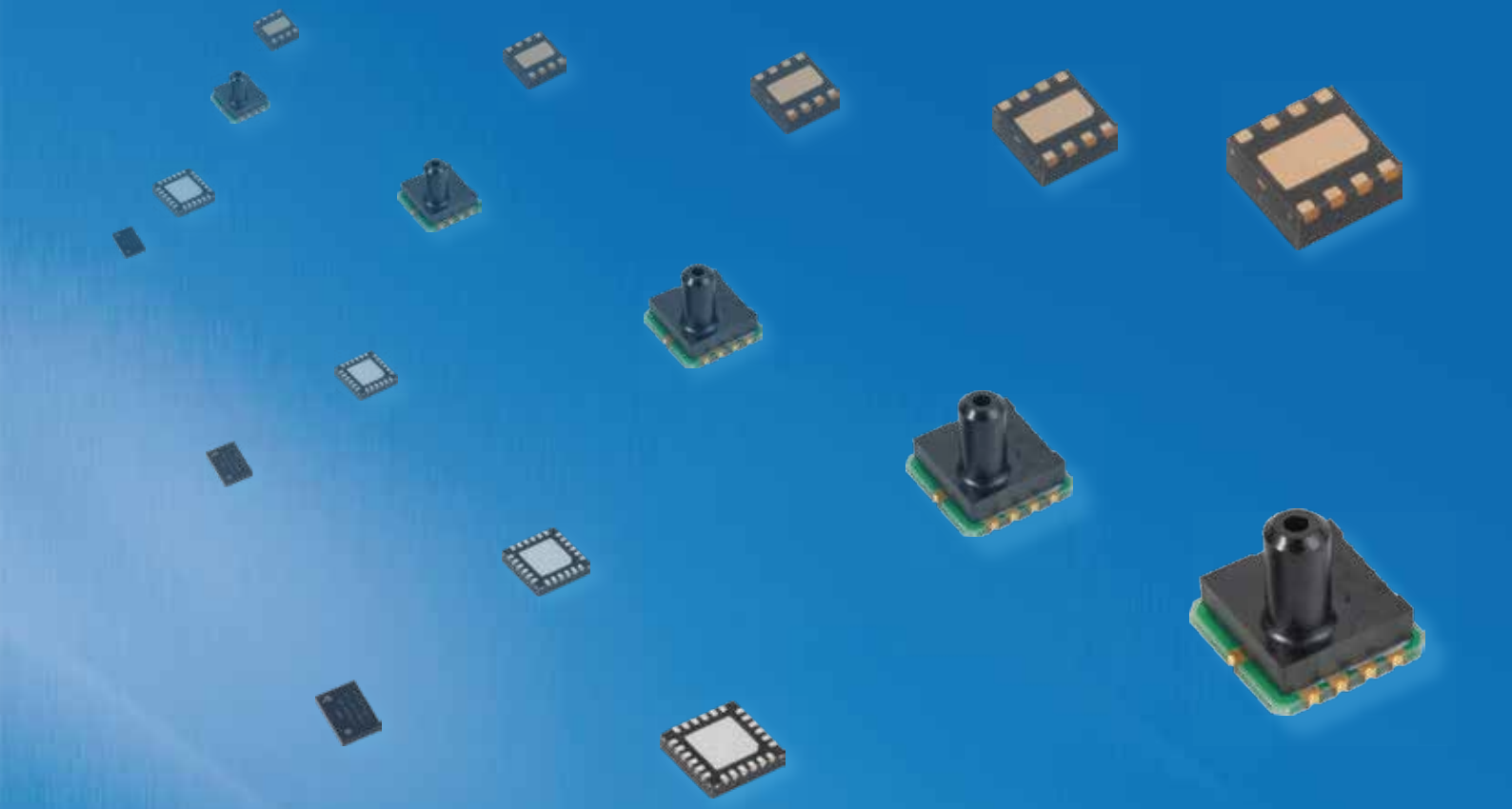
MinebeaMitsumi Inc.

MITSUMI

IC selection guide (Sensor ICs)

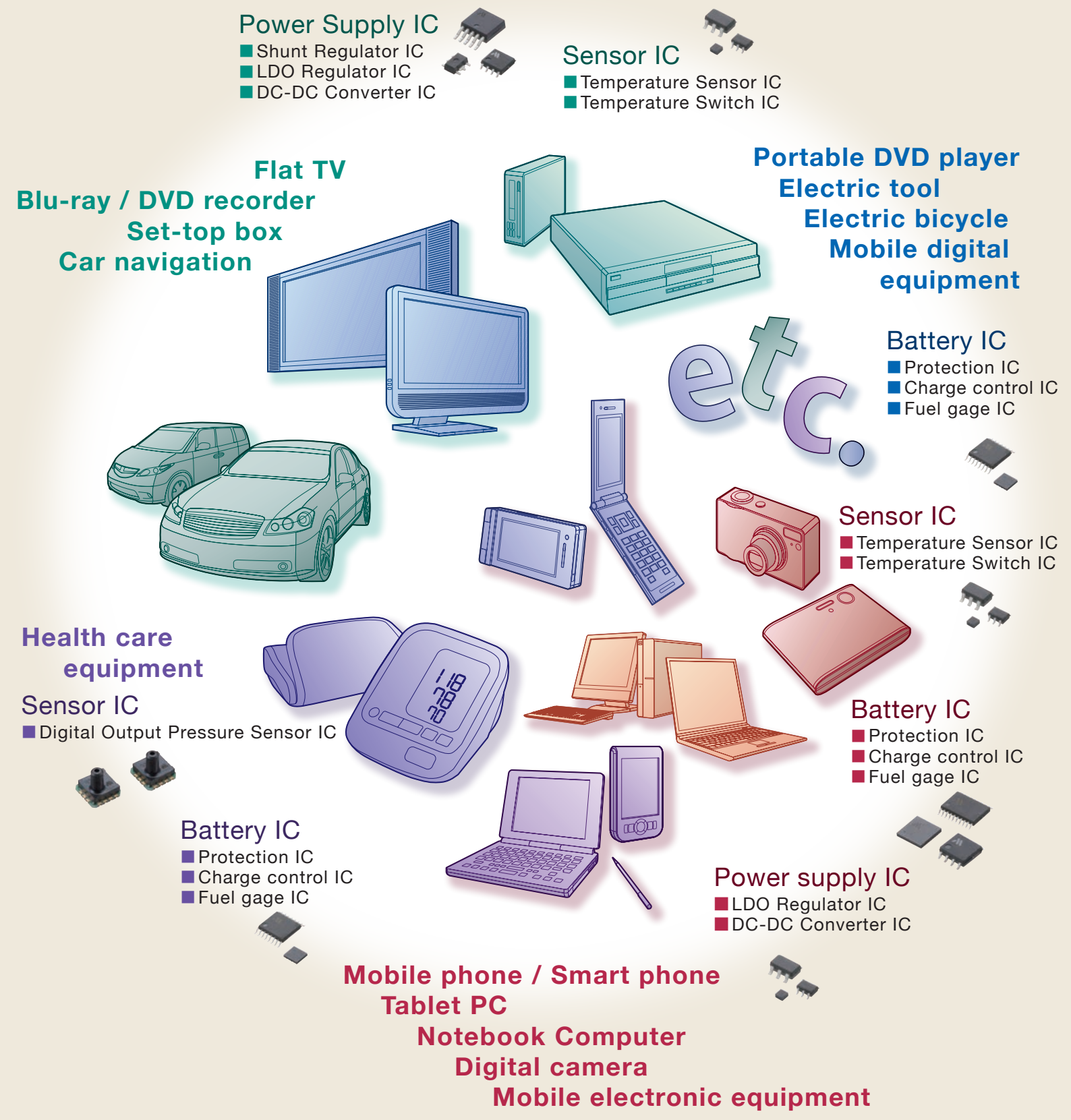
2019–2020



This catalog shows only outline specifications. When using the products, please obtain formal for specification supply.

English

MinebeaMitsumi's ICs implement high characteristics, high function, space saving, and low power consumption. They provide their optimum performance to meet various requirements.



1

SECONDARY BATTERY IC

- Various types of battery IC for single cell to multy–cells are lined up. They are applicable to various devices from mobile gadgets to Electric bicycle.
- The battery IC is provided with a high detection accuracy and abundant functions, enabling safe battery charging and protection.
- MITSUMI's Fuel Gauge IC achieves safe and effective use of batteries by detecting the battery level.

2

POWER SUPPLY IC

- The regulator IC lineup is available with an output current of 150mA to 1.5A. Suited to various applications with a range of products offering features such as high–precision and low consumption current.
- DC–DC converter ICs are available in step–up/step–down/ inversion type variations. Delivers high–efficiency, high–precision output over a wide input voltage range.

3

SENSOR IC

- The sensor IC is characterized by high detecting temperature accuracy and low current consumption. Digital pressure sensors are being developed by MEMS technology.
- The sensor IC is applicable to various applications through abundant rank expansion and I^2C BUS intended interface.

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IC LINEUP

1 SECONDARY BATTERY ICs

Protection for lithium-Ion batteries

				PLP-4D	PLP-4E	PLP-4-1228	PLP-6G	PLP-6J	PLP-10A	SON-6C	SON-6F	SOT-26A	SOT-26B	SSON-6A	SSON-6E	SSON-6J	SSON-6K	SSON-6M	SSON-6N	SSON-8F	SSON-8G	TSOP-8A	TSOP-16B	TSOP-20D	VSOP-20A	VSOP-24A	WLCSP-6B	WLCSP-6C	WLCSP-10A
For 1 cell	Small package	Built-in delay timer	MM3280							●		●	●		●	●	●												
		Built-in delay timer	MM3511							●				●		●														
		High accuracy current detection	MM3638							●						●														
		Temperature detection	MM3645																			●								
		Multi overcurrent protection	MM3721							●						●														
		High accuracy short detection	MM3722							●						●														
		High accuracy overcharge precision	MM3723																								●			
		High accuracy overcharge precision	MM3724							●						●														
		High accuracy overcharge precision	MM3725, MM3726							●						●		●												
		N channel high side FET drive	MM3746																											●
		High accuracy overcharge detection	MM3855																	●	●									
		Multi overcurrent protection	MM3856							●						●		●												
		Very high accuracy current detection	MM3860								●					●		●												
	Built-in FET	Low on state resistance 10.6mΩ	MC3002	●																										
		On state resistance 13.4mΩ	MC3011	●																										
		Super small package	MD1421ExxCPAL			●																								
		Wearable	MC3651		●																									
		Very low current consumption	MC3761					●																						
		Customization by OTP	MJ3401				●																							
		Customization by OTP	MJ3542																●											
For 2 cells		Built-in delay timer	MM3220									●																		
		Built-in delay timer	MM3766										●																	
For 3 cells		Delay time set by external capacitor	MM3783																				●							
For 3 to 5 cells		Delay time set by external capacitor	MM3474																					●						
		Built-in delay timer	MM3575																							●				
		Delay time set by external capacitor	MM3684																							●				
		Delay time set by external capacitor	MM3694																							●				
For 4 to 7 cells		Built-in delay timer	MM3877																						●					
For secondary protection		For 1 cell	MM3734							●																				
		For 2 to 4 cells with latch function	MM3508A									●		●																
		For 2 to 4 cells without latch function	MM3508B									●		●																
		For 2 to 3 cells with terminal CT	MM3508C									●		●																
		For 1 to 3 cells	MM3563									●		●																
		For 3–4 cells with RTC control function	MM3625						●																					

Voltage Monitering IC for li-ion battery

			PLP-6H	PLP-8G	PLP-8H	SOT-25A
Voltage monitoring	Protection EEPROM	MW3790		●		
	Protection	MW3793			●	
	Monitering	MM3757	●			

		SOT-25A
Cell balance control	MM3513	●

Fuel gauge IC for li-ion battery

			PLP-8F	PLP-10D	PLP-12A	PLP-12B	WLCSP-9A
For 1 cell	High accurach	Battery degradation judgment	MM8013			●		
		Super low consumption	MM8013W				●	
		Small package	MM8033		●			●
			MM3556	●				

Lithium–ion battery charge control ICs

			SSON-6E	SSON-10A	WLCSP-25A	SQFN-32A	WLCSP-48B
For 1 cell	Single function	Linear charger	MM3458		●			
			MM3635		●			
			MM3835W		●			
			MM3658		●			
			MM3865	●				
	Built-in System path	Linear charger	MM3538			●		
		Switching charger	MM3439				●	
			MM3539					●

2 POWER SUPPLY ICs

Voltage regulator ICs

			HSOP-8E	HSOP-8A	PLP-4C	PLP-6C	PLP-8E	SC-82ABB	SOT-25A	SOT89-5A	SSON-6A	SSON-6E	TO-252C	TO-252-5A
Less than 150mA LDO regulators	Reverse current protection	MM3376						●	●					
	Low current consumption	MM3534						●	●					
		MM3755			●									
Less than 200mA LDO regulators	Rush current protection	MM3411						●	●					
		MM3763			●									
	Capacitorless, ultralow quiescent current	MM3566						●	●					
		MM3866			●									
	15V withstand voltage	MM1836							●					
		MM1856						●	●					
	16V withstand voltage	MM1839							●			●		
	Low noise, Negative output voltage	MM1898							●		●			
Less than 300mA LDO regulators	Rush current protection	MM3571						●	●	●				
		MM3871			●									
	Thermal shoutdown circuit	MM3608							●					
	15V withstand voltage	MM1886							●	●				
	Low noise	MM1899							●		●			
Less than 500mA LDO regulator	Soft start function	MM3526							●	●	●			
		MM3478								●				
Less than 1000mA LDO regulators	15V withstand voltage	MM1877		●										
	Soft start function	MM3529								●	●			
		MM3479								●				
	Soft start function	MM3702								●				
		MM3703	●							●	●			
Less than 1500mA LDO regulator	Low output voltage	MM1870		●										●
Less than 150mA 2–channel LDO regulator		MM3548				●								
Less than 300mA 2–channel LDO regulator		MM3549					●							

IC LINEUP

Shunt regulators

			SC82ABB	SOT-23A	SOT-25A
Adjustable shunt regulator	Vref 2.495V	MM1431	●	●	●
	Vref 1.240V / 1.250V/1.270V	MM1530	●	●	

DC–DC converters

				HSOP-8A	HSOP-8C	SOP-8D	SOT-26B	SQFN-16A	SQFN-16B	SQFN-24A	SSON-6L	SSON-8E	TSOP-20E
Boost	Built–in powerFET	100mA	MM3333				●						
		200mA	MM3355			●							
Buck	Output 1ch	Synchronous rectification	3A	MM3370	●									
		Diode rectification	0.6A	MM3472							●		
			1.0A	MM3617							●		
			2A	MM3542BF			●						
			3A	MM3543BH		●							
			2.5A	MM3630BV									●
			1.5A	MM3630BR						●			
			0.9A	MM3690ARBE								●	
	External power FET		20A	MM3736BRLE					●				
Inverter	Charge pump			MM3558				●					
Double buck	Output 2ch + LDO			MM3631			●						

AC–DC converters

				SOP-8D	SOP-8J	SOP-10A
Primary–side	QR controller		MM3661			●
	PWM controller		MM3663		●	
Secondary–side	Synchronous rectifier	QR	MM3667		●	
		LLC	MM3669AF			●

LED lighting ICs

				SOT-25A	SOP-8C	SOP-8D	SOP-10A
DC Input		White LED driver 7 LEDs	MM3097	●			
AC Input	Isolated	Including PFC 1 convertor for flyback	MM3460			●	
		Dual OPAMP and shunt regulator	MM1837		●		
	Non–isolated	Triac dimmer power control	MM3760				●

Reset ICs (Voltage detectors)

				PLP-4A	SC-82ABB	SOT-23A	SOT-25A	SSON-4B
No delay function	Active-low	CMOS output			IC-PST81	●	●	●	●	●
		Open drain output			IC-PST82	●	●	●	●	●
		Open drain output			IC-PST86	●	●	●	●	
Separated sense line	Active-low	CMOS/Open drain output			PST851A, PST852A	●	●	●	●	●
		CMOS/Open drain output	Built-in delay function		PST853A, PST854A				●	
Delay function included (external capacitor)	Active-low	CMOS output			IC-PST83	●	●	●	●	●
		Open drain output			IC-PST84	●	●	●	●	●
		CMOS/Open drain output			PST893A, PST894A	●	●	●	●	
			High accuracy		PST893B, PST894B		●	●	●	
			With manual reset		PST893R, PST894R				●	
Built-in delay function	Active-low	CMOS output			PST87		●	●	●	●
					PST88		●	●	●	●
		Open drain output			PST807, PST809			●		
					PST803, PST805			●		
	Active-high	CMOS output			PST808, PST810			●		
		Open drain output			PST804, PST806			●		

3 SENSOR ICs

Temperature sensor ICs

				PLP-4A	SC-82ABB	SOT-25A	SOT-26A	SSON-4B
Detection output type (Temperature switch IC)		Active-high		MM3488					●
	Ultra low current consumption	Active-high		MM3688	●				
Sensor type	Analog output			MM3154		●			●
	I^2C BUS digital output (Adress set pin2)			MM3285			●	●	

Pressure sensor

Pressure sensor of digital output		MMR901XA	*Original package
	Low supply voltage	MMR902	
	Small package	MMR906	

Absolute Pressure sensor module

Absolute Pressure Sensor Module	MMR931XA	*Original package

AC current sensor

AC current sensor	Operational amplifier with a built-in spiral inductor	MM1969	SOP-8G

Flame detection amplifier

			SOP-8D
Flame detection sensor	Contains a comparator	MM1217	●
	Dual amplifiern	MM1278	●

Analog signal convert IC

Analog Front End IC	MM3609	PLP-24

3 SENSOR ICs

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

Temperature switch IC

Product name	Type	Operating temperature	Operating supply voltage	Detection temperature range	Temperature detection accuracy	Current consumption (typ.)	Package
MM3488	hysteresis	–30 to +105°C	1.6V to 5.0V	60 to 90°C (1.0°C step)	±2.0°C	1.5μA	SSON–4B
MM3688	hysteresis, Low current consumption	–40 to +125°C	1.6V to 5.0V	60 to 90°C (1.0°C step)	±2.0°C	0.12μA	PLP–4A

Analog output temperature sensor IC

Product name	Temperature sensitivity	Operating temperature	Operating supply voltage	Temperature detection accuracy	Current consumption (typ.)	Package
MM3154	-8.20mV / °C	–40 to +100°C	2.4V to 6.5V	±2.5°C (–30 to +100°C)	2.5μA	SC–82ABB SSON–4B

Digital output temperature sensor IC

Product name	Temperature resolution	Operating temperature	Operating supply voltage	Temperature detection accuracy	Current consumption (typ.)	Package
MM3285	0.5°C	–40 to +120°C	3.0V to 5.5V	±2.0°C (–25 to +100°C) ±3.0°C (–40 to +125°C)	75μA	SOT–25A SOT–26A

Pressure sensor

Product name	Operating supply voltage	Pressure medium	Pressure detecting method	Operating pressure range	Accuracy	Package
MMR901XA	2.4V to 3.6V	Air (no condensation)	Piezoresistive method	0 to 300mmHg	±2mmHg (266Pa)	7.0(W)×7.0(D)×7.2(H)mm
MMR902	1.7V to 3.6V	Air (no condensation)	Piezoresistive method	–10 to +330mmHg	±2mmHg (266Pa)	7.0(W)×7.0(D)×7.2(H)mm
MMR906 NEW	1.7V to 3.6V	Air (no condensation)	Piezoresistive method	–10 to +330mmHg	±2mmHg (266Pa)	5.0(W)×6.0(D)×7.2(H)mm

Absolute Pressure Sensor Module

Product name	Operating supply voltage	Pressure medium	Pressure detecting method	Operating pressure range	Accuracy	Package
MMR931XA NEW	1.7V to 3.6V	Air (No condensation)	Piezoresistive method	30K to 110KPa	±100Pa	3.0(W)×3.0(D)×1.1(H)mm

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

AC current sensor

Product name	VCC operating voltage	Operating temperature	Current consumption (typ.)	Current consumption (standby)	Output current	Package
MM1969 NEW	3.3V to 5.5V	–40 to +85°C	0.8mA	2μA Max. (VCC=3.3V)	1mA	SOP–8G

Flame detection amplifiers

Product name	Characteristic	Power supply voltage	Current consumption (typ.)	amplifier section Input voltage range	amplifier section Input offset voltage	Gain	Package
MM1217 NEW	Contains a comparator	1.8V to 6.0V	0.1mA	–0.2 to 0.3V	±0.1mV Typ.	100dB Typ.	SOP–8D
MM1278 NEW	Dual amplifier	1.8V to 6.0V	0.1mA	–0.2 to 0.3V	±0.1mV Typ.	100dB Typ.	SOP–8D

Analog signal convert IC

Product name	Power supply voltage	Operating temperature	Current consumption (typ.)	Current consumption (standby)	Effective resolution	Data output rate	Package
MM3609 NEW	VDD33 1.71 to 3.6V VDD33 1.14 to 3.6V (Typ.3.3V)	–40 to +85°C	540μA	1μA Max.	Up to 22bits	20Hz to 2,560Hz	PLP–24

3 SENSOR ICs

Temperature switch IC with hysteresis

MM3488 Series

Outline

This IC is a temperature switch IC that changes the IC output level from Low to High when the temperature around the IC reaches the detection temperature. With the hysteresis function, IC output level returns to Low when the ambient temperature drops to the hysteresis temperature selected after detection. Detection temperature (TDET) can be selected in 1.0°C steps between the range of 60 to 90°C with rank expansion, with detection temperature accuracy of ±2.0°C.

Features (Unless otherwise specified, Ta=+25°C)

(1) Low current consumption ..... 1.5μA typ.
(2) Small package SSON–4B
(3) High Temperature accuracy ..... ±2.0°C
(4) Low power supply operation range ..... 1.6V to 5.0V
(5) Comes with hysteresis function

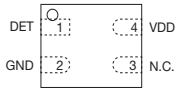
Applications

(1) Smart phones, Mobile phones
(2) Flat TVs
(3) Portable games
(4) Tablet PCs, PCs
(5) System temperature monitoring
(6) Office automation equipment

Pin assignment

SSON–4B

(Top view)



Pin no.	Symbol	Function
1	DET	Temp. Detect output pin
2	GND	Ground pin
3	N.C.	Non connection (Testing pin)
4	VDD	Power supply pin

Note1 : Testing pin is connected with the internal circuit for testing.
When resistance and capacity are connected with Testing pin, this product produce improper operating signals. Please set Testing pin to the open state.

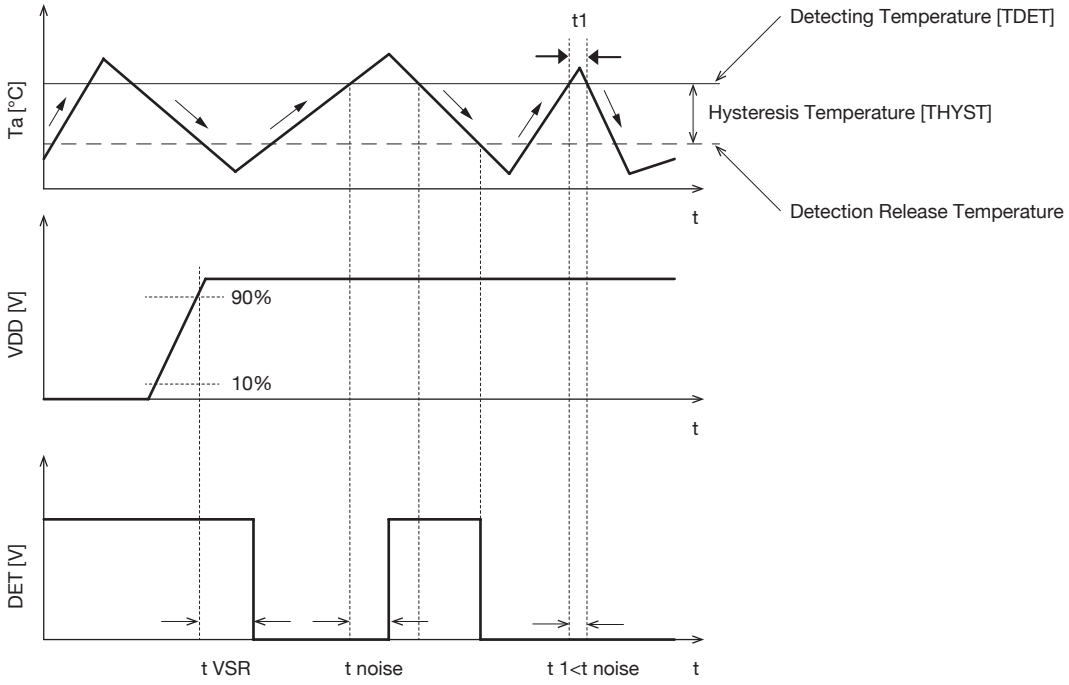
Model name structure

M M 3 4 8 8 □ □ □ R □ E

1 2 3 4

1		2		3		4	
Hysteresis Temperature (THYS)		Detecting Temperature (TDET)		Package		Packing Specifications	
A	THYS=5.0°C	60	TDET=60°C	R	SSON–4B	R	R HOUSING
B	THYS=10°C	|	TDET is 1.0°C steps	-	-	L	L HOUSING
C	THYS=15.0°C	90	TDET=90°C	-	-	-	-

Timing chart



3 SENSOR ICs

Temperature switch IC with hysteresis

MM3688 Series

Outline

This IC is a temperature switch IC that changes the IC output level from Low to High when the temperature around the IC reaches the detection temperature. With the hysteresis function, IC output level returns to Low when the ambient temperature drops to the hysteresis temperature selected after detection. Detection temperature T_{DET} can be selected in 1.0°C steps between the range of 60 to 90°C with rank expansion, with detection temperature accuracy of ±2.0°C.

Features (Unless otherwise specified, Ta=+25°C)

(1) Low current consumption ..... 0.12μA typ.
(2) Small package..... PLP–4A
(3) High Temperature accuracy ..... ±2.0°C
(4) Low power supply operation range ..... 1.6V to 5.0V
(5) Comes with hysteresis function

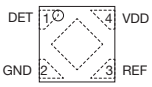
Applications

(1) Smart phones, Mobile phones
(2) Flat-TVs
(3) Game equipments
(4) Tablets, PCs
(5) System thermal monitor
(6) OA equipments

Pin assignment

PLP–4A

(Top view)



Pin no.	Symbol	Function
1	DET	Temperature detect output pin
2	GND	Ground pin
3	REF	REF pin (Testing pin)
4	VDD	Power supply pin

Note1 : Testing pin is connected with the internal circuit for testing.
When resistance and capacity are connected with Testing pin, this product produce improper operating signals. Please set Testing pin to the open state.

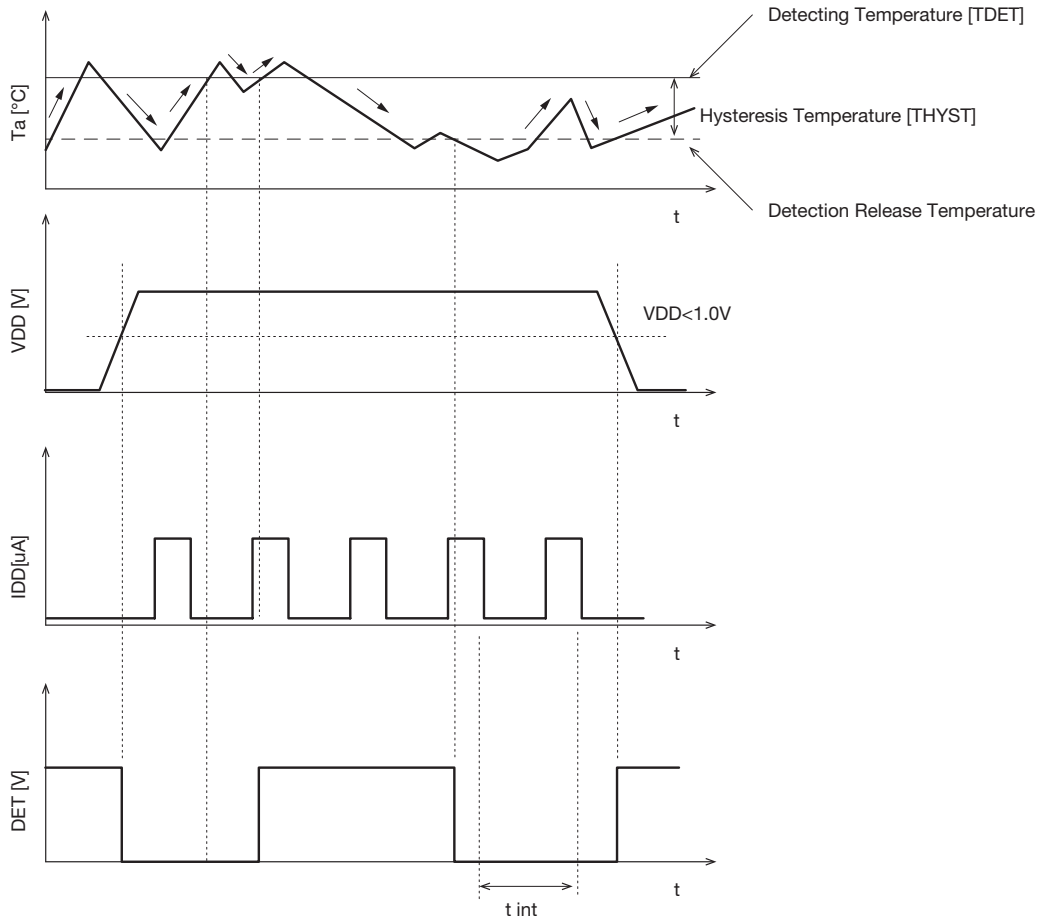
Model name structure

M M 3 6 8 8 □ □ □ R R E

1 2 3 4

1		2		3		4	
Hysteresis Temperature (T_{HYS})		Detecting Temperature (T_{DET})		Package		Packing Specifications	
B	T_{HYS}=10°C	60	T_{DET}=60°C	R	PLP–4A	R	R HOUSING
C	T_{HYS}=15°C	|	T_{DET} is 1.0°C steps	-	-	L	L HOUSING
D	T_{HYS}=20°C	90	T_{DET}=90°C	-	-	-	-
E	T_{HYS}=25°C	-	-	-	-	-	-

Timing chart



3 SENSOR ICs

High-accuracy temperature sensor

MM3154 Series

Outline

This IC is a high-accuracy temperature sensor IC that can linearly output the voltage in response to changes in temperature. The operating temperature range is -40°C to 100°C, and the operating supply voltage range is 2.4V to 6.5V. Compared to conventional thermistors and similar devices, it has superior linearity and a maximum temperature accuracy error of ±2.5°C. It is suitable for use in portable devices as the current consumption is as low as 4.5μA typ. (Ta = 25°C)

Features (Unless otherwise specified, Ta=+25°C)

(1) High temperature accuracy..... ±2.5°C
(2) Low current consumption ..... 4.5μA typ.
(3) Wide operating supply power voltage ..... 2.4V to 6.5V
(4) High input stability
(5) High load stability
(6) Temperature-output voltage high linearity

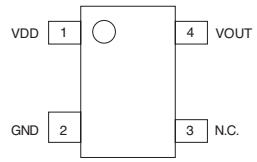
Applications

(1) Smart phones, Mobile phones
(2) Crystal oscillator modules
(3) Tablets, PCs
(4) Power modules
(5) Battery packs and chargers

Pin assignment

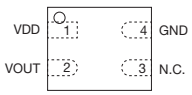
SC–82ABB

(Top view)



SSON–4B

(Top view)



Pin no.	Symbol	
	SC-82ABB	SSON-4B
1	VDD	VDD
2	GND	VOUT
3	N.C.	N.C.
4	VOUT	GND

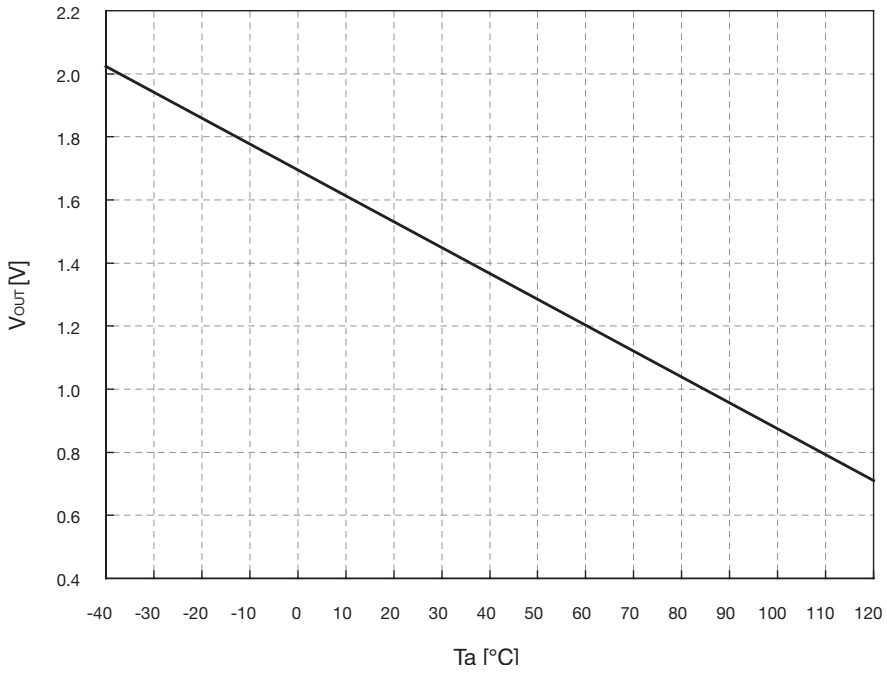
Model name structure

M M 3 1 5 4 X □ □ E □

1 2 3

1		2		3	
Package		Packing specifications		Halogen	
R	SSON-4B	R	R HOUSING	H	Halogen-free
U	SC-82ABB	L	L HOUSING	-	Not compliance

Output voltage vs Temperature



3 SENSOR ICs

Temperature sensor for I²C BUS

MM3285 Series

Outline

This IC is an I²C BUS compatible digital temperature sensor IC incorporating a temperature sensor and sigma-delta AD converter. It provides low current consumption and I²C BUS compatible interface, which makes it ideal for a wide range of applications.

Applications

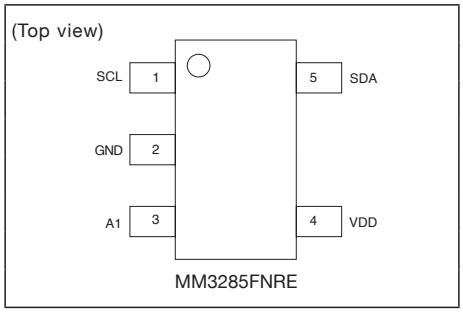
(1) Flat TVs
(2) Tablet PCs, PCs
(3) PC servers /network servers
(4) System temperature monitering
(5) Office automation equipments

Features (Unless otherwise specified, Ta=+25°C)

(1) Low voltage operation.....3.0V to 5.5V
(2) Low current consumption .....75μA typ.
(3) Temperature detection accuracy.....±2.0°C (–25°C to +100°C)
±3.0°C (–40°C to +125°C)
(4) Fast update of time .....2ms typ.
(5) Shutdown mode minimizing current consumption
(6) I²C BUS compatible interface
(7) Up to 4 ICs can be built into a bus
(8) Temperature data 9 bit resolution with a LSB equal to 0.5°C

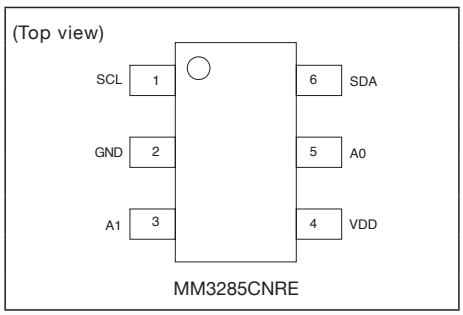
Pin assignment

SOT-25A



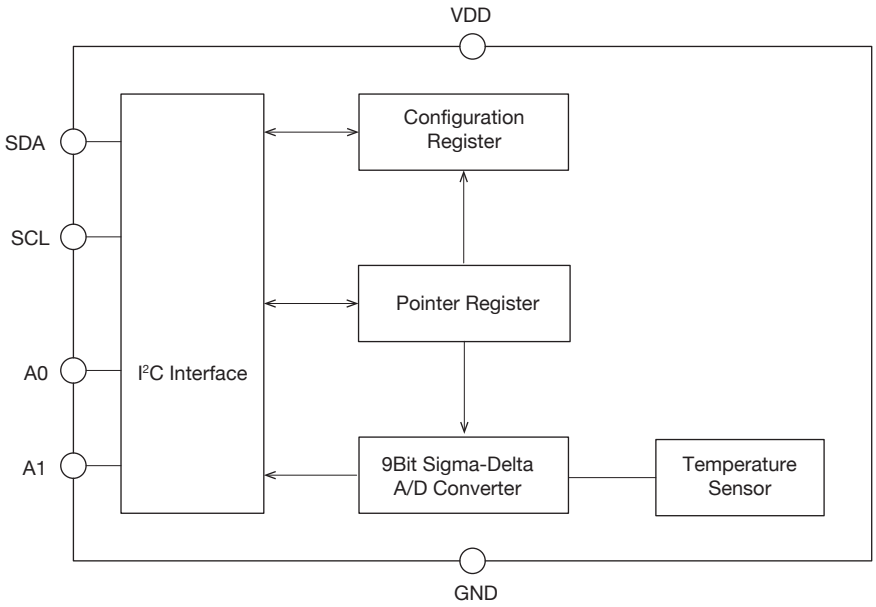
Pin no.	Symbol	Function
1	SCL	I²C BUS clock input pin
2	GND	Ground pin
3	A1	Slave address set pin
4	VDD	Power supply pin
5	SDA	I²C BUS data I/O pin

SOT-26A



Pin no.	Symbol	Function
1	SCL	I²C BUS clock input pin
2	GND	Ground pin
3	A1	Slave address set pin
4	VDD	Power supply pin
5	A0	Slave address set pin
6	SDA	I²C BUS data I/O pin

Block diagram



3 SENSOR ICs

Pressure Sensor of Digital Output

MMR901XA

Outline

This product is a compact piezoresistive pressure sensor that makes use of MEMS*1 technology.
It is equipped with a 16–bit resolution ⊿Σ AD converter and outputs a highly precise pressure value as a digital value.
As interface, an SPI*2 interface is used to communicate to a microcomputer.
Thanks to the builtin temperature sensor and EEPROM*3 data, the dedicated software running on the external microcomputer can correct the property fluctuation caused due to variation in temperature.

*1 MEMS : Micro-Electro-Mechanical Systems
*2 SPI : Serial Peripheral Interface
*3 EEPROM : Electronically Erasable and Programmable Read Only Memory

Applications

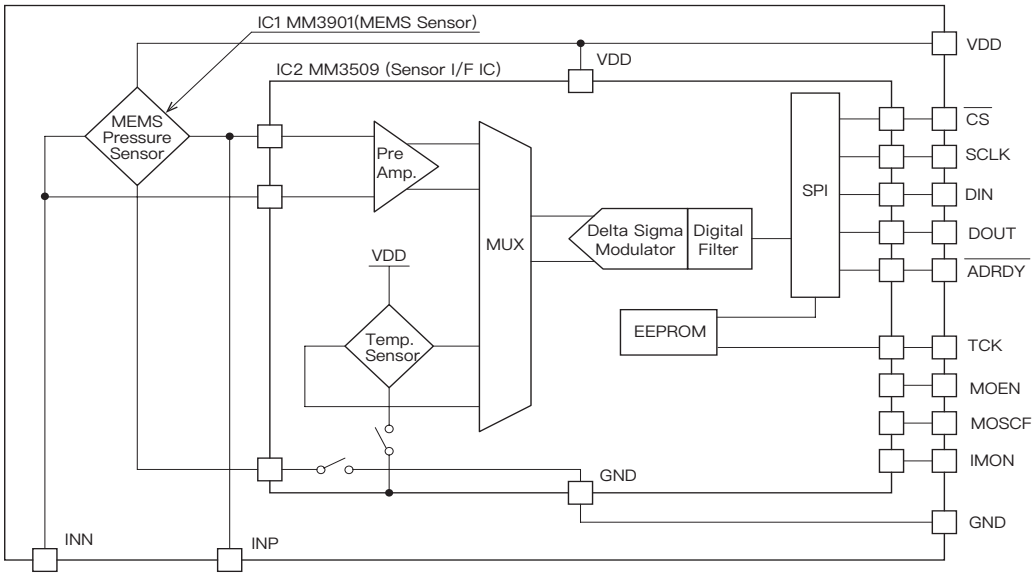
(1) for Sphygmomanometer

Features (Unless otherwise specified, Ta=+25°C)

(1) Small package..... 7.0 (W) ×7.0 (D) ×7.2 (H) mm
(2) Mounting of a ⊿Σ AD converter (16–bit resolution) allows the product to output a highly precise pressure value
(3) The built-in temperature sensor and correction data written on the EEPROM can correct the temperature
*Any calculation function is not built into the product.
(4) Data output rate suitable for detection of the pulsating waveforms synchronized with heart beats (approximately 200 Hz)
(5) Specifications

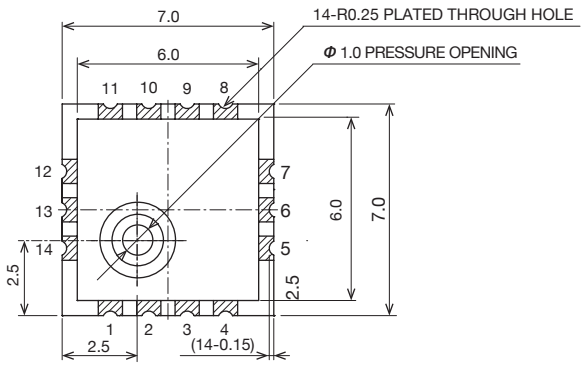
- Pressure type ..... Gauge pressure (Based on atmospheric pressure)
- Pressure medium ..... Air (no condensation)
- Pressure detecting method Piezoresistive method
- Maximum load pressure..... 80kPa (600mmHg)
- Operating pressure range .. 0.40kPa (300mmHg)
- Resolution ..... 3.3Pa(0.025mmHg)
- Accuracy ..... ±266Pa (±2mmHg)
- Power supply voltage range ... 2.4V, 3.6V (3.0V typ.)
- Current consumed when.....Max. 690μA pressure is measured
- Standby current consumption..... Max. 2μA
- Output type ..... 16–bit digital
- Conversion time 5.12msec
- Operating temperature range.... 5°C to 45°C

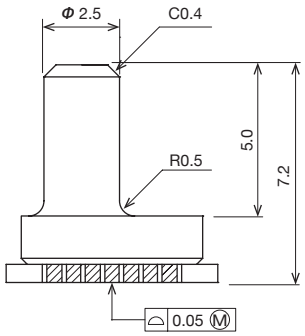
Block diagram

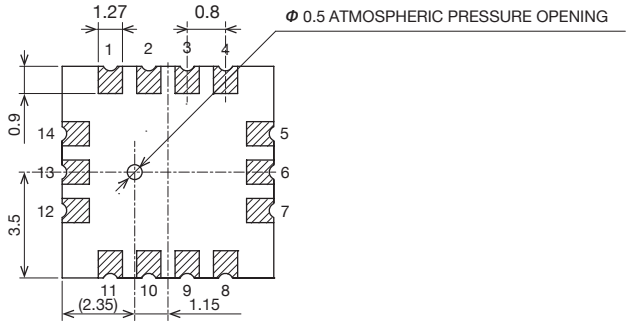


Dimensions

(Unit : mm)







3 SENSOR ICs

Low Supply Voltage, Digital Output Gage Pressure Sensor — MMR902

Outline

This product is a Gage pressure sensor which MEMS*1 Gage pressure sensor and AFE IC*2 are modularized. It digitally outputs a pressure value which was corrected in the module. Customers need no correction because it corrects and outputs the differences of sensors and temperature characteristics. It does not require complicated sensor drive or control circuit, and devices with high performance can be made only with this module and an external microcontroller which will be the host.

*1 MEMS : Micro-Electro-Mechanical Systems
*2 AFE IC : Analog Front End IC

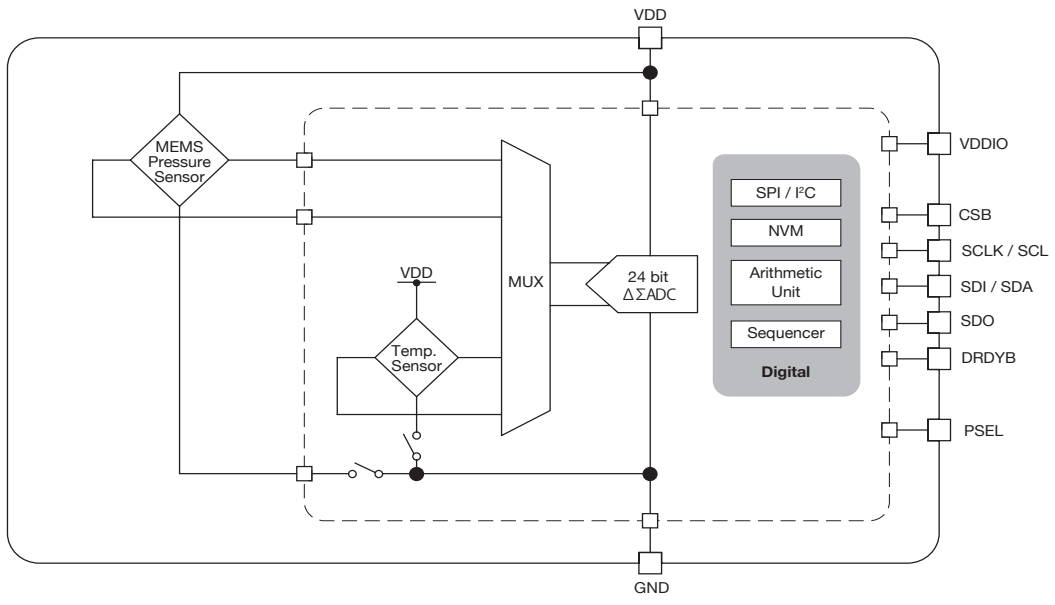
Applications

(1) Sphygmomanometer

Features (Unless otherwise specified, Ta=+25°C)

(1) Small package ..... 7.0 (W) ×7.0 (D) ×7.2 (H) mm
(2) It corrects the differences of sensors and temperature characteristics when shipped from our factor
(3) It digitally outputs pressure value by a built-in sequencer (SPI, I²C)
(4) Specifications
- Pressure type ..... Gage pressure (Based on atmospheric pressure)
- Pressure medium ..... Air (no condensation)
- Operating pressure range ..... −10 to +330mmHg (−1.33 to +43.99kPa)
- Pressure effective resolution .....0.040 / 0.028 / 0.020 / 0.005mmHgRMS
- Accuracy ..... ±2mmHg (266Pa)
- Power supply voltage range ..... 1.7V to 3.6V
- Conversion time ..... 3.91 / 7.81 / 15.625 / 250msec
- Current consumed when pressure is measured 650µA
- Standby current consumption 0.1µA
- Operating temperature range... 5 to 45°C

Block diagram

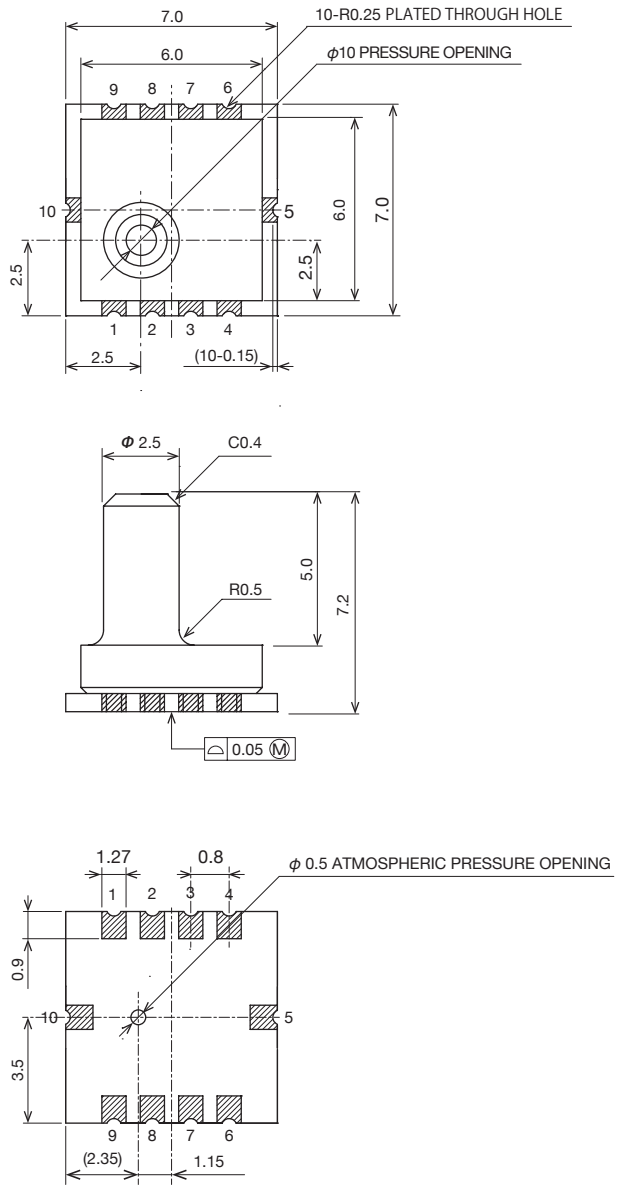


Lineup

Parts No.	Supply voltage	Current consumption	Operating pressure range	Package
MMR902A22A	2.2V typ.	575µA	−10 to +330mmHg	7.0(W) ×7.0(D) ×7.2(H)mm
MMR902A27A	2.7V typ.	605µA	−10 to +330mmHg	7.0(W) ×7.0(D) ×7.2(H)mm
MMR902A34A	3.4V typ.	650µA	−10 to +330mmHg	7.0(W) ×7.0(D) ×7.2(H)mm

Dimensions

(Unit : mm)



3 SENSOR ICs

Low Supply Voltage, Digital Output Gage Pressure Sensor

MMR906

Outline

This product is a Gage pressure sensor which MEMS*1 Gage pressure sensor and AFE IC*2 are modularized. It digitally outputs a pressure value which was corrected in the module. Customers need no correction because it corrects and outputs the differences of sensors and temperature characteristics. It does not require complicated sensor drive or control circuit, and devices with high performance can be made only with this module and an external microcontroller which will be the host.

*1 MEMS : Micro-Electro-Mechanical Systems
*2 AFE IC : Analog Front End IC

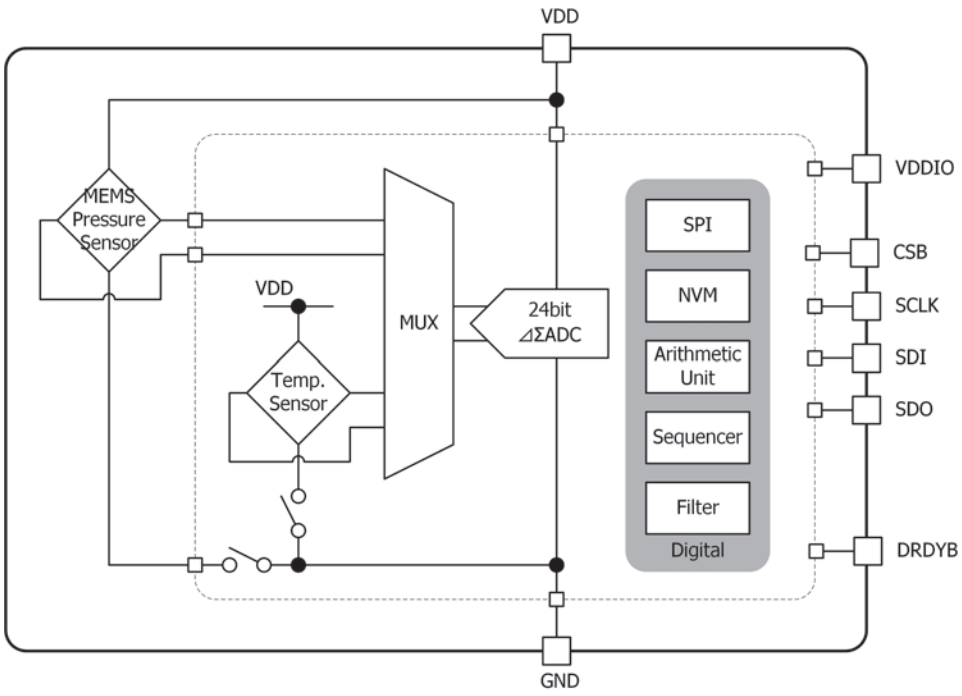
Applications

(1) Sphygmomanometer

Features (Unless otherwise specified, Ta=+25°C)

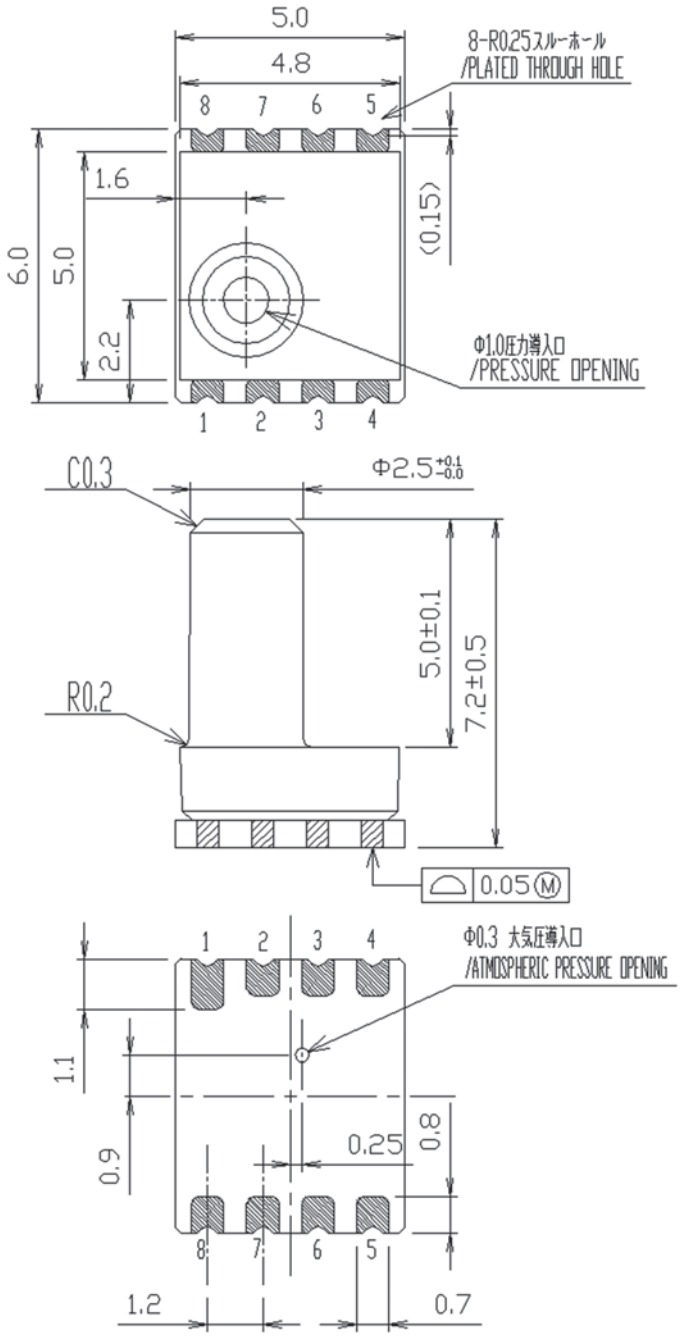
(1) Small package ..... 5.0 (W) ×6.0 (D) ×7.2 (H) mm
(2) It corrects the differences of sensors and temperature characteristics when shipped from our factor
(3) It digitally outputs pressure value by a built-in sequencer (SPI)
(4) Specifications
- Pressure type ..... Gage pressure (Based on atmospheric pressure)
- Pressure medium ..... Air (no condensation)
- Operating pressure range ..... −10 to +330mmHg (−1.33 to +43.99kPa)
- Pressure effective resolution .....0.050 / 0.035 / 0.025 / 0.007mmHgRMS
- Accuracy ..... ±2mmHg (266Pa)
- Power supply voltage range ..... 1.7V to 3.6V
- Conversion time ..... 4.07 / 7.92 / 15.625 / 247msec
- Current consumed when pressure is measured 640µA
- Standby current consumption 0.1µA
- Operating temperature range... 5 to 45°C

Block diagram



Dimensions

(Unit : mm)



3 SENSOR ICs

Absolute Pressure Sensor Module

MMR931XA

Outline

This product is an altitude atmospheric pressure sensor which MEMS absolute pressure sensor and AFE IC are modularized. It digitally outputs a pressure value which was corrected completely in the module.

Customers need no correction at all because it corrects and outputs the differences of sensors and temperature characteristics. It does not require complicated sensor drive or control circuit, and devices with high performance can be made only with this module and an external microcontroller which will be the host.

※1 MEMS : Micro–Electro–Mechanical Systems

Applications

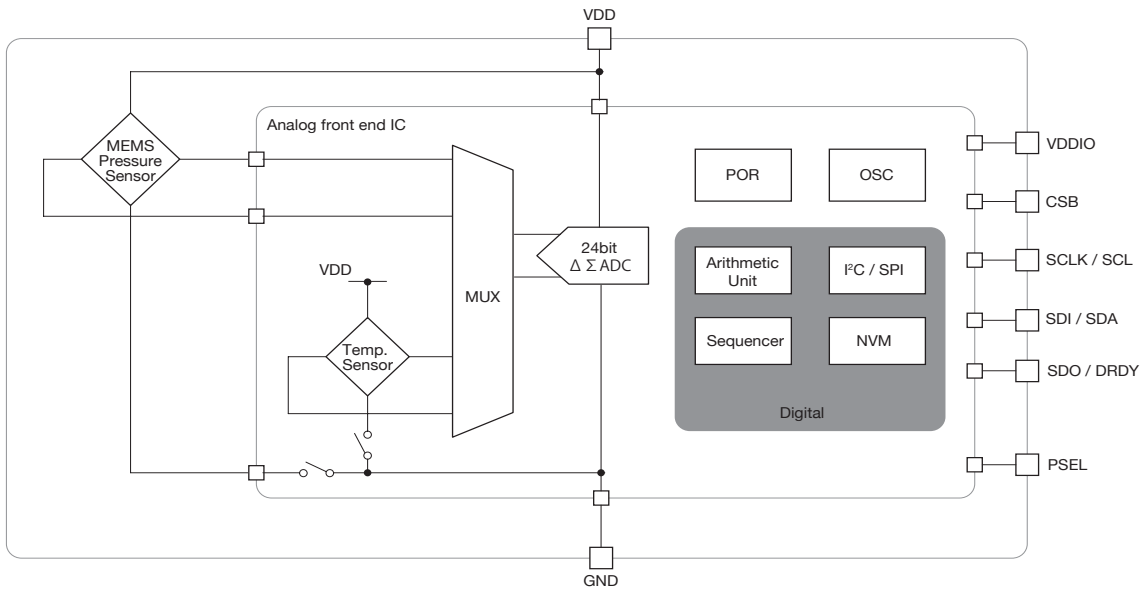
(1) Smartphone
(2) Wearable device
(3) Activity meter
(4) Drone

Features (Unless otherwise specified, Ta=+25°C)

(1) Small package..... 3.0 (W) ×3.0 (D) ×1.1 (H) mm
(2) It is able to measure atmospheric pressure from the altitudes of 0m to 9000m equivalent (from 30kPa to 110kPa)
(3) It has Performs high resolution of max 2.0Pa (0.17m)
(4) It corrects the differences of sensors and temperature characteristics when shipped from our factory (approximately 200Hz)
(5) It digitally outputs a corrected pressure value by a built–in sequencer (SPI, I²C)
(6) Specifications
- Operating voltage range..... VDD 1.7V (3.6V to 3.3V typ.)
  VDDIO 1.14V to 3.6V
- Operating temperature range ..... (-30°C to +85°C)
- Operating pressure range .. 30k to 110kPa
- Current consumption at 1sample *1
  2.4 / 3.8 / 10 / 28μA
- Current consumption at Shutdown
  I_{VDDsd} 0.1μA max.
  $I_{VDDIOsd}$ 0.2μA max.
- Pressure effective resolution... 17 / 7 / 3 / 2PaRMS *3
- Absolute accuracy pressure ... ±100Pa
- Conversion time *2 ..... 4.3 / 6.64 / 16.0 / 44.1msec

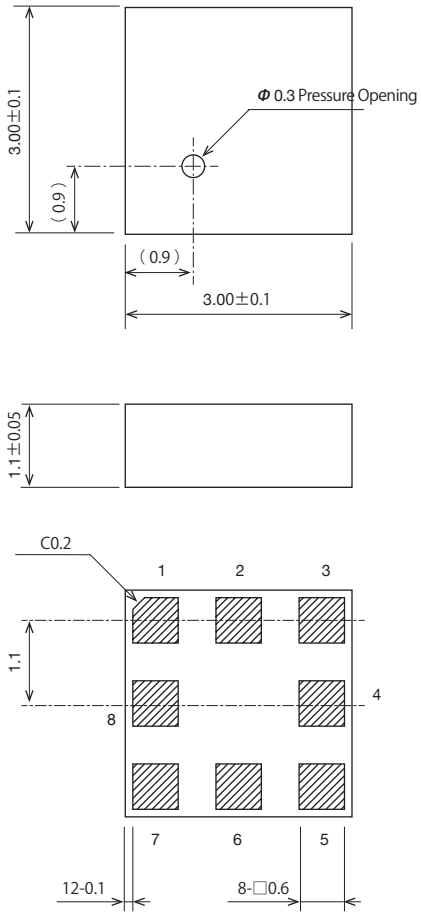
*1. The average of one sample per second.
*2. Time between issuance of command and completion of pressure measurement and calculation correction
*3. Any settings possible (consumption current, resolution and conversion time vary according to one another) corresponding to the application

Block diagram



Dimensions

(Unit : mm)



Caution

(1) The pressure medium which can use directly is only air. Please do not use other media, especially corrosive gases (organic solvent gas, sulfurous acid gas, hydrogen sulfide gas, etc.) and media which include moisture and foreign substance, since they could cause damages or malfunctions
(2) Please handle it noting the foreign body mixing with the pressure opening after opening packing
(3) Please do not put stress on the package. It could cause damages or malfunctions
(4) The light that enters from the pressure entrance reaches the semiconductor chip. Please avoid use in the environment that light enters into the pressure entrance directly, because the semiconductor chip might malfunction because of light

3 Sensor IC

Operational amplifier with a built-in spiral inductor

MM1969

Outline

MM1969 contains a low noise operational amplifier with a spiral inductor.
This inductor detects a magnetic field generated when AC current flows through the power line.
MM1969 amplifies the detected electromotive force with the built-in low noise operational amplifier (the gain can be set by changing external resistance), and transmits analog signals to an external ADC and microcontroller.

Features

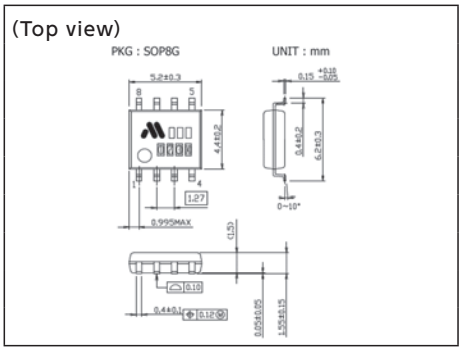
- VCC operating voltage ..... 3.0 to 5.5 V
- Output current ..... 1 mA
- Operating temperature range .. -40 to +85°C
- With standby mode control function
- Current consumption at standby ..... 2 µA (VCC = 3.3 V)
- An LPF of 17.5 kHz built in the spiral inductor suppresses high-frequency noise.

Application

(1) Power monitor
(2) Current detection of inverter, servo motor, and others
(3) Current detection in protection circuits and control circuits of various devices

Package

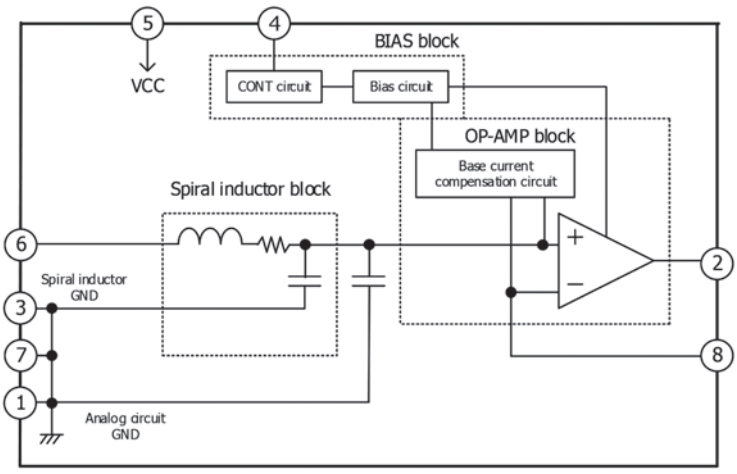
(Top view)



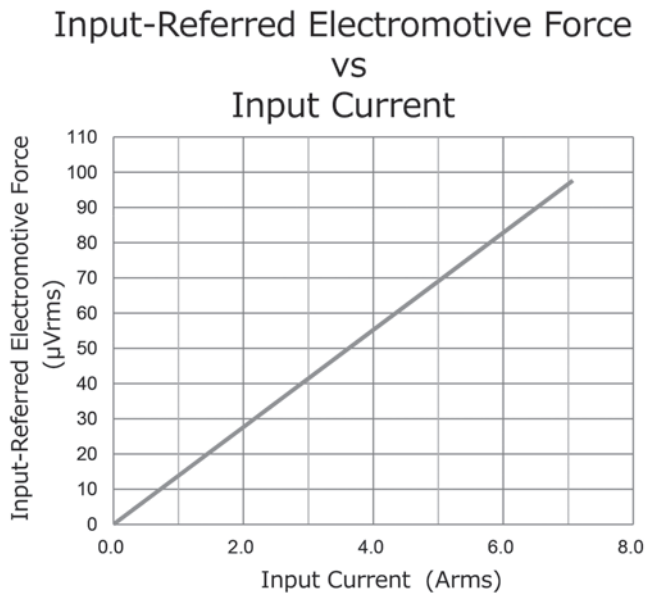
Pin No	Name	Function
1	GND_A	AMP-GND terminal (GND_A is internally connected to GND_S1 and S2.)
2	VO	Output terminal
3	GND_S1	Spiral inductor GND terminal
4	CONT	Standby control terminal
5	VCC	Supply voltage terminal
6	BIAS	Bias voltage connecting terminal
7	GND_S2	Spiral inductor GND terminal
8	IN-	Input (-) terminal

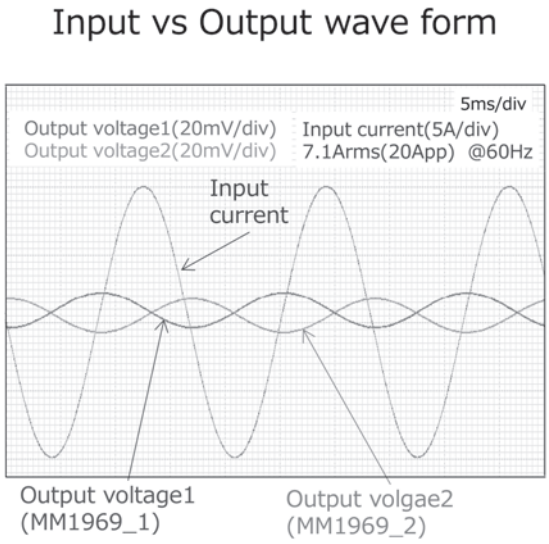
Block Diagram

Pin 1 (GND_A) is internally connected to pin 3 (GND_S1) and pin 7 (GND_S2).



Output characteristics

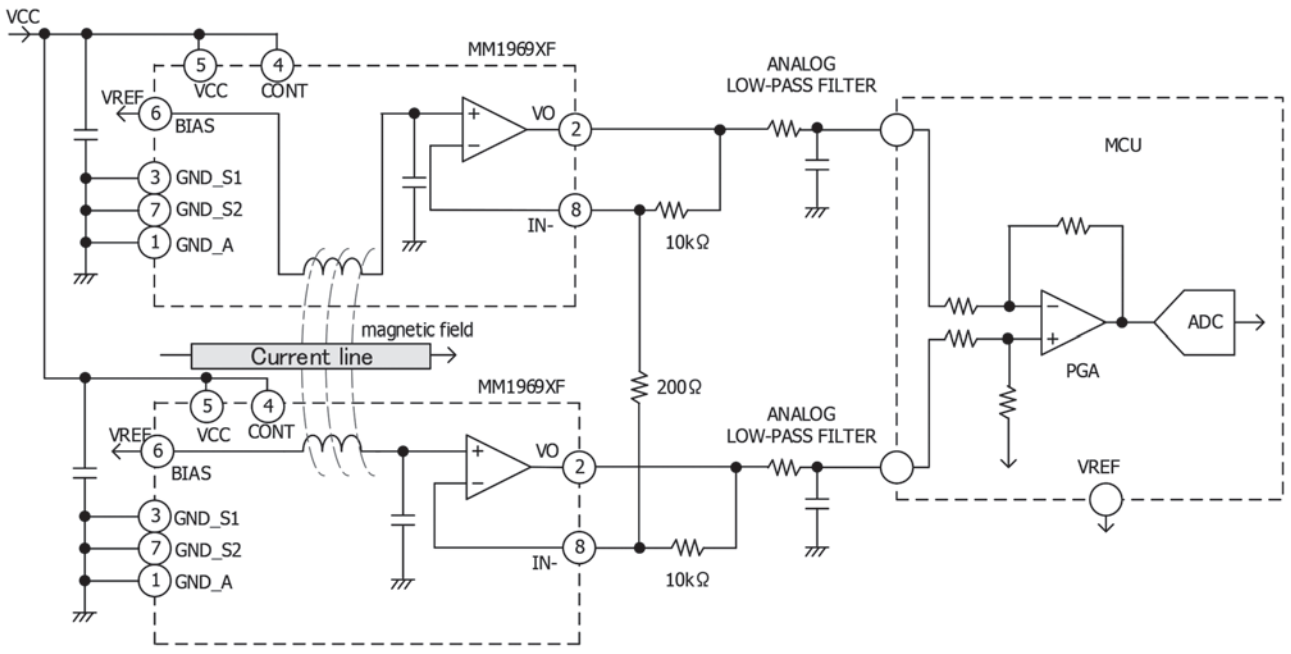




* Gain=101, with Application circuit board

Typical application

Gain=101 times / MCU VREF voltage is used as bias of MM1969XF.



3 Sensor IC

Flame detection amplifier

MM1217

Outline

This IC contains an operational amplifier and a comparator, achieving extremely low offset voltage with a single power supply. Since a single power supply can be used, this IC can be operated with the voltage from two batteries. Through the use of the operational amplifier and the comparator, this IC can amplify thermocouple electromotive force and detect ignition according to output from the amplifier, without using other parts. The low offset voltage improves accuracy of ignition detection.

Application

(1) Equipment requiring flame detection, such as gas stoves and water heaters
(2) Amplification and detection of very low voltage

Features (Unless otherwise specified, Topr = +25°C)

General

- Power supply voltage..... 1.8 to 6.0 V (Suitable for battery-powered devices)
- Current consumption .....0.1 mA Typ.
- Power supply line rejection ratio (PSRR).....60 dB Typ.

Amplifier section

- Input voltage range .....-0.2 to 0.3 V
- Input offset voltage .....±0.1 mV Typ.
- Gain.....100 dB Typ.

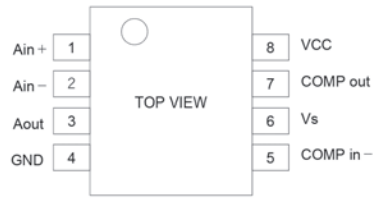
Comparator section

- Input voltage range .....0 to VCC-1.0 V
- Input offset voltage .....±0.1 mV Typ.

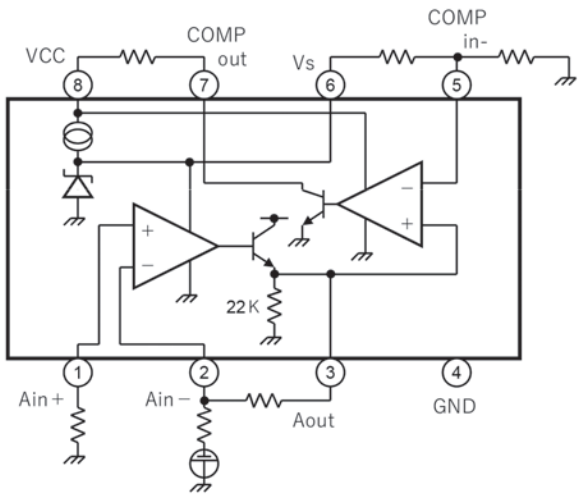
Package

SOP-8D

(Top view)



Block Diagram



3 Sensor IC

Dual amplifier

MM1278

Outline

This IC contains two operational amplifiers and achieves extremely low offset voltage with a single power supply. The input offset voltage and the temperature drift of the input offset voltage of these amplifiers are one digit less than those of our conventional products. Since a single power supply can be used, this IC can be operated with the voltage from two batteries. Because of the single power supply, low current consumption, and low offset voltage, this IC is suitable for equipment amplifying micro signals of portable devices using two batteries.

Application

(1) Amplification of very low voltage for sensors (thermocouples, strain gauges, magnetic sensors)
(2) Amplification and detection of very low voltage
(3) Detection of very low current

Features (Unless otherwise specified, Topr = +25°C)

General

- Power supply voltage..... 1.8 to 6.0 V (Suitable for battery-powered devices)
- Current consumption .....0.1 mA Typ.

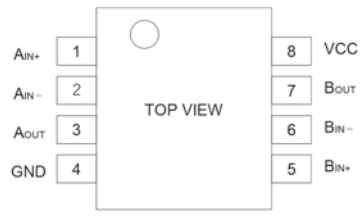
Amplifier section

- Input voltage range .....-0.2 to 0.3 V
- Input offset voltage .....±0.1 mV Typ.
- Temperature drift of input offset voltage.....±1 µV/°C Typ.
- Input offset current.....1 nA Typ.
- Input bias current .....50 nA Typ.
- Gain.....100 dB Typ.

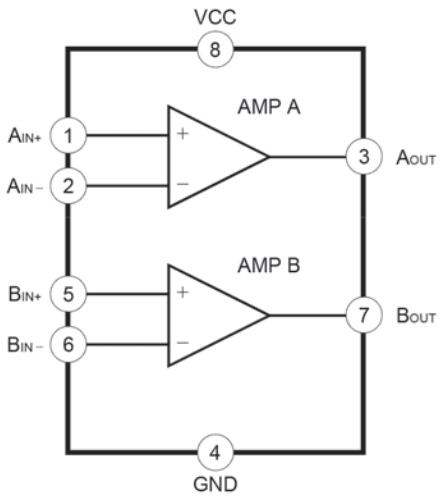
Package

SOP-8D (MM1278XF)

(Top view)



Block Diagram



3 Sensor IC

Analog Front End IC

MM3609

DESCRIPTION

This IC is analog front end IC which converts analog signal output from the sensor to digital signal, conducts digital signal processing and outputs to the host such as microcontroller etc. with digital transmission. It responds to a wide variety of sensors.

FEATURES

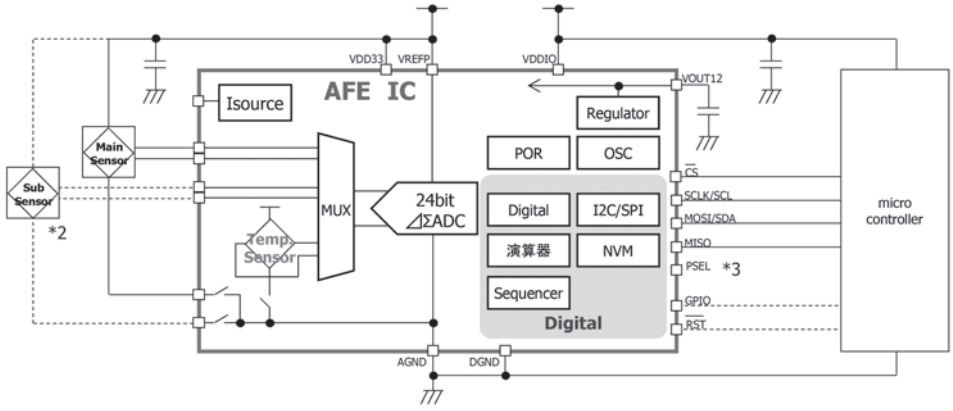
1. It has a 24bit⊿ΣADC with a wide dynamic range.
2. The correction factor needed for correcting sensor can be stored in the non-volatile memory (NVM) inside IC.
3. The sensor correction sequence can be stored in the memory and correction can be completed in IC.
4. The communication interface can be chosen from I2C Hs (max. 3.4Mbps) or SPI 4wire (max. 5Mbps).
5. It operates from the low voltage of 1.71V.
6. It has a temperature sensor and is able to correct the temperature characteristics of the exterior sensor.
7. An effective resolution or data output rate which is the most appropriate to the user can be selected.
8. It has a built-in oscillator and an external oscillator circuit is not needed.
9. There are two modes of sensor driving system – constant current and constant voltage.
10. The standby electricity of the set has been reduced significantly by the ON/OFF switch for external sensor and standby current of TYP. 0.1uA

KEY SPECIFICATIONS

- Operation supply voltage range ... VDD33 1.71V to 3.6V (Typ. 3.3V)
  VDDIO 1.14V to 3.6V (Typ. 3.3V)
- Operation temperature range..... -40°C to +85°C
- Consumption current..... Typ. 540μA
  Typ. 650μA *with Temp. Sensor
- Standby current..... Typ. 0.1μA, Max. 1μA
- Effective resolution ..... Up to 22bits *1
- Integral non-linearity INL ..... Typ. ±30 ppm of FSR
- Input conversion noise voltage..... 1.27μVrms
- Data output rate..... 20Hz to 2,560Hz

*1 Data output rate=20Hz, VDD33=VREFP=3.3V, Ta=25°C

BLOCK DIAGRAM & TYPICAL APPLICATION CIRCUIT



*2 The high-precision temperature sensor, etc. are assumed as Sub Sensor.
*3 For the communication interface, SPI/I2C can be selected at High/Low of protocol select terminal PSEL.

APPLICATION

(1) Gauge pressure sensor/Absolute pressure sensor
(2) Flow sensor
(3) Strain gauge

PACKAGE

PLP-24 (3.0mm□)

SUPPORT

- Possible to provide an evaluation board with memory write function.
- Possible to provide application for creating sensor correction sequence.
- Possible to provide sample firmware for external microcontroller (negotiable).

4 DISCONTINUATION INFOMATION

4 Products to be discontinued

The following products will be phased out or discontinued.
Please note that we will no longer accept any new enquires.

Part Number	Function
LAG665	Stereo Head Phone IC
LAG668	Stereo Head Phone IC
LMF501	Radio receiver IC
LVA519	Synchronous Detector IC
MM1021	Synchronous Detector IC
MM1024	Video amplifier IC for superimpose
MM1025	DRAM Back–up IC
MM1026, 1245	Battery Back–up IC
MM1027	SRAM Back–up IC
MM1028	SRAM Back–up IC
MM1029	Video amplifier IC for superimpose
MM1031	Video Amplifier IC
MM1034	HBS–Compatible Driver and Receiver
MM1035	Watchdog Timer IC
MM1038	Motor control IC
MM1041	Video Amplifier IC
MM1053	Video Switch IC
MM1060	3–Terminal regulator IC
MM1065, 1165	3–Terminal regulator IC
MM1067	Sync Separator + Sync detector IC
MM1069	Sync Separator + Sync detector IC
MM1075	Watchdog Timer IC
MM1081	SRAM Back–up IC
MM1093	4fsc Clock Generator
MM1095	Watchdog Timer IC
MM1096	Watchdog Timer IC
MM1099	Watchdog Timer IC
MM1100	COMPANDOR
MM1106	Watchdog Timer and Battery Back–up IC
MM1108	Synchronous Separator IC
MM1109	Synchronous Separator IC
MM1111~1118	Video Switch IC
MM1120	Video Switch IC
MM1124	Video Switch IC
MM1134	Battery Back–up IC
MM1135, 1136	Watchdog Timer IC
MM1140	Video Switch IC
MM1142	Watchdog Timer IC
MM1166	Video amplifier IC for superimpose
MM1177	Charge control for Coin–type Battery

Part Number	Function
MM1180, 1181	Regulator IC
MM1185	Watchdog Timer IC
MM1186	75Ω driver IC
MM1188	Video Switch IC
MM1196	75Ω driver IC
MM1203	Video Amplifier IC
MM1207, 1205	Video Amplifier IC
MM1206	Voltage Detector IC
MM1210	Voltage Detector IC
MM1215, 1216	Regulator IC
MM1222~1224	75Ω driver IC
MM1225~1228	75Ω driver IC
MM1231~1234	Video Switch IC
MM1238	Video Switch IC
MM1251, 1252, 1253	Voltage Detector IC
MM1257	3–Terminal regulator IC
MM1268	RGB Encoder
MM1288	TFT Liquid Crystal Interface IC
MM1290	Battery Back–up IC
MM1291	Li–ion Battery protection IC for 1cell
MM1292, 1302	Li–ion Battery protection IC for 2cells
MM1293	Li–ion Battery protection IC for 3cells
MM1294	Li–ion Battery protection IC for 4cells
MM1304	VCA with LPF of Y system and BPF of C system
MM1305	Voltage Detector IC
MM1311	Video Switch IC for I^2C BUS
MM1320	3–Terminal regulator IC
MM1327	Wide Video Detection IC
MM1331	DC–DC convertor IC
MM1332	Li–ion Battery protection IC for 1cell
MM1349	Switching Regulator IC
MM1357	Switching Regulator IC
MM1369	Q sound IC
MM1377, 1378	OP–AMP and Shunt Regulator
MM1381, 1382, 1383	Video Amplifier IC
MM1389	Video Switch IC
MM1426	Regulator IC
MM1437	Regulator and System Reset IC
MM159x	Regulator IC
MM1002	Video amplifier IC for superimpose

The following products will be phased out or discontinued.
Please note that we will no longer accept any new enquires.

Part Number	Function
MM6558	Dual OP–AMP
MM6564	Dual OP–AMP
PST518	System Reset IC
PST523	System Reset IC
PST529	System Reset IC
PST531	System Reset IC
PST572	System Reset IC
PST573	System Reset IC (Active–High)
PST574	System Reset IC
PST575	System Reset IC
PST591~595	System Reset IC (built–in delay circuit)
PST600	System Reset IC
PST611	System Reset IC
PST620,621	System Reset IC
PST623	System Reset IC
PST70xx	System Reset IC
PST7512,7801	Second Protect IC
PST90xx	System Reset IC
MM1270	Regulator IC
MM1301	Li–ion Battery protection IC for 1cell
MM1336	Stereo Headphones IC
MM1376	Stereo Headphones IC
MM1407	Audio IC
MM1421	Li–ion Battery protection IC for 1cell
MM1448	Composite regulator IC
MM1516	Composite regulator IC
MM1529	Secondary–side control for AC Adaptor
MM3042~3045	Regulator IC
MM3051~3055	Regulator IC
MM3002	OP–AMP
MM1581	Lithium–Ion Battery Charge Control IC
MM309x, MM310x	Regulator IC(150mA)

4 Phased Out Products

The following products will be phased out or discontinued.
Please note that we will no longer accept any new enquires.
For customers who currently use the products, please contact your distributors for details on user support.

Part Number	Function
MM1333	Lithium–Ion Battery Charge Control IC
MM1373	Second Protect IC
MM1375	RGB Video Amplifier
MM1385	Regulator IC (150mA)
MM1412	Li–ion Battery protection IC for 2cells
MM1424	TCXO IC
MM1434	QXPANDER
MM1422, MM1423 MM1442, MM1443	I²C Bus Controlled 4–input 3–output AV Switch
MM1451	Second Protect IC
MM1478	Regulator IC+System Reset IC
MM1481	Regulator IC+System Reset IC
MM1482	Regulator IC+System Reset IC
MM1491	Li–ion Battery protection IC for 1cell
MM1492	I²C BUS Controlled 5–Input 2–Output AV Switch
MM1495	I²C BUS Control 5–Input 2–Output AV Switch
MM1519	Component Input Video Swich with I²C Bus
MM1522	Linear Temperature Sensor
MM1532	Lithium–Ion Battery Charge Control IC
MM1539	Video Signal Driver for DVD Players
MM1566	Video Signal Driver for DVD Players
MM157x	Regulator IC (150mA)
MM1616	Visibility Correction Light Sensor
MM1623, MM1758	Video Signal Driver for DVD Players
MM1630	I²C Bus Control Broadband Video Switch
MM1699	I²C Bus Control 13–Input 4–Output Audio Switch
MM3005~3010	CMOS Switching Regulator IC
MM302x	Regulator IC (60mA)
MM303x	Regulator IC (100mA)
PST93xx	System Reset IC
PST993,PST994	System Reset IC
MM1433	Lithium–Ion Battery Charge Control IC
PST37xx	System Reset IC
PST38xx	System Reset IC
MM1485	Lithium–Ion Battery Charge Control IC
MM1530A	Shunt Regulator
MM1538	Motor Driver IC
MM1469	Motor Driver IC
MM1669	Motor Driver IC
MM1779	PD IC for DVD Players
MM1567	Video Signal Driver for DVD
MM1568	Video Signal Driver for DVD
MM156x	Regulator IC (500mA)
MM1631	I²Cbus controlled audio switch
MM1687	Regulator IC+System Reset IC
MM1688	Regulator IC+System Reset IC
MM1689	Regulator IC (2ch)

Part Number	Function
MM1692	Video Signal Driver for DVD
MM1697	Video Switch IC
MM1707	Lithium–Ion Battery Charge Control IC
MM1729	PDIC for CD
MM1730	PDIC for DVD
MM1731~MM1734	Video Switch IC
MM1746	PDIC for CD
MM1756	Video Driver IC
MM1757	HD–compatible Video Driver IC
MM1763	AV Switch+75Ω Driver IC
MM1764	AV Switch+75Ω Driver IC
MM1783	Video Switch IC
MM1788	Video Driver IC
MM1792	Regulator IC (3ch)
MM1793	Video Switch IC
MM1794	Video Driver IC
MM1797	HD–compatible 75Ω Driver IC
MM192x	Regulator IC(1A)
MM3018	Regulator IC+System Reset IC
MM3090	Li–ion Battery protection IC for 1cell
MM3099	Li–ion Battery protection IC for 1cell
MM3112	Li–ion Battery protection IC for 2cells
MM3113	Li–ion Battery protection IC for 3cells
MM3114	Li–ion Battery protection IC for 4cells
MM314x	Regulator IC (150mA)
MM3168	VCXO IC
MM3173, MM3174	Regulator IC+System Reset IC
MM3188	Temperature Switch IC
MM329x	Regulator IC (300mA)
PST31xx	System Reset IC
PST32xx	System Reset IC
PST33xx	System Reset IC
PST34xx	System Reset IC
PST92xx	System Reset IC
MM1414	Protection for Lithium–Ion Batteries (3 to 4 cells)
MM1636	Video Driver IC
PST35xx	System Reset IC (external capacitor)
PST36xx	System Reset IC (external capacitor)
PST41xAxxx	Reset IC with Built–In Delay Circuit
PST42xAxxx	Reset IC with Built–In Delay Circuit
PST43xAxxx	Reset IC with Built–In Delay Circuit
PST44xAxxx	Reset IC with Built–In Delay Circuit
MM3204	Lithium–Ion Battery Charge Control IC

The information shown here is current as of February 2013.

5 PACKAGE

5 Packsge Line-up

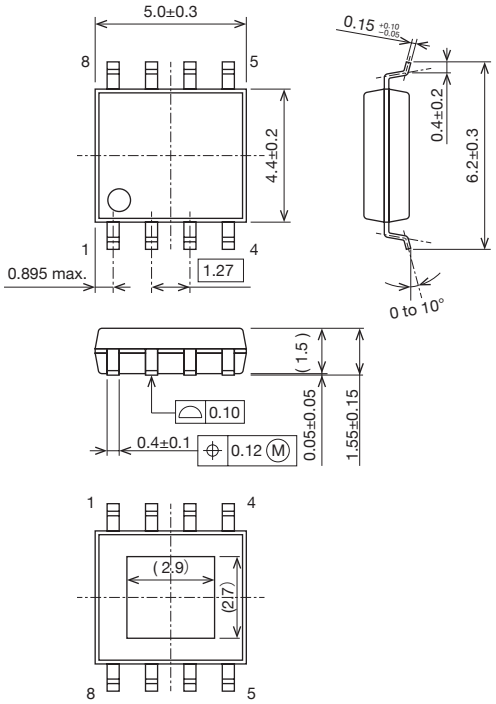
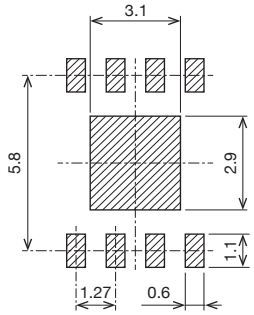
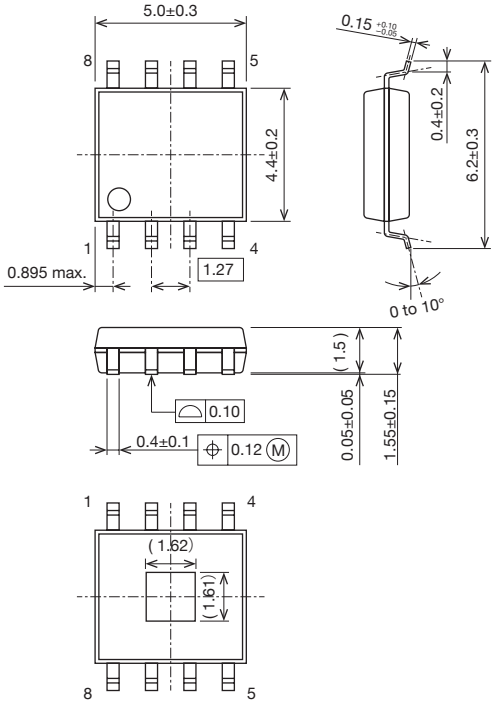
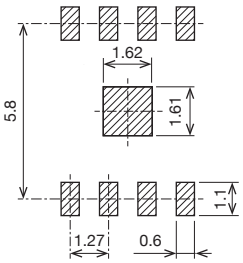
Package Type	Pin Count	Package Name	Package Size (mm)			Pin Pitch (mm)	Refer Number
			He	D	A	C	
Lead–through Type	3	TO–92A	5.40	3.80	7.50	2.50	P.354
Flat Lead Type	6	SON–6A	3.00	1.60	0.80	0.50	P.337
	6	SON–6C	2.00	1.60	0.55	0.50	P.338
	6	SON–6D	3.00	2.90	0.80	0.95	P.338
	6	SON-6F	1.60	1.60	0.80	0.50	P.339
	5	SOT89–5A	4.25	4.50	1.50	1.50	P.345
Gullwing Type	8	HSOP–8A	6.20	5.00	1.55	1.27	P.322
	8	HSOP–8C	6.20	5.00	1.55	1.27	P.322
	8	HSOP-8E	6.00	5.02	1.53	0.805	P.323
	28	HSOP–28A	9.90	18.60	2.30	0.80	P.323
	28	HSOP–28C	9.90	17.60	1.90	0.80	P.324
	4	SC–82ABA	2.10	2.00	0.95	1.30	P.336
	4	SC–82ABB	2.10	2.00	0.90	1.30	P.336
	6	SC–88A	2.10	2.00	0.90	0.65	P.337
	3	SOT–23A	2.80	2.90	1.15	1.90	P.343
	5	SOT–25A	2.80	2.90	1.15	0.95	P.344
	6	SOT–26A	2.80	2.90	1.15	0.95	P.344
	6	SOT–26B	2.80	2.90	1.15	0.95	P.345
	7	SOP–7B	6.20	5.00	1.55	1.27	P.339
	8	SOP–8C	6.20	5.20	1.55	1.27	P.340
	8	SOP–8D	6.20	5.00	1.55	1.27	P.340
	8	SOP-8G	6.20	5.20	1.55	1.27	P.341
	8	SOP–8J	6.00	5.02	1.65	1.27	P.341
	10	SOP–10A	6.20	5.00	1.55	1.00	P.342
	16	SOP–16B	6.20	10.20	1.55	1.27	P.342
	28	SOP–28B	9.90	17.60	1.85	1.27	P.343
	3	TO–252C	9.90	6.60	2.30	2.30	P.354
	5	TO–252–5A	9.90	6.60	2.30	1.27	P.355
	8	TSOP–8A	3.10	2.00	0.75	0.50	P.355
	16	TSOP–16B	6.40	5.00	1.10	0.65	P.356
	16	TSOP–16D	6.40	5.00	1.10	0.65	P.356
	20	TSOP–20A	6.40	6.50	1.10	0.65	P.357
	20	TSOP–20D	6.40	6.50	1.10	0.65	P.357
	20	TSOP–20E	6.40	6.50	1.10	0.65	P.358
	20	TSOP–20F	6.40	6.50	1.20	0.65	P.358
	8	VSOP–8B	4.00	2.90	1.30	0.65	P.359
	8	VSOP–8C	4.00	2.95	1.30	0.65	P.359
	8	VSOP–8D	4.00	2.80	1.30	0.65	P.360
	20	VSOP-20A	7.60	8.66	1.63	0.635	P.360
	24	VSOP–24A	7.60	7.90	1.25	0.65	P.361

Package Type	Pin Count	Package Name	Package Size (mm)			Pin Pitch (mm)	Refer Number
			He	D	A	C	
Non–Lead Type	4	PLP-4A	1.00	1.00	0.60	0.65	P.324
	4	PLP-4B	1.60	1.20	0.60	0.60	P.325
	4	PLP-4C	1.00	1.00	0.60	0.65	P.325
	4	PLP-4D	3.20	1.70	0.48	0.925	P.326
	4	PLP-4E	2.85	1.25	0.50	0.725	P.326
	4	PLP-4-1228	2.85	1.25	0.58	0.48	P.327
	4	PLP-4-2140	4.00	2.10	0.50	0.40	P.327
	6	PLP-6A	2.00	1.80	0.60	0.50	P.328
	6	PLP-6C	0.60	1.20	1.20	0.40	P.328
	6	PLP-6F	0.60	1.50	1.50	0.50	P.329
	6	PLP-6G	2.10	4.10	0.50	0.500	P.329
	6	PLP-6H	1.70	1.80	0.50	0.500	P.330
	6	PLP-6J	1.70	1.80	0.50	0.45	P.330
	6	PLP-6-2130	0.60	3.00	2.10	0.60	P.331
	8	PLP-8E	0.60	1.60	1.20	0.40	P.331
	8	PLP-8F	3.00	2.00	0.60	0.50	P.332
	8	PLP-8G	2.40	2.60	0.60	0.50	P.332
	8	PLP-8H	1.80	1.80	0.58	0.45	P.333
	10	PLP-10A	2.50	2.70	0.60	0.50	P.333
	10	PLP-10D	3.00	3.00	0.60	0.50	P.334
	12	PLP-12A	4.00	2.90	0.60	0.40	P.334
	12	PLP-12B	3.00	3.00	0.60	0.50	P.335
	24	PLP-24A	3.00	3.00	0.60	0.40	P.335
	16	SQFN-16A	3.00	3.00	0.75	0.50	P.346
	16	SQFN-16B	3.00	3.00	0.75	0.500	P.346
	24	SQFN-24A	4.00	4.00	0.75	0.50	P.347
	32	SQFN-32A	5.00	5.00	0.75	0.50	P.347
	4	SSON-4B	1.40	1.10	0.55	0.50	P.348
	6	SSON-6A	2.00	1.80	0.75	0.50	P.348
	6	SSON-6E	1.60	1.80	0.55	0.50	P.349
	6	SSON-6J	1.40	1.40	0.55	0.50	P.349
	6	SSON-6L	2.00	2.00	0.75	0.65	P.350
	6	SSON-6M	1.40	1.40	0.55	0.50	P.350
	6	SSON-6N	3.60	1.80	0.65	0.35	P.351
	8	SSON-8B	2.30	2.30	0.75	0.50	P.351
	8	SSON-8C	3.00	3.00	0.55	0.65	P.352
	8	SSON-8E	2.00	2.00	0.75	0.50	P.352
	8	SSON-8G	1.60	1.60	0.55	0.40	P.353
	10	SSON-10A	2.50	2.70	0.60	0.50	P.353
	6	WLCSP-6B	1.09	0.81	0.38	0.40	P.361
	6	WLCSP-6C	0.38	1.09	0.81	0.40	P.362
	10	WLCSP-10A	1.50	1.10	0.28	0.40	P.362
	25	WLCSP-25A	1.936	1.936	0.345	0.40	P.363
	48	WLCSP-48B	3.47	3.47	0.40	0.50	P.363

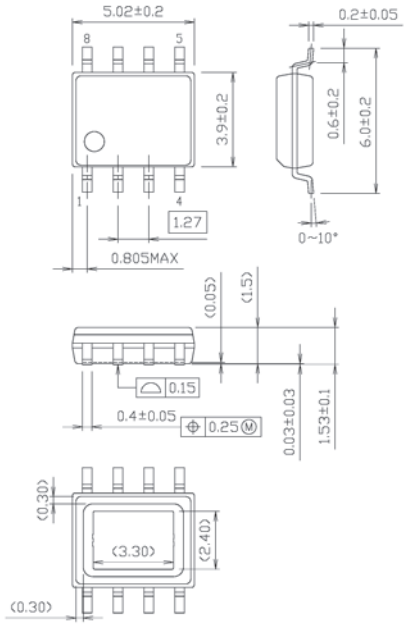
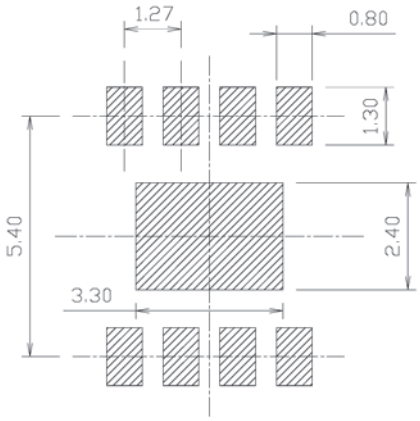
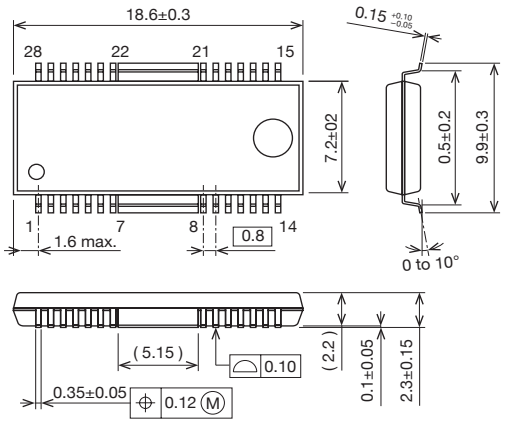
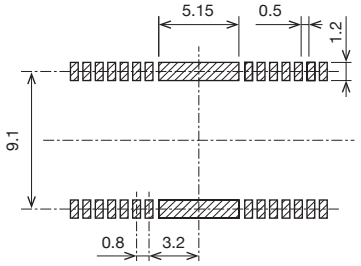
* Recommendation Land Pattern is a reference value. To design practically, correction(s) should be made for optimized dimensions considering the effects of the board type to be mounted, mount(soldering) method, type and coating thickness of cream solder.

5 PACKAGE

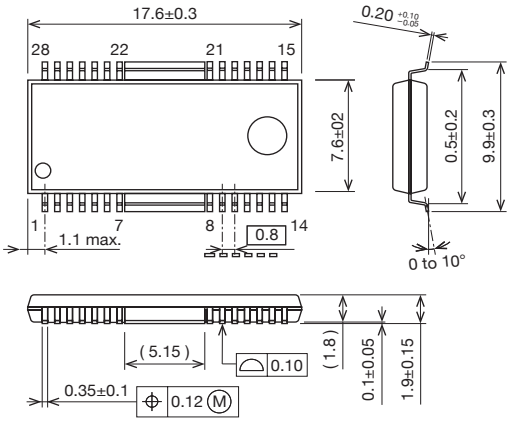
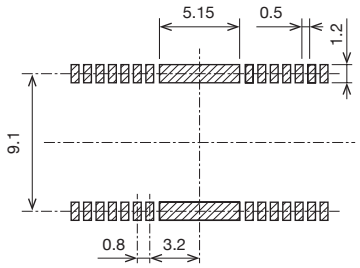
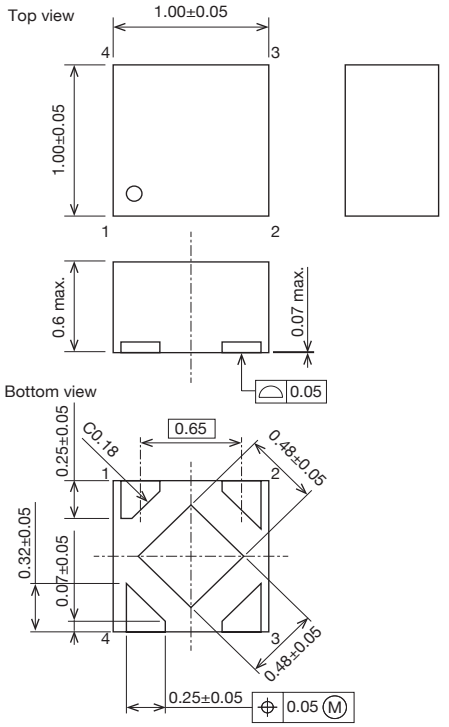
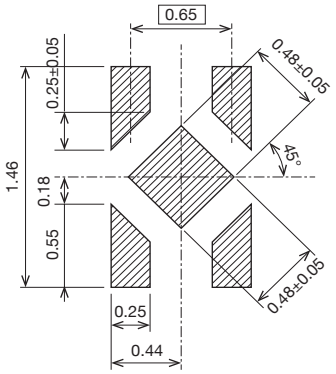
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
HSOP-8A		
HSOP-8C		

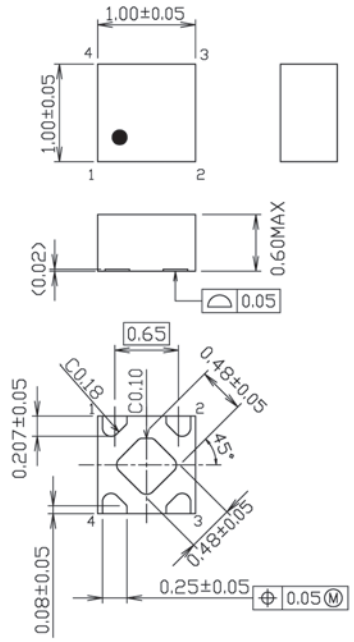
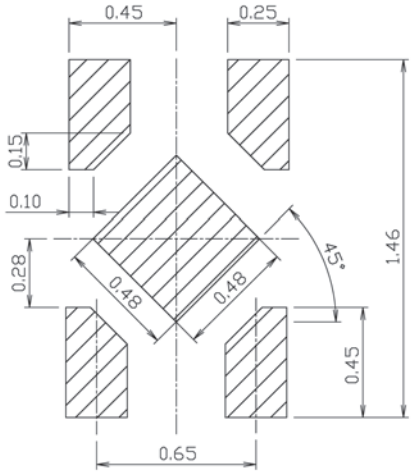
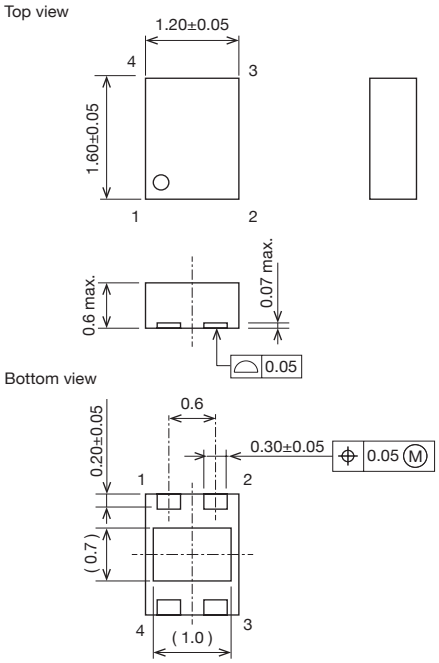
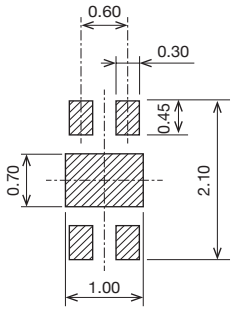
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
HSOP-8E		
HSOP-28A		

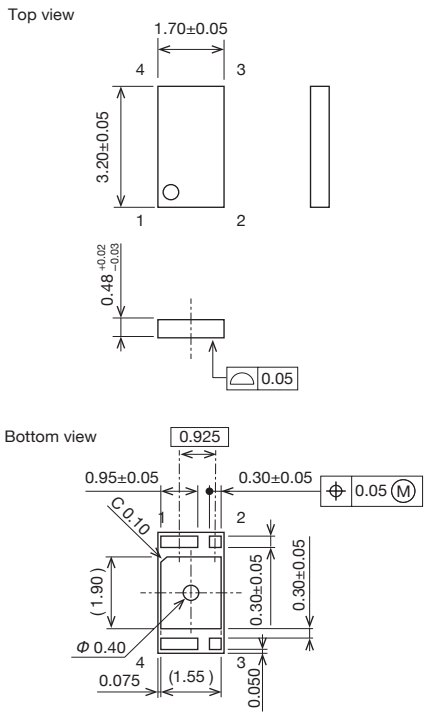
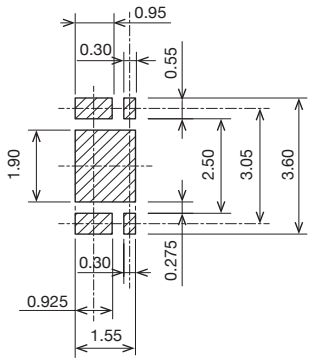
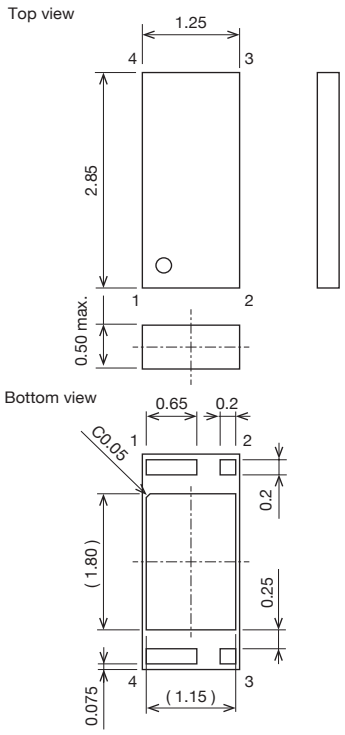
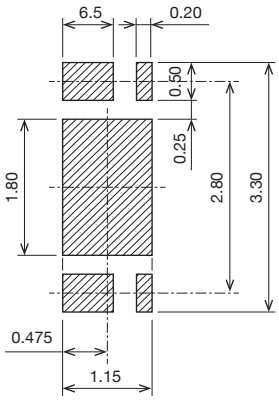
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
HSOP-28C		
PLP-4A		

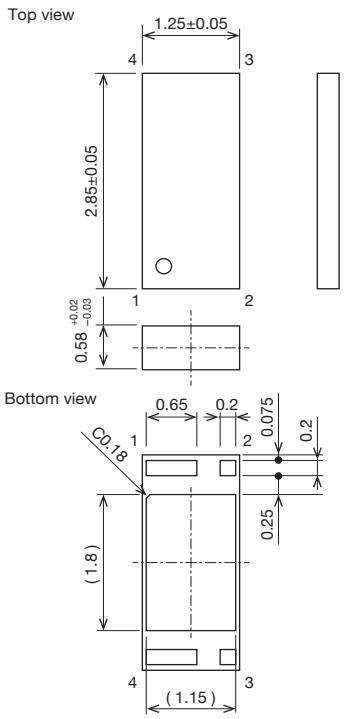
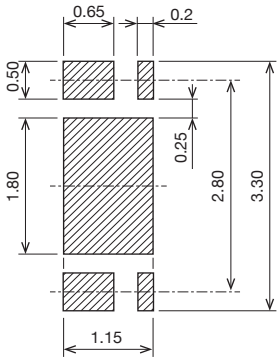
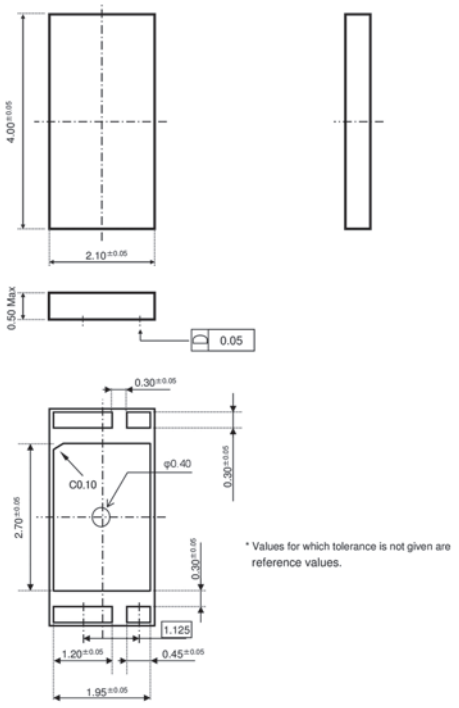
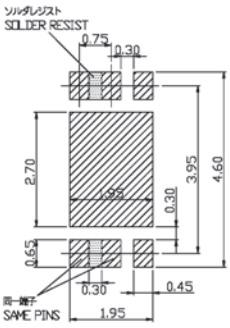
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-4C		
PLP-4B		

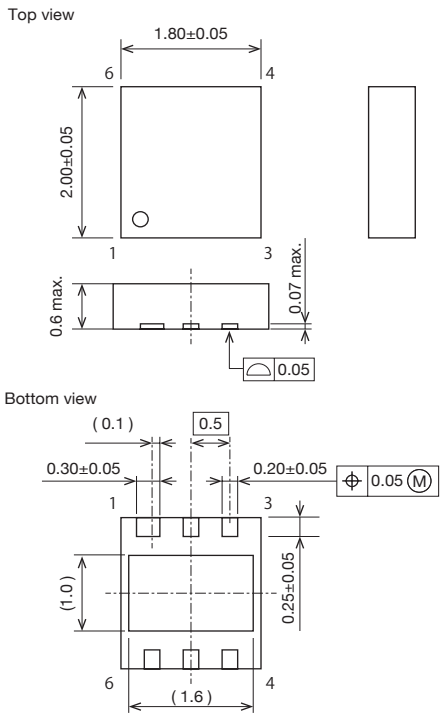
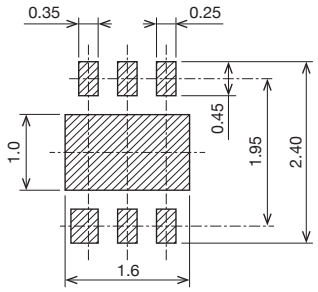
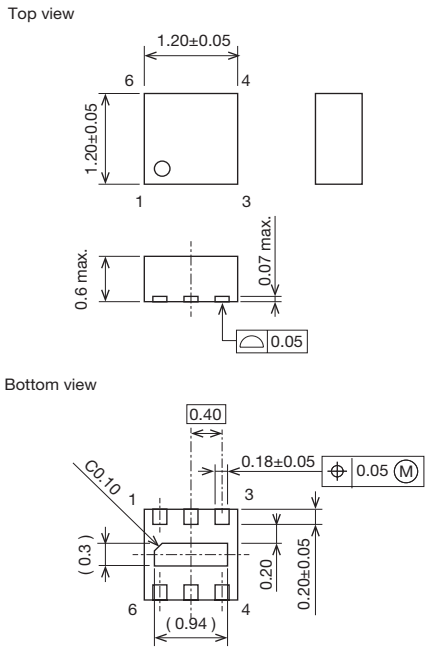
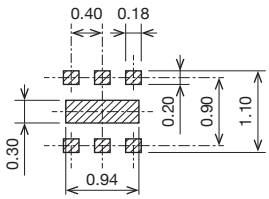
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-4D		
PLP-4E		

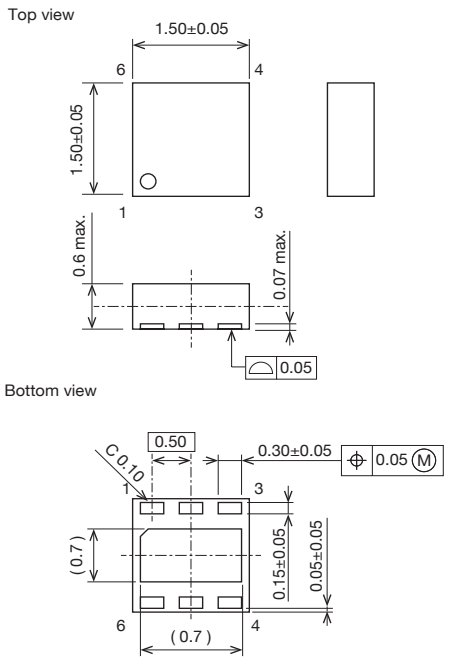
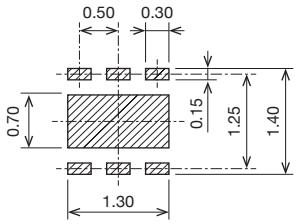
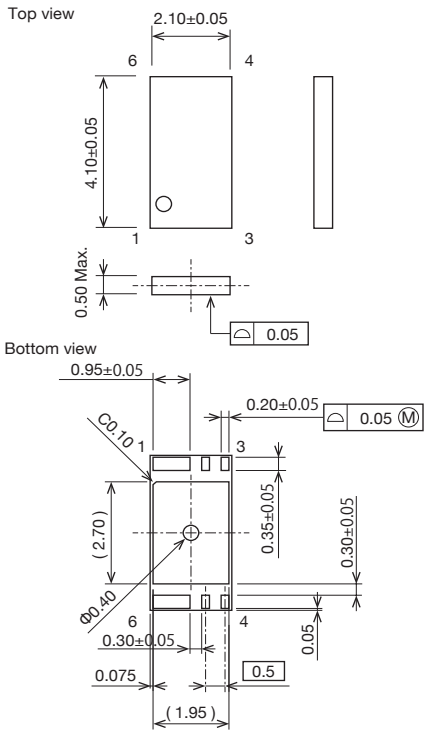
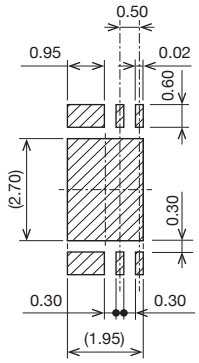
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-4-1228		
PLP-4-2140		

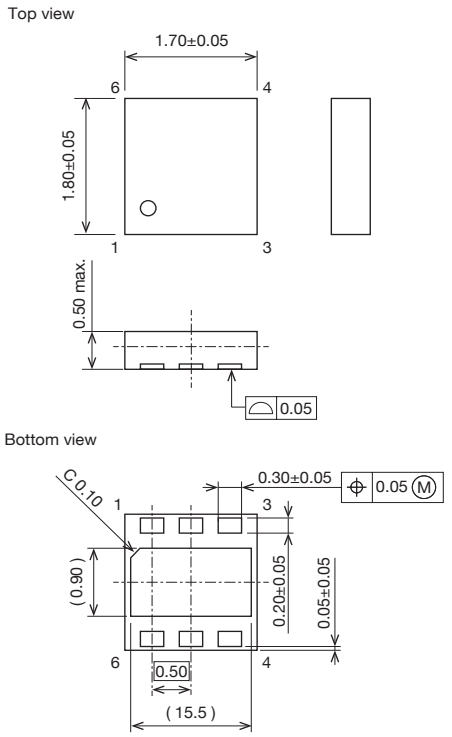
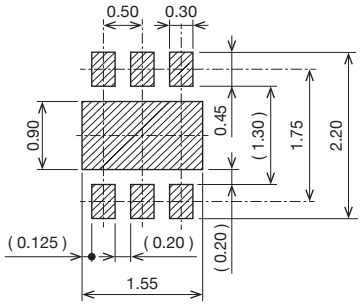
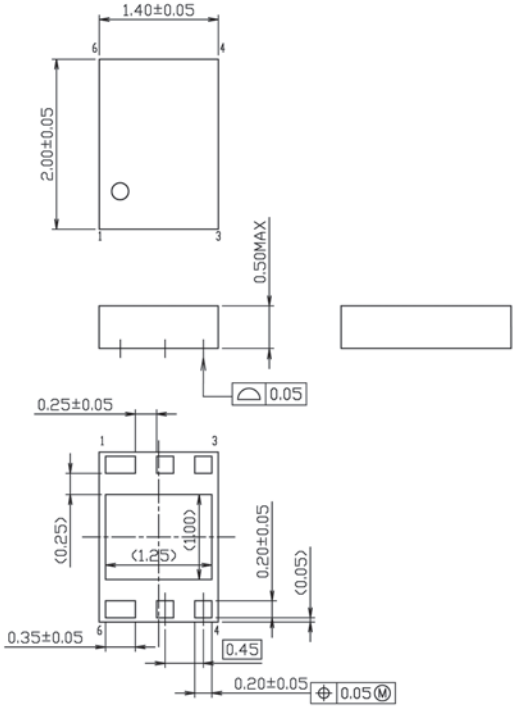
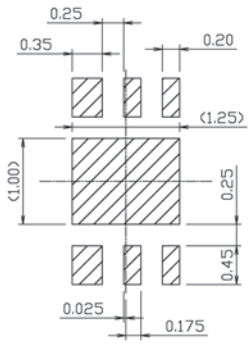
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6A		
PLP-6C		

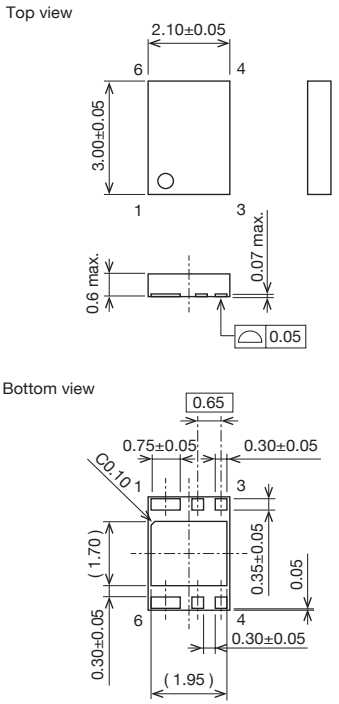
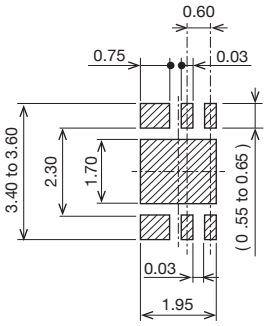
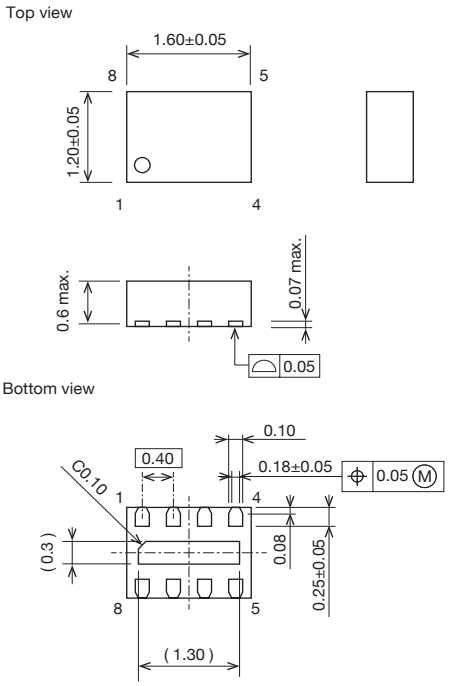
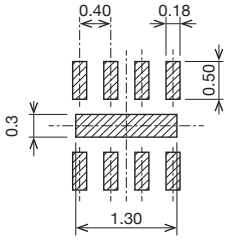
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6F		
PLP-6G		

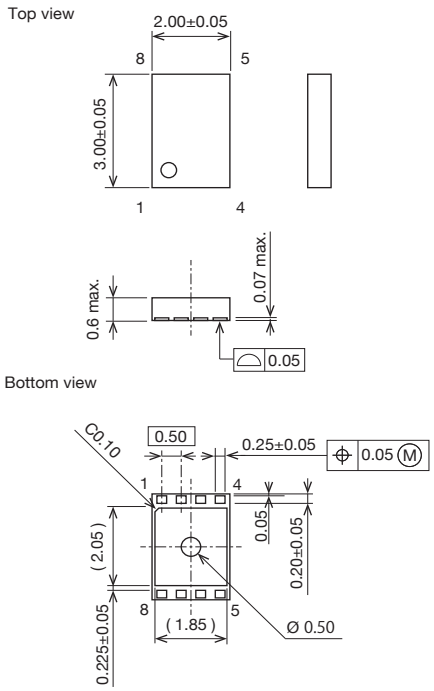
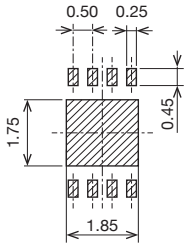
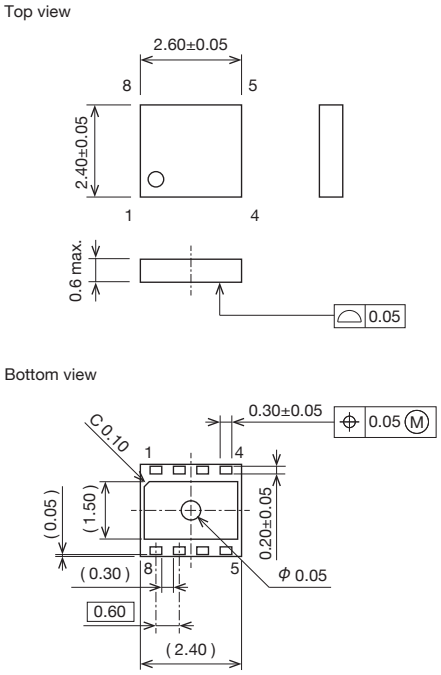
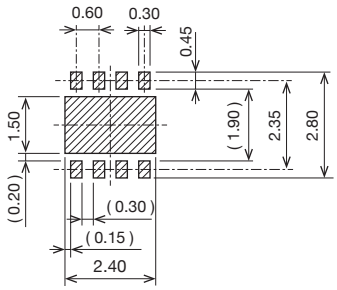
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6H		
PLP-6J		

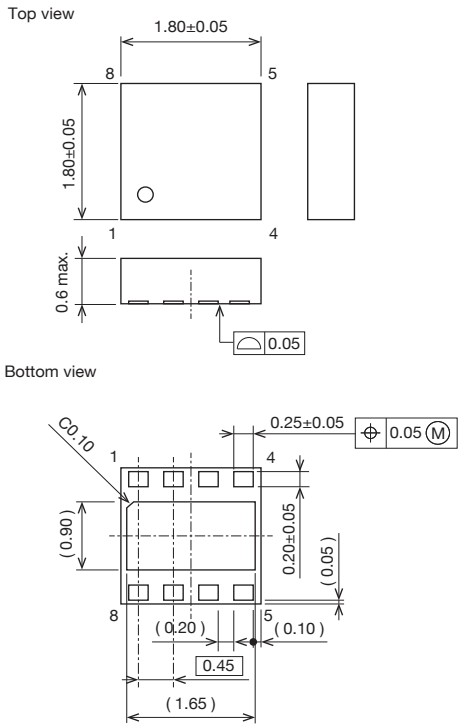
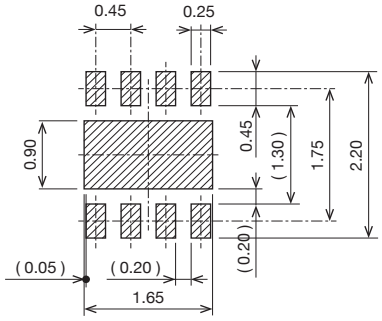
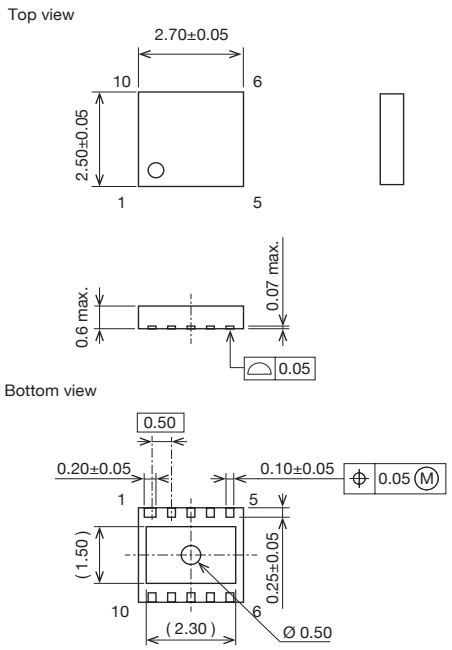
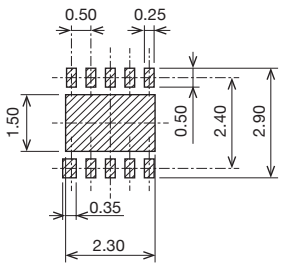
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6-2130		
PLP-8E		

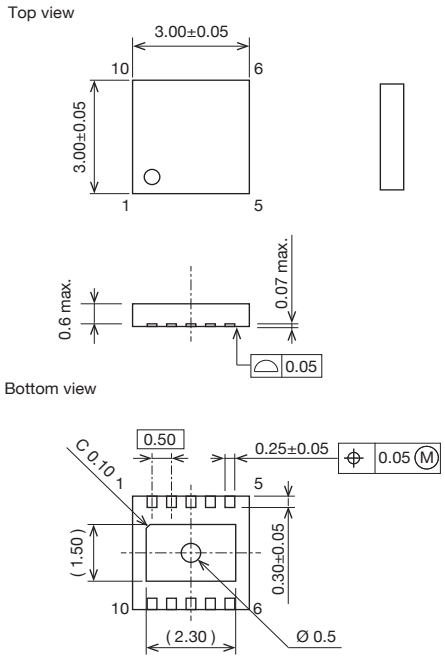
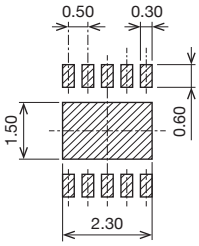
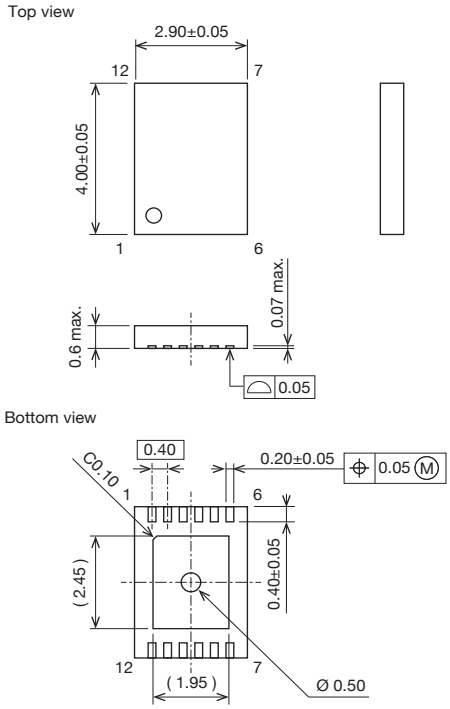
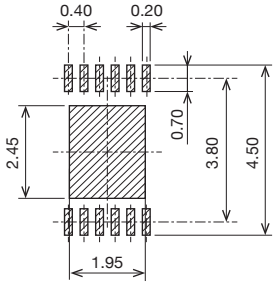
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-8F		
PLP-8G		

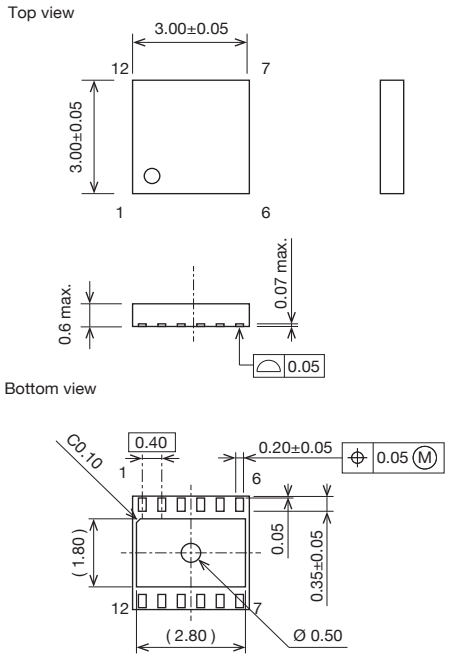
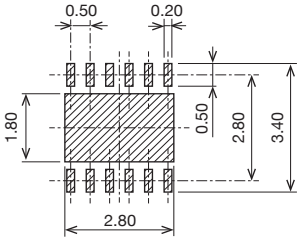
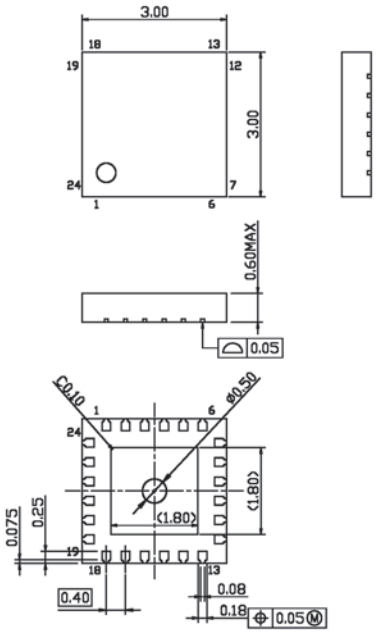
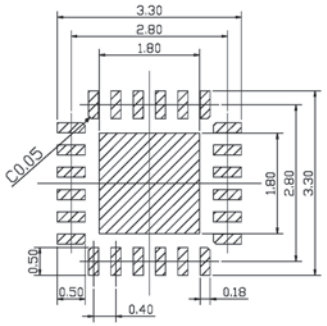
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-8H		
PLP-10A		

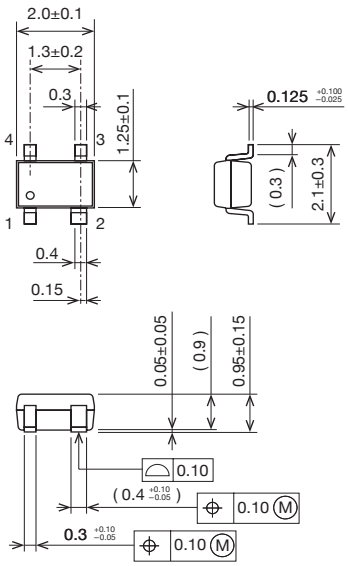
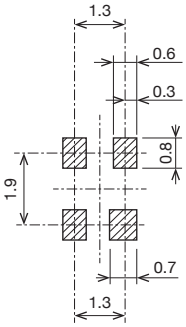
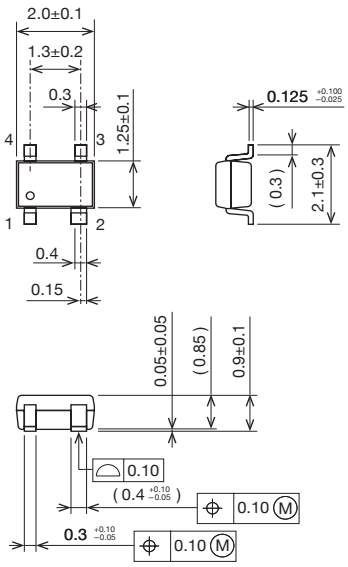
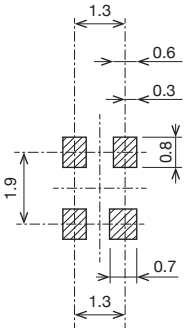
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-10D		
PLP-12A		

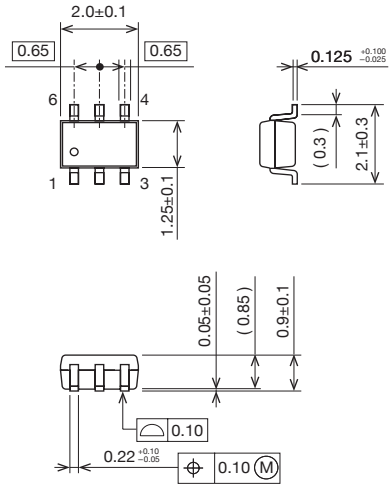
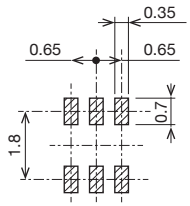
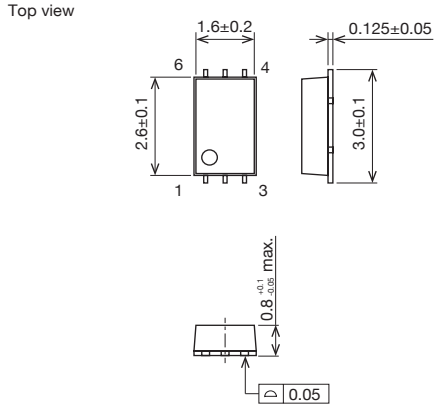
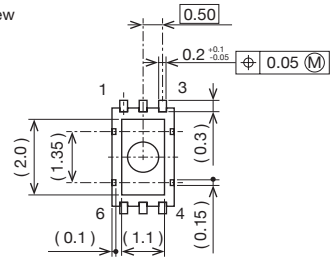
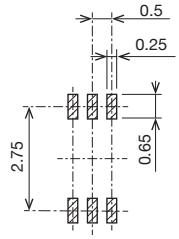
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-12B		
PLP-24A		

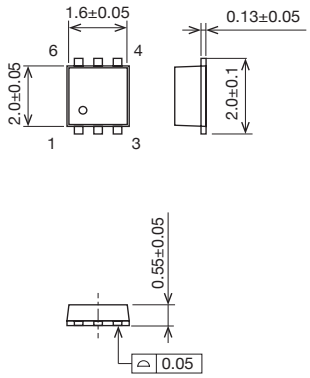
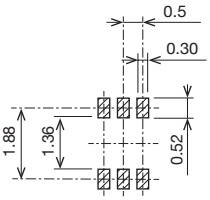
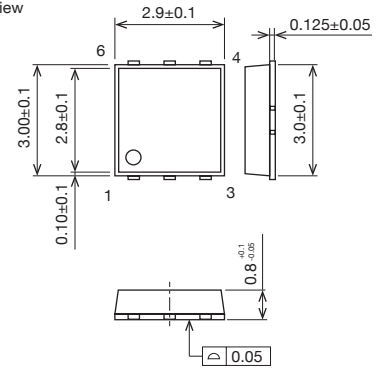
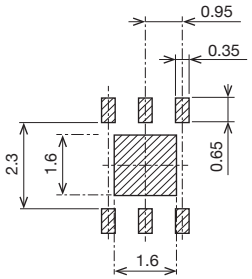
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SC-82ABA	Top view 	
SC-82ABB	Top view 	

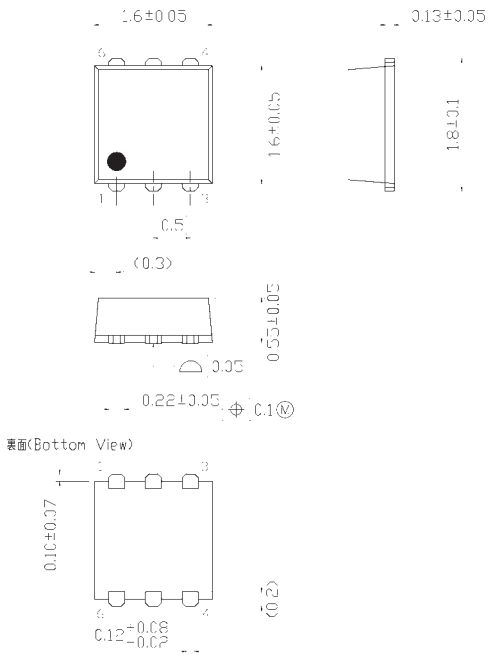
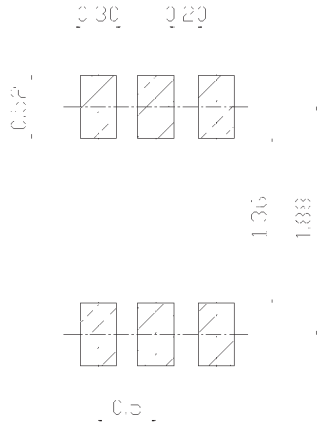
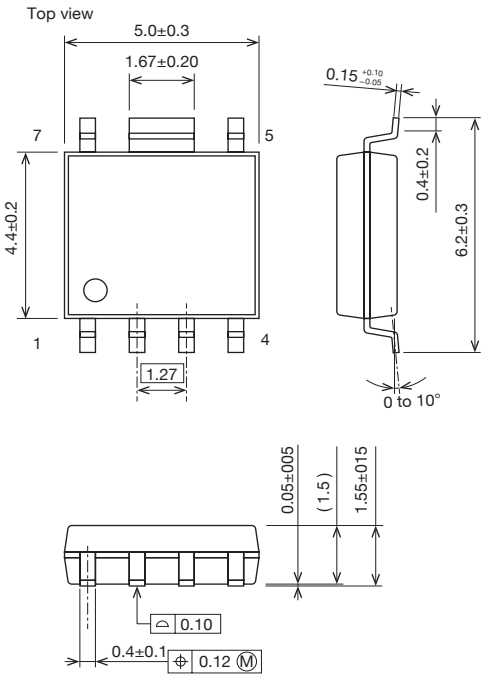
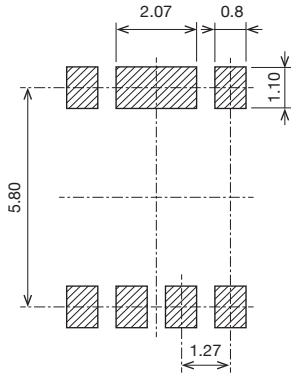
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SC-88A	Top view 	
SON-6A	Top view  Bottom view 	

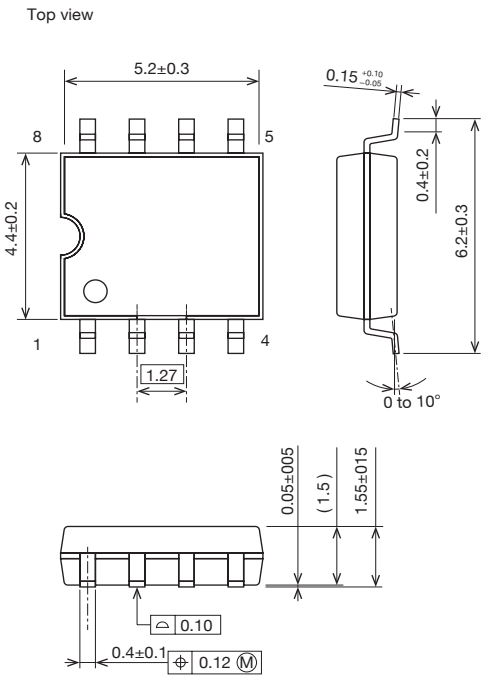
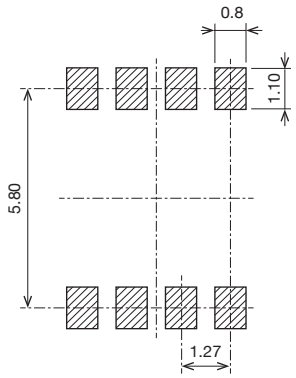
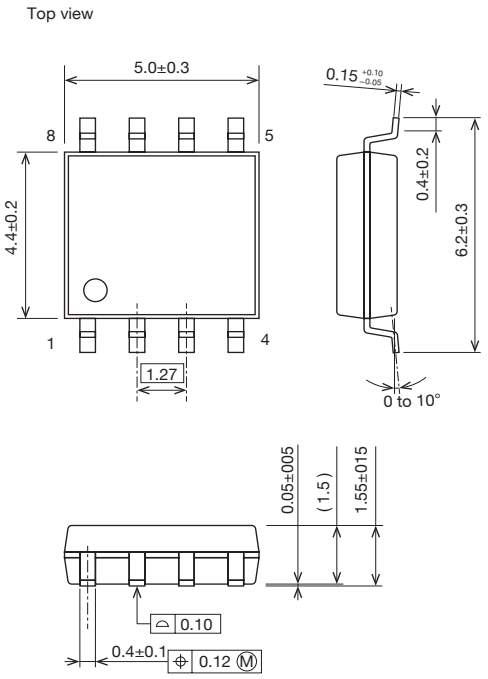
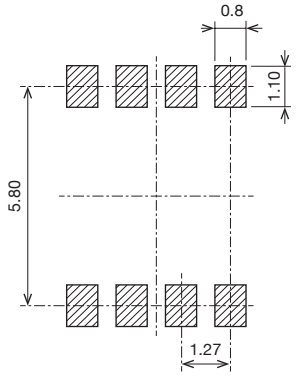
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SON-6C	Top view  	
SON-6D	Top view  	

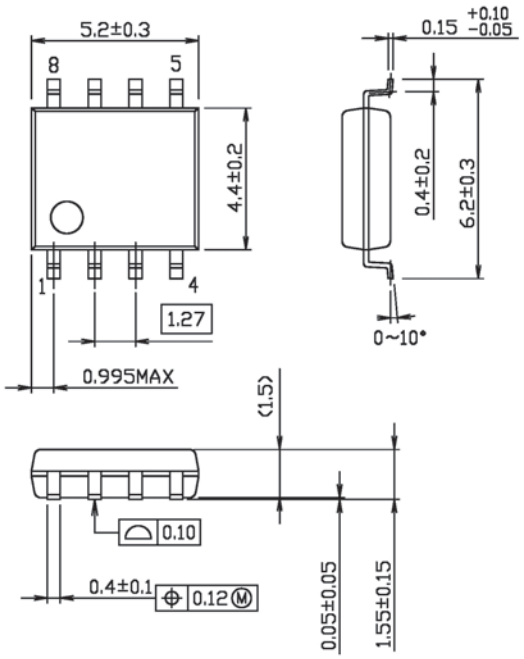
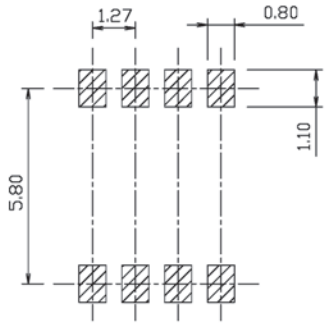
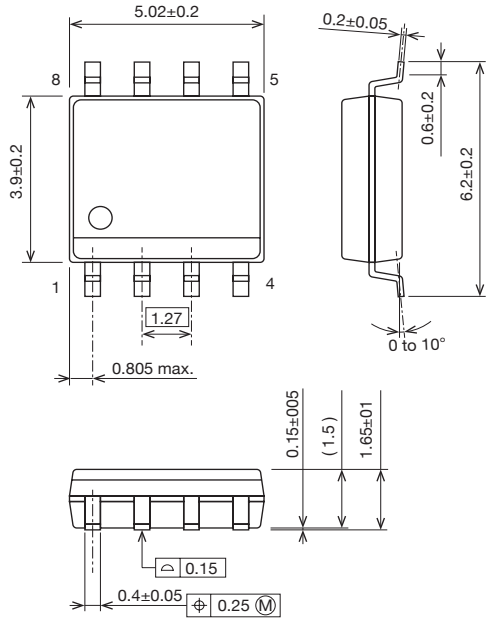
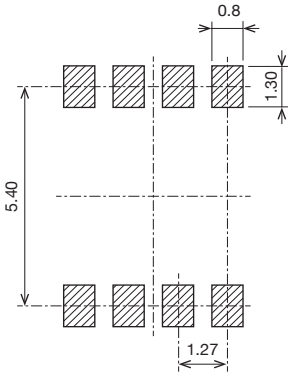
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SON-6F		
SOP-7B		

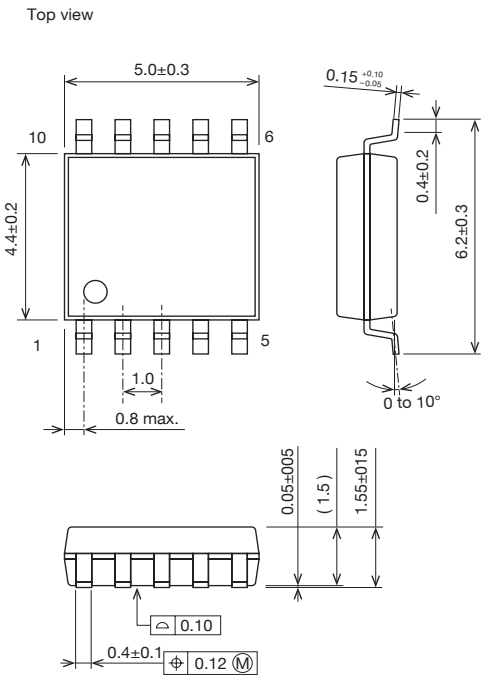
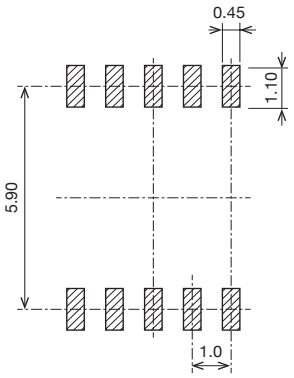
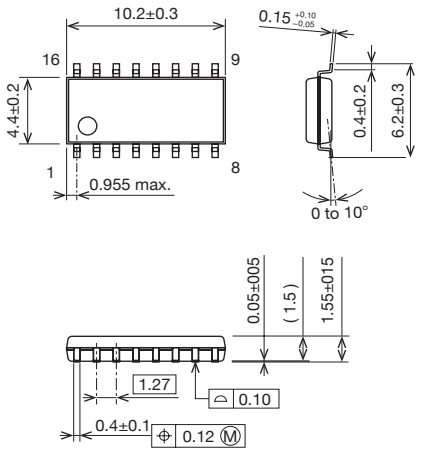
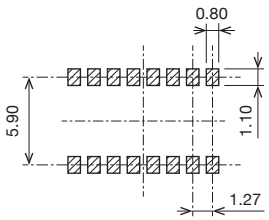
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-8C		
SOP-8D		

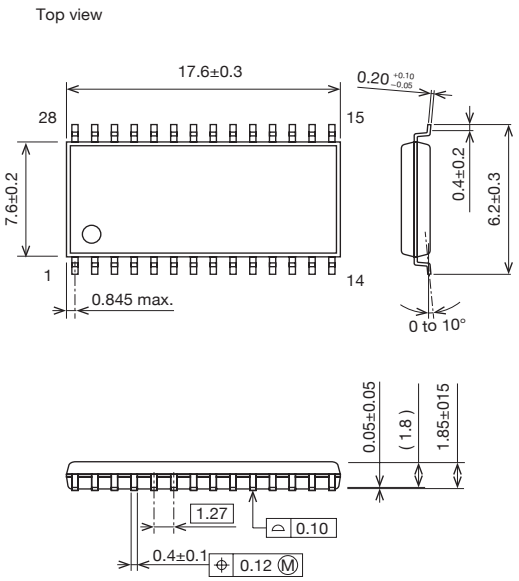
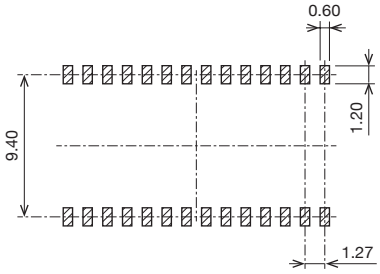
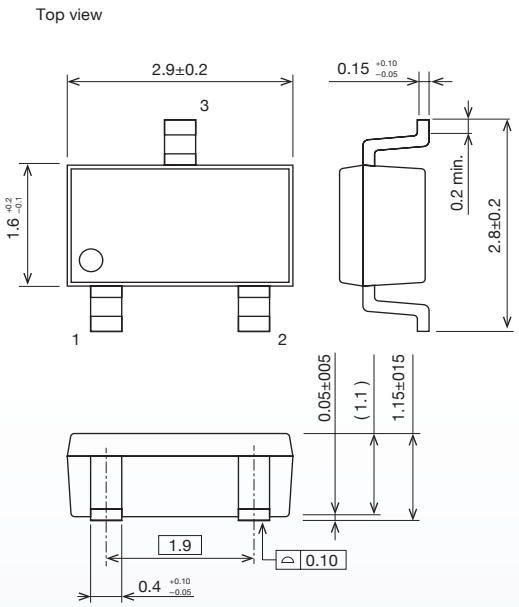
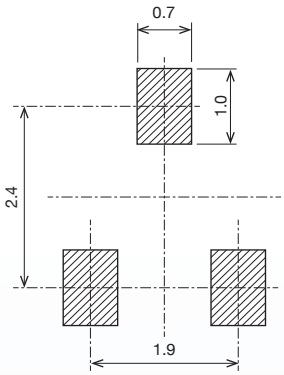
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-8G		
SOP-8J	Top view 	

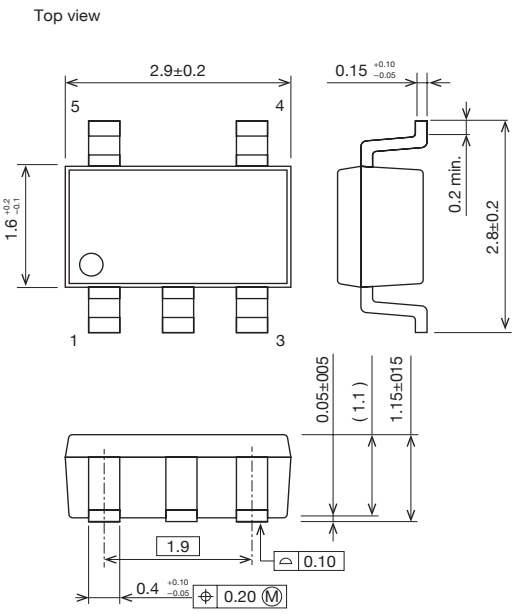
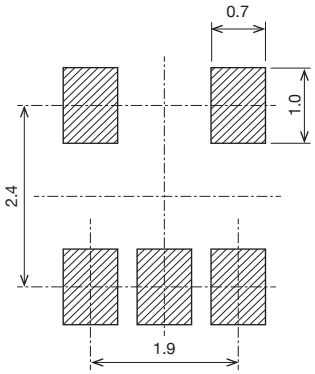
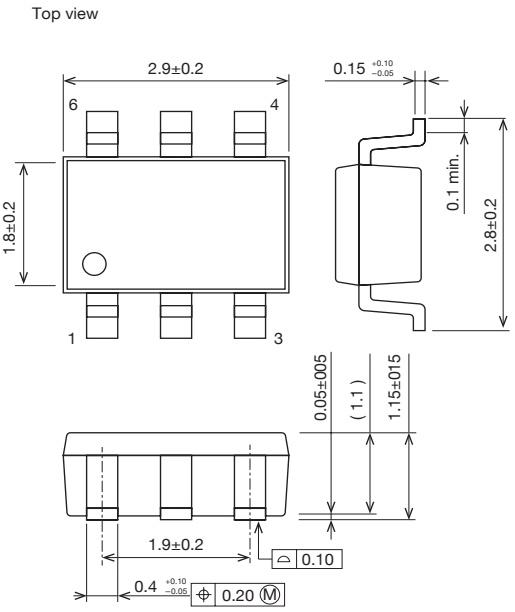
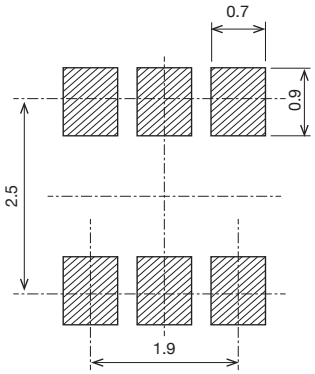
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-10A		
SOP-16B		

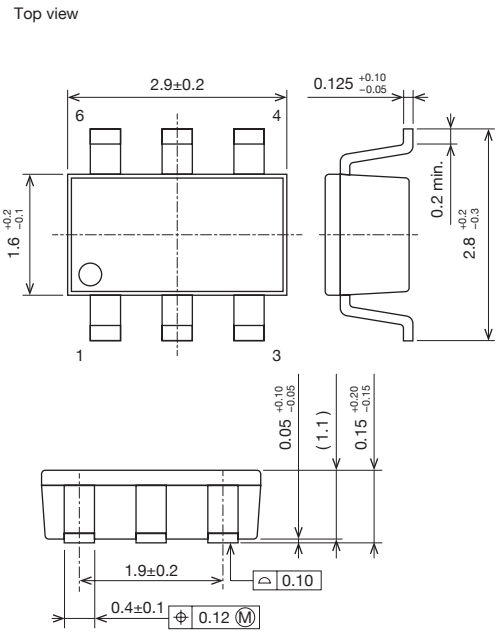
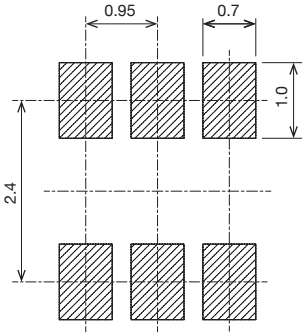
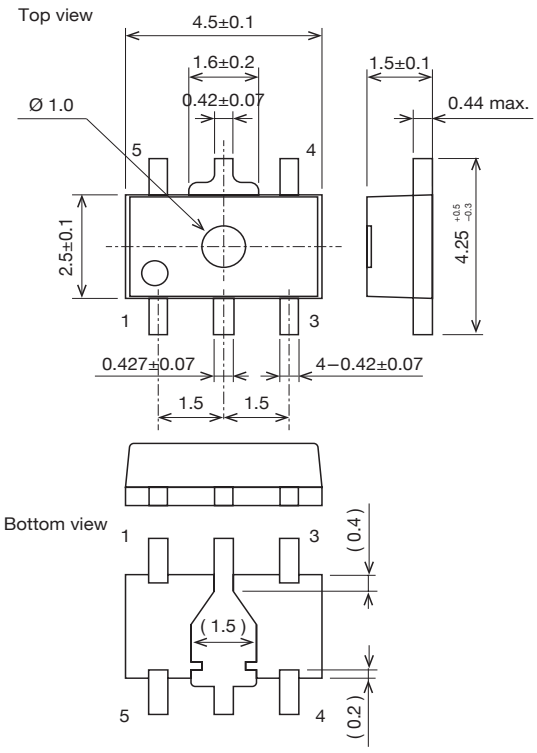
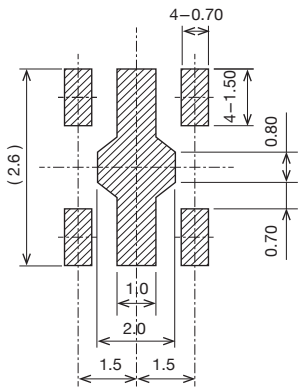
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-28B		
SOT-23A		

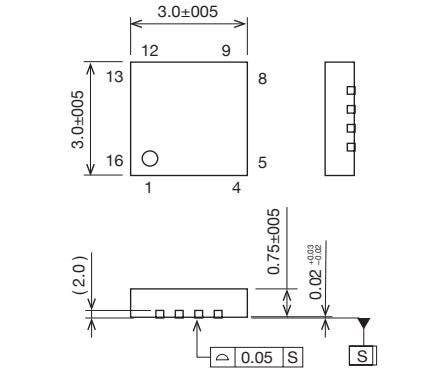
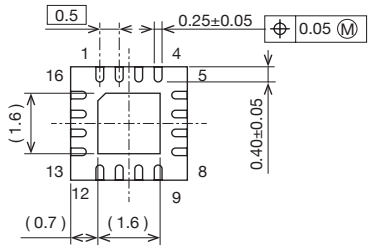
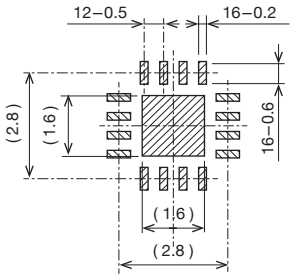
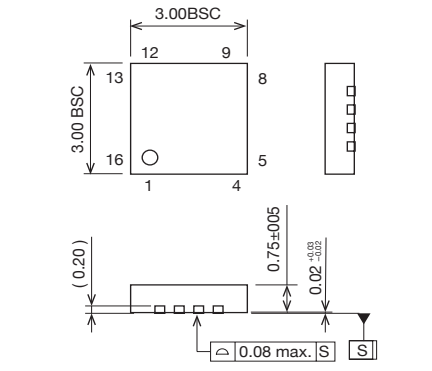
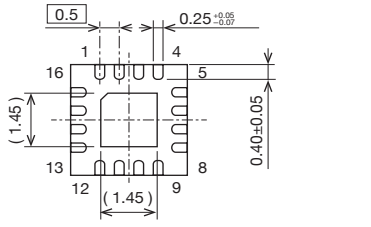
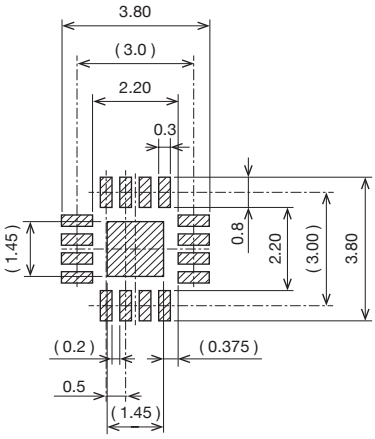
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOT-25A		
SOT-26A		

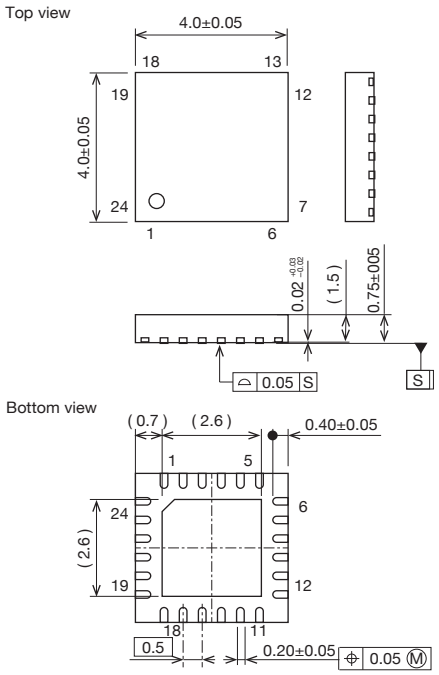
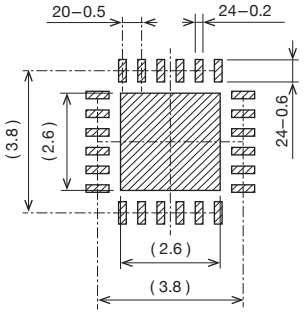
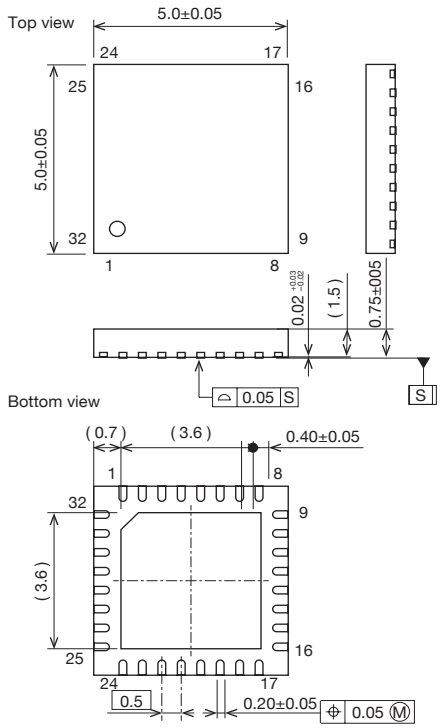
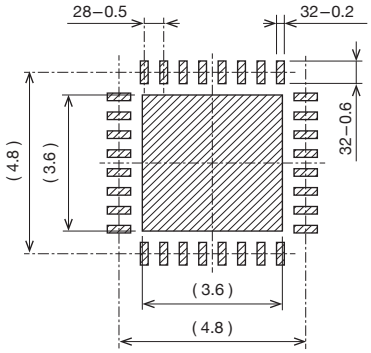
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOT-26B		
SOT89-5A		

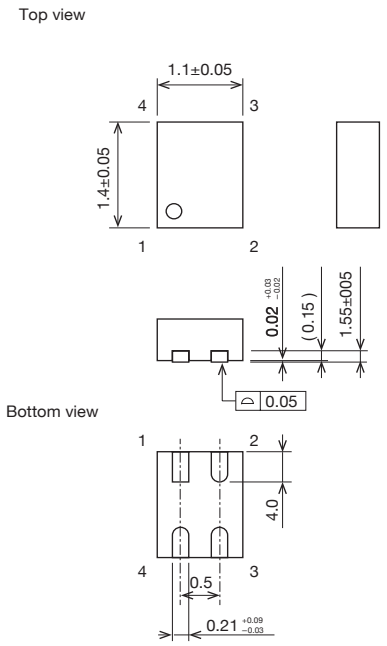
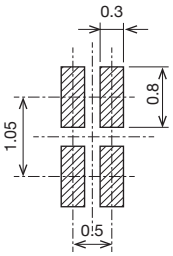
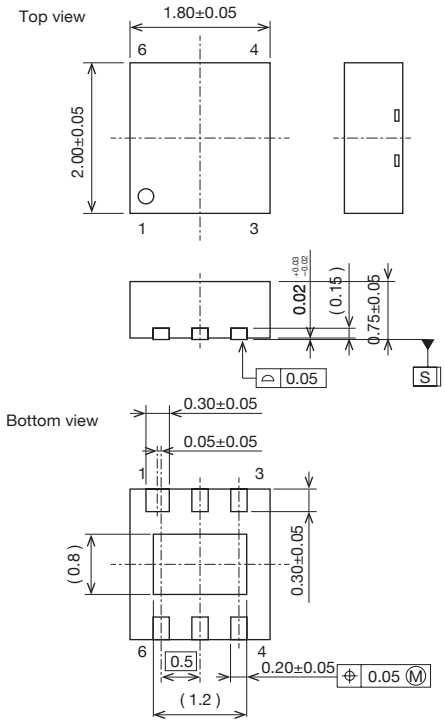
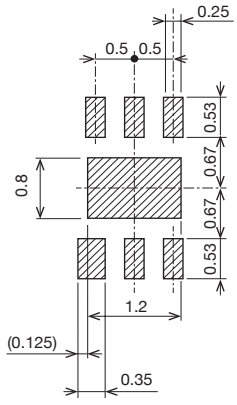
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SQFN-16A	Top view  Bottom view  	
SQFN-16B	Top view  Bottom view  	

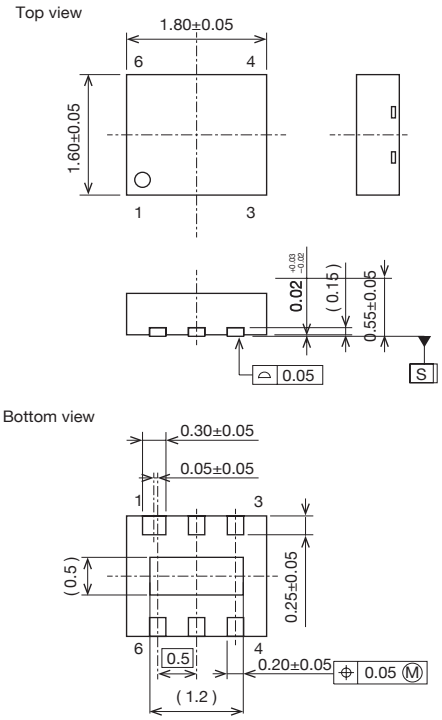
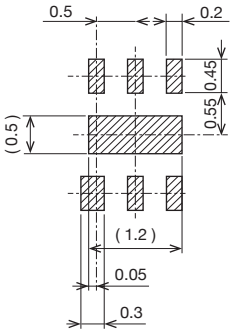
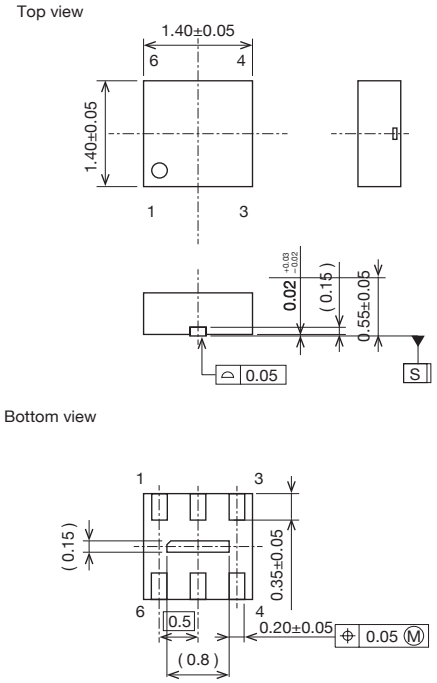
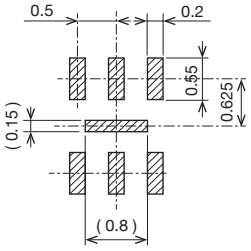
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SQFN-24A		
SQFN-32A		

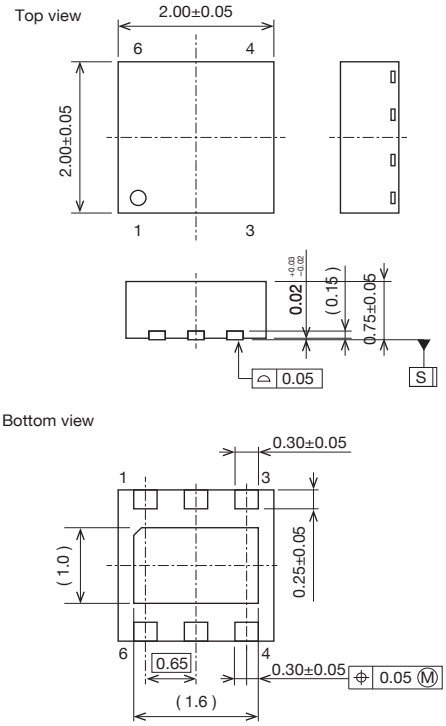
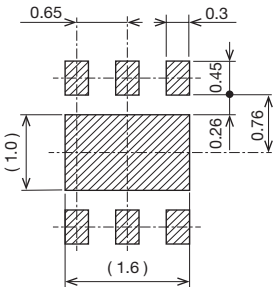
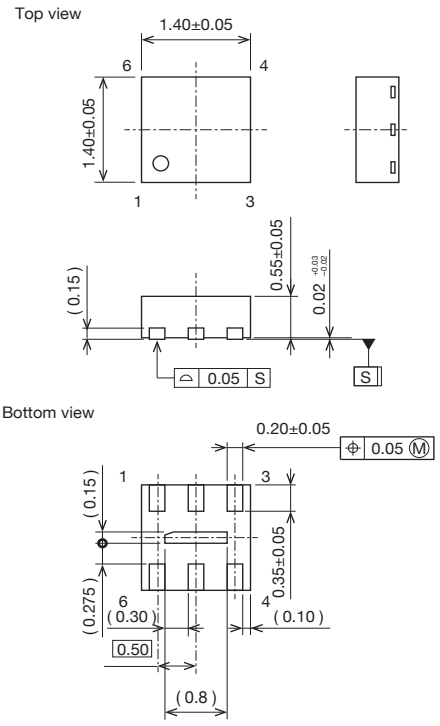
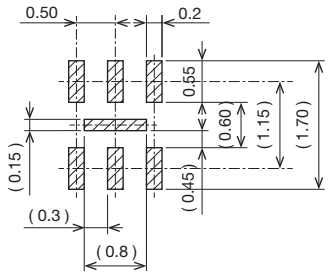
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-4B		
SSON-6A		

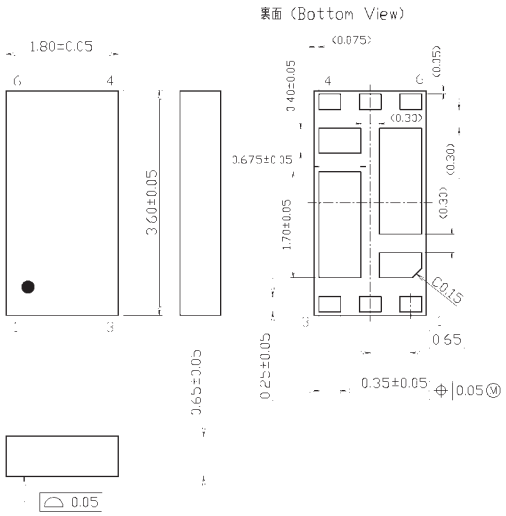
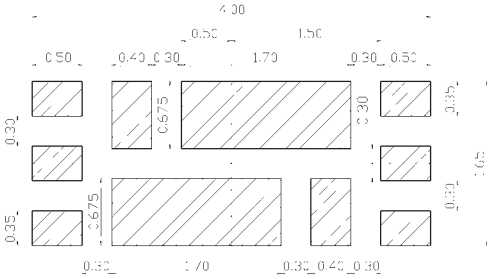
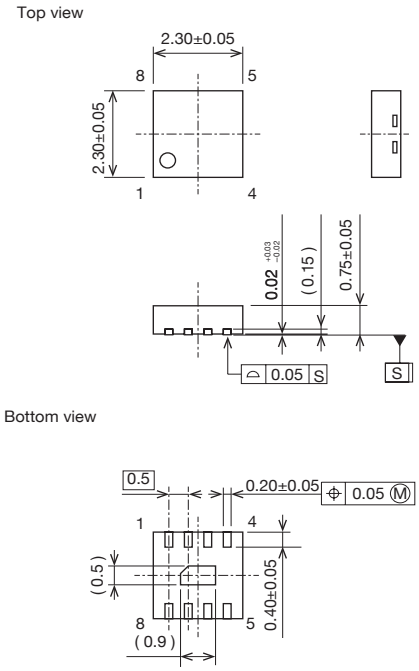
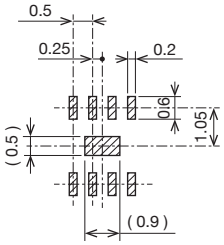
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-6E		
SSON-6J		

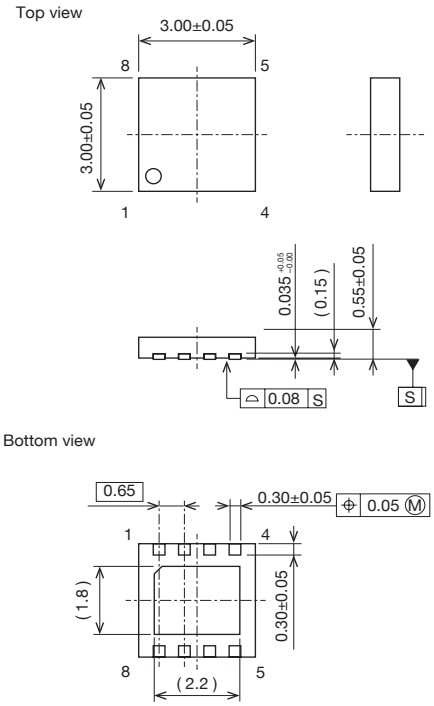
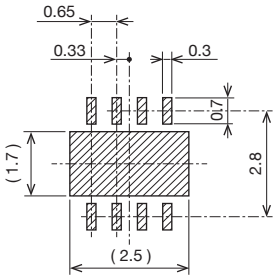
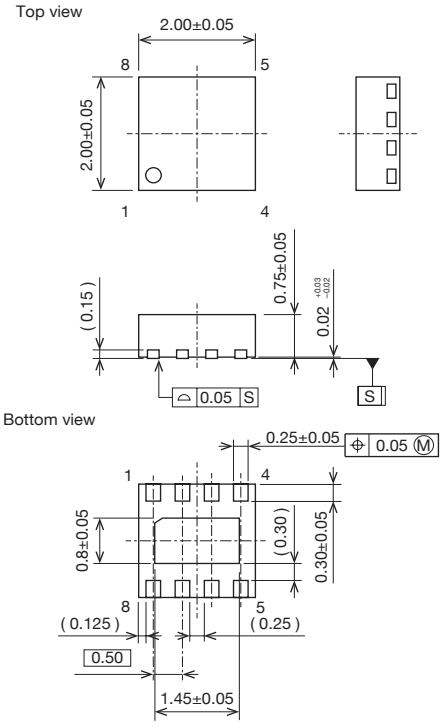
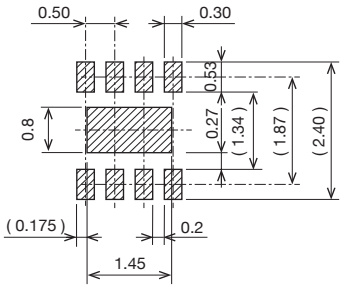
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-6L		
SSON-6M		

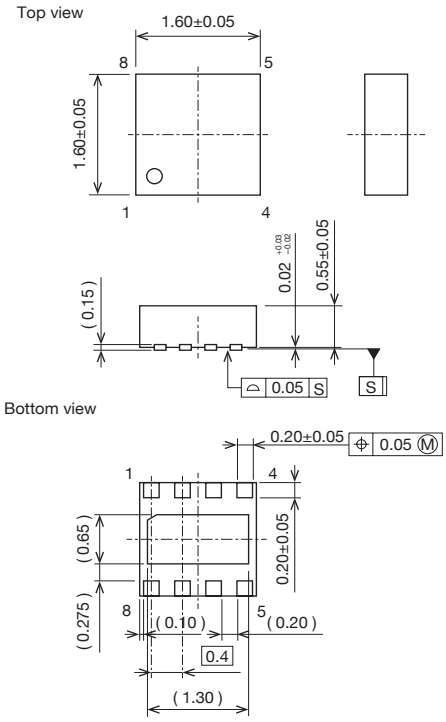
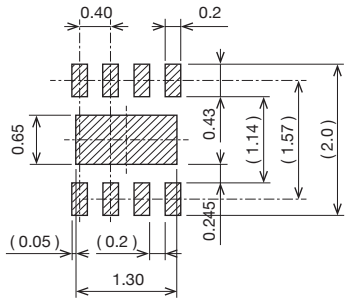
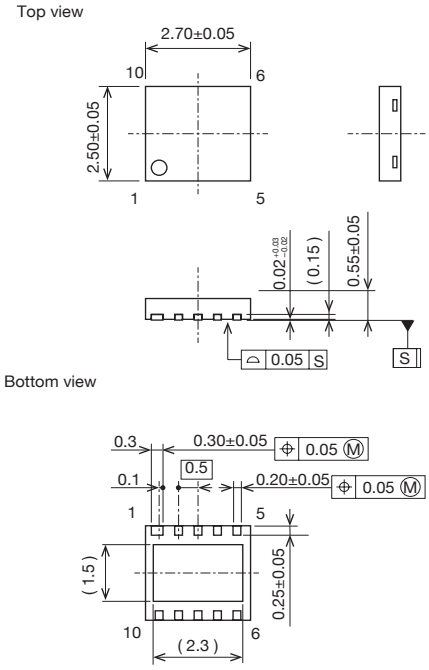
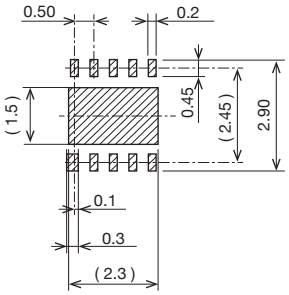
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-6N		
SSON-8B		

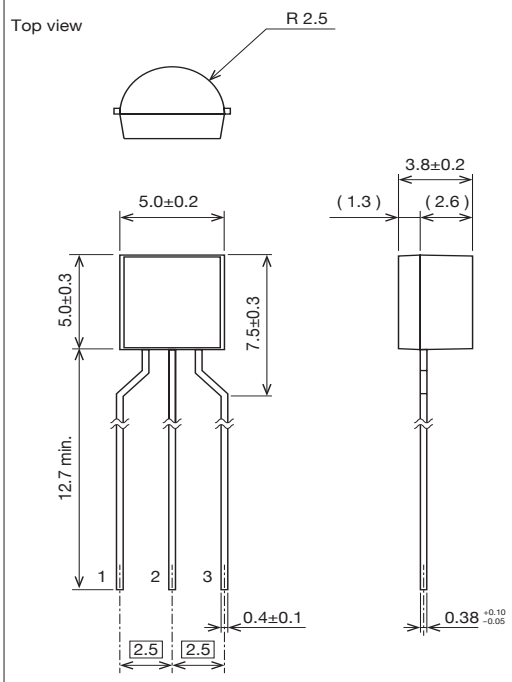
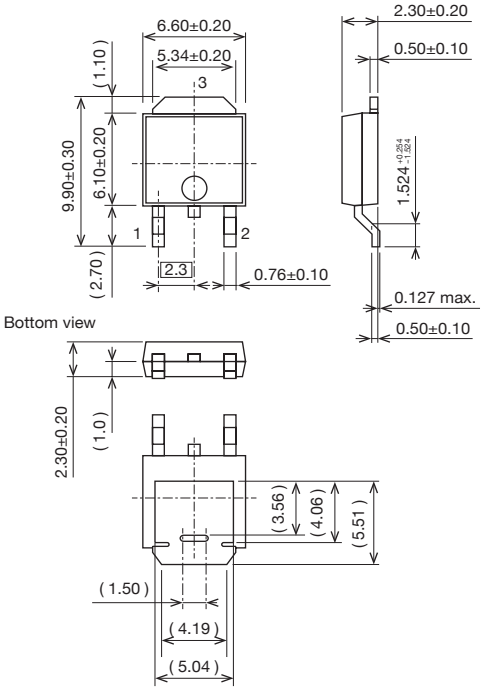
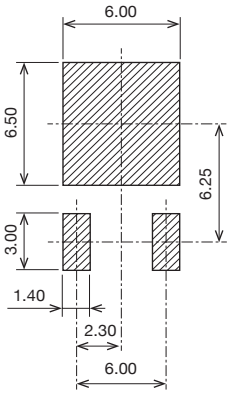
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-8C		
SSON-8E		

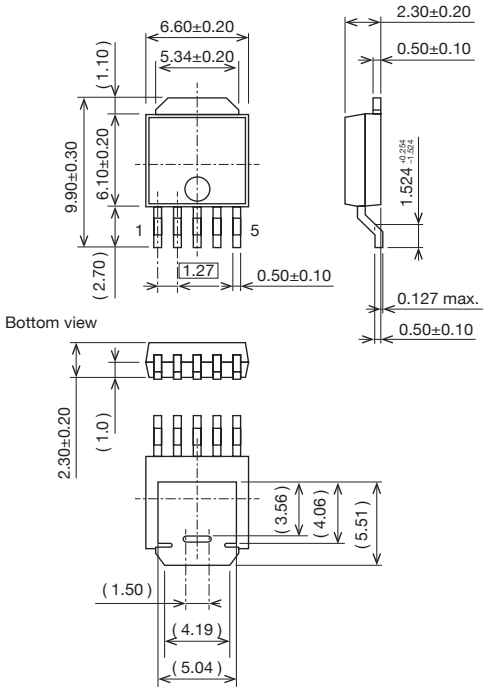
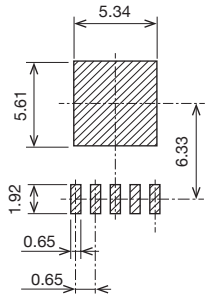
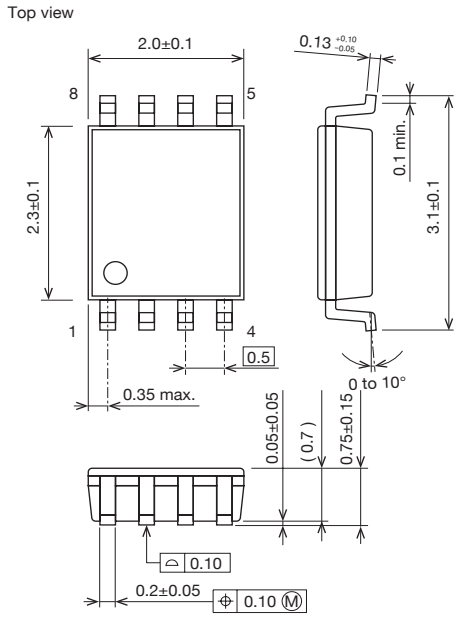
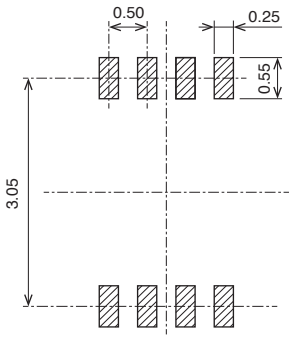
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-8G		
SSON-10A		

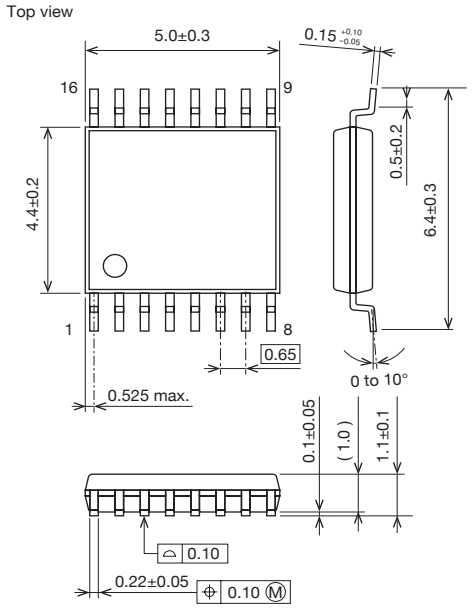
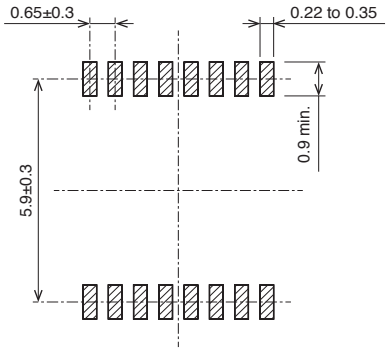
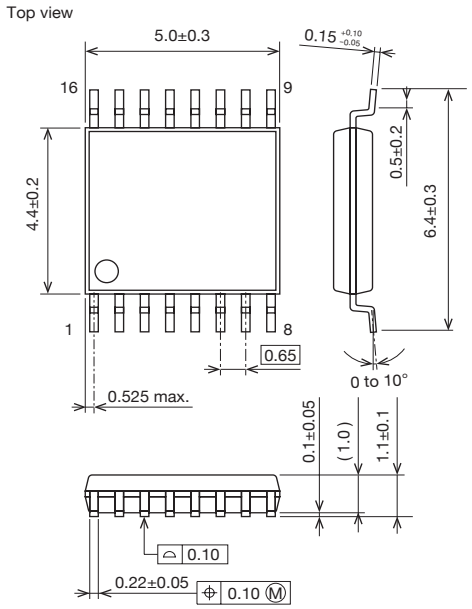
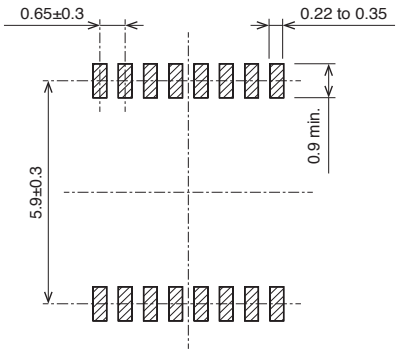
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TO-92A		
TO-252C		

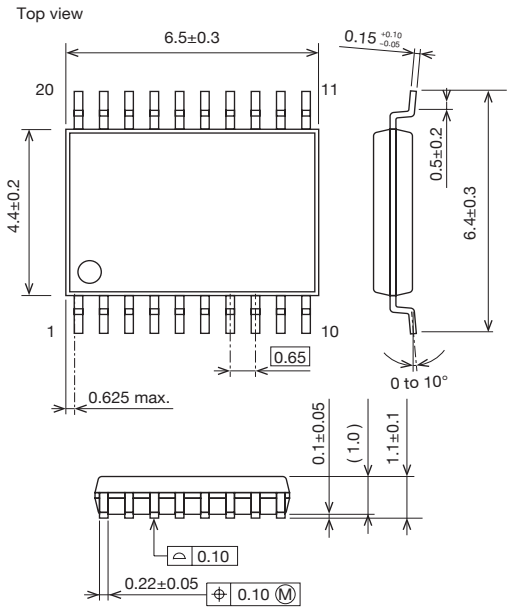
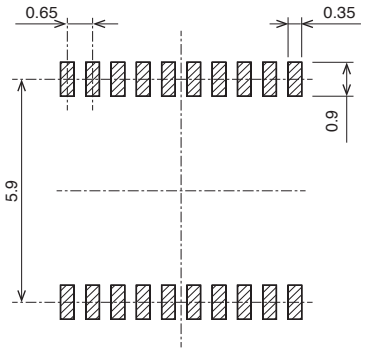
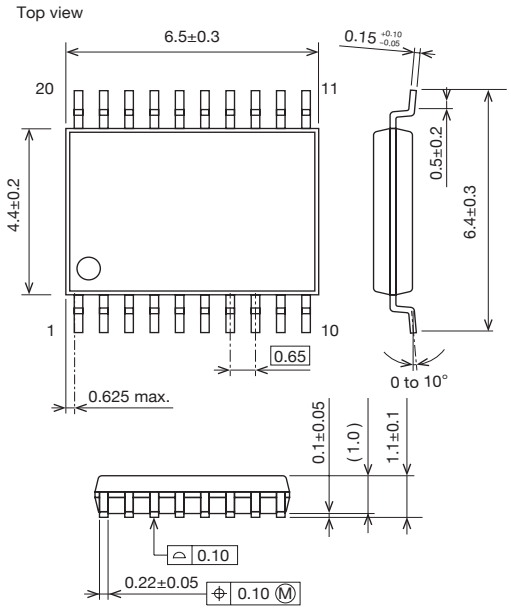
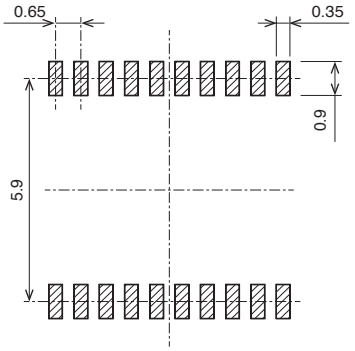
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TO-252-5A		
TSOP-8A		

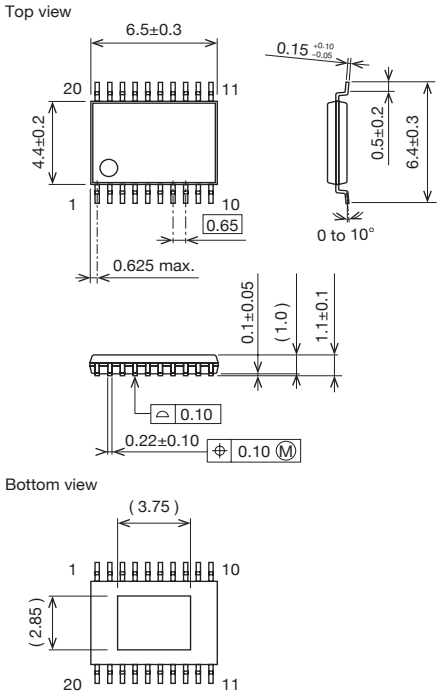
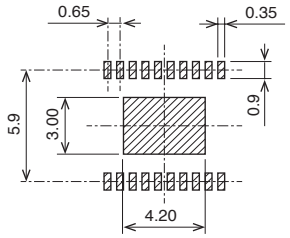
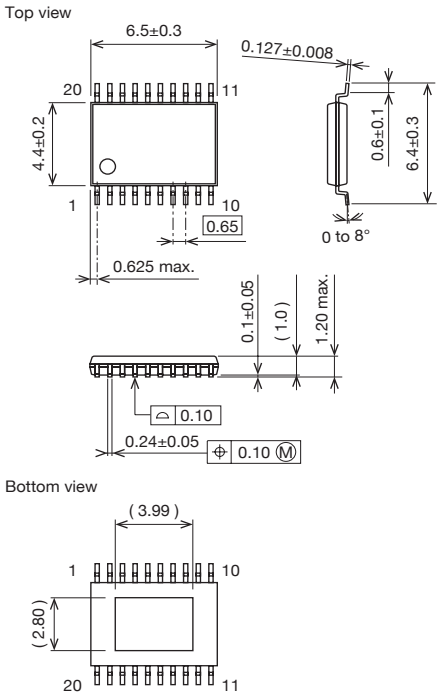
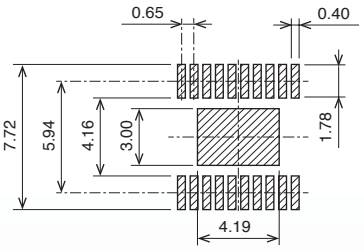
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TSOP-16B		
TSOP-16D		

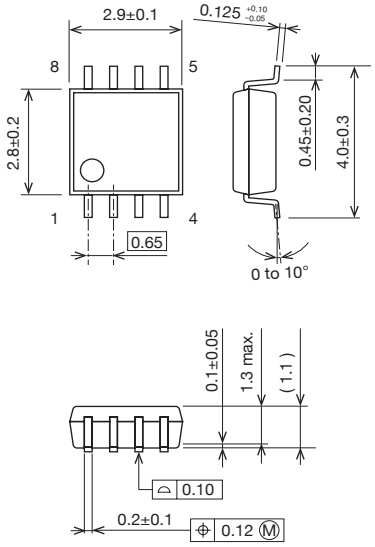
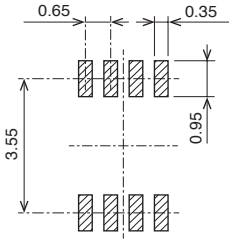
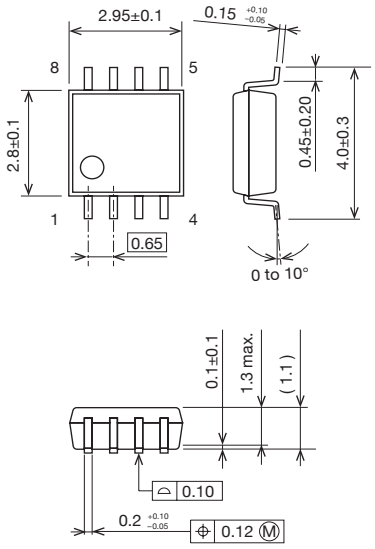
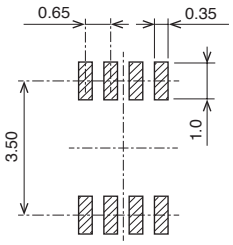
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TSOP-20A		
TSOP-20D		

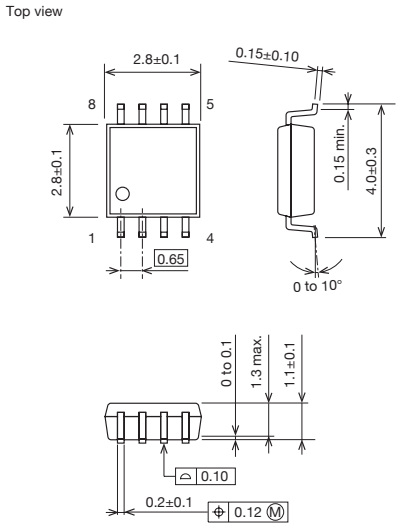
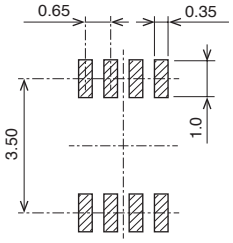
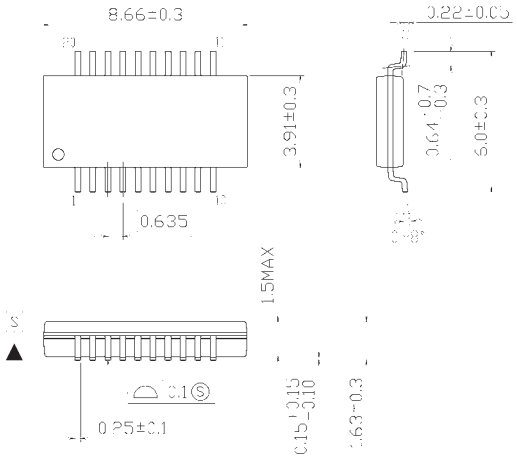
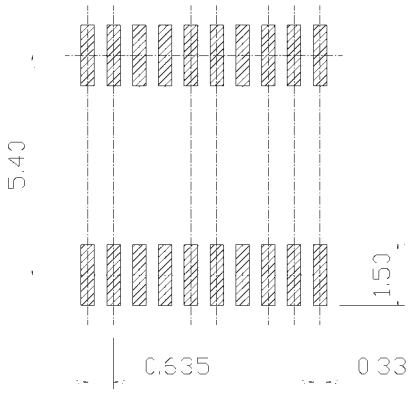
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TSOP-20E		
TSOP-20F		

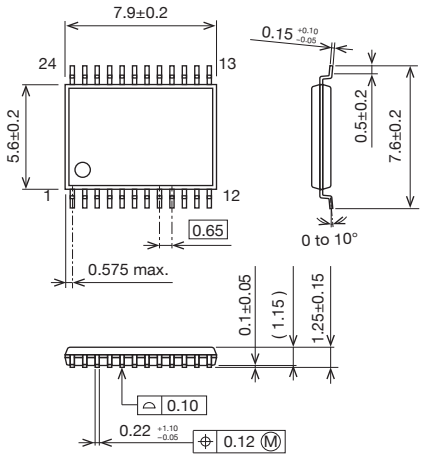
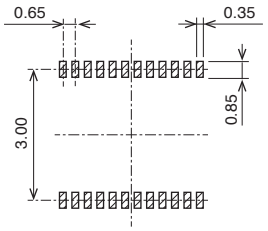
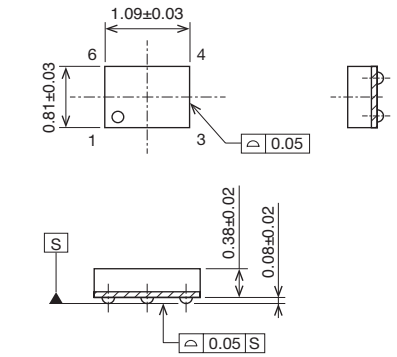
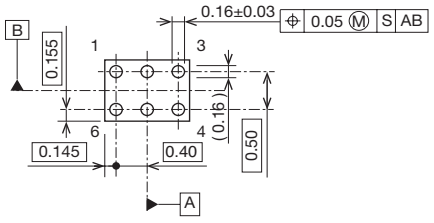
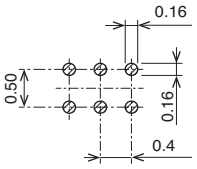
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
VSOP-8B	Top view 	
VSOP-8C	Top view 	

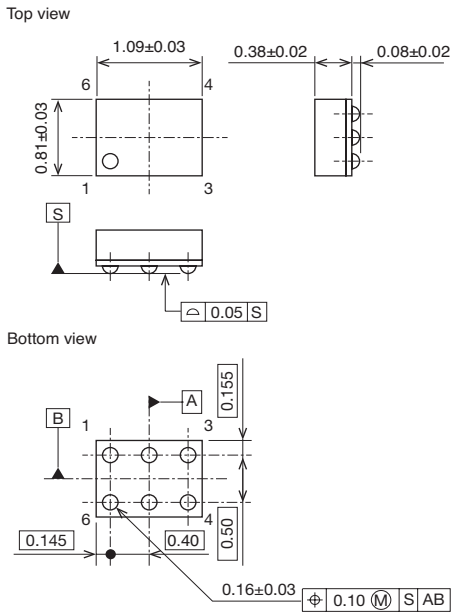
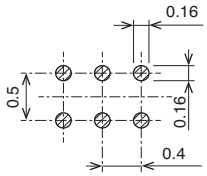
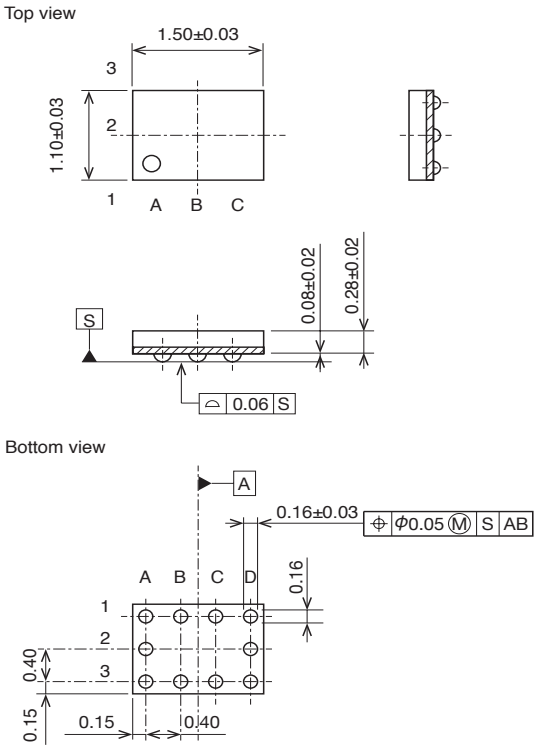
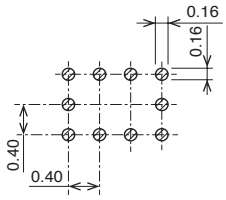
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
VSOP-8D		
VSOP-20A		

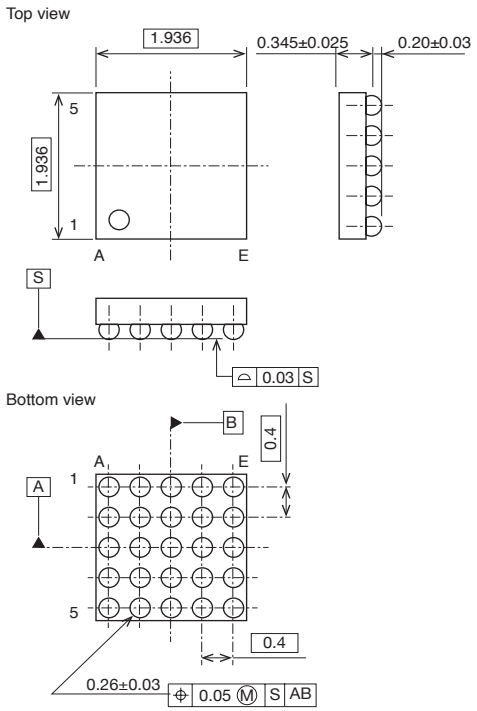
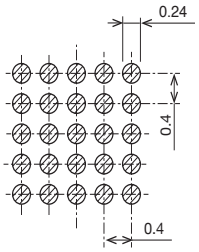
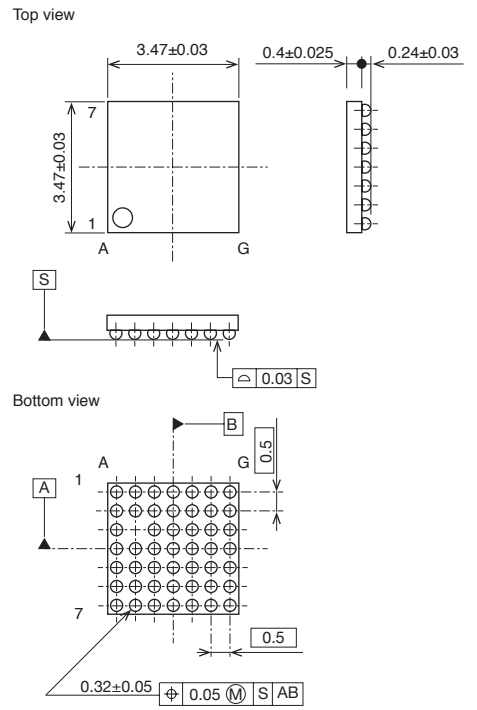
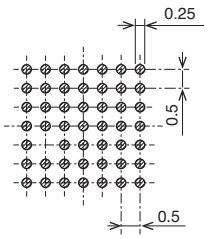
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
VSOP-24A	Top view 	
WLCSP-6B	Top view  Bottom view 	

Unit: mm

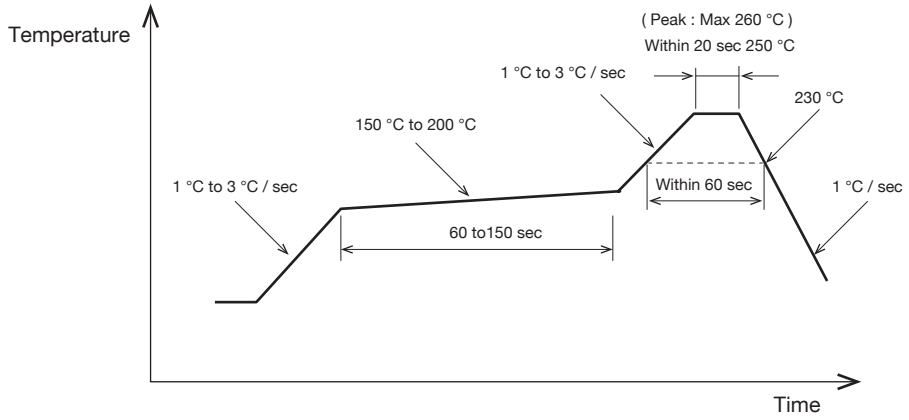
Package Name	Dimentional Drawing	Recommended Land Pattern
WLCSP-6C		
WLCSP-10A		

Unit: mm

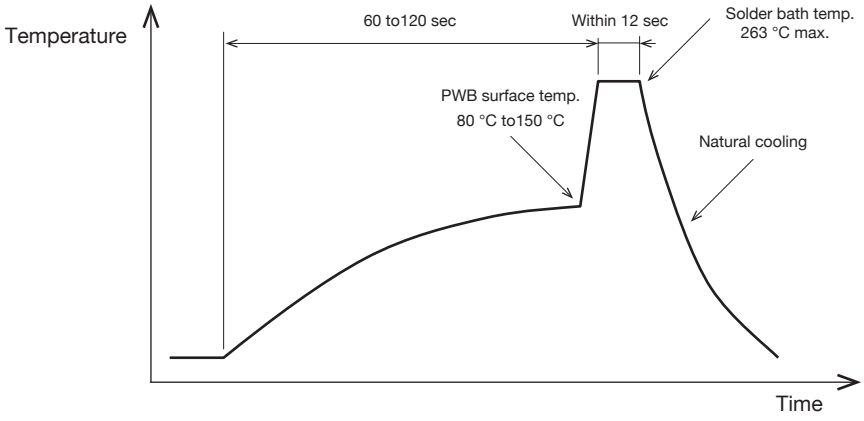
Package Name	Dimentional Drawing	Recommended Land Pattern
WLCSP-25A		
WLCSP-48B		

5 Pb–Free Recommended Profile

Reflow Soldering (max 2 times)



Flow Soldering (max 1 times)



Note : In case of double–wave soldering, the temp. is at its peak during the total time of 2max. temp.

Manual Soldering

Iron tip temp./time	times
400 °C max. / 3 sec	2 max.

Pre Treatment Moisture Soaking Condition of Reliability Test

85 °C 65 %RH 168h (1st), 85 °C 65 %RH 168h (2nd)

note : Please contact us for the CSP package separately.

5 permissible counts of solder methods for each packages

Package type	Package	Reflow soldering	Flow soldering	Manual soldering
Lead type	TO-92A		1	2
Flat-lead type	SON-6A	2		2
	SON-6C	2		2
	SON-6D	2		2
	SON-6F	2		2
	SOT89-5A	2		2
Gullwing type	SC-82ABA	2	1	2
	SC-82ABB	2	1	2
	SC-88A	2	1	2
	SOT-23A	2	1	2
	SOT-25A	2	1	2
	SOT-26A	2	1	2
	SOT-26B	2	1	2
	SOP-7B	2	1	2
	SOP-8C	2	1	2
	SOP-8D	2	1	2
	SOP-8G	2	1	2
	SOP-8J	2	1	2
	SOP-10A	2	1	2
	SOP-16B	2	1	2
	SOP-28B	2	1	2
	TSOP-8A	2		2
	TSOP-16B	2		2
	TSOP-16D	2		2
	TSOP-20A	2		2
	TSOP-20D	2		2
	TSOP-20E	2		2
	TSOP-20F	2		2
	VSOP-8B	2		2
	VSOP-8C	2		2
	VSOP-8D	2		2
	VSOP-20A	2		2
	VSOP-24A	2		2
	HSOP-8A	2		2
	HSOP-8C	2		2
	HSOP-8E	2		2
	HSOP-28A	2	1	2
	HSOP-28C	2	1	2
	TO-252C	2		2
	TO-252-5A	2		2

Package type	Package	Reflow soldering	Flow soldering	Manual soldering
Non-lead type	PLP-4A	2		
	PLP-4B	2		
	PLP-4C	2		
	PLP-4D	2		
	PLP-4E	2		
	PLP-4-1228	2		
	PLP-4-2140	2		
	PLP-6A	2		
	PLP-6C	2		
	PLP-6F	2		
	PLP-6G	2		
	PLP-6H	2		
	PLP-6J	2		
	PLP-6-2130	2		
	PLP-8E	2		
	PLP-8F	2		
	PLP-8G	2		
	PLP-8H	2		
	PLP-10A	2		
	PLP-10D	2		
	PLP-12A	2		
	PLP-12B	2		
	PLP-24A	2		
	SQFN-16A	2		
	SQFN-16B	2		
	SQFN-24A	2		
	SQFN-32A	2		
	SSON-4B	2		
	SSON-6A	2		
	SSON-6E	2		
	SSON-6J	2		
	SSON-6L	2		
	SSON-6M	2		
	SSON-6N	2		
	SSON-8B	2		
	SSON-8C	2		
	SSON-8E	2		
	SSON-8G	2		
	SSON-10A	2		
	WLCSP-6B	2		
	WLCSP-6C	2		
	WLCSP-10A	2		
	WLCSP-25A	2		
	WLCSP-48B	2		

*1 Ask us the temperature.
*2 This packages should be soldered within 168 hours after unpacking because they are moisture–proof packing products.
They should be also soldered within 168 hours in the second or following solder.

MinebeaMitsumi combines Minebea's ultra precision machining technology with MITSUMI ELECTRIC(MITSUMI)'s electronics technology as an "Electro Mechanics Solutions™" provider that contributes to the age of IoT, supporting manufacturing around the world.

* "Electro Mechanics Solutions" is a registered trademark in Japan of MinebeaMitsumi Inc. Its registration No. is 5322479.

ICs

- Power Supply IC
- Li-ion / Li-poly Battery IC
- Reset IC
- Sensor IC

Component Devices

- Power Inductor / Transformer / Coil
- Connector
- Switch
- DC Mini-Motor
- Stepping Motor

Power Supply

- AC Adaptor
- Charger
- DC Adaptor
- Internal Power Supply
- Power Supply for LED Light

High-frequency Products

- Wireless LAN Module
- Bluetooth® Module
- GPS Antenna
- Terrestrial Digital Broadcasting Antenna
- Keyless Module

CATV / IP

- Set-top Box

Our lead-free products meet the requirements of the RoHS directive.

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E97-024

●Note: The contents described in this catalog are subject to change without prior notice due to products improvements or termination of production.

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English

http://www.mitsumi.co.jp/products/eng/

- The product information on the home page is the same as that in the catalog.
- The data are updated continuously, so the home page always shows the newest product information.
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