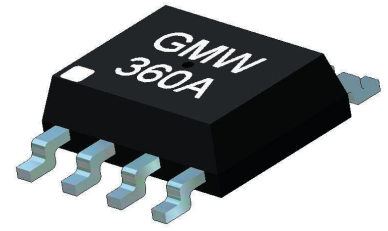


GMW360A Sin/Cos to Analog Interpolator IC



FEATURES

- Analog and PWM outputs for 0 to 360 degrees
- 10% to 90% active range output signals
- Resolution of up to 9 bits
- Magnet “Out of Range” discrete output
- User selectable “Zero Angle” set
- User initiated “Offset Null”
- Only one external part –bypass capacitor
- Single 5V supply (2.4 to 5.25 V operating)
- Surface mount SOIC-8 package
- Directly compatible with the Sentron 2SA -10 angle sensor



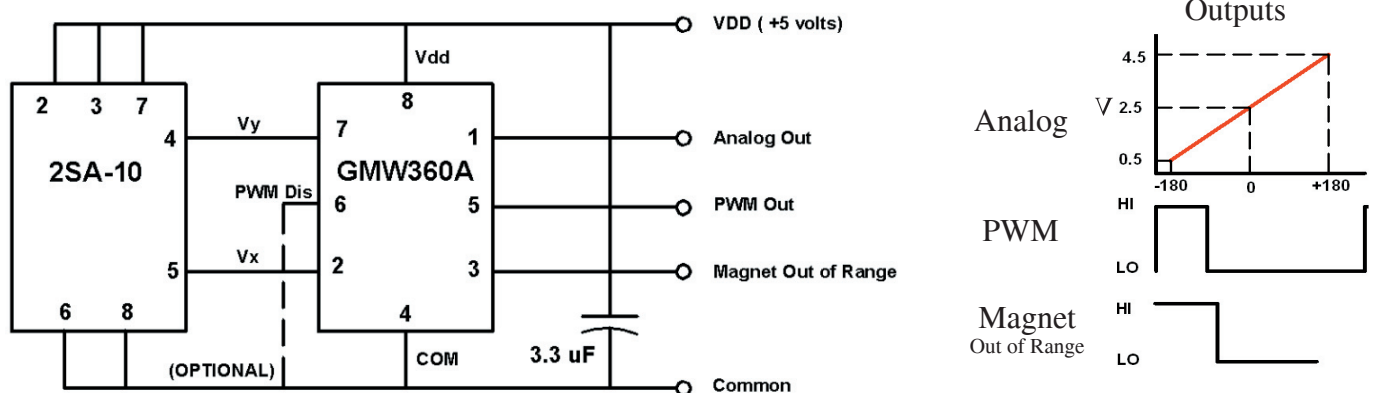
Pin Out:

- 1 Angle Analog Output
- 2 COS Input, V_x
- 3 Magnet Out of Range
- 4 COM, Supply Common
- 5 Angle PWM Output
- 6 PWM Disable
- 7 SIN Input, V_y
- 8 VDD, Supply Voltage

GENERAL DESCRIPTION

The GMW360A Interpolator IC is designed to be compatible with the Sentron 2SA-10, 2-Axis angular sensing IC, however it will work with any SIN and COS signal input with the required input amplitude. The GMW360A is based on the Cypress PSoc™, CY8C24123A, Mixed-Signal Array device. The GMW360A converts orthogonal SIN and COS signals to Analog and PWM output signals proportional to the angle with 9 bit resolution. The PWM output can be turned off by connecting the “PWM Disable” pin to “COM”. In addition to the absolute angle position outputs, the GMW360A detects when the magnetic strength of the magnet is too low and provides a discrete magnet “Out of Range” signal. The device incorporates an input voltage “Offset Null” capability which is activated by momentarily connecting the PWM output pin to VDD and applying power. The electrical Zero Angle position can be set to correlate to any mechanical position within 360 degrees. This is accomplished by momentarily connecting the Analog output pin to VDD and applying power. The IC only requires one external component (bypass capacitor) and operates with a single 5 Volt supply

Fig. 1 Basic schematic diagram



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Absolute Maximum Ratings

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remarks
T _{STG}	Storage Temperature	-55		100	°C	
T _A	Ambient Temperature	-40		85	°C	With power applied
V _{DD}	Supply Voltage	-0.5		+6.0	V	
V _{IO}	DC Input Voltage	V _{COM} -0.5		V _{DD} +0.5	V	
I _{MIO}	Max current into any pin	-25		+50	mA	
ESD	Electro Static Discharge	2000			V	Human Body Model ESD
LU	Latch up current			200	mA	

Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remarks
V _{DD}	Supply Voltage	2.4	5.0	5.25	V	5.0V ± 0.25 with 2SA-10
I _{DD}	Supply Current		5	8	mA	

Electrical Characteristics

Operating Conditions: V _{DD} = 5.0 V and T _A = 25° C	
Note (1): Outputs are ratiometric to the supply voltage V _{DD}	
Outputs:	
Analog output-Pin 1:	0.5 V to 4.5 V ⁽¹⁾ (0 deg to 360 deg- See Output Plot)
Analog output current:	± 1 mA max
PWM output - Pin 5:	10 % to 90 % ⁽¹⁾ duty cycle (0 deg to 360 deg)
PWM output voltage:	Low = 0.75 volts max @ IOL=25 mA High = V _{DD} -1.0 V min @ IOH=10 mA
PWM Frequency:	2 kHz Rise and fall times approximately 0.5 usec
Magnet "Out of Range Pin 3	High when magnet is in range (Both V _x and V _y ≥ 2.5 V ± 0.30 V) ⁽¹⁾ Low when magnet is out of range (Both V _x and V _y < 2.5 V ± 0.30 V) ⁽¹⁾
Magnet "Out of Range IOL:	25 mA max
Magnet "Out of Range IOH:	10 mA max
Inputs:	
Analog	
V _y input voltage (SIN) - Pin 7:	2.5 V ± 0.30 to 2.5 V ± 2.4 volts ⁽¹⁾
V _x input voltage (COS) - Pin 2	2.5 V ± 0.30 to 2.5 V ± 2.4 volts ⁽¹⁾
Digital	
Zero Angle & Offset Null commands:	Active High > 4.75V prior to V _{DD} application (Max voltage < 6.0V)
PWM Disable - Pin 6	Active Low < 0.5 volts - PWM Out will be disabled with this input low.
Zero Angle set analog voltage:	2.50 ± 0.01 volts ⁽¹⁾
Zero Angle set PWM duty cycle:	50 % ± 0.4 % ⁽¹⁾
Response Time:	≤ 5 mS (Time to sample inputs and perform angle calculation)
Resolution:	9 bits
Accuracy:	± 1 deg

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FUNCTIONAL OPERATION

Zero Angle set command - The electrical output of the IC for the zero angle position can be set to match any mechanical position of the magnet within the 360 degree rotation. This feature eliminates the need to mechanically align the position of the sensor output to the mechanical position of the rotating target. The zero angle output is 2.5V for the Analog Output and 50% Duty Cycle for the PWM output. The Zero Angle set function is initiated by providing a momentary connection between the Analog Output pin (PIN 1) and the 5V supply (PIN 8) prior to applying power to the IC. Once power is on for more than 100 ms, the momentary connection is removed and a 100 ms “Zero Angle” calculation is initiated. At the end of the 100 ms time, the GMW360A is operational and the Analog Output will be set to 2.5V and the PWM output will be set to 50 % Duty Cycle. The Zero Angle set point is permanently stored into flash memory and remains there until a new Zero Angle command is initiated. The maximum number of changes to this set point is 50,000.

Offset Null command - The accuracy of the angle measurement can be improved by eliminating any DC offset voltage at the SIN and COS inputs to the GMW360A. The GMW360A incorporates a user initiated Offset Null routine that eliminates the DC offset voltages. To determine the existing offset voltages at these inputs, the magnet target must be removed so that there is no magnetic field at the sensor. The Offset Null is initiated by momentarily connecting the PWM output pin (PIN 5) to the 5V supply (PIN 8) and then applying power to the IC. Once power is on for more than 100 ms, the momentary connection is removed and a 100 ms “Offset Null” calculation is initiated. At the end of the 100 ms time, the GMW360A is operational and can be exposed to the magnetic target. The new zero value offset voltages are permanently stored into flash memory and remain there until a new Offset Null command is initiated. The maximum number of Offset Null commands is 50,000.

Caution:

The output pins must not be exposed to voltages larger than the maximum specified voltage of 6.0V or damage to the IC may occur

PWM Disable- For applications requiring Analog Output only, it is recommended that the PWM Output be disabled by connecting Pin 6 to COM. This will eliminate any potential “cross talk” between the PWM squarewave output signal and the Analog output signal. Note: When pin 6 is left open (no connection), an internal 5.6K pull up resistor holds pin 6 high and the PWM output will be available.

APPLICATION HINTS

VDD Supply Capacitance - To minimize the noise on the Analog output, connect a 1uF to 10uF capacitor near the GMW360A between Pins 8 and 4.

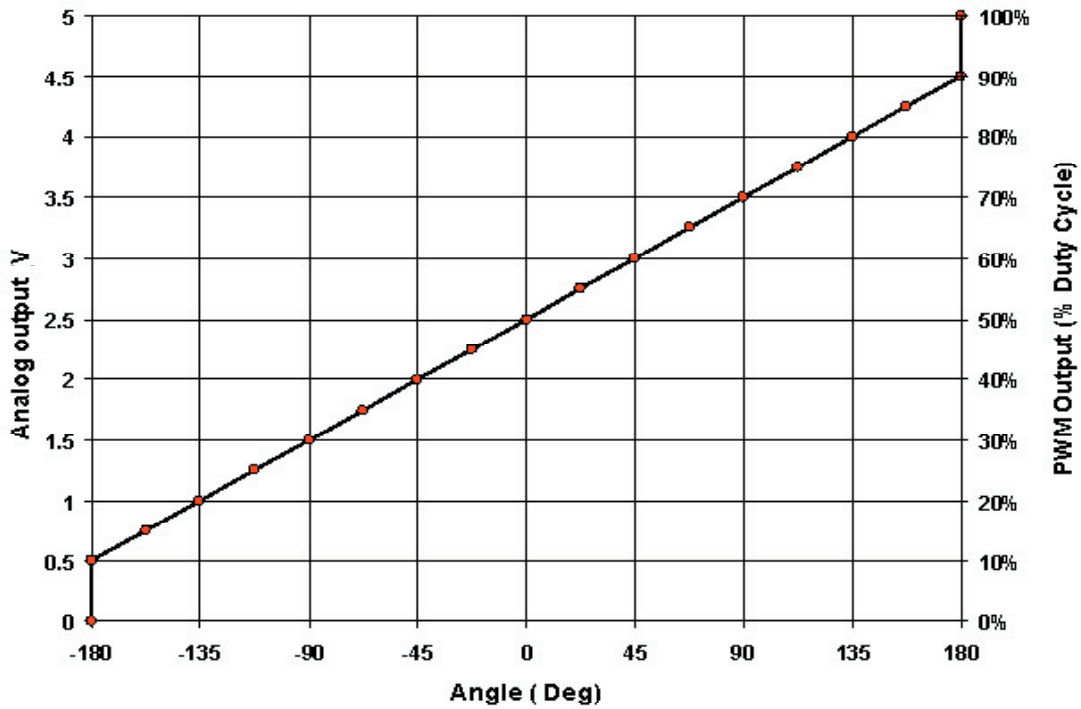
For normal operation, do not connect the outputs to an active high load. If the outputs (Analog and PWM) are held high during the power on, the Zero Angle set and Offset Null routines may be initiated. Loads should be referenced to Common.

Accuracy of the angle measurement will depend on the accuracy of the SIN and COS signals being interpolated.

Additional Analog output filtering. Although the noise level is low at the Analog output pin, additional noise reduction can be obtained by adding a low pass filter to the Analog output. This can be accomplished by adding a 1K resistor in series with pin 1 and the output lead with a 1.0 uF by pass capacitor to Common.

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Fig. 2 GMW360A Output Characteristic



PACAKAGE INFORMATION

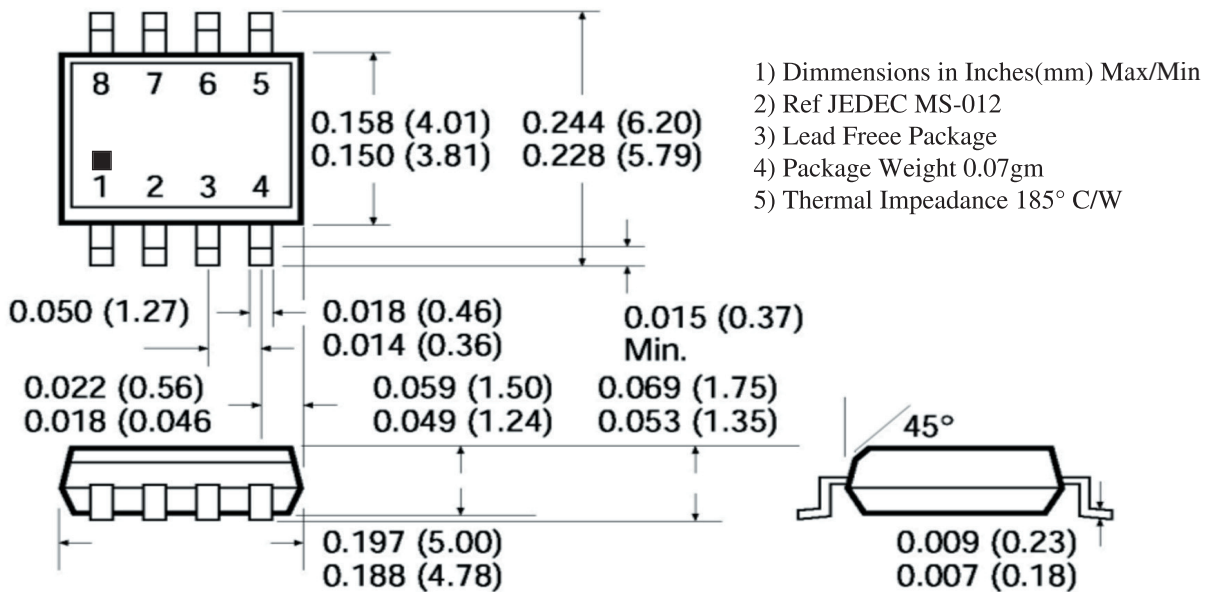


Fig 3. Eight (8) Lead (150-Mil) SOIC package

ORDERING INFORMATION

GMW360A (ref: CY8C24123A-24SXI)

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