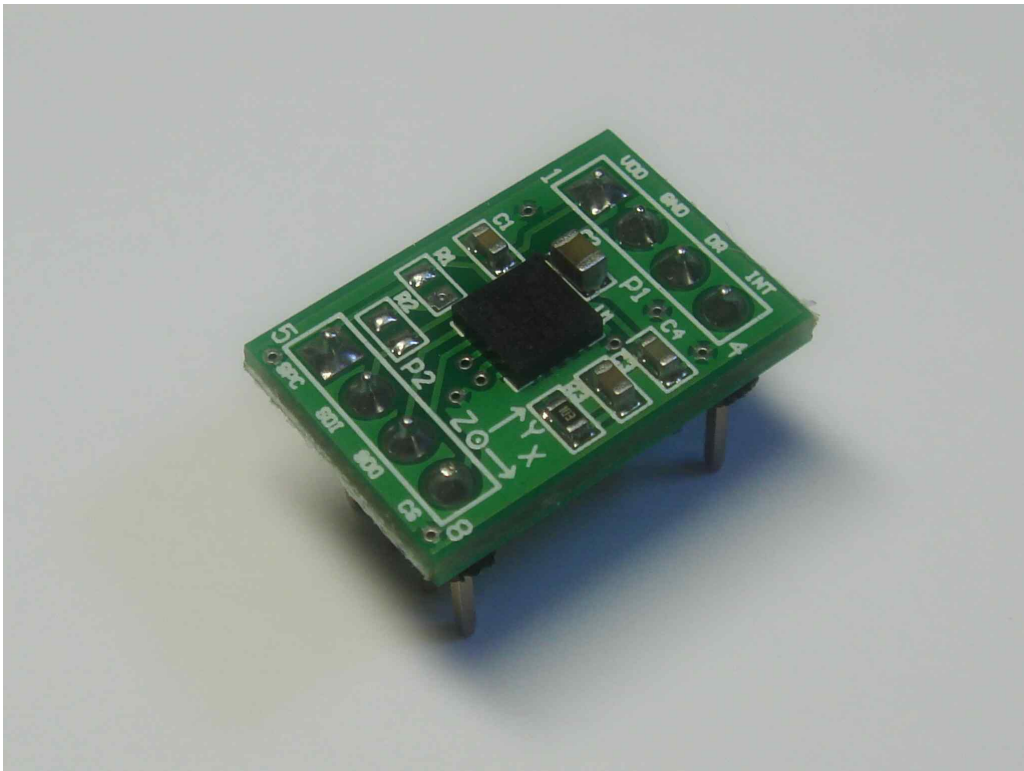


P0-GMD-20-01 Manual

(Digital Gyro Module)



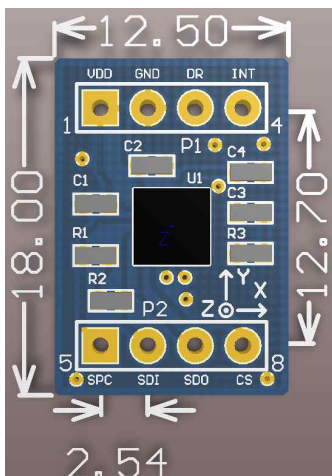
1. Overview

- STMicro사의 L3G4200D 센서가 장착된 초소형 모듈
- 3축(X, Y, Z)의 각속도 및 온도를 측정하여 디지털 신호로 출력(SPI, I2C)
- 출력 데이터 (각속도 : 16 bit, 온도 : 8 bit)
- Roll, Pitch, Yaw 스케일 선택(250 deg/s, 500 deg/s, 2000 deg/s) 출력
- LP(Low pass filter), HP(High pass filter), PD(Power-Down), ST(Self-Test) 등 칩에 대한 모든 기능 통신으로 설정 가능
- 핀 헤더(2.54mm)를 사용하여 브레드 보드 및 만능 기판에 장착 가능

2. Specification

Characteristic	Value		Unit
Supply Voltage	2.4 ~ 3.6		V
Supply Current	6.1		mA
Measuring range	250, 500, 2000		dps (deg/s)
Sensitivity	FS =250 dps	8.75	mdps/digit
	FS=500 dps	17.50	
	FS=2000 dps	70	
Measuring Axis	Roll, Pitch, Yaw		
Linearity	0.2		% FS
Noise	BW=50 Hz	0.03	dps/sqrt(Hz)
Digital output data rate	100, 200, 400, 800		Hz
Temperature change	-1		°C/digit
Operating Temperature	-40 ~ +85		°C

3. Pin Out Description



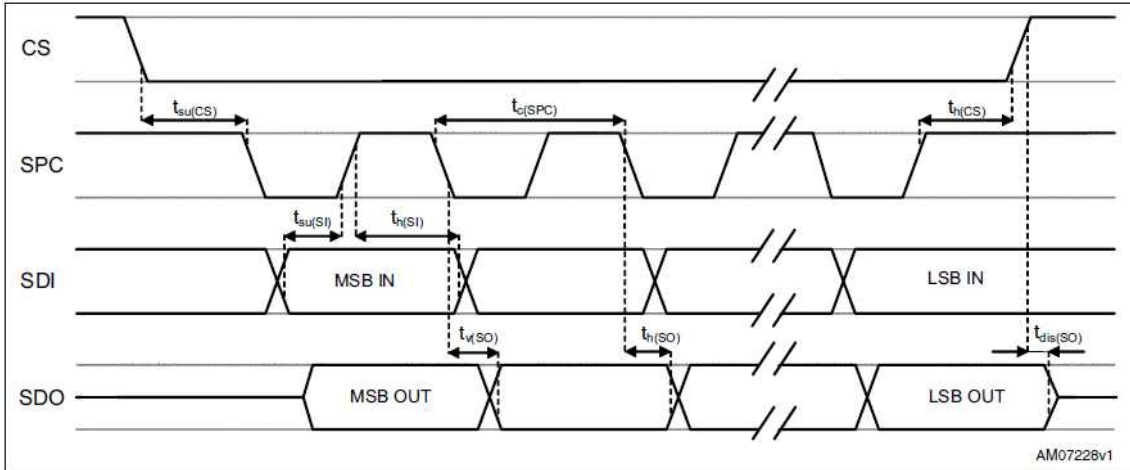
Pin No.	Name	Function
1	VDD	Power Supply
2	GND	GND
3	DR	Data ready / FIFO interrupt
4	INT	Programmable interrupt
5	SPC (SCL)	I2C serial clock
		SPI serial port clock
6	SDI (SDA)	I2C serial data
		SPI serial data input
7	SDO	I2C least significant bit of the device address
		SPI serial data output
8	CS	0 : SPI mode / I2C disabled
		1 : SPI idle mode / I2C enabled

4. SPI bus interface Description

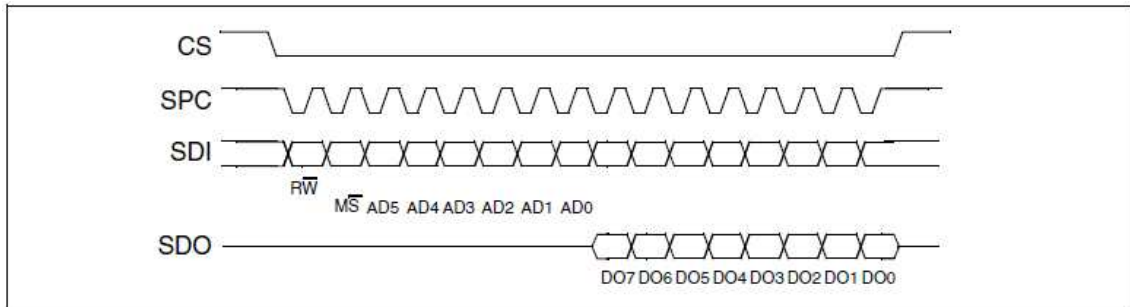
가. SPI slave timing table

Symbol	Parameter	Value ⁽¹⁾		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	8		
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	6		
tdis(SO)	SDO output disable time		50	

나. SPI slave timing diagram

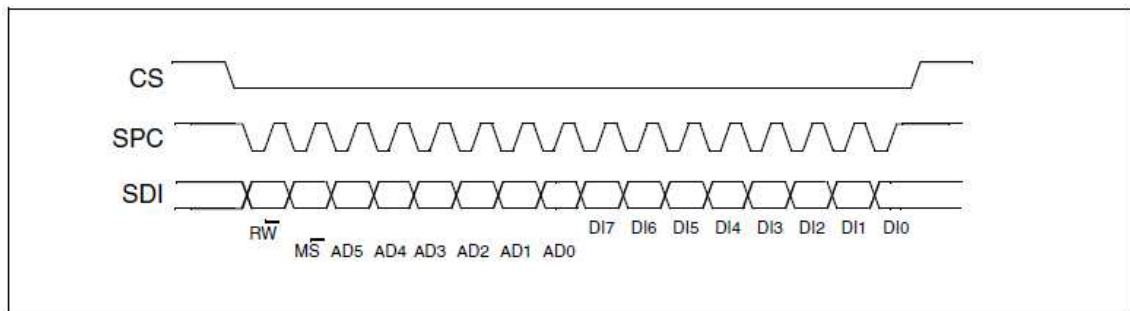


다. SPI read protocol



bits	Name	Description
0	RW	읽기 비트 값 : 1
1	MS	1 byte 데이터 읽기 : 0
2 ~ 7	AD5 ~ AD0	1 byte 레지스터 주소 입력
8 ~ 15	DO7 ~ DO0	1 byte 데이터 출력

라. SPI write protocol



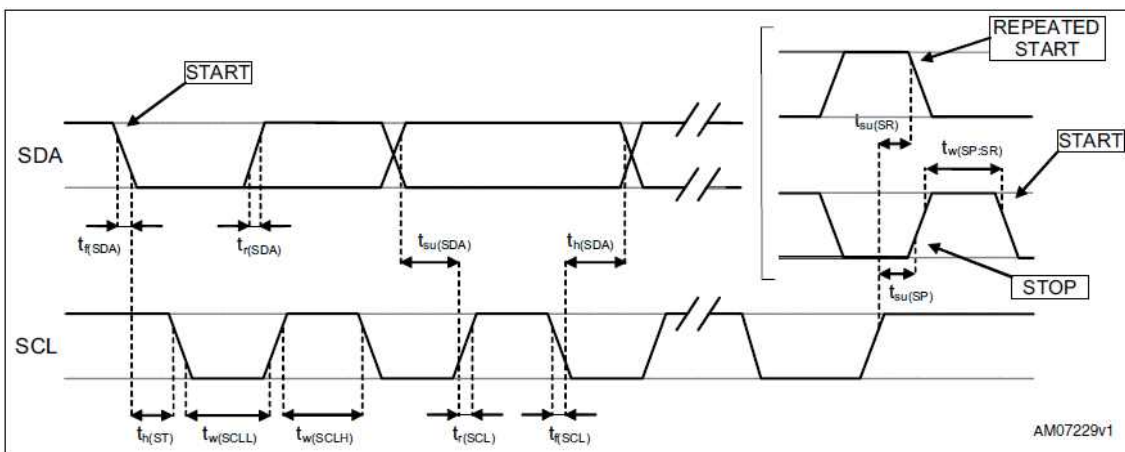
bits	Name	Description
0	RW	쓰기 비트 값 : 0
1	MS	1 byte 데이터 읽기 : 0
2 ~ 7	AD5 ~ AD0	1 byte 레지스터 주소 입력
8 ~ 15	DI7 ~ DI0	1 byte 데이터 입력

5. I2C serial interface Description

가. I2C slave timing table

Symbol	Parameter	I ² C standard mode ⁽¹⁾		I ² C fast mode ⁽¹⁾		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		
$t_{w(SCLH)}$	SCL clock high time	4.0		0.6		μ s
$t_{su(SDA)}$	SDA setup time	250		100		
$t_h(SDA)$	SDA data hold time	0	3.45	0	0.9	μ s
$t_r(SDA)$ $t_r(SCL)$	SDA and SCL rise time		1000	$20 + 0.1C_b^{(2)}$	300	
$t_f(SDA)$ $t_f(SCL)$	SDA and SCL fall time		300	$20 + 0.1C_b^{(2)}$	300	ns
$t_h(ST)$	START condition hold time	4		0.6		
$t_{su(SR)}$	Repeated START condition setup time	4.7		0.6		μ s
$t_{su(SP)}$	STOP condition setup time	4		0.6		
$t_w(SP:SR)$	Bus free time between STOP and START condition	4.7		1.3		

나. I2C slave timing diagram



다. I2C SAD+read/write patterns

Command	SAD[6:1]	SAD[0] = SDO	R/W	SAD+R/W
Read	110100	0	1	11010001 (D1h)
Write	110100	0	0	11010000 (D0h)
Read	110100	1	1	11010011 (D3h)
Write	110100	1	0	11010010 (D2h)

라. I2C writing one byte to slave

Master	ST	SAD + W		SUB		DATA		SP
Slave			SAK		SAK		SAK	

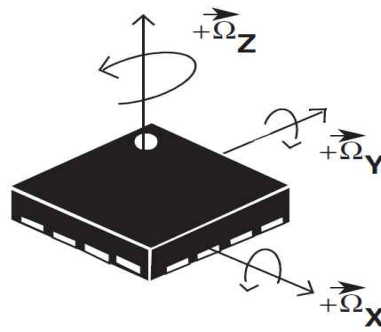
마. I2C reading on byte to slave

Master	ST	SAD + W		SUB		SR	SAD + R			NMAK	SP
Slave			SAK		SAK			SAK	DATA		

6. Output resister mapping

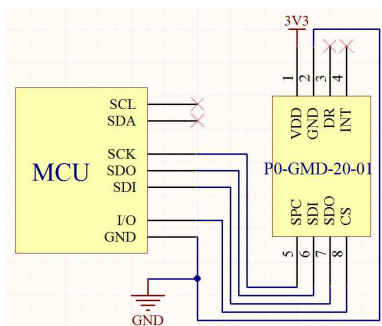
가. 칩 데이터 시트 27~38 page 참조

7. Chip Notation

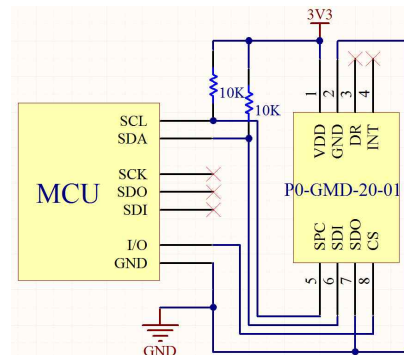


8. Application Circuit

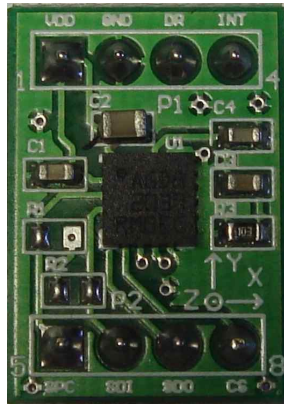
SPI



I2C



9. Product

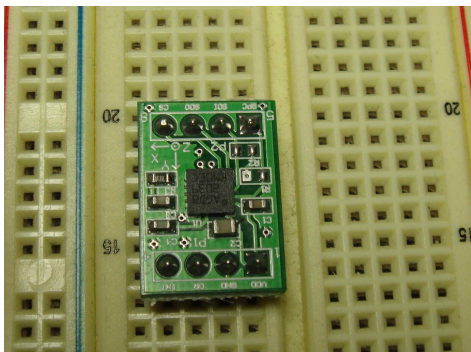


<TOP VIEW>

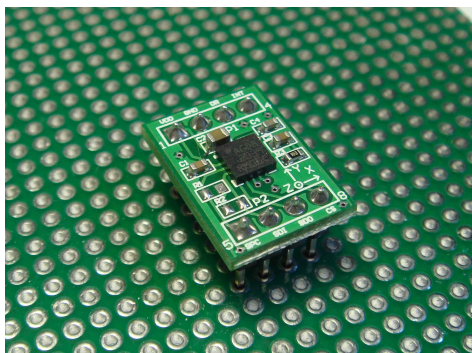
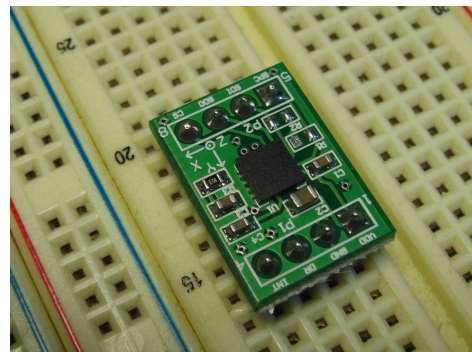


<BOTTOM VIEW>

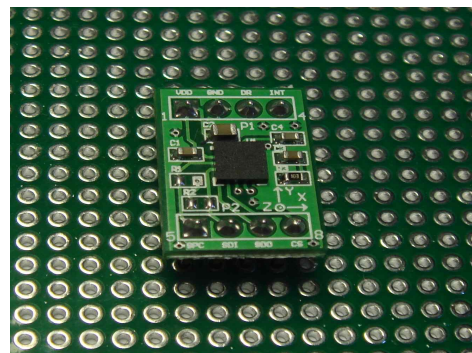
10. Application



<브레드 보드 장착>



< 만능기판 장착 >



11. Notes

- 제품 사용 시 본 Manual 을 숙지하여 사용
- 자이로센서 chip에 대한 상세 규격은 chip Manual 참조

(http://www.st.com/internet/com/TECHNICAL_RESOURCES/TECHNICAL_LITERATURE/DATASHEET/CD00265057.pdf)

12. Contact

- 판매사: mySen(마이센)
- 주소: 경기도 고양시 덕양구 화전동 200-1 중소벤처육성지원센터 310호
- 전화: 070-7010-6989
- Fax.: 070-7614-3989
- Homepage: www.mysen.kr

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