N32G401x6/x8 Product Brief

N32G401 series uses 32-bit ARM Cortex-M4F core, operating frequency up to 72MHz, supporting floating-point unit and DSP instructions. The devices integrate up to 64KB of encrypted flash, and 8KB of SRAM. The series features rich of high-performance interfaces, including 1 built-in 12bit 4.2Msps ADC, 3 high-speed comparators, multi-channel U(S)ART, I2C, SPI and other communication interfaces.

Key Features

- **CPU Core**
  - 32-bit ARM Cortex-M4F with FPU, supports DSP instructions
  - Built-in 1KB instruction Cache, supports Flash accelerator unit for zero-wait program execution
  - Maximum frequency of 72MHz, 90DMIPS
- **Memories**
  - Up to 64KByte of embedded Flash memory
    - Supporting encrypted memory function, partition management and data protection
    - 10,000 erase/write cycles and 10 years data retention
  - Up to 8KByte on-chip SRAM, retained in Stop2 mode, can be configured to retention in Standby mode
- **Low Power Management**
  - Sleep mode: The CPU is stopped; all peripherals are active and can wake up the CPU
  - Stop0 mode: PLL, HSI and HSE are disabled, LSE/LSI can keep running, RTC can keep running, SRAM and all register contents retained, all IOs retained.
  - Stop2 mode: PLL, HSI and HSE are disabled, LSE/LSI can keep running, RTC can keep running, SRAM and all register contents retained, all IOs retained, CPU register and backup register contents retained.
  - Standby mode: Internal voltage regulator is turned off, PLL, HSI and HSE are disabled, LSE/LSI can keep running, RTC and IWDG can keep running, SRAM can be configured to retention, all IOs retained.
- **High-performance Analog Interfaces**
  - 1x 12bit ADC with 4.2Msps
    - Configurable as 12/10/8/6 bits mode
    - Up to 16 external single-ended input channels, 3 internal single-ended input channels
    - Support differential mode
  - 3x COMPs with internal 64-level adjustable comparison reference
- **Clock**
  - HSE: 4MHz~32MHz high-speed external crystal oscillator
  - LSE: 32.768KHz low-speed external crystal oscillator
  - HSI: High-speed internal RC 8MHz
  - LSI: Low speed internal RC 40KHz
  - Built-in high-speed PLL

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road, Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

- MCO: Support 2-channals clock output, configurable as SYSCLK, HSI, HSE, LSI, LSE, and PLL divisional output

- **Reset**
  - Supports power-on/power-down/external pin reset.
  - Supports watchdog reset, software reset.
  - Supports programmable voltage detection.
- **GPIO**
  - Up to 39+1 GPIOs
- **Communication Interfaces**
  - 4x U(S)ART interfaces
    - 2x USART interfaces (support ISO7816, IrDA, LIN)
    - 2x UART interfaces
  - 2x SPI interfaces
    - Speed up to 28Mbps (without CRC) and 20Mbps (with CRC) in master mode.
    - Speed up to 32Mbps in slave mode.
    - Supports I2S
  - 2x I2C interfaces (Master/Slave) with speed up to 1 MHz, support dual address responses in slave mode
- **DMA controller**
  - 1 x high-speed DMA controller supports 8 channels, with arbitrarily configurable channel sources and destination addresses
- **RTC real-time clock**
  - Supports leap year calendar, alarm event, periodic wake up
  - Supports internal and external clock calibration
- **Beeper**
  - Supports complementary output, 12mA output driving capability
- **Timer**
  - 2x 16-bit advanced timers with maximum control precision of 7.8ns
    - Supports input capture, complementary output, quadrature encoder input, etc.
    - Each timer has four independent channels, of which Timer1 supports 8 channels complementary PWM output, Timer8 supports 6 channels complementary PWM output
  - 4x 16-bit general purpose timers
    - Each timer has 4 independent channels.
    - Supports input capture/output comparison /PWM output.
  - 1x 16-bit basic timer
  - 1x 16-bit low power timer

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road, Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

  - Supports single pulse and double pulse counting function.
  - Supports operating in STOP2 mode.
- 1x 24-bit SysTick timer
- 1x 14-bit Window Watchdog (WWDG)
- 1x 12-bit Independent Watchdog (IWDG)

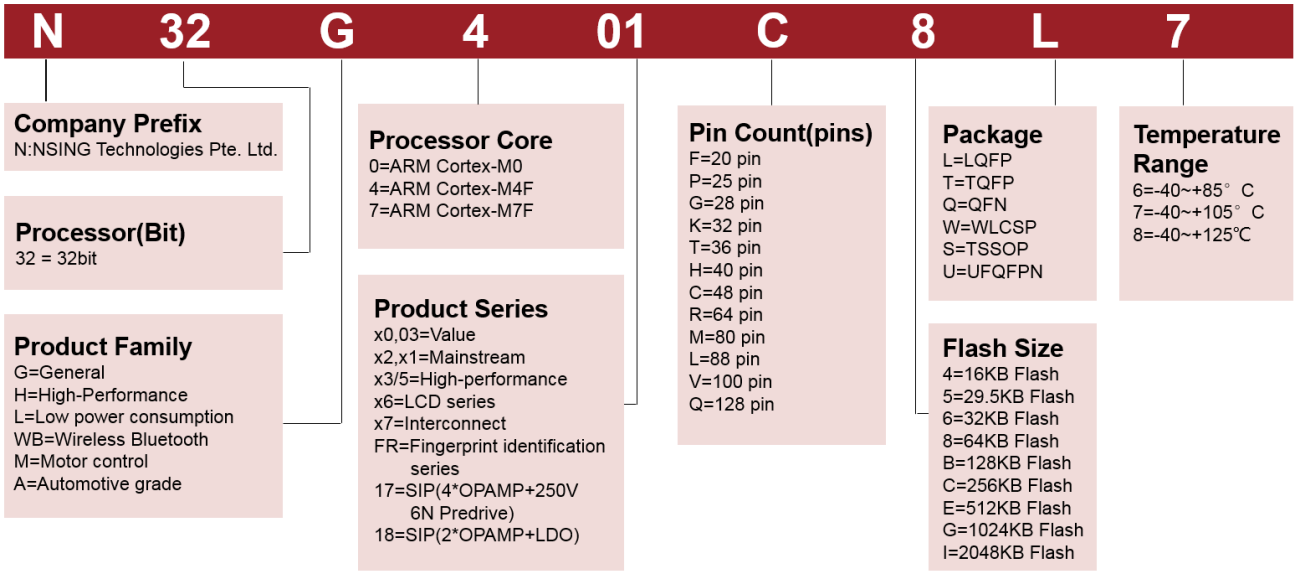
- **Programming Methods**
  - Supports SWD/JTAG debugging interface.
  - Supports UART Bootloader
- **Security Features**
  - Flash storage encryption, Multi-user partition Management Unit (MMU)
  - CRC16/32 computation
  - Supports write protection (WRP), multiple level (L0/L1/L2) of read protection (RDP)
  - Supports secure boot, encrypted program download, secure firmware updates.
  - Supports external clock failure detection, anti-tamper detection.
- **96-bit UID and 128-bit UCID**
- **Operating Conditions**
  - Operating voltage range: 2.4V~3.6V
  - Operating temperature range: -40℃ ~ 105℃
  - ESD: ±4KV (HBM model), ±2KV (CDM model)
- **Packages**
  - LQFP32(7mm x 7mm)
  - LQFP48(7mm x 7mm)
  - QFN20(3mm x 3mm)
  - QFN28(4mm x 4mm)
  - QFN32(4mm x 4mm)
  - QFN48(6mm x 6mm)
  - TSSOP20(6.5mm x 4.4mm)
- **Ordering Information**

Reference	Part Number
N32G401x6	N32G401C6L7, N32G401K6L7 N32G401C6Q7, N32G401K6Q7, N32G401G6Q7, N32G401F6Q7, N32G401F6S7-1
N32G401x8	N32G401C8L7, N32G401K8L7 N32G401C8Q7, N32G401K8Q7, N32G401G8Q7, N32G401F8Q7, N32G401F8S7-1

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

1 Naming Convention

Figure 1-1 N32G401 Series Part Naming Conversion



NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

2 Product Configurations

Table 2-1 N32G401 Series Resource Configuration (1)

Device		N32G401F6S7-1	N32G401F8S7-1	N32G401F6Q7	N32G401F8Q7	N32G401G6Q7	N32G401G8Q7
Flash capacity (KB)		32	64	32	64	32	64
SRAM capacity (KB)		8	8	8	8	8	8
CPU frequency		ARM Cortex-M4F @72MHz，90DMIPS					
Operating Conditions		2.4~3.6V/-40~105℃					
Timers	General	4					
	Advanced	2(1)					
	Basic	1					
	LPTIM	1					
Communication Interfaces	SPI	2					
	I2S	2					
	I2C	2					
	UART	1				2	
	USART	2					
BEEPER		1					
GPIO		15+1				23+1	
DMA Number of Channels		1 8 Channel					
12bit ADC Number of Channels		1 9Channel		1 7Channel		1 10Channel	
COMP		0		3			
Security Protection		Read and Write Protection (RDP/WRP), Memory Encryption, Partition Protection, Secure Boot					
Package		TSSOP20		QFN20		QFN28	

Note: (1) Timer1 supports 4 channels and 8 complementary output, Timer8 supports 3 channels and 6 complementary output.

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

Table 2-2 N32G401 Series Resource Configuration (2)

Device		N32G401K6L7 N32G401K6Q7	N32G401K8L7 N32G401K8Q7	N32G401C6L7 N32G401C6Q7	N32G401C8L7 N32G401C8Q7
Flash capacity (KB)		32	64	32	64
SRAM capacity (KB)		8	8	8	8
CPU frequency		ARM Cortex-M4F @72MHz，90DMIPS			
Operating Conditions		2.4~3.6V/-40~105℃			
Timers	General	4			
	Advanced	2(1)			
	Basic	1			
	LPTIM	1			
Communication Interfaces	SPI	2			
	I2S	2			
	I2C	2			
	UART	2			
	USART	2			
BEEPER		1			
GPIO		25+1		39+1	
DMA Number of Channels		1 8 Channel			
12bit ADC Number of Channels		1 10Channel		1 16Channel	
COMP		3			
Security Protection		Read and Write Protection (RDP/WRP), Memory Encryption, Partition Protection, Secure Boot			
Package		LQFP32 QFN32		LQFP48 QFN48	

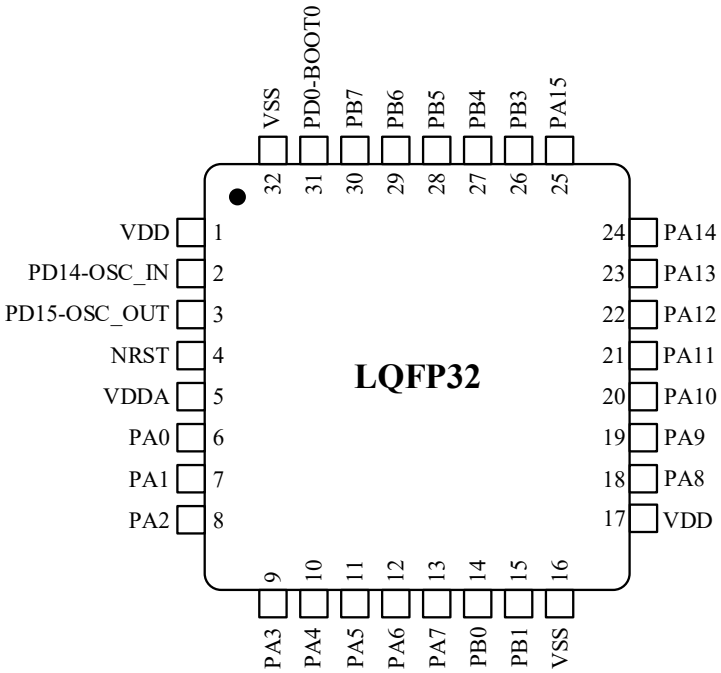
Note: (1) Timer1 supports 4 channels and 8 complementary output, Timer8 supports 3 channels and 6 complementary output

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3 Packages

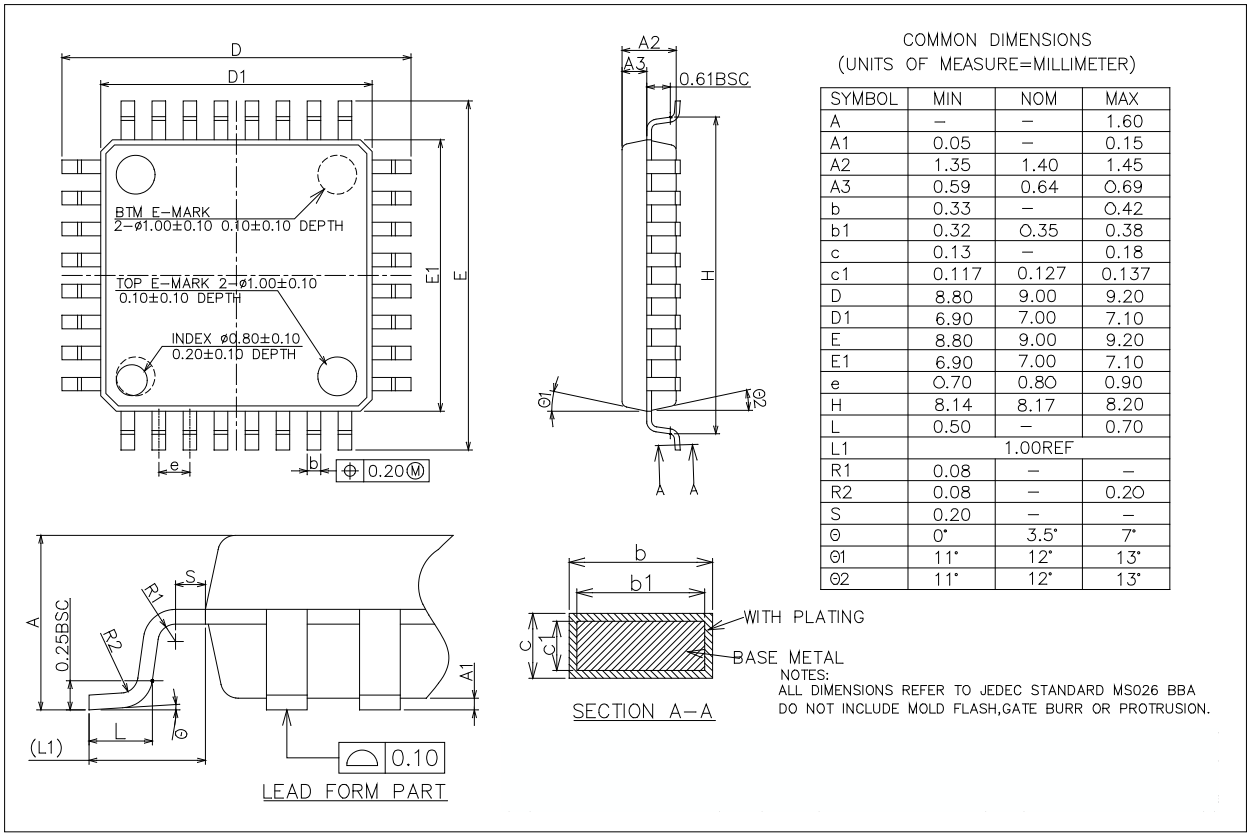
3.1 LQFP32(7mm x 7mm) Package

3.1.1 LQFP32 Pin Assignment



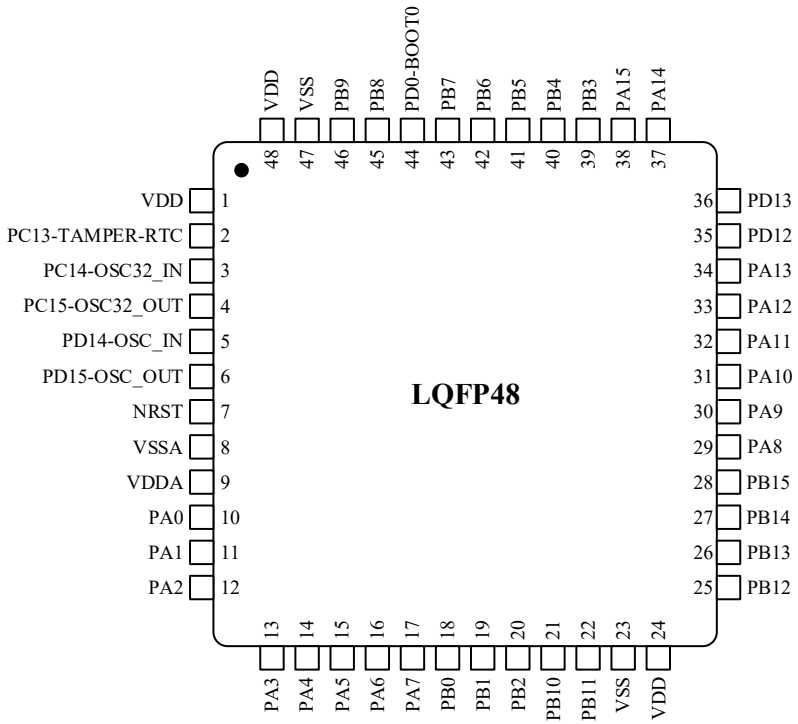
NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3.1.2 LQFP32 Package Dimensions



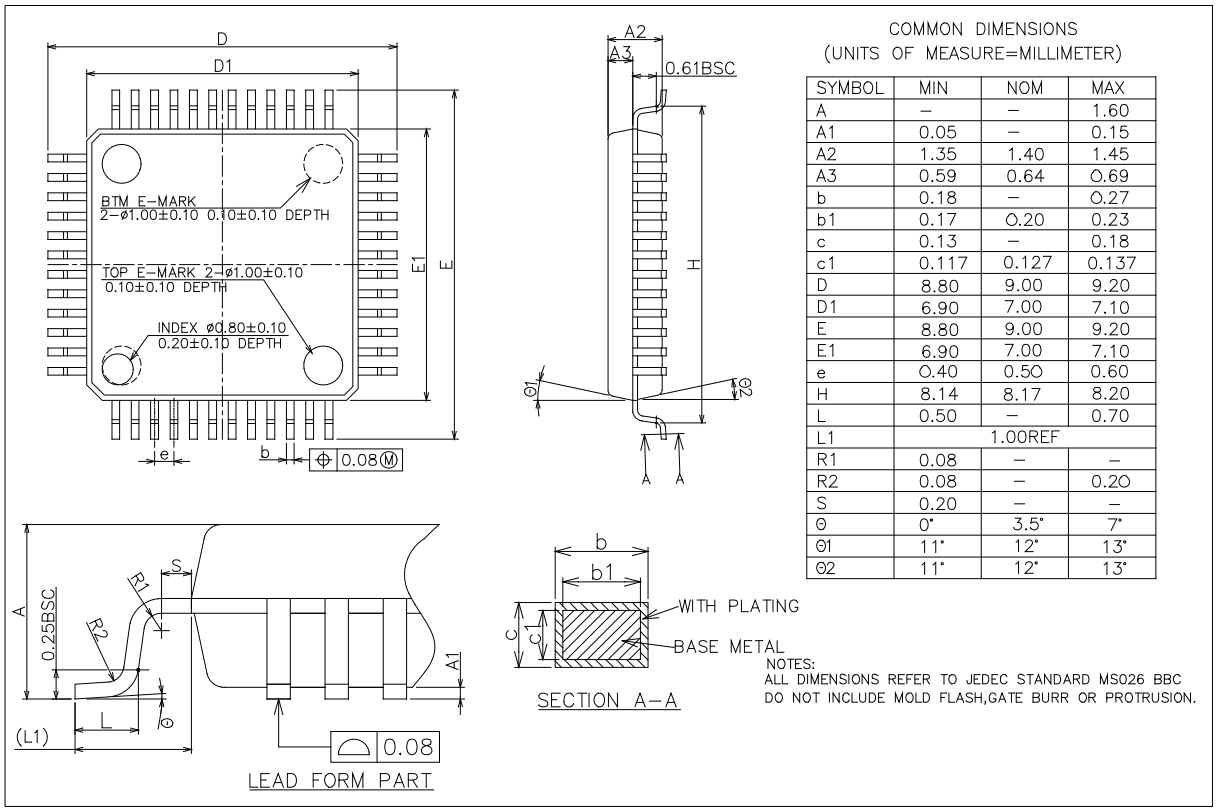
3.2 LQFP48(7mm x 7mm) Package

3.2.1 LQFP48 Pin Assignment



NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3.2.2 LQFP48 Package Dimensions



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

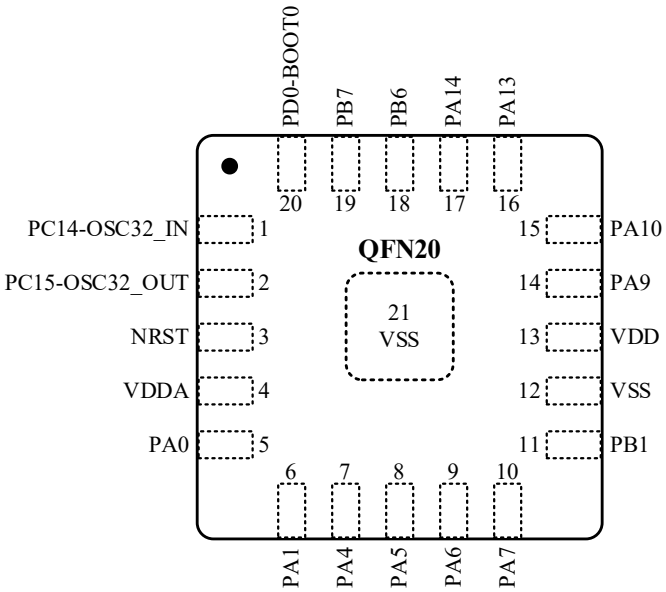
SYMBOL	MIN	NOM	MAX
A	–	–	1.60
A1	0.05	–	0.15
A2	1.35	1.40	1.45
A3	0.59	0.64	0.69
b	0.18	–	0.27
b1	0.17	0.20	0.23
c	0.13	–	0.18
c1	0.117	0.127	0.137
D	8.80	9.00	9.20
D1	6.90	7.00	7.10
E	8.80	9.00	9.20
E1	6.90	7.00	7.10
e	0.40	0.50	0.60
H	8.14	8.17	8.20
L	0.50	–	0.70
L1		1.00REF	
R1	0.08	–	–
R2	0.08	–	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.

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

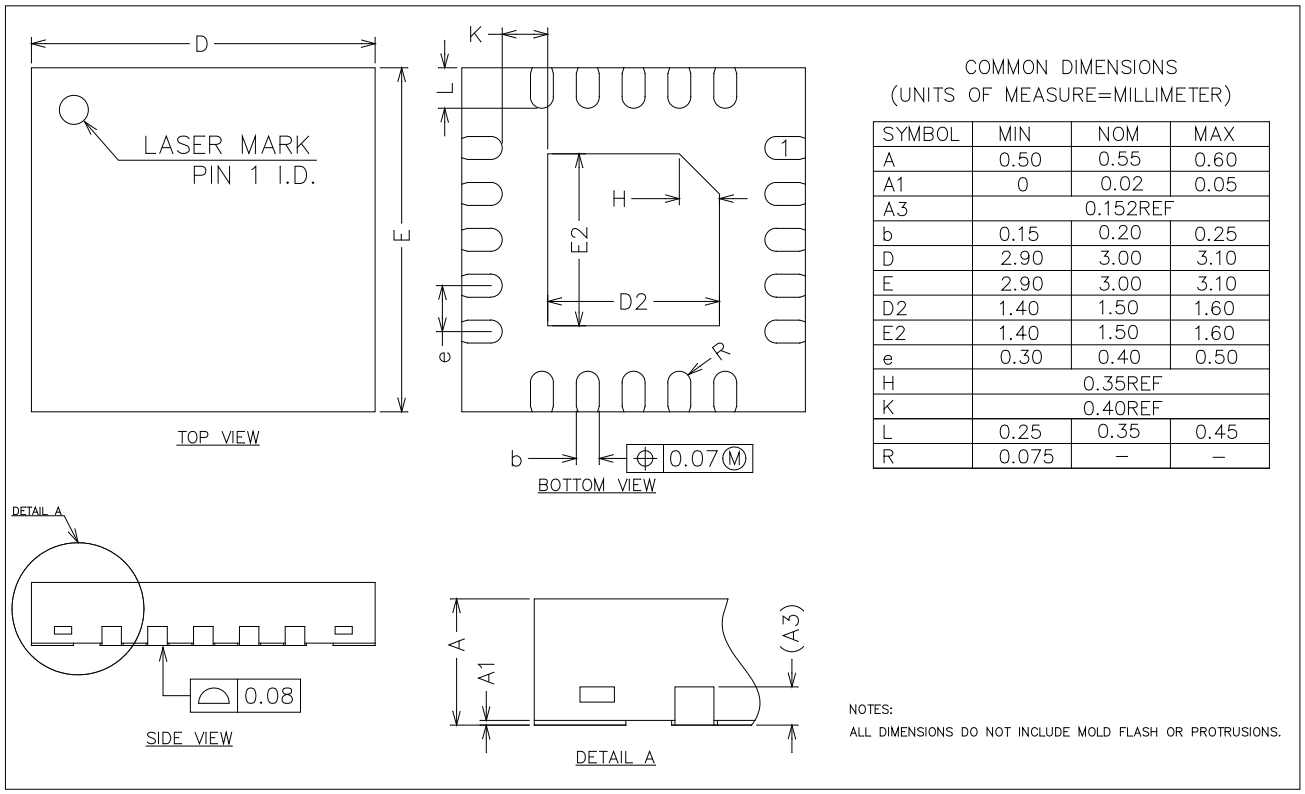
3.3 QFN20(3mm x 3mm) Package

3.3.1 QFN20 Pin Assignment



NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3.3.2 QFN20 Package Dimensions

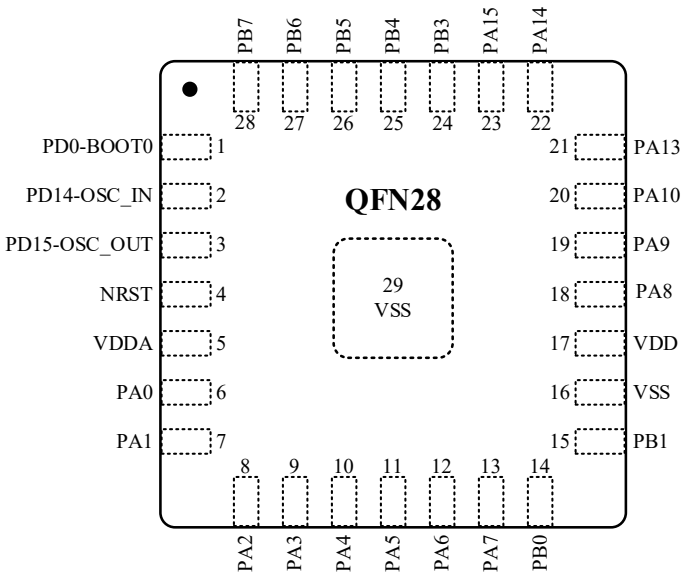


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0	0.02	0.05
A3		0.152REF	
b	0.15	0.20	0.25
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D2	1.40	1.50	1.60
E2	1.40	1.50	1.60
e	0.30	0.40	0.50
H		0.35REF	
K		0.40REF	
L	0.25	0.35	0.45
R	0.075	–	–

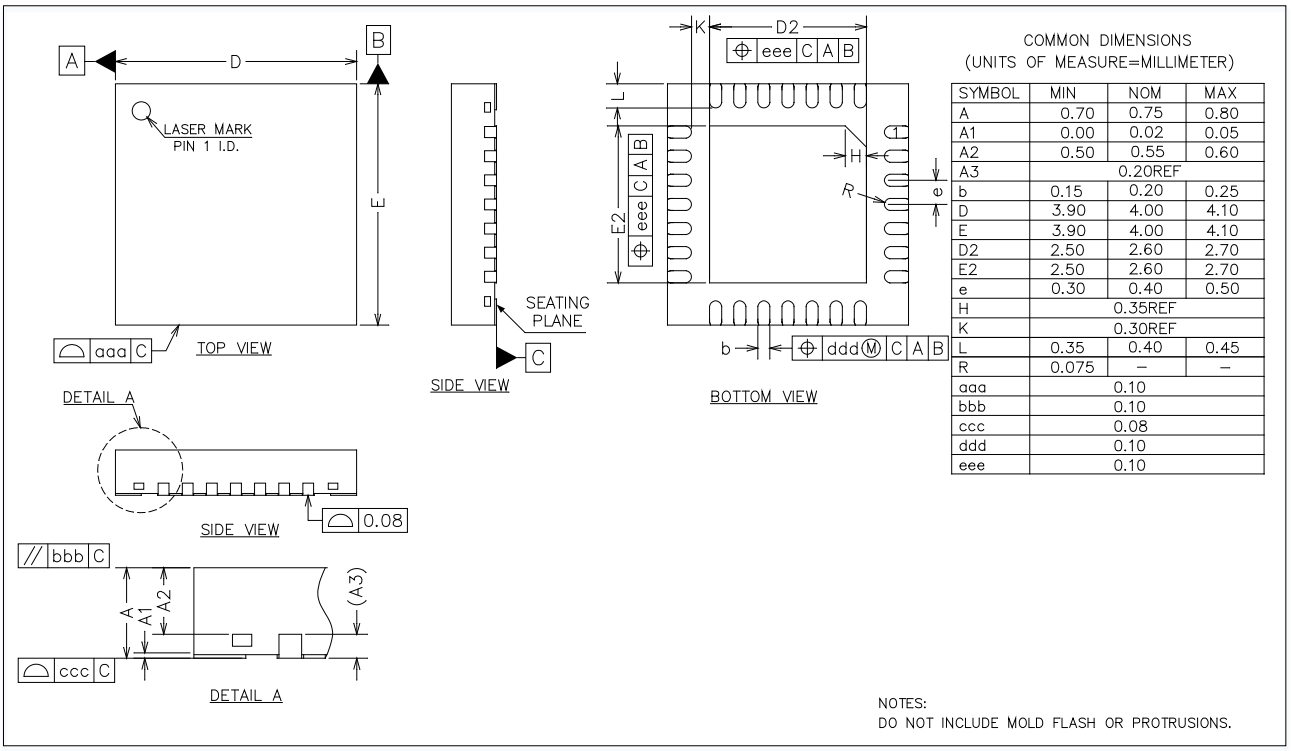
3.4 QFN28(4mm x 4mm) Package

3.4.1 QFN28 Pin Assignment



NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3.4.2 QFN28 Package Dimensions

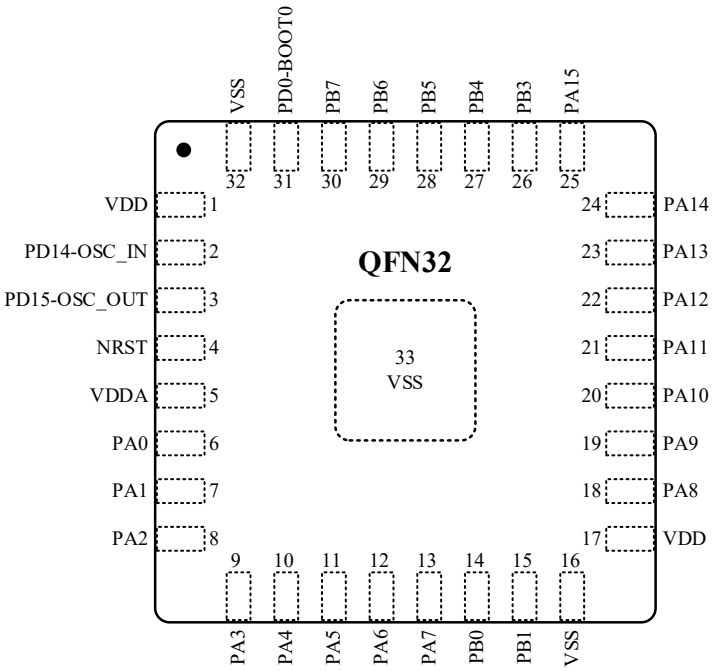


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

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	2.50	2.60	2.70
E2	2.50	2.60	2.70
e	0.30	0.40	0.50
H		0.35REF	
K		0.30REF	
L	0.35	0.40	0.45
R	0.075	–	–
aaa		0.10	
bbb		0.10	
ccc		0.08	
ddd		0.10	
eee		0.10	

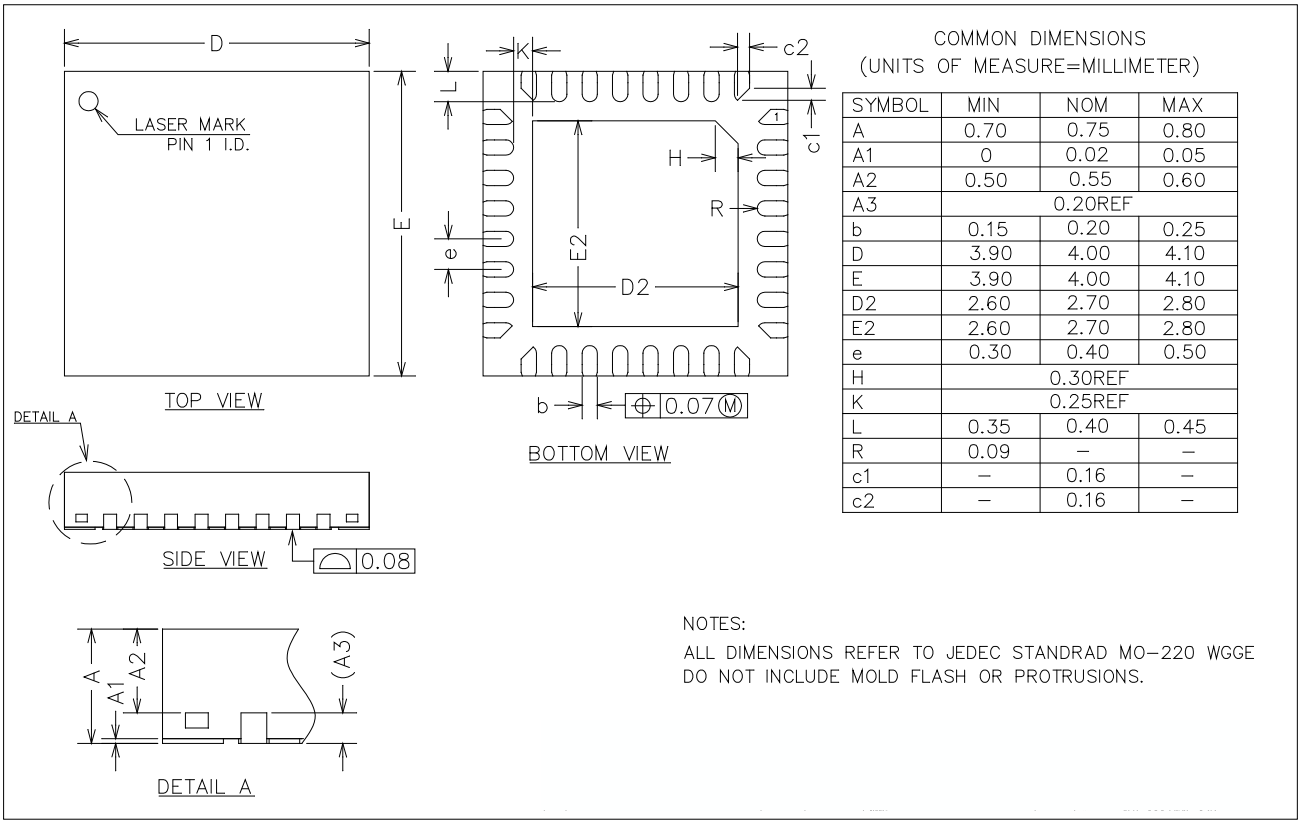
3.5 QFN32(4mm x 4mm) Package

3.5.1 QFN32 Pin Assignment



NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3.5.2 QFN32 Package Dimensions



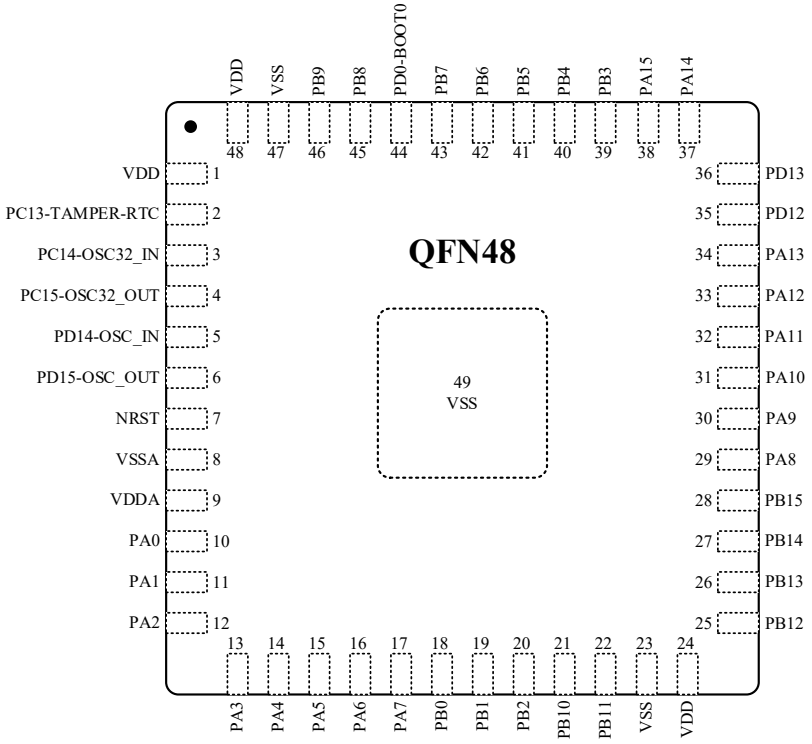
COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	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	2.60	2.70	2.80
E2	2.60	2.70	2.80
e	0.30	0.40	0.50
H		0.30REF	
K		0.25REF	
L	0.35	0.40	0.45
R	0.09	–	–
c1	–	0.16	–
c2	–	0.16	–

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

3.6 QFN48(6mm x 6mm) Package

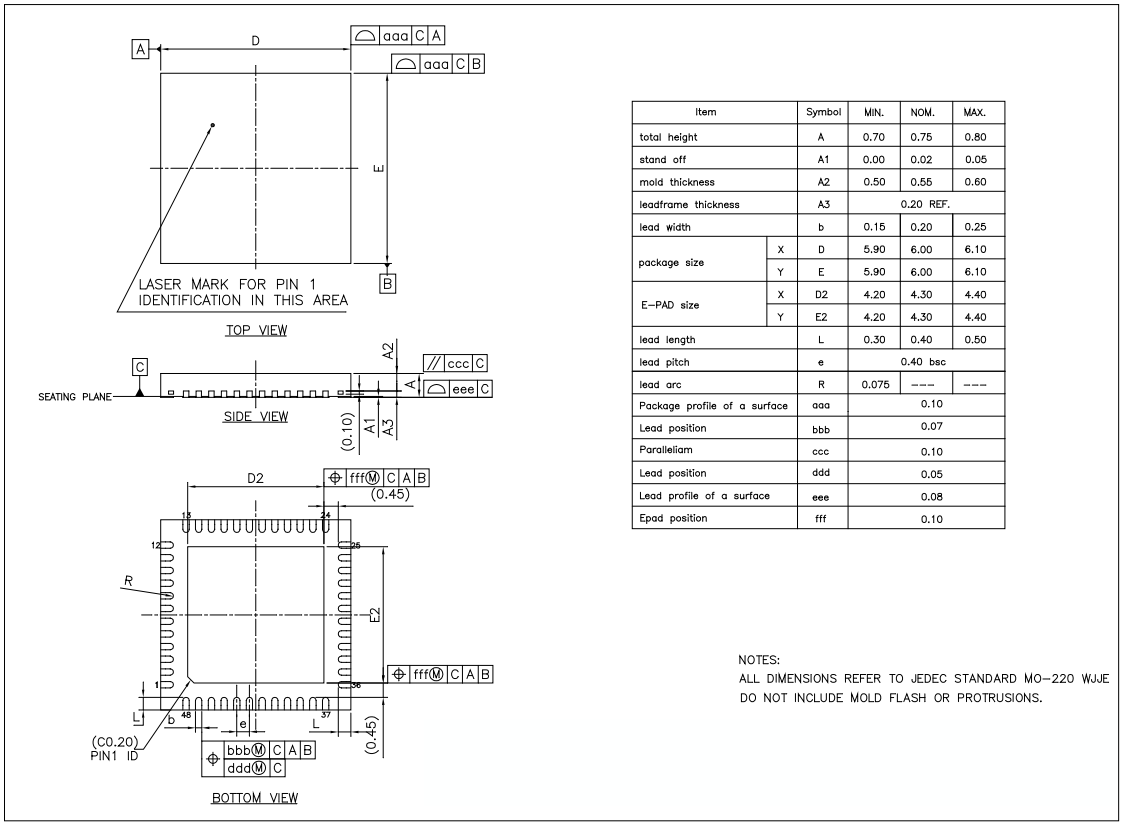
3.6.1 QFN48 Pin Assignment



NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3.6.2 QFN48 Package Dimensions

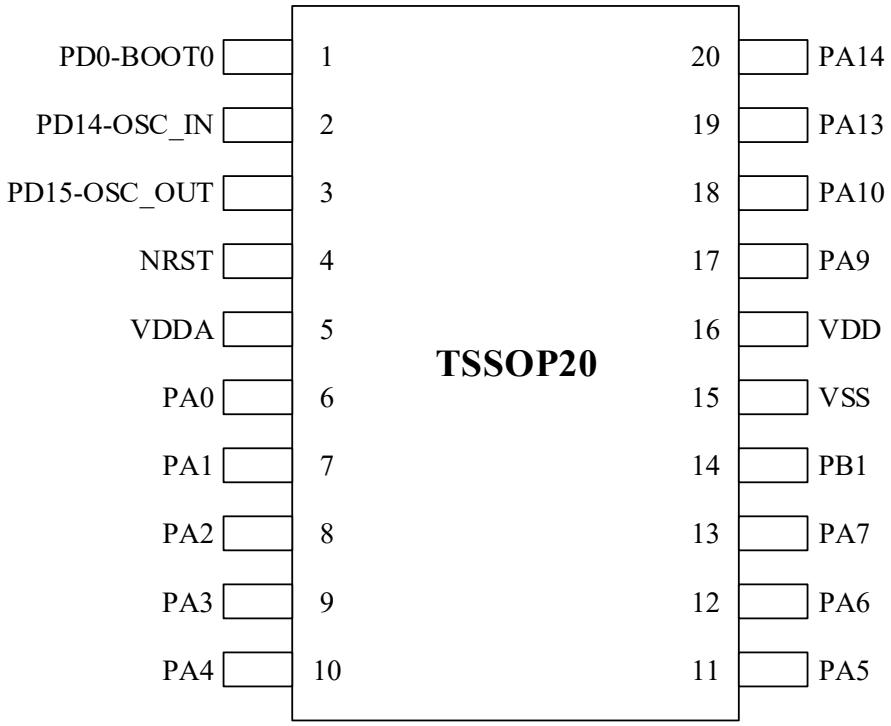


Item		Symbol	MIN.	NOM.	MAX.
total height		A	0.70	0.75	0.80
stand off		A1	0.00	0.02	0.05
mold thickness		A2	0.50	0.55	0.60
leadframe thickness		A3		0.20 REF.	
lead width		b	0.15	0.20	0.25
package size	X	D	5.90	6.00	6.10
	Y	E	5.90	6.00	6.10
E-PAD size	X	D2	4.20	4.30	4.40
	Y	E2	4.20	4.30	4.40
lead length		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	
Parallelism		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.

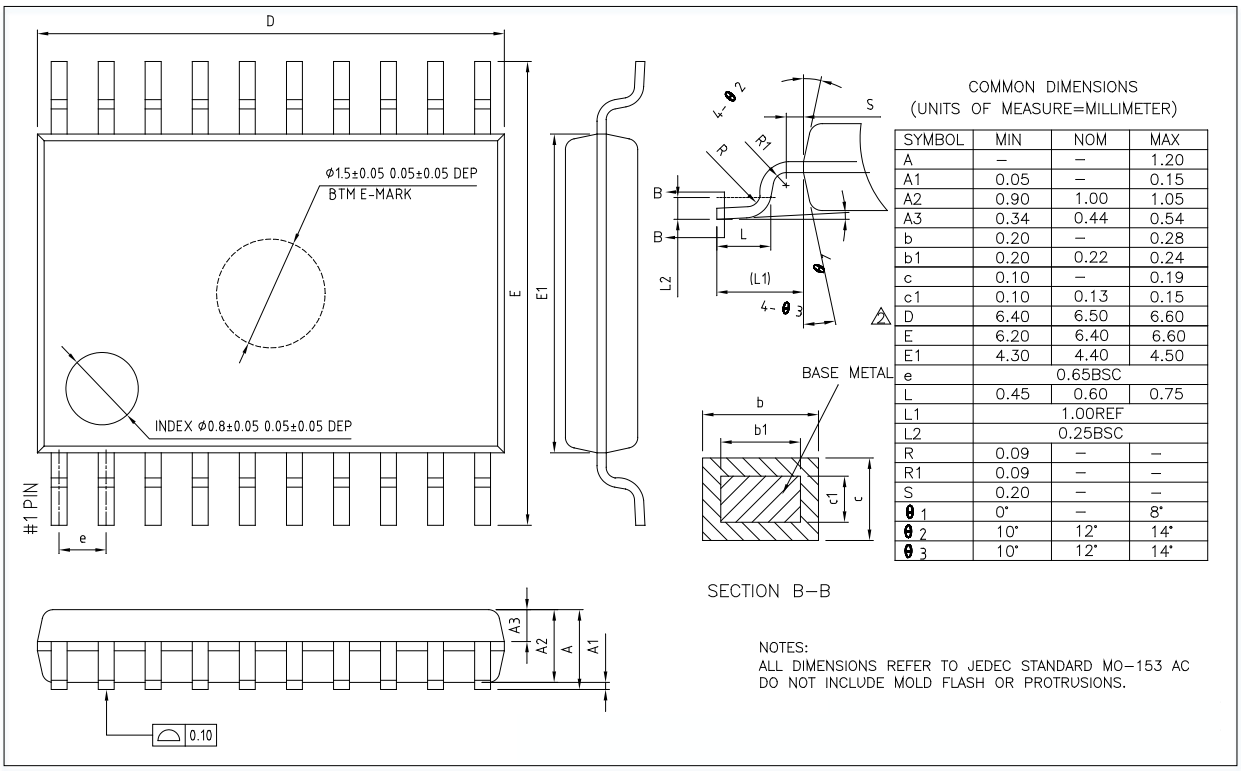
3.7 TSSOP20(6.5mm x 4.4mm) Package

3.7.1 TSSOP20 Pin Assignment



NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

3.7.2 TSSOP20 Package Dimensions



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	–	–
θ1	0°	–	8°
θ2	10°	12°	14°
θ3	10°	12°	14°

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

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

4 Version History

Version	Date	Changes
V1.0.0	2023.06.06	Initial release

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg

5 Disclaimer

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 Nations Technologies Inc. and Nations 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 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 supporter 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.

NSING Technologies Pte. Ltd.
Add: NSING, Teletech Park #02-28, 20 Science Park Road,
Singapore 117674
Tel: +65 69268090
Email: sales@nsing.com.sg