

N32L40xx8/xB

Product Brief

N32L40x series uses 32-bit ARM Cortex-M4F core, maximum working frequency 64MHz, support floating point operation and DSP instructions, integrated up to 128KB embedded encryption Flash, 24KB SRAM, integrated with rich high-performance analog interface, Built-in one 12bit 4.5Msps ADC, two independent rail-to-rail operational amplifiers, two high-speed comparators, one 1Msps 12bit DAC, Integrated multi-channel U(S)ART, I2C, SPI, USB, CAN and other digital communication interfaces, Segment LCD Driver Interface ,built-in password algorithm hardware acceleration engine

Main features

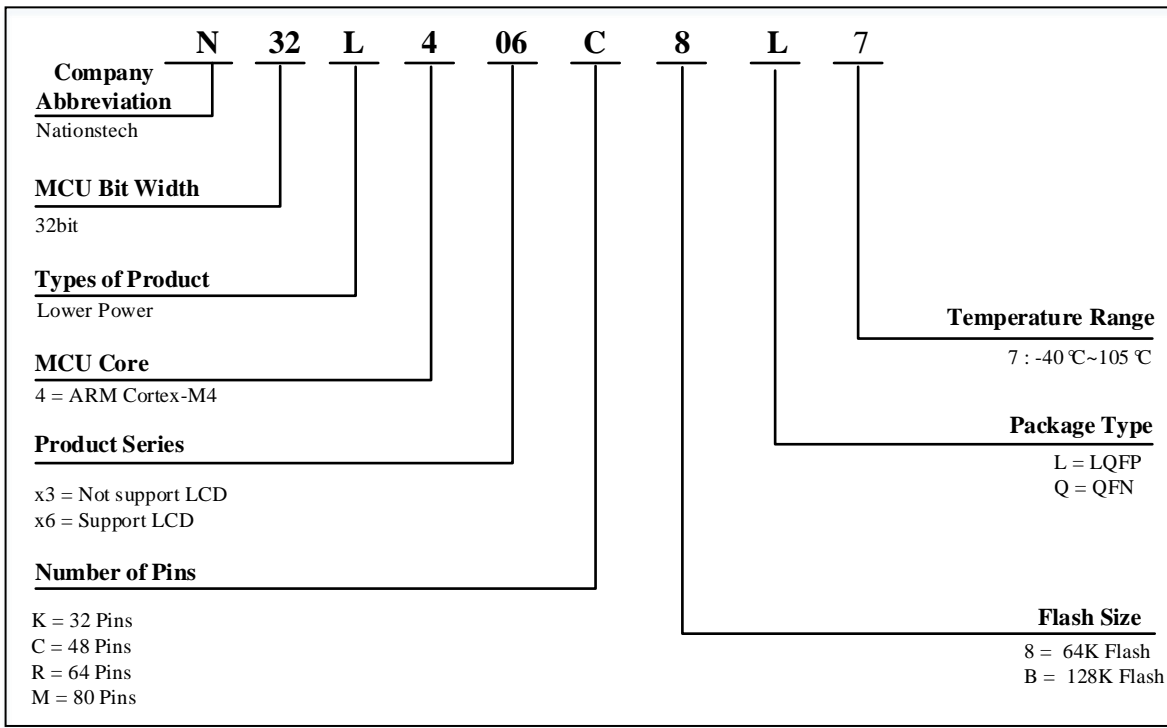
- **CPU core**
 - 32-bit ARM Cortex-M4 core + FPU, single-cycle hardware multiply and divide instructions, support DSP instructions and MPU.
 - Built-in 2KB instruction Cache, support Flash acceleration unit execution program 0 wait
 - The highest frequency is 64MHz, 80DMIPS
- **Cryptographic memory**
 - Up to 128KByte in-chip Flash, support encrypted storage, partition management and data protection, support hardware ECC verification, 100,000 erasing times, 10 years of data retention
 - Up to 24KByte in-chip SRAM, including 16Kbyte SRAM1(Stop2 mode can be configured as retention) and 8 Kbyte SRAM2(both Standby and Stop2 modes can be configured as retention), supporting hardware parity check
- **Low power management**
 - Support Run, Sleep, LP Run, LP Sleep, Stop2, Standby mode
- **High-performance analog interface**
 - One 12bit 4.5Msps ADC with a variety of precision configurable, sampling rate up to 8Msps in 6bit mode, up to 16 external single-ended input channels, supporting differential mode
 - Two rail-to-rail operational amplifiers with built-in programmable gain amplifier up to 32 times
 - Two high-speed analog comparators with built-in 64-level adjustable comparison reference, COMP1 support working in STOP2 mode
 - One 12bit DAC, sampling rate 1Msps
 - Internal 2.048V independent reference voltage reference source
 - All analog interfaces support full voltage from 1.8 to 3.6V
- **Clock**
 - 4MHz~32MHz external high-speed crystal
 - 32.768KHz External low-speed crystal
 - Internal high-speed RC(HSI) 16MHz
 - Internal multi-speed RC(MSI) 100K~4MHz
 - Internal low-speed RC(LSI) 40KHz
 - Built-in high-speed PLL
 - Supports one clock output, which can be configured as low-speed or high-speed clock output
- **Reset**

- Support power-on, brown-out, and external pin reset
- Support watchdog reset, software reset
- **Support up to 64 GPIOs.**
- **Communication interface**
 - Five U(S)ART interfaces, including three USART interfaces (support 1xISO7816, 1xIrDA, LIN) and two UART interfaces
 - One LPUART, support STOP2 to wake up MCU in low power consumption state
 - Two SPI interfaces, the rate is up to 16 Mbps, support I2S communication
 - Two I2C interfaces, the rate is up to 1 MHz, which can be configured in master/slave mode and support dual address response in slave mode
 - One USB2.0 FS Device interface
 - One CAN 2.0A/B bus interface
- **Segment LCD driver interface**
 - Supports up to 320 segments (8x40) or 176 segments (4x44) monochrome passive LCD display
 - Flexible LCD refresh rate support (30~102Hz)
 - Support static, 1/2, 1/3, 1/4, 1/8 duty cycle
 - Support static, 1/2, 1/3, 1/4 bias
 - Support normal display in Stop2 mode
- **One high-speed DMA controller, each controller supports 8 channels, channel source address and destination address can be configured arbitrarily**
- **RTC real-time clock, support leap year perpetual calendar, alarm event, periodic wake up, support internal and external clock calibration**
- **Timer counter**
 - Two 16bit advanced timer counters, support input capture, complementary output, quadrature encoding input, the highest control accuracy is 9.25ns, each timer has four independent channels, three of which support six-channel complementary PWM output
 - Five 16bit general purpose timer counters, each timer has 4 independent channels, support input capture/output comparison /PWM output
 - Two 16bit basic timer counters
 - One 16bit low power timer counter, support quadrature encoding and double pulse counting function, can work in STOP2 mode
 - 1x 24bit SysTick
 - 1x 7bit window Watchdog (WWDG)
 - 1x 12bit independent Watchdog (IWDG)
- **Programming method**
 - Support SWD/JTAG online debugging interface
 - Support UART and USB Bootloader
- **Security features**
 - Built-in cryptographic algorithm hardware acceleration engine
 - Support AES, DES, TDES, SHA1/224/256, SM1, SM3, SM4, and SM7 algorithms
 - Flash storage encryption, multi-user partition management (MMU)

- TRNG true random number generator
- CRC16/32 calculation
- Support write protection (WRP), multiple read protection (RDP) levels (L0/L1/L2)
- Support security start, program encryption download, security update
- Support external clock failure detection, tamper detection
- **96-bit UID and 128-bit UCID**
- **Working conditions**
 - Operating voltage range: 1.8V~3.6V
 - Operating temperature range: -40°C ~ 105°C
 - ESD: ±4KV (HBM model), ±1KV (CDM model)
- **Package**
 - QFN32(4mm x 4mm)
 - QFN48 (6mm x 6mm)
 - LQFP48(7mm x 7mm)
 - QFN64 (8mm x 8mm)
 - LQFP64(10mm x 10mm)
 - LQFP80(12mm x 12mm)
- **Order model**

Type	Model
N32L403	N32L403K8Q7, N32L403KBQ7
N32L406	N32L406C8Q7, N32L406R8Q7, N32L406CBL7, N32L406RBL7, N32L406MBL7

1 Naming rules



2 Product model resource configuration

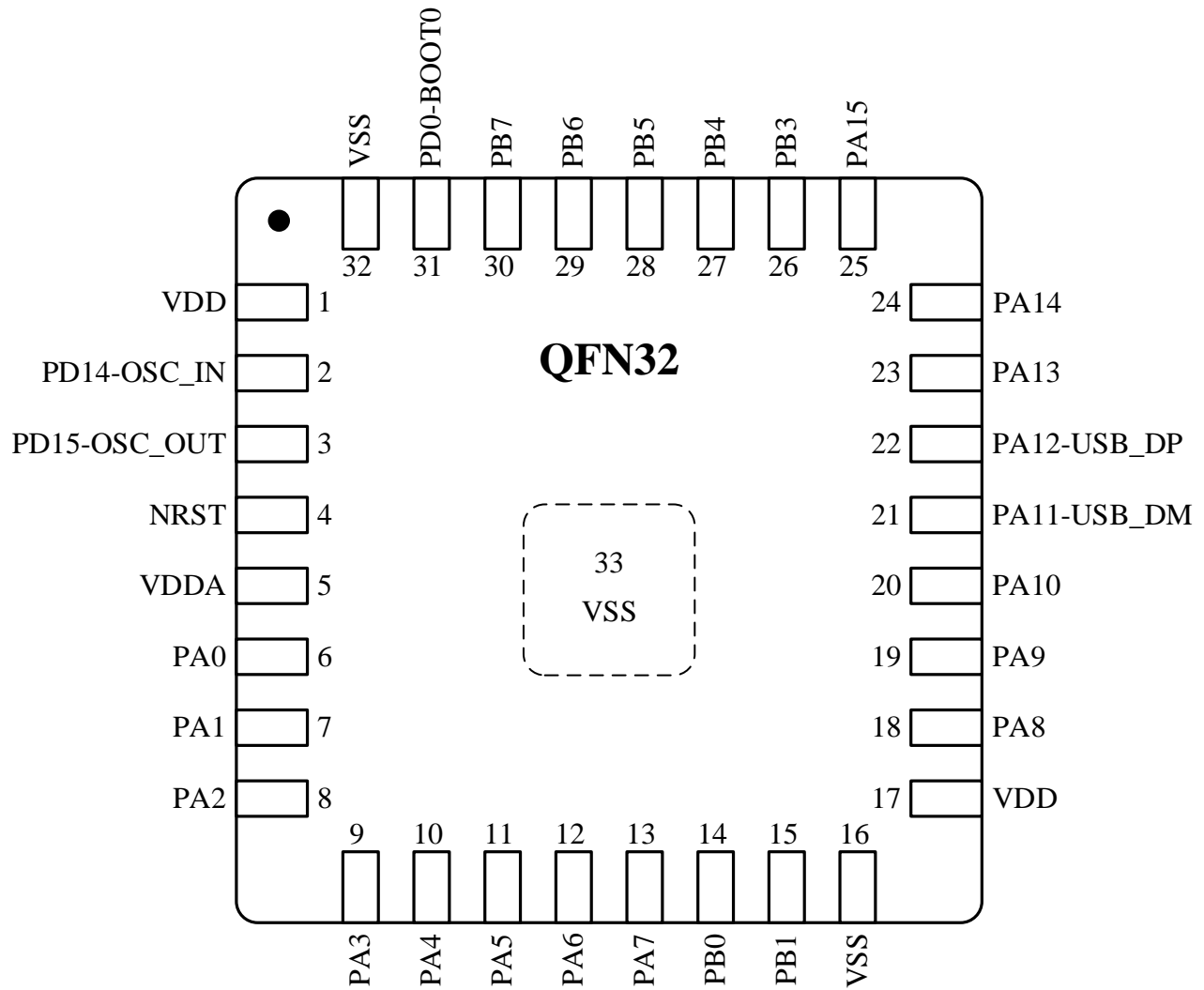
Type of device		N32L403K8/B		N32L406C8/B		N32L406R8/B		N32L406MB	
Flash size (KB)		64	128	64	128	64	128	128	
SRAM size (KB)		16	24	16	24	16	24	24	
CPU frequency		ARM Cortex-M4 @64MHz, 80DMIPS							
Work environment		1.8~3.6V/-40~105℃							
Timer	General	5							
	Advanced	2							
	Basic	2							
	LPTIM	1							
Communication interface	SPI ⁽¹⁾	2							
	I2S ⁽¹⁾	2							
	I2C	2							
	UART	2							
	USART	2		3					
	LPUART	1							
	USB	1							
	CAN	1							
GPIO		26		38		52		64	
DMA		1x							
Number of Channels		8 Channel							
12bit ADC		1x		1x		1x		1x	
Number of channels		10Channel		10Channel		16Channel		16Channel	
12bit DAC		1							
Number of channels		2Channel							
OPA/COMP		2/2		2/2		2/2		2/2	
Segment LCD		Not supported		4x20		4x34/8x30 ⁽²⁾⁽³⁾		4x44/8x40 ⁽³⁾	
Algorithm support		DES/TDES、AES、SHA1/SHA224/SHA256、SM1、SM3、SM4、SM7、CRC16/CRC32、TRNG							
Security and protection		Read and write protection (RDP/WRP), storage encryption, partition protection, and security startup							
Package		QFN32		LQFP48/QFN48		LQFP64/QFN64		LQFP80	

1. SPI1 and SPI2 interfaces can flexibly switch between SPI mode and I2S audio mode
2. LQFP64/QFN64 package version B chips do not support LCD 1/8 duty cycle mode (8x30)
3. In the 1/8 duty cycle mode, the B-version and C-version chip LCDs do not support 1/4 bias

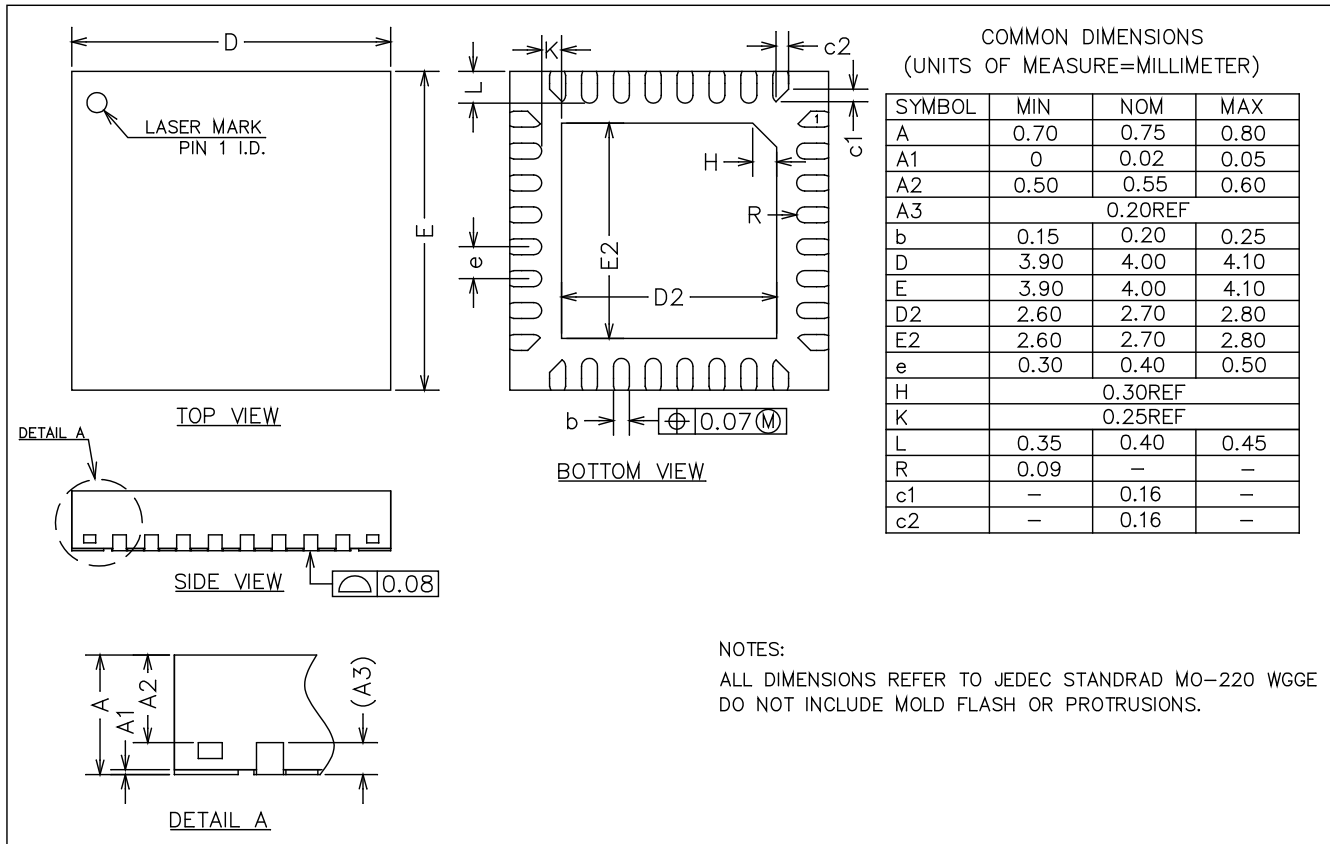
3 Package

3.1 QFN32package

3.1.1 QFN32 pinout

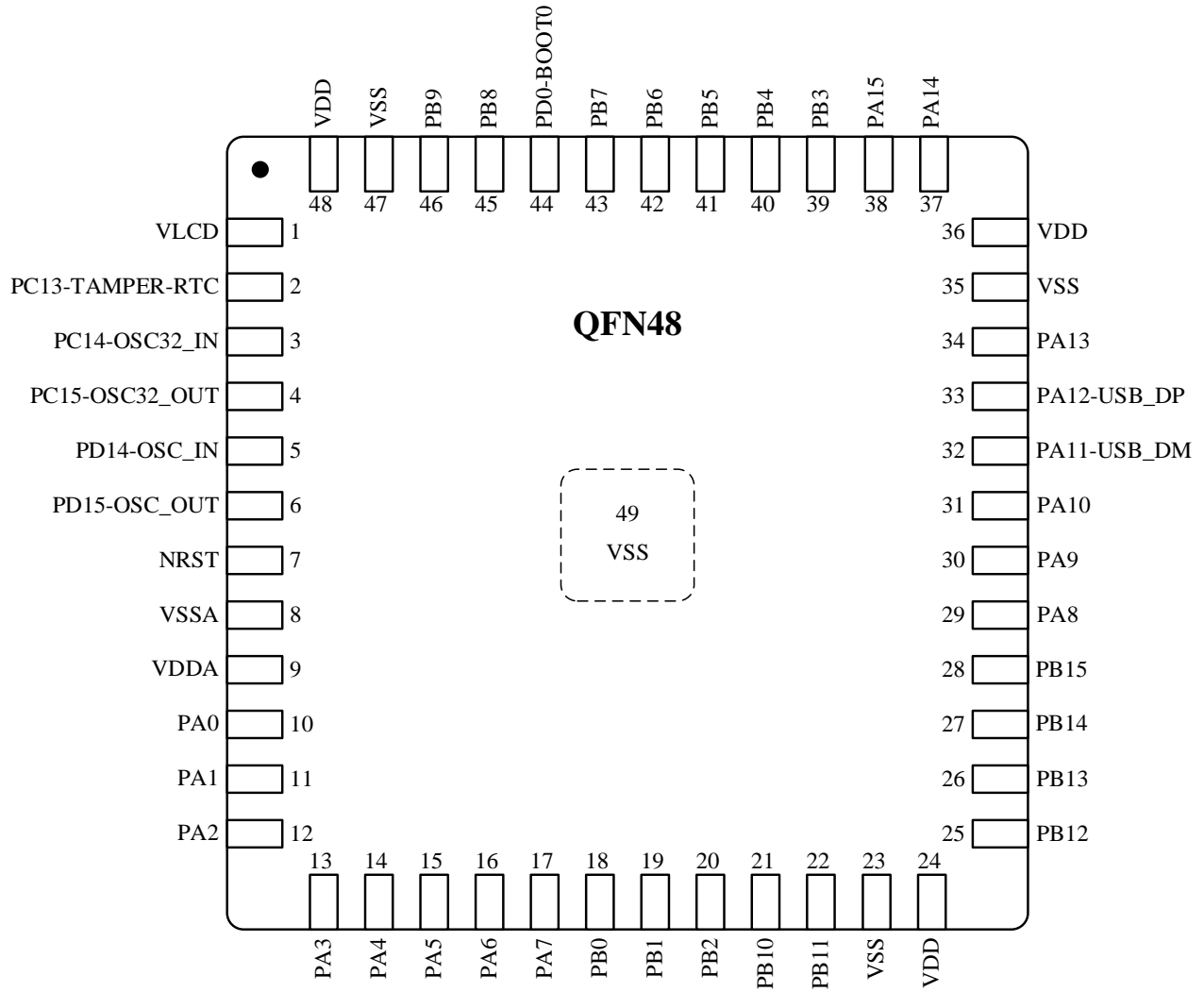


3.1.2 QFN32 package

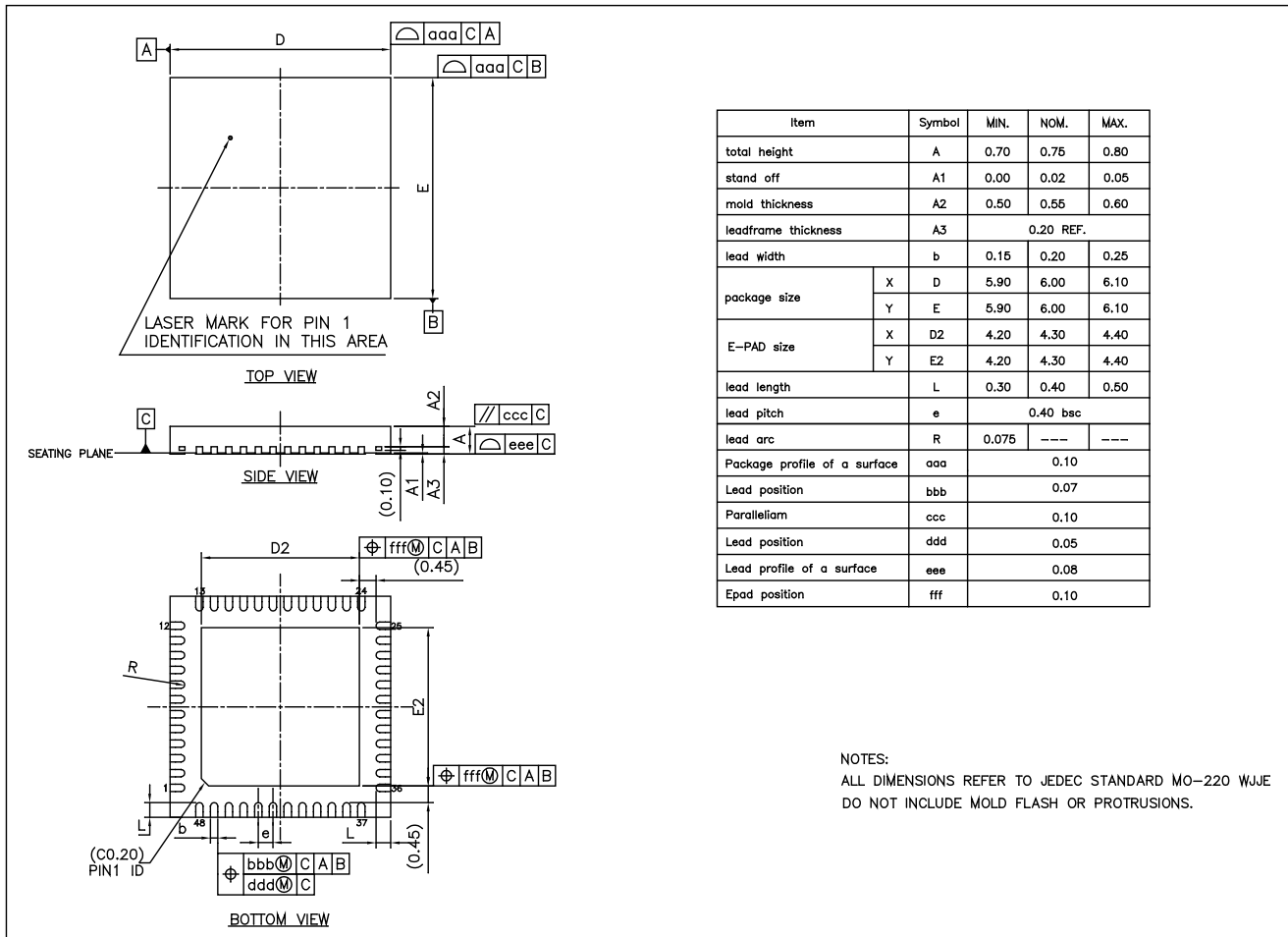


3.2 QFN48 package

3.2.1 QFN48 pinout



3.2.2 QFN48 package

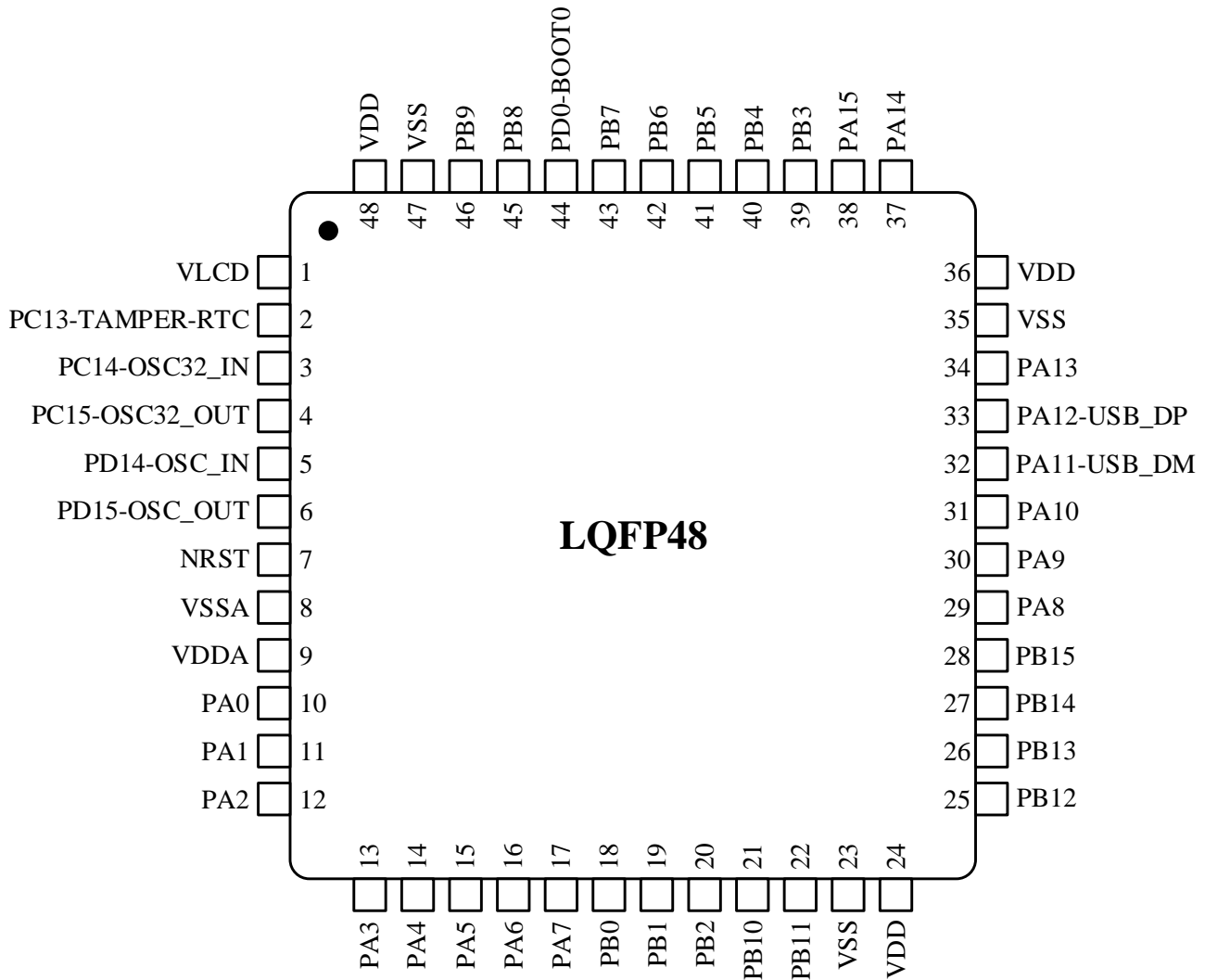


Item	Symbol	MIN.	NOM.	MAX.
total height	A	0.70	0.75	0.80
stand off	A1	0.00	0.02	0.05
mold thickness	A2	0.50	0.55	0.60
leadframe thickness	A3	0.20 REF.		
lead width	b	0.15	0.20	0.25
package size	X D	5.90	6.00	6.10
	Y E	5.90	6.00	6.10
E-PAD size	X D2	4.20	4.30	4.40
	Y E2	4.20	4.30	4.40
lead length	L	0.30	0.40	0.50
lead pitch	e	0.40 bsc		
lead arc	R	0.075	---	---
Package profile of a surface	aaa	0.10		
Lead position	bbb	0.07		
Paralleliam	ccc	0.10		
Lead position	ddd	0.05		
Lead profile of a surface	eee	0.08		
Epad position	fff	0.10		

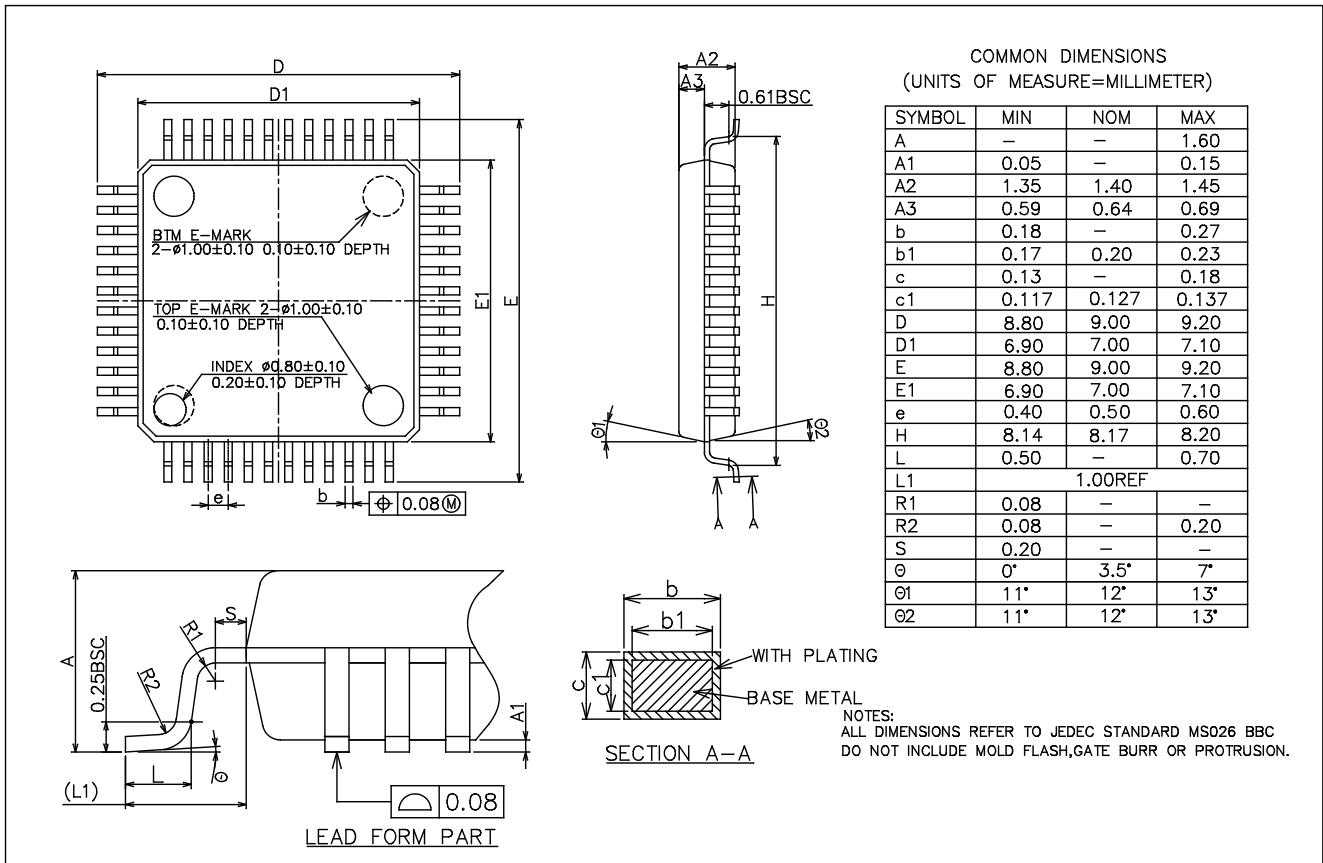
NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD MO-220 WJJE
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

3.3 LQFP48 package

3.3.1 LQFP48 pinout

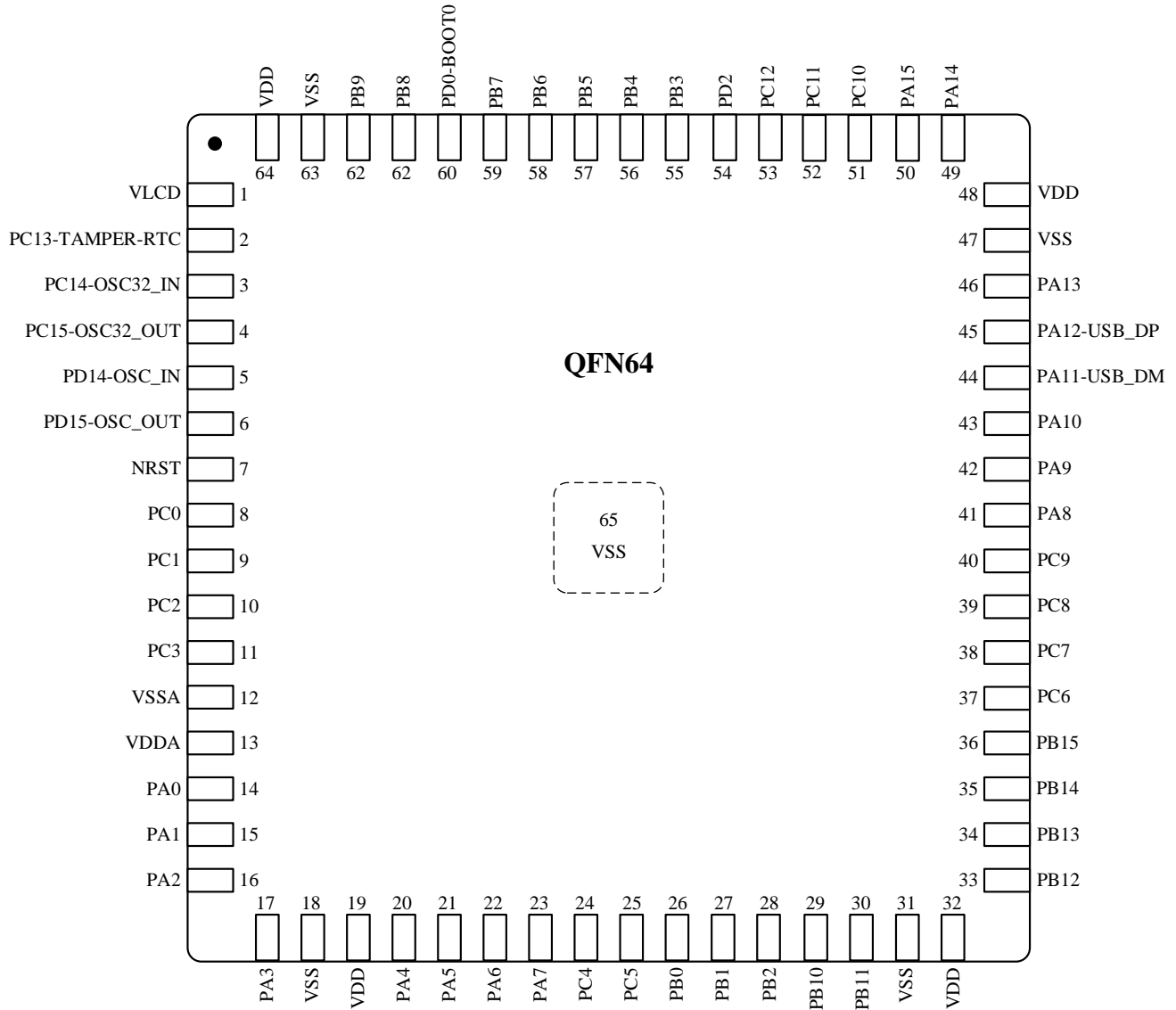


3.3.2 LQFP48 package

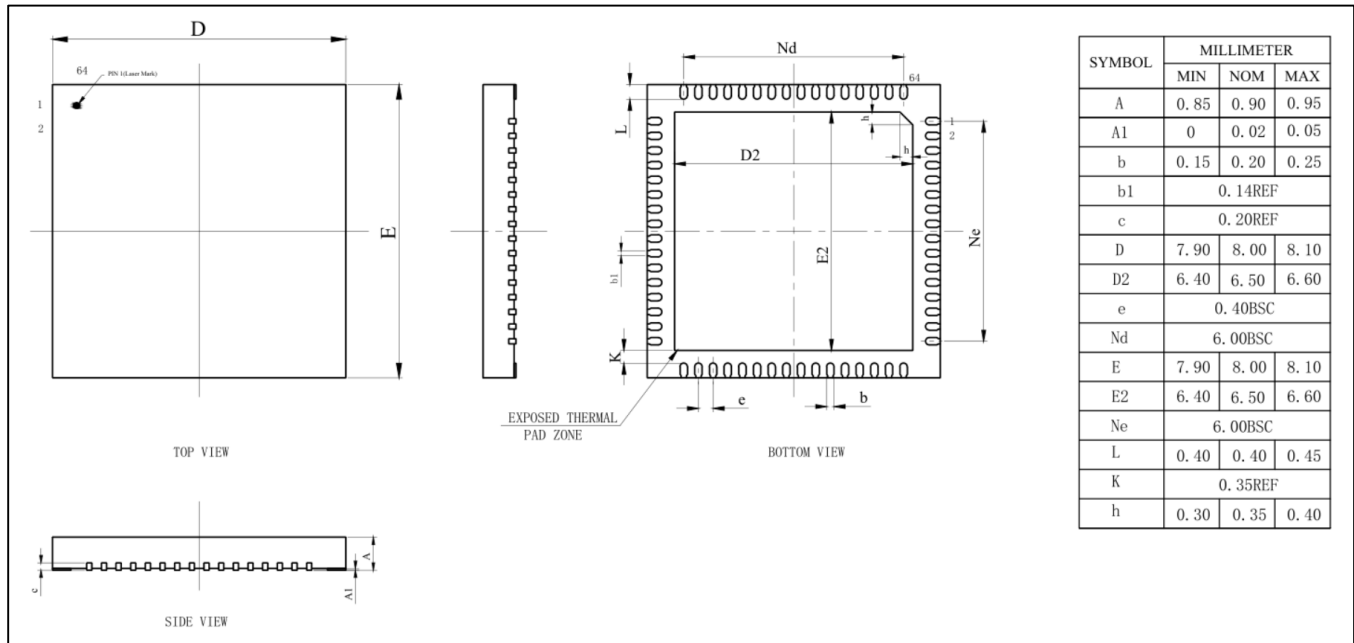


3.4 QFN64 package

3.4.1 QFN64 pinout

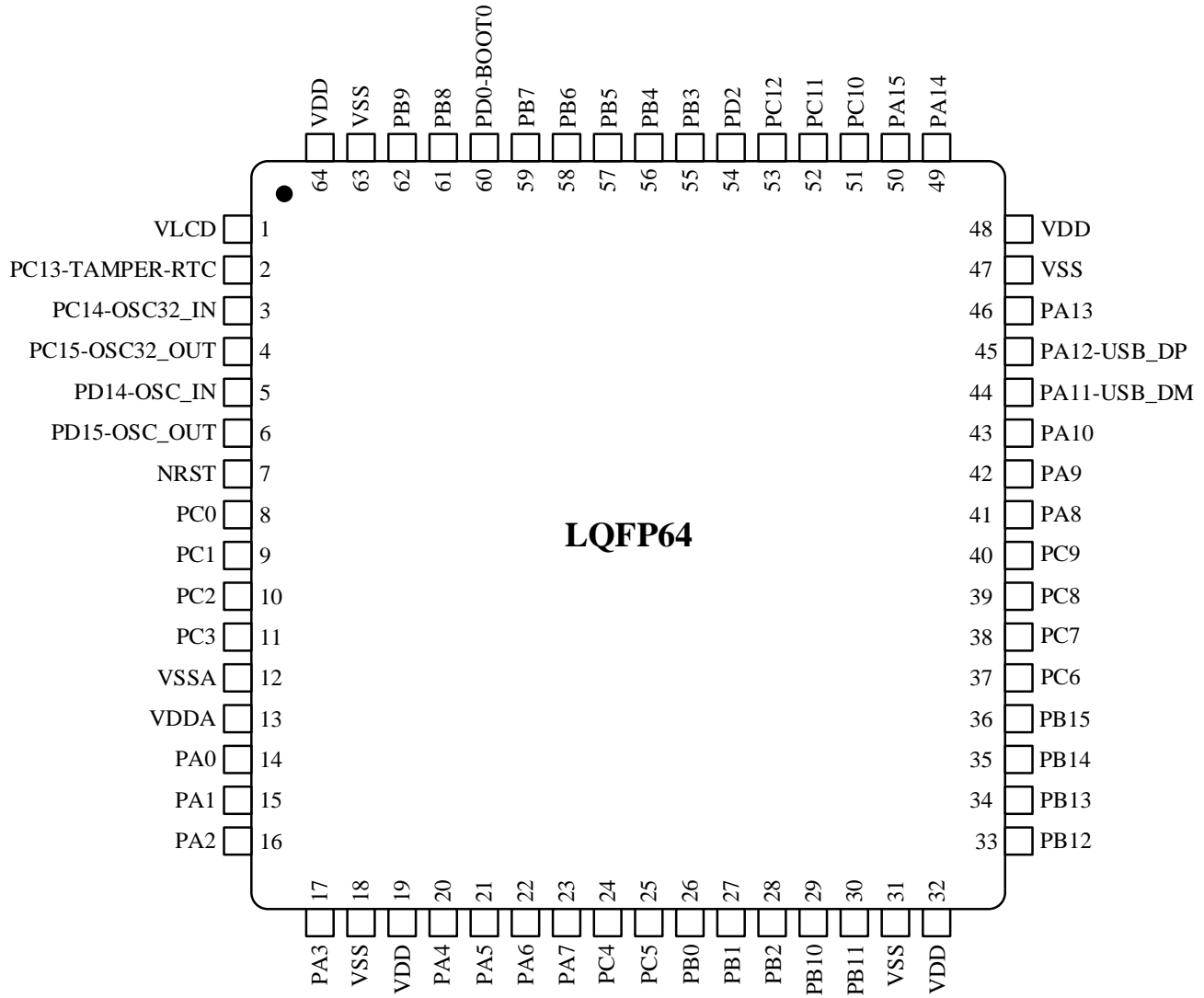


3.4.2 QFN64 package

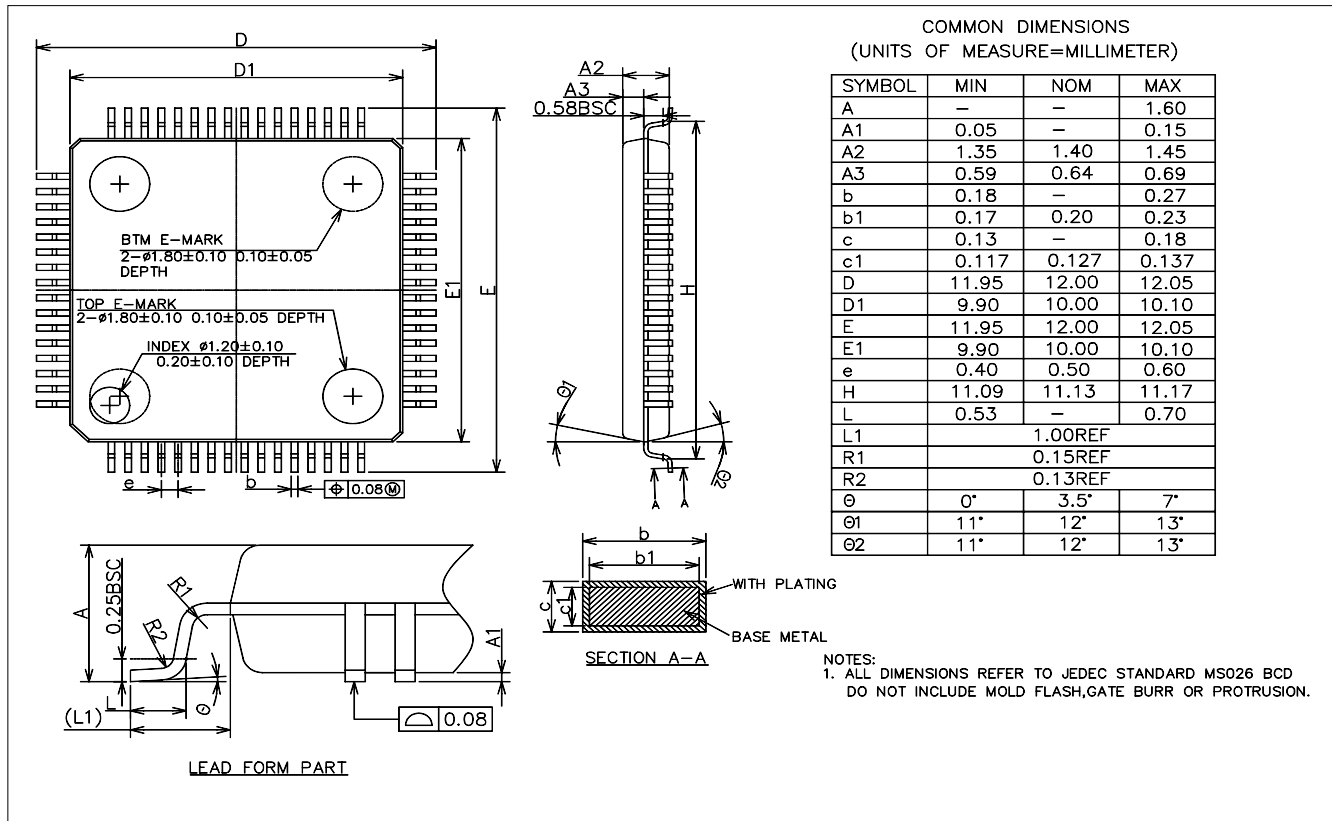


3.5 LQFP64 package

3.5.1 LQFP64 pinout

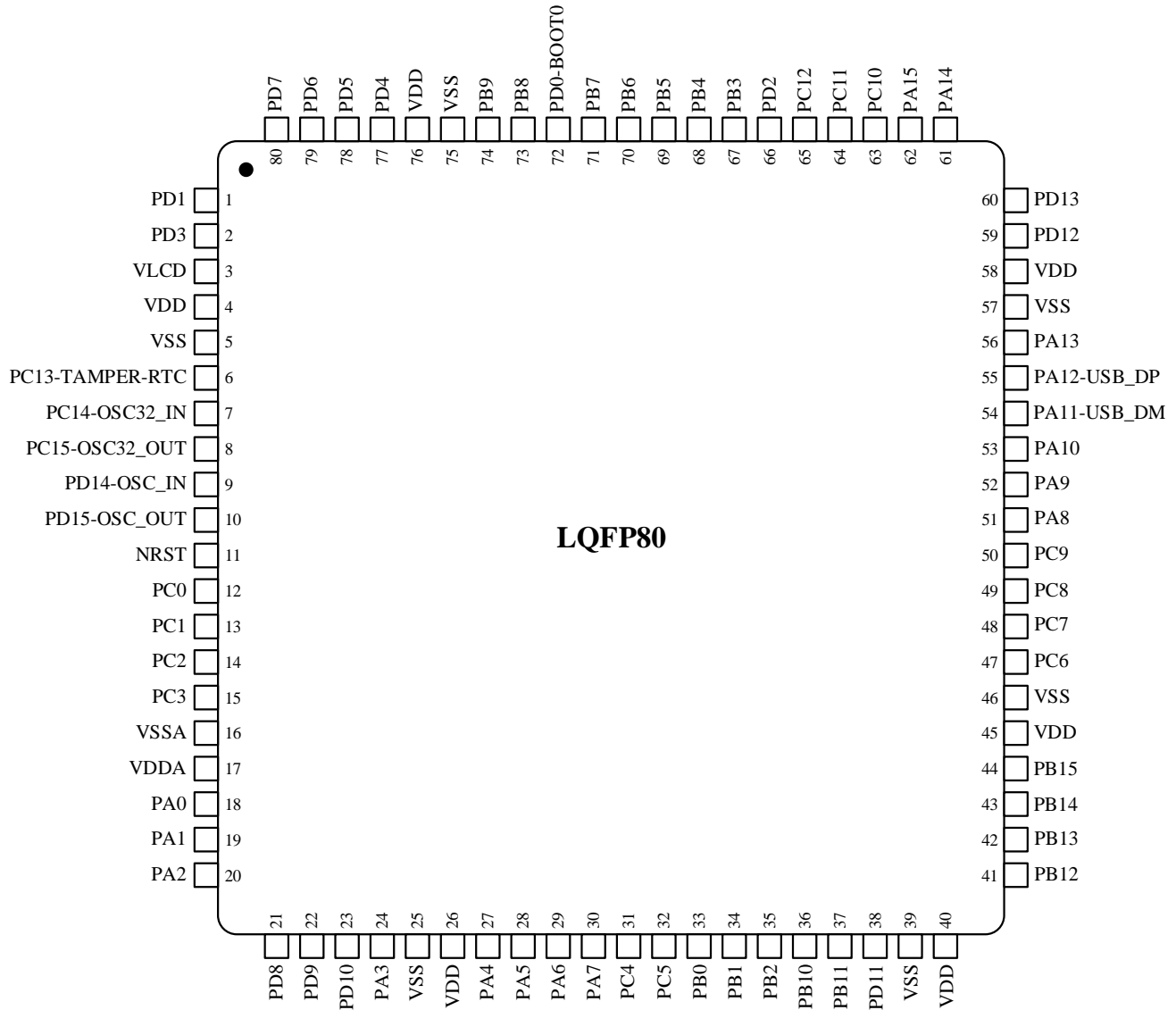


3.5.2 LQFP64 package

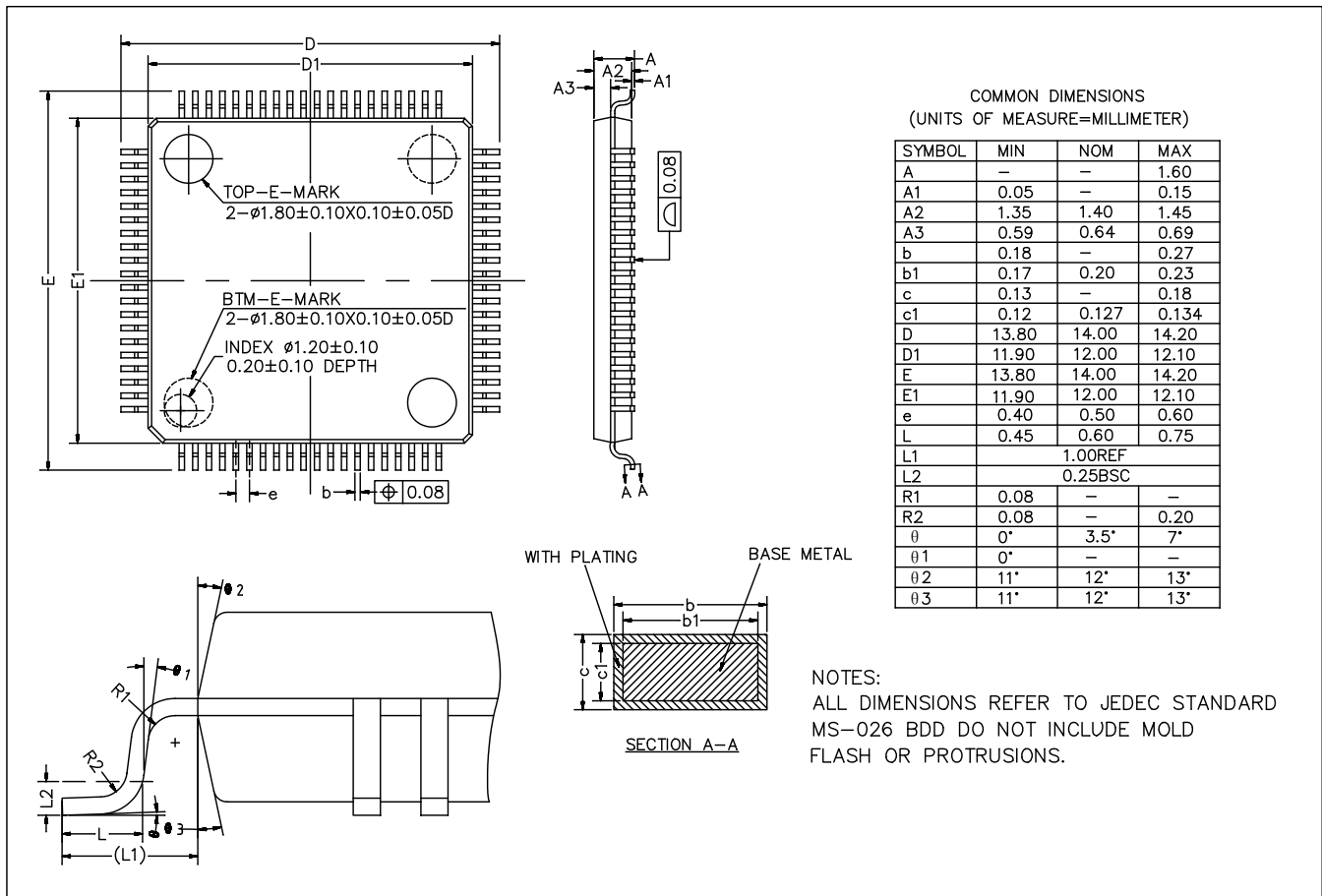


3.6 LQFP80 package

3.6.1 LQFP80 pinout



3.6.2 LQFP80 package



4 Version history

Version	Date	Note
V1.0	2020.7.1	New document
V1.2	2021.4.14	<ol style="list-style-type: none"> 1. Added N32L401x 2. Updated LCD version difference description, add the precautions for LCD 1/8 duty cycle mode
V1.3	2022.7.6	<ol style="list-style-type: none"> 1. Modify the description of low power 2. Delete N32L401x 3. Modify the description of time counter 4. Modify reset description

5 Notice

This document is the exclusive property of Nations Technologies Inc. (Hereinafter referred to as NATIONS). This document, and the product of NATIONS described herein (Hereinafter referred to as the Product) are owned by NATIONS under the laws and treaties of the People's Republic of China and other applicable jurisdictions worldwide. NATIONS does not grant any license under its patents, copyrights, trademarks, or other intellectual property rights. Names and brands of third party may be mentioned or referred thereto (if any) for identification purposes only. NATIONS reserves the right to make changes, corrections, enhancements, modifications, and improvements to this document at any time without notice. Please contact NATIONS and obtain the latest version of this document before placing orders.

Although NATIONS has attempted to provide accurate and reliable information, NATIONS assumes no responsibility for the accuracy and reliability of this document.

It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. In no event shall NATIONS be liable for any direct, indirect, incidental, special, exemplary, or consequential damages arising in any way out of the use of this document or the Product.

NATIONS Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at user's risk. User shall indemnify NATIONS and hold NATIONS harmless from and against all claims, costs, damages, and other liabilities, arising from or related to any customer's Insecure Usage. Any express or implied warranty with regard to this document or the Product, including, but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement are disclaimed to the fullest extent permitted by law.

Unless otherwise explicitly permitted by NATIONS, anyone may not use, duplicate, modify, transcribe or otherwise distribute this document for any purposes, in whole or in part.