Datasheet



Description: F82A-12BL8511-31S
Fan diameter: ϕ305mm
Rated voltage: 13.6V DC

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2.Units and Acronyms

Unit		Physical Quantity	Prefix	Dimension	
%	percent	Proportionality	M	10^6	mega
Ω	Ohm	Electrical Resistance	k	10^3	kilo
℃	degree Celsius	Temperature	m	10^{-3}	Milli
A	Ampere	Current	µ	10^{-6}	micro
h	hours	Time	n	10^{-9}	nano
dBA	deciBel (A-weighting)	Sound pressure level	p	10^{-12}	pico
Hz	Hertz	Frequency			
min	minute	Time			
Pa	Pascal	Pressure			
rpm	Revolutions per minute	Rotation frequency			
s	second	Time			
V	Volt	Voltage			
W	Watt	Power			

Table 1: Units of measurements table

Key Word	Descriptions
CCU	Custom Control Unit
Drive	Motor with axially integrated electronics
PWM	Pulse Width Modulation
R_i	Input Resistance
SBL	Sealed brushless
T	Temperature
T_{AMB}	Ambient Temperature
U_B	Supply voltage
U_n	Nominal supply Voltage
rms	root mean square

Table 2: Acronyms table

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3.General

Fan diameter：ϕ305mm

Nominal voltage ： 12V

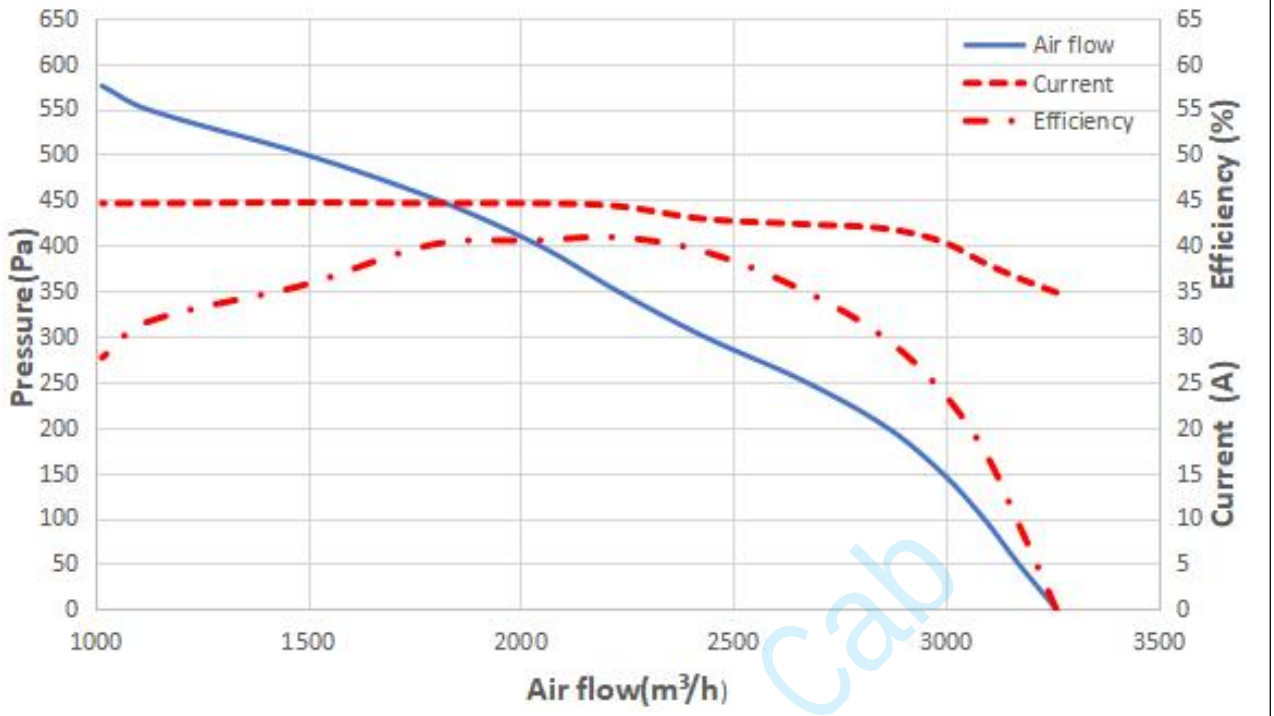
4.Features

Max fan speed	rpm	4200
Min fan speed	rpm	1600
Sound pressure level at max speed	dBA	80- at 1 m from the fan module - lateral side (2)
Weight	kg	3.1
Operating supply voltage range	V	9.0 ~ 16.0 at the Drive connector
Supply voltage to reach max speed	V	13.6 ~ 16.0 at the Drive connector
Operating ambient temperature range	°C	-40 ~ +120
Speed derating threshold	°C	+95 (1)
Storage temperature range	°C	-40 ~ +125
Lifetime	h	Up to 40000H (depending on mission profile)
Time from 0 rpm to max speed	s	14 (20°C)
Load dump protection (Pulse 5b)	V	35 (Pulse peak value voltage U_S^* -ISO16750-2:2010)
Reverse polarity protection		ISO 16750-1 functional status class C - device fully functional after correcting the polarity
Notes: (1) Due to the thermal inertia of the system, rapid temperature changes will not cause the fan to derate. Overload may cause the fan to derate prematurely. (2) The noise value in the free-air intake state is for reference only and does not represent the actual noise of the fan in application, because the noise of the fan in application will be affected by the water tank, air guide cover, etc.		

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5.Air Performance

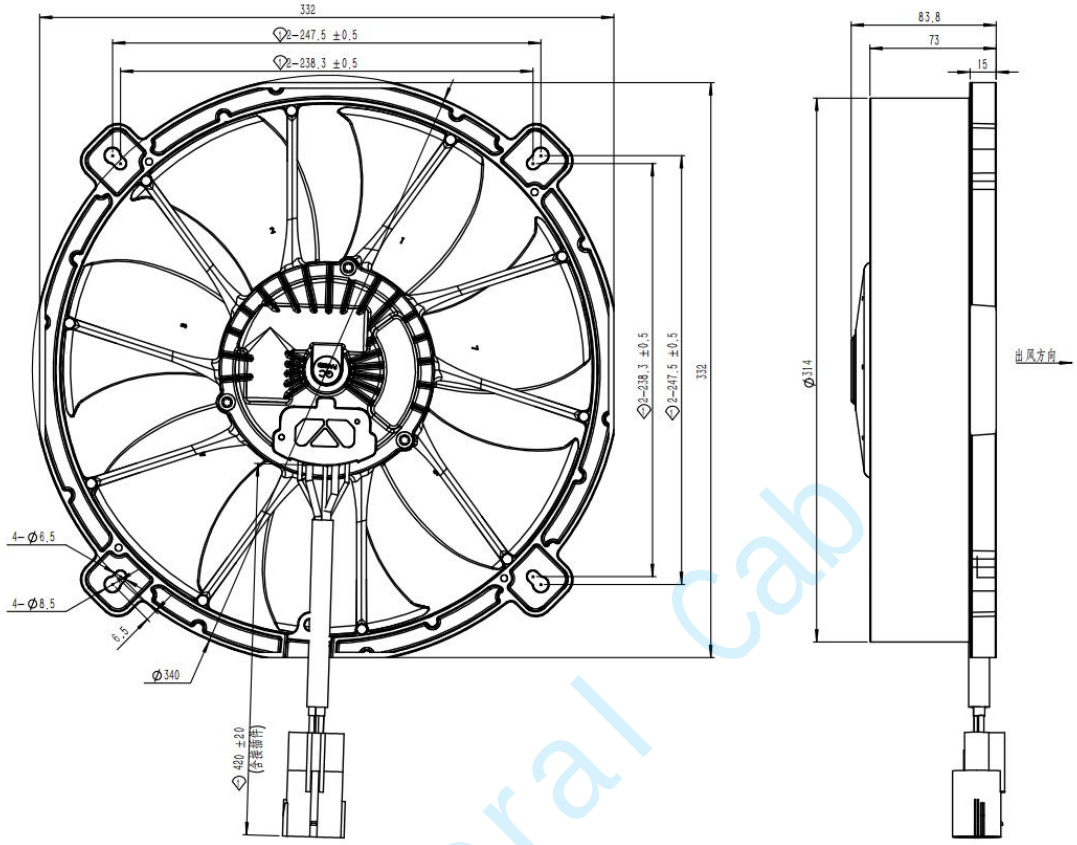


Power Supply Voltage	13.6V (at the connection)	Test Number	-	Test equipment setup in accordance with ANSI AMCA 210
Air Density	1.16 kg/m³	Ambient Temperature	20°C ± 5°C	

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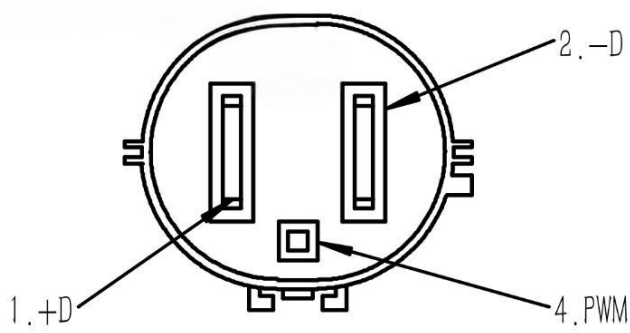
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6.Mechanical Data



All the dimensions in the above figure are in millimeters. M6 or M8 bolts are used to fix the fan, and the nominal maximum tightening torque is M6 - 3(+1/0) Nm for M6 bolts and M8 - 4(+1/0) Nm for M8 bolts. The definition of the nominal tightening torque is applicable to new, clean, and lubricant-free bolts.

7.Connector and Wires



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Connector： YAZAKI				
Connector Part Number ：7282-8496-30				
Identification(*)	+D	-D	/	PWM/E
Pin Number	1	2	/	4
Wire Color	Red	Black	/	Blue
Sealing Color	Yellow	Yellow	/	Blue
Sealing p/n	7158-3036-70	7158-3036-70	/	7158-3031-90
Pin p/n	7114-3250	7114-3250	/	7114-4103-02
Section [mm²]	8.0	8.0	/	0.75

* For abbreviations, please refer to the chapter on drive pin functions.

Remarks: It is prohibited to pick up the fan directly by the wire harness.

8.Further Features

Compliance		ECE Reg.10-07 and its updated content-Unified Provisions on the Approval of Vehicles in Respect of Electromagnetic Compatibility
		2002/95/EC RoHS - Directive on the Restriction of the Use of Hazardous Substances
		2000/53/EC and its updated content-End-of-Life Vehicles (ELV) Directive
Ingress Protection		IP68 and IP6K9K
Allowed power supply max ripple	rms	1%
Fuse protection		According to the requirements of ISO8820 - 3, the specified fuses must be used in the circuit. Each fan should be equipped with a separate fuse.

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9.Measurement Conditions

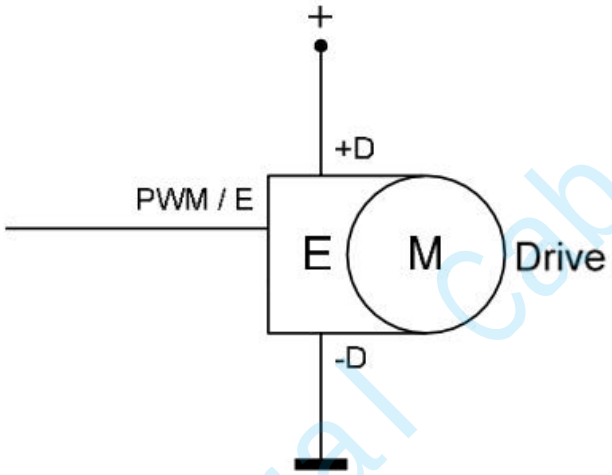
Unless otherwise specified, the below conditions are assumed:

- T_{AMB} = 20℃±5℃ and
- U_B = 13.6V±0.2V (at the Drive connector)

10.Hardware Function

10.1.Fan Drive

The drive diagram is as follows:



E stands for integrated electronics. M stands for motor. Drive stands for motor with axial integrated electronics.

10.2.Drive pin Functions

The electrical Drive interface consists of 3 pins:
Power pins:

- supply voltage plus: +D
- supply voltage minus: -D

Signal pins:

1. Input: digital PWM input / active low: PWM/E

The signal pin PWM/E is used to control the Drive mode.

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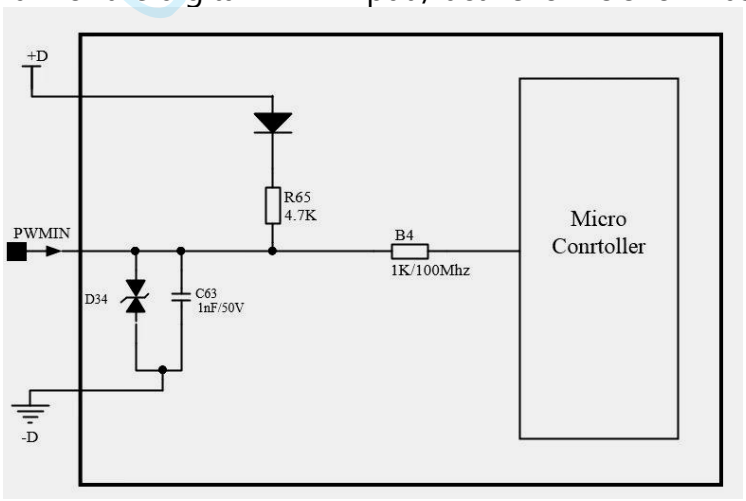
10.3 Interface Hardware for Digital Control: pin PWM/E

10.3.1. Digital PWM Input / Active Low: PWM/E

The input PWM/E is used to wake up the Drive from Quiescent current mode. Any PWM duty cycle that guarantees a pulse going to the dominant level for more than T_{wakeup} will wake up the Drive electronics.

Parameter	Min	Typical	Max	Unit	Denomination
PWM/E Frequency Range	50	100	1000	Hz	f_{PWM}
PWM/E Duty Cycle Range	0		100	%	dc_{min} ..dc_{max}
PWM High Level Voltage	UB * 0.65			V	U_{PWMH}
PWM Low Level Voltage			UB * 0.40	V	U_{PWML}
PWM/E Resolution		1		%	dc_{resol}
PWM/E Accuracy		1		%	dc_{accu}
PWM/E Current			5	mA	I_{PWM}
PWM / E wake up voltage	UB – 2			V	U_{PWMWU}
PWM/E Wake - up Pulse	150			µs	T_{wakeup}
PWM* pull up resistor		4.7		KΩ	

The schematic diagram of the digital PWM input / active low is shown as follows:



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11.Software Functions

11.1.Drive Modes

The Drive has three working modes, and the main difference lies in the different Drive current consumption:

1. Quiescent current mode
2. Electronics active mode
3. Run mode

The Drive mode changes accordingly to the control input duty cycle on pin PWM/E and the voltage level on analog input A.

No.	Drive mode	Current consumption	Drive speed
1	Quiescent current mode	< 200 µA	0
2	Electronics active mode	< 50 mA	0
3	Run mode	Depends on the required speed and on the load	Depends on the duty cycle of the PWM signal

When the PWM/E receives a 100% duty cycle signal, the Drive enters the Quiescent current mode. The time for the Drive to enter the Quiescent current mode depends on the actual PWM fundamental frequency and the number of samples for authenticity checking. After detecting that the PWM signal is a 100% Drive signal, the Drive will enter the Quiescent current mode after waiting for another 2 - 10 seconds.

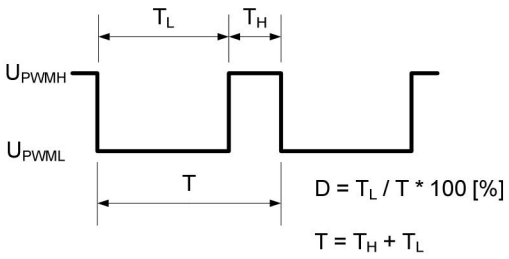
When the PWM duty cycle is at any value between 0 and 100%(excluding 100%) and meets the conditions in Chapter 10.3, the Drive will enter the Electronics active mode.

The condition of the Drive enter the Run mode:
If the duty cycle of the PWM signal reaches the proportion required for the Drive to run, and the PWM duty cycle value is valid according to the chapter 11.2.

11.2.Digital Control: Transfer Function PWM Input

The transfer function PWM input refers to the relationship between the Drive speed and the duty cycle of the pin digital PWM input/active low: PWM/E

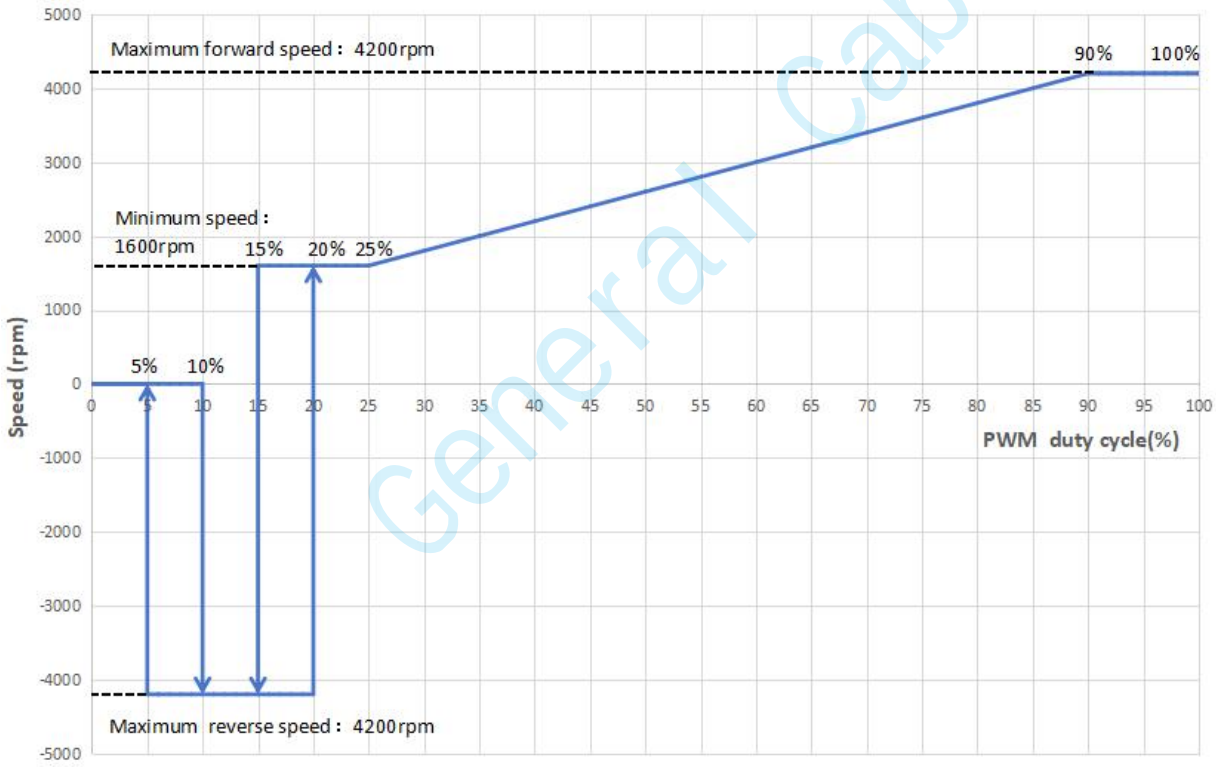
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The definition of the duty cycle in the above figure is also called the negative logic duty cycle.
Refer to the following definitions:

- Continuous low voltage is 100 % duty cycle (dominant level)
- Continuous high voltage is 0% duty cycle (recessive level)

Based on the definition of the duty cycle, the transfer function PWM input is shown in the following figure.



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11.3.Drive Protection Modes

There are the following cases where the Drive will go into Protection mode and stop the Drive :

Protection Mode	**Fault Handling**
Drive Blocked	Once the fan stall is detected, the following strategy will be executed: The controller tries to automatically start 10 times (restart without power - off), with an interval of 10 seconds each time. If it still doesn't recover after 10 attempts, the fan will not stop, and it will keep trying to start at 10s intervals.
Over-current	Once the fan over-current is detected, the following strategy will be executed: The controller stops outputting, and then tries to automatically start 10 times (restart without power-off), with an interval of 10s each time. If it still doesn't recover after 10 attempts, the fan will automatically stop. To resume operation, it needs to be manually powered off and restarted.
Drive Overloaded	When drive overload is detected, the fan will operate at a reduced speed while maintaining a constant power, and it will not stop.
Drive Overheated	When drive overheating (derating temperature point) is detected, the fan will operate at a reduced speed; when the maximum operating temperature point is exceeded, the controller stops outputting. When the temperature returns to normal, the fan resumes operation.
Over/Under voltage	If the power supply voltage exceeds the operating voltage range, the controller stops outputting. When the voltage returns to normal, the fan resumes operation.

In any case, when the Drive receives a valid PWM signal requiring it to run, the drive will try to recover from failures.

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12.Document Change Records

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Latest revision version number: V9

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Fu Ying	20241112	V1	Initial Release
Chu Shimei	20250428	V2	Content format correction
Chu Shimei	20250716	V3	Update part of the data in 11.1
SIMON	20251113	V4	PQ updating
SIMON	20251206	V5	Drawing updating
SIMON	20260426	V6	PWM negative logic duty cycle
SIMON	20260608	V7	PQ updating with efficiency
SIMON	20260815	V8	Min speed 1600RPM
SIMON	20261107	V9	7.Connector and Wires updated

Document status： Released

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