N32H493 xE/xG   Product Brief

N32H493 series employs a 32-bit ARM Cortex-M4F core operating at a maximum frequency of 240MHz, supporting floating-point operations and DSP instructions. It integrates up to 1MB of embedded Flash, 256KB of SRAM (including 64KB of CCM SRAM) plus 4KB of Backup SRAM , three 12-bit 4.7Msps ADCs, two 12-bit DACs, and integrated communication interfaces including U(S)ART, I ᵗC, and SPI. It supports the xSPI high-speed memory interface, multiple advanced timers, general-purpose timers, basic timers, and low-power timers. The device incorporates a hardware acceleration engine for cryptographic algorithms, supporting AES/TDES, SHA, SM3, SM4, and MD5 algorithms. Supports TRNG true random number generator and CRC16/32.

Key Features

- **CPU Core**

  - 32-bit ARM Cortex-M4F + FPU, single-cycle hardware multiplication and division instruction, support DSP instruction and MPU

  - Built-in 8KB I-Cache (instruction cache) and 1KB D-Cache (data cache), supporting Flash Accelerator Unit for zero-wait program execution

  - Frequency up to 240 MHz, 300 DMIPS

- **Memories**

  - 1MByte on-chip Flash, dual-bank support, enabling secure storage, partition management and data protection, 10,000 erase/write cycles, 10-year data retention

  - 192KB general-purpose SRAM, configurable for ECC support

  - 64KB CCM SRAM, defaulted as general-purpose SRAM, configurable as CCM SRAM, configurable for ECC support

  - 4-KByte of Backup SRAM with ECC available in Standby mode

- **Power Modes**

  - Run mode: All peripherals configurable for operation

  - Sleep Mode: CPU halted, peripherals configurable for operation

  - Stop0 mode: SRAM and all registers can be configured to retention, RTC run

  - Standby mode: 6uA, all backup registers and Backup SRAM retained, all IOs retained, optional RTC run

  - VBAT mode: 4uA, all backup registers and Backup SRAM retained, optional RTC run

- **Clock**

  - HSE: 4MHz~32MHz high-speed external crystal oscillator

  - LSE: 32.768KHz low-speed external crystal oscillator

  - Built-in multiple high speed PLLs

  - MCO: Supports 2-channel clock outputs, which can be configured independently as clock output

  - HSI: High-speed internal RC 8MHz, -1.5% to +2% accuracy (full temperature range)

  - LSI: Low-speed internal RC 32KHz, +/-10% accuracy (full temperature range)

- **Reset**

  - Supports power-on/brown-out/external pin reset

– Supports watchdog reset

– Supports programmable voltage detection

- **GPIOs**

  – Up to 67 GPIOs, PG9 to PG14 comprise 6 I/O pins capable of supporting VDDIO input power supply operation.

- **Communication Interfaces**

  – 6x SPI interfaces, support half/full duplex mode

  – U(S)ART interfaces

    ◆ 1x USART interfaces (support ISO7816, IrDA, LIN)

    ◆ 2x UART interfaces

    ◆ TX/RX can be mapped to all pins

  – 4x I2C interfaces(Master/Slave) with speed up to 1 MHz where slave mode support dual address response

- **High Performance Analog Interfaces**

  – 3x 12-bit 4.7 Msps ADCs, supporting 12-bit, 10-bit, 8-bit, and 6-bit sampling precision, with hardware oversampling capability up to 16 bits. ADC1 supports up to 16 external single-ended input channels, ADC2 supports up to 17 external single-ended input channels, and ADC3 supports up to 10 external single-ended input channels. Both single-ended and differential modes are supported.

  – 2x 12-bit DACs, each supporting one internal output channel and one external output channel. Sampling rate: 1 Msps. Supports buffered and unbuffered outputs. Capable of internal output, external output, or simultaneous internal and external output.

  – 1x temperature sensor

- **High Speed External Memory Interfaces**

  – 1x xSPI interface, supporting external SRAM, PSRAM and Flash, supporting XIP

- **DMA Controllers**

  – 2x DMA controller

  – Each controller supports 8 channels

  – Channel source address and destination address can be configured arbitrarily

- **RTC real-time clock**

  – Supports leap-year calendar, alarm event, periodic wake up

  – Supports internal and external clock calibration

- **Timers**

  – 3x 16-bit advanced timer/counters supporting input capture, complementary outputs, quadrature encoding inputs, etc., with a maximum control precision of 4.17ns; each timer features six independent channels, four of which support four pairs of complementary PWM outputs

  – 10x general-purpose timers (GTIM1–10):

- GTIM2/3/5/6/7: 16-bit counters with a maximum control precision of 4.17 ns. Each timer features up to 4 independent channels, each supporting input capture, output compare, PWM generation, and single-pulse mode output.

- GTIM1/4: 32-bit counters with maximum control precision of 4.17 ns. Each timer provides up to 4 independent channels, each supporting input capture, output compare, PWM generation, and single-pulse mode output;

- GTIM8–10, 16-bit counters with a maximum control precision of 4.17 ns. Each timer features up to four independent channels, each supporting input capture, output compare, PWM generation, and single-pulse mode output. Only Channel 1 supports complementary outputs with dead time and brake input capability.

  – 2x 32-bit basic timers
  – 2x 16-bit low-power timer, can operate in Stop0 and Standby mode.
  – 1x 24-bit SysTick timer.
  – 1x 14-bit Window Watchdog (WWDG)
  – 1x 12-bit Independent Watchdog (IWDG)

- **Programming Methods**

  – Support SWD/JTAG debugging interface.
  – Support UART and I2C Bootloader

- **Security Features**

  – Flash encryption, multi-user partition management unit (SMPU)
  – Supports write protection (WRP), multiple read protection (RDP) levels (L0/L1/L2)
  – Built-in hardware acceleration engine for cryptographic algorithm
  – Supports AES/TDES, SHA, SM3, SM4, and MD5 algorithms
  – True random number generator(TRNG)
  – CRC16/32 operation
  – Supports secure boot, program encryption download, secure firmware update
  – Supports external clock failure detection, anti-tamper detection.

- **96-bit UID and 128-bit UCID**

- **Operating Conditions**

  – Operating voltage range: 1.8V~3.6V
  – Operating temperature range: -40℃ ~ 105℃

- **Packages**

  – BGA64 (5mm x 5mm)
  – BGA72 (4.41mm x 3.76mm)
  – BGA81 (4.41mm x 3.76mm)
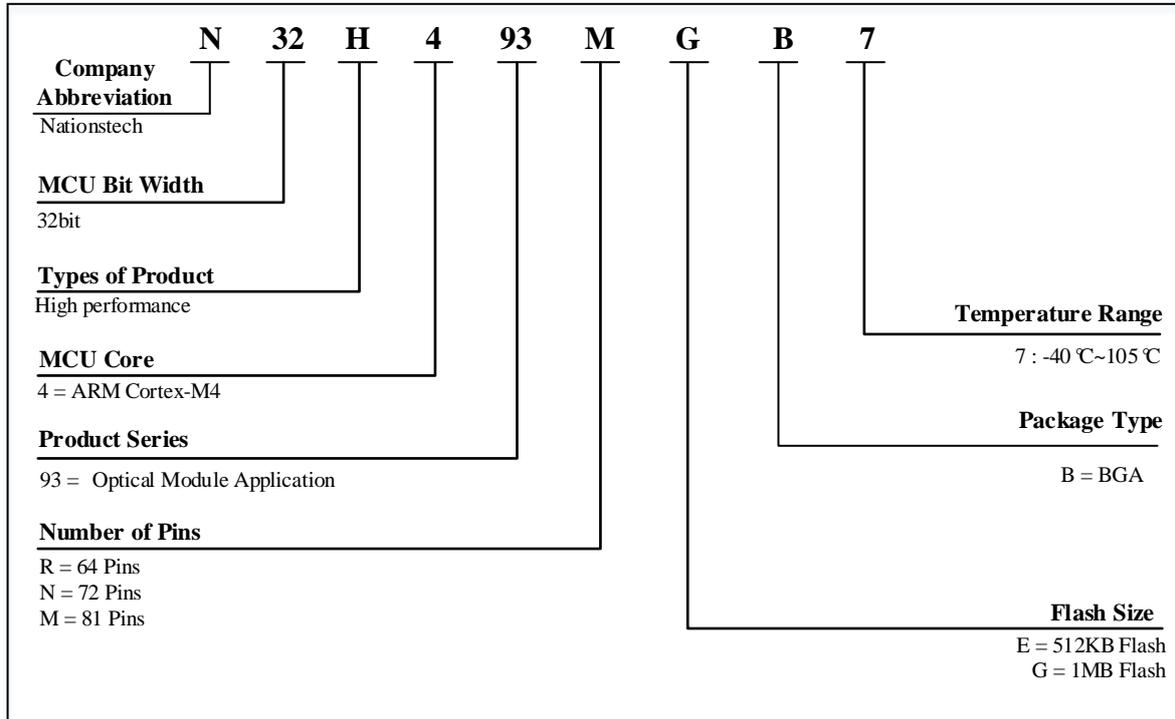
1 Ordering Information

```
                     N   32   H   4   93   M   G   B   7
```

Company Abbreviation
Nationstech

MCU Bit Width
32bit

Types of Product
High performance

MCU Core
4 = ARM Cortex-M4

Product Series
93 = Optical Module Application

Number of Pins
R = 64 Pins
N = 72 Pins
M = 81 Pins

Temperature Range
7 : -40℃~105℃

Package Type
B = BGA

Flash Size
E = 512KB Flash
G = 1MB Flash

Table 1-1 N32H493 Series Ordering Code

Ordering Code[1]	Package	Size	Packaging[2]	SPQ[3]	Temperature range
N32H493REB7	BGA64	5mm x 5mm	TBD	TBD	-40℃~105℃
N32H493RGB7	BGA64	5mm x 5mm	TBD	TBD	-40℃~105℃
N32H493NEB7	BGA72	4.41mm x 3.76mm	TBD	TBD	-40℃~105℃
N32H493NGB7	BGA72	4.41mm x 3.76mm	TBD	TBD	-40℃~105℃
N32H493MEB7	BGA81	4.41mm x 3.76mm	TBD	TBD	-40℃~105℃
N32H493MGB7	BGA81	4.41mm x 3.76mm	TBD	TBD	-40℃~105℃

1. For the latest detailed-ordering information, please refer to the Selection Guide.

2. The packaging provided is the basic packaging. If user has any other requirements, please contact Naitons.

3. Minimum packaging quantity.

2   Product Configurations

Table 2-1 N32H493 Series Product Configuration

Device		N32H493ME/MGB7		N32H493NE/NGB7		N32H493RE/RGB7	
Operating Condition		1.8~3.6V/-40~105℃					
CPU Frequency		ARM Cortex-M4F @240MHz, 300DMIPS					
Flash Capacity (KB)		512	1024	512	1024	512	1024
Total SRAM (KB)	General SRAM	192	192	192	192	192	192
	CCM SRAM[1]	64					
	Backup SRAM	4					
Times	ATIM	3*16bit					
	GTIM	5*16bit					
		2*32bit[2]					
		3*16bit[3]					
	BTIM	2*32bit					
	LPTIM	2*16bit					
	SysTick timer	1					
	WWDG	1*14bit					
	IWDG	1*12bit					
	RTC	Yes					
Communication Interfaces	SPI	6					
	I²C	4					
	USART	1[4]					
	UART	2[5]					
Memory Expansion	XSPI	Yes					
GPIO WKUP Pins		67 5		59 5		52 5	
Nb of I/Os down to 1.8 V[6]		6		6		0	
DMA Number of channels		2 16					

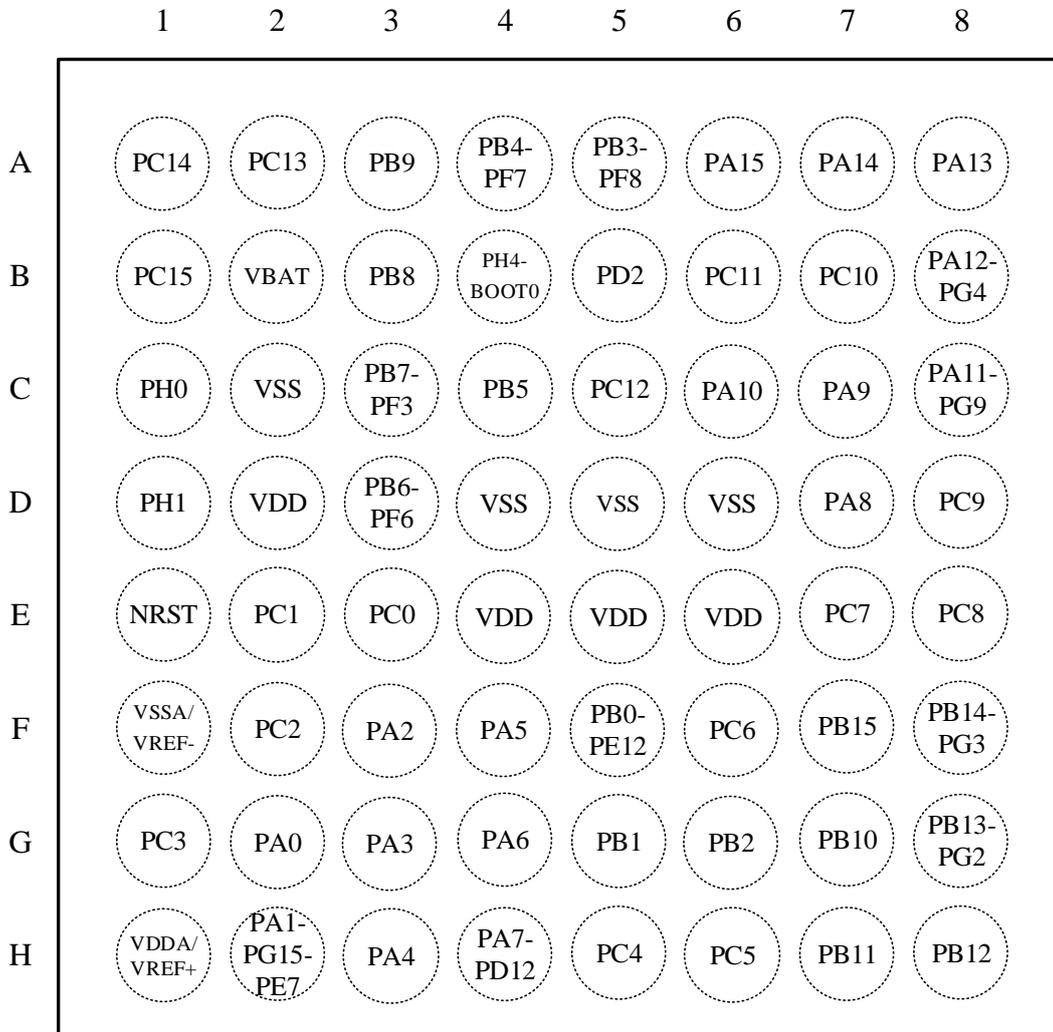| 12bit ADC Number of channels	3 23	3 23	3 23
12bit DAC Number of channels	2 2		
Algorithm Support	DES/3DES、AES、 SHA1/SHA224/SHA256、SM3、SM4、 MD5、CRC16/CRC32		
TRNG	Yes		
Security Protection	Read-write protection (RDP/WRP), storage encryption, partition protection, secure boot		
Package	BGA81	BGA72	BGA64

Note:

1. *Power-on default is general-purpose SRAM; software configurable as CCM SRAM;*

2. *Only GTIM1 and GTIM4 support 32-bit timers;*

3. *Only GTIM8/9/10 support braking; channel 1 supports complementary channel output;*

4. *USART interface is USART3; TX, RX, RTS_DE support full pin mapping;*

5. *UART interfaces are UART5 and UART8, with TX, RX, and RTS_DE supporting full pin mapping;*

6. *The PG9 to PG14 pins on the BGA81 and BGA72 packages support operation via VDDIO input, accommodating 1.8 to 3.6V input..*
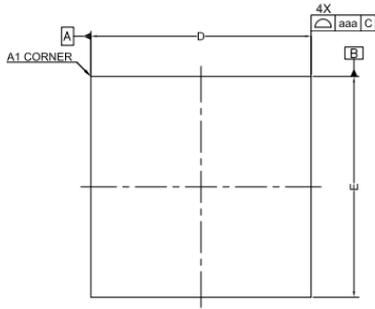
3 Package

3.1 BGA64

3.1.1 BAG64 Pinout

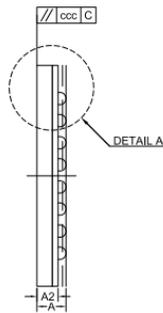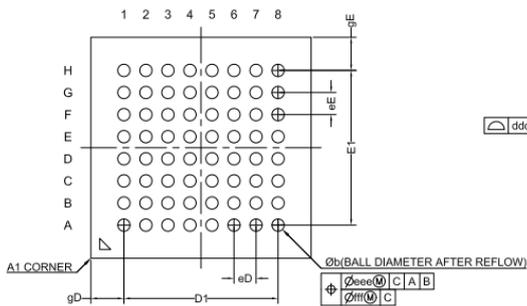|	1	2	3	4	5	6	7	8
A	PC14	PC13	PB9	PB4-PF7	PB3-PF8	PA15	PA14	PA13
B	PC15	VBAT	PB8	PH4-BOOT0	PD2	PC11	PC10	PA12-PG4
C	PH0	VSS	PB7-PF3	PB5	PC12	PA10	PA9	PA11-PG9
D	PH1	VDD	PB6-PF6	VSS	VSS	VSS	PA8	PC9
E	NRST	PC1	PC0	VDD	VDD	VDD	PC7	PC8
F	VSSA/VREF-	PC2	PA2	PA5	PB0-PE12	PC6	PB15	PB14-PG3
G	PC3	PA0	PA3	PA6	PB1	PB2	PB10	PB13-PG2
H	VDDA/VREF+	PA1-PG15-PE7	PA4	PA7-PD12	PC4	PC5	PB11	PB12

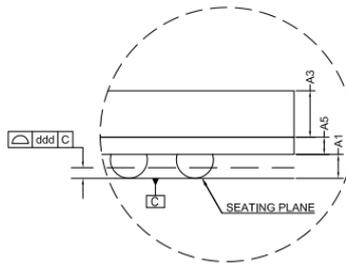Top view

3.1.2 BGA64 Package

TOP VIEW

SIDE VIEW

BOTTOM VIEW

DETAIL A
ROTATED 90°
(SCALE: 3/1)
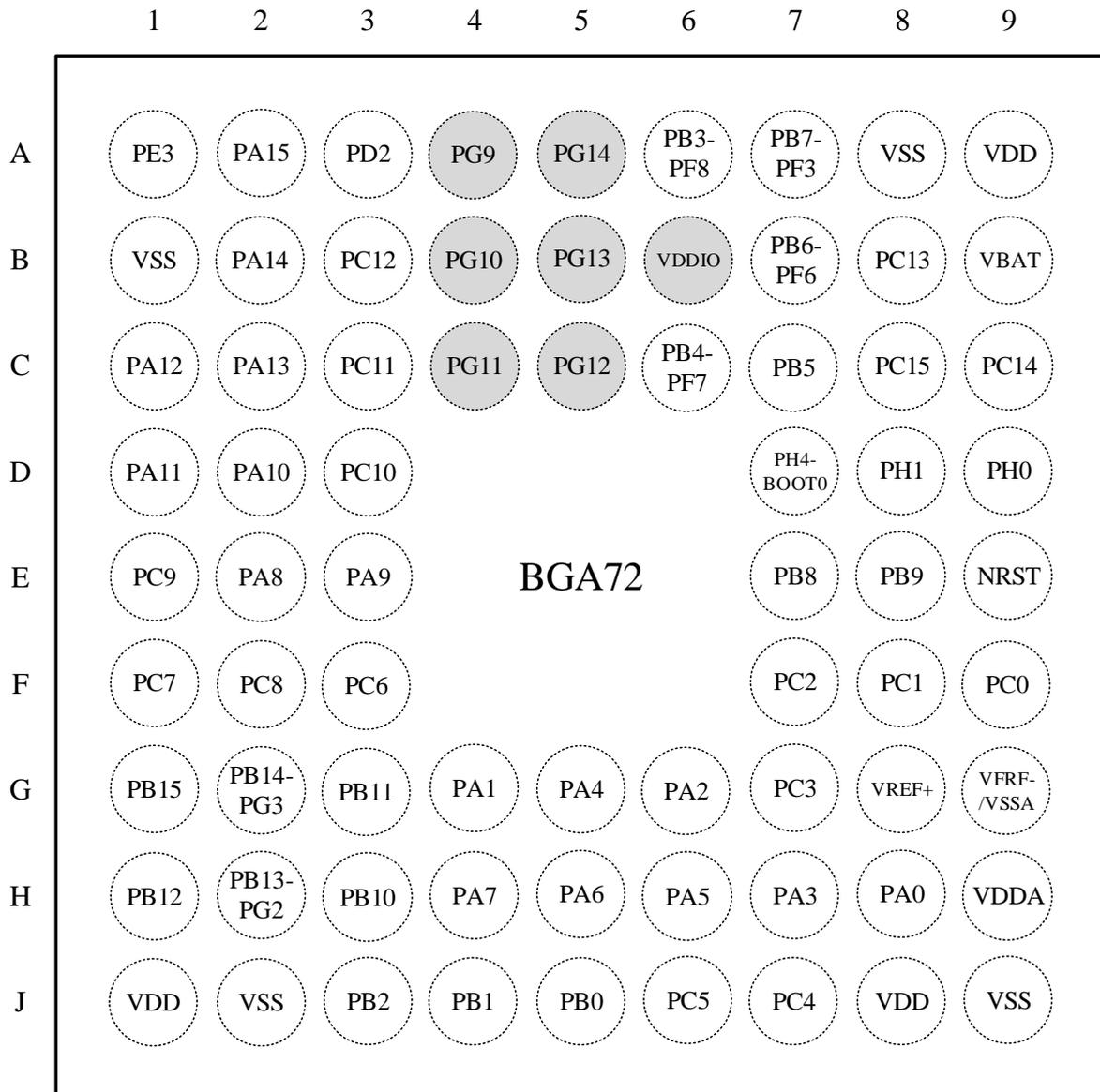
COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

ITEM		SYMBOL	COMMON DIMENSIONS		
			MIN.	NOM.	MAX.
Body Size	X	D	4.850	5.000	5.150
	Y	E	4.850	5.000	5.150
Ball Pitch	X	eD		0.500	
	Y	eE		0.500	
Total Thickness		A	0.592	0.660	0.728
Ball Stand Off		A1	0.130	0.180	0.230
Mold+Substrate		A2	0.435	0.480	0.525
Mold Thickness		A3	0.310	0.350	0.390
Substrate Thickness		A5	0.110	0.130	0.150
Raw Ball Size		b'		0.250	
Ball Size(After Reflow)		b	0.230	0.280	0.330
Package Edge Tolerance		aaa		0.150	
Mold Flatness		ccc		0.200	
Coplanarity		ddd		0.080	
Ball Offset (Package)		eee		0.150	
Ball Offset (Ball)		fff		0.050	
Ball Count		n		64	
Edge Ball Center to Center	X	D1		3.500	
	Y	E1		3.500	
Edge Ball Center to Package Edge	X	gD		0.750	
	Y	gE		0.750	

NOTES:

1.   DIMENSIONS ARE IN MILLIMETERS.

2.   All DIMENSIONS AND TOLERANCE CONFORM TO ASME Y14.5M-2009.

3.   TERMINAL POSITIONS DESIGNATION PER JESD 95.

4.   DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER
     PARALLEL TO PRIMARY DATUM C.
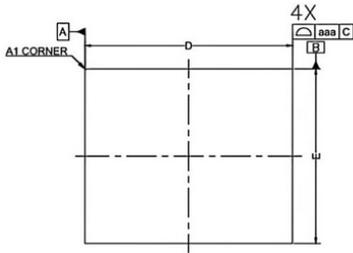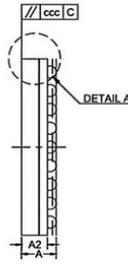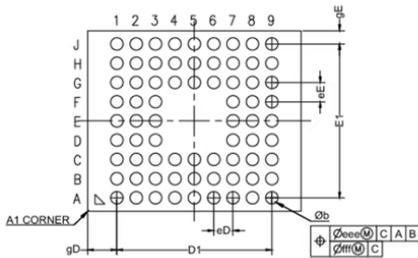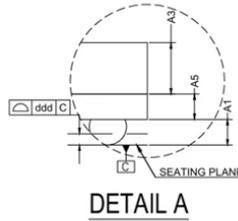
5.   BGA PAD SOLDER MASK OPENING IS Ø0.27mm;

3.2 BGA72

3.2.1 BGA72 Pinout

	1	2	3	4	5	6	7	8	9
A	PE3	PA15	PD2	PG9	PG14	PB3-PF8	PB7-PF3	VSS	VDD
B	VSS	PA14	PC12	PG10	PG13	VDDIO	PB6-PF6	PC13	VBAT
C	PA12	PA13	PC11	PG11	PG12	PB4-PF7	PB5	PC15	PC14
D	PA11	PA10	PC10				PH4-BOOT0	PH1	PH0
E	PC9	PA8	PA9		BGA72		PB8	PB9	NRST
F	PC7	PC8	PC6				PC2	PC1	PC0
G	PB15	PB14-PG3	PB11	PA1	PA4	PA2	PC3	VREF+	VFRF-/VSSA
H	PB12	PB13-PG2	PB10	PA7	PA6	PA5	PA3	PA0	VDDA
J	VDD	VSS	PB2	PB1	PB0	PC5	PC4	VDD	VSS

Top view

3.2.2 BGA72 Package

TOP VIEW

SIDE VIEW

DETAIL A

BOTTOM VIEW

DETAIL A

COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

ITEM		SYMBOL	COMMON DIMENSIONS		
			MIN.	NOM.	MAX
Body Size	X	D	4.300	4.400	4.500
	Y	E	3.660	3.760	3.860
Ball Pitch	X	eD		0.400	
	Y	eE		0.400	
Total Thickness		A	0.662	0.733	0.804
Ball Stand Off		A1	0.138	0.188	0.238
Mold+Substrate		A2	0.495	0.545	0.595
Mold Thickness		A3	0.325	0.365	0.405
Substrate Thickness		A5	0.150	0.180	0.210
Ball Size		b	0.208	0.258	0.308
Package Edge Tolerance		aaa		0.100	
Mold Flatness		ccc		0.200	
Coplanarity		ddd		0.080	
Ball Offset (Package)		eee		0.150	
Ball Offset (Ball)		fff		0.050	
Ball Count		n		72	
Edge Ball Center to Center	X	D1		3.200	
	Y	E1		3.200	
Edge Ball Center to Package Edge	X	gD		0.600	
	Y	gE		0.280	

NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. All DIMENSIONS AND TOLERANCE CONFORM TO ASME Y14.5M-2009.
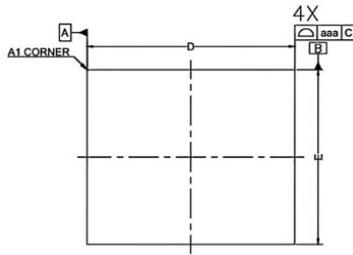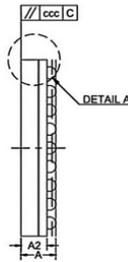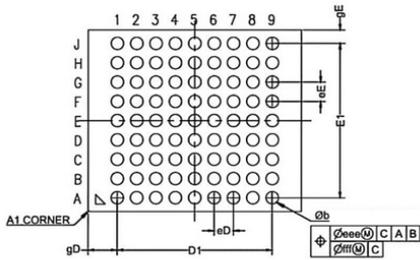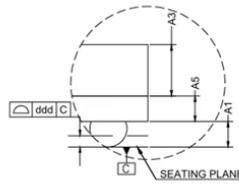3. TERMINAL POSITIONS DESIGNATION PER JESD 95.

3.3 BGA81

3.3.1 BGA81 Pinout

	1	2	3	4	5	6	7	8	9
A	PE3	PA15	PD2	PG9	PG14	PB3-PF8	PB7-PF3	VSS	VDD
B	VSS	PA14	PC12	PG10	PG13	VDDIO	PB6-PF6	PC13	VBAT
C	PA12	PA13	PC11	PG11	PG12	PB4-PF7	PB5	PC15	PC14
D	PA11	PA10	PC10	PD5	PD0	PD1	PH4-BOOT0	PH1	PH0
E	PC9	PA8	PA9	VDD	PD4	PE7	PB8	PB9	NRST
F	PC7	PC8	PC6	PD9	PD8	PE8	PC2	PC1	PC0
G	PB15	PB14-PG3	PB11	PA1	PA4	PA2	PC3	VREF+	VFRF-/VSSA
H	PB12	PB13-PG2	PB10	PA7	PA6	PA5	PA3	PA0	VDDA
J	VDD	VSS	PB2	PB1	PB0	PC5	PC4	VDD	VSS

Top view

3.3.2 BGA81 Package

TOP VIEW

SIDE VIEW

BOTTOM VIEW

DETAIL A

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

ITEM	SYMBOL		COMMON DIMENSIONS		
			MIN.	NOM.	MAX
Body Size	X	D	4.300	4.400	4.500
	Y	E	3.660	3.760	3.860
Ball Pitch	X	eD		0.400	
	Y	eE		0.400	
Total Thickness		A	0.662	0.733	0.804
Ball Stand Off		A1	0.138	0.188	0.238
Mold+Substrate		A2	0.495	0.545	0.595
Mold Thickness		A3	0.325	0.365	0.405
Substrate Thickness		A5	0.150	0.180	0.210
Ball Size		b	0.208	0.258	0.308
Package Edge Tolerance		aaa		0.100	
Mold Flatness		ccc		0.200	
Coplanarity		ddd		0.080	
Ball Offset (Package)		eee		0.150	
Ball Offset (Ball)		fff		0.050	
Ball Count		n		81	
Edge Ball Center to Center	X	D1		3.200	
	Y	E1		3.200	
Edge Ball Center to Package Edge	X	gD		0.600	
	Y	gE		0.280	

NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. All DIMENSIONS AND TOLERANCE CONFORM TO ASME Y14.5M-2009.
3. TERMINAL POSITIONS DESIGNATION PER JESD 95.

4 Version History

Date	Version	Changes
2026.1.22	V1.0.0	Initial release.

5 Disclaimer

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