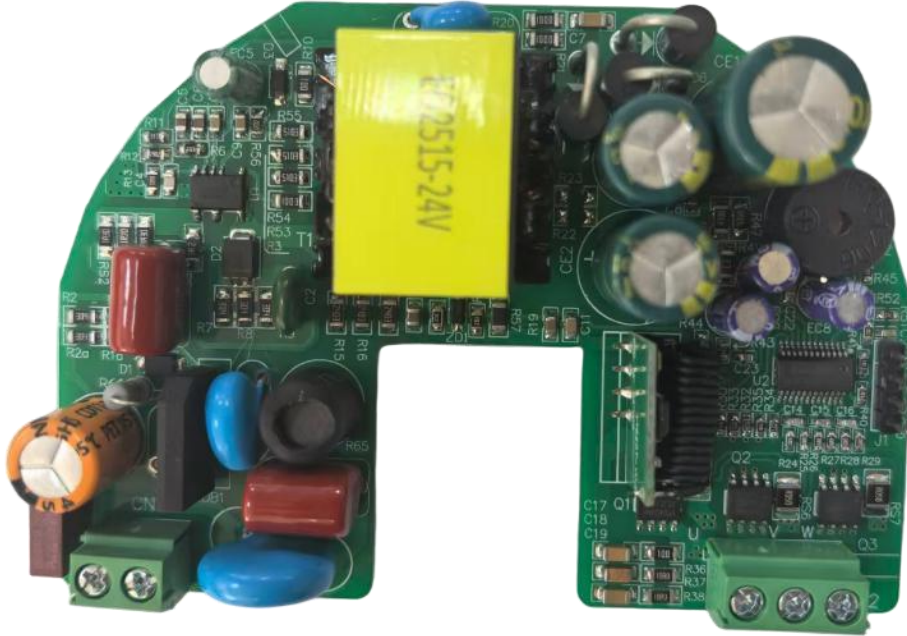
- Key Point:

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 winding

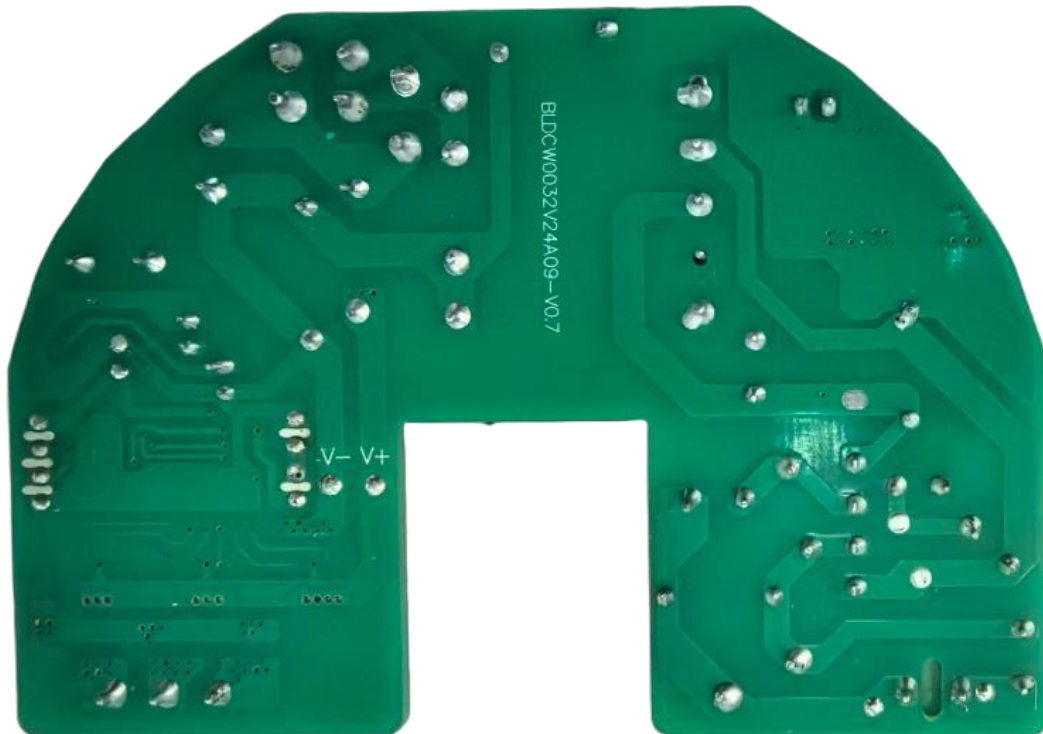
5 BLDC Driver Picture and Size

- L*W: 97.5×67.5mm

Top view



Bottom view

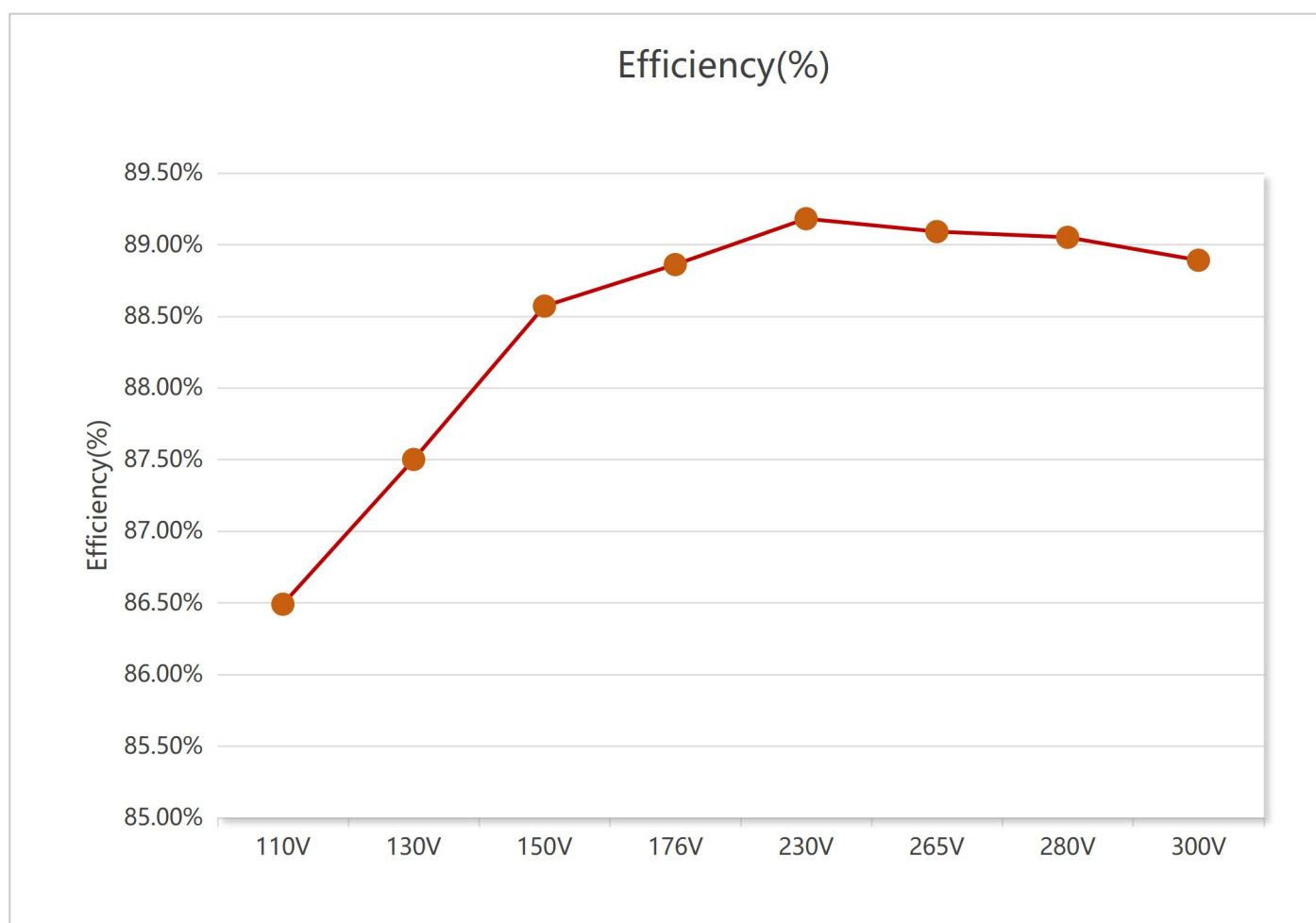


6 Detail Test Data

6.1 Test conditions: CC Mode

Vin (AC)	Hz	Iin (A)	Pin(W)	PF	Vout(V)	Iout(A)	Pout(W)	Efficiency(%)	THD
110V	60	0.368	40.54	0.997	24.14	1.5	36.21	89.31	1.58
130V	60	0.312	40.41	0.996	24.14	1.5	36.21	89.6	1.79
150V	50	0.27	40.33	0.994	24.16	1.5	36.24	89.85	2.33
176V	50	0.229	40.05	0.992	24.21	1.5	36.31	90.67	2.72
230V	50	0.18	40.54	0.981	24.23	1.5	36.34	89.65	3.16
265V	50	0.159	40.69	0.968	24.23	1.5	36.34	89.32	4.33
280V	50	0.152	40.75	0.963	24.22	1.5	36.33	89.15	4.47
300V	50	0.143	40.85	0.952	24.21	1.5	36.31	88.88	5.16

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	24.98	24.97	24.97	24.95	24.91	24.88	24.85	24.81

Note.: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)	2.05	2.19	2.21	2.18	2.06	1.99	2.0	1.93

Note.: 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)	0.296	0.323	0.361	0.408	0.548	0.654	0.707	0.815

7 Temperature test @ Vout=24V 1.5A (Unit: 30°C)

Vin (ac)	IC (U1)	Schottky Diode (D5)	Schottky Diode (D5)	Bridge Rectifiers (DB1)	Transformer Wire (T1)	Inductance (L1)	Electrolytic Capacitor (EC3)
110V	76.6	84.5	84.7	76.4	95.4	78.5	77.6
130V	74.0	84.0	84.4	63.9	82.7	61.8	68.8
150V	72.7	84.8	85.1	60.7	83.6	58.4	69.2
176V	71.7	84.6	84.9	58.0	83.7	55.6	69.0
230V	74.5	85.9	85.9	56.0	86.2	53.9	69.8
265V	77.6	87.3	87.1	55.1	89.0	53.4	70.8
280V	77.9	87.2	87.0	55.2	89.3	53.7	70.7
300V	80.0	88.2	87.9	55.4	90.9	54.2	71.4

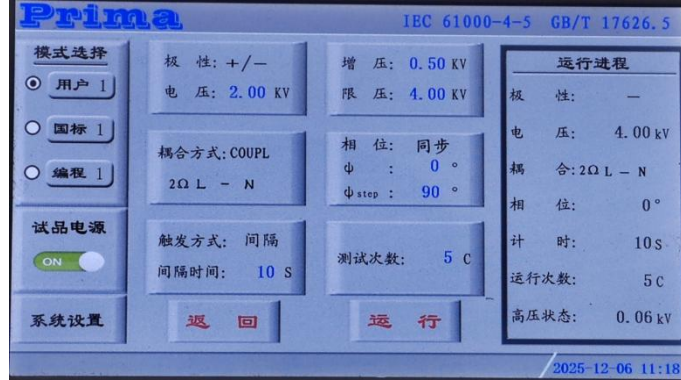
Note.The above data are measured when the bare drive is placed at the ambient temperature of 30°C.

8 Reliability Test

8.1 Open Circuit Protection: OK

8.2 Short Circuit Protection: OK

8.3 Surge Capability: 5 counts of 4 kV for each ± polarity and 0, 90, 180 and 270 phase

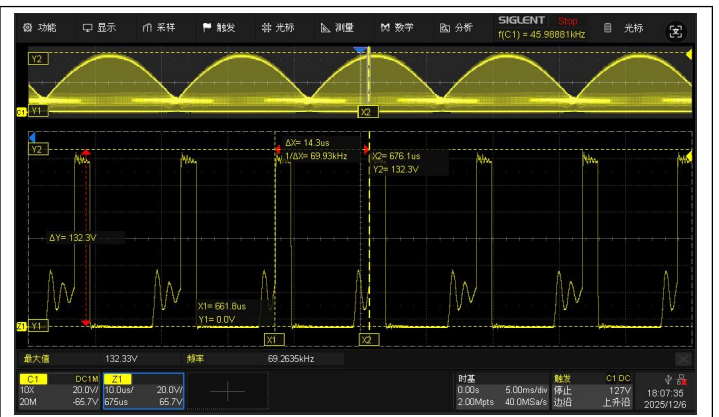


8.4 Component stress Test

CH1/1#: V_{DS} (YT91021NH7N), CH1/2#: V_D (SR5200)

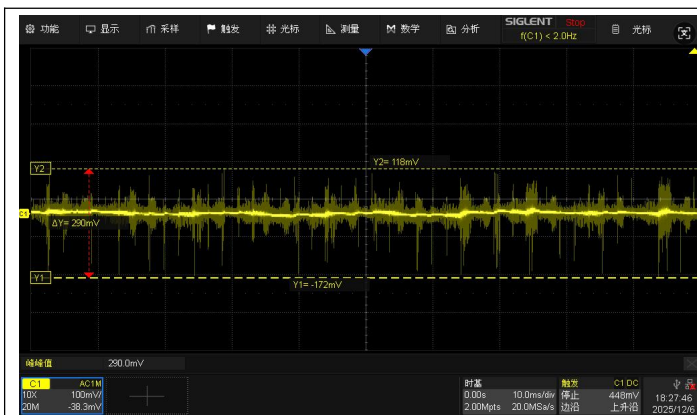


1#: Vin=300Vac,DC=24V 1.5A,V_{DS}≈618V

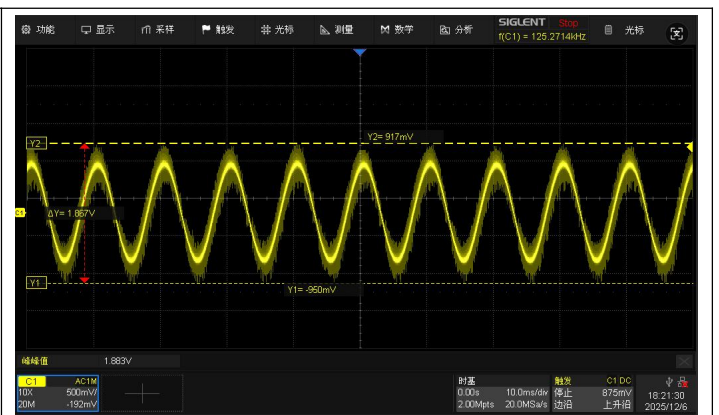


2#: Vin=300Vac,DC=24V 1.5A,V_D≈132.3V

8.5 Output Ripple voltage

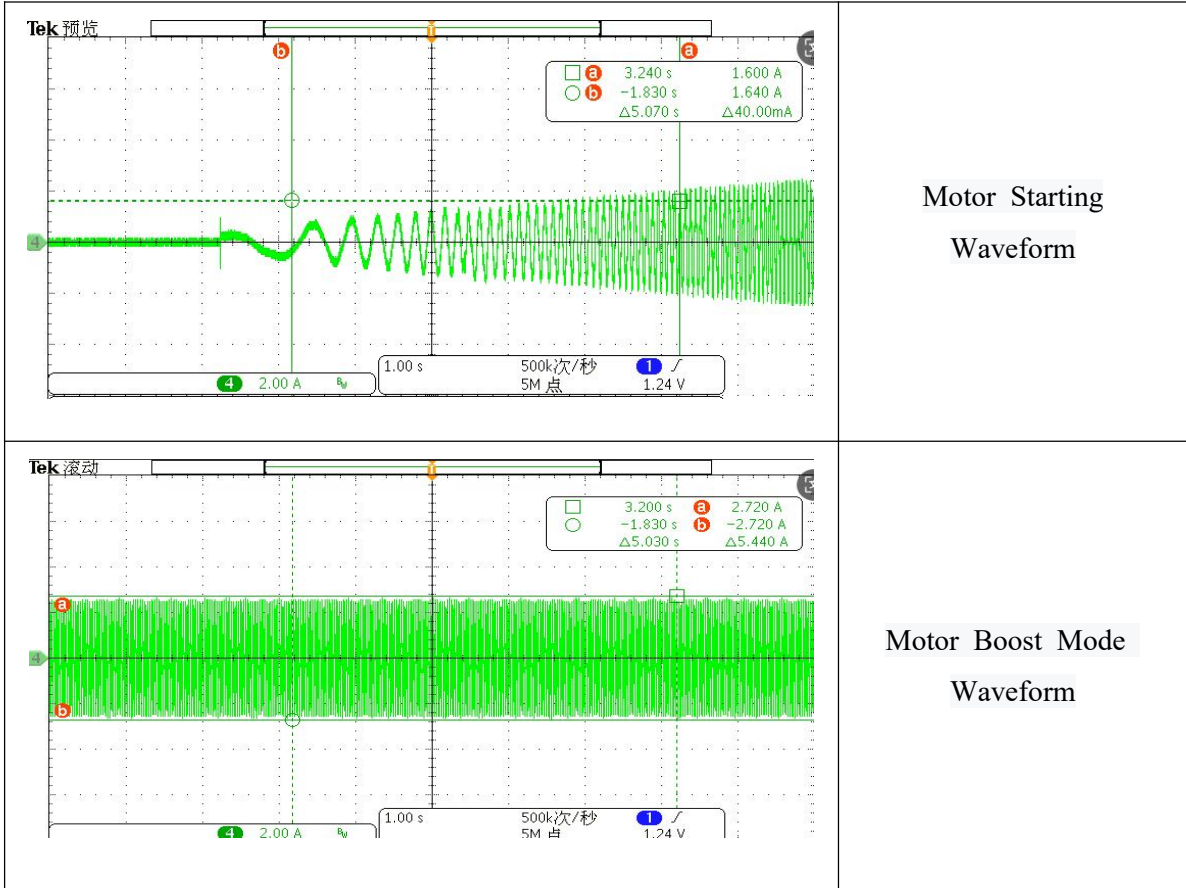


Typical Ripple Voltage of V_{OUT}=24V,
I_{OUT}=0A@230V_{ac} NO load
(Power frequency ripple)

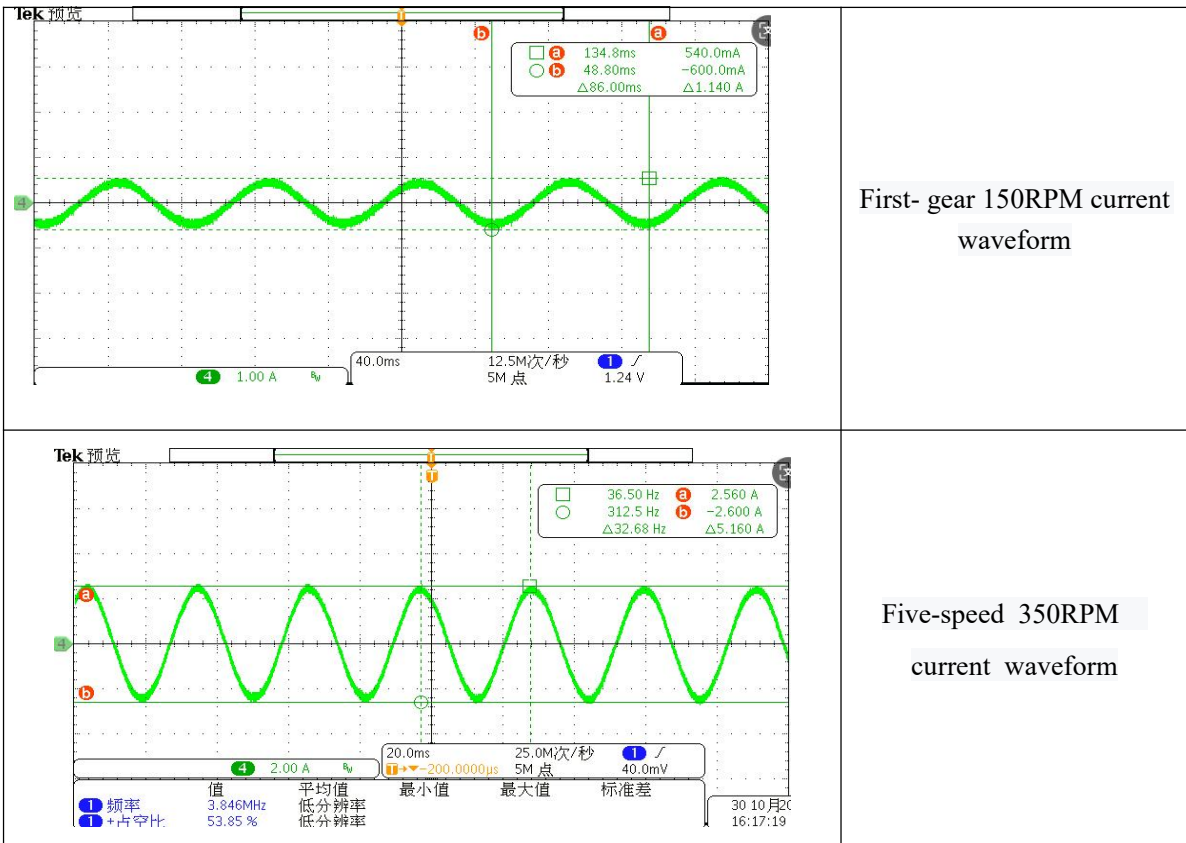


Typical Ripple Voltage of V_{OUT}=24V,
I_{OUT}=1.5A@230V_{ac} FULL load
(Power frequency ripple)

8.6 Starting and braking waveforms

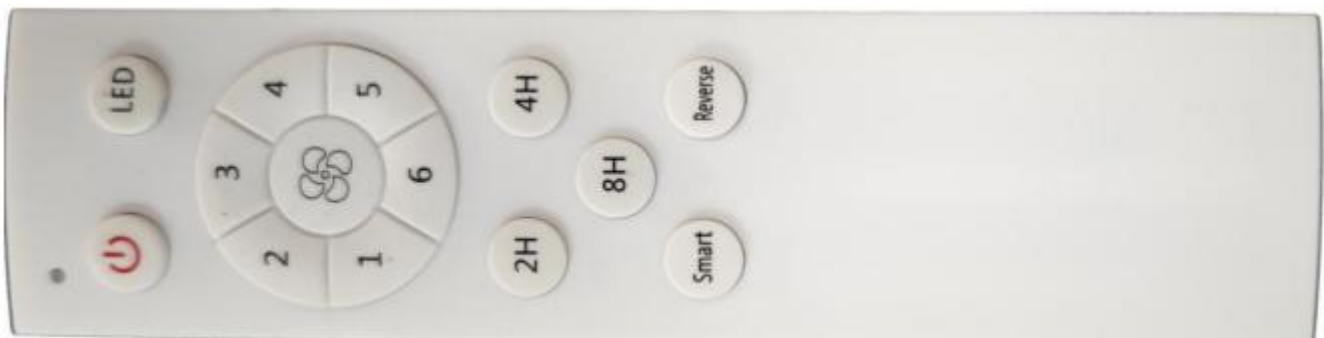


8.6 Fan file number waveform



8 RF433 Remote Control Function Description

Function Key	Description	Decision to go ahead
Speed1 to 6	The BLDC controller has a power control feature that allows you to set the power to 1 to 6 steps, so we can achieve constant power operation.	Yes, ok as stated
Boost Mode	The Boost Mode allows the fan to operate beyond the power set by the button, i.e., the rated power.	Yes, the maximum 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 power step 4. The maximum power in reverse mode will be limited to step 4, and the step 5, 6 & Boost buttons will be inactive, but buttons of steps 1 to 4 will be active.Press again to switch back to Forward Mode.	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 enters the shutdown state.	Yes, ok as stated
Smart Mode	In Smart mode, the fan will reduce its power by a certain amount every hour starting from the current gear, until the power drops to Gear 1.	Yes, ok as stated
Toggle Switch Mode	In this mode, the fan power can be controlled by repeatedly toggling the main wall switch at 1-second intervals to achieve the desired power. This function is intended for scenarios where the remote control is not handy but power adjustment is still required. When the fan is turned on for the first time, it will operate at the previously set power. 1. Toggling 3 times, then the step 2 is activated, 2. Toggling 4 times, then the step 4 is activated, 3. Toggling 5 times, then the step Boost 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



9 Affix

9.1 Affix1 Schematics

9.2 Affix2 BOM

9.3 Affix3 PCB

9.4 Affix4 Transformer specification

9.5 Affix5 IC Data shee

Version History

Version	Date	Description
A0	Dec. 2025	Draft
A1	Jan. 2026	Upgrade and optimize the quick startup function
A2	Fed. 2026	Optimize the program and power-on startup speed