AU1612

Datasheet

Features:

- AEC-Q100 qualified
- Extended temperature range from -40 to +105 °C
- Embedded compensation for high stability over temperature
- ±2/±4/±8/±16/±32 g full scale
- ±31.25/±62.5/±125/±250/±500/±1000/ ±2000/±4000 dps full scale
- SPI / I²C serial interface with main processor data synchronization
- Analog supply voltage: 1.71 V to 3.6 V
- Independent IO supply
- Compact footprint: 2.5 mm x 3 mm x 0.96 mm

Description:

The AU1612 is a system-in-package featuring a 3D digital accelerometer and a 3D digital gyroscope with an extended temperature range up to +105 °C and designed to address automotive non-safety applications.

The digital output data of the sensor is formatted as 16-bit two's complement and is accessible through SPI/I2C interface.

The AU1612 has a full-scale acceleration range of ±2/±4/±8/±16/±32 g and a wide angular rate range of ±31.25/±62.5/±125/ ±250/±500/±1000/±2000/±4000 dps that enables its usage in a broad range of automotive applications.

The device is in 2.5×3×0.96mm LGA package with 14 pins. It can operate in temperature range from -40℃ to 105℃.

Application:

- Dead reckoning (DR)
- Vehicle-to-everything (V2X)
- Anti-theft systems
- Reverse Route Assist
- Seat Angle Adjustment
- Motion-activated functions
- Driving comfort
- Vibration monitoring and compensation

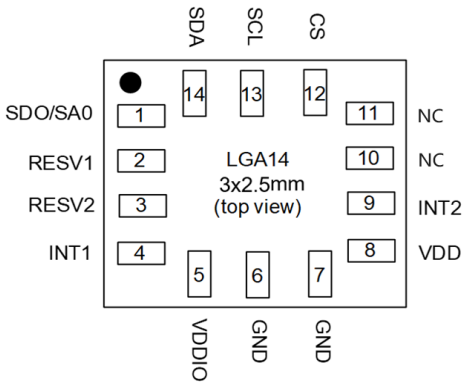
Contents

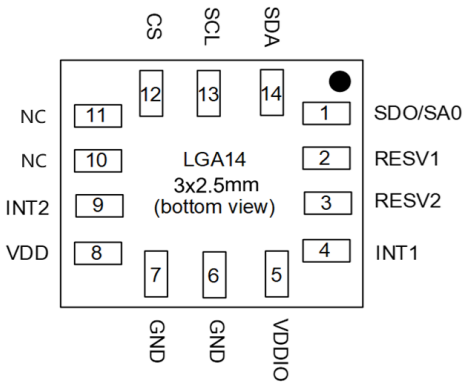
1 PIN description

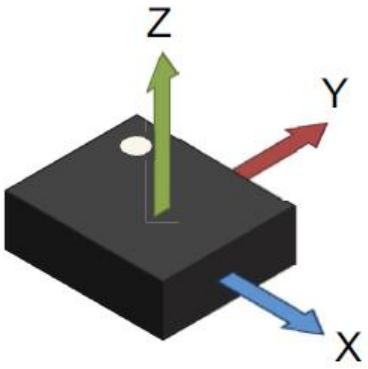
AU1612 is in 3x2.5x0.96mm LGA package with 14 pins.

Table 1. **Pin list and description**

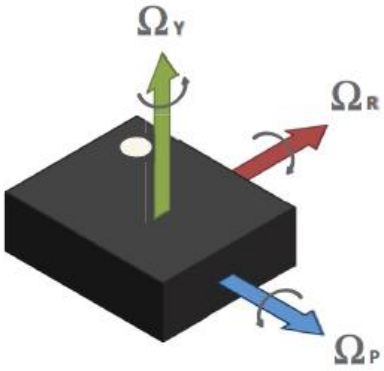
Pin Number	Type	Pin Name	Function
1	IO	SDO/SA0	SPI 4-wire interface serial data output (SDO)
			I^2C slave LSB bit of the device address (SA0)
2	IO	RESV1	Connect to VDDIO or GND
3	IO	RESV2	Connect to VDDIO or GND
4	O	INT1	Programmable Interrupt 1 (INT1)
5	I	VDDIO	Power Supply for IO Pins
6	I	GND	Ground (0 V supply)
7	I	GND	Ground (0 V supply)
8	I	VDD	Power supply
9	O	INT2	Programmable Interrupt 2 (INT2)
10	IO	NC	No Connect
11	IO	NC	No Connect
12	I	CS	I^2C/SPI mode selection.
			(1: I^2C enabled, SPI disabled)
			(0: SPI enabled, I^2C disabled)
13	I	SCL	I^2C Serial Clock (SCL)
			SPI Serial Clock (SPC)
14	IO	SDA	I^2C serial data (SDA)
			SPI serial data input (SDI) in 4-wire Mode







Direction of detectable acceleration (top view)



Direction of detectable angular rate (top view)

(Pitch: $\Omega_P=\Omega_{X\text{-axis}}$, Roll: $\Omega_R=\Omega_{Y\text{-axis}}$, Yaw: $\Omega_Y=\Omega_{Z\text{-axis}}$)

2 Mechanical and electrical specifications

2.1 Gyroscope specifications

VDD = VDDIO = 1.8 V, T = 25°C unless otherwise noted.

Table 2. **Gyroscope specifications**

Parameter	Conditions	Min	Typ	Max	Unit
Full-Scale Range	Selectable via serial digital interface		±31.25		dps
			±62.5		
			±125		
			±250		
			±500		
			±1000		
			±2000		
			±4000		
Digital resolution			16		bit
Sensitivity	±31.25dps input range		1048.576		LSB/dps
	±62.5dps input range		524.288		
	±125dps input range		262.144		
	±250dps input range		131.072		
	±500dps input range		65.536		
	±1000dps input range		32.768		
	±2000dps input range		16.384		
	±4000dps input range		8.192		
Noise Density	High-resolution mode @ 100Hz BW		8	10	mdps/√Hz
ODR			833		Hz
Bandwidth			166		Hz
Sensitivity error	Over-Temperature Range of -40°C to 105°C @lifetime		±6		%
Temperature Coefficient of Offset (TCO)	Over-Temperature Range of -40°C to 105°C		±0.01	±0.03	dps/°C
Temperature Coefficient of Sensitivity (TCS)	Over-Temperature Range of -40°C to 105°C		±150	±600	ppm/°C
Initial Offset Tolerance				±10	dps
Non-Linearity			±0.1	±1	%
Cross-Axis Sensitivity			±1	±3	%
Gyro Turn-On Time	From Software Reset, No Power, or Power Down to drive amplitude reach +/- 5% of target value		35		ms

2.2 Accelerometer specifications

VDD = VDDIO = 1.8V, T = 25°C unless otherwise noted.

Table 3. **Accelerometer specifications**

Parameter	Conditions	Min	Typ	Max	Unit
Full-Scale Range			±2		g
			±4		g
			±8		g
			±16		g
			±32		g
Digital resolution			16		bit
Sensitivity	±2g full scale input		16,384		LSB/g
	±4g full scale input		8,192		LSB/g
	±8g full scale input		4,096		LSB/g
	±16g full scale input		2,048		LSB/g
	±32g full scale input		1,024		LSB/g
Noise Density	High-resolution mode @ 100Hz BW		100		μg/√Hz
ODR			833		Hz
Bandwidth			208		Hz
Sensitivity error	Over-Temperature Range of -40°C to 105°C @lifetime			±5	%
Temperature Coefficient of Offset (TCO)	-40°C to 105°C		±0.1	±0.6	mg/°C
Temperature Coefficient of Sensitivity (TCS)	-40°C to 105°C			±150	ppm/°C
Zero-g Offset	on board		±80	±100	mg
Non-linearity	Best Fit Line		±0.5	±2	%
Cross-Axis Sensitivity			±1	±3.5	%
Accel Turn-on Time	Accel turn on from power-on default state or from Low Power state		10		ms

2.3 Electrical characteristics

VDD = VDDIO = 1.8V, T = 25°C unless otherwise noted.

Table 4. **Electrical characteristics**

Parameter	Conditions	Min	Typ	Max	Unit
VDD		1.71	3.0	3.6	V
VDDIO		1.62		3.6	V
Voltage input low level	SPI			0.3VDDIO	V
Voltage input high level	SPI	0.7VDDIO			V
Voltage output low level	IOL=3mA, SPI			0.2VDDIO	V
Voltage output high level	IOH=3mA, SPI	0.6VDDIO			V
Operating temperature	Ambient temperature for consumer	-40		85	°C
	Ambient temperature for automotive	-40		105	
Current consumption	Gyro and accel normal operation mode			3000	uA
	Gyro normal operation, accel off			2000	
	Accel normal operation, gyro off		360	500	
	Gyro and accel off		3	5	

3 I2C interface

3.1 I2C interface details

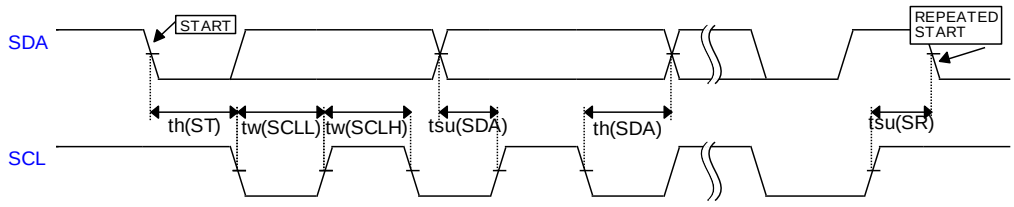
The AU1612 registers can be configured through I2C interface, which is comprised of SCL (serial clock) and SDA (serial data). In addition to SCL/SDA, the AU1612 also provides SA0 for slave address alternation. The I2C data rate of the device is up to 100kbps/400kbps depending on the data transfer modes.

With SA0 low, the 7-bit I2C address is 0x30 followed by the R/W bit. This translates to 0x60 for a write and 0x61 for a read. If SA0 is pulled high, the slave address becomes 0x31 followed by the R/W bit. This translates to 0x62 for a write and 0x63 for a read.

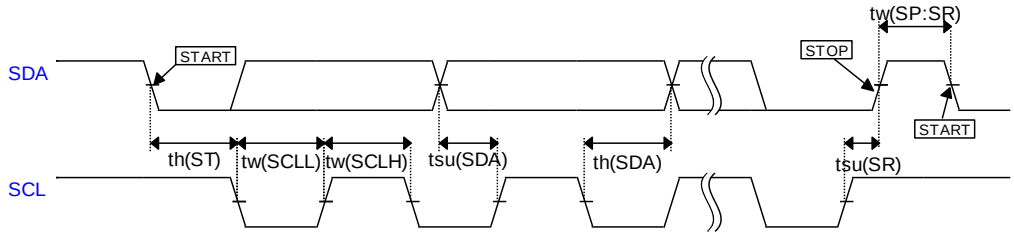
I2C_SA0	Address (7-bit)	R/W bit	Address+R/W (8-bit)	Description
Low	0x30	0	0x60	Write to slave address 0x30.
Low	0x30	1	0x61	Read from slave address 0x30.
High	0x31	0	0x62	Write to slave address 0x31.
High	0x31	1	0x63	Read from slave address 0x31.

3.2 I2C characteristics

Symbol	Parameter	I2C standard mode		I2C fast mode		Unit
		Min	Max	Min	Max	
$f_{(SCL)}$	SCL clock frequency	0	100	0	400	kHz
$t_{w(SCLL)}$	SCL clock low time	4.7		1.3		μs
$t_{w(SCLH)}$	SCL clock high time	4.0		0.6		
$t_{SU(SDA)}$	SDA setup time	250		100		ns
$t_{h(SDA)}$	SDA data hold time	0	3.45	0	0.9	μs
$t_{h(ST)}$	START condition hold time	4		0.6		μs
$t_{SU(SR)}$	Repeated START condition setup time	4.7		0.6		
$t_{SU(SP)}$	STOP condition setup time	4		0.6		
$t_{w(SP:SR)}$	Bus free time between STOP and START condition	4.7		1.3		



I2C timing diagram 1



I2C timing diagram 2

3.3 I2C read/write sequence

I2C read and write sequences is illustrated as below:

SINGLE-BYTE WRITE										
MASTER	ST		S_ADDR+WR		R_ADDR		DATA		SP	
SLAVE				ACK		ACK		ACK		

MULTI-BYTE WRITE												
MASTER	ST		S_ADDR+WR		R_ADDR		DATA		DATA		SP	
SLAVE				ACK		ACK		ACK		ACK		

SINGLE-BYTE READ														
MASTER	ST		S_ADDR+WR		R_ADDR		RST		S_ADDR+RD			NACK		SP
SLAVE				ACK		ACK				ACK		DATA		

MULTI-BYTE READ																
MASTER	ST		S_ADDR+WR		R_ADDR		RST		S_ADDR+RD			ACK			NACK	SP
SLAVE				ACK		ACK				ACK		DATA		DATA		

ST: START condition
S_ADDR: Slave address
WR: Write
ACK: Acknowledge (SDA low)
SP: STOP condition
R_ADDR: Register address
RD: Read
NACK: Not acknowledge (SDA high)
RST: Either a restart or a stop followed by a start
Shaded areas represent when the device is listening.

4 SPI interface

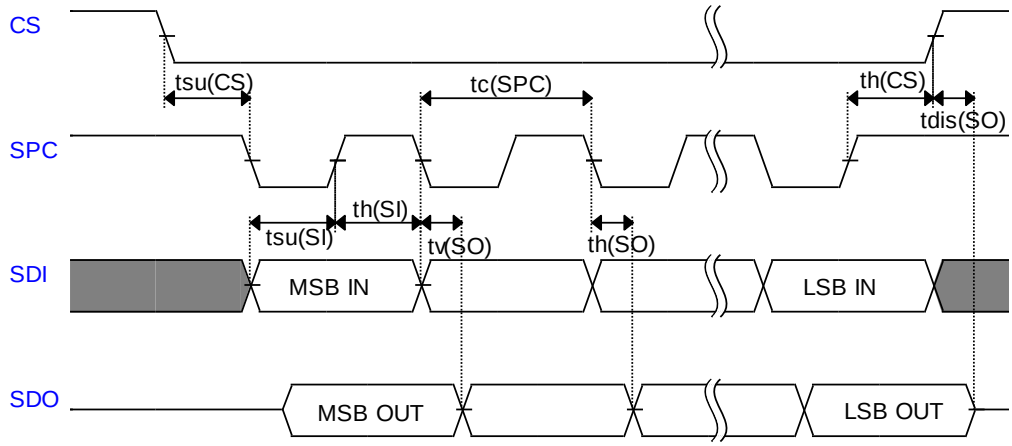
4.1 SPI protocol

The AU1612 registers can also be configured through SPI interface. SPI is a 4-wire interface consisting of SPC(SCL), SDI(MOSI), SDO(MISO) and CS. The master device controls the chip-select line (CS), keeps it low during communication and pulls it high at the end of communication. SPC is the clock signal supplied by master device and is held to high/low if no data transmission. SDI and SDO are serial data input and output.

SPI provides the flexibility to select clock polarity (CPOL) and phase (CPHA) for data synchronization. To communicate with the AU1612, the master device has to set the mode to CPOL=1 and CPHA=1. Clock is high during idle state, data are sampled on the rising edge and shifted out in the falling edge.

4.2 SPI characteristics

Symbol	Parameter	Value		Unit
		Min	Max	
tc(SPC)	SPI clock cycle	100		ns
fc(SPC)	SPI clock frequency		10	MHz
tsu(CS)	CS setup time	5		ns
th(CS)	CS hold time	20		
tsu(SI)	SDI input setup time	5		
th(SI)	SDI input hold time	15		
tv(SO)	SDO valid output time		50	
th(SO)	SDO output hold time	5		
tdis(SO)	SDO output disable time		50	



4.3 SPI command format

The AU1612 provides read and write commands for communication with master device. Data is in 8-bit length and MSB is transmitted first.

Read command:

Bit7	Bit6-Bit0
1	Address of register to be read.

Write command:

Bit15	Bit14-Bit8	Bit7-Bit0
0	Address of register to be written.	Data to be written to the register.

In the single read/write mode, after the data (8-bit) sent through SDO/SDI, CS signal will go high to end the communication. The AU1612 also provides burst mode to read/write multiple data by one command communication. In burst read mode, a sequence of data from consecutive addresses following the target address will be transmitted automatically through SDO as long as CS is low. In the same way, for burst write mode, a sequence of data to be written to consecutive addresses following the target address can be sent through SDI as long as CS is high.

5 Functionality

5.1 Power mode

In the AU1612, the accelerometer and the gyroscope can be turned on/off independently of each other and are allowed to have different power modes.

The AU1612 has three operating modes available:

only accelerometer active and gyroscope in power-down or standby mode

only gyroscope active and accelerometer in power-down or standby mode

both accelerometer and gyroscope sensors active

The accelerometer is activated from standby mode by writing accl_en in Mode_En (0x02) while the gyroscope is activated from standby mode by writing gyro_en in Mode_En (0x02). Both accelerometer and gyroscope are activated from standby mode by writing gyro_accl_en in Mode_En (0x02).

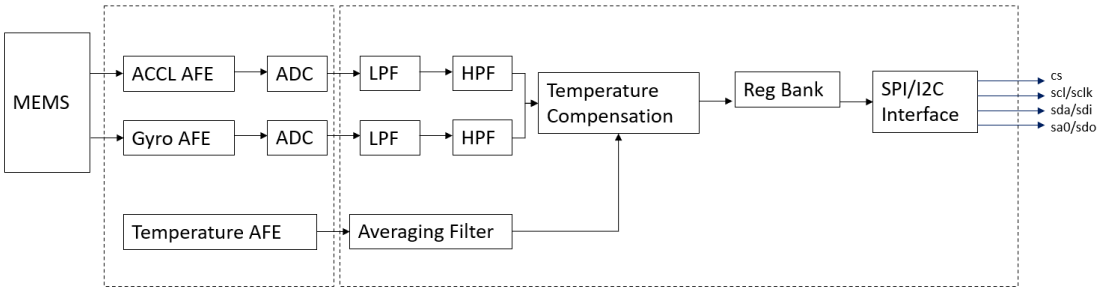
5.2 Gyroscope modes

In the AU1612, the gyroscope can be configured in two different operating modes: power-down and high-performance mode.

5.3 Accelerometer modes

In the AU1612, the accelerometer can be configured in two different operating modes: power-down and high-performance mode.

5.4 Block diagram of filters



6 Registers

Register name	Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Chip_ID	0x00	ID[7]	ID[6]	ID[5]	ID[4]	ID[3]	ID[2]	ID[1]	ID[0]
Soft_Reset	0x01	reserve	reserve	reserve	reserve	reserve	reserve	reserve	SRST
Mode_En	0x02	reserve	reserve	reserve	reserve	reserve	accl_en	gyro_en	gyro_accl_en
Gyro_ODR_Config	0x06	reserve	reserve	reserve	reserve	g_odr_sel 3	g_odr_sel 2	g_odr_sel 1	g_odr_sel 0
Accel_ODR_Config	0x07	reserve	reserve	reserve	reserve	a_odr_sel 3	a_odr_sel 2	a_odr_sel 1	a_odr_sel 0
Accel_FS_Config	0x08	reserve	reserve	reserve	reserve	a_fs_sel 3	a_fs_sel 2	a_fs_sel 1	a_fs_sel 0
Gyro_FS_Config	0x09	reserve	reserve	reserve	reserve	g_fs_sel 3	g_fs_sel 2	g_fs_sel 1	g_fs_sel 0
Gyro_DRV_Cnt	0x16	g_drive_count 7	g_drive_count 6	g_drive_count 5	g_drive_count 4	g_drive_count 3	g_drive_count 2	g_drive_count 1	g_drive_count 0
Accel_X_Data_H	0x20	accel_x 15	accel_x 14	accel_x 13	accel_x 12	accel_x 11	accel_x 10	accel_x 9	accel_x 8
Accel_X_Data_L	0x21	accel_x 7	accel_x 6	accel_x 5	accel_x 4	accel_x 3	accel_x 2	accel_x 1	accel_x 0
Accel_Y_Data_H	0x22	accel_y 15	accel_y 14	accel_y 13	accel_y 12	accel_y 11	accel_y 10	accel_y 9	accel_y 8
Accel_Y_Data_L	0x23	accel_y 7	accel_y 6	accel_y 5	accel_y 4	accel_y 3	accel_y 2	accel_y 1	accel_y 0
Accel_Z_Data_H	0x24	accel_z 15	accel_z 14	accel_z 13	accel_z 12	accel_z 11	accel_z 10	accel_z 09	accel_z 08
Accel_Z_Data_L	0x25	accel_z 7	accel_z 6	accel_z 5	accel_z 4	accel_z 3	accel_z 2	accel_z 1	accel_z 0
Gyro_X_Data_H	0x26	gyro_x 15	gyro_x 14	gyro_x 13	gyro_x 12	gyro_x 11	gyro_x 10	gyro_x 09	gyro_x 08
Gyro_X_Data_L	0x27	gyro_x 7	gyro_x 6	gyro_x 5	gyro_x 4	gyro_x 3	gyro_x 2	gyro_x 1	gyro_x 0
Gyro_Y_Data_H	0x28	gyro_y 15	gyro_y 14	gyro_y 13	gyro_y 12	gyro_y 11	gyro_y 10	gyro_y 09	gyro_y 08
Gyro_Y_Data_L	0x29	gyro_y 7	gyro_y 6	gyro_y 5	gyro_y 4	gyro_y 3	gyro_y 2	gyro_y 1	gyro_y 0
Gyro_Z_Data_H	0x2a	gyro_z 15	gyro_z 14	gyro_z 13	gyro_z 12	gyro_z 11	gyro_z 10	gyro_z 09	gyro_z 08
Gyro_Z_Data_L	0x2b	gyro_z 7	gyro_z 6	gyro_z 5	gyro_z 4	gyro_z 3	gyro_z 2	gyro_z 1	gyro_z 0

7 Register description

7.1 Chip_ID (0x00)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
ID[7]	ID[6]	ID[5]	ID[4]	ID[3]	ID[2]	ID[1]	ID[0]

ID[7:0]	Chip ID. Default value: 0x62.

7.2 Soft_Reset (0x01)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
reserve	reserve	reserve	reserve	reserve	reserve	reserve	SRST

SRST	Write 1 to reset the rest of digital circuit and automatically get clear to 0 after the reset

7.3 Mode_En (0x02)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
reserve	reserve	reserve	reserve	reserve	accl_en	gyro_en	gyro_accl_en

gyro_accl_en	In standy mode, write 1 to enter the 6 axis working mode (3 axis accl + 3 axis gyro), exclusive to gyro or accl normal mode
gyro_en	In standy mode, write 1 to enter the gyro 3 axis working mode, exclusive to gyro_accl mode or accl mode
accl_en	In standy mode, write 1 to enter the accl 3 axis working mode, exclusive to gyro_accl mode or gyro mode

7.4 Gyro_ODR_Config (0x06)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
reserve	reserve	reserve	reserve	g_odr_sel 3	g_odr_sel 2	g_odr_sel 1	g_odr_sel 0

g_odr_sel [3:0]	Gyro ODR selection 0000: 6666.7Hz; 0001: 3333 Hz; 0010: 1667Hz; 0011: 833Hz; 0100: 416Hz; 0101: 208Hz; 0110: 104Hz; 0111: 52Hz; 1000: 32Hz; 1111: 8203Hz

7.5 Accel_ODR_Config (0x07)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
reserve	reserve	reserve	reserve	a_odr_sel 3	a_odr_sel 2	a_odr_sel 1	a_odr_sel 0

a_odr_sel [3:0]	Accel ODR selection 0000: 6666.7Hz; 0001: 3333 Hz; 0010: 1667Hz; 0011: 833Hz; 0100: 416Hz; 0101: 208Hz; 0110: 104Hz; 0111: 52Hz; 1000: 32Hz; 1111: 8203 Hz

7.6 Accel_FS_Config (0x08)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
reserve	reserve	reserve	reserve	a_fs_sel 3	a_fs_sel 2	a_fs_sel 1	a_fs_sel 0

a_fs_sel[3:0]	Accel full scale selection 0000: +/-32g; 0001: +/-16g; 0010: +/-8g; 0011: +/-4g; 0100/0101/0110/0111: +/-2g; 1000: +/-64g; others: +/-32g;

7.7 Gyro_FS_Config (0x09)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
reserve	reserve	reserve	reserve	g_fs_sel 3	g_fs_sel 2	g_fs_sel 1	g_fs_sel 0

g_fs_sel[3:0]	Gyro full scale selection 0000: +/-4000dps; 0001: +/-2000dps; 0010: +/-1000dps; 0011: +/-500dps; 0100: +/-250g; 0101: +/-125g; 0110: +/-62.5g; 0111: +/-31.25g; 1000: +/-8000g; others: +/-4000g;

7.8 Gyro_DRV_Cnt (0x16)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
g_drive_count 7	g_drive_count 6	g_drive_count 5	g_drive_count 4	g_drive_count 3	g_drive_count 2	g_drive_count 1	g_drive_count 0

g_drive_count[7:0]	gyro_drive_adc_clk = 16.8MHz / g_drive_count[7:0]

7.9 Accel_X_Data_H (0x20)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
accel_x 15	accel_x 14	accel_x 13	accel_x 12	accel_x 11	accel_x 10	accel_x 9	accel_x 8

accel_x [15:8]	Accel_x data MSB 8 bits

7.10 Accel_X_Data_L (0x21)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
accel_x 7	accel_x 6	accel_x 5	accel_x 4	accel_x 3	accel_x 2	accel_x 1	accel_x 0

accel_x [7:0]	Accel_x data LSB 8 bits

7.11 Accel_Y_Data_H (0x22)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
accel_y 15	accel_y 14	accel_y 13	accel_y 12	accel_y 11	accel_y 10	accel_y 9	accel_y 8

accel_y [15:8]	Accel_y data MSB 8 bits

7.12 Accel_Y_Data_L (0x23)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
accel_y 7	accel_y 6	accel_y 5	accel_y 4	accel_y 3	accel_y 2	accel_y 1	accel_y 0

accel_y [7:0]	Accel_y data LSB 8 bits

7.13 Accel_Z_Data_H (0x24)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
accel_z 15	accel_z 14	accel_z 13	accel_z 12	accel_z 11	accel_z 10	accel_z 09	accel_z 08

accel_z [15:8]	Accel_z data MSB 8 bits

7.14 Accel_Z_Data_L (0x25)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
accel_z 7	accel_z 6	accel_z 5	accel_z 4	accel_z 3	accel_z 2	accel_z 1	accel_z 0

accel_z [7:0]	Accel_z data LSB 8 bits

7.15 Gyro_X_Data_H (0x26)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
gyro_x 15	gyro_x 14	gyro_x 13	gyro_x 12	gyro_x 11	gyro_x 10	gyro_x 09	gyro_x 08

gyro_x [15:8]	Gyro_x data MSB 8 bits

7.16 Gyro_X_Data_L (0x27)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
gyro_x 7	gyro_x 6	gyro_x 5	gyro_x 4	gyro_x 3	gyro_x 2	gyro_x 1	gyro_x 0

gyro_x [7:0]	Gyro_x data LSB 8 bits

7.17 Gyro_Y_Data_H (0x28)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
gyro_y 15	gyro_y 14	gyro_y 13	gyro_y 12	gyro_y 11	gyro_y 10	gyro_y 09	gyro_y 08

gyro_y [15:8]	Gyro_y data MSB 8 bits

7.18 Gyro_Y_Data_L (0x29)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

gyro_y 7	gyro_y 6	gyro_y 5	gyro_y 4	gyro_y 3	gyro_y 2	gyro_y 1	gyro_y 0

gyro_y [7:0]	Gyro_y data LSB 8 bits

7.19 Gyro_Z_Data_H (0x2a)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
gyro_z 15	gyro_z 14	gyro_z 13	gyro_z 12	gyro_z 11	gyro_z 10	gyro_z 09	gyro_z 08

gyro_z [15:8]	Gyro_z data MSB 8 bits

7.20 Gyro_Z_Data_L (0x2b)

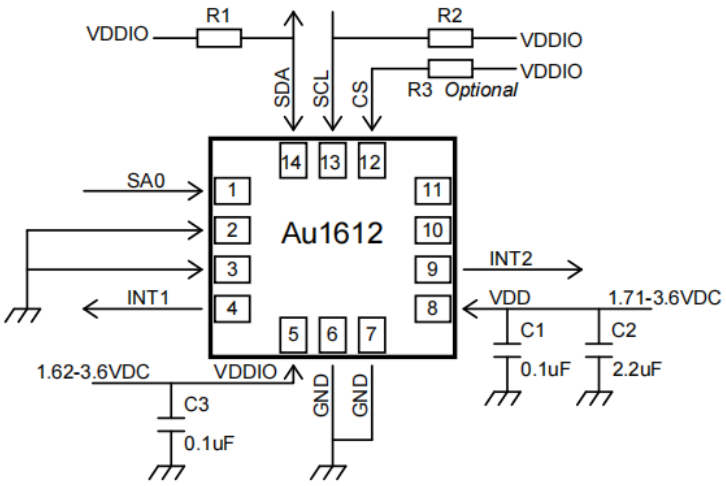
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
gyro_z 7	gyro_z 6	gyro_z 5	gyro_z 4	gyro_z 3	gyro_z 2	gyro_z 1	gyro_z 0

gyro_z [7:0]	Gyro_z data LSB 8 bits

8 Application hints

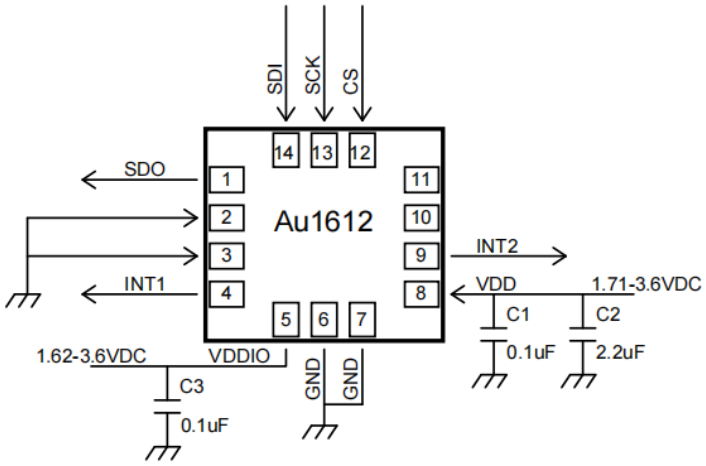
8.1 Electrical connections

Typical operating circuit



Au1612 Application Schematic (I2C interface)

Note: I2C lines(SDA/SCL) are open drain and pull-up resistors R1/R2 (e.g. 10kΩ) are required. There is already a internal pull-up resistor on CS, the external pull-up resistor R3 is optional.



Au1612 Application schematic (SPI interface)

The power supply decoupling capacitors should be close to Pin 8 and Pin5. Typically, the decoupling capacitors C1=0.1uF/X7R/10%, C2=2.2uF/X7R/10%, C3=0.1uF/X7R/10%.

8.2 Measurement workflow

Assuming the AU1612 powered on and entered standby mode, following is a typical sequence to configure and start the measurement:

1. Gyro_ODR_Config = 0x03; // set Gyro odr 833Hz.

2. Accel_ODR_Config = 0x03; // set Accel odr 833Hz.

3. Accel_FS_Config = 0x01; // set Accel full-scale input +/-16g.

4. Gyro_FS_Config = 0x01; // set Gyro full-scale input +/-2000dps.

5. Gyro_DRV_Cnt = 0x20; // set gyro_drive_adc_clk 500KHz.

6. Mode_En = 0x01; // 0x01:Enable both accel and gyro; 0x02: Enable gyro only; 0x04: Enable accel only.

Get accelerometer data from registers 0x20~0x25. And get gyroscope data from 0x26~0x2b.

NOTE: Reserved bits in registers must remain default value during configuration.

8.3 Data format and conversion

The output data of sensor are formatted as 16-bit signed integers in two's complement. The accelerometer or gyroscope data can be converted to *ug* or *dps* by dividing the sensitivity value of corresponding full-scale range.

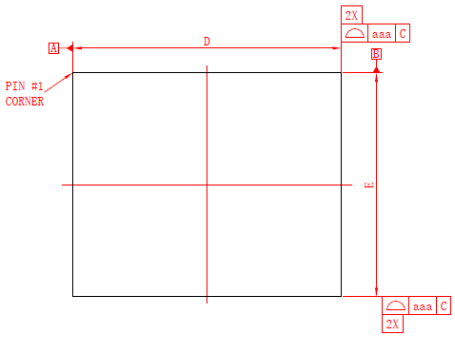
Example for accelerometer, retrieved output data is 0x2345 if ±16g full scale input, the converted accelerometer data should be 4408691*ug*.

Parameter	Conditions	Typ	Unit
A_Sensitivity	±2g full scale input	16,384	LSB/g
	±4g full scale input	8,192	LSB/g
	±8g full scale input	4,096	LSB/g
	±16g full scale input	2,048	LSB/g
	±32g full scale input	1,024	LSB/g

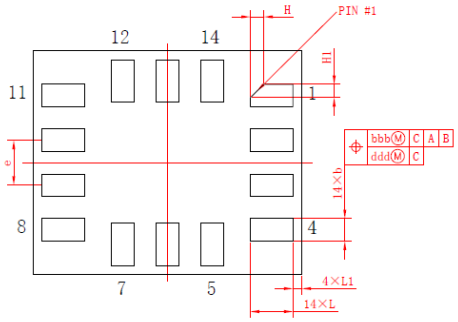
Example for gyroscope, retrieved output data is 0x2345 if ±2000dps full scale input, the converted gyroscope data should be 551086*mdps*.

Parameter	Conditions	Typ	Unit
G_Sensitivity	±31.25dps input range	1048.576	LSB/dps
	±62.5dps input range	524.288	
	±125dps input range	262.144	
	±250dps input range	131.072	
	±500dps input range	65.536	
	±1000dps input range	32.768	
	±2000dps input range	16.384	
	±4000dps input range	8.192	

9 Package Information

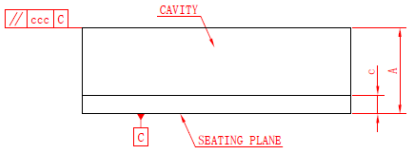


Top View



Bottom View

symbol	Dimension in mm			Dimension in inch		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.910	0.960	1.010	0.036	0.038	0.040
c	0.180	0.210	0.240	0.007	0.008	0.009
D	2.950	3.000	3.050	0.116	0.118	0.120
E	2.450	2.500	2.550	0.096	0.098	0.100
L	0.425	0.475	0.525	0.017	0.019	0.021
H	---	0.150	---	---	0.006	---
H1	---	0.150	---	---	0.006	---
L1	0.025	0.100	0.175	0.001	0.004	0.007
e	---	0.500	---	---	0.020	---
b	0.200	0.250	0.300	0.008	0.010	0.012
aaa	0.100			0.004		
bbb	0.150			0.006		
ccc	0.100			0.004		
ddd	0.050			0.002		



Side View

10 Ordering Information

Ordering Part Number (OPN)	Marking	Package	Shipping Package	Temperature Range	MSL Level
AU1612A01-LAR	AU1612	LGA 3x2.5, 14L	Tape and Reel	-40°C ~ 105°C	3

11 Revision history

Version	Date	Changes	Status
V1.0	2024/01/29	Initial release	Released
V1.1	2024/02/29	Add measurement workflow	Released