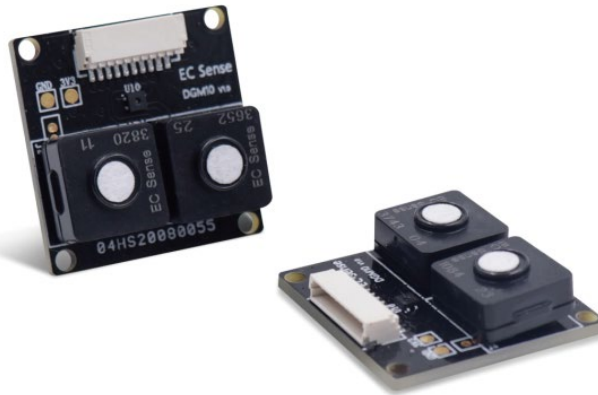




DGM10 Double Gas Sensor Module

SPI Communication Protocol

1. Communication Mode

The DGM10 module uses SPI as interface communication, and the communication parameters are as follows:

Signal Voltage	Maximum Clock	Clock Polarity (CPOL)	Clock Phase (CPHA)	Minimum Communication Interval
3.3V	180K Hz	0 (Low)	1 (2 Edge)	300 ms

2. SPI Read and Write Operations

2.1 Read Data Operation

Send	Start Byte	Command Byte	Address Byte	Data Length	Check Byte	
	0xAA	0x00 (read operation)	--	--	0-Add8	
Receive	Start Byte	The Data Read				Check Byte
	0xAA	...				0-Add8

Please refer to [4. SPI Register Address]

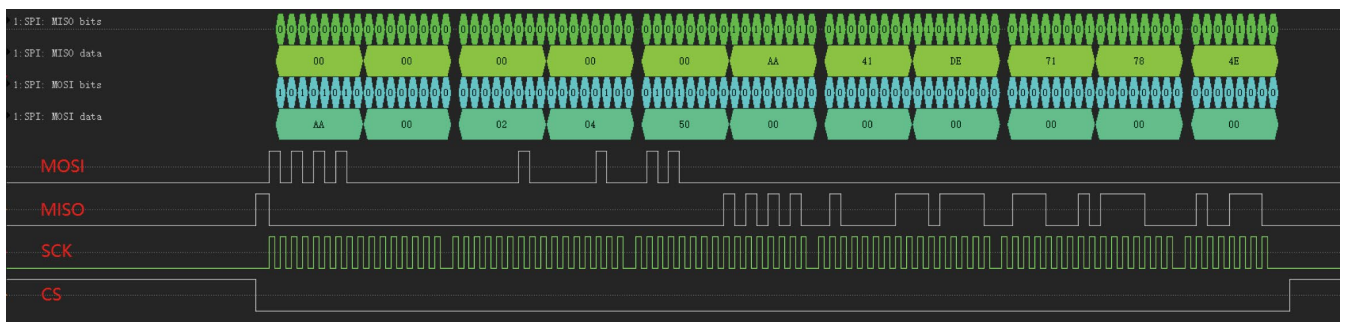
- Read temperature reference:

Send	0xAA	0x00	0x02	0x04	0x50	
Receive	0xAA	0x41	0xDE	0x71	0x78	0x4E

$$0\text{-Add8} = (0 - (0\text{xAA} + 0\text{x00} + 0\text{x02} + 0\text{x04})) \& 0\text{xFF} = 0\text{x50}$$

$$0\text{-Add8} = (0 - (0\text{xAA} + 0\text{x41} + 0\text{xDE} + 0\text{x71} + 0\text{x78})) \& 0\text{xFF} = 0\text{x4E}$$

The timing diagram is as follows:



2.2 Write Data Operation

Send	Start Byte	Command Byte	Address Byte	Data Length	Data Content	Check Byte
	0xAA	0x01	--	--	--	0-Add8
Receive	Start Byte	Address Byte	Data Length	Data Content	Check Byte	
	0xAA	--	--	--	0-Add8	

Please refer to [4. SPI Register Address]

Data can only be written to writable register addresses.

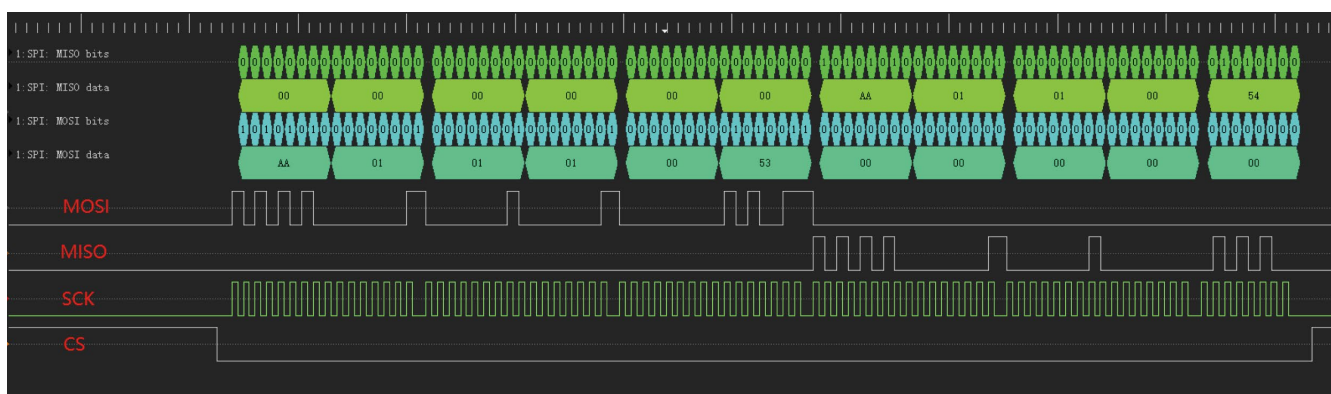
- Turn off the light and write data example:

Send	0xAA	0x01	0x01	0x01	0x01	0x00	0x53
Receive	0xAA	0x01	0x01	0x00	0x54	0x4E	

$0\text{-Add8} = (0 - (0\text{AA} + 0\text{x01} + 0\text{x01} + 0\text{x01} + 0\text{x00})) \& 0\text{xFF} = 0\text{x53}$

$0\text{-Add8} = (0 - (0\text{AA} + 0\text{x01} + 0\text{x01} + 0\text{x00})) \& 0\text{xFF} = 0\text{x54}$

The timing diagram is as follows:



3. Sensor Type Code Table

The sensor type configured on the current module can be identified by reading the sensor type value in the holding register.

Gas Formula	HCHO	VOC	CO	Cl ₂	H ₂	H ₂ S	HCl	HCN	HF	NH ₃	NO ₂
Numeric	0x17	0x18	0x19	0x1A	0x1B	0x1C	0x1D	0x1E	0x1F	0x20	0x21
Gas Formula	O ₂	O ₃	SO ₂	HBr	Br ₂	F ₂	PH ₃	AsH ₃	SiH ₄	GeH ₄	B ₂ H ₆
Numeric	0x22	0x23	0x24	0x25	0x26	0x27	0x28	0x29	0x2A	0x2B	0x2C
Gas Formula	BF ₃	WF ₆	SiF ₄	XeF ₂	TiF ₄	SMELL	IAQ	AQI	NMHC	SO _x	NO _x
Numeric	0x2D	0x2E	0x2F	0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37
Gas Formula	NO	C ₄ H ₈	C ₃ H ₈ O ₂	CH ₄ S	C ₈ H ₈	C ₄ H ₁₀	C ₂ H ₆	C ₆ H ₁₄	C ₂ H ₄ O	C ₃ H ₉ N	C ₂ H ₇ N
Numeric	0x38	0x39	0x3A	0x3B	0x3C	0x3D	0x3E	0x3F	0x40	0x41	0x42
Gas Formula	C ₂ H ₆ O	CS ₂	C ₂ H ₆ S	C ₂ H ₆ S ₂	C ₂ H ₄	CH ₃ OH	C ₆ H ₆	C ₈ H ₁₀	C ₇ H ₈	CH ₃ COOH	ClO ₂
Numeric	0x43	0x44	0x45	0x46	0x47	0x48	0x49	0x4A	0x4B	0x4C	0x4D
Gas Formula	H ₂ O ₂	N ₂ H ₄	C ₂ H ₈ N ₂	C ₂ HCl ₃	CHCl ₃	C ₂ H ₃ Cl ₃					
Numeric	0x4E	0x4F	0x50	0x51	0x52	0x53					

4. SPI Register Address

This group of addresses is used to output gas concentration, temperature, humidity, range, sensor type, operating light switch control, and current status of the sensor.

Register Address	Register Value	Read/Write	Data Name	Description
0x00	Byte[0]	Only Read	Sensor status	Bit[7:4]: S0 status Bit[3:0]: S1 status 2: Sensor failure, replace new sensor 1: Sensor is close to failure, prepare replacement 0: Working
0x01	Byte[1]	Read & Write	Running light status	1: Open 0: Off
0x02	Byte[2]	Only Read	Temperature	Type: 32 Bit float type (data[2]<<24) (data[3]<<16) (data[4]<<8) data[5] Then follow the 32-bit float data type conversion Unit: °C
0x03	Byte[3]			
0x04	Byte[4]			
0x05	Byte[5]			
0x06	Byte[6]	Only Read	Humidity	Type: 32 Bit float type (data[6]<<24) (data[7]<<16) (data[8]<<8) data[9] Then follow the 32-bit float Data type conversion Unit: %RH
0x07	Byte[7]			
0x08	Byte[8]			
0x09	Byte[9]			
0x0A	Byte[10]	Only Read	Sensor (1) concentration	Type: 32 Bit float type (data[10]<<24) (data[11]<<16) (data[12]<<8) data[13] Then follow the 32-bit float data type conversion Unit: ppm (Oxygen: %)
0x0B	Byte[11]			
0x0C	Byte[12]			
0x0D	Byte[13]			
0x0E	Byte[14]	Only Read	Sensor (1) Range	Type: uint 32 (data[14]<<24) (data[15]<<16) (data[16]<<8) data[17] Unit: ppm (Oxygen: %)
0x0F	Byte[15]			
0x10	Byte[16]			
0x11	Byte[17]			
0x12	Byte[18]	Only Read	Sensor (1) Type	Type: uint 16 (byte[18]<<8) byte[19]
0x13	Byte[19]			
0x14	Byte[20]	Only Read	Sensor (2) concentration	Type: 32 Bit float type (data[20]<<24) (data[21]<<16) (data[22]<<8) data[23] Then follow the 32-bit float data type conversion Unit: ppm (Oxygen: %)
0x15	Byte[21]			
0x16	Byte[22]			
0x17	Byte[23]			
0x18	Byte[24]	Only Read	Sensor (2) Range	Type: uint 32 (data[24]<<24) (data[25]<<16) (data[26]<<8) data[27] Unit: ppm (Oxygen: %)
0x19	Byte[25]			
0x1A	Byte[26]			
0x1B	Byte[27]			
0x1C	Byte[28]	Only Read	Sensor (2) Type	Type: uint 16 (byte[28]<<8) byte[29]
0x1D	Byte[29]			
0x1E	Byte[30]	Only Read	Software Version Number	The software version number is ASCII. The basic format is as follows: DGM10_1.1.1.0_2020.08.24
0x1F	Byte[31]			
0x20	Byte[32]			
0x21	Byte[33]			
0x22	Byte[34]			
0x23	Byte[35]			
0x24	Byte[36]			
0x25	Byte[37]			
0x26	Byte[38]			
0x27	Byte[39]			
0x28	Byte[40]			
0x29	Byte[41]			
0x2A	Byte[42]			
0x2B	Byte[43]			
0x2C	Byte[44]			
0x2D	Byte[45]			

Register Address	Register Value	Read/Write	Data Name	Description
0x2E	Byte[46]	Only Read	Software Version Number	The software version number is ASCII. The basic format is as follows: DGM10_1.1.1.0_2020.08.24
0x2F	Byte[47]			
0x30	Byte[48]			
0x31	Byte[49]			
0x32	Byte[50]			
0x33	Byte[51]			
0x34	Byte[52]			
0x35	Byte[53]			
0x36	Byte[54]	Only Read	Sensor(1) Serial Number	The sensor serial number is ASCII. The basic format is as follows: 1111111111111111
0x37	Byte[55]			
0x38	Byte[56]			
0x39	Byte[57]			
0x3A	Byte[58]			
0x3B	Byte[59]			
0x3C	Byte[60]			
0x3D	Byte[61]			
0x3E	Byte[62]			
0x3F	Byte[63]			
0x40	Byte[64]			
0x41	Byte[65]			
0x42	Byte[66]			
0x43	Byte[67]			
0x44	Byte[68]			
0x45	Byte[69]			
0x46	Byte[70]	Only Read	Sensor(2) Serial Number	The sensor serial number is ASCII. The basic format is as follows: 1111111111111111
0x47	Byte[71]			
0x48	Byte[72]			
0x49	Byte[73]			
0x4A	Byte[74]			
0x4B	Byte[75]			
0x4C	Byte[76]			
0x4D	Byte[77]			
0x4E	Byte[78]			
0x4F	Byte[79]			
0x50	Byte[80]			
0x51	Byte[81]			
0x52	Byte[82]			
0x53	Byte[83]			
0x54	Byte[84]			
0x55	Byte[85]			
0x56	Byte[86]	Read & Write	Sleep Mode	Entering Sleep Mode: "To enter sleep mode: Pull RX high, write a value of 1 via SPI, and continue to keep RX high after entering sleep mode. Once in sleep mode, the SPI channel becomes inactive until the device exits sleep mode." Exiting Sleep Mode: "To exit sleep mode: Pull RX low for 5ms, and then pull it high again."



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