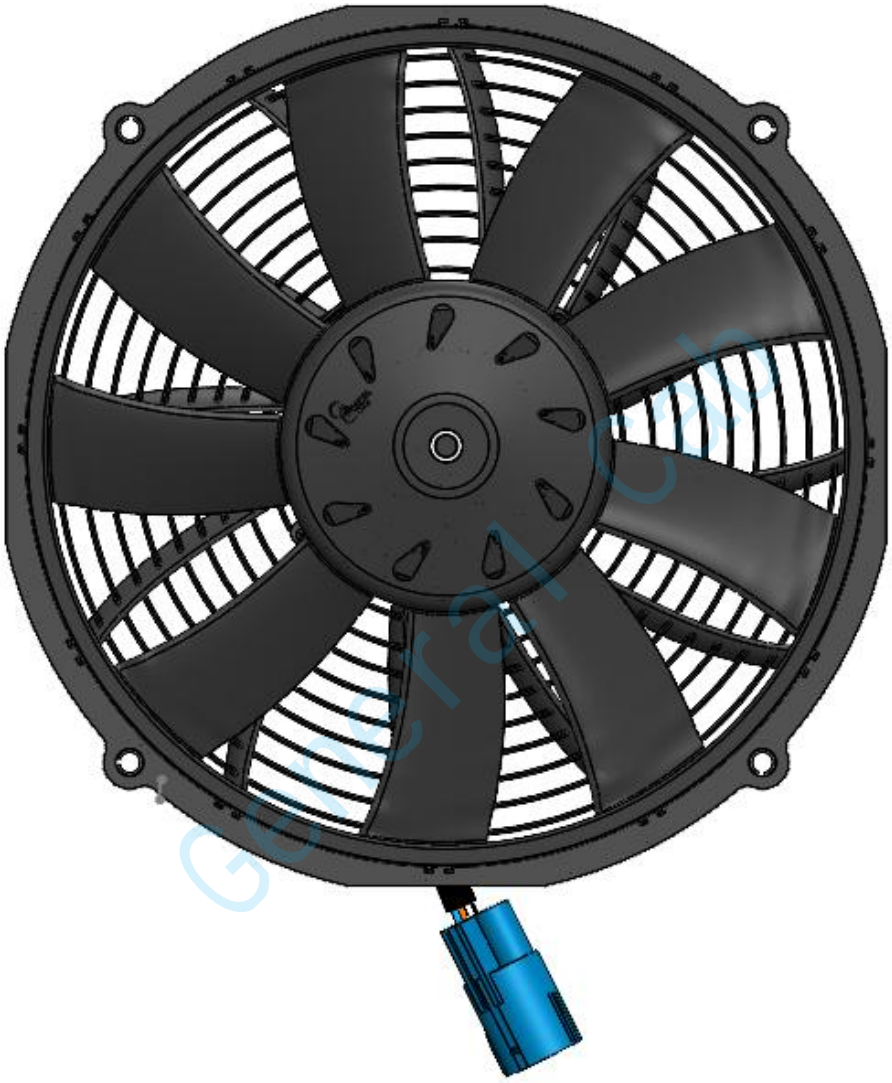
# Datasheet



## Description: F82B-12BL8410-32S
## Fan diameter: ϕ305mm
## Rated voltage: 13.6V DC

***All content is for reference only. In case of any changes, we will not give a separate notice.***
***Unauthorized use and/or photocopying of this document is strictly prohibited.***

General Cab Automotive Technology (Hefei) Co., Ltd.
Tel：0551-68899160 Website：www.sifilco.com
Address: Area A, 2nd Floor, Building 4, No. 58, Ningxi Road, Taohua Town, Feixi County, Hefei City, Anhui Province

# 1.Index

1.Index ..... 2
2.Units and Acronyms ..... 3
3.General ..... 4
4.Features ..... 4
5.Air Performance ..... 5
6.Mechanical Data ..... 6
7.Connector and Wires ..... 6
8.Further Features ..... 7
9.Measurement Conditions ..... 8
10.Hardware Function ..... 8
10.1.Fan Drive ..... 8
10.2.Drive pin Functions ..... 8
11.Drive Interface ..... 9
12. Interface Hardware for Digital Control: pin PWM/E ..... 9
13.Feedback Output / Active High: pin FO ..... 10
14.Software Functions ..... 111
14.1.Drive Modes ..... 11
14.2.Digital Control: Transfer Function PWM Input ..... 12
14.3.Drive Failure Modes ..... 12
15. Document Change Records ..... 13

General Cab

***All content is for reference only. In case of any changes, we will not give a separate notice.***
***Unauthorized use and/or photocopying of this document is strictly prohibited.***

## 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**

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

## 3.General

Fan diameter：ϕ305mm

Nominal voltage ： 12V

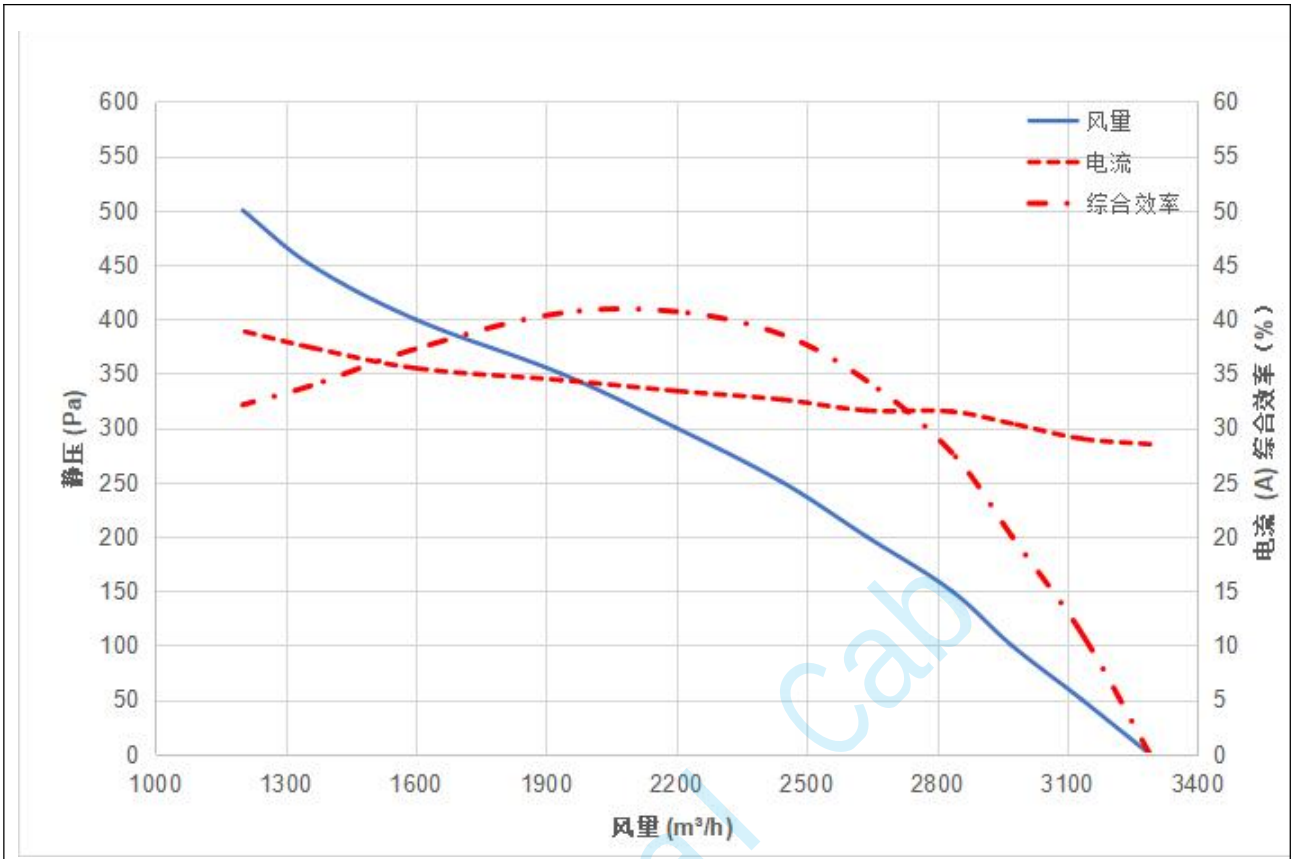
## 4.Features

| | | |
|---|---|---|
| Max fan speed | rpm | 3850 |
| Min fan speed | rpm | 1025 |
| Sound pressure level at max speed | dBA | 79- at 1 m from the fan module - lateral side (2) |
| Weight | kg | 2.7 |
| 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 | +90 (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:<br>(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.<br>(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. | | |

General Cab

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

## 5.Air Performance

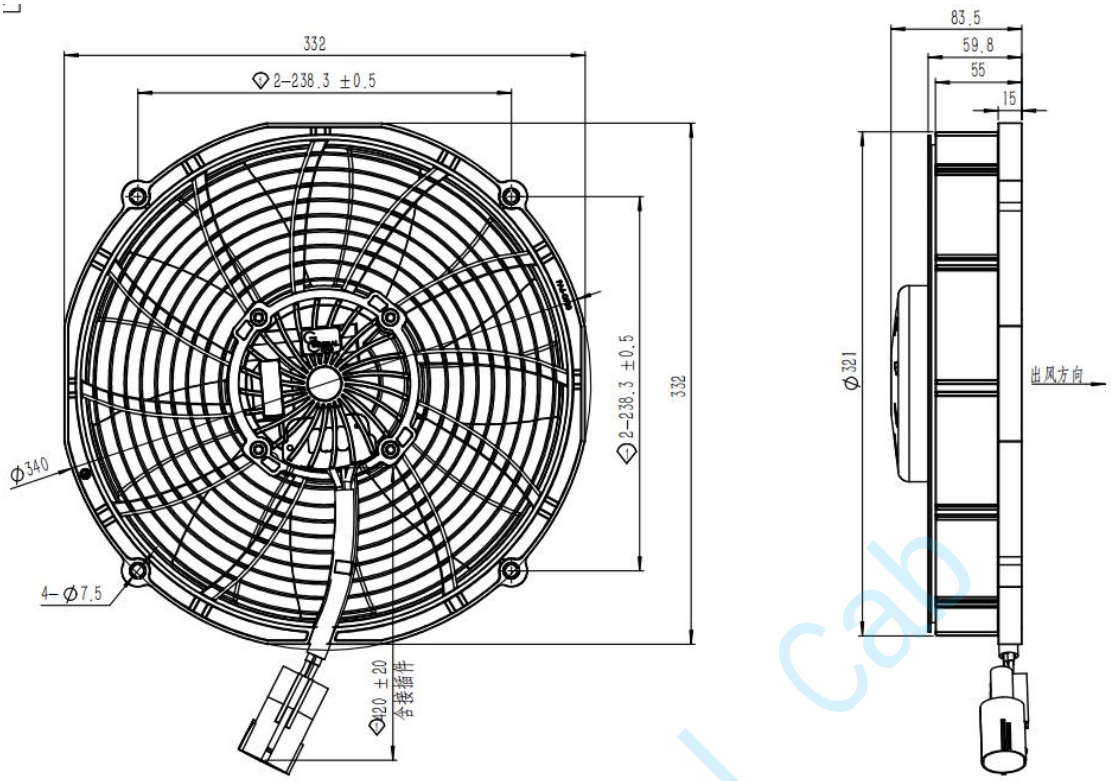



| | | | | |
|---|---|---|---|---|
| Power Supply Voltage | 13.6V (at the connection) | Test Number | - | Test equipment setup in accordance with ANSI AMCA 210 |
| Air Density | 1.16 kg/m³ | Ambient Temperature | 20°C ± 5°C | |

General Cab

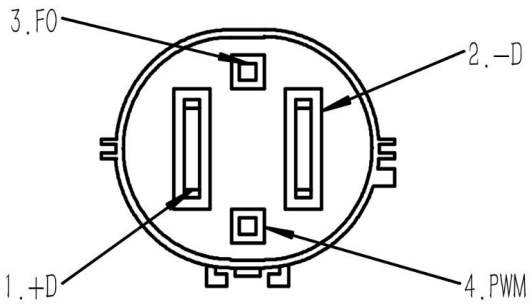
*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

## 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




*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

| **Connector： YAZAKI** | | | | |
|---|---|---|---|---|
| **Connector Part Number ：7282-8497-90** | | | | |
| **Identification(*)** | +D | -D | FO | PWM/E |
| **Pin Number** | 1 | 2 | 3 | 4 |
| **Wire Color** | Red | Black | White | Blue |
| **Sealing Color** | Yellow | Yellow | Blue | Blue |
| **Sealing p/n** | 7158-3036-70 | 7158-3036-70 | 7158-3031-90 | 7158-3031-90 |
| **Pin p/n** | 7114-3250 | 7114-3250 | 7114-4103-02 | 7114-4103-02 |
| **Section [$mm^2$]** | 8.0 | 8.0 | 0.75 | 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. |

General Cab

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

# 9.Measurement Conditions

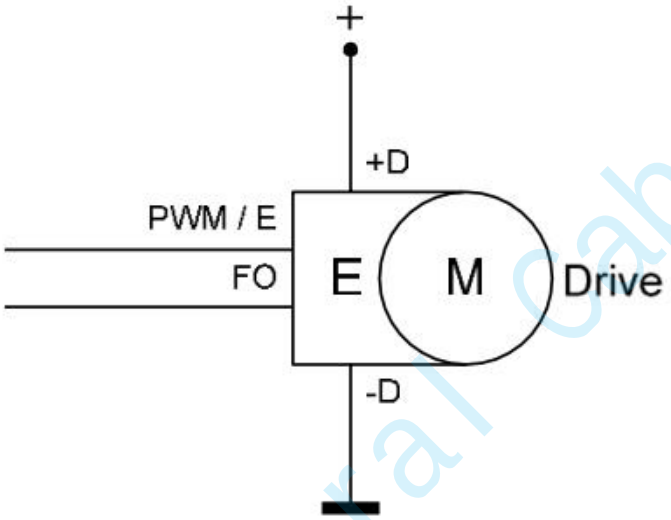
Unless otherwise specified, the below conditions are assumed:

- $T_{AMB}$ = 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 4 pins:
Power pins:
- supply voltage plus: +D
- supply voltage minus: -D

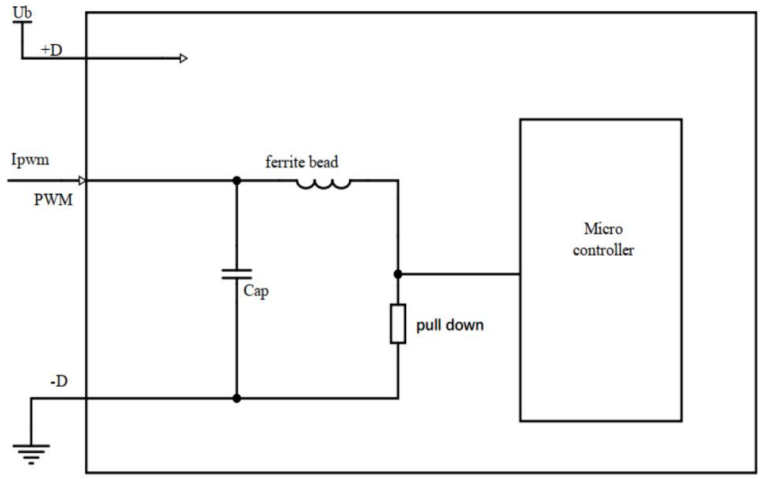
Signal pins:
1. Input: digital PWM input / active high: PWM/E
2. Output: feedback output / active high: FO

The signal pin PWM/E is used to control the Drive mode, it is the control input.
The signal pin FO is used to notify the Drive status.

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

## 11.Drive Interface

The PWM signal for the input PWM/E comes from the CCU electronics and uses a pull down resistor (PWM/E pull down) located in the Drive electronics to determine the recessive level.
This pull down resistor is connected to the supply voltage minus: -D/GND.
The schematic diagram of high active interface electronics for the PWM input is shown as follows:




## 12. Interface Hardware for Digital Control: pin 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.
It must be noted that the electronics activation level $U_{Eact}$ is independent of the PWM thresholds $U_{PWMH}$ and $U_{PWML}$(see the following table).

| 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 | $U_{PWMH}$ 1) |
| PWM Low Level Voltage | | | UB * 0.40 | V | $U_{PWML}$ 1) |
| PWM/E Resolution | | 1 | | % | $Dc_{resol}$ |

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

| | | | | | |
|---|---|---|---|---|---|
| PWM/E Current | | | 5 | mA | $I_{PWM}$ |
| PWM/E Wake - up Pulse | 150 | | | µs | $T_{wakeup}$ |
| PWM/E Activation Level | UB – 2 | | | V | $U_{Eact}$ 2) |
| PWM/E Pull Down resistor | | 6.8 | | KΩ | |

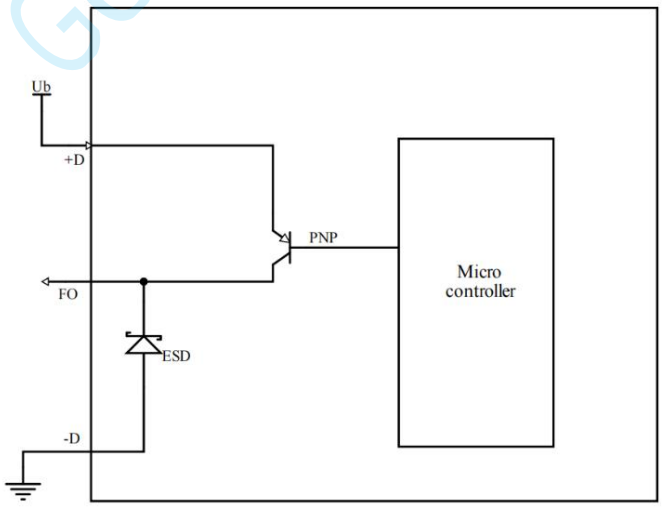
**Table 1 PWM/E: Digital PWM Input/Active high Parameter Table**

1. The operating temperature range of the electronics required by the PWM threshold is from -40°C to 130°C.
2. The operating temperature range of the electronics required by the activation level $U_{Eact}$ is from -40°C to 130°C.

## 13.Feedback Output / Active High: pin FO

| Parameter | Min | Typical | Max | Unit | Denomination |
|---|---|---|---|---|---|
| FO Dominant Level | $U_B$-3 | | $U_B$ | V | $U_{FOH}$ |
| FO Recessive Level | 0 | | 3 | V | $U_{FOL}$ |
| FO Current | | | 50 | mA | $I_{FO}$ |

The schematic diagram of the high-active interface electronics for FO feedback is shown as follows:
The activation level of the output pin FO is dominant level, which is provided when the PNP - type transistor inside the Driver is turned on.




General Cab

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

# 14.Software Functions

## 14.1.Drive Modes

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

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

The Drive mode changes accordingly to the control input duty cycle on pin PWM/E.

| 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 |
| 4 | Failure mode | < 50 mA | Depends on the fault/alarm |

When the PWM/E receives a 0% 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 0% 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 (excluding 0%) and 100% and meets the conditions in Chapter 12, the Drive will enter the Electronics active mode.When the duty cycle is at 95% to 100%, the fan will work at a max speed.

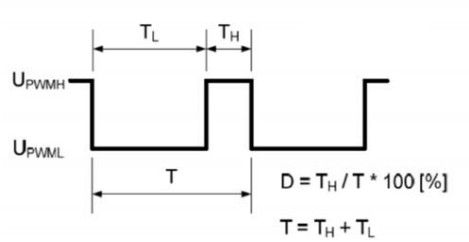
If the duty cycle of the PWM signal reaches the proportion required for the Drive to run, the Drive will enter the Run mode. Refer to Chapter 14.2.

The Failure mode is entered in case of failures of the Drive (refer to 14.3).

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

## 14.2.Digital Control: Transfer Function PWM Input

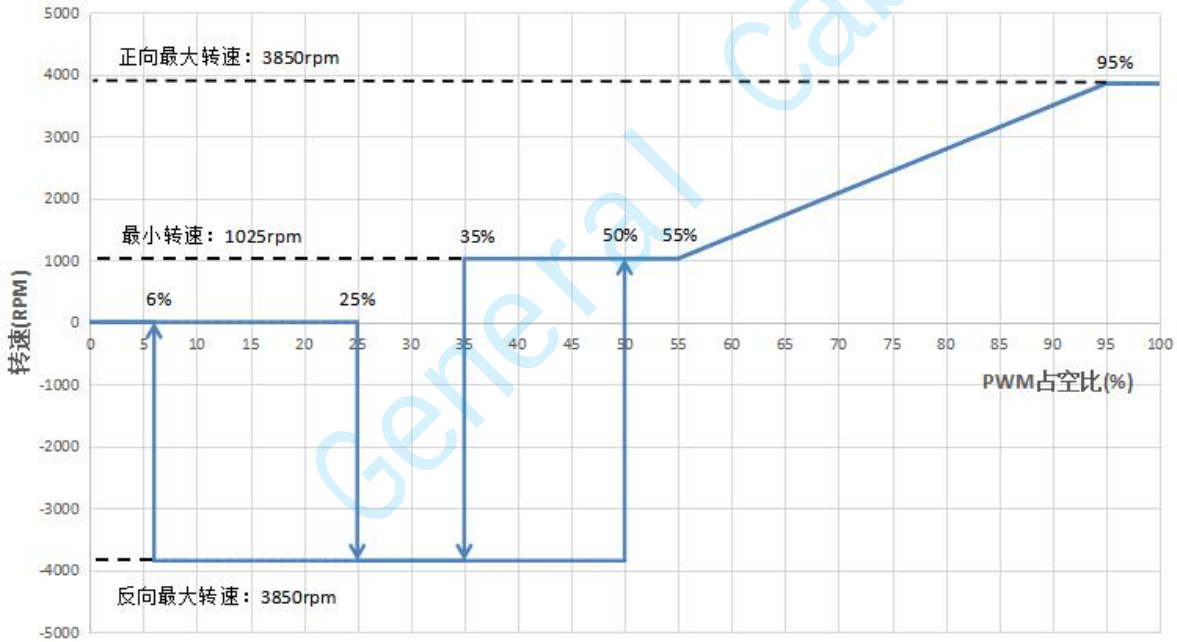
The transfer function PWM input refers to the relationship between the Drive speed and the duty cycle of the pin digital PWM input/active high:PWM/E




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

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

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




## 14.3.Drive Failure Modes

The feedback output FO signal is used for the notification of the Drive mode Failure mode.
In the Drive mode Quiescent current mode, Electronics active mode and Run mode , the output FO is set to recessive level.
In case of the Drive mode Failure mode the output FO is pulled to dominant level.
If the Failure mode disappears the output FO goes back to the recessive level.
There are the following cases where the Drive will go into Failure mode and stop the Drive:

*All content is for reference only. In case of any changes, we will not give a separate notice.*
*Unauthorized use and/or photocopying of this document is strictly prohibited.*

| Failure Mode | Fault Handling | Fault Feedback (*) |
|---|---|---|
| Drive blocked | Once a fan locked is detected, the following strategy will be executed: The controller attempts to automatically start 10 times (restart without power-off), with an interval of 10s each time. If it still does not recover after 10 attempts, the output FO is set to dominant level,The fan doesn't stop and keeps attempting to start at 10s intervals. | Dominant level |
| Over current | Once a fan over current is detected, the following strategy will be executed: The controller stops outputting, the output FO is set to dominant level, and the controller then attempts to automatically start 10 times (restart without power-off), with an interval of 10s each time. If it still does not recover after 10 attempts, the fan stops automatically. If recovery is needed, it requires manual power-off and restart to run again. | Dominant level |
| Drive overloaded | When Drive overload is detected, the fan will maintain a constant power reduction and work at a low speed without stopping, and the output FO is set to recessive level. | Recessive level |
| Drive overheated | When Drive overheating (derating temperature point) is detected, the fan will reduce its speed; when the maximum operating temperature point is exceeded, the controller stops outputting, and the output FO is set to dominant level. After the temperature returns to normal, the fan resumes operation. | Dominant level (when exceeding the maximum operating temperature) |
| Over and Under voltage | If the power supply voltage exceeds the operating voltage range, the controller stops outputting, and the output FO is set to dominant level. After the voltage returns to normal, the fan resumes operation. | Dominant level |

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

## 15. Document Change Records

Original document author: SIMON
Latest revision version number: V3

| Document Author | Date | Version Number | Remarks |
|---|---|---|---|
| SIMON | 20251110 | V1 | Initial release |
| SIMON | 20251125 | V2 | Drawing update |
| SIMON | 20261107 | V3 | 7.Connector and Wires updated |

Document status： Released

***All content is for reference only. In case of any changes, we will not give a separate notice.***
***Unauthorized use and/or photocopying of this document is strictly prohibited.***