N32H474xC/xE Product Brief

N32H474 series adopts a 32-bit ARM Cortex-M4F core, with a maximum operating frequency of 200MHz, 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, 8x 12bit DAC, 4x PGA, 7x COMP, USB FS Device, U(S)ART, I2C, SPI, CAN-FD, Ethernet, and other communication interfaces. It supports FEMC, xSPI high-speed storage interfaces, I2S audio interface, super high-resolution timer, 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 200 MHz, 250 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@200 MHz (peripherals off, 3.3 V@25℃)
  - Stop0 mode: SRAM and all registers can be configured to retention, RTC run
  - Standby mode: typical value 6uA, all backup registers and Backup SRAM retained, all IOs 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

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- MCO: Supports 2-channel clock outputs, which can be configured independently as clock output
- HSI: High-speed internal RC 8MHz, with an accuracy of -1.5% to +2% across the full temperature range.
- LSI: Low-speed internal RC 32KHz, with an accuracy of +/-10% across the full temperature range.

- **Reset**
  - Supports power-on/brown-out/external pin reset
  - Supports watchdog reset
  - Supports programmable voltage detection
- **GPIOs**
  - Up to 107 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
- **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
  - 8x 12bit DAC
    - DAC1~4: Support 1 internal output channel and 1 external output channel, with a sampling rate of 1Msps. Support output channel buffered/unbuffered modes.
    - DAC5~8: Support 1 internal output channel and 1 external output channel, with a sampling rate of 15Msps. Only support output channel buffered/unbuffered modes.
  - 4x rail-to-rail PGAs, support differential mode and single-ended mode
  - 7x high-speed comparators (COMP)
  - Supports 1 reference voltage VREFBUF (2.048V/2.5V/2.9V configurable)
  - 1x temperature sensor

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- **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
- **CORDIC Mathematical hardware accelerator 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**
  - 1x 16bit super high-resolution timer (SHRTIM1)
    - Supports 6x 16-bit timer units, each timer unit has 2 independent channels, with a maximum control precision of 125ps.
    - Supports 12 independent PWM outputs or 6 pairs of complementary PWM outputs.
  - 3x 16-bit advanced control timers with maximum control precision of 5 ns
    - Support input capture, complementary output, quadrature encoder input etc.
    - Each 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 5ns, 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**

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- 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, 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℃/125℃
  - ESD: ±4KV (HBM model), ±1KV (CDM model)
  - EFT: EFT：VDD (+/-4KV，level A)，I/O (+/-2KV，level A)
- **Packages**
  - UQFN48(7mm x 7mm)
  - LQFP48(7mm x 7mm)
  - LQFP64(10mm x 10mm)
  - LQFP80(12mm x 12mm)
  - LQFP100(14mm x 14mm)
  - LQFP128(14mm x 14mm)
- **Ordering Information**

Reference	Part Number
N32H474xC	N32H474CCU7 N32H474CCL7, N32H474RCL7, N32H474MCL7, N32H474VCL7, N32H474QCL7 N32H474CCU8 N32H474CCL8, N32H474RCL8, N32H474MCL8, N32H474VCL8, N32H474QCL8
N32H474xE	N32H474CEU7 N32H474CEL7, N32H474REL7, N32H474MEL7, N32H474VEL7, N32H474QEL7, N32H474VEL7-W

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	N32H474CEU8 N32H474CEL8, N32H474REL8, N32H474MEL8, N32H474VEL8, N32H474QEL8

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1 Ordering Information

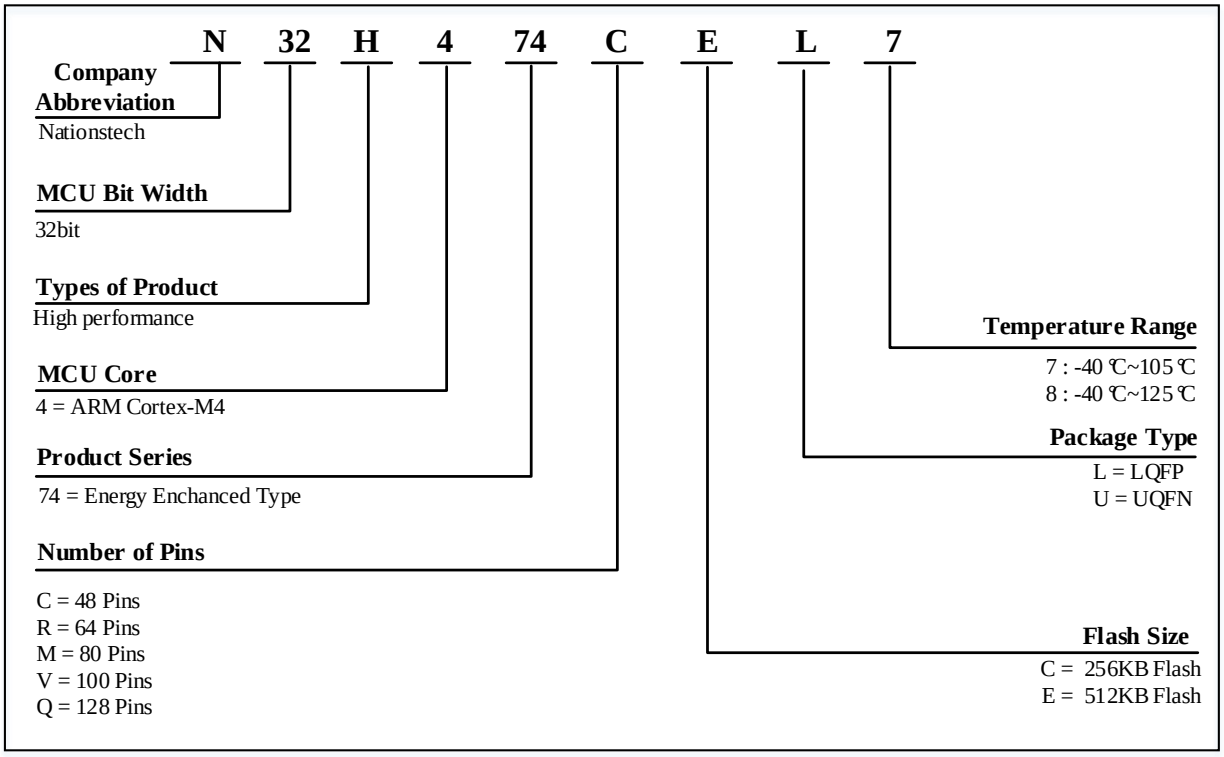

Table 1-1 N32H474 Series Ordering Code

Ordering Code(1)	Package	Size	Packaging(2)	SPQ(3)	Temperature range
N32H474CCU7	UQFN48	7mm x 7mm	Tray	260	-40℃～105℃
N32H474CCL7	LQFP48	7mm x 7mm	Tray	250	-40℃～105℃
N32H474RCL7	LQFP64	10mm x 10mm	Tray	160	-40℃～105℃
N32H474MCL7	LQFP80	12mm x 12mm	Tray	119	-40℃～105℃
N32H474VCL7	LQFP100	14mm x 14mm	Tray	90	-40℃～105℃
N32H474QCL7	LQFP128	14mm x 14mm	Tray	90	-40℃～105℃
N32H474CEU7	UQFN48	7mm x 7mm	Tray	260	-40℃～105℃
N32H474CEL7	LQFP48	7mm x 7mm	Tray	250	-40℃～105℃
N32H474REL7	LQFP64	10mm x 10mm	Tray	160	-40℃～105℃
N32H474MEL7	LQFP80	12mm x 12mm	Tray	119	-40℃～105℃
N32H474VEL7	LQFP100	14mm x 14mm	Tray	90	-40℃～105℃
N32H474QEL7	LQFP128	14mm x 14mm	Tray	90	-40℃～105℃
N32H474VEL7-W	LQFP100	14mm x 14mm	Tray	90	-40℃～105℃
N32H474CCU8	UQFN48	7mm x 7mm	Tray	260	-40℃～125℃
N32H474CCL8	LQFP48	7mm x 7mm	Tray	250	-40℃～125℃
N32H474RCL8	LQFP64	10mm x 10mm	Tray	160	-40℃～125℃

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N32H474MCL8	LQFP80	12mm x 12mm	Tray	119	-40℃～125℃
N32H474VCL8	LQFP100	14mm x 14mm	Tray	90	-40℃～125℃
N32H474QCL8	LQFP128	14mm x 14mm	Tray	90	-40℃～125℃
N32H474CEU8	UQFN48	7mm x 7mm	Tray	260	-40℃～125℃
N32H474CEL8	LQFP48	7mm x 7mm	Tray	250	-40℃～125℃
N32H474REL8	LQFP64	10mm x 10mm	Tray	160	-40℃～125℃
N32H474MEL8	LQFP80	12mm x 12mm	Tray	119	-40℃～125℃
N32H474VEL8	LQFP100	14mm x 14mm	Tray	90	-40℃～125℃
N32H474QEL8	LQFP128	14mm x 14mm	Tray	90	-40℃～125℃

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 N32H474 Series Product Configuration

Device		N32H474CCU7/8 N32H474CEU7/8		N32H474CCL7/8 N32H474CEL7/8		N32H474RCL7/8 N32H474REL7/8		N32H474MCL7/8 N32H474MEL7/8		N32H474VCL7/8 N32H474VEL7/8		N32H474QCL7/8 N32H474QEL7/8	
Operating Condition		1.8~3.6V/-40~105℃ /125℃											
CPU Frequency		ARM Cortex-M4F @200MHz, 250DMIPS											
Flash Capacity (KB)		256	512	256	512	256	512	256	512	256	512	256	512
Total SRAM (KB)	General SRAM	112	160	112	160	112	160	112	160	112	160	112	160
	CCM SRAM(1)	32											
	Backup SRAM	4											
Times	SHRTIM	1*16bit(2)				1*16bit							
	ATIM	3*16bit				3*16bit							
	GTIM	7*16bit 3*16bit				7*16bit 3*16bit				7*16bit 3*16bit			
	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^2C	4											
	USART	4											
	UART	4											
	USB FS Device	Yes											
	FDCAN	3											
Memory Expansion	XSPI	Yes(3)				Yes							
	FEMC	No								Yes(4)		Yes	

GPIO WKUP Pins	42 3	38 3	52 4	66 4	86 5	107 5
DMA Number of channels	2 16Channel					
12bit ADC Number of channels	4 21Channel	4 20Channel	4 26Channel	4 38Channel	4 45Channel	4 51Channel
12bit DAC Number of channels	8 8 (4 External/Internal + 4 Internal)					
PGA	4					
COMP	7					
VREFBUF	Yes					
Algorithm Support	DES/3DES、AES、 SHA1/SHA224/SHA256、SM3、SM4、MD5、CRC16/CRC32					
TRNG	Yes					
Cordic	Yes					
FMAC	Yes					
Security Protection	Read-write protection (RDP/WRP), storage encryption, partition protection, secure boot					
Package	UQFN48	LQFP48	LQFP64	LQFP80	LQFP100	LQFP128

Notes:

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

(2) SHRTIM in the two packaging forms UQFN48 and LQFP48 only supports 4 timing units A~D.

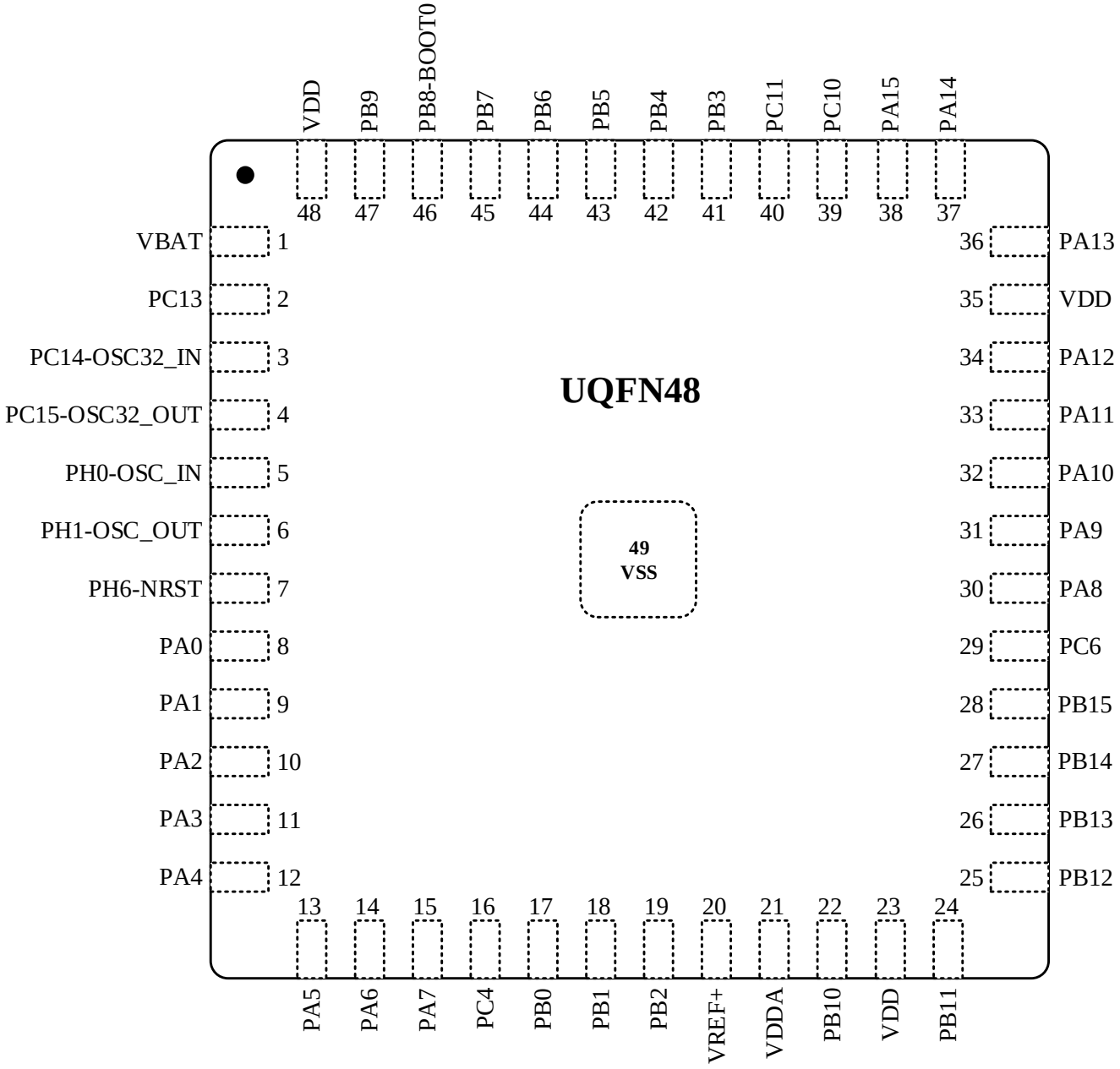
(3) XSPI does not support 8-wire mode.

(4) FMEC only supports address bus and data bus multiplexing

3 Package

3.1 UQFN48

3.1.1 UQFN48 Pinout



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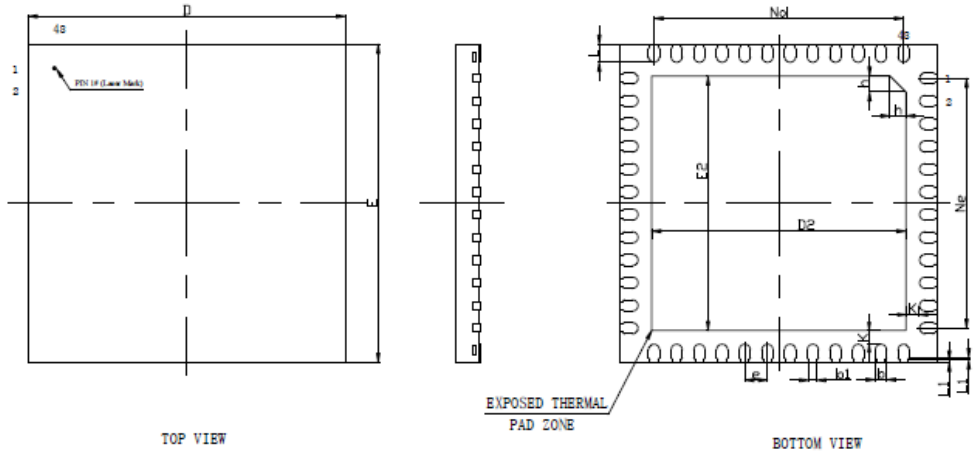
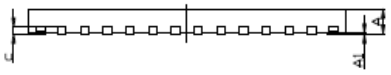
3.1.2 UQFN48 Package



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0	0.02	0.05
b	0.20	0.25	0.30
b1	0.18REF		
c	0.152REF		
D	6.90	7.00	7.10
D2	5.50	5.60	5.70
Nd	5.50BSC		
e	0.50BSC		
E	6.90	7.00	7.10
E2	5.50	5.60	5.70
Ne	5.50BSC		
L	0.35	0.40	0.45
L1	0	0.05	0.10
K	0.30REF		
h	0.30	0.35	0.40



SIDE VIEW

** 特殊设计：无；

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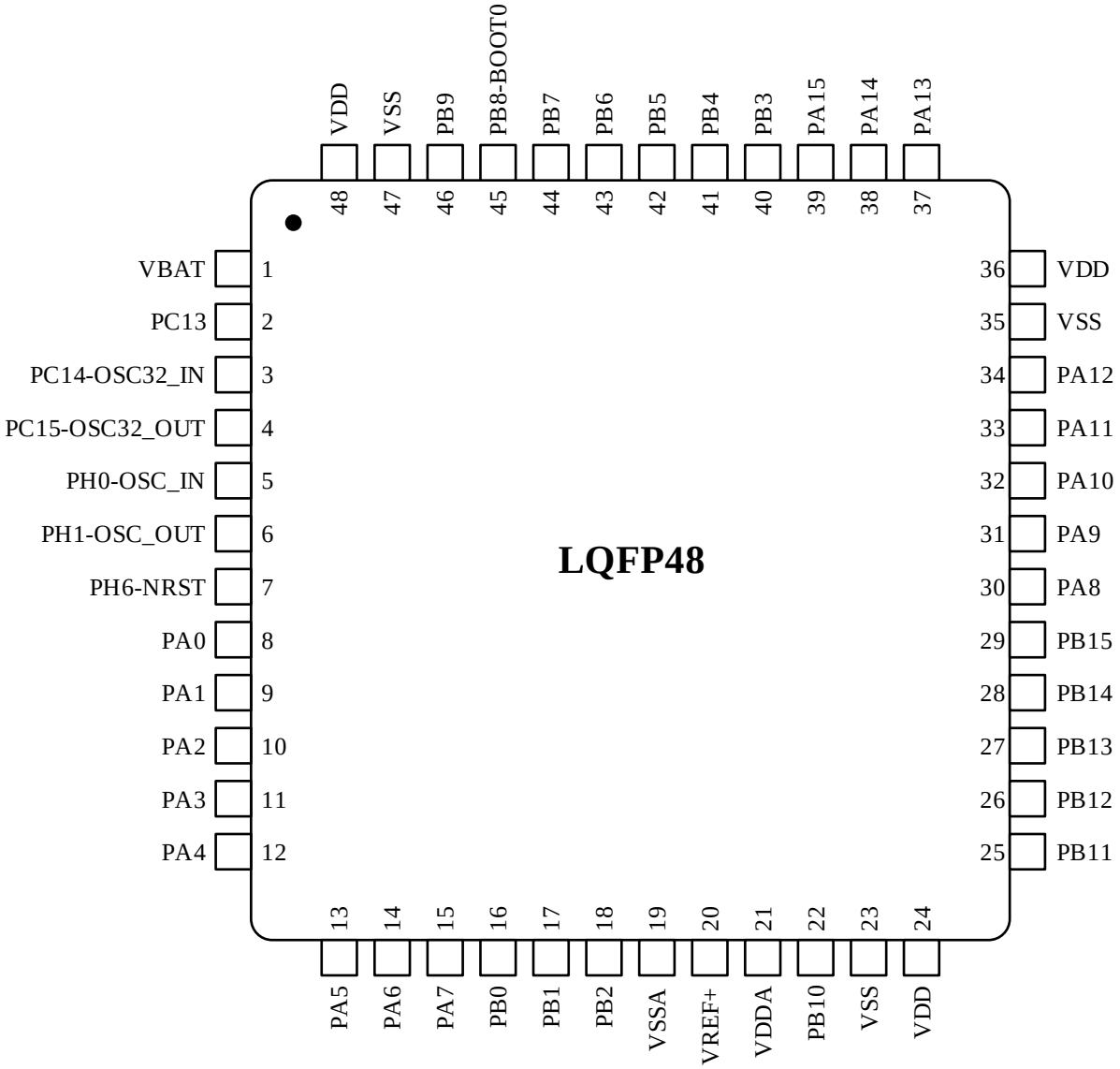
3.2 LQFP48

3.2.1 LQFP48 Pinout



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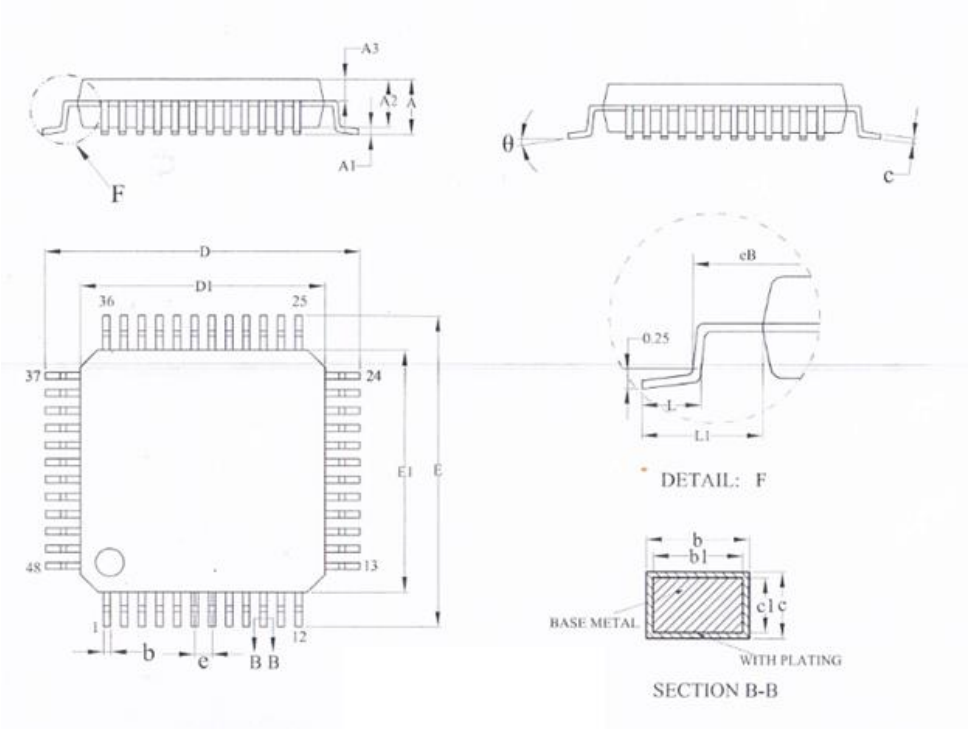
3.2.2 LQFP48 Package



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	0.18	—	0.26
b1	0.17	0.20	0.23
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	0.50BSC		
L	0.45	—	0.75
L1	1.00REF		
θ	0	—	7°

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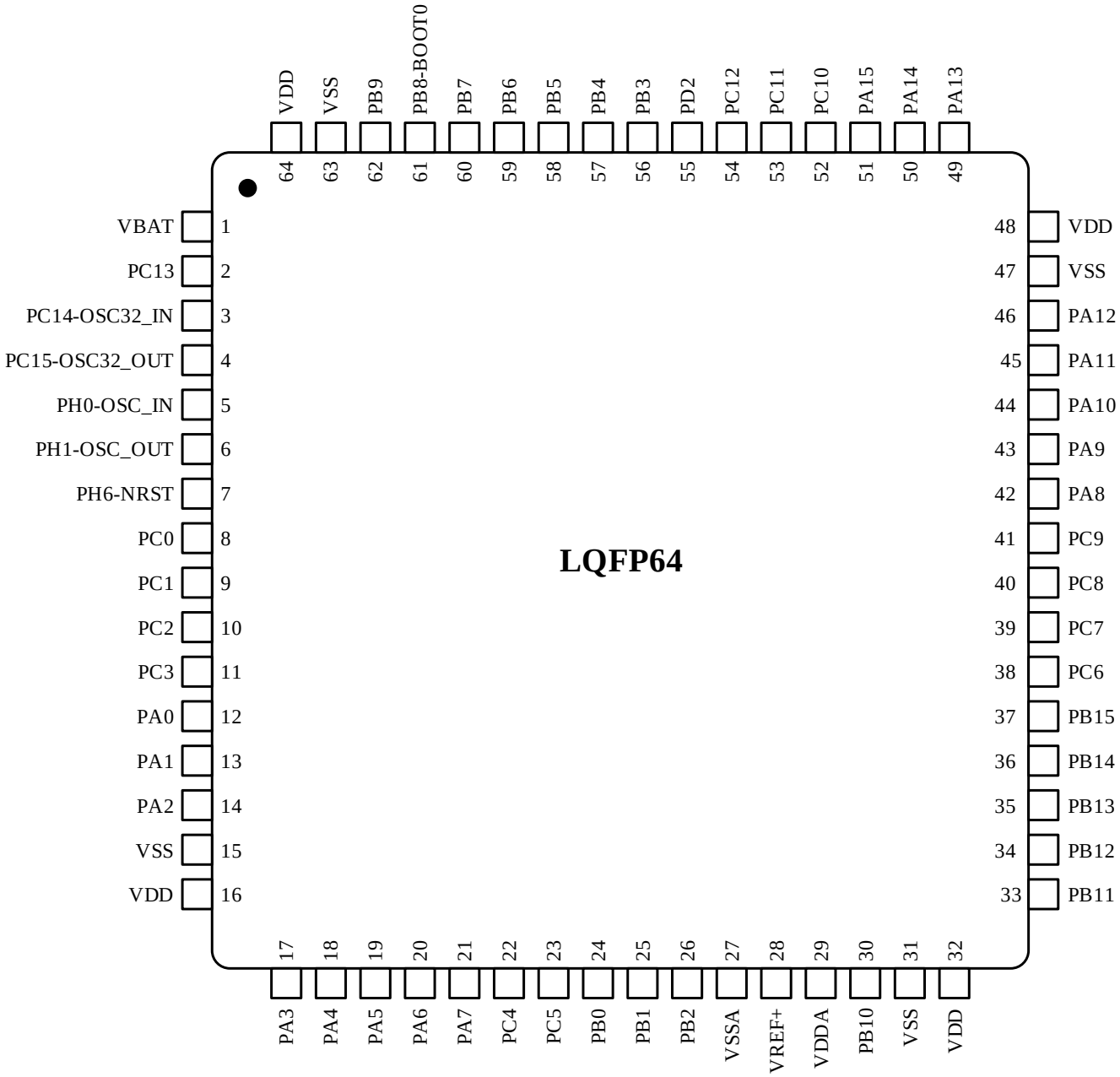
3.3 LQFP64

3.3.1 LQFP64 Pinout



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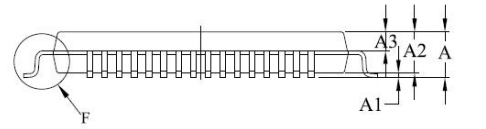
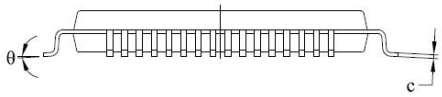
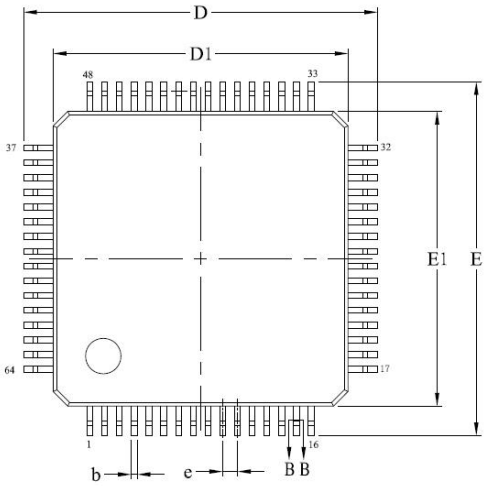
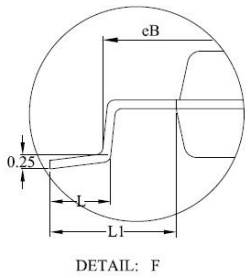
3.3.2 LQFP64 Package

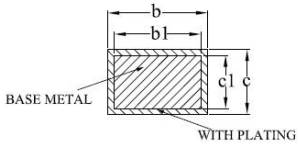








DETAIL: F



SECTION B-B

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	0.18	—	0.26
b1	0.17	0.20	0.23
c	0.13	—	0.17
c1	0.12	0.13	0.14
D	11.80	12.00	12.20
D1	9.90	10.00	10.10
E	11.80	12.00	12.20
E1	9.90	10.00	10.10
e	0.50BSC		
eB	11.05	—	11.25
L	0.45	—	0.75
L1	1.00REF		
θ	0	—	7°

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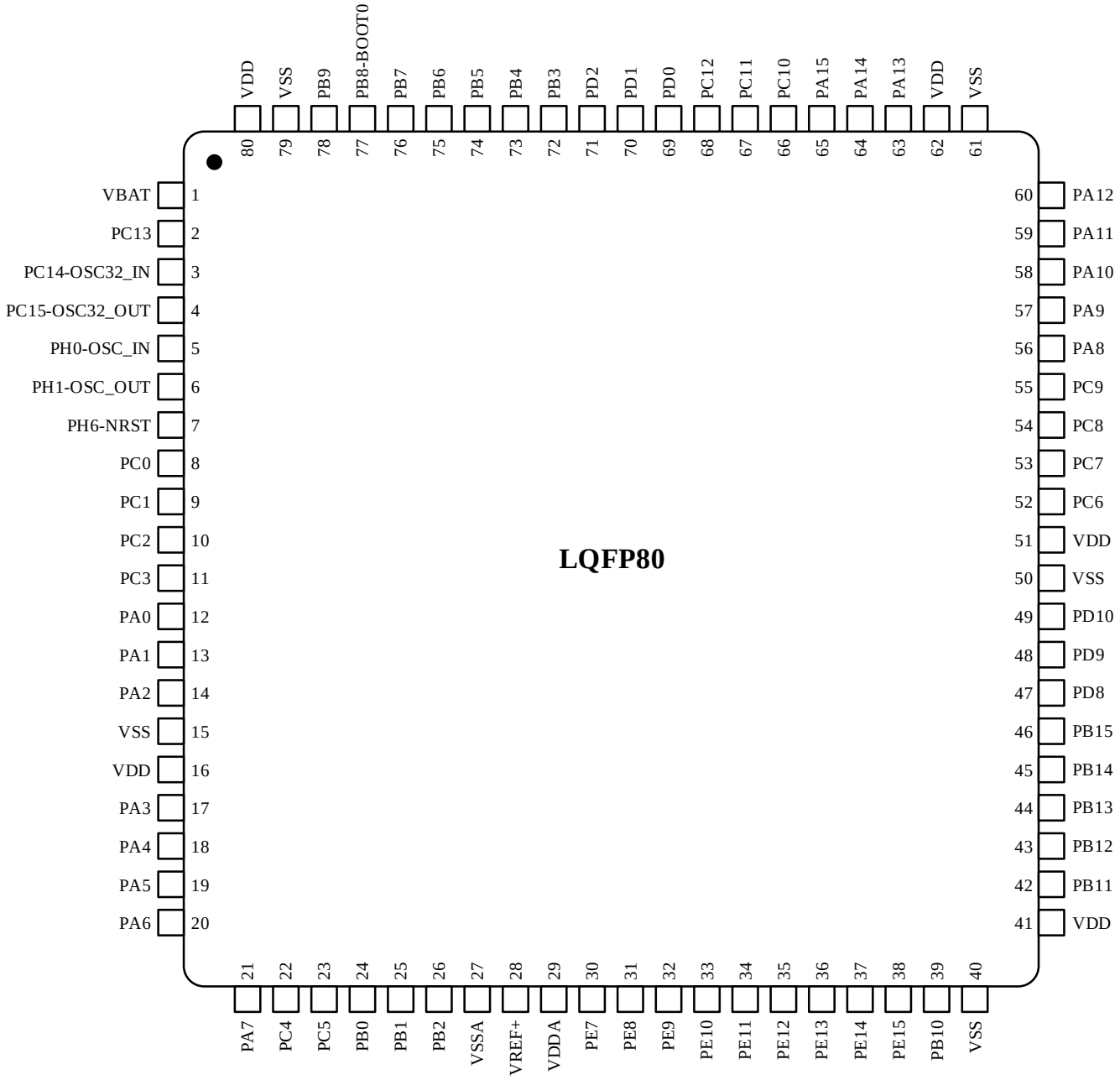
3.4 LQFP80

3.4.1 LQFP80 Pinout



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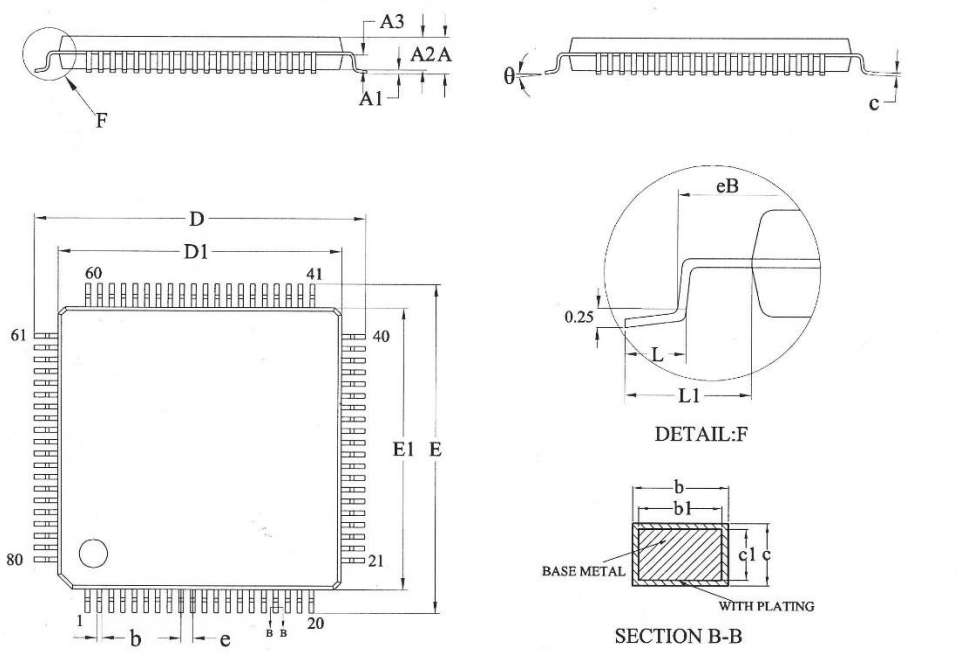
3.4.2 LQFP80 Package



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	0.18	—	0.26
b1	0.17	0.20	0.23
c	0.13	—	0.17
c1	0.12	0.13	0.14
D	13.80	14.00	14.20
D1	11.90	12.00	12.10
E	13.80	14.00	14.20
E1	11.90	12.00	12.10
eB	13.05	—	13.25
e	0.50BSC		
L	0.45	0.60	0.75
L1	1.00REF		
θ	0	—	7°

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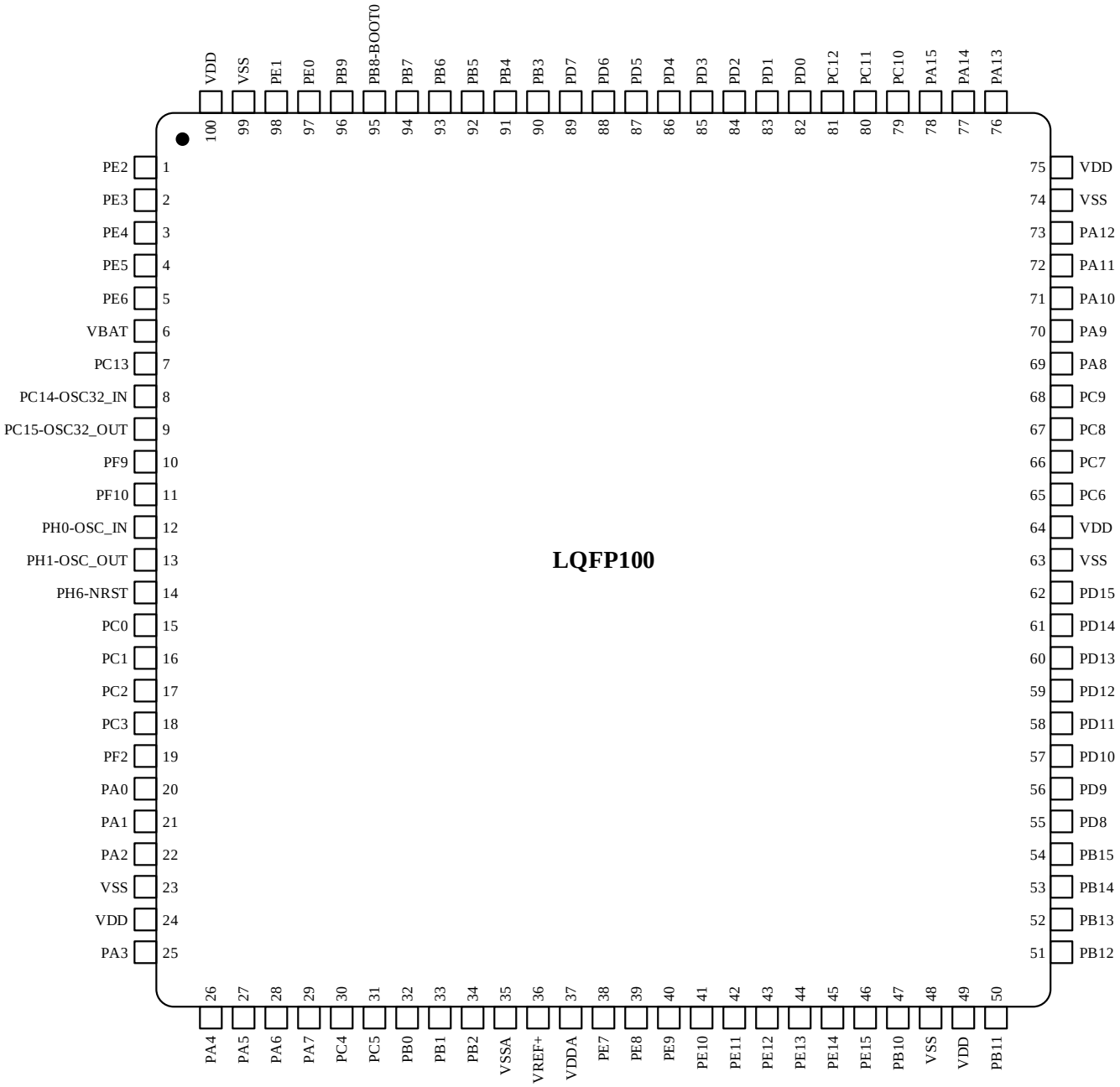
3.5 LQFP100

3.5.1 LQFP100 Pinout



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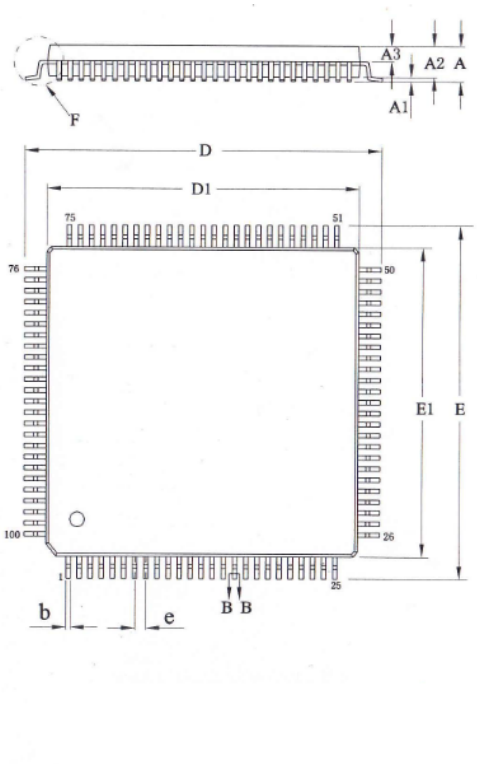
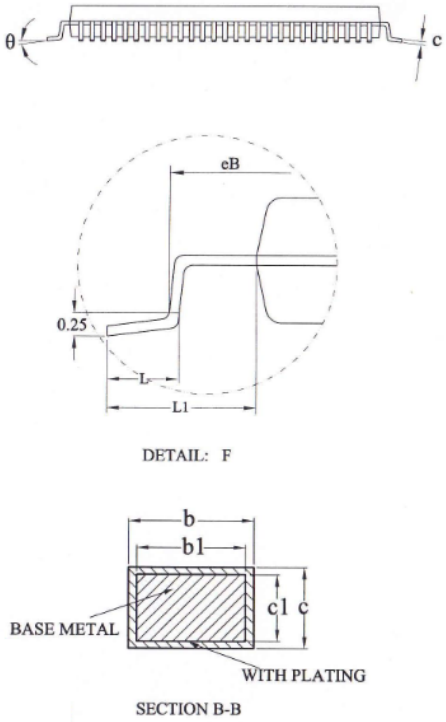
3.5.2 LQFP100 Package





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	0.18	—	0.26
b1	0.17	0.20	0.23
c	0.13	—	0.17
c1	0.12	0.13	0.14
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
eB	15.05	—	15.35
e	0.50BSC		
L	0.45	—	0.75
L1	1.00REF		
θ	0	—	7°

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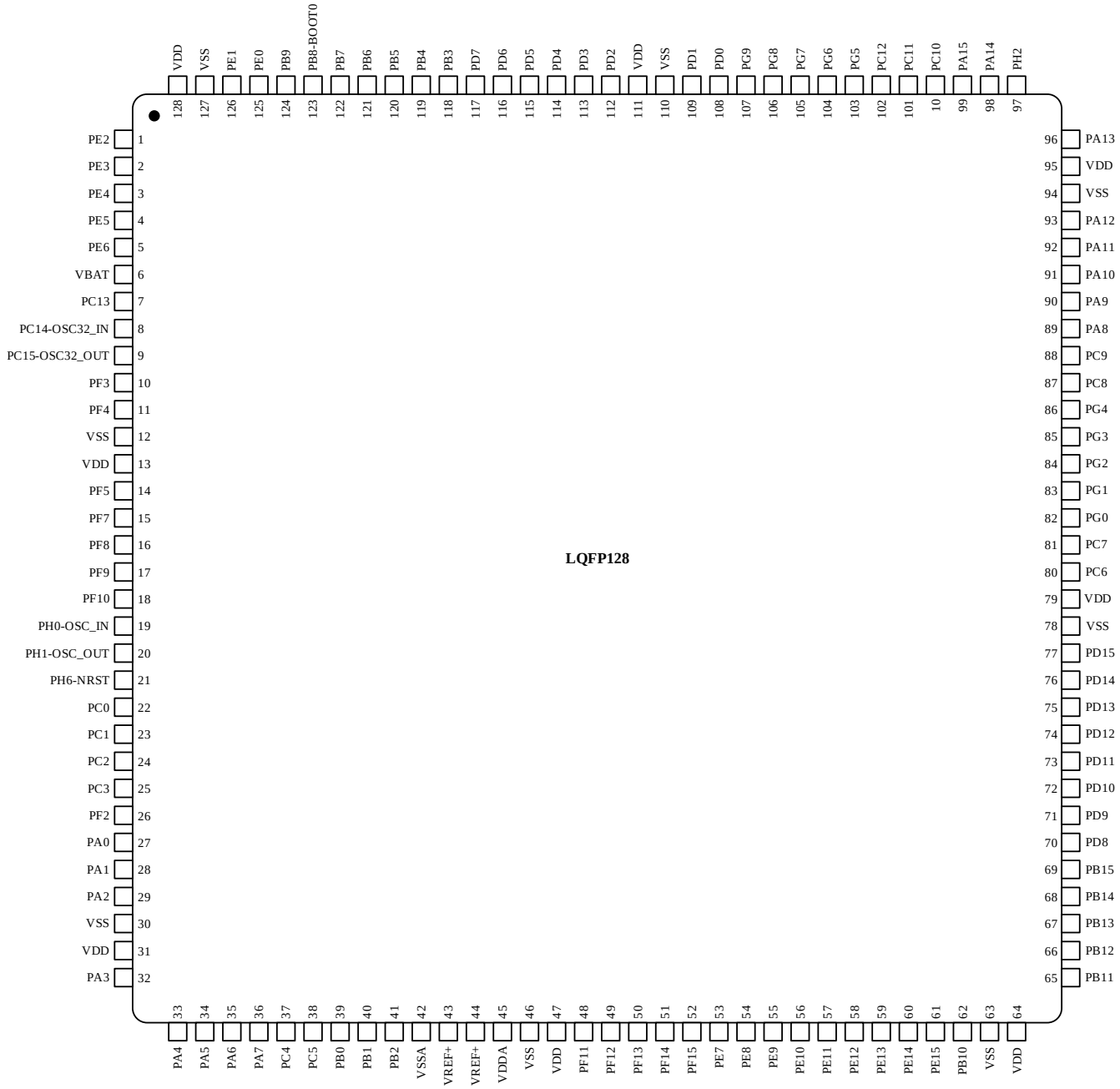
3.6 LQFP128

3.6.1 LQFP128 Pinout



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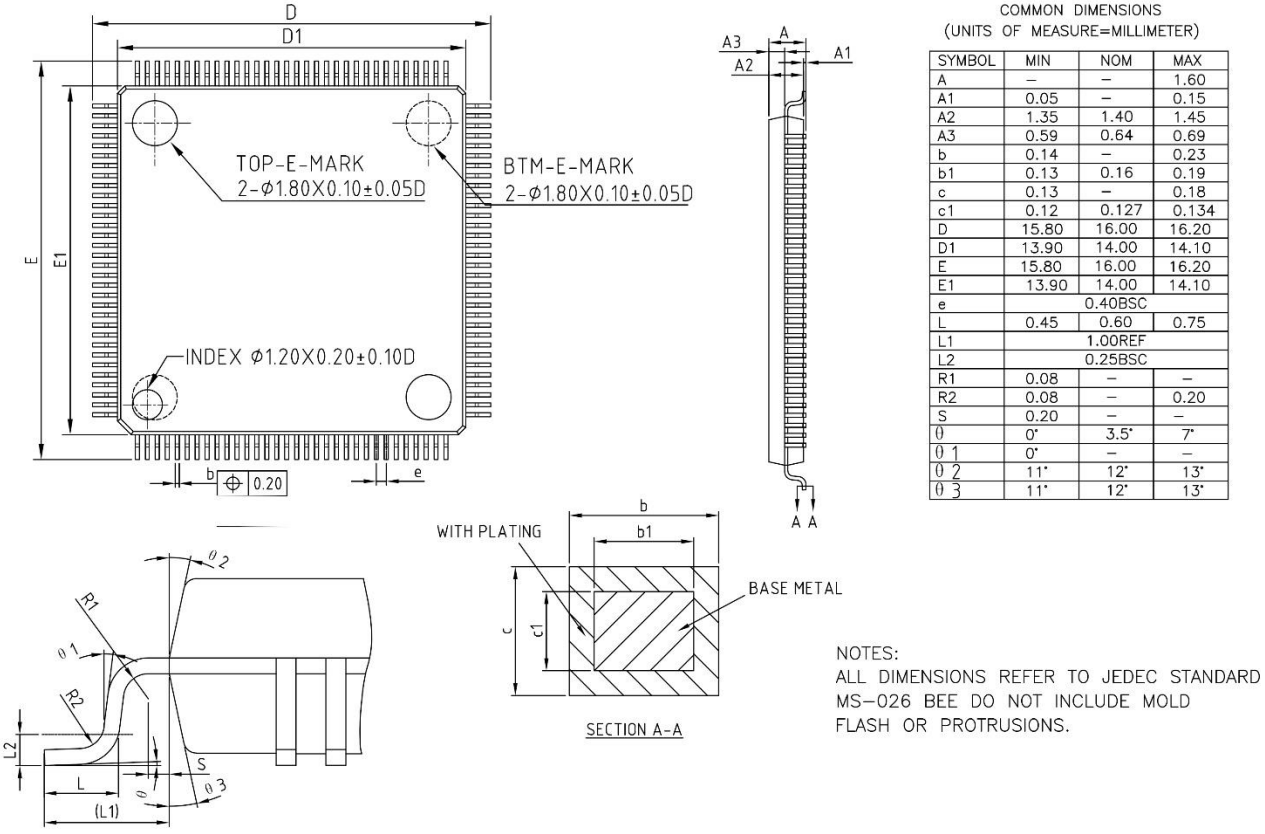
3.6.2 LQFP128 Package



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	0.14	–	0.23
b1	0.13	0.16	0.19
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	0.40BSC		
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°
θ1	0°	–	–
θ2	11°	12°	13°
θ3	11°	12°	13°

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

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4 Version History

Version	Date	Changes
V1.0.0	2024.11.12	Initial release

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