# Single Phase Hall Effect Fan Driver

## Features

- On-Chip High sensitivity Hall-effect Sensor
- Wide Operating Voltage: 3 V to 24V
- Integrated 2.8Ω H-Bridge Drivers for Single Coil
- Built-in VDD To GND reverse voltage protection
- Thermal Shutdown Protection
- Low Output Switching Current Noise
- Rotor-locked shutdown and automatically restart function
- -40°C to 125°C Operating Temperature
- RoHS Compliant SIP-4L Package

## Applications

- Single-coil Brushless DC Motor
- Single-coil Brushless DC Fan
- Single Coil Design Cooling Fans
- Office Automated Equipment

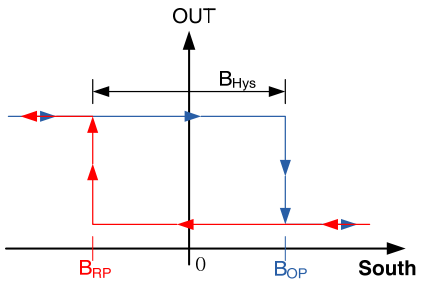
## Description

The SD477 is an integrated Hall sensor with H-Bridged output driver designed for brushless DC motor applications. The device includes an on-chip Hall sensor for magnetic sensing, an amplifier that amplifies the Hall voltage, a comparator to provide switching hysteresis for noise rejection, a bi-directional driver for sinking and driving large current load.

Placing the device in a variable magnetic field, if the magnetic flux density is larger than threshold $B_{OP}$, the DO is turned to sink and DOB is turned to drive. This output state is held until the magnetic flux density reverses and falls below $B_{RP}$, then causes DO to be turned to drive and DOB turned to sink.

SD477 is available in SIP-4L package and is rated over the -40°C to 125°C.

## Output state

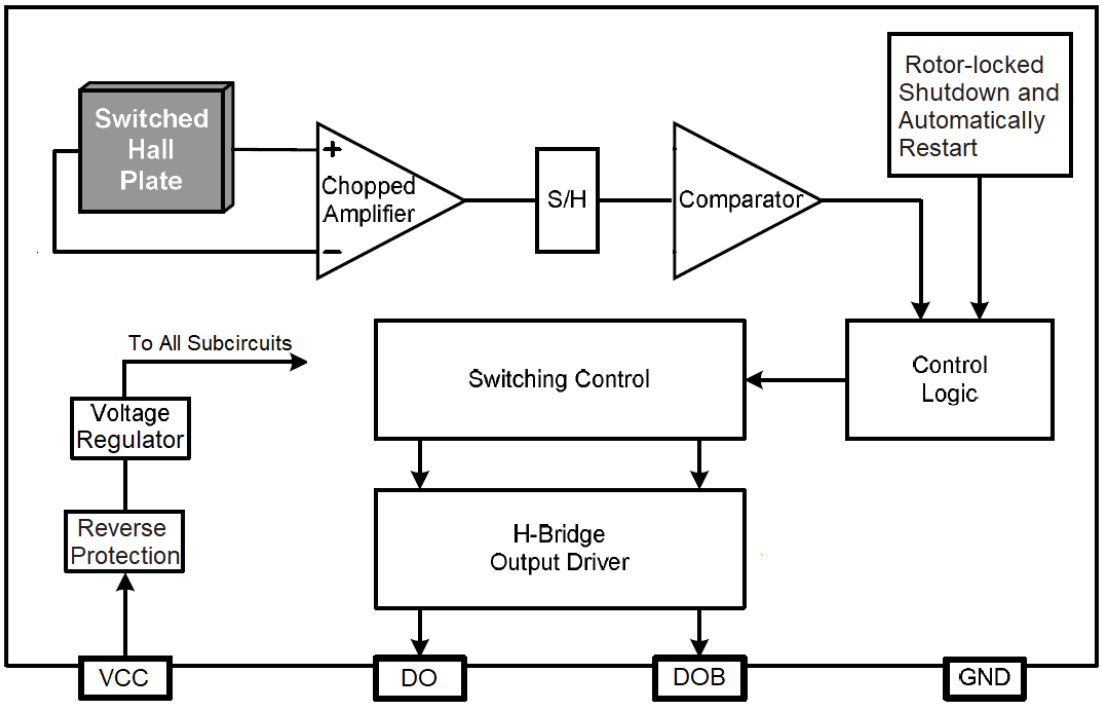


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## Device Information

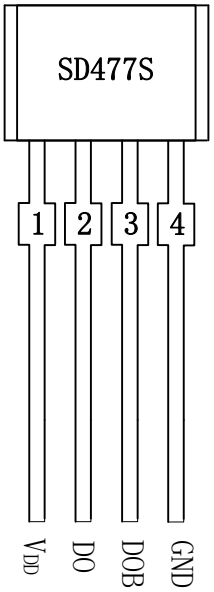
| Part Number | Packing | Mounting | Ambient, $T_A$ | Marking ID | Bop(Gauss) | Brp(Gauss) |
|---|---|---|---|---|---|---|
| SD477VB-BK | Bulk, 1000 pieces/bag | SIP4 | -40℃ to 125℃ | SD477S | 15 (Typ.) | -15 (Typ.) |

## Functional Block Diagram



## Terminal configuration and functions

4-Terminal SIP
VB Package
Top View




| Terminal | | Type | Description |
|---|---|---|---|
| Name | Number | | |
| VDD | 1 | PWR | 3 V to 24 V power supply |
| DO | 2 | Output | Output 1 |
| DOB | 3 | Output | Output 2 |
| GND | 4 | Ground | Ground terminal |

## Absolute Maximum Ratings (TA=25°C, unless otherwise noted)

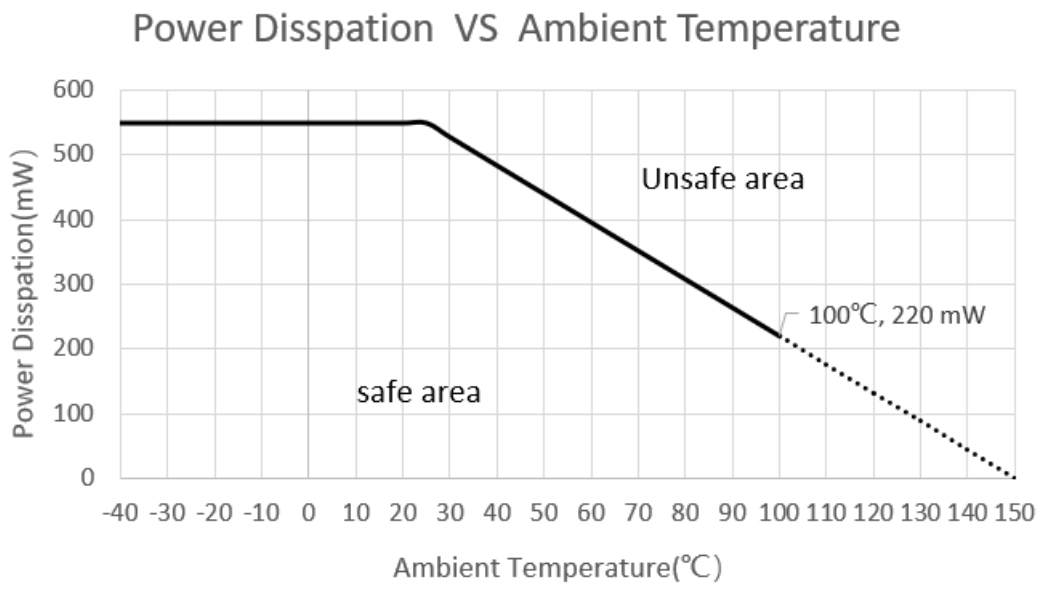
| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| VDD | Supply Voltage | | 30 | V |
| $V_{RDD}$ | Reverse Protection Voltage | | -30 | V |
| B | Magnetic Flux Density | | Unlimited | Gauss |
| IO | Output Current | Continuous | 350 | mA |
| | | Peak | 1000 | mA |
| PD | Power Dissipation | | 550 | mW |
| θ JA | Thermal Resistance | Die to atmosphere | 227 | ℃/W |
| θ JC | | Die to package case | 49 | ℃/W |
| TSTG | Storage Temperature | | -50 to 150 | ℃ |
| TLEAD | Maximum Soldering Temperature (at leads, 10 sec) | | 300 | ℃ |

Note 1: Stresses greater than those listed under “Absolut Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. “Absolute Maximum Ratings” for extended period may affect device reliability.

## Recommended Operating Conditions (TA=25°C, unless otherwise noted)

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | VDD | 2.8 | 24 | V |
| Ambient Temperature | Ta | -40 | 125 | ℃ |

Note 2：In practical application, the effect of fan coil heating on the chip must take into account, with the actual over temperature protection point of actual test of high temperature fan for reference. On the basis of pre leave relatively safe temperature allowance, avoid chip in the critical limit (maximum ratings) for a long time and affects the reliability.



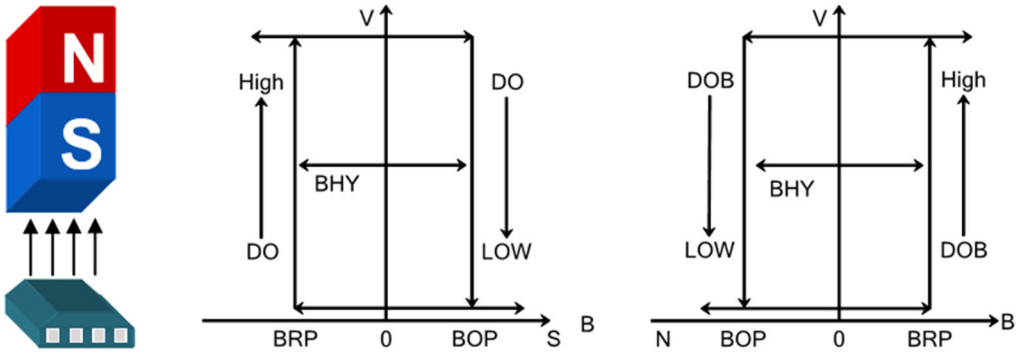
## Electrical Characteristics (Typical values are at TA = +25℃, VDD =12V, unless otherwise noted.)

| Symbol | Characteristics | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{DD}$ | Input Voltage | | 2.8 | - | 24 | V |
| $I_{DD}$ | Supply Current | no load | - | 2.5 | 5 | mA |
| $R_{DS(on)}$ | Output On-Resistance | 300mA | - | 2.8 | - | Ω |
| Tlp_on | Locked Protection On Time | | - | NA | - | s |
| Tlp_off | Locked Protection Off Time | | - | NA | - | s |
| Tshut | Thermal Shutdown Threshold | | 150 | 155 | - | ° C |
| **Magnetic Characteristics** | | | | | | |
| Bop | Operating Point | | 5 | 15 | 40 | Gauss |
| Brp | Releasing Point | | -40 | -15 | -5 | Gauss |
| Bhys | Hysteresis | | - | 30 | - | Gauss |

## Driver Output VS Magnetic Pole

| Parameter | Test Conditions | DO | DOB |
|---|---|---|---|
| North Pole | B<Brp | High | Low |
| South Pole | B>Bop | Low | High |

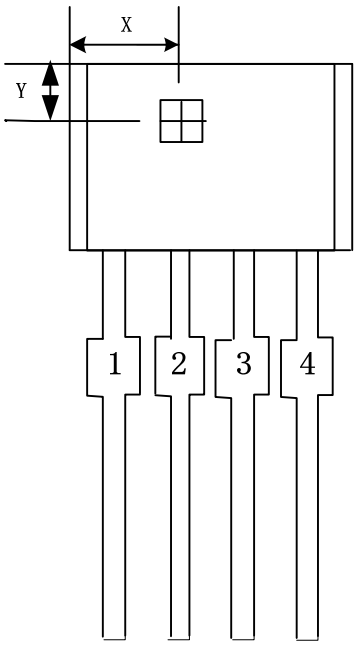
## Operating Characteristics




## *Output Switch Principle*

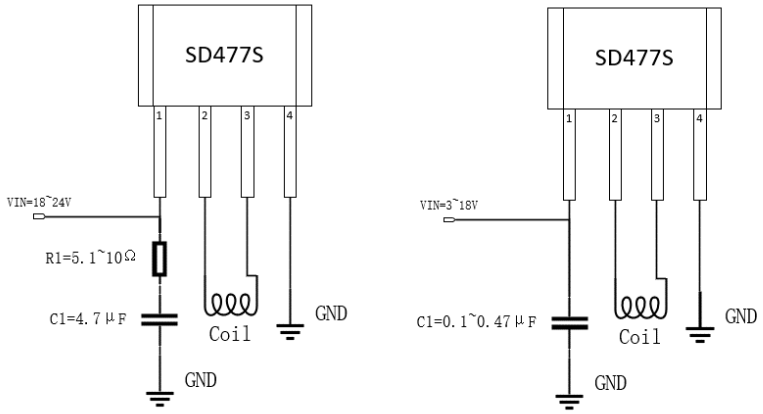
*The SD477S built in a Hall-effect sensor plane to sense the vertical magnetic flux density (B). There are two output drivers in SD477S to drive Single-phase DC brushless fan or motor. When the South pole magnetic field is close to the IC marking surface and the magnetic flux density higher than operate point (Bop), the DO pin output will turn to Low and the DOB pin output will turn to High. When the South pole magnetic field far away the IC marking surface and North pole magnetic field close to the IC marking surface until the magnetic flux density higher than release point (Brp), the DO pin output will turn to High and the DOB pin output will turn to low.*

## *Hall Sensor Location*



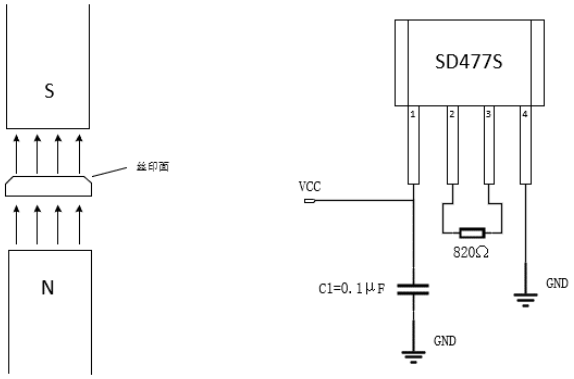

| Orientation | Value | Unit |
|---|---|---|
| X | 1.9 | mm |
| Y | 1.2 | mm |

## *Typical Application Circuit*



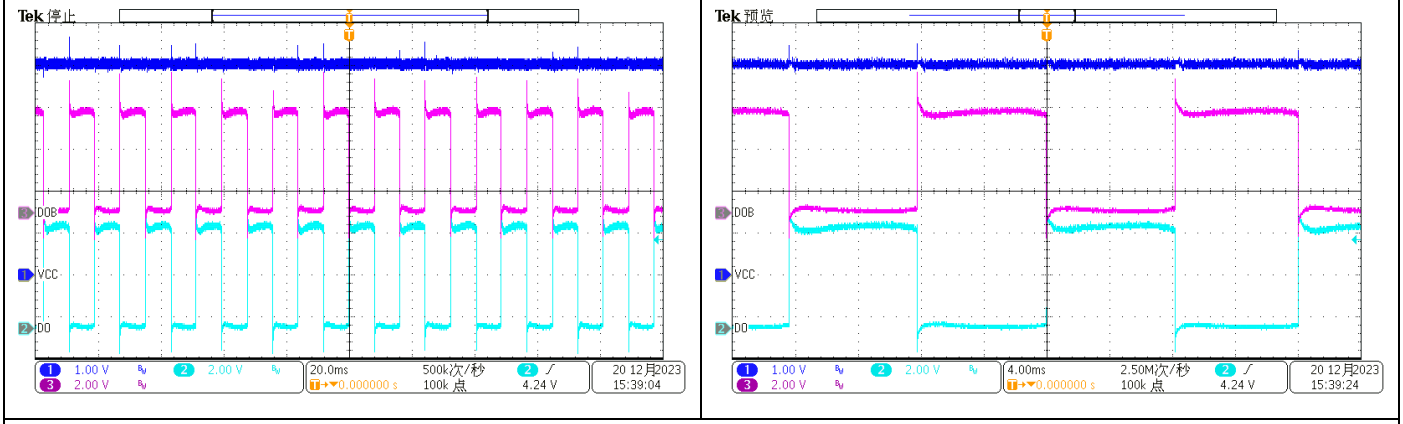

Note 3: When the power pulse is relatively large，Must use least C1=4.7μF(ceramic capacitor) capacitor & R1=5.1~10Ω for the decoupling between VIN and GND and place the capacitor as close to the IC as Possible. C1 is an optional capacitor, which can enhance the reliability during hot swap.

## *Test Circuit*



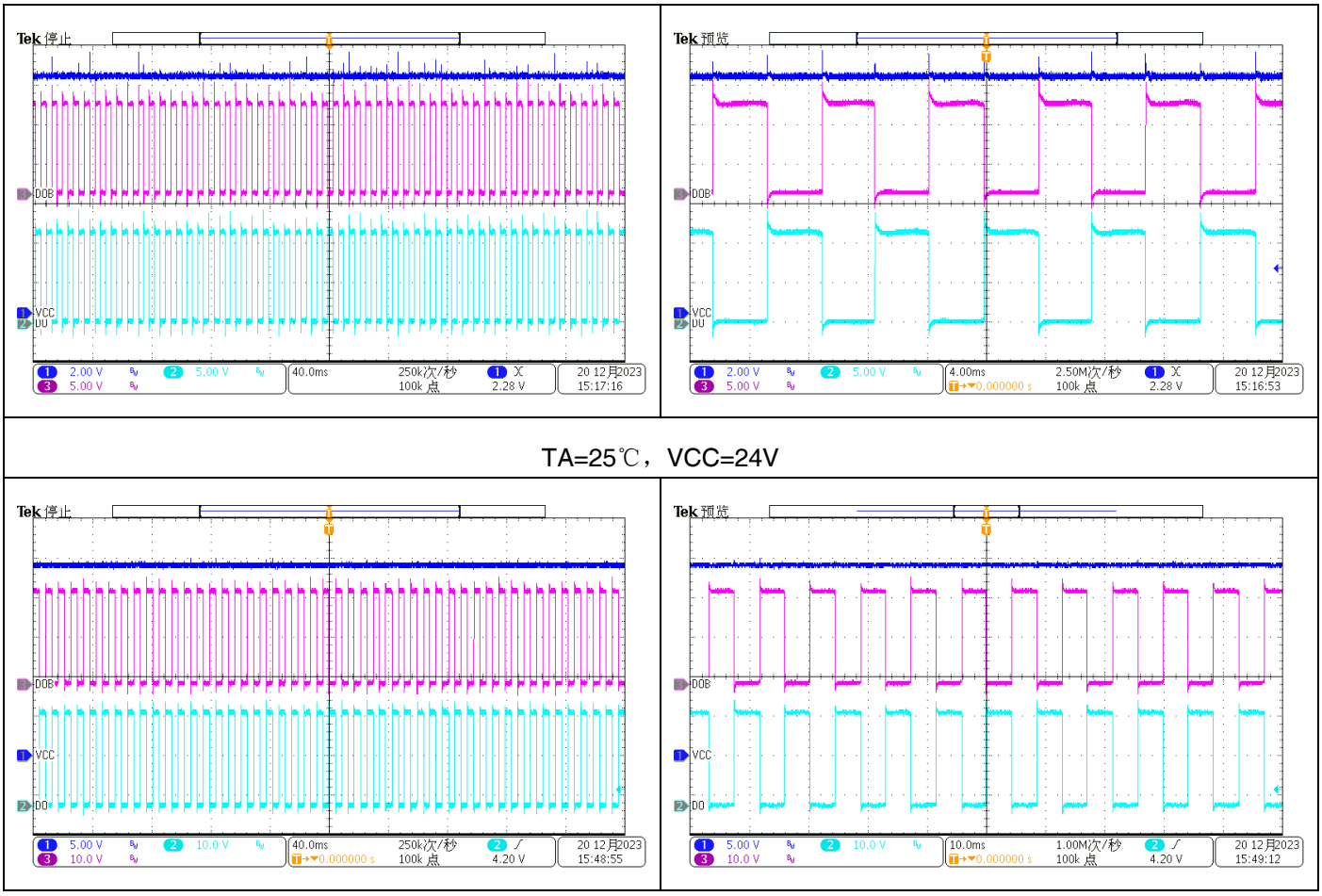

## *Typical Performance Characteristics*

TA=25℃，VCC=5V




TA=25℃，VCC=12V

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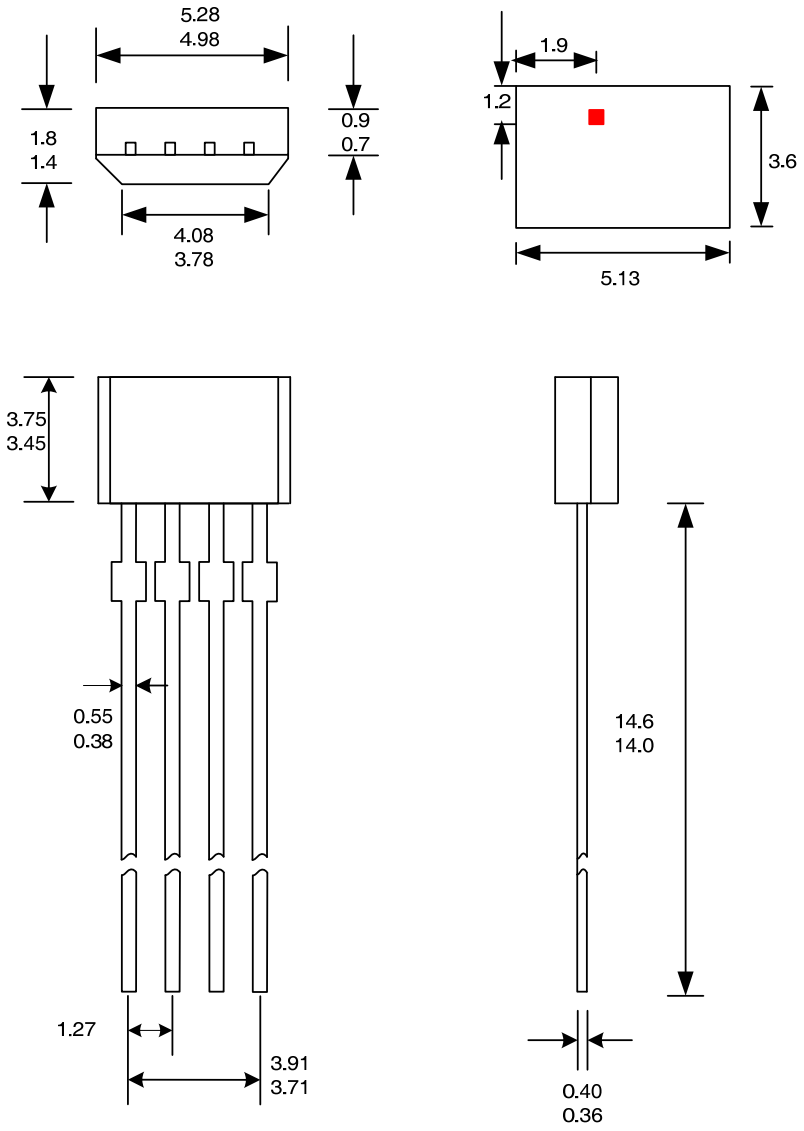


## *Package Information*

# Single Phase Hall Effect Fan Driver

4-Terminal
VB Package

**Dimension:mm**




*Notes:*

1. *Exact body and lead configuration at vendor's option within limits shown.*
2. *Height does not include mold gate flash.*

*Where no tolerance is specified, dimension is nominal.*

## REVISION HISTORY

| Revision | Date | Description |
|---|---|---|
| RevE1.0 | 2023-12-25 | Preliminary Datasheet |
| RevA1.0 | 2024-03-21 | Final Datasheet |