# N32G031 x6/x8 Product Instruction

**N32G031 series based on Arm® Cortex®-M0, run up to 48MHz, up to 64KB embedded flash, 8KB SRAM, integrated analog interface, 1x12bit 1Msps ADC, 1xOPAMP, 1xcomparator, integrated multi-channel U(S)ART, I2C, SPI and other digital communication interfaces.**

## Key feature

- **Core**
  - A 32-bit general-purpose microcontroller based on the Arm® Cortex®-M0 core, Single-cycle hardware multiply instruction
  - Run up to 48MHz
- **Encrypted memory**
  - Up to 64KByte embedded Flash memory, supports encrypted storage, supports hardware ECC verification, data 100,000 cycling and 10 years of data retention
  - SRAM of 8KB, supporting hardware parity
- **Low-power management**
  - Stop mode: RTC Run, maximum 8KByte SRAM retention, CPU register retention, all IO retention
  - Power Down mode: support 3 IO wakeup
- **Clock**
  - HSE: 4MHz~20MHz external high-speed crystal
  - LSE: 32.768KHz external low-speed crystal
  - HSI: Internal high-speed RC OSC 8MHz
  - LSI: Internal low-speed RC OSC 30KHz
  - Built-in high-speed PLL
  - MCO: Support 2-way clock output, configurable SYSCLK, HSI, HSE, LSI, LSE, and PLL clock output that can be divided.
- **Reset**
  - Support power-on/power-off/external pin reset
  - Support watchdog reset
- **Communication interface**
  - 3xU(S)ART, with a maximum rate of 3 Mbps, of which 2 USART interfaces (support 1xISO7816, 1xIrDA, LIN), 1 of which support low power (LPUART, the highest communication rate in this mode is 9600bps) ,Stop mode can be awakened
  - 2xSPI, up to 18 MHz, one of which supports multiplexing with I2S
  - 2xI2C, the rate is up to 1 MHz, which can be configured in master/slave mode and support dual address response in slave mode
- **Analog interface**
  - 1x12bit 1Msps ADC , up to 12 external single-ended input channels
  - 1xOPAMP, internal programmable gain amplifier up to 32 times



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

- 1xCOMP (Comparator has an internal independent 6bit DAC)

- **Up to 40 GPIOs**
- **1xDMA, 5-channel, channel source address and destination address can be arbitrarily configurable**
- **1x RTC real-time clock, support leap year perpetual calendar, alarm event, periodic wake up, support internal and external clock calibration**
- **1xBeeper, support complementary output, 16mA output drive capacity**
- **Timer counter**
  - 2x16-bit advanced timer counters, support input capture, complementary output, orthogonal encoding input, each timer support 4 independent channels. Each timer support 3 pairs complementary PWM outputs
  - 1x16-bit general purpose timer counters, 4 independent channels, supports input capture/output compare/PWM output
  - 1x16-bit basic timer counters
  - 1x16-bit low power timer counter. support single pulse and double pulse counting function, can work in STOP mode
  - 1x24-bit SysTick
  - 1x7-bit Window Watchdog (WWDG)
  - 1x12-bit Independent watchdog (IWDG)
- **Programming mode**
  - Support SWD online debugging interface
  - Support UART Bootloader
- **Hardware Divider(HDIV)and Square Root(SQRT)**
- **Security features**
  - Flash storage encryption
  - CRC16/32 calculation
  - Support write protection(WRP), multiple read protection(RDP) levels (L0/L1/L2)
  - Support external clock failure detection, tamper detection
- **96-bit UID and 128-bit UCID**
- **Working conditions**
  - Operating voltage Range: 1.8V~5.5V
  - Operating Temperature Range: -40℃~105℃
  - ESD: ±4KV (HBM model), ±1KV (CDM model)
- **Package**
  - UFQFPN20(3mm x 3mm)
  - TSSOP20(6.5mm x 4.4mm)
  - QFN32(4mm x 4mm)
  - QFN32(5mm x 5mm)
  - LQFP32(7mm x 7mm)
  - LQFP48(7mm x 7mm)
- **Order model**



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

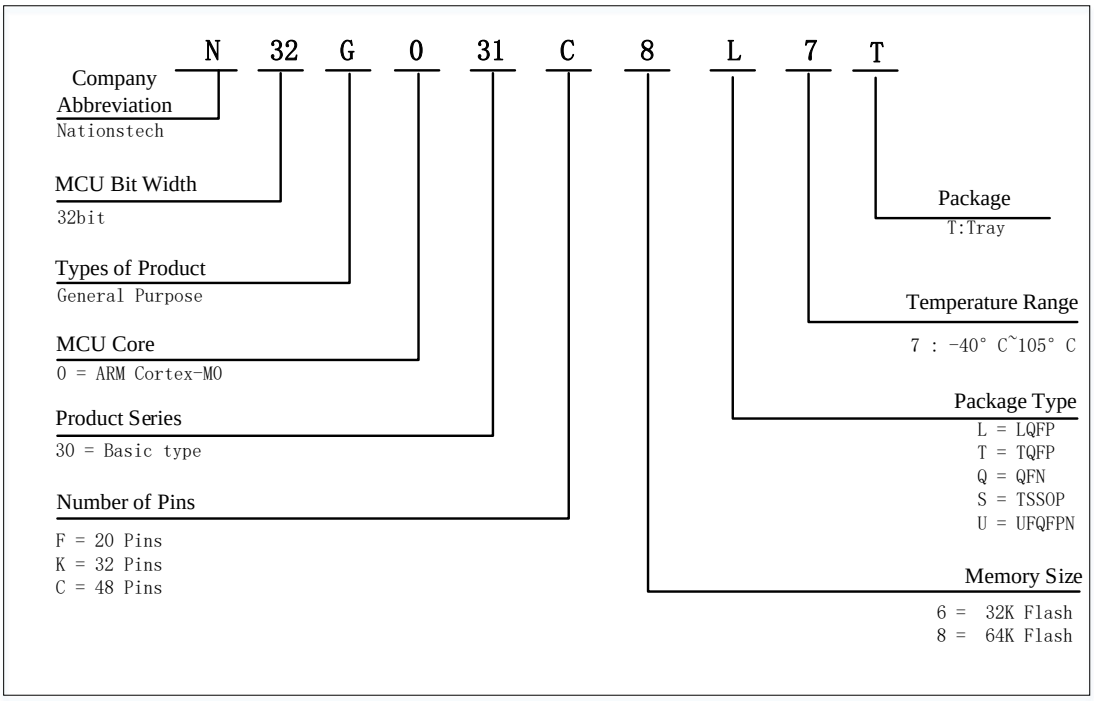
| Series | Part Number |
|---|---|
| N32G031x6<br>N32G031x8 | N32G031F6U7, N32G031F6S7,<br>N32G031K6L7, N32G031K6Q7, N32G031K6Q7-1,<br>N32G031F8U7, N32G031F8S7,<br>N32G031K8L7, N32G031K8Q7, N32G031K8Q7-1,<br>N32G031C8L7 |



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

# 1 Part number information

Figure 1-1 N32G031 Series Order code information






**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

# 2 List of devices

Table 2-1 N32G031 Series devices features and peripheral list (1)

| Part Number | | N32G031 F8U7 | N32G031 F8S7 | N32G031 K8Q7 | N32G031 K8Q7-1 | N32G031 K8L7 | N32G031 C8L7 |
|---|---|---|---|---|---|---|---|
| Flash capacity (KB) | | 32 | 32 | 32 | 32 | 32 | 64 |
| SRAM capacity (KB) | | 64 | 64 | 64 | 64 | 64 | 64 |
| CPU frequency | | ARM Cortex-M0 @48MHz | | | | | |
| working environment | | 1.8~5.5V/-40~105 ℃ | | | | | |
| Timer | General | 1 | | | | | |
| | Advanced | 2 | | | | | |
| | Basic | 1 | | | | | |
| | LPTIM | 1 | | | | | |
| | RTC | 1 | | | | | |
| communication interface | SPI | 2 | | | | | |
| | I2S | 1 | | | | | |
| | I2C | 2 | | | | | |
| | USART | 2 | | | | | |
| | LPUART | 1 | | | | | |
| GPIO | | 16 | | 28 | | 26 | 40 |
| DMA Number of Channels | | 16 | | | | | |
| 12bit ADC Number of channels | | 1x12bit 7Channel | 1x12bit 9Channel | 1x12bit 10Channel | | | 1x12bit 12Channel |
| OPA/COMP | | 1/1 | | | | | |
| Beeper | | 1 | | | | | |
| Algorithm support | | CRC16/CRC32 | | | | | |
| security protection | | Read and write protection (RDP/WRP), storage encryption | | | | | |
| Package | | UFQFPN20 | TSSOP20 | QFN32 (5mmx5mm) | QFN32 (4mmx4mm) | LQFP32 | LQFP48 |



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

Table 2-2 N32G031 Series devices features and peripheral list (2)

| Part Number | | N32G031F6U7 | N32G031F6S7 | N32G031K6Q7 | N32G031K6Q7-1 | N32G031K6L7 |
|---|---|---|---|---|---|---|
| Flash capacity (KB) | | 32 | 32 | 32 | 32 | 32 |
| SRAM capacity (KB) | | 8 | 8 | 8 | 8 | 8 |
| CPU frequency | | ARM Cortex-M0 @48MHz | | | | |
| working environment | | 1.8~5.5V/-40~105℃ | | | | |
| Timer | General | 1 | | | | |
| | Advanced | 2 | | | | |
| | Basic | 1 | | | | |
| | LPTIM | 1 | | | | |
| | RTC | 1 | | | | |
| communication interface | SPI | 2 | | | | |
| | I2S | 1 | | | | |
| | I2C | 2 | | | | |
| | USART | 2 | | | | |
| | LPUART | 1 | | | | |
| GPIO | | 16 | | 28 | | 26 |
| DMA Number of Channels | | 5 | | | | |
| 12bit ADC Number of channels | | 1x12bit 7Channel | 1x12bit 9Channel | 1x12bit 10Channel | | |
| OPA/COMP | | 1/1 | | | | |
| Beeper | | 1 | | | | |
| Algorithm support | | CRC16/CRC32 | | | | |
| security protection | | Read and write protection (RDP/WRP), storage encryption | | | | |
| Package | | General | TSSOP20 | QFN32 (5mmx5mm) | QFN32 (4mmx4mm) | LQFP32 |

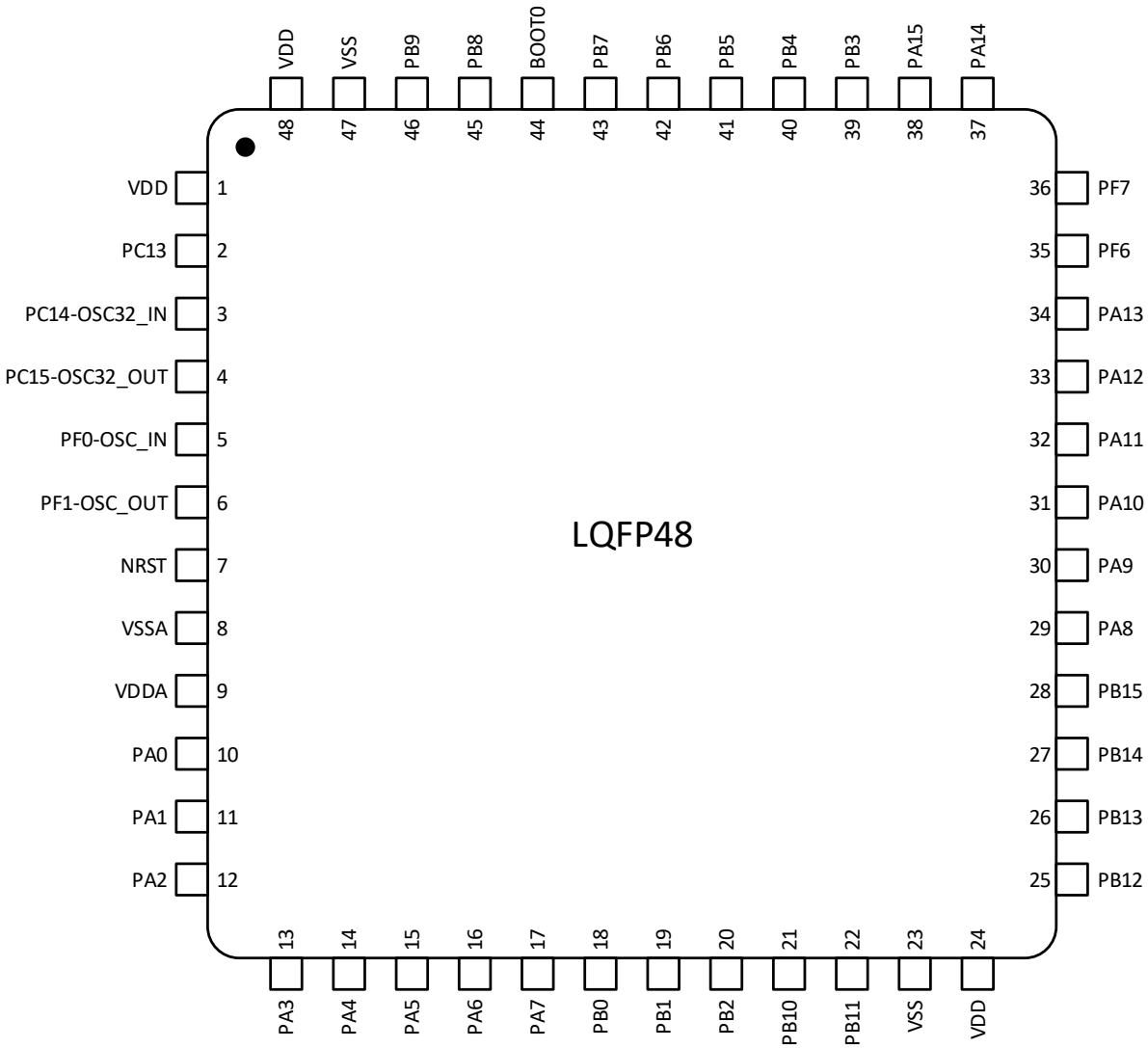


**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

# 3 Package information

## 3.1 LQFP48

### 3.1.1 LQFP48 pinouts



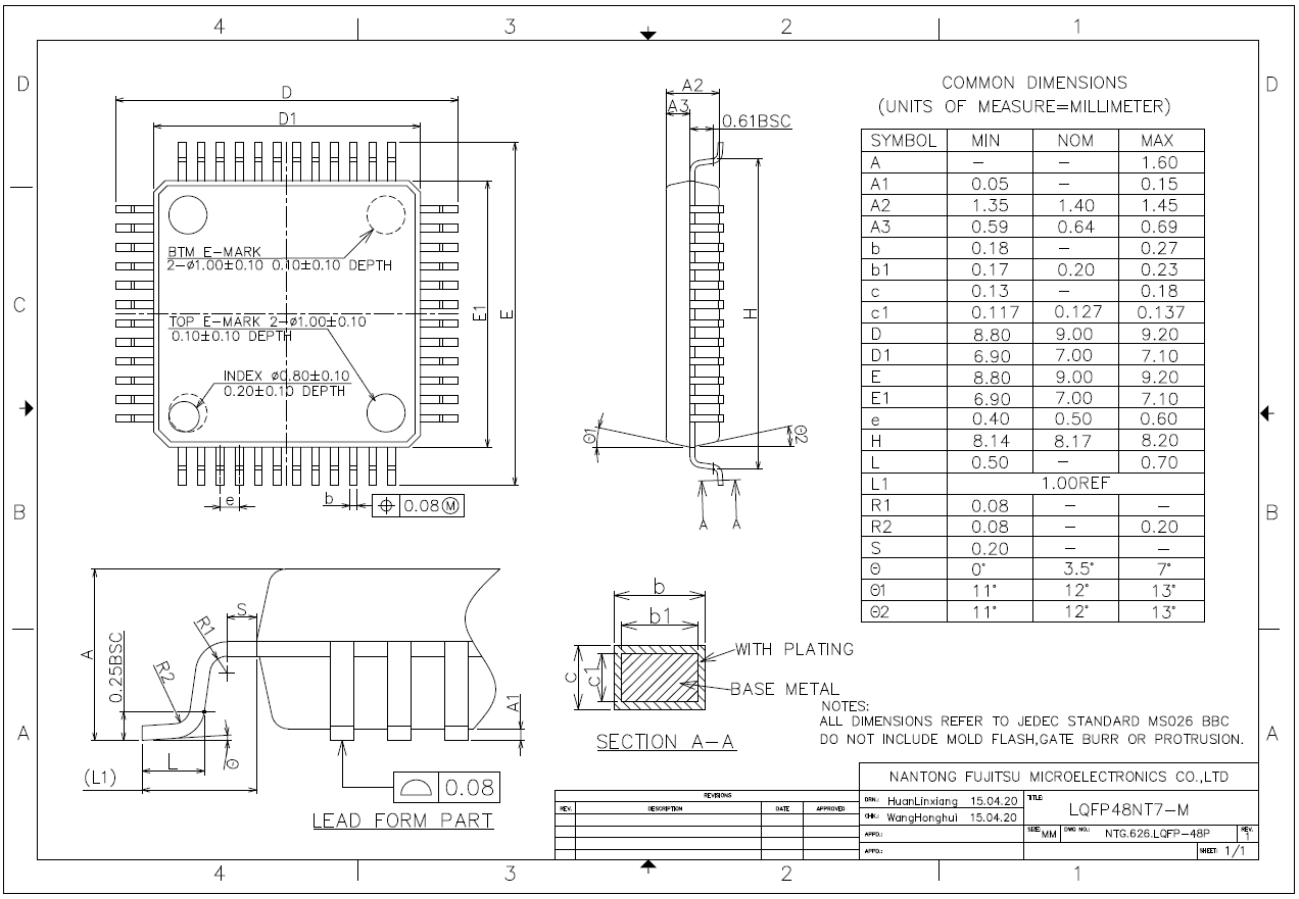



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

### 3.1.2 LQFP48 package



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg




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 | 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 |
| e | 0.40 | 0.50 | 0.60 |
| H | 8.14 | 8.17 | 8.20 |
| L | 0.50 | – | 0.70 |
| L1 | 1.00REF | | |
| R1 | 0.08 | – | – |
| R2 | 0.08 | – | 0.20 |
| S | 0.20 | – | – |
| θ | 0° | 3.5° | 7° |
| θ1 | 11° | 12° | 13° |
| θ2 | 11° | 12° | 13° |

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

| REVISIONS | | | |
|---|---|---|---|
| REV. | DESCRIPTION | DATE | APPROVED |

NANTONG FUJITSU MICROELECTRONICS CO.,LTD

DRN: HuanLinxiang 15.04.20
CHK: WangHonghui 15.04.20
APPD:
APPD:

TITLE: LQFP48NT7-M

SIZE: MM | DWG NO: NTG.626.LQFP-48P | REV: 1

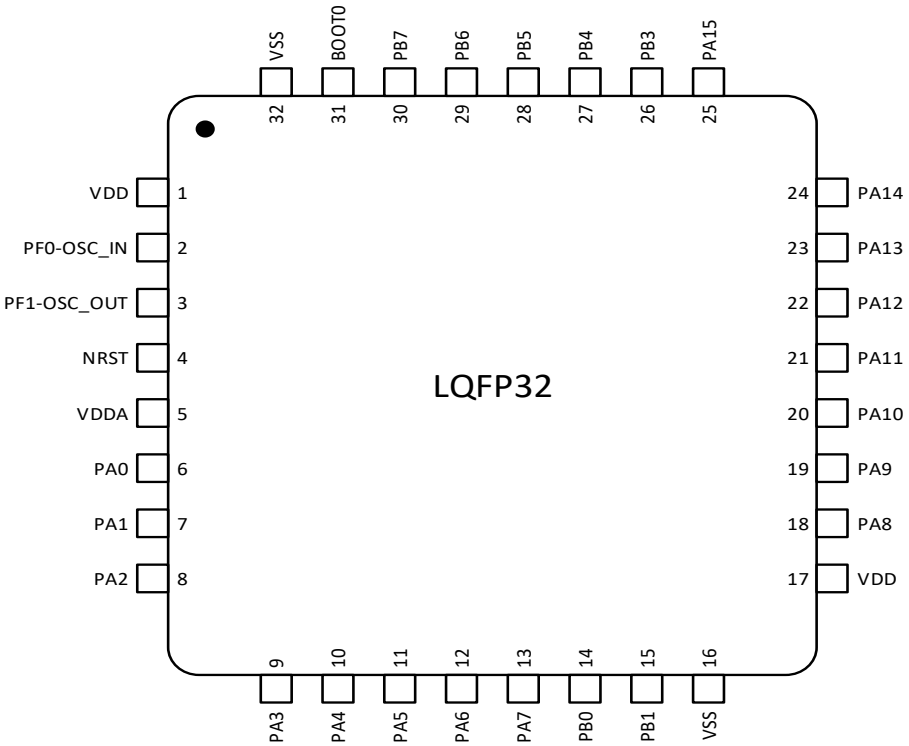
SHEET: 1/1



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

## 3.2 LQFP32

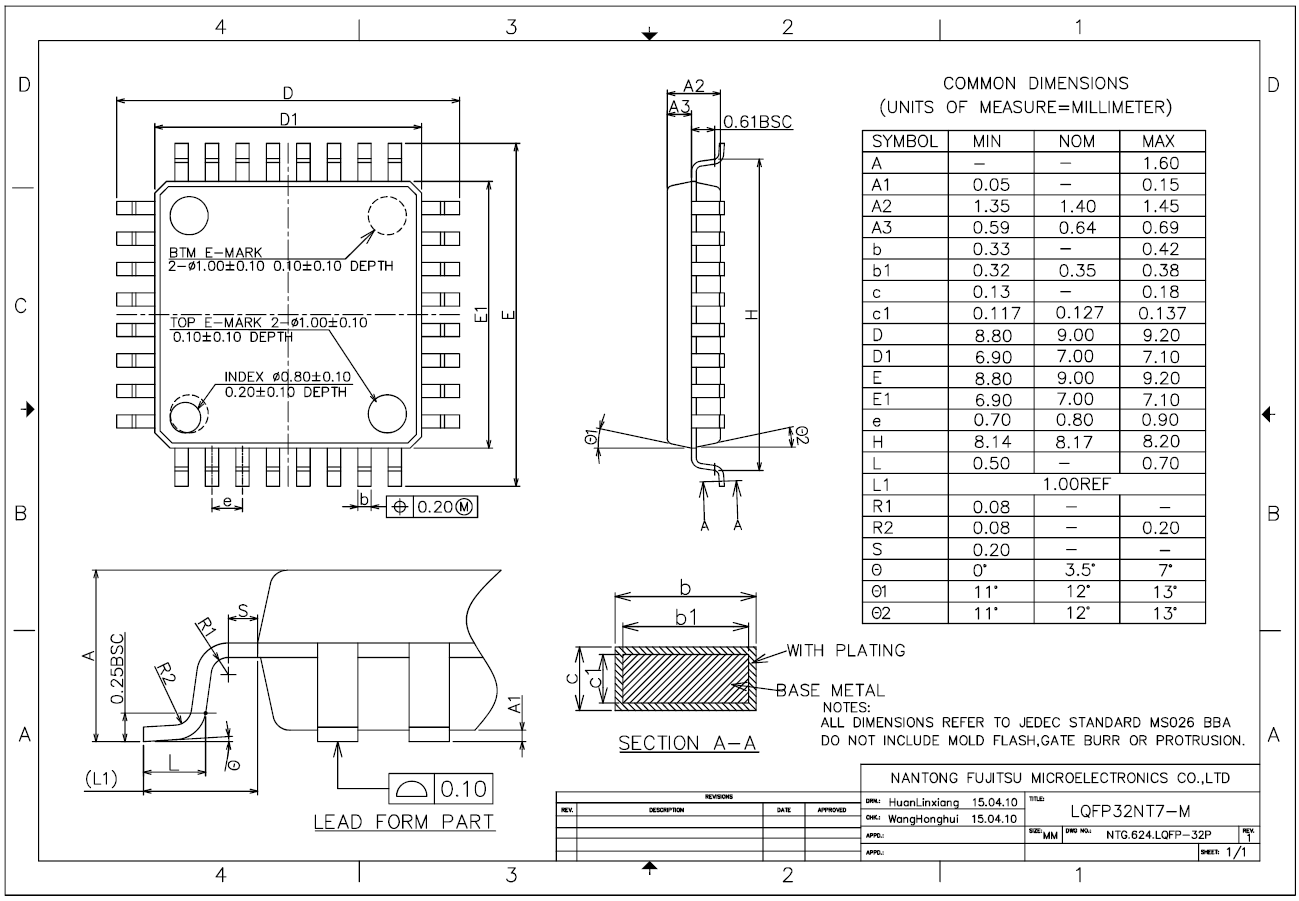
### 3.2.1 LQFP32 pinouts




### 3.2.2 LQFP32 package



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

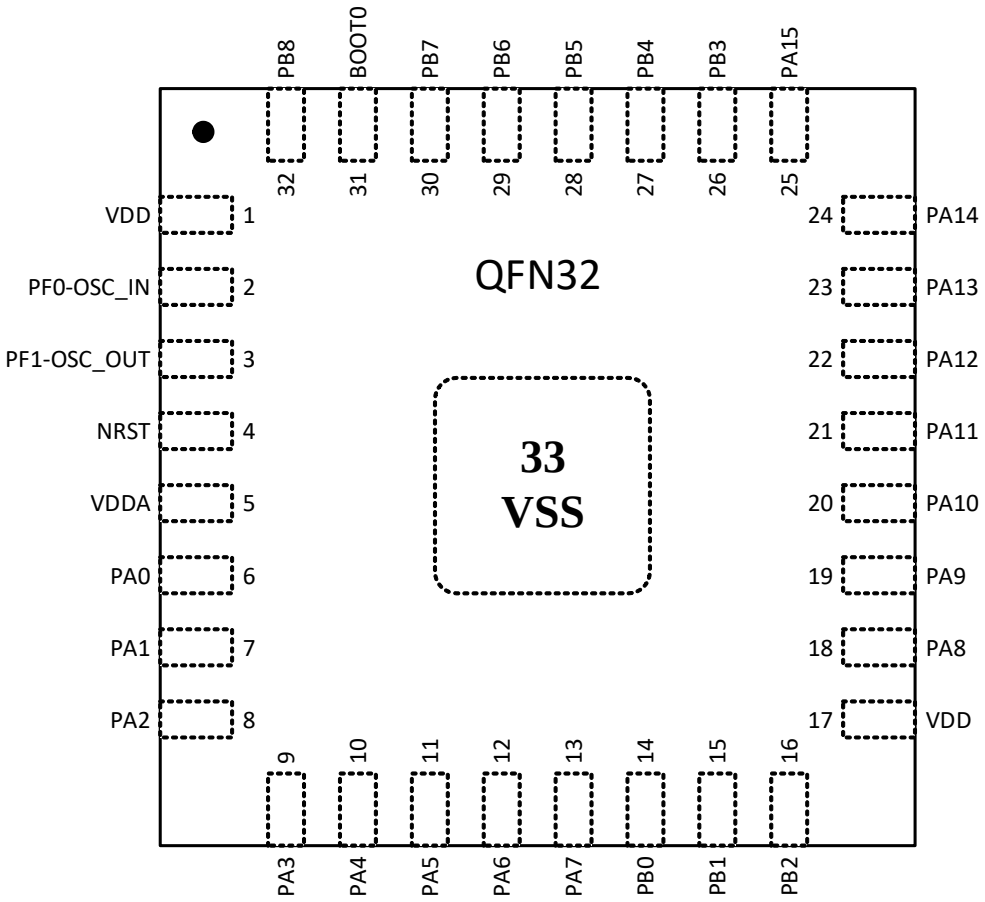





**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

## 3.3 QFN32

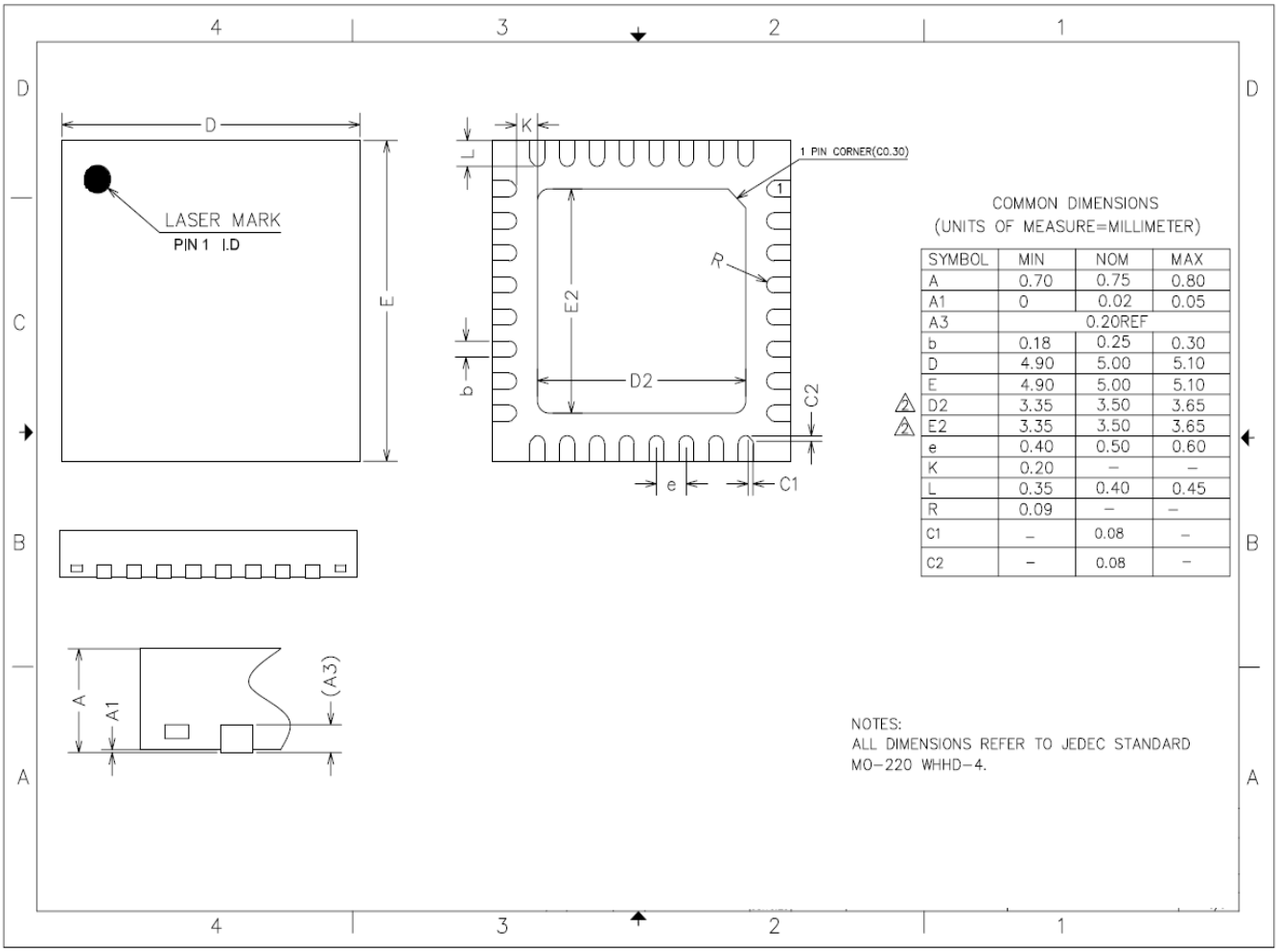
### 3.3.1 QFN32 (5mmx5mm) pinouts






**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

## 3.3.2 QFN32 (5mmx5mm) package



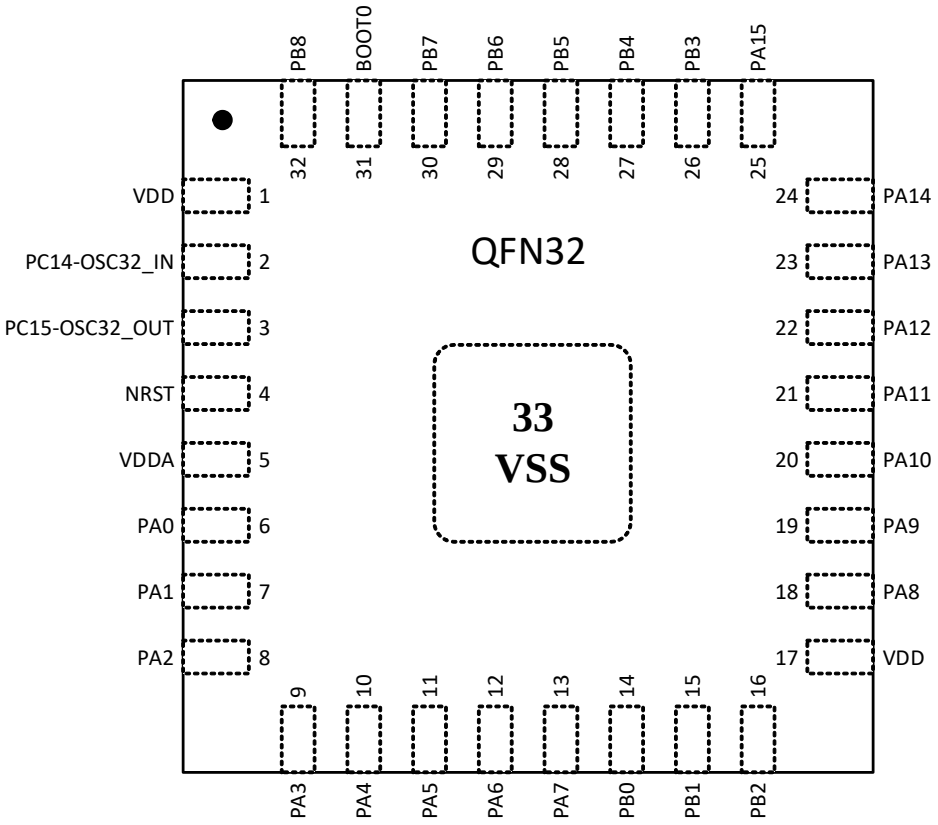

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0 | 0.02 | 0.05 |
| A3 | | 0.20REF | |
| b | 0.18 | 0.25 | 0.30 |
| D | 4.90 | 5.00 | 5.10 |
| E | 4.90 | 5.00 | 5.10 |
| D2 | 3.35 | 3.50 | 3.65 |
| E2 | 3.35 | 3.50 | 3.65 |
| e | 0.40 | 0.50 | 0.60 |
| K | 0.20 | – | – |
| L | 0.35 | 0.40 | 0.45 |
| R | 0.09 | – | – |
| C1 | – | 0.08 | – |
| C2 | – | 0.08 | – |



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

## 3.4 QFN32

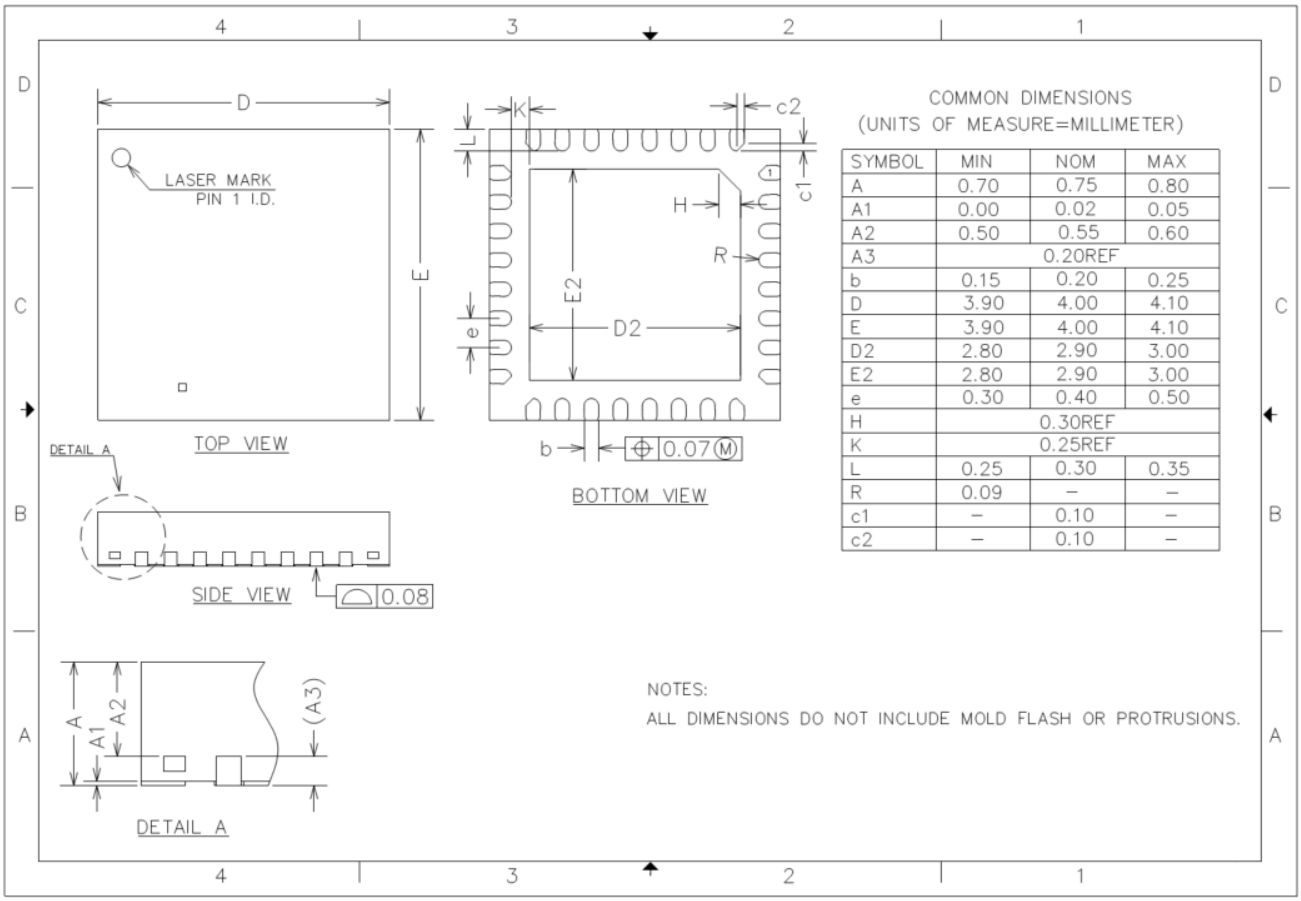
### 3.4.1 QFN32 (4mmx4mm) pinouts






**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

## 3.4.2 QFN32 (4mmx4mm) package




COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

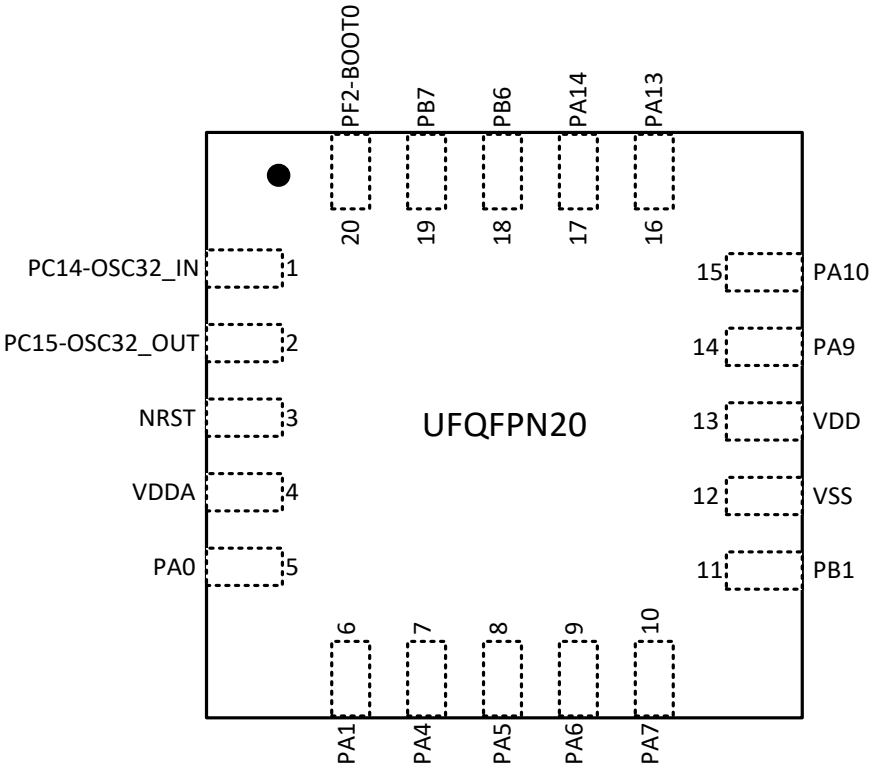
| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | 0.02 | 0.05 |
| A2 | 0.50 | 0.55 | 0.60 |
| A3 | | 0.20REF | |
| b | 0.15 | 0.20 | 0.25 |
| D | 3.90 | 4.00 | 4.10 |
| E | 3.90 | 4.00 | 4.10 |
| D2 | 2.80 | 2.90 | 3.00 |
| E2 | 2.80 | 2.90 | 3.00 |
| e | 0.30 | 0.40 | 0.50 |
| H | | 0.30REF | |
| K | | 0.25REF | |
| L | 0.25 | 0.30 | 0.35 |
| R | 0.09 | – | – |
| c1 | – | 0.10 | – |
| c2 | – | 0.10 | – |



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

## 3.5 UFQFPN20

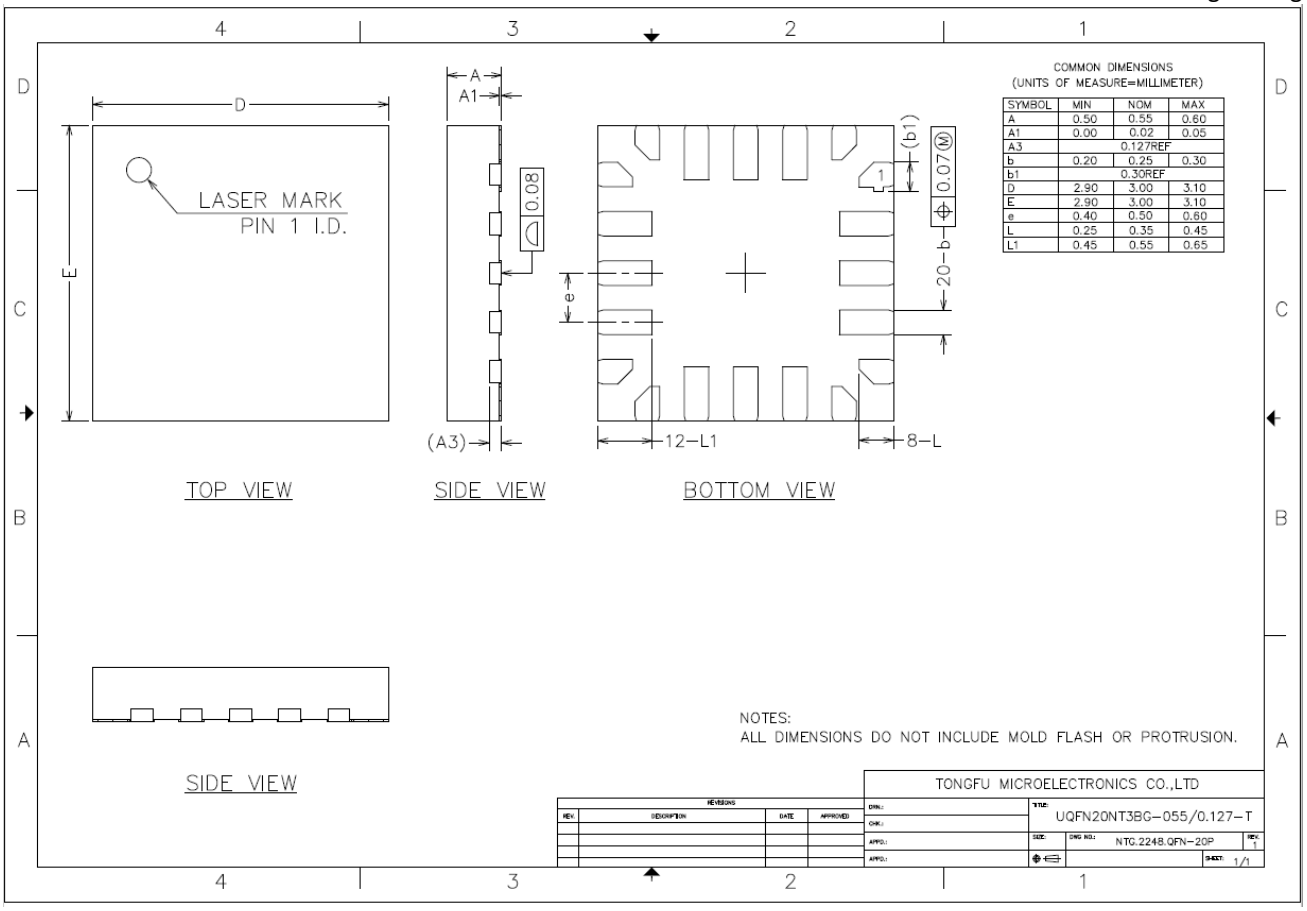
### 3.5.1 UFQFPN20 pinouts




### 3.5.2 UFQFPN20 package

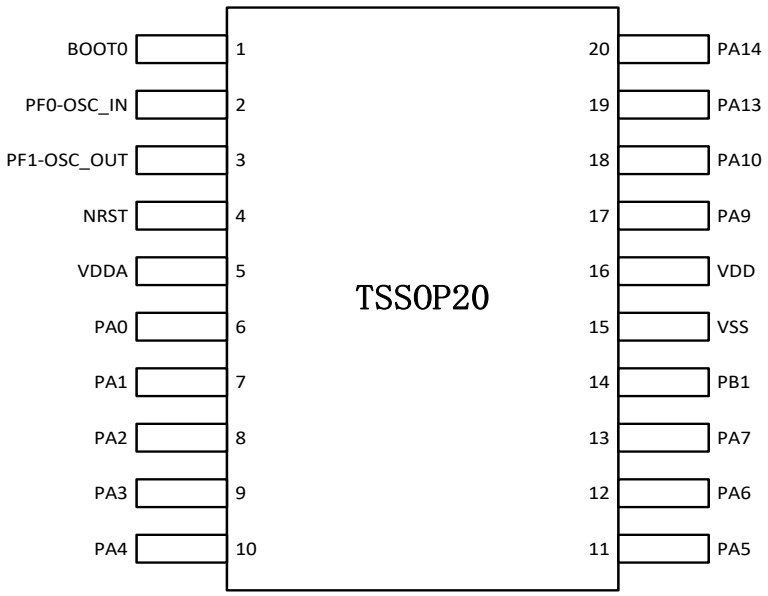


**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg




## 3.6 TSSOP20

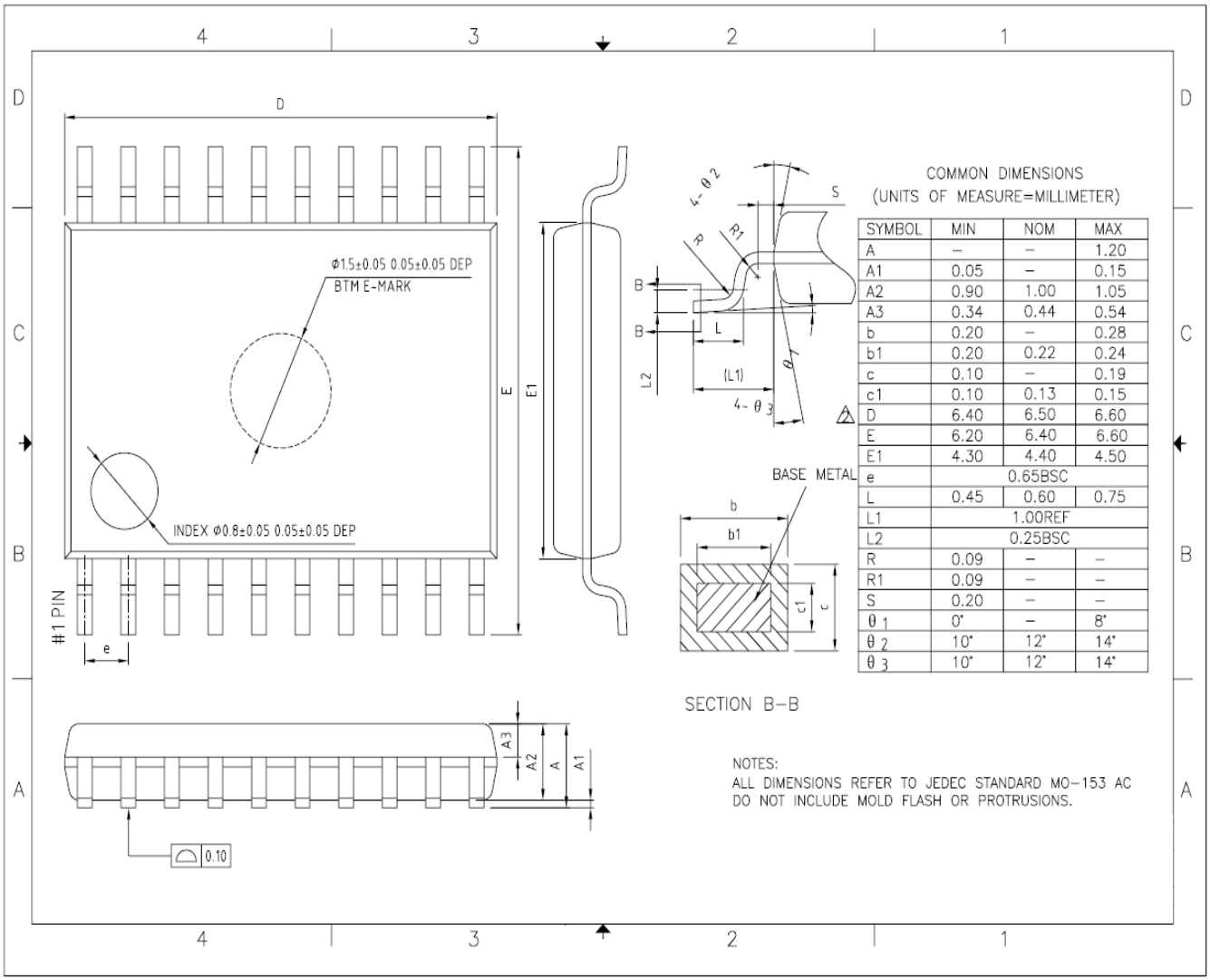
### 3.6.1 TSSOP20 pinouts






**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

## 3.6.2 TSSOP20 package




COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | – | – | 1.20 |
| A1 | 0.05 | – | 0.15 |
| A2 | 0.90 | 1.00 | 1.05 |
| A3 | 0.34 | 0.44 | 0.54 |
| b | 0.20 | – | 0.28 |
| b1 | 0.20 | 0.22 | 0.24 |
| c | 0.10 | – | 0.19 |
| c1 | 0.10 | 0.13 | 0.15 |
| D | 6.40 | 6.50 | 6.60 |
| E | 6.20 | 6.40 | 6.60 |
| E1 | 4.30 | 4.40 | 4.50 |
| e | 0.65BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| L1 | 1.00REF | | |
| L2 | 0.25BSC | | |
| R | 0.09 | – | – |
| R1 | 0.09 | – | – |
| S | 0.20 | – | – |
| θ 1 | 0° | – | 8° |
| θ 2 | 10° | 12° | 14° |
| θ 3 | 10° | 12° | 14° |

NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD MO-153 AC
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

# 4 Revision History

| Version | Date | Note |
|---|---|---|
| V1.0.0 | 2021.9.15 | 1. Initial document |
| V1.0.1 | 2022.1.13 | 1. Modify the size of Retention SRAM to 8Kbyte |
| V1.1 | 2022.7. 5 | 1. Modify MCO to 2-way output in key feature<br>2. Delete TQFP48<br>3. Delete reel in part number information |
| V1.2 | 2022.9.13 | 1. Key feature, delete programmable low level detection and reset |
| V1.3.0 | 2023.7.31 | 1. Section 3.4.2. Modify package dimension of QFN32(4mmx4mm) in the package |
| V1.4.0 | 2024.7.24 | 1. Modify package dimension of LQFP48\LQFP32\UFQFPN20 in the package |



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg

# 5 Notice

This document is the exclusive property of NSING TECHNOLOGIES PTE. LTD. (Hereinafter referred to as NSING). This document, and the product of NSING described herein (Hereinafter referred to as the Product) are owned by NSING under the laws and treaties of Republic of Singapore and other applicable jurisdictions worldwide. The intellectual properties of the product belong to NSING Technologies Inc. and NSING Technologies Inc. does not grant any third party 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. NSING reserves the right to make changes, corrections. enhancements, modifications, and improvements to this document at any time without notice. Please contact NSING and obtain the latest version of this document before placing orders. Although NSING has attempted to provide accurate and reliable information, NSING 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 NSING 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. NSING 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 supporter sustain life. All Insecure Usage shall be made at user's risk. User shall indemnify NSING and hold NSING 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 NSING, anyone may not use, duplicate, modify, transcribe or otherwise distribute this document for any purposes, in whole or in part.



**NSING Technologies Pte. Ltd.**
Address: 20 Science Park, #03-15/16
Teleteck Park, East Wing, Singapore 117674
Email: sales@nsing.com.sg