

# N32H487xE

# Product Brief

N32H487 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 FS Device, USB HS DualRole, U(S)ART, I2C, SPI, CAN-FD, Ethernet, and other communication interfaces. It supports DVP interface, SDIO, FEMC, 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, MD5 algorithms, TRNG true random number generator, and CRC16/32.

## Key Feature

- **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
    - 100,000 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: 45 mA/MHz@240 MHz (peripherals off, 3.3 V@25°C)
  - 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 118 GPIOs
- **Communication Interfaces**
  - 1x USB2.0 FS Device interface, built-in PHY, supports crystal-less mode
  - 6x SPI interfaces, 2x I2S interfaces, support half/full duplex mode, multiplexed with SPI interfaces
  - U(S)ART interfaces
    - ◆ 4x 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
  - 3x CAN-FD bus interface, TX/RX can be mapped to all pins
  - 1x IEEE-802.3-2002 compatible Ethernet MAC interface, supports 10M/100M Ethernet, IEEE1588 synchronized Ethernet protocol
  - 1x DVP (Digital Video Port) supporting 8/10/12/16 bit data
- **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
    - Up to 16 external single-ended input channels, 3 internal single-ended input channels, support differential mode and single-ended mode
  - 2x 12bit DAC with 1MSPS sampling rate
    - Each DAC support 1 internal output channel and 1 external output channel
    - Support output channel buffered/unbuffered 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
- 1x FEMC (Flexible External Memory Controller) interface, supporting external SRAM, PSRAM, NOR Flash and NAND Flash, 8/16-bit data bus width configurable
- 1x SDIO interface, support SD/SDIO/MMC format
- **Mathematical hardware accelerator CORDIC for motor control functions**
- **Built-in filter mathematical accelerator FMAC, supporting FIR, IIR filtering**
- **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 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, 4 of which support 4 pairs of complementary PWM output.
  - 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 and USB 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, 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°C ~ 105°C
- ESD: ±4KV (HBM model), ±1KV (CDM model)
- EFT: VDD (+/-4KV, level A), I/O (+/-2KV, level A)

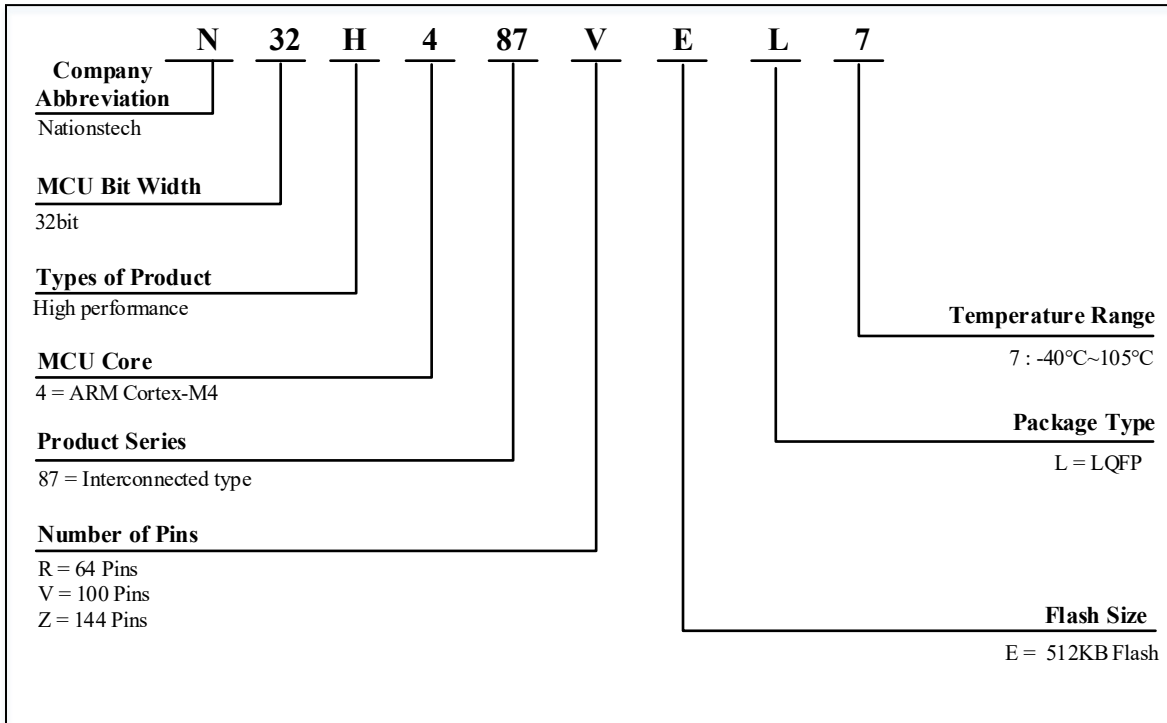
● **Packages**

- LQFP64(10mm × 10mm)
- LQFP100(14mm × 14mm)
- LQFP144(20mm × 20mm)

● **Ordering Information**

Reference	Part Number
N32H487xE	N32H487REL7, N32H487VEL7, N32H487ZEL7

# 1 Ordering Information



**Table 1-1 N32H487 Series Ordering Code**

Ordering Code <sup>(1)</sup>	Package	Size	Packaging <sup>(2)</sup>	SPQ <sup>(3)</sup>	Temperature range
N32H487REL7	LQFP64	10mm x 10mm	Tray	160	-40°C ~ 105°C
N32H487VEL7	LQFP100	14mm x 14mm	Tray	90	-40°C ~ 105°C
N32H487ZEL7	LQFP144	20mm x 20mm	Tray	60	-40°C ~ 105°C

- For the latest detailed-ordering information, please refer to the Selection Guide.
- The packaging provided is the basic packaging. If user has any other requirements, please contact Naitons.
- Minimum packaging quantity.

## 2 Product Configurations

Table 2-1 N32H487 Series Product Configuration

Device		N32H487REL7	N32H487VEL7	N32H487ZEL7
Operating Condition		1.8~3.6V/-40~105°C		
CPU Frequency		ARM Cortex-M4F @240MHz, 300DMIPS		
Flash Capacity (KB)		512	512	512
Total SRAM (KB)	General SRAM	160	160	160
	CCM SRAM <sup>(1)</sup>	32		
	Backup SRAM	4		
Times	ATIM	3*16bit		
	GTIM	7*16bit 3*16bit <sup>(2)</sup>		
	BTIM	2*32bit		
	LPTIM	2*16bit		
	SysTick timer	1		
	WWDG	1*14bit		
	IWDG	1*12bit		
	RTC	Yes		
Communication Interfaces	SPI/I2S	5/2	6/2	
	I <sup>2</sup> C	4		
	USART	4		
	UART	4		
	USB FS Device	Yes		
	USB HS Dualrole	Yes		
	FDCAN	3		
	Ethernet	Yes		
Memory Expansion	XSPI	Yes		
	FEMC	No	Yes <sup>(3)</sup>	Yes
	SDIO	Yes		
human-computer interaction	DVP	Yes		
GPIO		54	85	118
WKUP Pins		4	5	5
DMA		2		
Number of channels		16Channel		
12bit ADC		4	4	4
Number of channels		26Channel	42Channel	51Channel
12bit DAC		2		
Number of channels		2 External		
Algorithm Support		DES/3DES、AES、SHA1/SHA224/SHA256, MD5, CRC16/CRC32		
TRNG		Yes		

Cordic	Yes		
FMAC	Yes		
Security Protection	Read-write protection (RDP/WRP), storage encryption, partition protection, secure boot		
Package	LQFP64	LQFP100	LQFP144

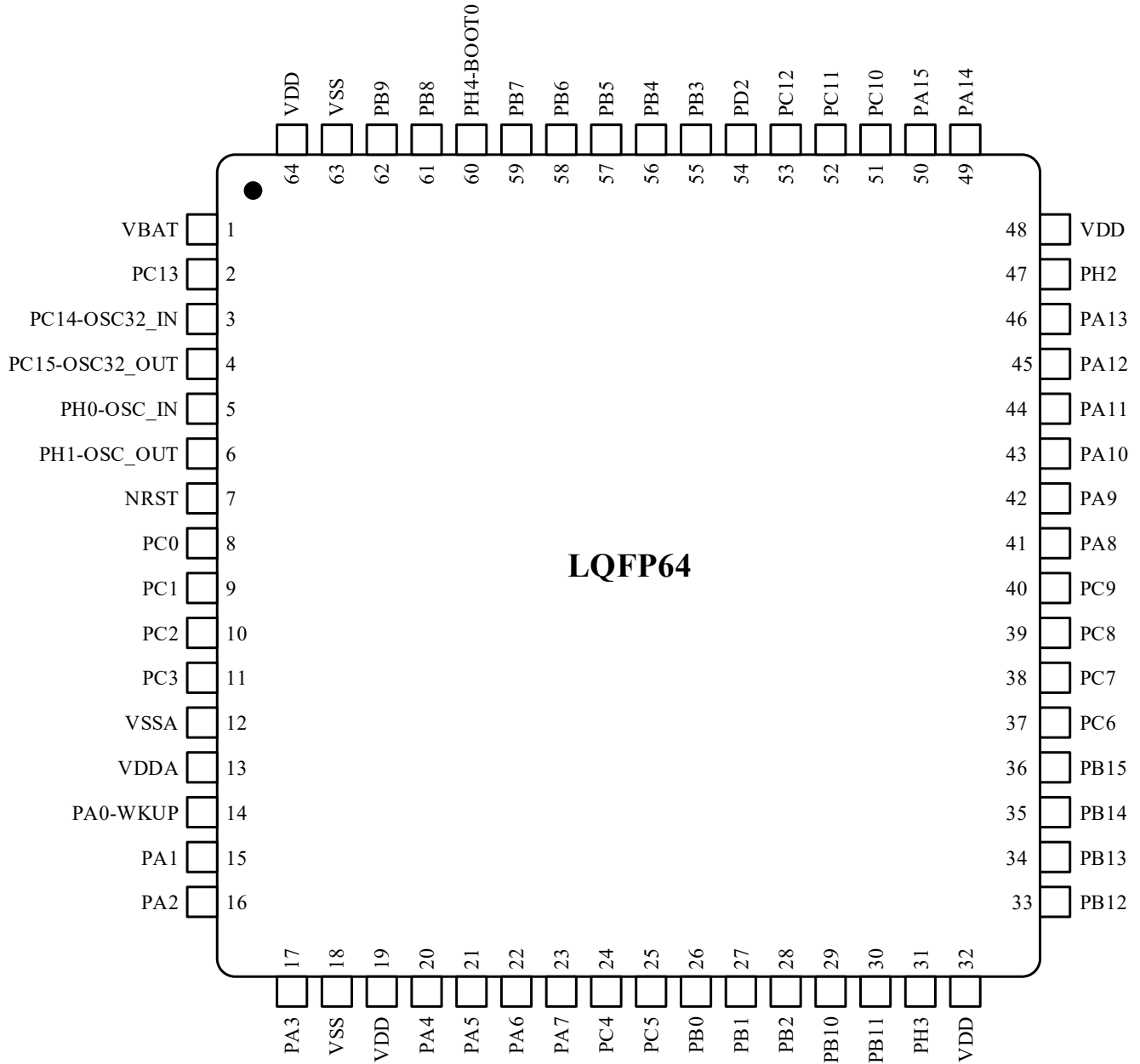
*Notes:*

- (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) Only supports address bus and data bus multiplexing.

### 3 Package

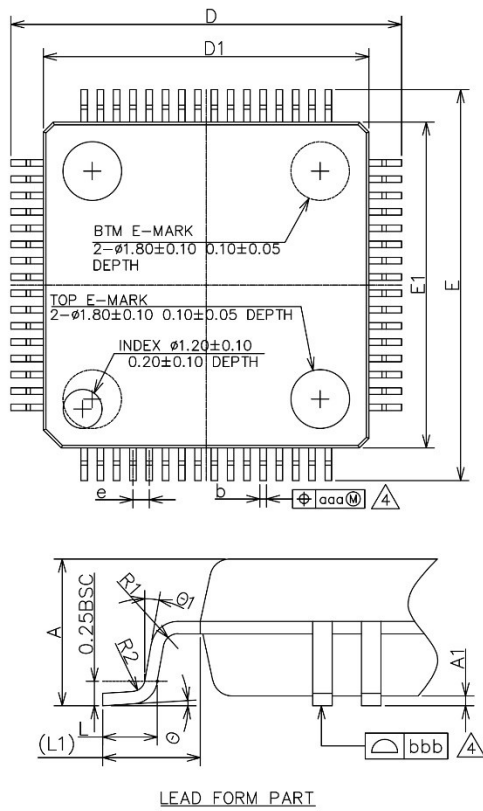
#### 3.1 LQFP64

##### 3.1.1 LQFP64 Pinout





### 3.1.2 LQFP64 Package



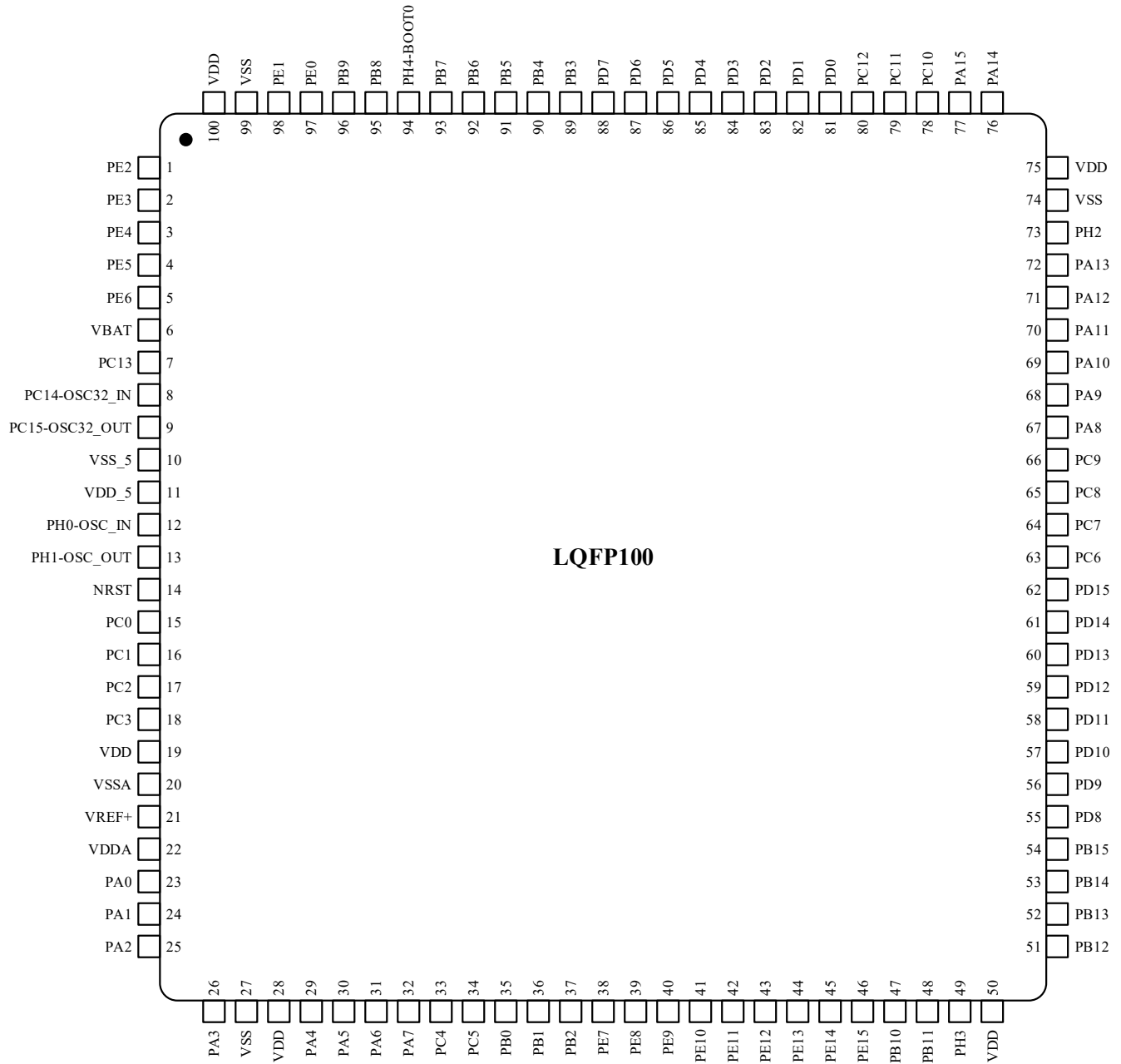
COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	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	0.18	—	0.27
b1	0.17	0.20	0.23
c	0.13	—	0.18
c1	0.117	0.127	0.137
D	11.95	12.00	12.05
D1	9.90	10.00	10.10
E	11.95	12.00	12.05
E1	9.90	10.00	10.10
e	0.40	0.50	0.60
H	11.09	11.13	11.17
L	0.53	—	0.70
L1	1.00REF		
R1	0.15REF		
R2	0.13REF		
$\theta$	0°	3.5°	7°
$\Delta 3$ $\theta 1$	0°	—	—
$\Delta 3$ $\theta 2$	11°	12°	13°
$\Delta 3$ $\theta 3$	11°	12°	13°
$\Delta 4$ aaa	0.08		
$\Delta 4$ bbb	0.08		

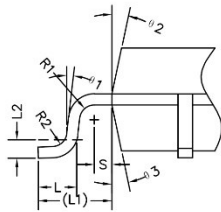
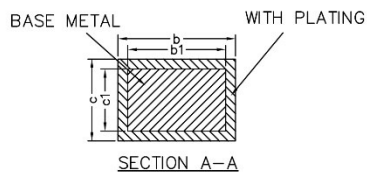
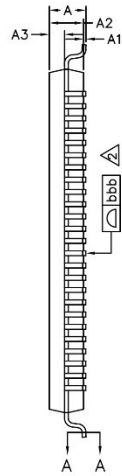
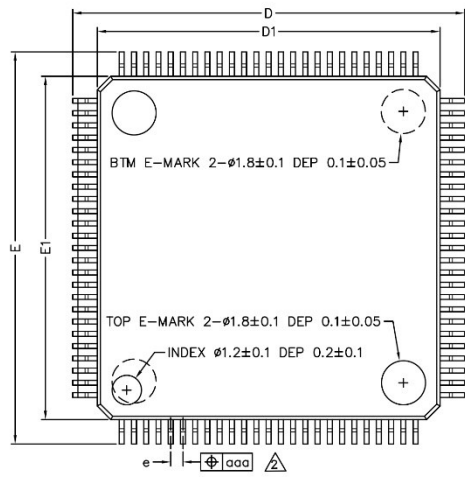
NOTES:  
1. ALL DIMENSIONS REFER TO JEDEC STANDARD MS026 BCD  
DO NOT INCLUDE MOLD FLASH, GATE BURR OR PROTRUSION.

### 3.2 LQFP100

#### 3.2.1 LQFP100 Pinout



### 3.2.2 LQFP100 Package



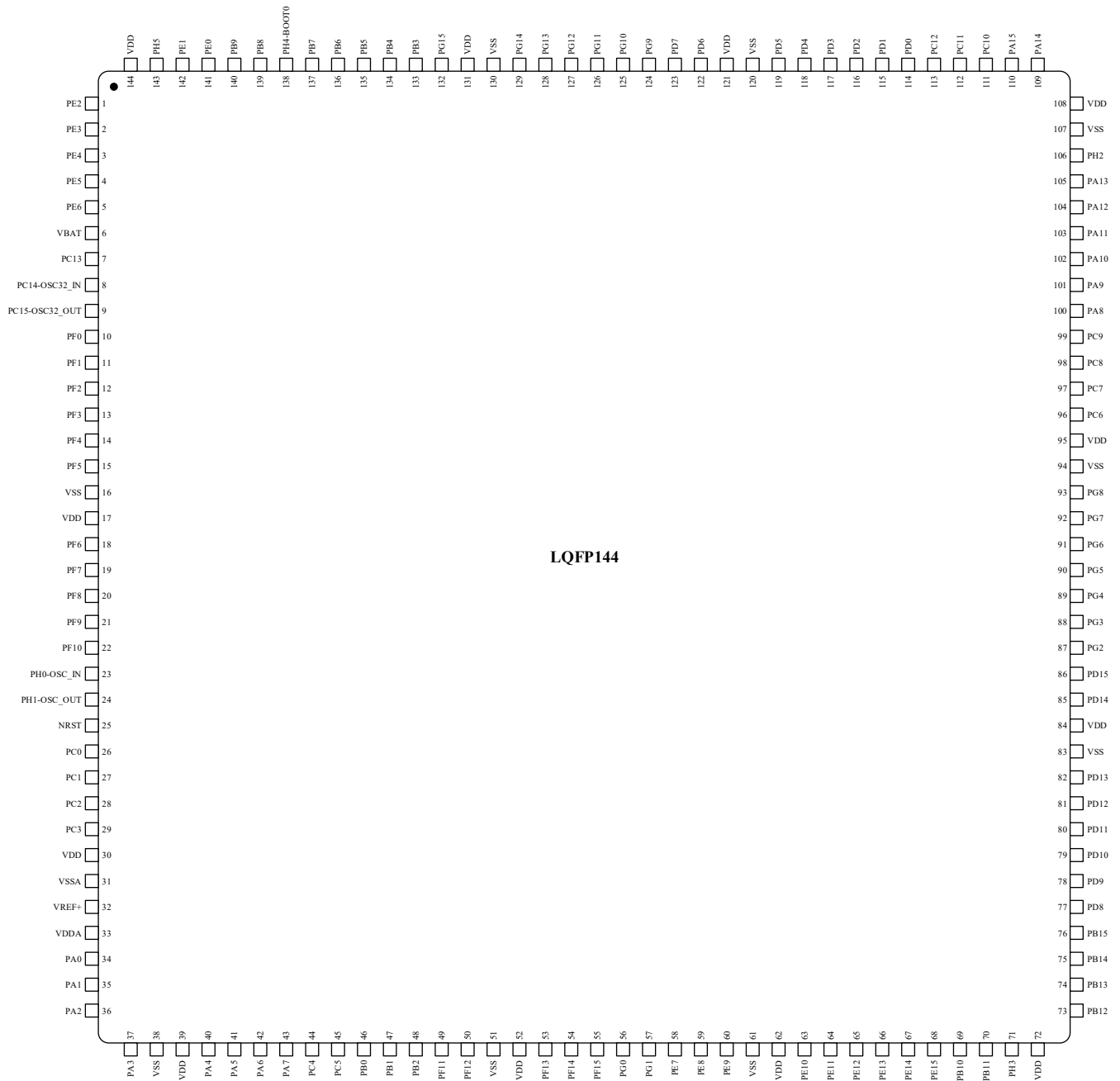
COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	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	0.17	—	0.27
b1	0.17	0.20	0.23
c	0.13	—	0.18
c1	0.12	0.127	0.134
D	15.80	16.00	16.20
D1	13.90	14.00	14.10
E	15.80	16.00	16.20
E1	13.90	14.00	14.10
e	0.50BSC		
L	0.45	0.60	0.75
L1	1.00REF		
L2	0.25BSC		
R1	0.08	—	—
R2	0.08	—	0.20
S	0.20	—	—
θ	0°	3.5°	7°
θ 1	0°	—	—
θ 2	11°	12°	13°
θ 3	11°	12°	13°
aaa	0.08		
bbb	0.08		

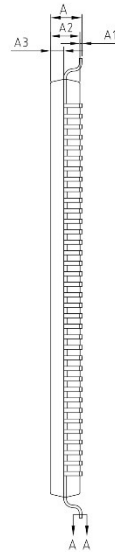
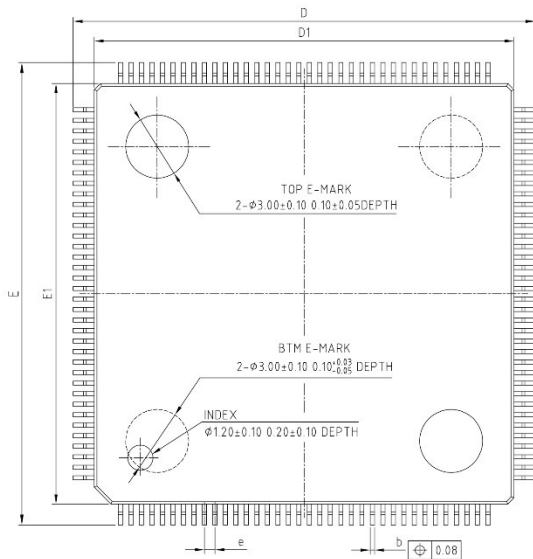
NOTES:  
ALL DIMENSIONS REFER TO JEDEC STANDARD MS-026 BED DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

### 3.3 LQFP144

#### 3.3.1 LQFP144 Pinout

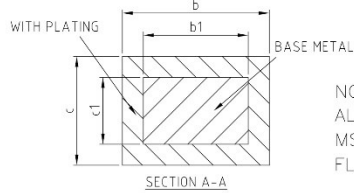
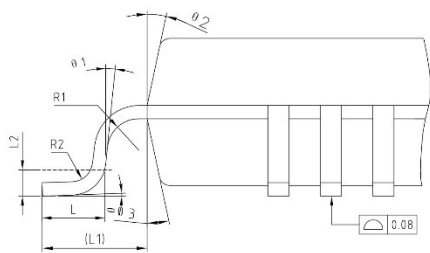


### 3.3.2 LQFP144 Package



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	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	0.17	—	0.27
b1	0.17	0.20	0.23
c	0.127	—	0.18
c1	0.119	0.127	0.135
D	21.80	22.00	22.20
D1	19.90	20.00	20.10
E	21.80	22.00	22.20
E1	19.90	20.00	20.10
e	0.40	0.50	0.60
L	0.45	0.60	0.75
L1	1.00REF		
L2	0.25BSC		
R1	0.08	—	—
R2	0.08	—	—
$\theta$	0°	—	7°
$\theta 1$	0°	—	—
$\theta 2$	11°	12°	13°
$\theta 3$	11°	12°	13°



NOTES:  
ALL DIMENSIONS REFER TO JEDEC STANDARD  
MS-026 BFB DO NOT INCLUDE MOLD  
FLASH OR PROTRUSIONS.

## 4 Version History

Version	Date	Changes
V1.0.0	2024.11.12	Initial release.

## 5 Disclaimer

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