30A BLDC ESC



Figure 1: 30A BLDC ESC

Introduction

This is fully programmable 30A BLDC ESC with 5V, 3A BEC. Can drive motors with continuous 30Amp load current. It has sturdy construction with 2 separate PCBs for Controller and ESC power MOSFETs. It can be powered with 2-4 lithium Polymer batteries or 5-12 NiMH / NiCd batteries. It has separate voltage regulator for the microcontroller for providing good anti-jamming capability. It is most suitable for UAVs, Aircrafts and Helicopters.

Specifications

- Output: 30A continuous; 40Amps for 10 seconds
- Input voltage: 2-4 cells Lithium Polymer / Lithium Ion battery or 5-12 cells NiMH / NiCd
- BEC: 5V, 3Amp for external receiver and servos
- Max Speed: 2 Pole: 210,000rpm; 6 Pole: 70,000rpm; 12 Pole: 35,000rpm
- Weight: 32gms
- Size: 55mm x 26mm x 13mm

Features:

- High quality MOSFETs for BLDC motor drive
- High performance microcontroller for best compatibility with all types of motors at greater efficiency
- Fully programmable with any standard RC remote control
- Heat sink with high performance heat transmission membrane for better thermal management
- 3 start modes: Normal / Soft / Super-Soft, compatible with fixed wing aircrafts and helicopters
- Throttle range can be configured to be compatible with any remote control available in the market

- Smooth, Linear and Precise throttle response
- Low-Voltage cut-off protection
- Over-heat protection
- Separate voltage regulator IC for the microcontroller to provide anti-jamming capability
- Supported Motor Speed (Maximum): 210000RPM (2 poles), 70000RPM (6poles), 35000RPM (12 poles)

Package contains: One 30A BLDC Motor

Warning:

In case the BLDC ESC is connected directly to the remote control receiver, never ever switch off the remote control before switching off power to the BLDC ESC. Depending on the model of the remote control, it may result in full throttle applied to the motor and it will rotate at full speed.

Connections:

BLDC ESC has three Blue wires coming out from the one end which are to be connected to the BLDC motor. On the other end, it has red and black wires which are to be connected to the battery. It also has a 3 pin servo connector which is used for receiving the throttle command and for giving out regulated 5V, 3Amp supply for the remote receiver and the servo motors.

Connection type	Wire Colour	Function
Power	Red	7.4 to 14.8V
	Black	Ground
BLDC Motor Connections	Three Blue Wires	BLDC ESC connections
Servo Connector	White	Throttle Input
	Red	5V, 2Amp Out
	Black	Ground

Table 1: BLDC ESC Connections

Control Signal:

30A BLDC ESC requires standard 50-60Hz PWM signal from any remote control as throttle input. You can also generate similar input signal from the microcontroller for making your own customized flying platform. Throttle speed is proportional to the width of the pulse. Maximum throttle position is user programmable. In general throttle is set at zero for 1mS pulse width and full at the 2mS pulse width.

Notes:

Different brands of remote controls use slightly different signal range. Say 0.5ms to 2.5ms at 50 to 60Hz instead of 1ms to 2ms at 60Hz. You can program the throttle of the BLDC ESC corresponding to the new remote control. For more information on this, refer to section Throttle Range Setting.

In all the subsequent text, you will encounter sentences like “ESC will emit special tone like “123”. For information regarding these tones refer to subsection 2 of the ESC Programming and Table 2.

Interfacing BLDC ESC with the remote control

1. Connect BLDC ESC with the BLDC motor
2. Move remote’s throttle stick to zero and switch on the transmitter
3. Connect the battery pack to the BLDC ESC. It will begin self test process and emit special tone “123” which means battery pack voltage is in normal range. After this it will emit number of Beeps corresponding to the number of batteries in the battery pack. Finally, a long Beep will appear which means that now it is ready to fly.

Important:

Instead of tone sequence as mentioned in the section 3 if you hear special tones like “56712” after 2 Beep tones, it means that ESC has entered in the program mode and your remote’s throttle is in full instead of zero. In this case switch off the ESC, move throttle to the opposite direction (correct zero throttle position for the remote control) and repeat steps 1, 2 and 3.

If you hear rapid Beep-Beep tones then it means that supply voltage is too low or too high. Check your battery’s voltage. You can also refer to the Troubleshooting section.

Throttle Range Setting

Different remote controls have servo control signals in different ranges. They can be in the range of 1mS to 2mS or 0.5mS to 2.5mS at 50 to 60Hz. Whenever you connect this ESC to a new remote control or microcontroller then you need to teach the ESC about the control signal range corresponding to the zero and full throttle. To do this, follow these instructions.

1. Switch on the transmitter and move throttle position to the maximum.
2. Connect the battery to the ESC. (BLDC motor should be connected to the ESC) ESC will do the self test. Emit special tone like “123”. After this it will emit number of Beeps corresponding to number of batteries in your battery pack.
3. Wait for 2 more seconds. ESC will emit Beep twice which means ESC has latched the maximum throttle position.
4. Now within next 5 seconds move throttle stick to zero position and wait for 1 second. ESC will emit a long Beep indicating that it has latched the zero position of the throttle.

This throttle setting is permanently recorded in the ESC. Always change this setting when you are using new remote control.

As mention in the step 4 if you don’t move throttle to zero position within 5 seconds, then ESC will enter in the programming mode. If this happens then switch off the ESC and remote control and repeat steps 1 to 4.

Alert Tones:

Abnormal Input Voltage
ESC checks for the battery voltage at the start-up. If the battery voltage is not in the acceptable range then ESC starts giving alert signal such as Beep-Beep with the interval of 1 second.

Abnormal throttle signal:
When ESC does not detect throttle signal or it detects abnormality in the throttle signal then it gives Beep sound with the interval of 1 second.

Throttle stick is not in the zero position:
When throttle stick is not in the zero position at start-up then it will give rapid Beeps with the intervals of 0.25 seconds.

Protection Functions:

Abnormal Start Protection:
If motor fails to start within 2 seconds of throttle application then ESC will cut-off the output power. Throttle stick should be brought to zero position again to resume operations.
Such case may arise if connection between ESC and motor is not reliable, propeller or motor is blocked or gearbox (if installed) is damaged etc.

Over Temperature Protection:
If ESC gets heated above 110^0C then it reduces the output power.

Throttle signal loss protection:
ESC will reduce the output power to the motor if throttle signal is lost for 1 second. If signal is lost for further 2 seconds then it will kill the throttle and stop the motor.

Programmable Settings

1. **Brake Setting:**
   Enabled / Disabled (Default is disabled)

2. **Battery type:**
   Li-ion / Li-poly or NiMh / NiCd (Default is Li-ion / Li-poly)

3. **Low voltage protection mode (Cut-off Mode):**
   Soft Cut-off (Gradually reduce the output power) / Hard Cut-off (Immediately stop the output power) (Default is Soft Cut-off)

4. **Low Voltage Protection Threshold:**
   Low / Medium / High (default is medium)
   A. **Lithium batteries:**
      Number of batteries is calculated automatically. Low / Medium / High cut-off level per cell of the battery pack is 2.6V / 2.85V / 3.1V respectively. To get cut-off value for the battery pack, multiply this value with the number of cells in the battery pack.
   B. **Nickel based Batteries:**
      Low / Medium / High cut-off voltages are 0% / 45% / 60% of the start-up voltage. Start-up voltage is the initial voltage of the battery pack. 0% means voltage cut-off is disabled.

5. **Start-up Mode:**
   Normal / Soft / Super Soft (Default is normal)
   Normal mode is preferred for the fixed wing aircrafts or small UAVs. The initial acceleration of the Soft and Super Soft modes are slower in comparison. Usually it takes 1 second for Soft start-up or 2 seconds for Super Soft start-up from initial throttle advance to full throttle. If throttle is set to 0 and moved to full throttle again within 3 seconds of the initial start-up, then restart-up will be temporarily changed to normal mode to get rid of chances of a crash caused by slow throttle response. This special design is very suitable for aerobatic flight where quick throttle response is needed.

6. **Timing:**
   Low / Medium / High (Default is Low)
   Usually, low timing value can be used for the most of the motors. We recommend low timing value for 2 poles motor and medium timing value for motors with more than 6 poles to get high efficiency. For higher speed, high timing value can be chosen.

Note:
High KV outrunner BLDC motors have large space between magnet and many BLDC ESCs can’t drive these motors. This ESC is capable of driving these motors. For high KV motors it is recommended to have high or medium timing.

ESC Programming:

1. **Entering programming mode**
   A. Switch on Transmitter, Move throttle to full, Connect battery to the ESC
   B. Wait for 2 seconds. ESC will emit tone like “Beep-Beep”
   C. Wait for another 5 seconds, ESC will emit tone “56712”. Now ESC is entered in the programming mode.

2. **Select programmable items**

BLDC ESC emits different types of tones to communicate with you when BLDC motor is connected to it. It actually uses BLDC motor to generate these tones. Table below lists these tones. We will identify these tones by number allocated to them as mentioned in the table below. In the below table “Beep” stands for the short tone. “Beeeep” stands for the long tone. Here One long “Beeeep” = 5 short “Beep”

Right most column in the table shows the function which is valid only for this step 2. Number and tone corresponding to it is used in this product manual.

Number	Tone	Function in Program mode
1	Beep	Brake
2	Beep-Beep	Battery Type
3	Beep-Beep-Beep	Cut-off mode
4	Beep-Beep-Beep-Beep	Cut-off Threshold
5	Beeeep-	Start-up mode
6	Beeeep-Beep	Timing
7	Beeeep-Beep-Beep	Set all functions to factory defaults
8	Beeeep-Beeeep	Exit

Table 2: Special tones

After entering in the programming mode as mentioned in step 1 you will here these 8 sequences with the interval of 3 seconds. After hearing tone of your interest move throttle to zero to enter in particular item’s setting type. Follow step 3 to change the setting in the particular item.

3. **Set Item Value (programmable value)**

Now you will hear several tones in loop. Set the value matching to the tone by moving throttle stick to full position. If new setting is saved successfully then you will hear special tone “1515” which indicates that value is successfully set and saved.
Now if you still keep the throttle stick to top then you will be reverted back to step 2 to go to other items. Moving throttle stick to the zero within 2 seconds will result in program mode exit.

Items / Tones	Beep	Beep-Beep	Beep-Beep-Beep
Brake	Off	On	N.A.
Battery Type	Li-ion / Li-poly	NiMh / NiCd	N.A.
Cut-off Mode	Soft-cut	Cut-off	N.A.
Cut-off Threshold	Low	Medium	High
Start Mode	Normal	Soft	Super Soft
Timing	Low	Medium	High

Table 3: Item settings

4. Exiting the Program Mode

There are 2 ways to exit program modes

A. In step 3 after hearing special tone “1515”move throttle stick to zero position with in 2 seconds.
B. In step 2 after hearing tone Beeeep-Beeeep (Item no. 8) move throttle stick to bottom within 8 seconds.

Program Example

Setting the “Start” mode to “Super Soft” setting

1. Enter Program mode:

Switch on Transmitter, Move throttle stick to full position, connect battery to the BLDC ESC, wait for 2 seconds, “Beep-Beep’ sound will be emitted. Now wait again for 5 seconds, special tone “56712” should be emitted, which means you have entered program mode.

2. Select Programmable Items:

Now you will here 8 tones in loop as mentioned in the Table 2. At Item 5 (Start Mode), tone corresponding to long Beeeep will be heard. Now move throttle stick to zero to enter in the “Start Mode”.

3. Set Item vale (Programmable value):

Refer to the Table 3. You will hear Beep followed by 3 seconds delay, Beep-Beep followed by 3 seconds delay and Beep-Beep-Beep. After hearing Beep for 3 times move throttle position to full. Now special tone like “1515” will be emitted. Now in the Start Mode, Super Soft Mode is set.

4. Exit Program Mode:

After the special tone “1515” move throttle stick to zero within 2 seconds. Or follow step 4 as mentioned in the section 4 of the ESC Programming

Trouble Shooting

Sr. No.	Problem	Possible Reason	Action
1.	After power on, motor does not work, no sound is emitted	The connection between battery and ESC is not correct	Check the power connection, Replace the connector
2.	After power on, motor does not work. Beep-Beep alert tone is emitted with the time interval of 1 second	Abnormal input voltage. It is too high or too low.	Check the voltage of the battery pack.
3.	After power on, motor does not work; Beep tone with the interval of 2 second is emitted.	Throttle signal is abnormal	Check the receiver and the transmitter Check the cable to the throttle channel
4.	After power on, motor does not work; fast Beep tones with the interval of 0.25 seconds are emitted.	Throttle stick is not in the zero position.	Move the throttle stick to the bottom position
5.	After power on, motor does not work; a special tone “56712” is emitted after two Beep-Beep tones.	Direction of the throttle channel is reversed. Hence throttle is in full position instead of zero position and hence ESC has entered in the programming mode.	Switch off the ESC. Set the throttle condition to the correct direction. Restart the ESC
6.	Motor runs in the opposite direction	Connection between ESC and the BLDC motor needs to be changed	Swap any two wires between motor and the ESC to reverse the direction
7.	Motor stops working while running	Throttle signal is lost	Check the receiver and the transmitter Check the cable of the throttle channel
		ESC has entered in the low voltage protection mode	Replace the battery as soon as possible
		Some connections are not reliable	Check all the connections: Battery pack connection, Throttle signal cable, motor connections etc.
8.	Random stop or restart or irregular working state	There is strong electromagnetic interference in the field.	Reset the ESC to resume normal operation. If issue is not resolved then check the radio link, your system, shielding etc.

Table 4: Trouble Shooting

Interfacing BLDC ESC with a microcontroller:

Connect signal of the BLDC ESC to the microcontroller. Make sure that you make the ground common between microcontroller board and the BLDC ESC. You can also set the throttle range as mentioned in the section Throttle Range Setting. Now you are ready to drive BLDC motor using this BLDC ESC with microcontroller.

Notice

The contents of this manual are subject to change without notice. All efforts have been made to ensure the accuracy of contents in this manual.

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⚠ **Read the user manuals completely before start using this product**



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Almost all the part of this product is recyclable. Please send this product to the recycling plant after its operational life. By recycling we can contribute to cleaner and healthier environment for the future generations.