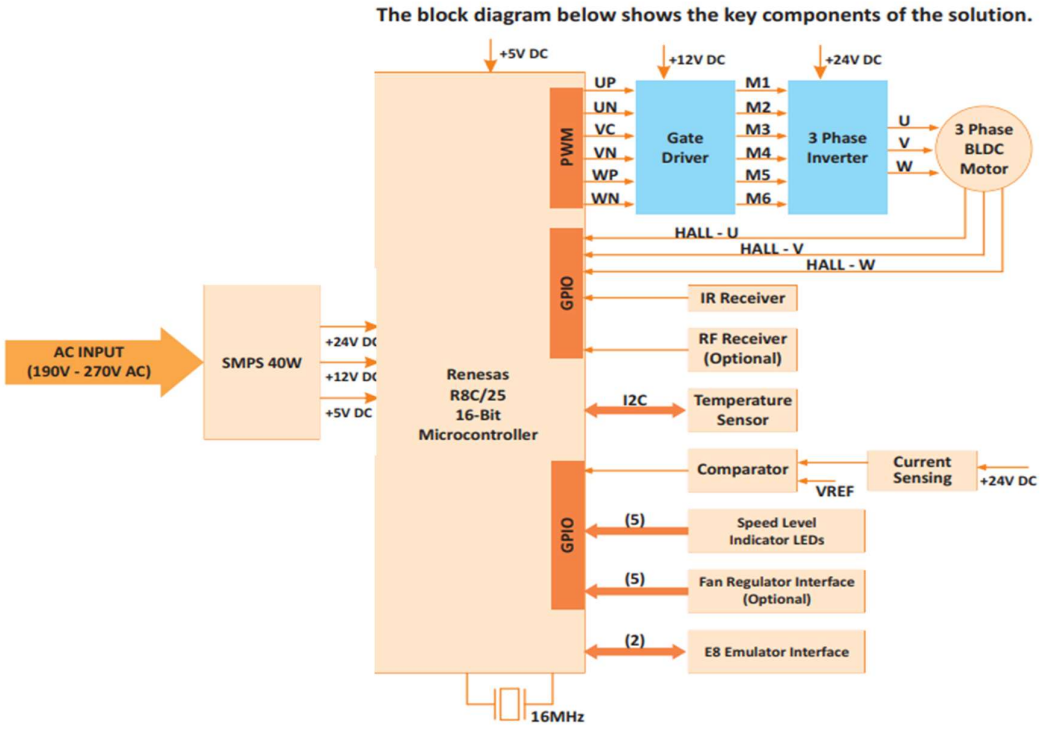
Energy Efficient BLDC Ceiling Fan Solution– A case study

Brushless DC (BLDC) motors offer several advantages over conventional AC operated ceiling fans, including higher efficiency and reliability, reduced noise, longer lifetime (no brush and commutator erosion), elimination of ionizing sparks from the commutator, and overall reduction of electromagnetic interference (EMI).In general, BLDC motors are often more efficient at converting electricity into mechanical power than brushed DC or AC motors. This improvement is largely due to the absence of electrical and friction losses due to brushes.

Aashaya Group of Companies offers complete solution to ceiling fan manufacturers including the power supply board, the controller board and remote controller. This solution has been extensively tested with a commercially available 24V BLDC motor and ceiling fans with blade lengths up to 1200 mm.



Block Diagram

Solutions include the hardware and controller firmware for BLDC motor and IR receiver. The switch mode power supply (SMPS) is capable of operating from 190V - 270V AC.

Brushless DC (BLDC) motor based ceiling fan control solution takes energy efficiency and ease-of-operation to a whole new level. This path-breaking solution offers a number of unique benefits including,

- 40 to 50% power savings compared to conventional ceiling fans
- Low noise
- Easy remote control based operation

Detailed specifications are listed below

Power Supply

SMPS Power Rating (max)	40W
SMPS Efficiency	>80%
Internal Circuitry Power Consumption (Controller and Power supply)	<6 W
AC Input Operating Voltage Range	190V to 270V
DC Input Operating Voltage Range	24V DC
SMPS output	
Output 1	24V, 1.5 A
Output 3	12V, 0.2 A
Output 3	5V, 0.3 A

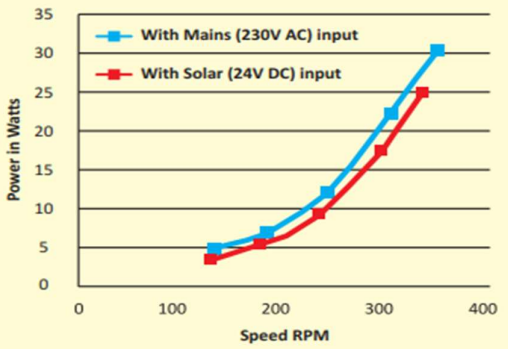
BLDC motor

Input Voltage Rating (max)	24V DC
Input Current Rating (max)	1 to 1.2A
Motor type	3 Phase
Torque at 350 RPM	0.65 Nm
Speed with Blade (min)	100 RPM
Speed with Blade (max)	350 RPM
Speed Control	Hall sensor approach
Efficiency (Electrical to Mechanical)	85% to 90%
Operating Voltage	24V DC
Power Consumption at 350 RPM	<30 W
Protection	Short Circuit Protection

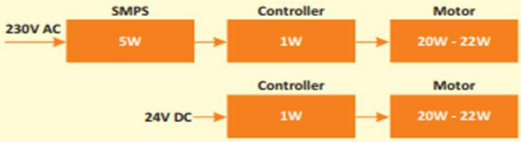
System Features

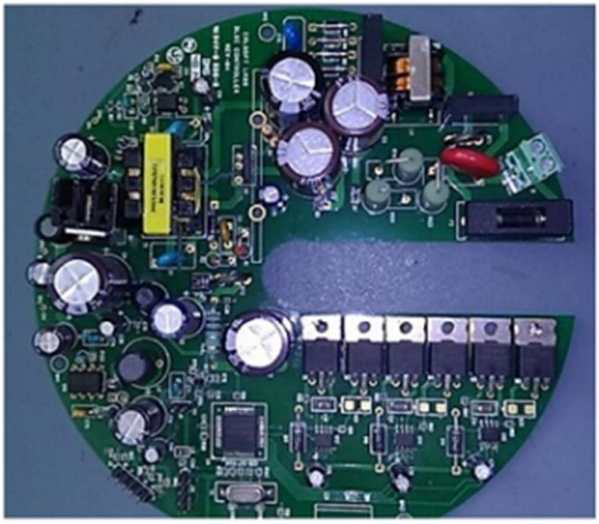
- Control logic for Hall sensor based speed control
- Temperature sensor logic for speed variation
- Infra red (IR) receiver for remote operation
- Fan On/Off, speed increase/decrease, temperature sensor enable/disable, etc. through IR remote
- Can be operated from 230V AC or 24V DC power supply
- Short circuit and Stall protection

Power Consumption vs Speed



Total Power Consumption breakup





For any further queries, please contact us at 99010-23235