

Single Phase Hall Effect Smart Fan Driver

❖ GENERAL DESCRIPTION

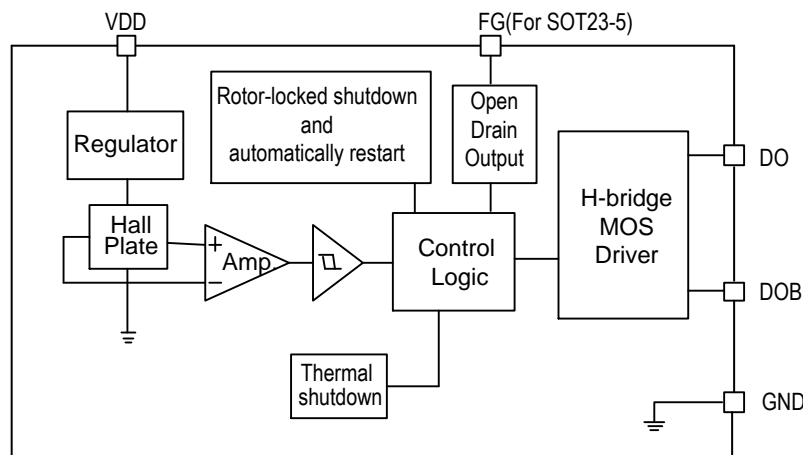
The MA7110 is an integrated Hall sensor with H-Bridged output driver designed for brushless DC motor applications. The device includes an on-chip Hall sensor for magnetic sensing, an amplifier that amplifies the Hall voltage, a comparator to provide switching hysteresis for noise rejection, a bi-directional drivers for sinking and driving large current load.

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

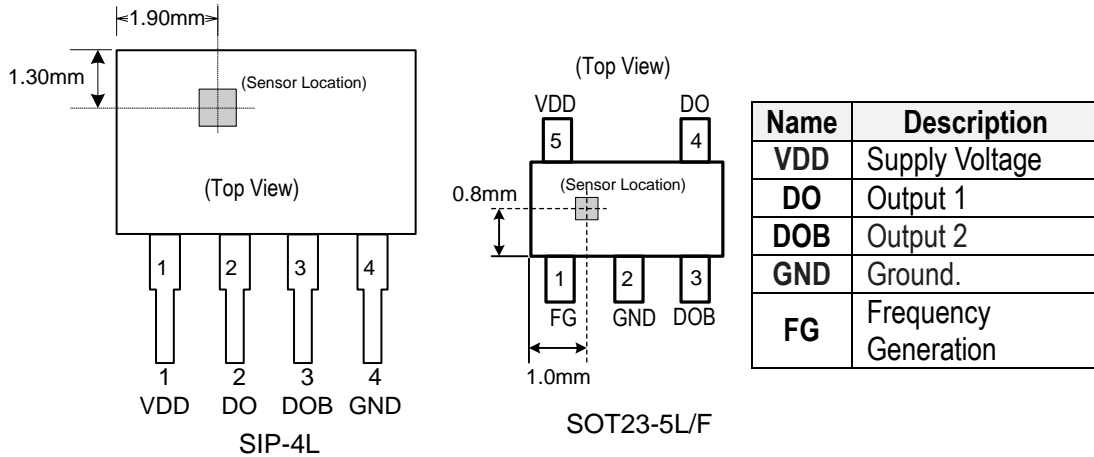
- On-Chip High sensitivity Hall-effect Sensor
- Operating Voltage: 3.3V to 18V
- H-Bridge Output Drivers for Single Coil
- Thermal Shutdown Protection
- Low Output Switching Current Noise
- -40°C to 85°C Operating Temperature
- Rotor-locked shutdown and automatically restart function
- For 5V and 12V DC motor / FAN systems
- Low Profile SIP-4L & SOT23-5L/F Package

❖ BLOCK DIAGRAM



❖ PIN ASSIGNMENT

The package of MA7110 is SIP-4L; the pin assignment is given by:


❖ RDER/MARKING INFORMATION

Order Information	Top Marking (SIP-4L)
<p>MA7110XXX</p> <p>Package Type Packing P4: SIP-4L Blank: Bag A : Taping</p>	<p>7110 → Part number</p> <p>Y Y W W X → ID code: internal</p> <p> → WW:01~52</p> <p> → Year:16=2016</p>
Order Information	Top Marking (SOT23-5L/F)
<p>MA7110X X</p> <p>Package Type Packing B: SOT23-5L Blank: Bag BP: SOT23-5F A : Taping</p>	<p>H D Y W X → ID Code: Internal</p> <p> → Week: 01~26(A~Z) 27~52(a~z)</p> <p> → Year : 6 = 2016</p>

❖ ABSOLUTE MAXIMUM RATINGS (at $T_A=25^\circ\text{C}$)

Characteristics		Symbol	Rating	Unit
Supply Voltage		V_{CC}	20	V
Magnetic Flux Density		B	Unlimited	Gauss
Output Current	Continuous	I_O	400	mA
	Hold		800	
	Peak (start up)		900	
Power Dissipation		P_D	550	mW
Storage Temperature Range		T_{STG}	-50 to +150	$^\circ\text{C}$
Junction Temperature		T_J	150	$^\circ\text{C}$
Thermal Resistance from Junction to case		θ_{JC}	49	$^\circ\text{C/W}$
Thermal Resistance from Junction to ambient		θ_{JA}	227	$^\circ\text{C/W}$
Recommended Operating Conditions ($T_A=25^\circ\text{C}$)				
Supply Voltage		V_{CC}	3.3 to 18	V
Ambient Temperature		T_A	-40 to 85	$^\circ\text{C}$

❖ ELECTRICAL CHARACTERISTICS

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

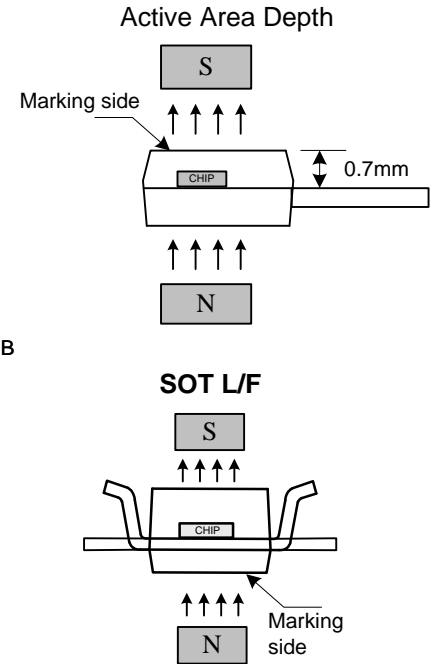
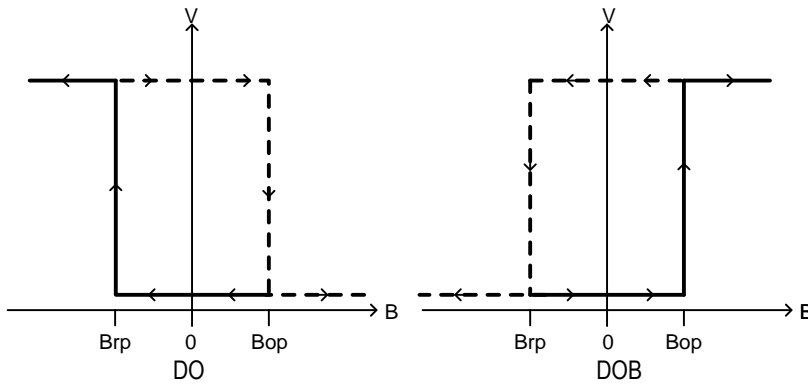
Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Average Supply Current	I_{DD}	no load	-	3	-	mA
On resistance(RPMOS+RN MOS)	$R_{DS(ON)}$	300mA	-	2.6	-	Ω
Locked Protection On	Tlrp-on		-	0.45	-	Sec
Locked Protection Off	Tlrp-off		-	2.6	-	Sec
Thermal Shutdown Threshold	T_{SHUT}		150	-	-	$^\circ\text{C}$
Operating Point	B_{OP}		5	30	50	Gauss
Releasing Point	B_{RP}		-50	-30	-5	Gauss
Hysteresis	B_{HYS}		-	60	-	Gauss

Note: Guaranteed by design.

Driver output vs. magnetic pole

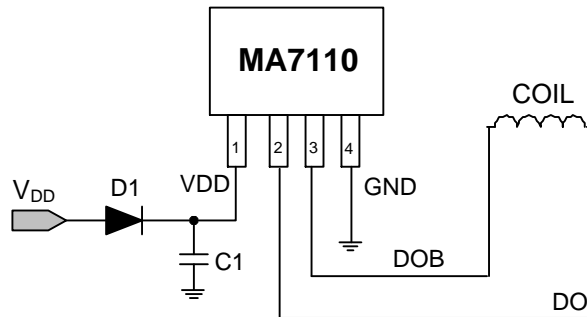
Characteristics	Test Conditions	DO	DOB
North pole	$B < Brp$	High	Low
South pole	$B > Bop$	Low	High

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



❖ APPLICATION CIRCUIT

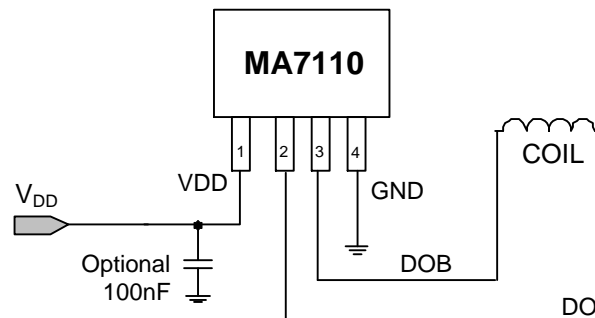
1. Circuit 1

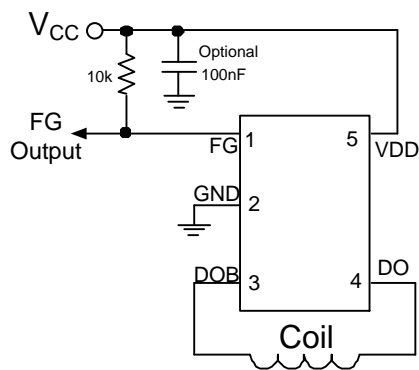


NOTE

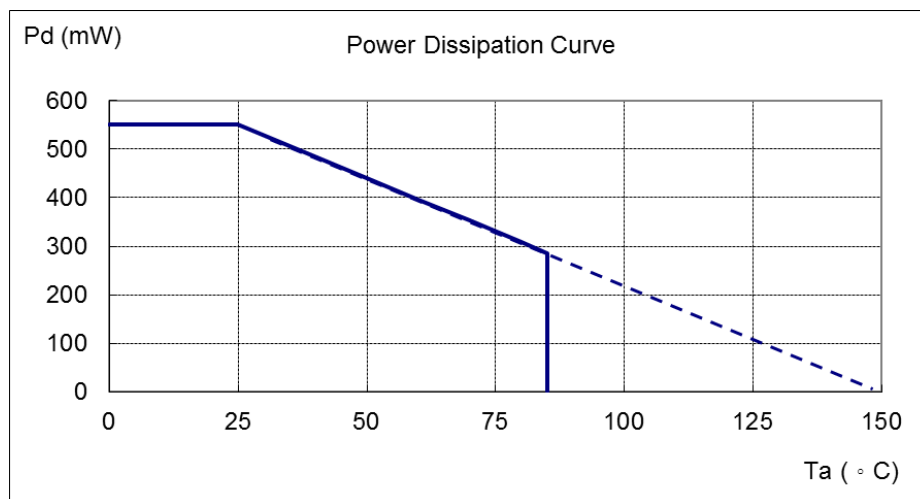
1. D1 is reversed protection diode,
2. C1 : ECA $\geq 2.2\mu\text{F}$, MLCC $\geq 10\mu\text{F}$

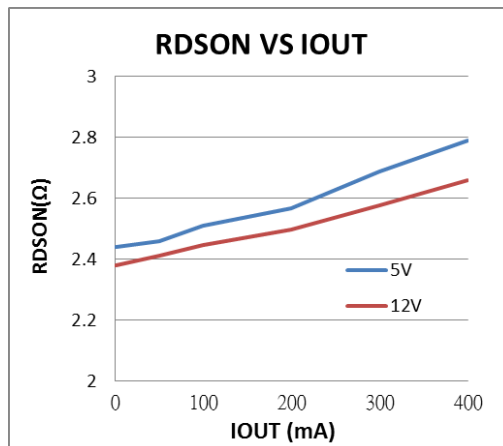
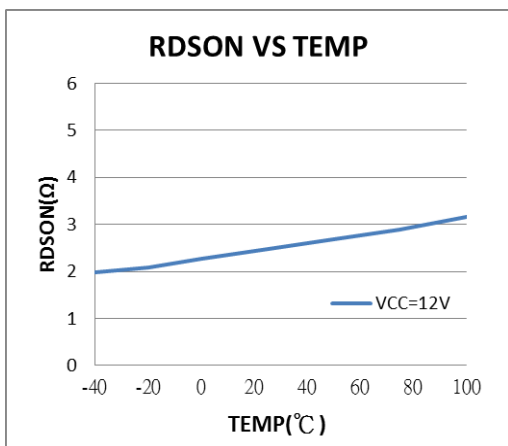
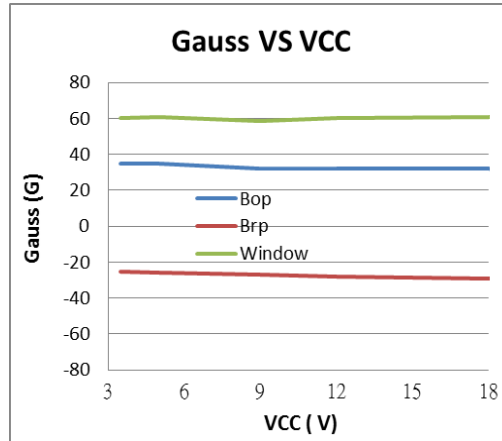
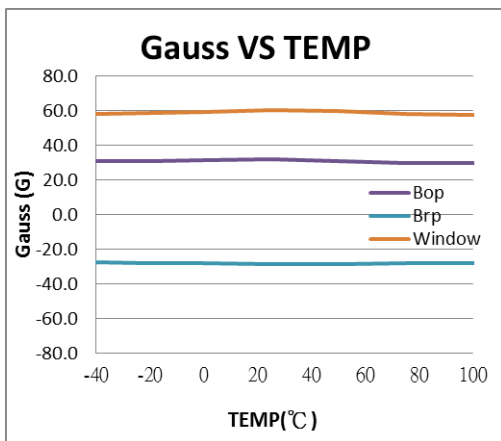
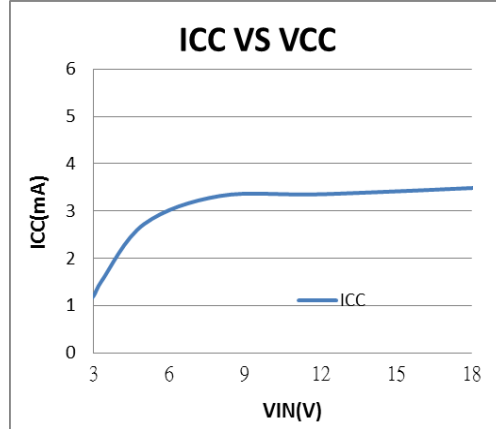
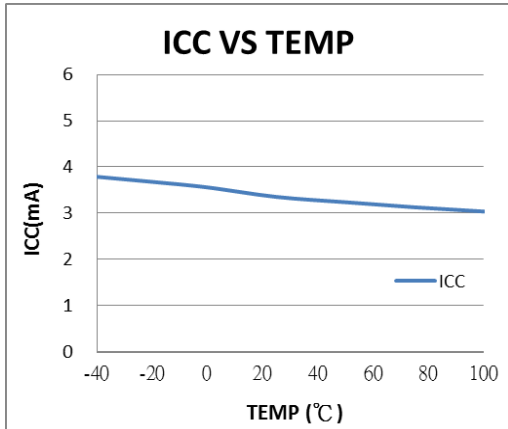
2. Circuit 2

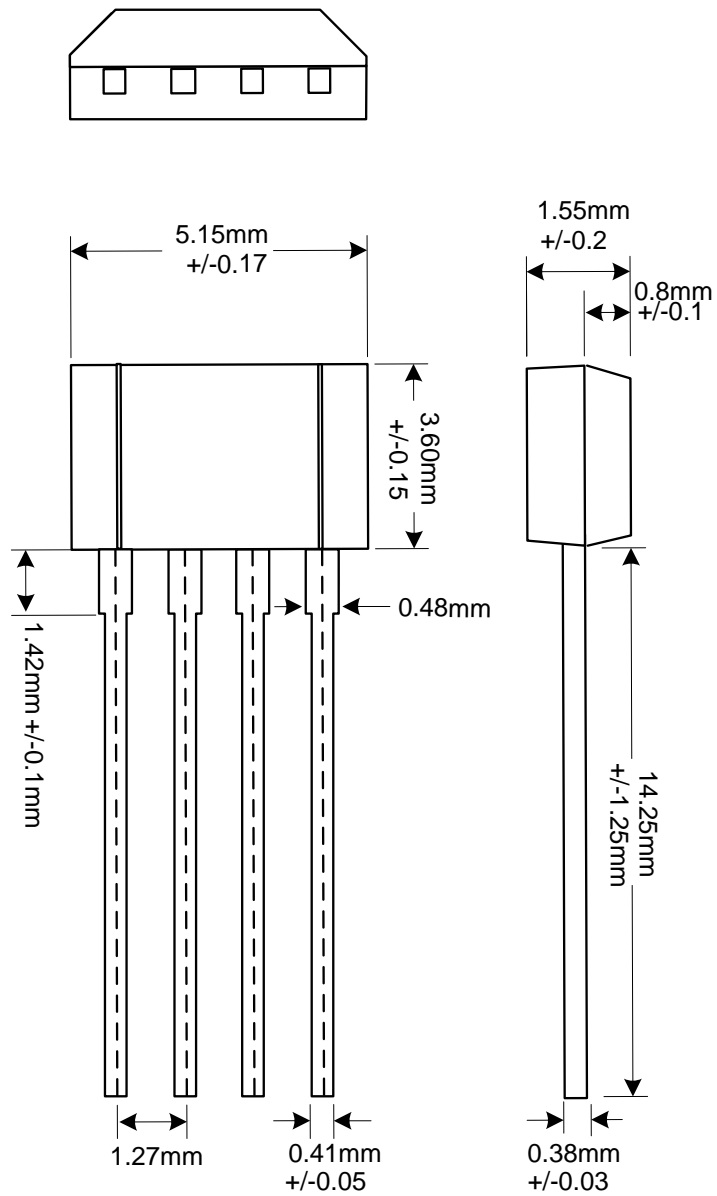


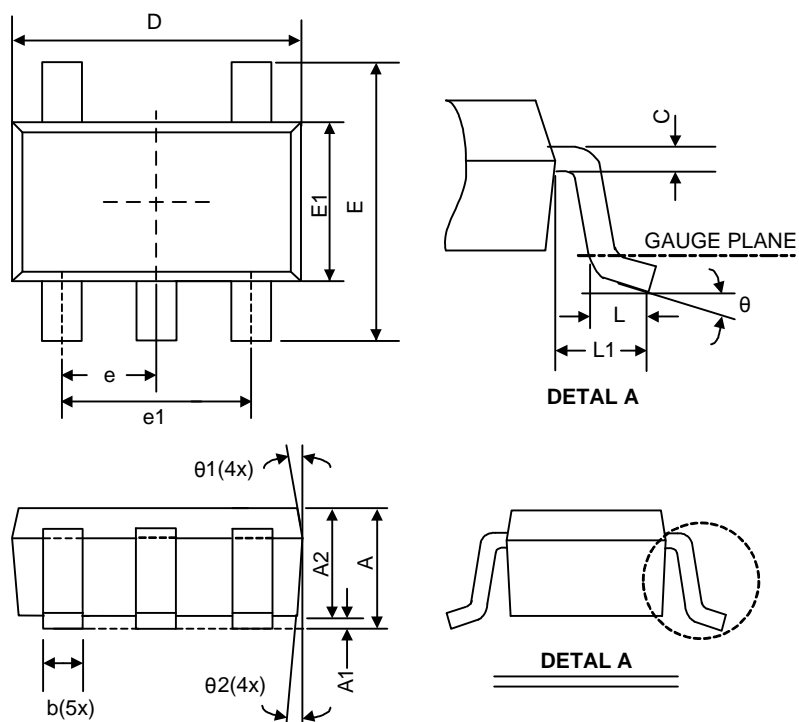
❖ APPLICATION CIRCUIT
3. Circuit 3

❖ PERFORMANCE CHARACTERISTICS

T_A (°C)	25	50	60	70	80	85	90	95	100
Pd (mW)	550	440	396	352	308	286	264	242	220
T_A (°C)	105	110	115	120	125	130	135	140	150
Pd (mW)	198	176	154	132	110	88	66	44	0

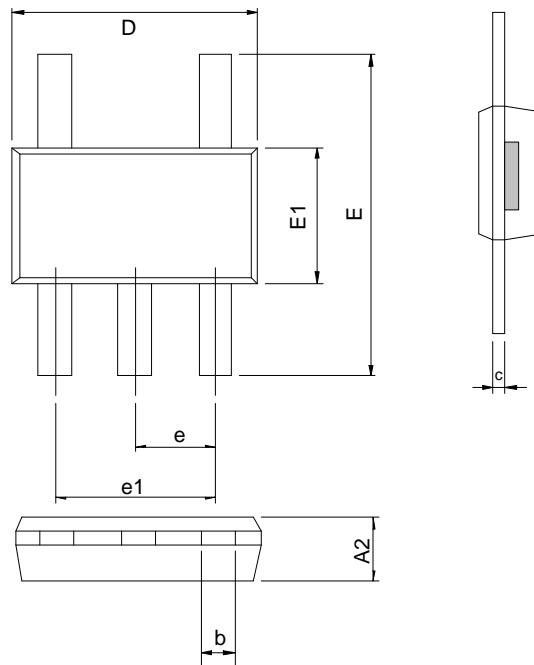




❖ PACKAGE OUTLINES
1. SIP-4L


2. SOT23-5L


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.05	-	1.35	0.041	-	0.053
A1	0.05	-	0.15	0.002	-	0.006
A2	1.00	1.10	1.20	0.039	0.043	0.047
b	0.30	-	0.50	0.012	-	0.020
C	0.08	-	0.22	0.003	-	0.009
D	2.80	2.90	3.00	0.110	0.114	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
E	2.60	2.80	3.00	0.102	0.110	0.118
L	0.30	-	0.60	0.012	-	0.024
L1	0.50	0.60	0.70	0.020	0.024	0.028
e1	1.80	1.90	2.00	0.071	0.075	0.079
e	0.85	0.95	1.05	0.033	0.037	0.041
θ	0°	4°	8°	0°	4°	8°
$\theta1$	5°	10°	15°	5°	10°	15°
$\theta2$	5°	10°	15°	5°	10°	15°

3. SOT23-5F


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A2	0.85	1.00	1.15	0.033	0.039	0.045
b	0.30	0.40	0.55	0.012	-	0.020
c	0.08	-	0.22	0.003	-	0.009
D	2.70	2.90	3.10	0.106	1.114	0.122
E1	1.40	1.60	1.80	0.055	0.063	0.071
E	3.90	4.10	4.25	0.153	0.161	0.167
e1		1.90BSC			0.075BSC	
e		0.95BSC			0.037BSC	