

## **Complementary Output Hall Effect Fan Driver**

### ❖ GENERAL DESCRIPTION

MA7210 is integrated Hall sensors with output drivers, mainly designed for electronic commutation of brush-less DC Fan. This IC is using HV BCD process internally includes the regulator, protecting diode, Hall plate, amplifier, comparator, and a pair of complementary open-Drain outputs (DO, DOB).

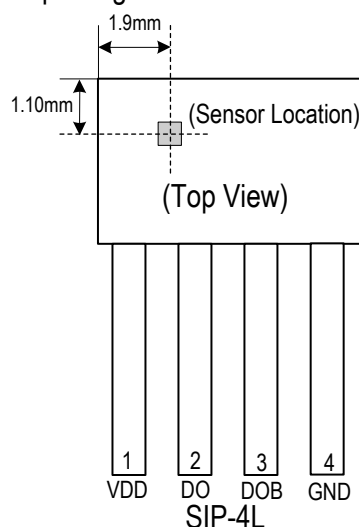
To avoid coil burning, rotor-lock shutdown detection circuit shut down the output driver if the rotor is blocked and then the automatic recovery circuit will try to restart the motor. This function repeats while rotor is blocked. Until the blocking is removed, the motor recovers running normally.

### ❖ FEATURES

- Built-in protecting diode only for chip reverse power connecting
- Wide operating voltage range: 3.5V~18V
- Output sink current up to 0.6A
- On-Chip High sensitivity Hall-effect Sensor
- Thermal Shutdown Protection
- -40°C to 85°C Operating Temperature range
- Rotor-locked shutdown and automatically restart function
- For 5V and 12V DC motor / FAN systems
- Low Profile SIP-4L Package

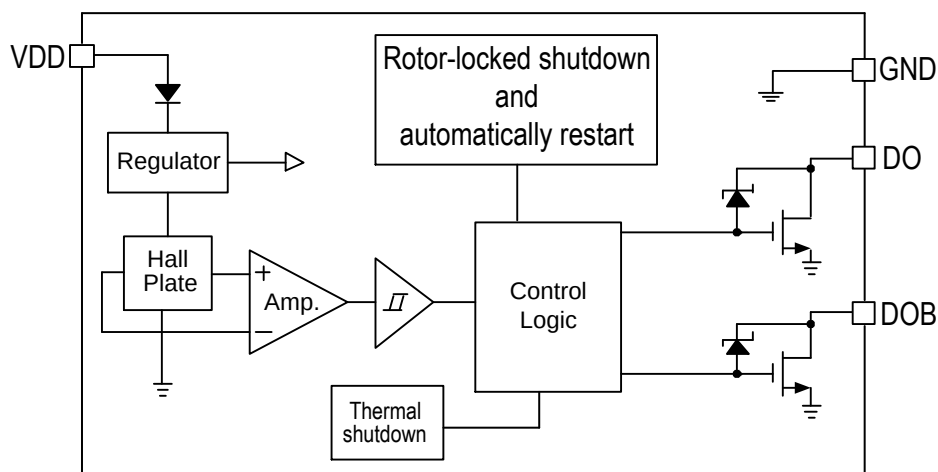
### ❖ PIN ASSIGNMENT

The package of MA7210 is SIP-4L; the pin assignment is given by:



| Name | Description    |
|------|----------------|
| VDD  | Supply Voltage |
| DO   | Output 1       |
| DOB  | Output 2       |
| GND  | Ground.        |

### ❖ BLOCK DIAGRAM



### ❖ RDER/MARKING INFORMATION

| Order Information                                                                                                                                                                                                                                            | Top Marking                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MA7210 XX X</b><br><div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div>             Package Type<br/>             P4: SIP-4L           </div> <div>             Packing<br/>             Blank: Bag           </div> </div> | <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <b>7 2 1 0</b><br/> <b>Y Y W W X</b> </div> <div>             → Part number<br/>             → ID code: internal<br/>             → WW: 01~52<br/>             → Year: 15=2015           </div> </div> |

### ❖ ABSOLUTE MAXIMUM RATINGS (at T<sub>A</sub>=25°C)

| Characteristics                             | Symbol           | Rating          | Unit  |
|---------------------------------------------|------------------|-----------------|-------|
| Supply Voltage                              | V <sub>CC</sub>  | 20              | V     |
| Reverse VCC Polarity Voltage                | V <sub>RCC</sub> | -20             | V     |
| Magnetic Flux Density                       | B                | Unlimited       | Gauss |
| Output Current                              | I <sub>O</sub>   | Continuous      | 600   |
|                                             |                  | Hold            | 900   |
|                                             |                  | Peak (start up) | 1200  |
| Power Dissipation                           | P <sub>D</sub>   | 550             | mW    |
| Storage Temperature Range                   | T <sub>STG</sub> | -65 to +150     | °C    |
| Junction Temperature                        | T <sub>J</sub>   | 150             | °C    |
| Thermal Resistance from Junction to case    | θ <sub>JC</sub>  | 49              | °C/W  |
| Thermal Resistance from Junction to ambient | θ <sub>JA</sub>  | 227             | °C/W  |
| Operating temperature Range                 | T <sub>O</sub>   | -40 to 85       | °C    |

### ❖ ELECTRICAL CHARACTERISTICS

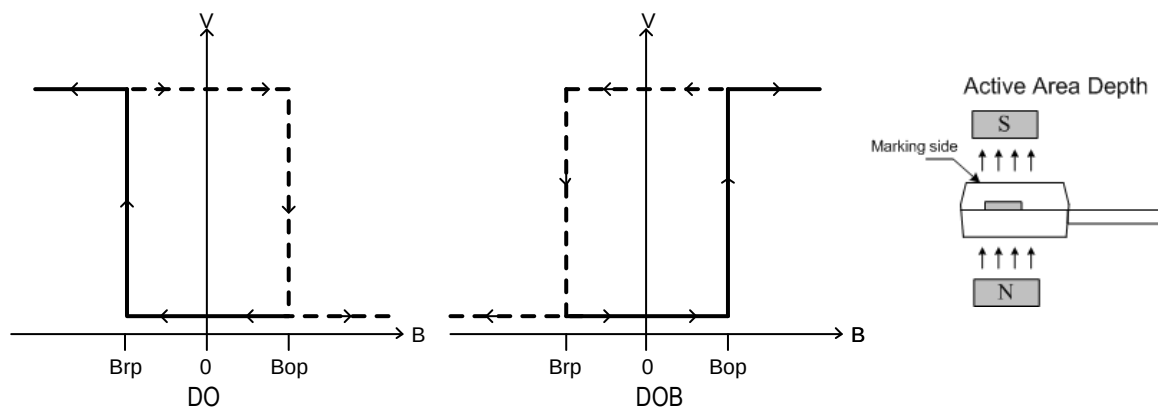
( $V_{DD} = 12V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

| Characteristics                | Symbol       | Conditions      | Min | Typ   | Max | Units      |
|--------------------------------|--------------|-----------------|-----|-------|-----|------------|
| Supply Voltage                 | $V_{DD}$     | Operating       | 3.5 | -     | 18  | V          |
| Supply current                 | $I_{DD}$     | Operating       | -   | 3.5   | 5   | mA         |
| Output Leakage Current         | $I_{OFF}$    | $V_{OUT}=12V$   | -   | < 0.1 | 10  | $\mu A$    |
| Output On resistance           | $R_{DS(ON)}$ | $I_{OUT}=300mA$ | -   | 0.9   | -   | $\Omega$   |
| Output Clamping Voltage        | $V_Z$        | DO, DOB         | -   | 32    | -   | V          |
| Locked Protection On           | Tlrp-on      |                 | -   | 0.40  | -   | Sec        |
| Locked Protection Off          | Tlrp-off     |                 | -   | 2.4   | -   | Sec        |
| Thermal shutdown Temp          | $T_{SD}$     |                 | 150 | -     | -   | $^\circ C$ |
| Thermal Shutdown Hysteresis    | $T_{SH}$     |                 | -   | 30    | -   | $^\circ C$ |
| <b>Magnetic</b> (1mT=10 Gauss) |              |                 |     |       |     |            |
| Operate Point                  | $B_{OP}$     |                 | 5   | 30    | 50  | Gauss      |
| Release Point                  | $B_{RP}$     |                 | -50 | -30   | -5  | Gauss      |
| Hysteresis                     | $B_{HYS}$    |                 | -   | 60    | -   | Gauss      |

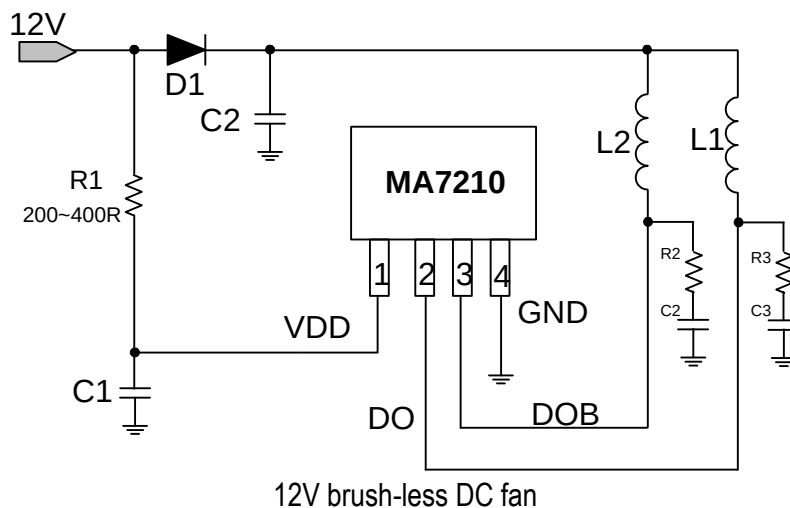
Driver output vs. magnetic pole

| Characteristics | Test Conditions | DO   | DOB  |
|-----------------|-----------------|------|------|
| North pole      | $B < Brp$       | High | Low  |
| South pole      | $B > Bop$       | Low  | High |

Note: The magnetic pole is applied facing the branded side of the package



## ❖ APPLICATION CIRCUIT



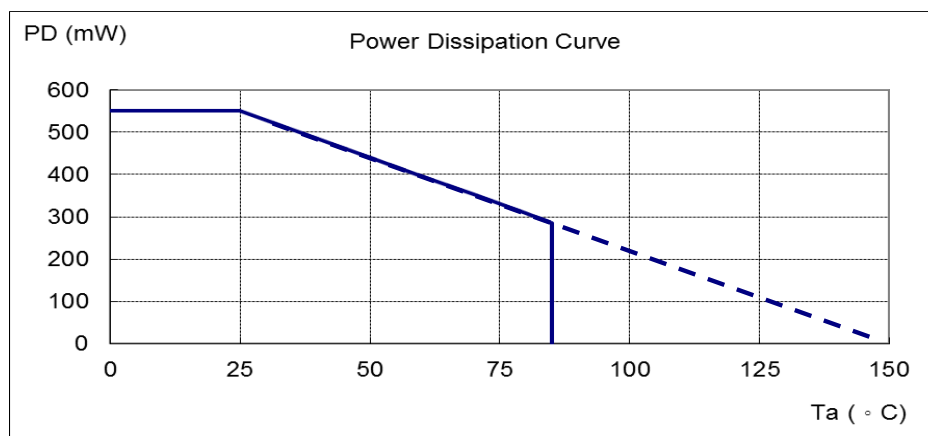
**Note1:** C2(Optional) is for power stabilization, Recommended E-Cap 2.2uF/50V and D1 (Optional) is a reverse protect diode.

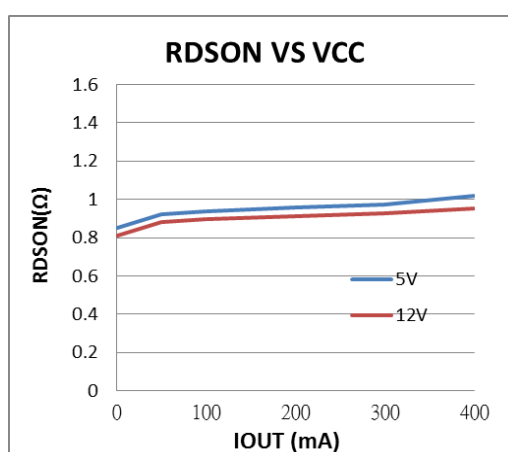
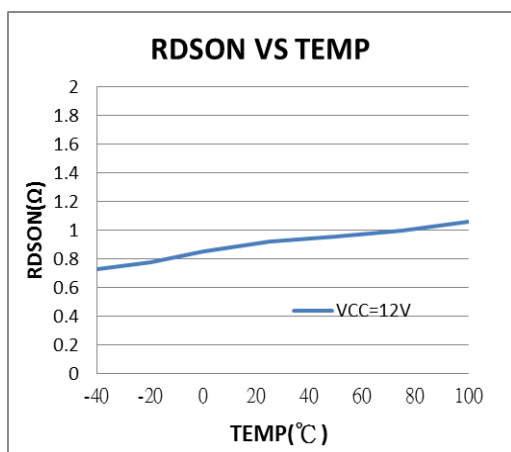
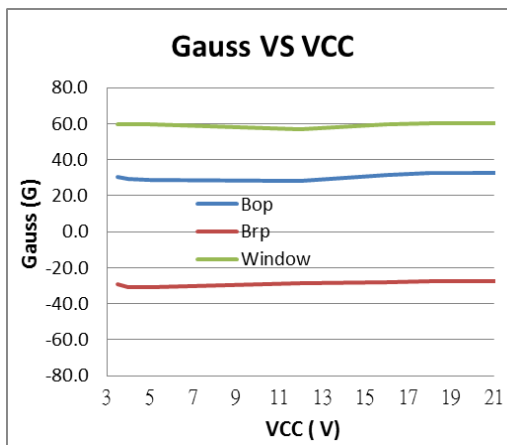
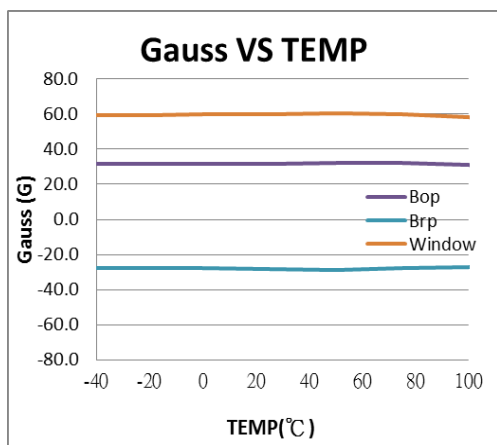
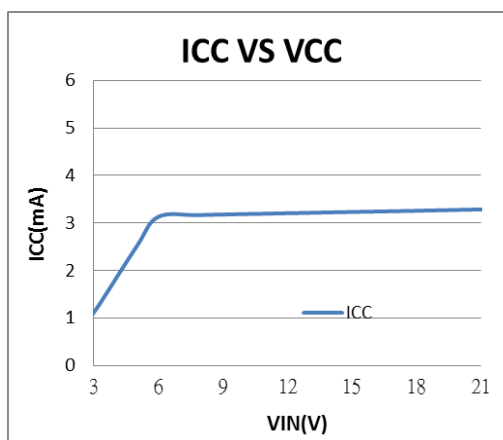
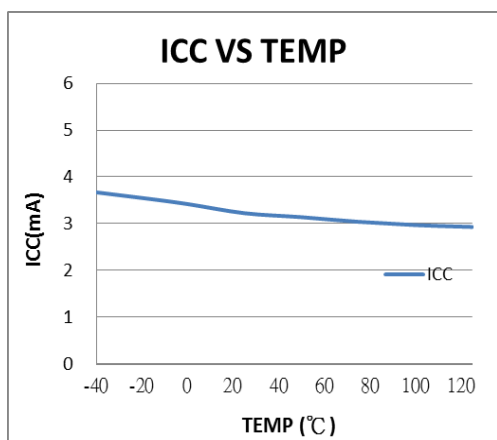
**Note2:** R1(1/8W 0805) and C1(100nF) : Enhance the reliability during hot swap.

**Note3:** Recommended to use a 47 ohm for R2 & R3 and a 1uF E-Cap for C2 & C3. These values may need to be optimized depending on the coil used.

## ❖ PERFORMANCE CHARACTERISTICS

| T <sub>A</sub> (°C) | 25  | 50  | 60  | 70  | 80  | 85  | 90  | 95  | 100 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| PD (mW)             | 550 | 440 | 396 | 352 | 308 | 286 | 264 | 242 | 220 |
| T <sub>A</sub> (°C) | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 150 |
| PD (mW)             | 198 | 176 | 154 | 132 | 110 | 88  | 66  | 44  | 0   |





❖ **PACKAGE OUTLINES**
