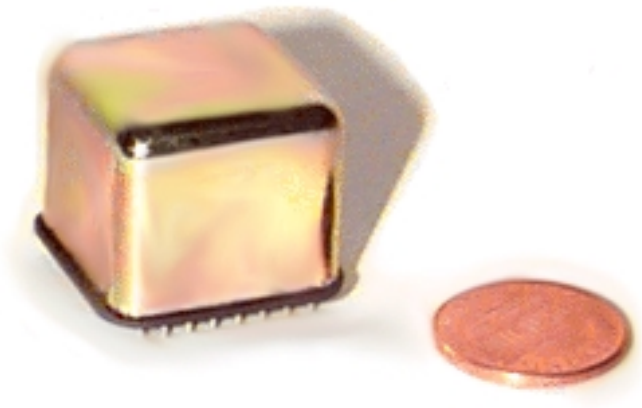
Gyration

MicroGyro 100

The low-cost mini gyroscope
for interactive pointing devices,
remote controls or game controls



Gyration

MicroGyro® 100 is a low-cost, dual-axis mini rate gyroscope optimized for easy integration into input devices, computer mice or remote controls.

Its unique single-stamping design offers high reliability and low manufacturing cost. It features low voltage operation with a 2.2 volt minimum requirement. Its extremely low current consumption is enhanced by a low current sleep mode.

Internal soft mounting isolates the vibrating elements, greatly decreasing drift and improving shock resistance. The module can be mounted directly to a printed circuit board, without additional shock mounting.

A unique *electromagnetic transducer design* and a single metal stamping utilize the Coriolis effect to sense rotation. Analog voltages proportional to angular rates around the two sensed axes are provided relative to a voltage reference output. A temperature sensor is provided for the most demanding applications. Suggested applications are computer pointers, TV remote controllers, robotics, factory automation, antenna stabilization and auto navigation.

Features

Low cost	Extremely light weight	Internal shock mounting
Two-axis sensing	Low drift	PCB-mountable
Miniature size	High temperature stability	No moving parts - no wear

Pin Definitions

SYM	PIN	DESCRIPTION	SYM	PIN	DESCRIPTION
VREF_1	1	Reference 1.225 V Output	VREF_2	5	Reference 1.225 V Output
VG_1	2	Rate Output for Axis 1	VG_2	6	Rate Output for Axis 2
GND	3	Ground	WAKE	7	Sleep mode control pin
VCC	4	Positive Voltage Supply	TEMP	8	Temperature Output
			N. C.	9	No Connection

Maximum Ratings

SYM	PARAMETER	CONDITIONS	MIN	NOM	MAX	UNITS
Tstore	Storage Temperature		-30	-	+85	degrees C
Tlead	Lead Temperature 0.06 inch from case	3 sec. duration	-	-	+260	°C
Ss	Shock Survivability	11 mSEC half sine pulse	-	-	1000	G peak
VCC	Positive Power Supply		0.0	-	+7.0	V
VIN	Voltage on WAKE input pin		-0.3	-	VCC +0.3	V
OC	Output Current, any output pin	VREF, VG_1, VG_2 or TEMP	-	-	±30	mA / output

Recommended Operating Conditions

SYM	PARAMETER	CONDITIONS	MIN	NOM	MAX	UNITS
MAV	Maximum Angular Velocity		-	-	±150	DEG/SEC
Toper	Operating Temperature		-5	-	+45	degrees C
VCC	Positive Power Supply		2.2	-	5.5	V
VRES	Power Supply Source Impedance		-	-	3	Ω
VRIP	Power Supply Ripple		-	-	50	mVPP
OC_ REF	Output Current Total for VREF_1 and VREF_2		-	-	±100	uA
OC_ VG	Output Current for VG_1 or VG_2		-	-	±40	uA / output
OC_ TEMP	Output Current for TEMP		-	-	±5	uA
OCL_ REF	Output Capacitive Load Total for VREF_1 and VREF_2		-	-	200	pF
OCL_ VG	Output Capacitive Load for VG_1 or VG_2		-	-	100	pF / output

MicroGyro 100 Specifications

Characteristics

SYM	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
VREF	Reference Output		-7%	1.225	+5%	VOLTS
SE	Sensitivity	Measured at ±MAV at +5°C to +35°C at -5°C to +45°C	 -10% -15%	 1.11	 +10% +15%	mV / DEG / SEC
SETC	Sensitivity Temperature Coefficient	Measured at 10°C intervals	-	±0.02	±0.15	% / °C
OFF	Offset	Output with no rotation, 30 sec. after power on	-	±20	±150	mV
OFFTC	Offset Temperature Coefficient	Measured in 10°C intervals at +5°C to +35°C at -5°C to +45°C	 - -	 ±0.2 ±0.2	 ±1.0 ±2.0	mV/ °C
OFFVC	Offset Supply Voltage Coefficient	Measured from 2.2V to 3.3V, and from 3.3V to 5.5V	-	±0.2	±2.0	mV / V
Tset	Power On Settling Time	Time to reach OFF ± 5 mV, after power on or waking from sleep mode	-	0.3	0.8	SEC
TOD1	Turn On Drift, Period 1	1 to 5 seconds after power on See Footnote [1] at +5°C to +35°C at -5°C to +45°C	 - -	 ±0.20 ±0.25	 ±2.0 ±4.0	mV
TOD2	Turn On Drift, Period 2	5 to 15 seconds after power on See Footnote [1] at +5°C to +35°C at -5°C to +45°C	 - -	 ±0.16 ±0.20	 ±1.4 ±2.8	mV
TOD3	Turn On Drift, Period 3	15 to 291 seconds after power on See Footnote [1] at +5°C to +35°C at -5°C to +45°C	 - -	 ±0.13 ±0.15	 ±1.4 ±2.6	mV
LIN	Linearity	See Footnote [2]	-	0.1	1.0	% MAV
BW	Bandwidth	90 degree phase lag	-	10	-	Hz
NZ_ OUT	Output Noise	No rotation, with 1 pole 50 Hz low pass filter on output. RMS noise measured for 1.0 second.	-	0.17	0.50	mVRMS
I_PWR	Power Supply Current	Starting (Before Tset) Running (After Tset)	- -	26 5.4	65 10	mA Peak mA Average
I_SLP	Sleep Mode Current	While VCC is 2.2-5.5V: WAKE < V_LO	-	2.4	20	µA
I_IN	WAKE pin Input Current		-	-	5	µA
V_LO	WAKE pin low voltage threshold		0.5	-	-	V
V_HI	WAKE pin high voltage threshold		-	-	VCC - 0.5	V
T_AMB	TEMP output at 20°C		0.77	0.96	1.15	V
T_TC	TEMP sensor output Sensitivity		-5.4	-4.5	-3.6	mV / °C

Dimensions[3] and Mass

SYM	PARAMETER	MIN	TYP	MAX	UNITS
HT	Height	0.795 [2.02]	0.810 [2.06]	0.825 [2.10]	inches [centimeters]
WD	Width	0.912 [2.32]	0.920 [2.34]	0.925 [2.35]	inches [centimeters]
DP	Depth	0.912 [2.32]	0.920 [2.34]	0.925 [2.35]	inches [centimeters]
M	Mass	-	0.74 [21]	-	ounces [grams]

[1] At constant temperature and 3.3V, the output is sampled at least 8 times per second. The output is averaged in 1.0 second intervals from 1.0 to 5.0 seconds, then in 2.0 second intervals from 5.0 seconds to 5 minutes. Turn On Drift is the difference between any interval average and the steady state offset. The steady state offset is defined as the average offset from 291 seconds to 301 seconds.

[2] Define a line by least-squares method using five points including zero rotation input, maximum dynamic range and minimum dynamic range. Then divide the difference of the actual measured value and the line by the dynamic range.

[3] Refer to Package Envelope Drawing on Page 5.

*Sample Calculations**

*Assumes ambient temperature is between +5°C to +35°C

Drift

If the MG100 output is sampled at 15 seconds from power on, then again 5 minutes from power on (steady state), the typical difference between these values (drift) is 0.13 mV. Dividing this by the Sensitivity of 1.11mV/DEG/SEC yields a typical drift of 0.12 DEG/SEC.

Resolution

The resolution of the MG100 is defined by the noise floor of 0.17 mVRMS. Dividing by the Sensitivity of 1.11mV/DEG/SEC yields a resolution of

0.15 DEG/SEC.

Temperature Coefficient

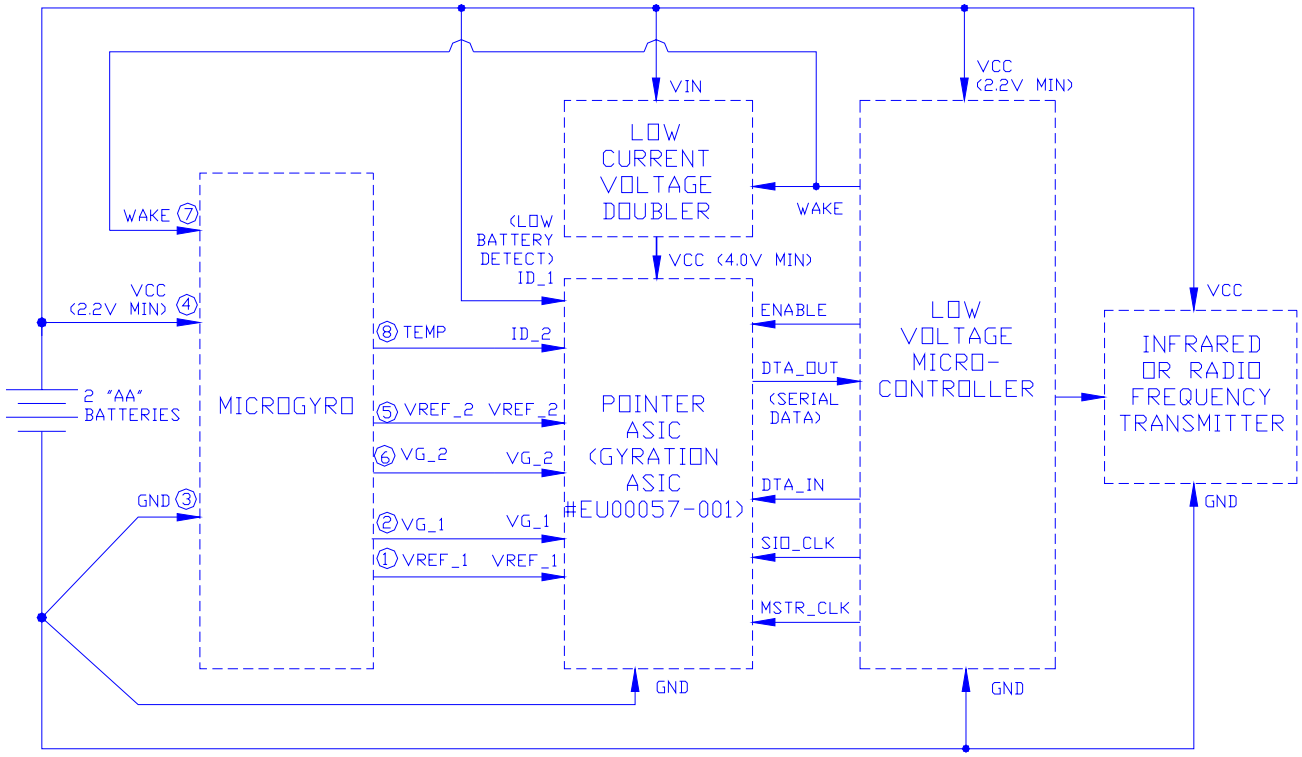
The typical temperature coefficient is 0.2mV/°C. Dividing by a Sensitivity of 1.11mV/DEG/SEC yields a TEMPCO of 0.18 DEG/SEC/°C.

Notes

Two of the three degrees of rotational freedom (yaw, pitch, roll) can be sensed by one MicroGyro 100. Angular rate output characteristics are specified as the voltage difference between VG_1 output and VREF_1 output for the first degree of freedom (e.g. yaw) and the voltage difference between VG_2 output and VREF_2 output for the second degree of freedom (e.g. pitch). Characteristics are valid when recommended operating conditions are used. Unless otherwise specified, characteristics are measured with WAKE pin voltage between V_HI and VCC. (Please see MicroGyro 100 Application Notes for sensing all three degrees of freedom using two MicroGyro 100 gyroscopes).

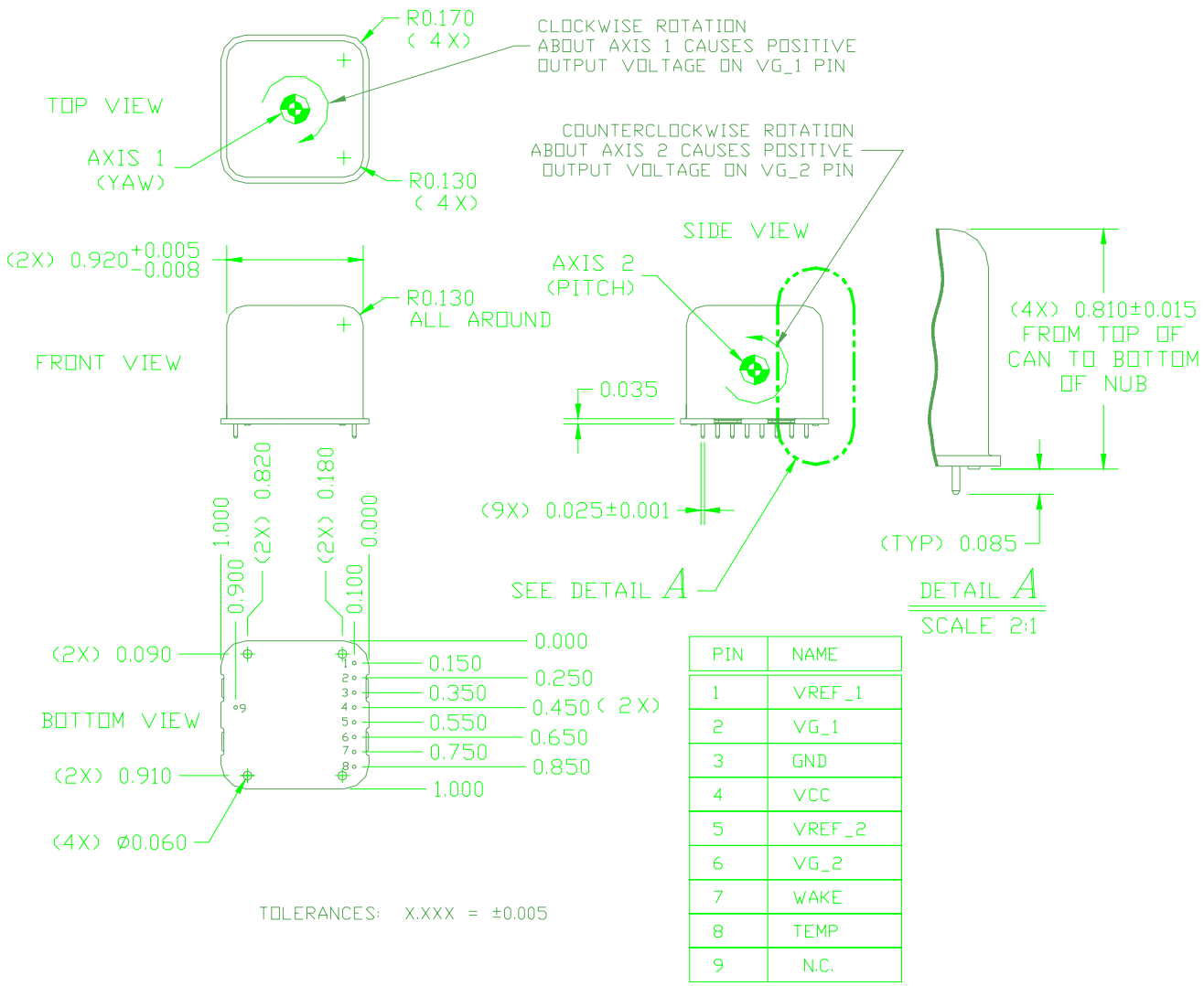
FIGURES

Fig. 1: Application Circuit Example



The circuit above depicts the GyroPoint ASIC which Gyration has developed to compliment the MicroGyro 100 for consumer applications. The GyroPoint ASIC features a 12 Bit A/D converter and instrumentation amplifiers.

Fig. 2: Package Envelope Drawing (dimensions in inches)



PIN	NAME
1	VREF_1
2	VG_1
3	GND
4	VCC
5	VREF_2
6	VG_2
7	WAKE
8	TEMP
9	N.C.

Refer to MicroGyro 100 Application Notes for further information.

About Gyration

Gyration is one of the leading U.S. suppliers of consumer gyroscopes and wireless radio technology.

The company was the first to apply optics to gyroscopes — a technology unchanged for nearly 100 years. Its new, highly innovative approach paid off in three technology patents in the U.S.

Consequently, Gyration owns the concept of using gyroscopes to control a cursor or graphic on a computer or TV screen. Called *GyroPoint Technology*, the gyro senses motion of a user's hand and translates it into cursor movement on the screen.

Gyration is equipped to help you build new controllers and pointers featuring its unique GyroPoint Technology and RF radio — or to help you create brand new applications with MicroGyro.

Gyration, Inc.
12930 Saratoga Avenue, Bldg. C
Saratoga, CA 95070, USA

P: 1-800-316-5432 or 408-255-3016
E: sales@gyration.com

F: 408-255-9075
W: www.gyration.com