Document#	13-52-13	**Title:**	QMP6989 Datasheet	**Rev:** A
Originator:	ASIC/ Zhinan Luo			

REVISION RECORD

Rev.	Date	Change Description
A	28/06/2021	Initial Release

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Digital Barometric Pressure Sensor QMP6989

Advanced Information

High accuracy and small size barometric pressure sensor with low current consumption

- Measure barometric pressure and temperature with high accuracy
- Built-in low noise 24bit ADC
- Digital control and output via I²C/SPI interface
- Automatically power down non-working circuit to minimize power consumption
- Individual calibration parameters stored in OTP*
  (*One Time Programmable ROM)

Application Example

・Indoor navigation (floor detection)
・Car navigation (to distinguish highway and frontage road)
・Altimeter
・Activity monitor (to detect up and down of stairs)
・Life log
・Weather forecast

Target Devices Example

・Smart Phones / Tablet PCs
・Wearable devices, such as watch type, band type, clip type or glasses type
・GPS devices
・Healthcare devices such as pedometer

Packaging Information

■Standard Models with Surface Mounting Terminals

Structure	Packaging	Model	Minimum Packing Unit
LGA 8pin	Tape and Reel	QMP6989	5000

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Table of Contents

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1. Ratings, Specifications and Functions

1.1 Use conditions and recommended operating conditions

Type of Pressure	Absolute Pressure
Medium	Air (*1)
Operating Pressure Range	30kPa to 110kPa

Note. *1: Never use corrosive gases.

1.2 Absolute Maximum Ratings

Item	Symbol	Rating	Unit	Remark
Power Supply Voltage	Vddmax	5.5	V	
Input Voltage (other than power)	Vmax	5.5	V	
Maximum Pressure	Pmax	2000	kPa	
Storage Temperature	Tstr	-40~125	℃	with no condensation or icing
Storage Humidity	Hstr	10~95	%RH	with no condensation or icing
ESD(HBM)	Vhbm	±2000	V	
ESD(MM)	Vmm	±200	V	
ESD(CDM)	Vcdm	±500	V	

1.3 Operating Ratings

Item	Symbol	Min	Typ	Max	Unit	Remark
Operating Voltage	Vopr	1.7	——	5.5	V	VDD
	Vio	1.2	——	VDD	V	VDDIO
Operating Temperature	Topr	-40	25	85	℃	

1.4 Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Average Current *	Ihp	1sample/s force-mode Ultra High Accuracy	-	0.1	-	μA
Operating Current Consumption	Iddp	Pressure mode	-	640	800	μA
	Iddt	Temperature mode	-	410	520	μA
Sleep Mode Current Consumption	Isleep		-	1.1	2.3	μA
Measurable Pressure Range	Popr		30	-	110	kPa
Absolute Pressure Accuracy	Pabs1	30-110kPa, -20℃ - 65℃	-100	-	100	Pa
Relative Pressure Accuracy *	Prel1	Ultra High Accuracy	-	±12	-	Pa
rms Noise *	Pnoise	Ultra High Accuracy	-	1.9	-	Pa
Absolute Temperature Accuracy	Tabs	30-110kPa, -20℃ - 65℃	-2	-	2	℃
Pressure Resolution *	Pres		-	0.18	-	Pa
Temperature Resolution *	Tres		-	0.004	-	℃

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(At Ta=25℃, VDD=1.8V, unless otherwise noted)

Note * Above characteristics are guaranteed by design.

Note2: The above table shows the characteristics of the package before soldering

1.5 Digital Interface Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Digital Input Low Voltage	Vil_d		-	-	Vio*0.2	V
Digital Input High Voltage	Vih_d		Vio*0.8	-	-	V
Digital Input Hysterisis	Vidhys		Vio*0.1	-	-	V
Digital Output Low Voltage(I2C)	Vol_d1	Io=3mA (SDI) *1)	0	-	Vio*0.2	V
Digital Output Low Voltage(SPI)	Vol_d2	Io=1mA (SDI, SDO) *1)	0	-	Vio*0.2	V
Digital Output High Voltage1 (SPI) (Vio>=1.62V)	Voh_d1	Io=1mA (SDI, SDO) *1)	Vio*0.8	-	-	V
Digital Output High Voltage2 (SPI) (Vio>=1.2V)	Voh_d2	Io=1mA (SDI, SDO) *1)	Vio*0.6	-	-	V
Leakage Current at Output OFF	Ioff	SDI, SDO	-10	-	10	µA
Internal Pullup Resistor	Rpullup	CSB	70	120	190	kohm
I2C Load Capacitor	Cb	SDI, SCK	-	-	400	pF
Load Capacitance of Reset Terminal	Crst		-	-	20	pF
Pulse Width of Asynchronous Reset	Trst		100	-	-	µsec
Power On Startup Time	Tstart		-	-	10	msec

(At Ta=25℃, VDD=1.8V, unless otherwise noted)

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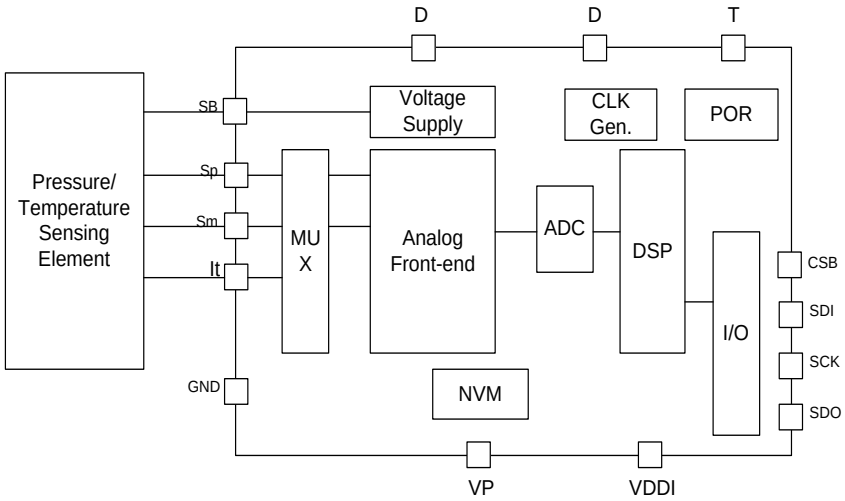
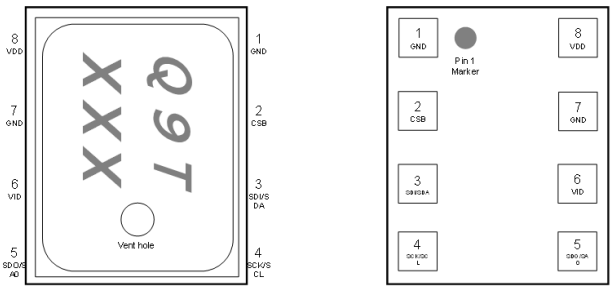
2. Connection

2.1 Block Diagram



2.2 Pin Description and Layout



Top View　　Bottom View

Pin Description

Pin#	Name	Description
1	GND	Ground pin
2	CSB	I2C/SPI mode select High for I2C mode Low for SPI mode
3	SDI/SDA	I2C mode: SDA data I/O pin SPI 4-wire mode: SDI data input pin SPI 3-wire mode: SDA data I/O pin
4	SCK/SCL	I2C mode: SCL clock pin SPI mode: SCK clock pin
5	SDO/SA0	I2C mode: slave address select pin SPI mode: data output pin
6	VID	Digital interface power supply in
7	GND	Ground pin
8	VDD	Core circuit power supply in

Note. *1) If you do not need the reset function, please just have the layout design of PCB of connecting both No.1 (RST) pin and No.7 (GND) pin into the ground of PCB.

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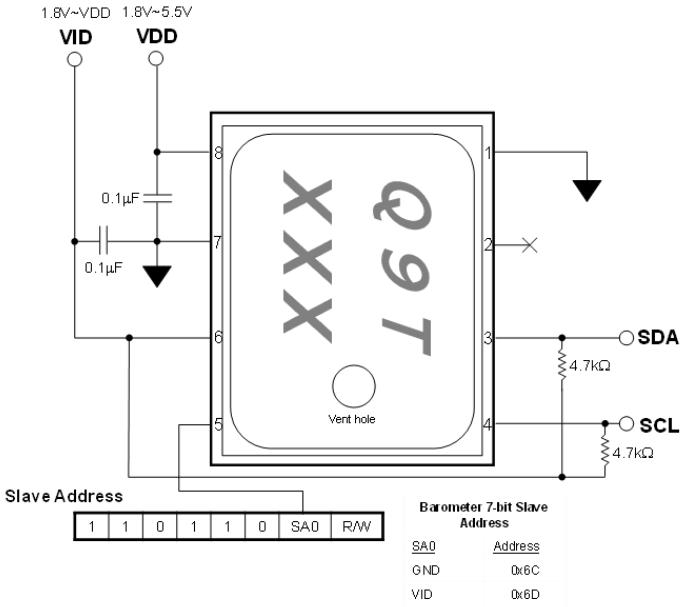
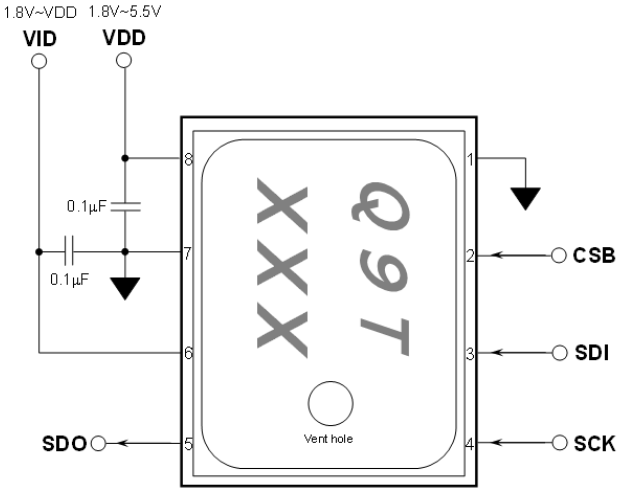
2.3 Typical Connection Diagram

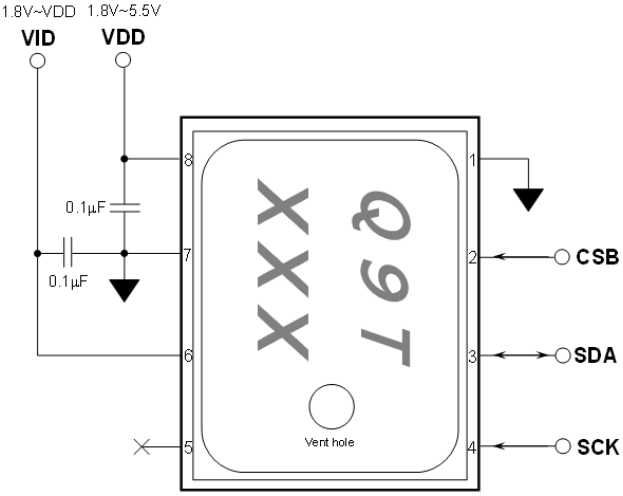
(1) I²C mode
Corresponding to 100Kbit/s (at Standard Mode), 400Kbit/s (at Fast Mode) and 3.4Mbit/s (at High Speed Mode)



(2) 4-wire SPI mode (Corresponding to 10Mbit/s)



(3) 3-wire SPI mode (Corresponding to 10Mbit/s)



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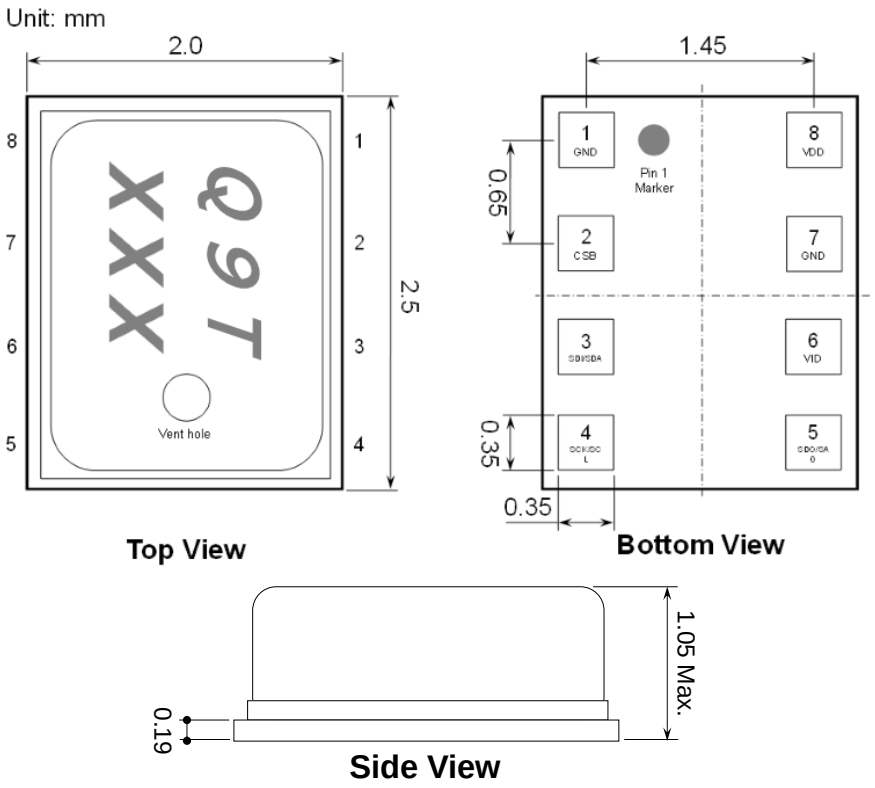
3. Dimensions

3.1 Package



Package Type：LGA (Land Grid Array) 8pin

Package Size：2.00×2.50×1.05 mm

Material of the terminal surface: Au

RoHS Compliance

QST LGA with metal lid packaged sensors are compliant with Restrictions on Hazardous Substances (RoHS), having halide-free molding compound (green) and lead-free terminations. Reflow profiles applicable to those processes can be used successfully for soldering the devices.

Moisture Sensitivity Level

QMP6989 package MSL rating is Level 3.

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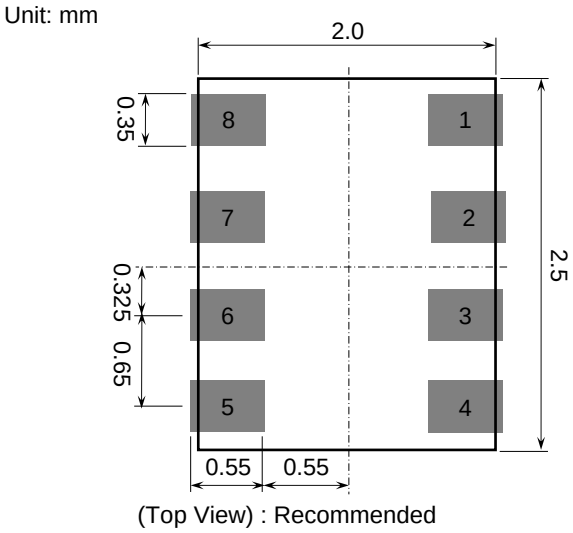
3.2 Mounting PAD Dimensions



(Top View) : Recommended

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4. Operations

4.1 Communication Mode

When changing the communication mode, also see Typical Connection Diagram section.

1) I²C mode becomes effective by pulling CSB up to VDDIO.
2) SPI mode becomes effective by pulling CSB down to GND.
3) Once CSB is pulled down, SPI mode would not be changed unless otherwise Power on Reset (POR) or Asynchronous Reset. Switching between SPI 3-Wire mode and SPI 4-Wire mode can be configured with the register value of "spi3w". Refer to IO_SETUP register section for more detail.
4) Default mode after POR or Asynchronous Reset will be I²C mode.

4.2 Power Mode

This sensor has three power modes and it can be switched by setting CTRL_MEAS register. Refer to the "CTRL_MEAS" register section for more detail.
Transition diagram for each mode is as follows.

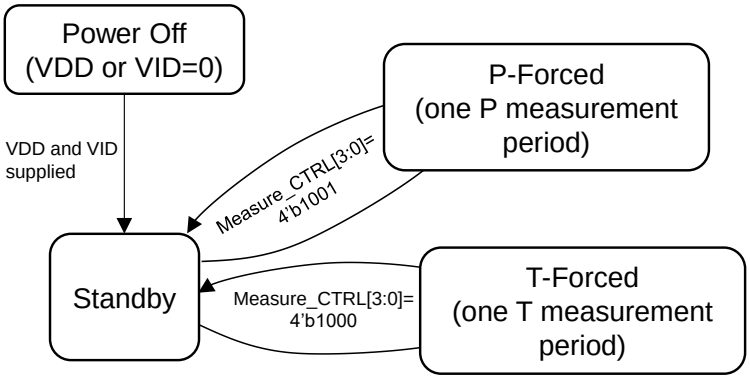

Fig 1: Mode transactions diagram

- Standby mode

QMP6989 will enter standby mode after complete POR sequence. In this mode, data measurement stops and the power consumption is at the minimum. All registers, including PID and calibration parameters, are accessible.

- P-Forced mode

In P-Forced mode, QMP6989 will take one-time pressure measurement and returns to standby mode automatically. The measurement results can then be obtained from the pressure data registers. Users need to set to P-Forced mode again to have another pressure measurement. The timing diagram of the P-Forced mode is illustrated in the following Figure 6.

Before set to the P-Forced mode, make sure the A5h[1] (Raw) bit value is 1'b1 in order to have the raw pressure ADC output. Below summarized the single shot pressure conversion steps:

1. Make sure A5h[1] (Raw) is set. If not, set A5h = 0x02.
2. Set to the P-Forced mode by set 30h = 0x09.
3. Check 02h[0] (DRDY) bit and wait until its value is set. The data is available in the registers when DRDY = 1'b1.
4. Read the raw pressure ADC output from the pressure data registers (06h~08h).

- T-Forced mode

In T-Forced mode, QMP6989 will take one-time temperature measurement and returns to standby mode automatically. The measurement results can then be obtained from the temperature data registers. Users need to set to T-Forced mode again to have another temperature measurement. The timing diagram of the T-Forced mode is illustrated in the following Figure 7.

Before set to the T-Forced mode, make sure the A5h[1] (Raw) bit value is 1'b0 in order to have the calibrated temperature output. Below summarized the single shot temperature conversion steps:

1. Make sure A5h[1] (Raw) is not set. If not so, set A5h = 0x00.
2. Set to the T-Forced mode by set 30h = 0x08.
3. Check 02h[0] (DRDY) bit and wait until its value is set. The data is available in the registers when DRDY = 1'b1.
4. Read the calibrated temperature output from the temperature data registers (09h~0Ah).

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4.4 Implementing Register List

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
00h	RESET	SPI4W	R'ved	RST	0	0	RST	R'ved	SPI4W	RW	0x00
01h	PID	PID[7:0]								R	0x02
02h	STATUS	Reserved				0	0	0	DRDY	R	NA
06h	PRESSH	Pressure [23:16]								R	NA
07h	PRESSM	Pressure [15:8]								R	NA
08h	PRESSL	Pressure [7:0]								R	NA
09h	TEMPH	Temperature[15:8]								R	NA
0Ah	TEMPL	Temperature[7:0]								R	NA
30h	CMD	Reserved				Measure_CTRL[3:0]				RW	0x00
A5h	CONFIG 1	Reserved						Raw	Reserved	RW	0x00
A6h	CONFIG 2	Reserved					OSR[2:0]			RW	0x1F
AAh ~ BBh	Calib00 ~ Calib17	Calibration data								R	NA

escription of Registers

Register 00h: RESET Register

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
00h	RESET	SPI4W	R'ved	RST	0	0	RST	R'ved	SPI4W	RW	0x00

Set RESET register (00h) to 0x24 to trigger the device soft reset. All register values will be reset to default. The RST bits will automatically return to 1'b0 when the soft reset complete.

SPI4W bits control the 3-/4-wire SPI selection. Default 0x00 is 3-wire SPI interface. Set 0x81 to RESET register (00h) will switch to the 4-wire SPI.

Register 01h: PID Register

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
01h	PID	PID[7:0]								R	0x02

PID is the product identification register and the value is fixed to 0x02. This register is available for reading after the device finished the power-on-reset.

Register 02h: STATUS Register

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
02h	STATUS	Reserved				0	0	0	DRDY	R	NA

The DRDY bit will be set once the data conversion is complete. The output data is ready for reading from pressure or temperature data registers.

Register 06h~08h: Pressure Data Registers

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
06h	PRESSH	Pressure [23:16]								R	NA
07h	PRESSM	Pressure [15:8]								R	NA
08h	PRESSL	Pressure [7:0]								R	NA

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The pressure data output is encoded to a 24-bit value and stored across three bytes. Data representation is 2's complement, i.e. MSB (bit 23) is the sign bit with 1'b1 representing negative value.

The pressure data output is raw pressure sensor ADC value. User can then calculate the calibrated pressure value with the calibration parameters (AAh~BBh). Reference calibration code is available upon request.

Register 09h~0Ah: Temperature Data Registers

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
09h	TEMPH	Temperature[15:8]								R	NA
0Ah	TEMPL	Temperature[7:0]								R	NA

The temperature data output is encoded to a 16-bit value and stored across two bytes. Data representation is 2's complement, i.e. MSB (bit 15) is the sign bit with 1'b1 representing negative value.

The temperature sensor has sensitivity of 256 LSB/℃. The central value (0x00) stands for 0℃. Thus the Celsius temperature can be converted from the temperature reading by the following formula:

$$T(℃) = \frac{\text{Temperature}[15:0]}{256}$$

Register 30h: CMD Register

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
30h	CMD	Reserved				Measure_CTRL[3:0]				RW	0x00

Measure_CTRL[3:0] control the signal conversion mode. After each single shot signal conversion, QMP6989 will return to standby mode. Available setting is summarized in the following table.

Measure_CTRL[3:0]	Power Mode
4'b1000	T-Forced mode Make a single shot temperature conversion.
4'b1001	P-Forced mode Make a single shot pressure conversion
Others	Reserved

Register A5h: CONFIG1 Register

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
A5h	CONFIG 1	Reserved						Raw	0	RW	0x00

Set Raw = 1'b0 before making a single shot temperature conversion. This will output calibrated temperature value to the temperature data registers (09h~0Ah).

Set Raw = 1'b1 before making a single shot pressure conversion. This will output raw pressure ADC value to the pressure data registers (06h~08h). User can then calculate the calibrated pressure value with the calibration parameters (AAh~BBh). Reference calibration code is available upon request.

Register A6h: CONFIG2 Register

Addr.	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Access	Default
A6h	CONFIG 2	Reserved					OSR[2:0]			RW	0x1F

OSR[2:0] selects the oversampling ratio for the pressure data conversion as summarized in the following table.

OSR[2:0]	Conversion Time (ms)	Oversampling Ratio	Typical Resolution (ENOB)
3'b000	2.5	1024	17.8
3'b001	3.78	2048	18.2
3'b010	6.34	4096	18.7
3'b011	11.46	8192	19.1
3'b100	1.54	256	17
3'b101	1.86	512	17.3
3'b110	21.7	16384	19.4
3'b111	42.18	32768	19.7

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4.5 I2C Protocol

The I2C interface is compliant with standard and fast I2C standard. The devices support the 7-bit control functions and SDA and SCL facilitate communication between QMP6989 and master with clock rate up to 400kHz.

The 7-bit device slave address can be selected by the SA0 pin as summarized in the below table.

SA0	7-bit Slave Address
1'b0	0x6C
1'b1	0x6D

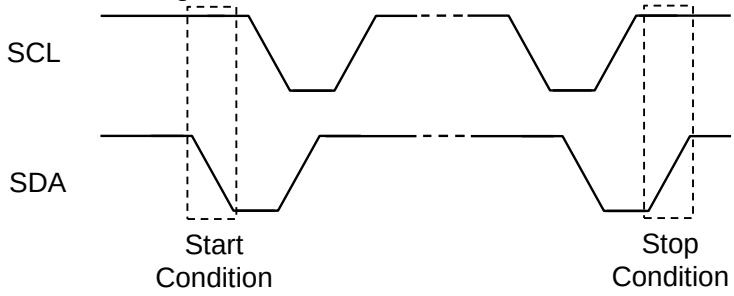
The I2C bus takes master clock through SCL pin and exchanges serial data via SDA. SDA is a bidirectional (input/output) connection. Both are open-drain connection and must be connected externally to VID via a pull-up resistor. The I2C interface supports multiple read and write. When using multiple read/write, the internal I2C address pointer will automatically increase by 1 for the next access.

I2C Access Format: Standard and Fast Mode

One data bit is transferred for each SCL cycle. The SDA must not change level when the SCL is high. The level changes in SDA while SCL is high are reserved control signals. The SDA and SCL remain high when I2C bus is idle.

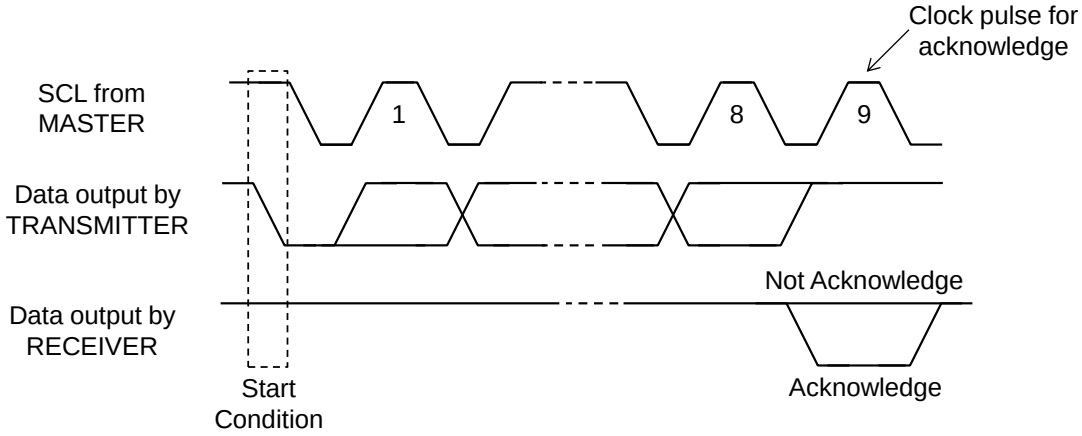
Data transfer begins by bus master indicating a start condition (ST) of a falling edge on SDA when SCL is high. The master terminates transmission and frees the bus by issuing a STOP condition (SP). Stop condition is a rising edge on SDA while SCL is high. The bus remains active if a repeated START (SR) condition is generated instead of a STOP condition. Figure 8 illustrates the START and STOP condition.

Figure 8: I2C START and STOP condition



After a start condition (ST), the 7-bit slave address + RW bit must be sent by master. If the slave address does not match with QMP6989, there is no acknowledge and the following data transfer will not affect QMP6989. If the slave address corresponds to QMP6989, it will acknowledge by pulling SDA to low and the SDA line should be let free by bus master to enable the data transfer. The master should let the SDA high (no pull down) and generate a high SCL pulse for QMP6989 acknowledge. Figure 9 illustrates the acknowledge signal sequence.

Figure 9: Acknowledge signal sequence



A write to QMP6989 includes transmission of a START condition, the slave address with R/W bit=1'b0, one byte of data to specify the register address to write, subsequent one or more bytes of data, and finally a STOP condition. "Single Write" and "Multiple Write" in Figure 10 illustrates the frame format of single and multiple write to QMP6989 respectively.

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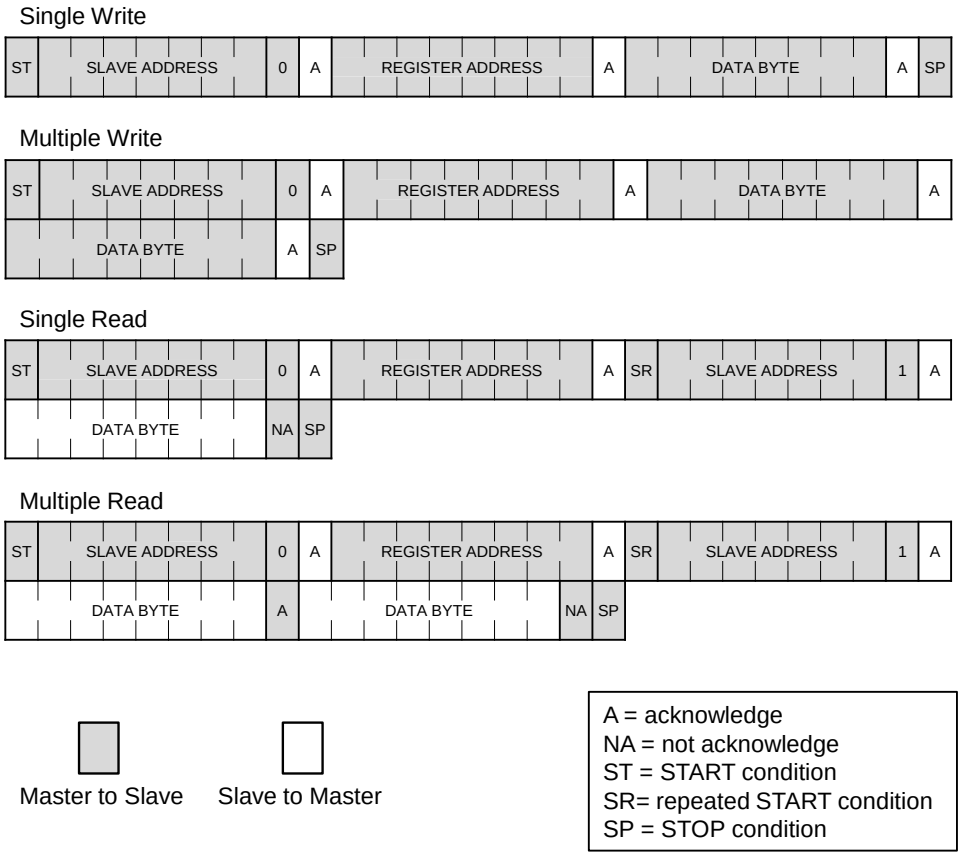
Figure 10: I2C access format: standard and fast mode



A read from QMP6989 starts with transmission of a START condition, the slave address with R/W bit=1'b0, and one byte of data to specify the register address to read. A repeated START condition and the slave address with R/W bit=1'b1 are transmitted subsequently. The slave address with R/W bit=1'b1 initiates a read operation. QMP6989 acknowledge receipt of the read operation command by pulling SDA low during the 9th SCL clock and begin transmitting the contents starting from the specified register address. The master must acknowledge all correctly received bytes except the last byte. The final byte must be followed by a not acknowledge from the master and the STOP condition. "Single Read" and "Multiple Read" in Figure 10 illustrates the frame format for reading single or multiple byte from QMP6989.

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I2C Specifications

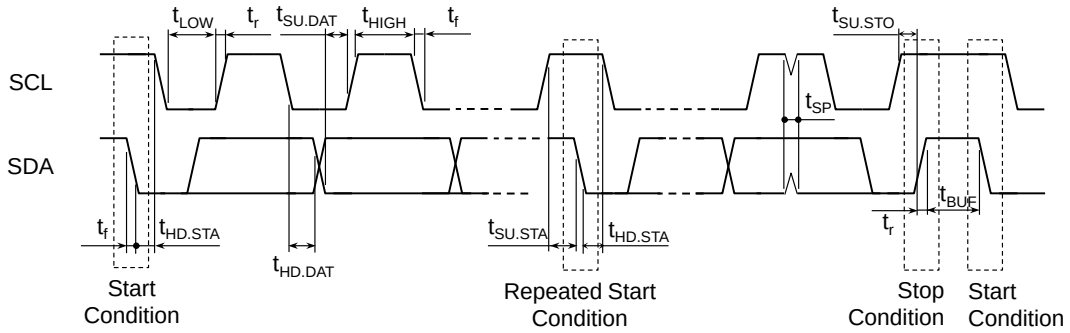
Table 5: I2C Timing Specification: Standard Mode

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SCL clock frequency	f_{SCL}	—	—	100	kHz
Clock low period	t_{LOW}	4.7	—	—	µs
Clock high period	t_{HIGH}	4	—	—	µs
Start hold time	$t_{HD.STA}$	4	—	—	µs
Start setup time	$t_{SU.STA}$	4.7	—	—	µs
Data-in hold time	$t_{HD.DAT}$	0	—	—	µs
Data-in setup time	$t_{SU.DAT}$	250	—	—	ns
Stop setup time	$t_{SU.STO}$	4	—	—	µs
Rise time	t_r	—	—	1	µs
Fall time	t_f	—	—	0.3	µs

Table 6: I2C Timing Specification: Fast Mode

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SCL clock frequency	f_{SCL}	—	—	400	kHz
Clock low period	t_{LOW}	1.3	—	—	µs
Clock high period	t_{HIGH}	0.6	—	—	µs
Bus free to new start	t_{BUF}	1.3	—	—	µs
Start hold time	$t_{HD.STA}$	0.6	—	—	µs
Start setup time	$t_{SU.STA}$	0.6	—	—	µs
Data-in hold time	$t_{HD.DAT}$	0	—	—	µs
Data-in setup time	$t_{SU.DAT}$	100	—	—	ns
Stop setup time	$t_{SU.STO}$	0.6	—	—	µs
Rise time	t_r	—	—	0.3	µs
Fall time	t_f	—	—	0.3	µs
Spike width	t_{SP}	—	—	50	µs

Figure 11: I2C Timing Diagram: Standard and Fast Mode



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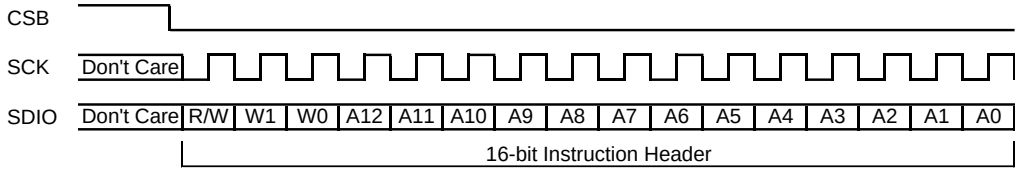
4.6 Digital Interface: SPI

Both 3-wire and 4-wire SPI interfaces are supported. The SPI4W bits of RESET register (00h) control such selection. See 00h register description for more detail.

The SPI transaction starts with the falling edge of CSB and the rising edge of SCK. The first phase of the transfer is the instruction phase of 16 bits, followed by multiple data bytes (every byte consists of 8 bits).

The first instruction phase is shown in the Figure 12. The instruction phase is divided into several bit fields.

Figure 12: SPI instruction phase bit field



The first bit field is the read/write indicator bit (R/W). When this bit is set, a read operation is requested. On the other hand when this bit is clear, it indicates a write operation.

The second bit field consists of two bits, W1 and W0. They represent the number of data bytes to transfer for either read or write. If the number of bytes to transfer is three or less (W1:W0 = 2'00, 2'b01 or 2'b10), CSB can stall high on byte boundaries. Stalling on a non-byte boundary terminates the communication cycle. If W1:W0 = 2'b11, data can be transferred until CSB transit to high, and CSB is not allowed to stall during the whole streaming process. Table 7 summaries such behaviors for W1:W0 settings.

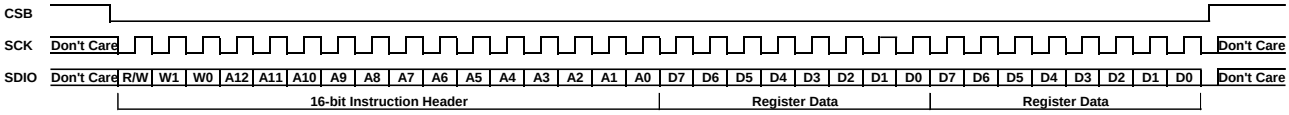
Table 7: W1/W0 settings

W1:W0	**Description**	**CSB stalling**
2'b00	1 bytes of data can be transferred	Optional
2'b01	2 bytes of data can be transferred	Optional
2'b10	3 bytes of data can be transferred	Optional
2'b11	4 or more bytes of data can be transferred. CSB must be held low for the entire process.	No

The third bit field of the remaining 13 bits represents the starting address of the data transfer. If more than one word is being sent, sequential addressing is used.

Data follows the instruction phase. Multiple bytes can be transferred in one transaction determined by the W1:W0 bits. Every byte consists of 8 bits. Figure 13 illustrates the timing for transferring two bytes.

Figure 13: SPI access timing



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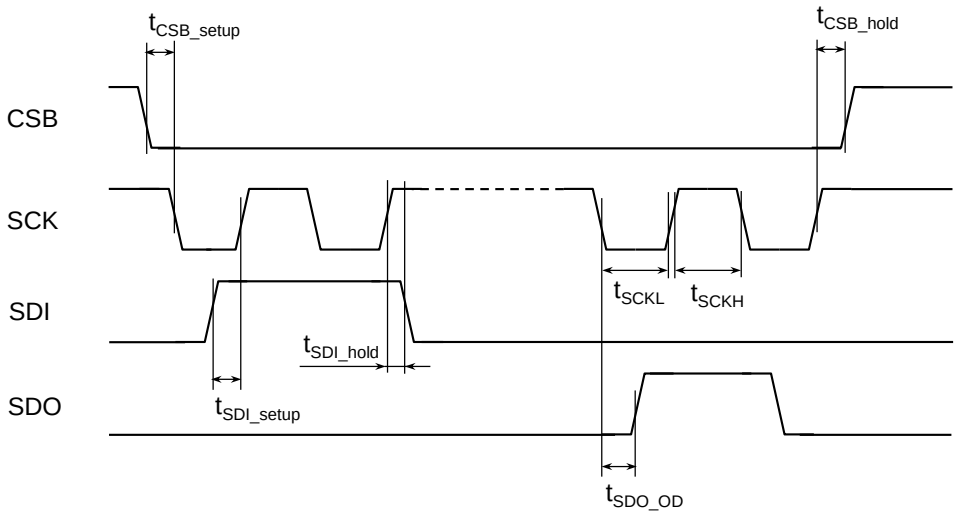
SPI Specification

Table 8: SPI Timing Specification

Parameter	Symbol	Minimum	Maximum	Unit
SCK clock frequency	f_{SCK}	—	10	MHz
SCK clock low pulse	t_{SCKL}	20	—	ns
SCK clock high pulse	t_{SCKH}	20	—	ns
SDI setup time	t_{SDI_setup}	20	—	ns
SDI hold time	t_{SDI_hold}	20	—	ns
SDO/SDI output delay	t_{SDO_OD}	—	30 (25pF) 40 (250pF)	ns
CSB setup time	t_{CSB_setup}	20	—	ns
CSB hold time	t_{CSB_hold}	40	—	ns

Figure 14: SPI Timing Diagram



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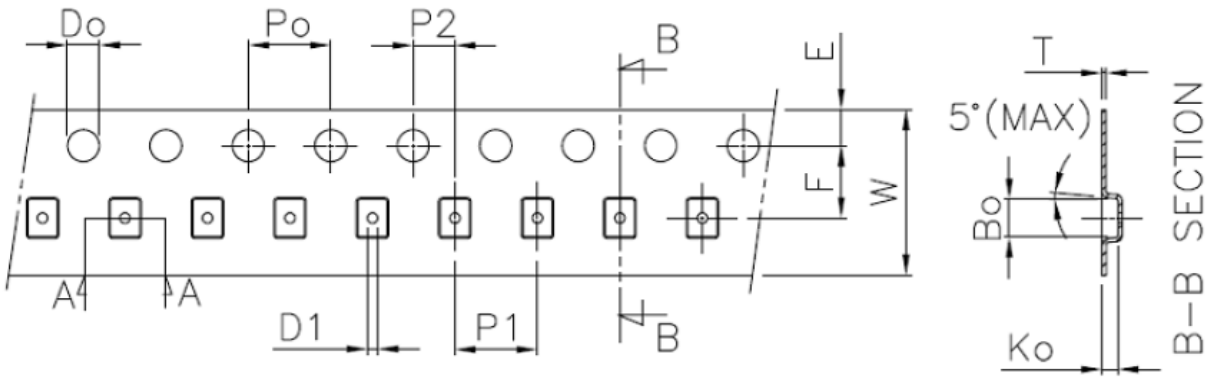
5. Packaging

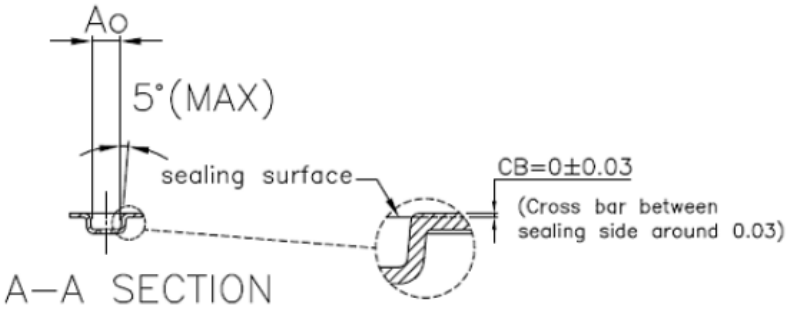
5.1 Configuration of shipment

Packaging	Embossed Carrier Tape
Quantity	5000 pcs / 1 reel 1 reel / 1 Interior box Max. 7 Interior boxes / 1 exterior box
Reel	13 寸
Insert method	see below

5.2 Taping

Tape Specification： Tape Outline Drawing





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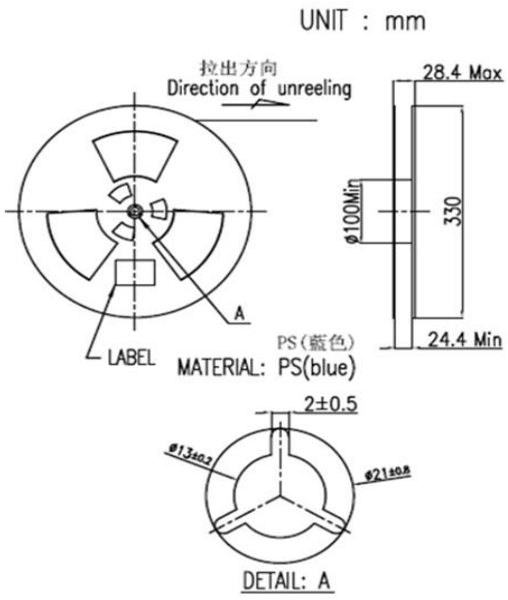
Tape Dimension

Symbol	Dimension (mm)
A_0	2.35±0.1
B_0	2.85±0.1
K_0	1.25±0.1
P_0	4.0±0.1
P_1	8.0±0.1
P_2	2.0±0.05
T	0.3±0.05
E	1.75±0.1
F	5.5±0.05
D_0	1.5+ 0.1/-0
D_1	Min. 1.5
W	12.0±0.3

5.3 Reel



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6. Precautions

(1) General

1) Please use QST products in compliance with usage conditions including rating and performance.
2) Please confirm fitness of QST products in your application and use your own judgment to determine the appropriateness of using them in such application. QST shall not warrant the fitness of QST products in customer application.
3) Please confirm that QST products are properly wired and installed for their intended use in your ove rall system.
4) When using QST products, please make sure to (i) maintain a margin of safety vis-à-vis the publish ed rated and performance values, (ii) design to minimize risks to customer application in case of failur e of QST products, such as introducing redundancy, (iii) introduce system-wide safety measures to n otify risks to users, and (iv) conduct regular maintenance on QST products and customer application.
5) QST products are designed and manufactured as general-purpose products for use in general indust rial products. They are not intended to be used in the following applications. If you are using QST products in the following applications, QST shall not provide any warranty for such QST products.
   a) Applications with stringent safety requirements, including but not limited to nuclear power control e quipment, combustion equipment, aerospace equipment, railway equipment, elevator/lift equipment, amusement park equipment, medical equipment, safety devices and other applications that could cause danger/harm to people's body and life
   b) Applications that require high reliability, including but not limited to supply systems for gas, water and electricity, etc., 24 hour continuous operating systems, financial settlement systems and other applications that handle rights and property
   c) Applications under severe condition or in severe environment, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic i nterference and equipment exposed to vibration and shocks
   d) Applications under conditions and environment not described in specification
6) In addition to the applications listed from (a) to (d) above, QST products are not intended for use in automotive applications (including two wheel vehicles). Please do NOT use QST products for autom otive applications. Please contact QST sales staff for products for automotive use.

(2) Handling

1) Only air can be used as pressure media on the product directly. It is prohibited to use pressure media including corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases), fluid and any other foreign materials.
2) The products are not water proof. The product shall be kept dry in use excluding the sensor port.
3) The product shall not be used under dew-condensing conditions. Frozen fluid on sensor chips may cause fluctuation of sen-sor output and other troubles.
4) The product shall be used within rated pressure. Usage at pressure out of the range may cause breakage.
5) The product may be damaged by static electricity. Charged materials (e.g. a workbench and a floor) and workers should pro-vide measures against static electricity, including ground connection.
6) The product shall not be dropped and handled roughly.
7) The product shall not be used under dusty or damp condition.
8) Do not wash the print circuit board after the pressure sensor is mounted using solvent. It may cause a mal-function.
9) Please connect the sensor terminals according to the connection diagram.
10) The product shall not be used under high-frequency vibration including ultrasonic wave.
11) This product uses the elastic adhesive for bonding the lid, so do not add excessive stress to the lid.
12) If soldering is not fit, then this product may catch fire or get hot.
13) There is a possibility that the peripheral circuit board or some electronic part generates heat while driving this product. Please handle with care.
14) Do not tear down this product.
15) Please do not use the sensor after following case;
    - excessive shock added to the terminal of the sensor
    - the sensor lid decapped
    - the sensor dropped
16) If you use other conditions described in this document, please check yourself in advance.

(3) Environmental conditions for transport and storage

1) The product shall not be kept with corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases).
2) The products are not water proof. The product shall be kept dry during storage.
3) The outer box strength may be degraded depending on the storage conditions. Please use the product in order.
4) For this product, please keep away from direct sunlight or ultraviolet rays.
5) The product shall be kept in appropriate conditions of temperature and humidity.
6) The product shall not be kept under dusty or damp condition.

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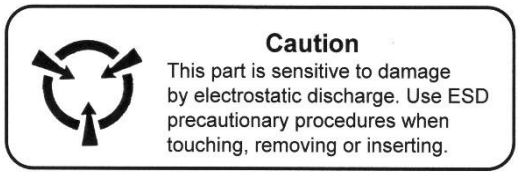
ORDERING INFORMATION

Ordering Number	Temperature Range	Package	Package
QMP6989-TR	-40℃~85℃	LGA	Tape and Reel: 5000 pieces/reel



CAUTION: ESDS CAT. 1B

FIND OUT MORE

For more information on QST's Accelerometer Sensors contact us at 86-21-50497300.

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ISO9001 : 2008

China Patents 201510000399.8, 201510000425.7, 201310426346.3, 201310426677.7, 201310426729.0, 201210585811.3 and 201210553014.7 apply to the technology described.

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