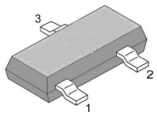
CH464A/ CH464AN

High-performance Hall latch sensors with built-in freewheeling diode

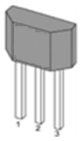
Features

- Enhanced Sensitivity Options (BOP / BRP): +50 / -50 Gauss
- Wide temperature range: -40°C to 150°C
- Wide operating voltage range: 3.8V to 30V
- Output short-circuit protection
- Built-in reverse voltage withstand protection
- Built-in inductance freewheeling diode, with the OUT terminal high voltage discharge capability enhances the protection of the sensor and the circuits
- Lead-Free Package: Flat TO-92S, SOT-23-3L surface mount package

Package

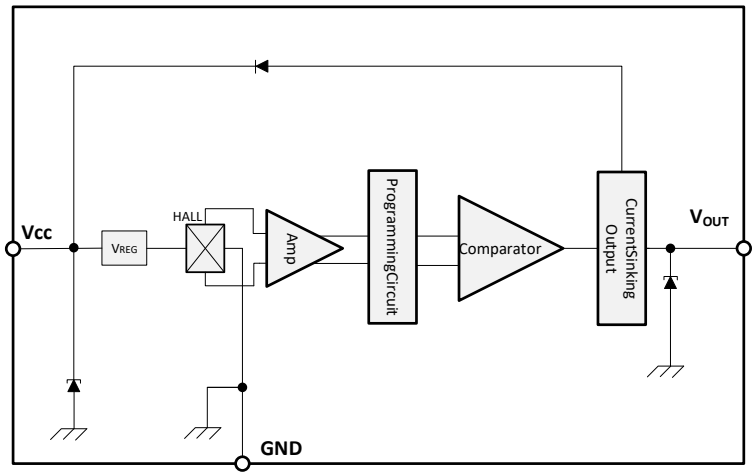


SOT-23-3L



TO-92S

Functional Block Diagram



Applications

- Motor and fan control
- Power tools
- Flow-rate sensing
- Valve and solenoid valve status
- Position sensing
- Speed and RPM (revolutions per minute)

Description

The CH464A and CH464AN are small, versatile digital Hall-effect devices designed to respond to alternating north and south poles.

Bipolar latching sensor ICs have enhanced sensitivity, often allowing the use of cheaper magnets.

Available in two package types, the CH464AS/CH464ANS in an ultra-small package SOT-23-3L surface mount package and the CH464AT/CH464ANT in a leaded flat TO-92S package.

The small size of the CH464AS/CH464ANS requires less printed circuit board space, allowing it to be used in smaller components. Its 3V capability allows for use in low-voltage applications, improving energy efficiency.

CH464AS/CH464ANS available in tape and reel formats; CH464AT/CH464ANT is available in bulk packaging (1000 pcs per bag).

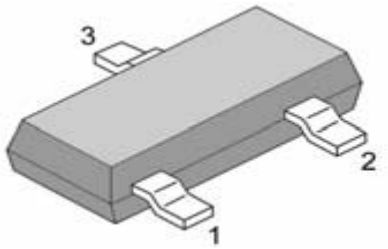
Table of Contents

1. Product Family Members

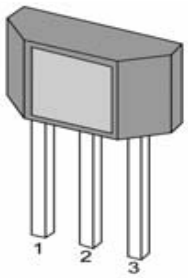
Part Number	Marking ID	Description
CH464ATB	464A	Bipolar latching, Hall-effect digital sensor IC, TO-92S, bulk packing (1000 units per bag)
CH464ATB-A1	464A	Bipolar latching, Hall-effect digital sensor IC, TO-92S-A1, bulk packing (1000 units per bag)
CH464ATB-A2	464A	Bipolar latching, Hall-effect digital sensor IC, TO-92S-A2, bulk packing (1000 units per bag)
CH464ATB-B2	464A	Bipolar latching, Hall-effect digital sensor IC, TO-92S-B2, bulk packing (1000 units per bag)
CH464ANTB	464AN	Bipolar latching, Hall-effect digital sensor IC, TO-92S, bulk packing (1000 units per bag)
CH464ANTB-A1	464AN	Bipolar latching, Hall-effect digital sensor IC, TO-92S-A1, bulk packing (1000 units per bag)
CH464ANTB-A2	464AN	Bipolar latching, Hall-effect digital sensor IC, TO-92S-A2, bulk packing (1000 units per bag)
CH464ANTB-B2	464AN	Bipolar latching, Hall-effect digital sensor IC, TO-92S-B2, bulk packing (1000 units per bag)
CH464ASR	464A	Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH464ANSR	464AN	Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L, tape and reel packing (3000 units per reel)

2. Pin Definitions and Descriptions

SOT-23-3L(S)	TO-92S(T)	Name	Type	Function
1	1	VDD	Supply	Supply Voltage pin
2	3	OUT	Output	Open Collector Output pin (include freewheeling diode)
3	2	GND	Ground	Ground pin



SOT-23-3L



TO-92S

3. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Supply Voltage	V_{DD}	-	40	V
Reverse Voltage	V_{RDD}	-22	-	V
Supply Current	I_{DD}	-	20	mA
Output Voltage	V_{OUT}	-0.3	40	V
Output Current	I_{OUT}	-	20	mA
Operating Ambient Temperature	T_A	-40	150	°C
Storage Temperature	T_S	-50	150	°C
Junction temperature	T_J	-50	165	°C
Magnetic Flux	B	No Limit		Gauss

Note 1: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

4. ESD Protections

Parameter	Value	Unit
All pins [1)]	+/-4000	V
All pins [2)]	+/-400	V
All pins [3)]	+/-1500	V

1) HBM (human body mode, 100pF, 1.5 kohm) according to MIL-STD-883H Method 3015.8
2) MM (Machine Mode C=200pF, R=0Ω) according to JEDEC EIA/JESD22-A115
3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

5. Function Description

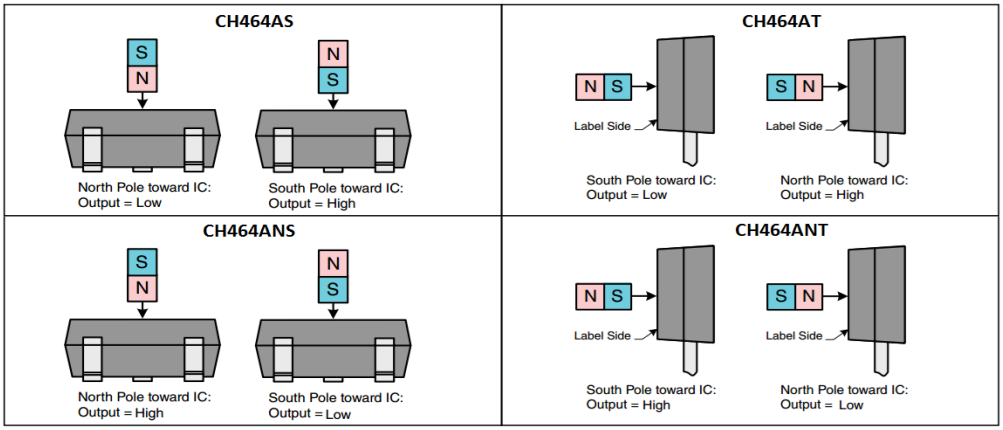
The CH464A/CH464AN exhibits latch magnetic switching characteristics. Therefore, it requires both south and north poles to operate properly.

The device behaves as a latch with symmetric operating and release switching points (BOP=|BRP|). This means magnetic fields with equivalent strength and opposite direction drive the output high and low.

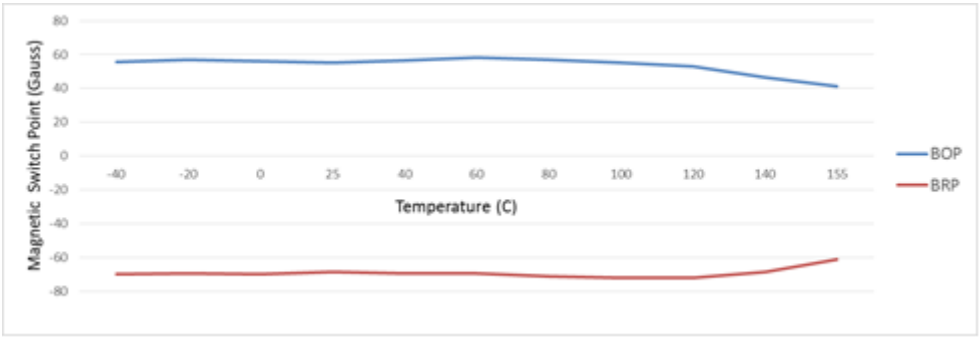
Removing the magnetic field (B→0) keeps the output in its previous state. This latching property defines the device as a magnetic memory.

A magnetic hysteresis BHYST keeps BOP and BRP separated by a minimal value. This hysteresis prevents output oscillation near the switching point.

6. Magnetic Activation



7. Temperature Characteristics



8. Parameters Specification

(At 3.8V to 30V supply, 20mA load, TA= -40 °C to 150 °C except where otherwise specified.)

Symbol	Parameter	Test Condition		Min	Typ.	Max	Units
V_{DD}	Supply voltage	-40 °C to 150 °C		3.8	-	30	V
I_{DD}	Supply Current	V_{DD} = 5V		-	5.0	10	mA
V_{DSon}	Output saturation voltage	at 20mA, Gauss >120		-	-	0.6	V
I_{OFF}	Output Leakage Current	B<-120GS		-	-	10	uA
T_R	Output rise time	V_{DD} =12V at 25 °C C_L= 20 pF		-	-	1.5	uS
T_F	Output fall time	V_{DD} =12V at 25 °C C_L= 20 pF		-	-	1.5	uS
R_{TH}	Thermal resistance: CH464AS (SOT-23-3L) CH464AT (TO-92S)	-		- -	303 203	- -	°C /W °C/W
B_{OP}	Magnetic operating point	CH464A	-40°C~150°C	5	50	100	Gauss
B_{RP}	Magnetic release point		-40°C~150°C	-100	-50	-5	Gauss
B_{HYST}	Magnetic hysteresis window		TA=25°C |BOP-BRP|	60	100	140	Gauss
B_{OP}	Magnetic operating point	CH464AN	-40°C~150°C	-100	-50	-5	Gauss
B_{RP}	Magnetic release point		-40°C~150°C	5	50	100	Gauss
B_{HYST}	Magnetic hysteresis window		TA=25°C |BOP-BRP|	60	100	140	Gauss

R_{LIM}(1)	Output current limitation Resistor		-	60	-	Ohm
F_{SW}	Maximum Switching Frequency				100	KHz
T	Operating temperature		-40	-	150	°C
T_S	Storage temperature:	-	-40	-	150	°C

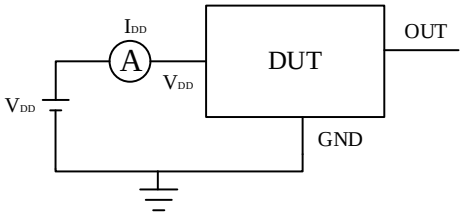
(1) Current limitation resistor guaranteed by design

NOTICE
Bipolar Hall-effect sensor ICs may have an initial output in either the ON or OFF state if powered up with an applied magnetic field in the differential zone (applied magnetic field >Brp and <Bop). Cosemitech recommends allowing 10 µs for output voltage to stabilize after supply voltage has reached 5V.

NOTICE
The magnetic field strength (Gauss) required to cause the switch to change state (operate and release) will be as specified in the magnetic characteristics. To test the switch against the specified magnetic characteristics, the switch must be placed in a uniform magnetic field.

9. Test Conditions

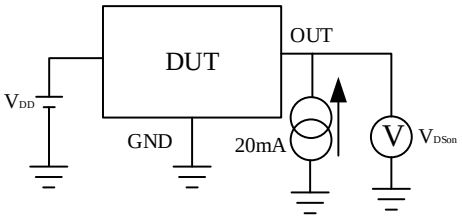
Supply Current



Note 1 - The supply current I_{DD} represents the static supply current.
OUT is left open during measurement

Note 2 - The device is put under magnetic field with B<B_{RP}

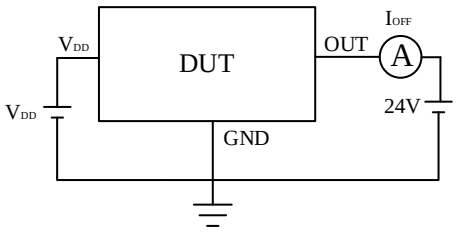
Output Saturation Voltage



Note 1 - The output saturation voltage V_{DSon} is measured at V_{DD}=3.8V and V_{DD}=24V.

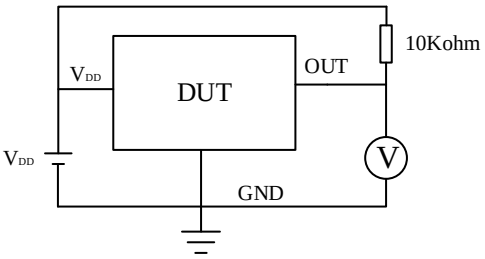
Note 2 - The device is put under magnetic field with B>B_{OP}

Output Leakage Current



Note 1 - The device is put under magnetic field with B<B_{RP}

Magnetic Thresholds



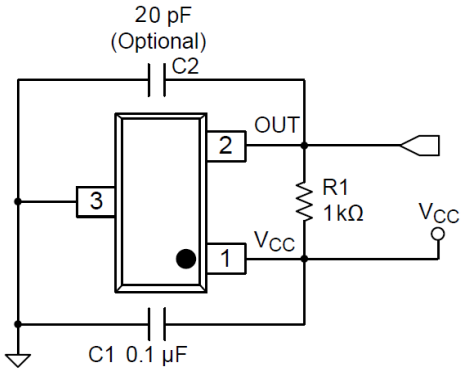
Note 1 - Bop is determined by putting the device under magnetic field swept from B_{RPmin} up to B_{OPmax} until the output is switched on.

Note 2 - BRP is determined by putting the device under magnetic field swept from B_{OPmax} down to B_{RPmin} until the output is switched off.

10. Application Information

10.1. Typical Application

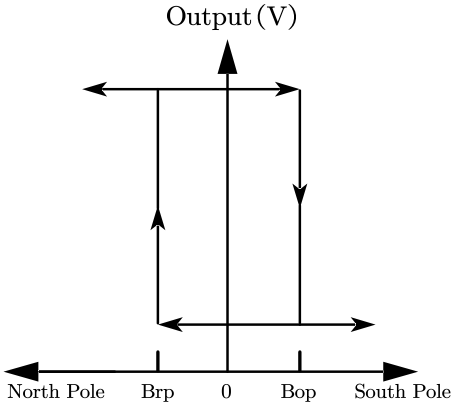
It is recommended that an external capacitor C1 is connected to the supply. This can reduce the noise injected into the device. Normal 0.1uF is suggested.



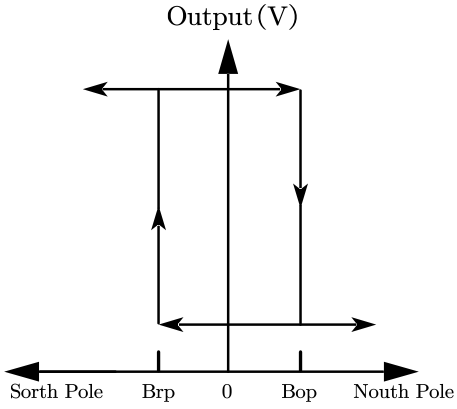
10.2. Device Output

If the device is powered on with a magnetic field strength between BRP and BOP, then the device output is indeterminate and can either be Hi-Z or Low. If the field strength is greater than BOP, then the output is pulled low. If the field strength is less than BRP, then the output is released.

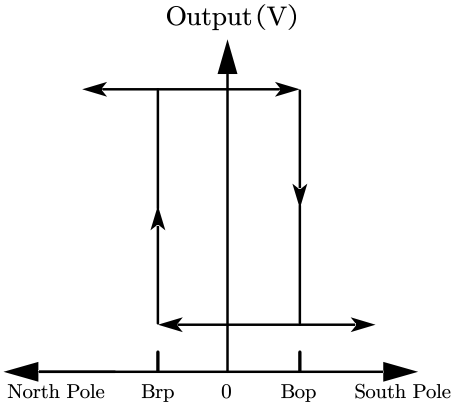
CH464
(TO-92S/SOT-89-3L)



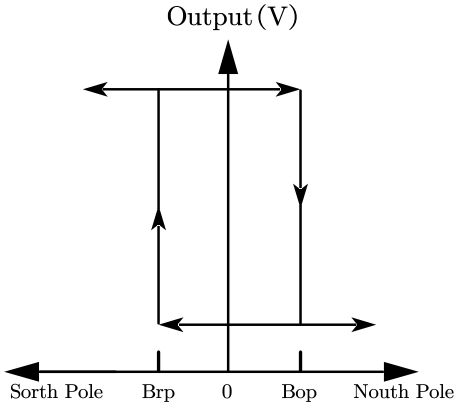
CH464N
(TO-92S/SOT-89-3L)



CH464N
(SOT-23-3L)

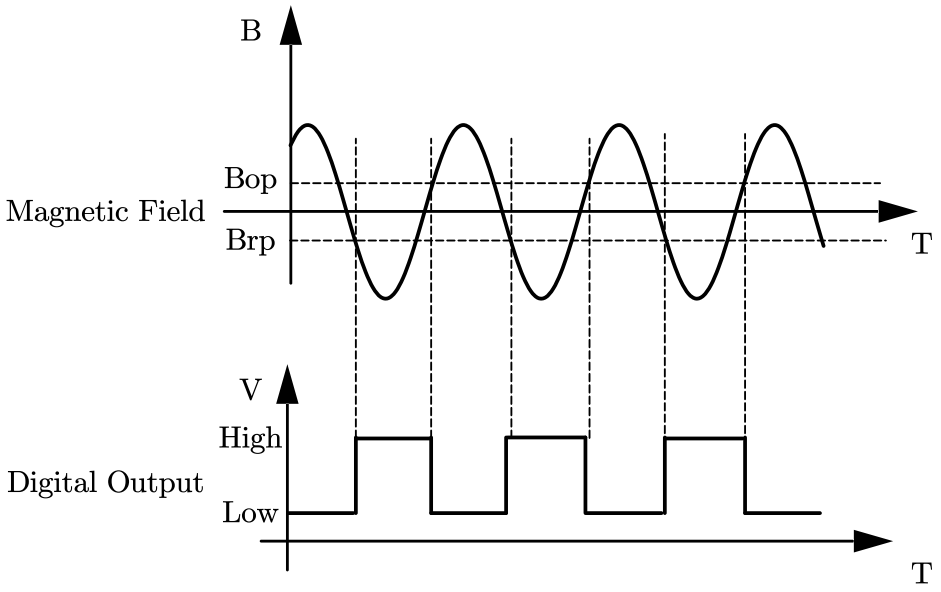


CH464
(SOT-23-3L)



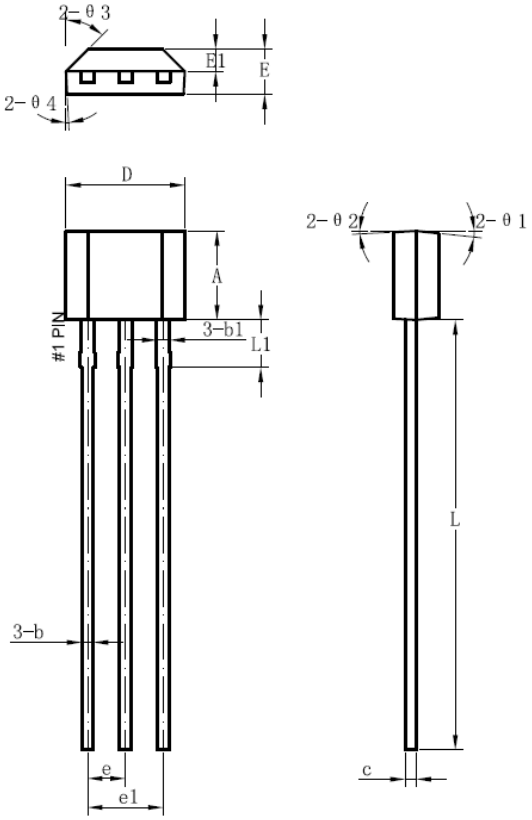
10.3. Typical Output Waveform

(The TO-92S package as an example)



11. Package Information

Package Designator
TO-92S



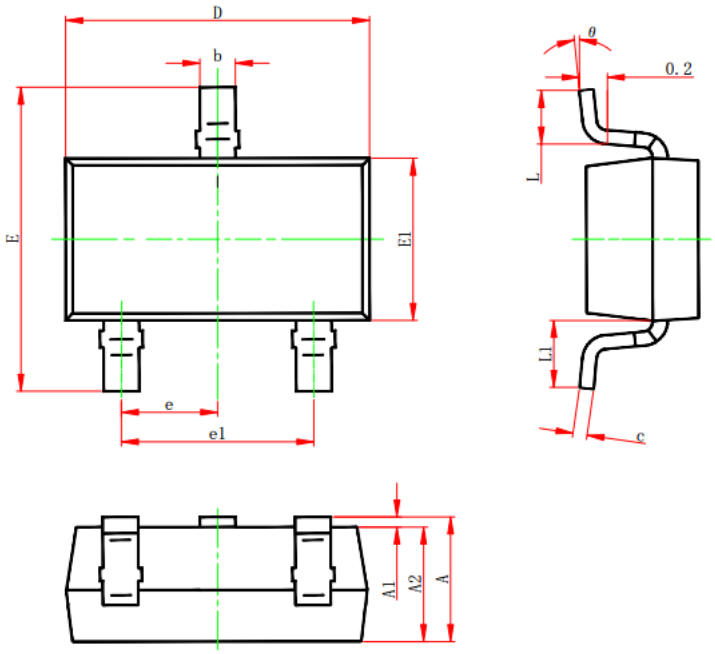
TO-92S Dimensions			
Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	2.9	3.0	3.1
b	0.35	0.39	0.56
b1		0.44	
c	0.36	0.38	0.51
D	3.9	4.0	4.1
E	1.42	1.52	1.62
E1		0.75	
e		1.27	
e1		2.54	
L	13.5	14.5	15.5
L1		1.6	
θ1		6°	
θ2		3°	
θ3		45°	
θ4		3°	

TO-92S-A1 Dimensions			
Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	3.08	3.18	3.28
b	0.38	0.44	0.56
b1		0.44	
c	0.36	0.38	0.51
D	4.0	4.1	4.2
E	1.47	1.57	1.67
E1		0.76	
e		1.27	
e1		2.54	
L	13.5	14.5	15.5
L1		2.8	
θ1		6°	
θ2		3°	
θ3		45°	
θ4		3°	

TO-92S-A2 Dimensions			
Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	3.08	3.18	3.28
b	0.38	0.44	0.56
b1		0.44	
c	0.36	0.38	0.51
D	4.0	4.1	4.2
E	1.47	1.57	1.67
E1		0.76	
e		1.27	
e1		2.54	
L	15.5	15.7	16.2
L1		2.8	
θ1		6°	
θ2		3°	
θ3		45°	
θ4		3°	

TO-92S-B2 Dimensions			
Symbol	Dimensions In Millimeters		
	Min	TYP	Min
A	2.9	3.0	3.1
b	0.35	0.39	0.56
b1		0.44	
c	0.36	0.38	0.51
D	3.9	4.0	4.1
E	1.42	1.52	1.62
E1		0.75	
e		1.27	
e1		2.54	
L	15.5	15.7	16.2
L1		1.6	
θ1		6°	
θ2		3°	
θ3		45°	
θ4		3°	

Package Designator
SOT-23-3L



SOT-23-3L Dimensions				
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

12. Revision History

Date	Revision	Change
Mar 2021	1.0	Initial release
Mar 2022	1.2	Update Package
Jun 2023	1.3	Update Package、 Functional Block Diagram

13. Disclaimer

Cosmitech reserves the right to make changes to the information published in this document at any time without prior notice.

Cosmitech's products are limited to normal commercial use only. Without the express written consent of Cosmitech, Cosmitech products shall not be used as critical components of life support equipment or systems.

For the latest version of the document, please visit our website at https://www.cosemitech.com/