N32H481xE Product Brief

N32H481 series adopts a 32-bit ARM Cortex-M4F core, with a maximum operating frequency of 240MHz, supporting floating-point unit and DSP instructions. It integrates up to 512-KB embedded flash, 192-KB SRAM (including 32-KB CCM SRAM), and 4-KB Backup SRAM. It also integrates 4x 12bit 4.7Msps ADCs, 2x 12bit DAC, USB HS DualRole, U(S)ART, I2C, SPI, and other communication interfaces. It supports xSPI high-speed storage interfaces, I2S audio interface, multiple advanced control timers, general timers, basic timers, low-power timers. It also features a built-in hardware acceleration engine for cryptographic algorithms, supporting AES/TDES, SHA, SM3, SM4, MD5 algorithms, 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 8-KB instruction Cache supporting Flash acceleration unit for zero-wait program execution
  - Frequency up to 240 MHz, 300 DMIPS
- **Memories**
  - 512-KByte of embedded Flash memory with ECC
    - Supports encryption, multi-user partition and data protection
    - 10,000 erase/write cycles and 10-years data retention
  - 160-KByte of general SRAM with hardware parity checking
  - 32-KByte of CCM SRAM with ECC, defaults to general SRAM after power-up, configurable as CCM SRAM
  - 4-KByte of Backup SRAM with ECC available in Standby mode
- **Power Modes**
  - Run mode: 48 mA/MHz@240 MHz (peripherals off, 3.3 V@25°C)
  - Stop0 mode: SRAM and all registers can be configured to retention
  - Standby mode: 22uA, all backup registers and Backup SRAM retained, all IOs retained, optional RTC run
- **Clock**
  - HSE: 4MHz~32MHz high-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)

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- **Reset**
  - Supports power-on/brown-out/external pin reset
  - Supports watchdog reset
  - Supports programmable voltage detection
- **GPIOs**
  - Up to 56 GPIOs
- **Communication Interfaces**
  - 1x USB HS DualRole interface, built-in PHY
  - 6x SPI interfaces, 2x I2S interfaces, support half/full duplex mode, multiplexed with SPI interfaces
  - U(S)ART interfaces
    - 3x USART interfaces (support ISO7816, IrDA, LIN)
    - 4x UART interfaces
    - TX/RX of USART3/UART5/UART8 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**
  - 4x 12bit ADCs with 4.7Msps
    - Multiple precision configuration, support 12-bit, 10-bit, 8-bit, 6-bit sampling precision, resolution up to 16-bit with hardware oversample
    - support differential mode and single-ended mode, 4 ADCs support a total of 47 external channels
  - 2x 12bit DAC with 1Msps sampling rate
    - Each DAC support 1 internal output channel and 1 external output channel
    - Support output channel buffered/unbeffered modes, supports internal output, external output, and 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

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- **Timers**
  - 3x 16-bit advanced control timers with maximum control precision of 4.16 ns
    - Support input capture, complementary output, quadrature encoder input etc.
    - Each timer has 6 independent channels, ATM1 supports 4 pairs of complementary PWM outputs, ATM2 and ATIM3 support 3 pairs of complementary PWM outputs.
  - 10x 16-bit general purpose timers (GTIM1~10)
    - GTIM1~7, with a maximum control precision of 5.56ns, each timer has up to 4 independent channels, each channel supports input capture, output comparison, PWM generation, and single-pulse mode output.
    - GTIM8~10, with a maximum control precision of 4.16ns, each timer has up to 4 independent channels, each channel supports input capture, output comparison, PWM generation, and single-pulse mode output, only channel 1 supports complementary output with dead time, supports break input.
  - 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 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.
- **96-bit UID and 128-bit UCID**
- **Operating Conditions**
  - Operating voltage range: 1.8V~3.6V
  - Operating temperature range: -40℃ ~ 105℃
  - ESD: ±4KV (HBM model), ±1KV (CDM model)

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- EFT: VDD (+/-4KV，level A)，I/O (+/-2KV，level A)

- **Packages**
  - LQFP64(7mm × 7mm)

- **Ordering Information**

Reference	Part Number
N32H481xE	N32H481REL7K

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1 Ordering Information

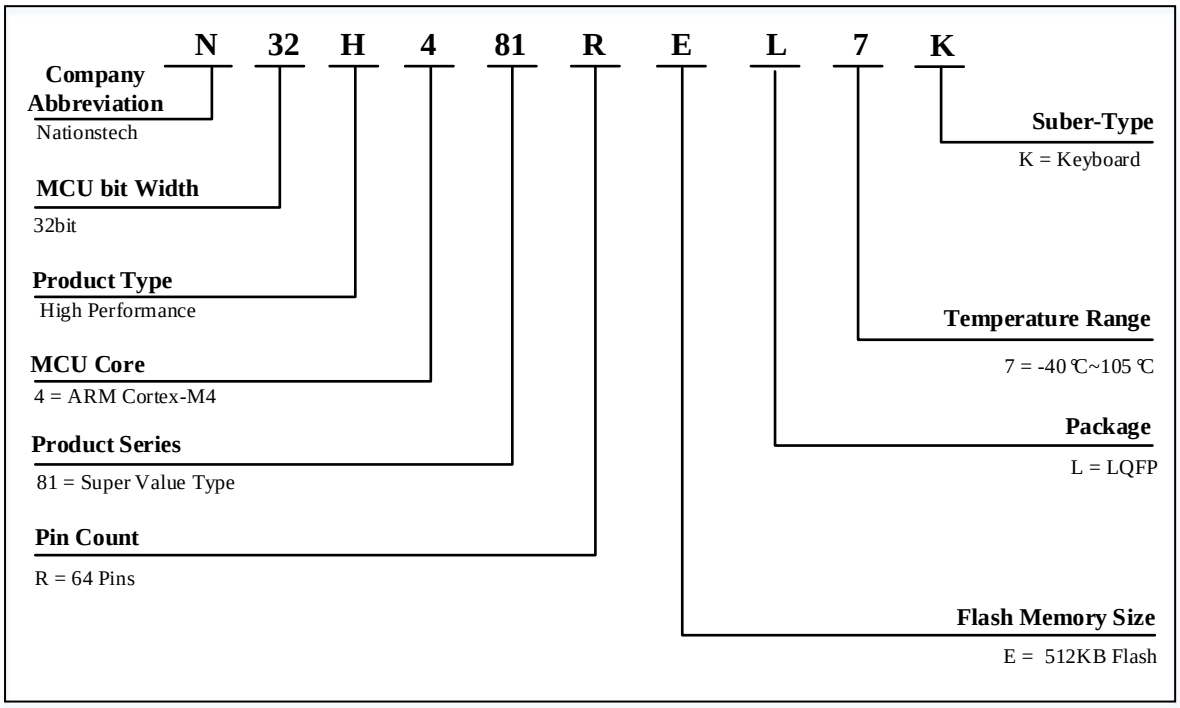

Table 1-1 N32H481 Series Ordering Code

Ordering Code(1)	Package	Size	Packaging(2)	SPQ(3)	Temperature range
N32H481REL7K	LQFP64	7mm x 7mm	Tray	250	-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.

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2 Product Configurations

Table 2-1 N32H481 Series Product Configuration

Device		N32H481REL7K
Operating Condition		1.8~3.6V/-40~105℃
CPU Frequency		ARM Cortex-M4F @240MHz, 300DMIPS
eFlash Capacity (KB)		512
Total SRAM (KB)	General SRAM	160
	CCM SRAM(1)	32
	Backup SRAM	4
Timers	ATIM	3*16bit
	GTIM	7*16bit 3*16bit(2)
	BTIM	2*32bit
	LPTIM	2*16bit
	SysTick timer	1
	WWDG	1*14bit
	IWDG	1*12bit
	RTC	Yes
Communication Interface	SPI/I2S	6/2
	I^2C	4
	USART	3
	UART	4
	USB HS DualRole	1
Memory Expansion	XSPI	1
GPIO WKUP Pins		56 4
DMA Number of channels		2 16Channel
12bit ADC Number of channels		4 47Channel(3)
12bit DAC Number of channels		2 2 External
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
Package		LQFP64

Notes:

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(1) CCM SRAM is powered up as general SRAM by default, and users can configure it as CCM SRAM.

(2) Supports break input, Channel 1 supports complementary channel output.

(3) 2 ADCs multiplexed with OSC_IN and OSC_OUT, 2 ADCs multiplexed with USB_HS_DP and USB_HS_DM, 14 channels in ADC1, 16 channels in ADC2, 19 channels in ADC3, 18 channels in ADC4.

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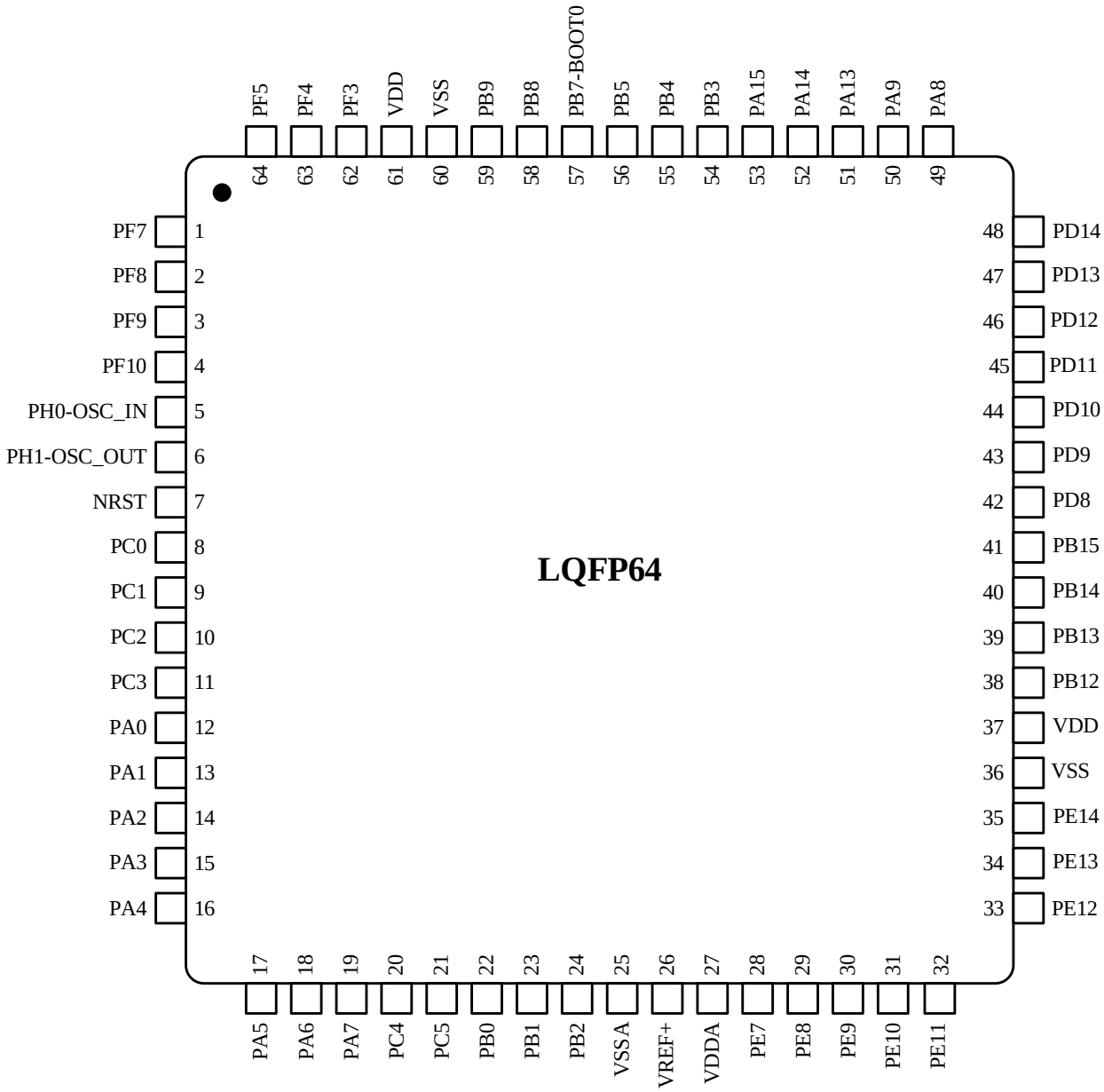
3 Package

3.1 LQFP64

3.1.1 LQFP64 Pinout



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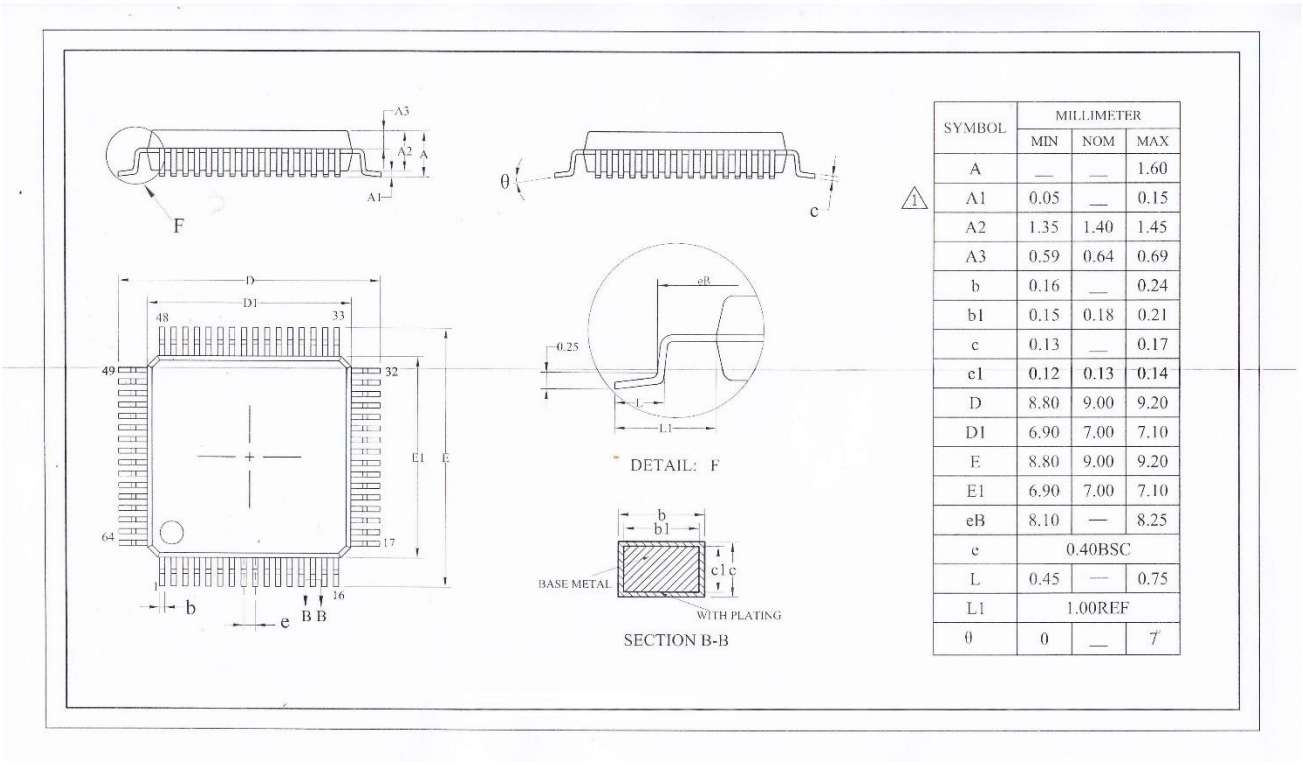
3.1.2 LQFP64 Package



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.60
A1	0.05	—	0.15
A2	1.35	1.40	1.45
A3	0.59	0.64	0.69
b	0.16	—	0.24
b1	0.15	0.18	0.21
c	0.13	—	0.17
c1	0.12	0.13	0.14
D	8.80	9.00	9.20
D1	6.90	7.00	7.10
E	8.80	9.00	9.20
E1	6.90	7.00	7.10
eB	8.10	—	8.25
e	0.40BSC		
L	0.45	—	0.75
L1	1.00REF		
θ	0	—	7°

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4 Version History

Version	Date	Changes
V1.0.0	2025.5.9	Initial release.

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