

Single Output Hall Effect Latch

❖ GENERAL DESCRIPTION

MA7020/B is an integrated Hall effect latched sensor designed for electronic commutation of brush-less DC motor applications. The device is using HV BCD process includes an on-chip Hall voltage generator for magnetic sensing, a comparator that amplifies the Hall voltage, and a Schmitt trigger to provide switching hysteresis for noise rejection, and open-collector output. An internal band-gap regulator is used to provide temperature compensated supply voltage for internal circuits and allows a wide operating supply range.

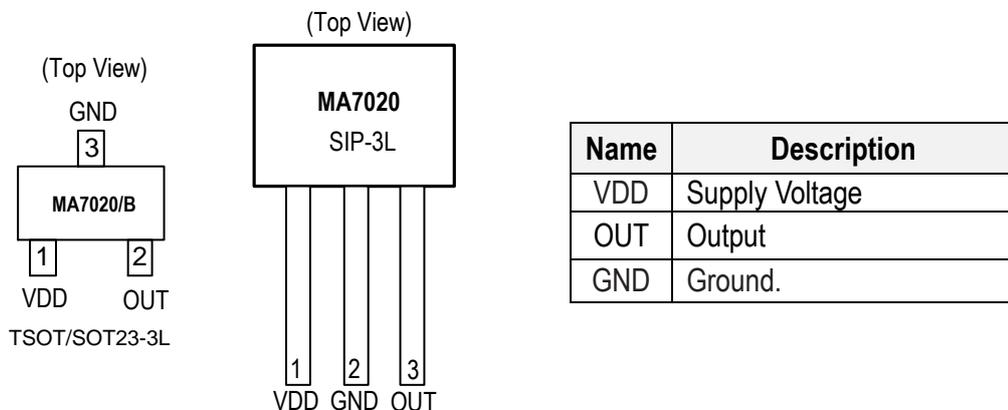
If a magnetic flux density larger than threshold B_{op} , OUT is turned on(low). The output state is held until a magnetic flux density reversal falls below B_{rp} causing OUT to be turned off (high).

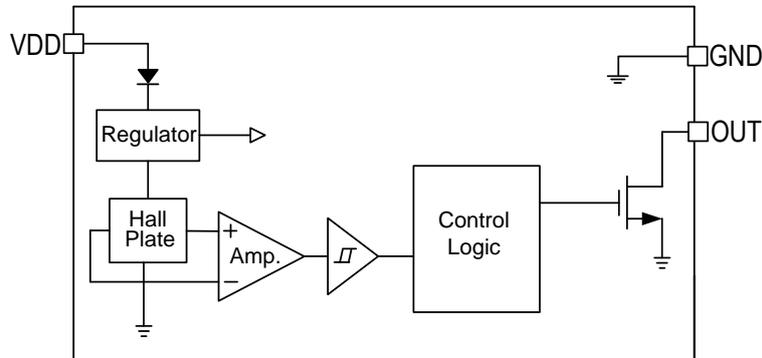
❖ FEATURES

- 2.5V to 26V DC operation voltage
- Temperature compensation
- Wide operating voltage range
- Open-Drain pre-driver
- 25mA maximum sinking output current.
- Low Profile TSOT/SOT23-3L and SIP-3L(TO-92S) Package(Green and Lead Free)

❖ PIN ASSIGNMENT

The package of MA7020/B , the pin assignment is given by:



❖ BLOCK DIAGRAM

❖ RDER/MARKING INFORMATION

Order Information	Top Marking (SIP-3L)
MA7020 XX X Package Type: P3: SIP-3L Packing: Blank: Bag, A: Taping	7020 → Part number YYWWX → ID code: internal WW: 01~52 Year: 13=2013
Order Information	Top Marking (TSOT/SOT23-3L)
MA7020 X A X Device Name: Blank: MA7020, B: MA7020B Packing: Blank: Bag, A: Taping A: SOT23-3L, AT: TSOT23-3L	H X Y W X → ID Code: Internal Week: 01~26(A~Z), 27~52(a~z) Year: 7 = 2017 H6=MA7020, H7=MA7020B

❖ ABSOLUTE MAXIMUM RATINGS (at T_A=25°C)

Characteristics	Symbol	Rating	Unit
Supply Voltage	V _{CC}	28	V
Reverse VCC Polarity Voltage	V _{RCC}	-28	V
Magnetic Flux Density	B	Unlimited	Gauss
Output Current	I _O	25	mA
Power Dissipation(SIP3/SOT23)	P _D	550/230	mW
Storage Temperature Range	T _{STG}	-65 to +150	°C
Thermal Resistance from Junction to case(SIP3/SOT23)	θ _{JC}	49/410	°C/W
Thermal Resistance from Junction to ambient(SIP3/SOT23)	θ _{JA}	227/543	°C/W
Junction temperature	T _J	150	°C
Operating temperature	T _O	-40 to 120	°C
Magnetic signal input frequency(note1)	F _{sw}	0~3	kHz

Note1 : Not subject to production test, verified by design/characterization.

❖ ELECTRICAL CHARACTERISTICS

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

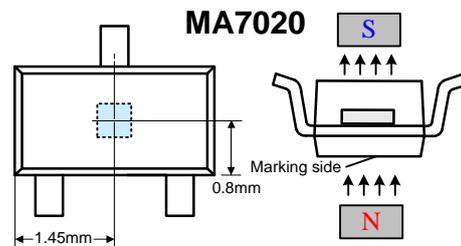
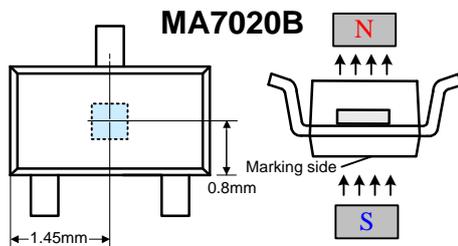
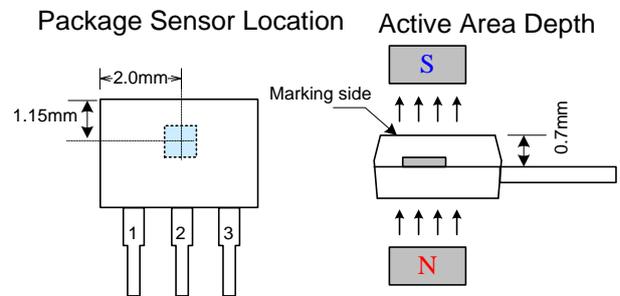
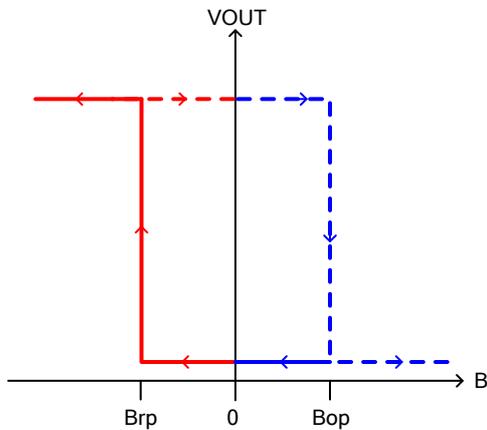
Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	2.5	-	26	V
Supply current	I_{DD}	Operating	-	2.0	3.0	mA
Output Leakage Current	I_{OFF}	$V_{OUT}=12V$	-	< 0.1	10	μA
Output Saturation Voltage	$V_{ds(sat)}$	$I_{OUT}=20mA$	-	0.3	-	V
Chopper frequency(note2)	fosc			50		kHz
Magnetic (1mT=10 Gauss)						
Operate Point	B_{OP}		5	28	60	Gauss
Release Point	B_{RP}		-60	-28	-5	Gauss
Hysteresis	B_{HYS}		-	56	-	Gauss

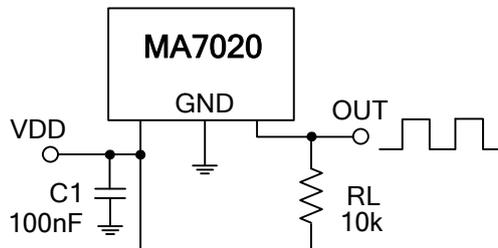
Note2: Not subject to production test, verified by design/characterization.

Driver output vs. magnetic pole(SIP3)

Characteristics	Test Conditions	OUT
North pole	$B < B_{rp}$	High
South pole	$B > B_{op}$	Low

Note: The magnetic pole is applied facing the branded side of the SIP3 package

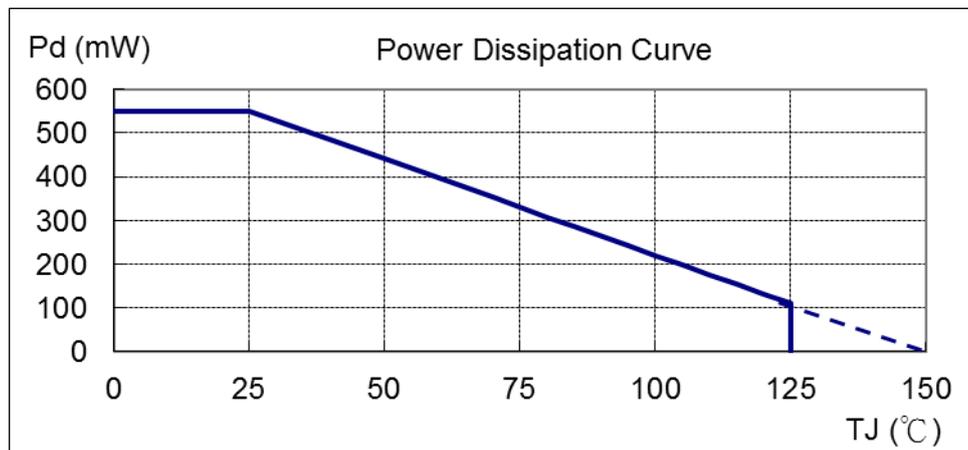


❖ TEST CIRCUIT


Note : C1 is for power stabilization and to strengthen the noise immunity. RL is the pull-up resistor.

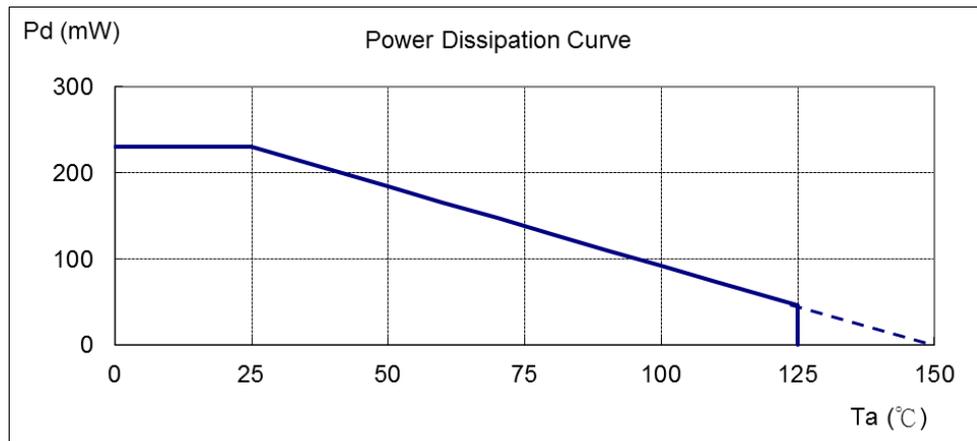
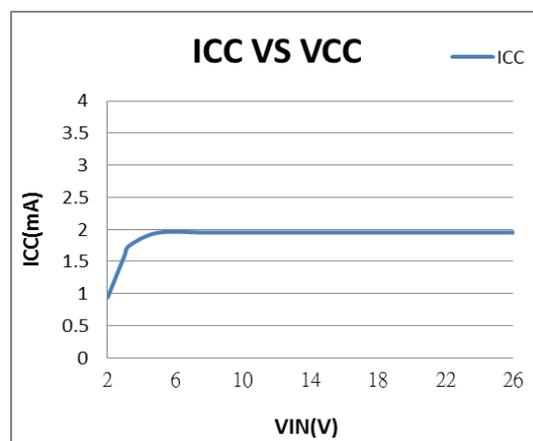
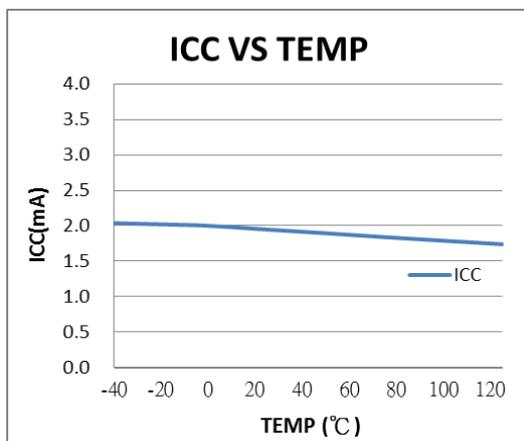
❖ PERFORMANCE CHARACTERISTICS
SIP-3L

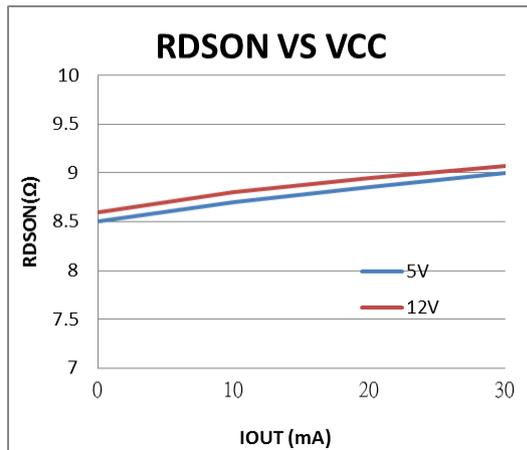
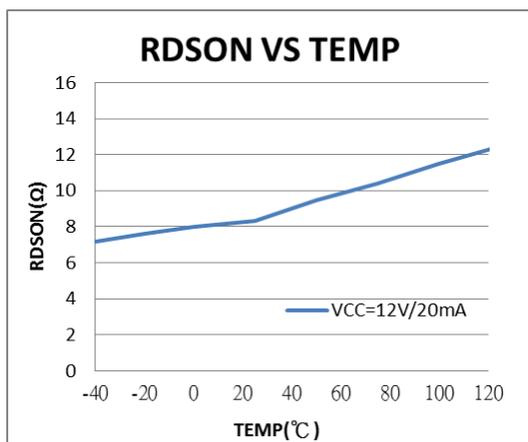
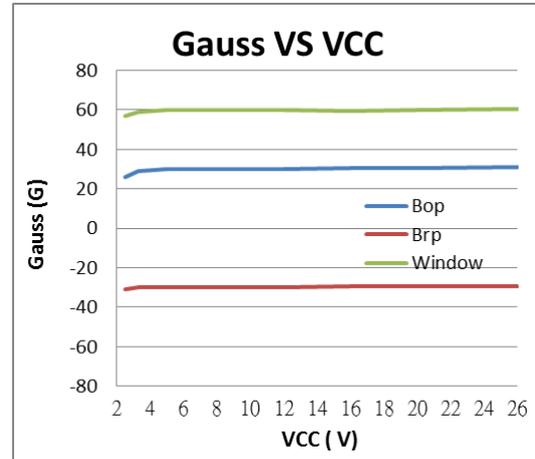
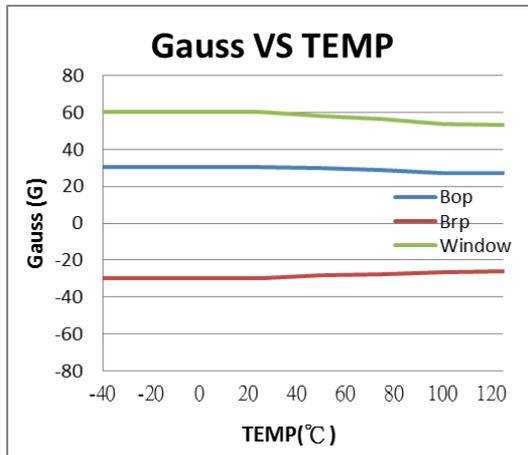
T_A (°C)	25	50	60	70	80	85	90	95	100
P_d (mW)	550	440	396	352	308	286	264	242	220
T_A (°C)	105	110	115	120	125	130	135	140	150
P_d (mW)	198	176	154	132	110	88	66	44	0

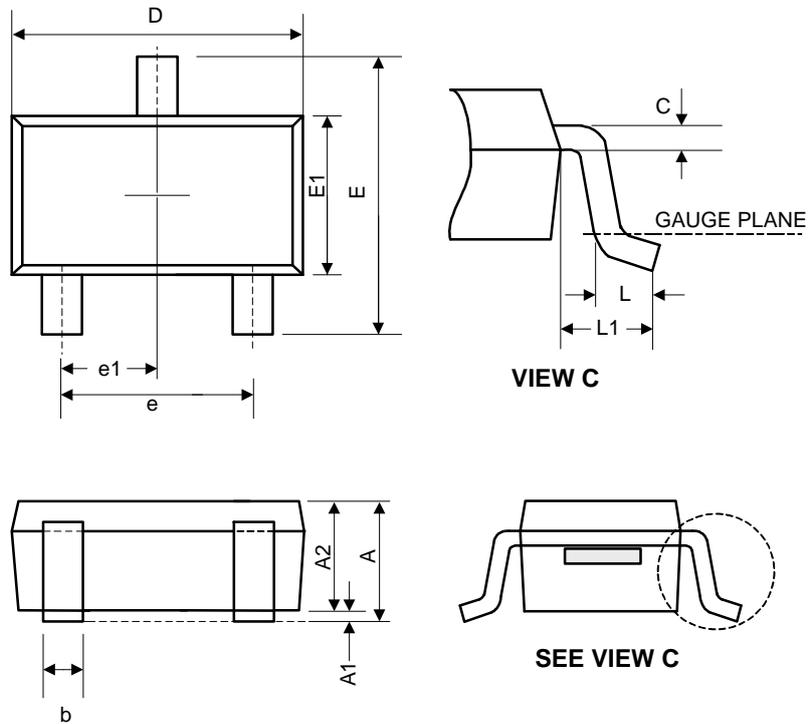


SOT-23-3L

T_A (°C)	25	50	60	70	80	85	90	95	100
Pd (mW)	230	230	184	166	147	129	120	110	101
T_A (°C)	105	110	115	120	125	130	135	140	150
Pd (mW)	83	74	64	55	46	37	27	18	0

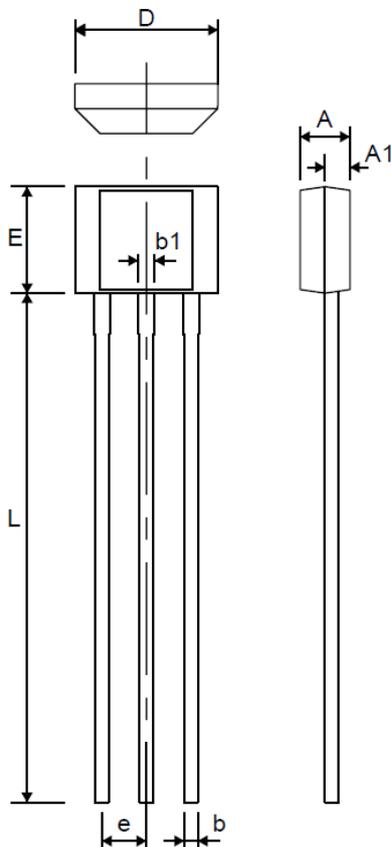

❖ PERFORMANCE CHARACTERISTICS


❖ PERFORMANCE CHARACTERISTICS


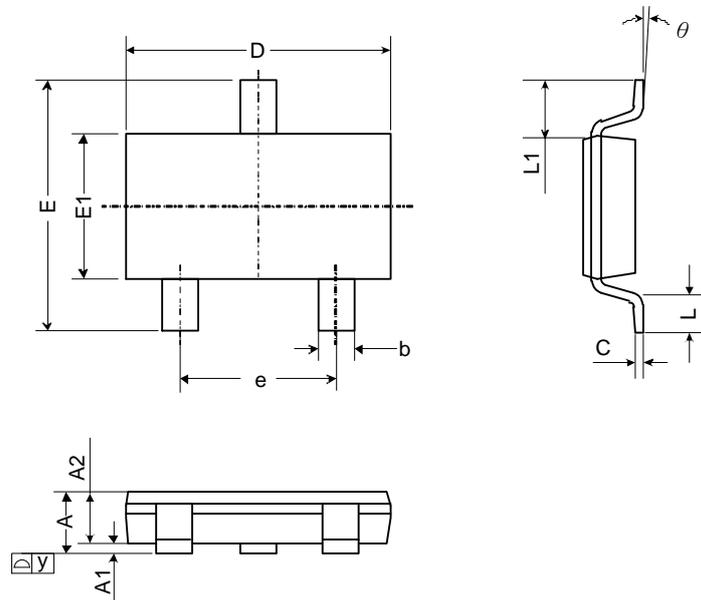
❖ PACKAGE OUTLINES
(1) SOT-23-3L


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.45	-	-	0.057
A1	0	0.08	0.15	-	-	0.006
A2	0.9	1.1	1.3	0.035	0.043	0.051
b	0.3	0.4	0.5	0.012	0.016	0.02
C	0.08	0.15	0.22	0.003	0.006	0.009
D	2.7	2.9	3.1	0.106	0.114	0.122
E	2.6	2.8	3	0.102	0.11	0.118
E1	1.4	1.6	1.8	0.055	0.063	0.071
L	0.3	0.45	0.6	0.012	0.018	0.024
L1	0.5	0.6	0.7	0.02	0.024	0.028
e	1.9 BSC			0.075 BSC		
e1	0.95 BSC			0.037 BSC		

JEDEC outline: NA

2. SIP-3L


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.20	1.48	1.76	0.047	0.058	0.069
A1	0.75 REF.			0.030 REF.		
b	0.33	0.38	0.43	0.013	0.015	0.017
b1	0.40	0.45	0.50	0.016	0.018	0.020
D	3.90	4.10	4.30	0.154	0.161	0.169
e1	1.27 BSC			0.050 BSC		
E	2.80	3.00	3.20	0.110	0.118	0.126
L	13.60	14.60	15.60	0.535	0.575	0.614

3. TSOT23-3L


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.00	0.030	-	0.039
A1	0.00	-	0.15	0.000	-	0.006
A2	0.70	0.75	0.85	0.028	0.030	0.034
b	0.35	-	0.51	0.014	-	0.020
C	0.10	-	0.25	0.004	-	0.010
D	2.80	2.90	3.00	0.110	0.114	0.118
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
e	1.90 BSC.			0.075 BSC.		
L	0.37	-	-	0.015	-	-
L1	0.60 REF.			0.024 REF.		
L2	0.25 BSC.			0.010 BSC.		
y	-	-	0.10	-	-	0.004
θ	0°	-	8°	0°	-	8°