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## What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

## Applications of "Embedded - Microcontrollers"

| Details | |
|---|---|
| Product Status | Active |
| Core Processor | ARM® Cortex®-M0 |
| Core Size | 32-Bit Single-Core |
| Speed | 42MHz |
| Connectivity | I²C, SPI, UART/USART |
| Peripherals | Brown-out Detect/Reset, DMA, I²S, LCD, POR, PWM, WDT |
| Number of I/O | 51 |
| Program Memory Size | 128KB (128K x 8) |
| Program Memory Type | FLASH |
| EEPROM Size | - |
| RAM Size | 16K x 8 |
| Voltage - Supply (Vcc/Vdd) | 1.8V ~ 3.6V |
| Data Converters | A/D 7x12b; D/A 2x12b |
| Oscillator Type | Internal |
| Operating Temperature | -40°C ~ 85°C (TA) |
| Mounting Type | Surface Mount |
| Package / Case | 64-LQFP |
| Supplier Device Package | - |
| Purchase URL | https://www.e-xfl.com/product-detail/nuvoton-technology-corporation-america/nano110se3bn |

Power-down mode with RAM retention and fast wake-up via many peripheral interfaces.

The Nano120 USB Connectivity line, an ultra-low power 32-bit microcontroller with the embedded ARM® Cortex™-M0 core, operates at wide voltage range from 1.8V to 3.6V and runs up to 42 MHz frequency with 32K/64K/128K bytes embedded flash and 8K/16K bytes embedded SRAM. It integrates USB 2.0 full-speed device function, RTC, 12-channels12-bit SAR ADC, 2-channels 12-bit DAC and provides high performance connectivity peripheral interfaces such as 2xUART, 3xSPI, 2xI2C, I2S, GPIOs, EBI (External Bus Interface) for external memory-mapped device access and 3xISO-7816-3 for Smart card. The Nano120 USB Connectivity line supports Brown-out Detector, Power-down mode with RAM retention and fast wake-up via many peripheral interfaces.

The Nano130 Advanced line, an ultra-low power 32-bit microcontroller with the embedded ARM® Cortex™-M0 core, operates at wide voltage range from 1.8V to 3.6V and runs up to 42 MHz frequency with 32K/64K/128K bytes embedded flash and 8K/16K bytes embedded SRAM. It integrated LCD 4x40 or 6x38 (COM/Segment), USB 2.0 full-speed device function, RTC, 8-channels 12-bit SAR ADC, 2-channels 12-bit DAC and provides high performance connectivity peripheral interfaces such as 2xUART, 2xSPI, 2x$I^2C$, $I^2S$, GPIOs, EBI (External Bus Interface) for external memory-mapped device access and 3xISO-7816-3 for Smart card. The Nano130 Advanced line supports Brown-out Detector, Power-down mode with RAM retention and fast wake-up via many peripheral interfaces.

| Product Line | UART | SPI | $I^2C$ | $I^2S$ | USB | LCD | ADC | DAC | RTC | EBI | SC | Timer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nano100 | ● | ● | ● | ● | | | ● | ● | ● | ● | ● | ● |
| Nano110 | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● | ● |
| Nano120 | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| Nano130 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

Table 1-1 Connectivity Support Table

- Supports word/half-word/byte transfer data width from/to peripheral
- Supports address direction: increment, fixed, and wrap around

- CRC
  - Supports four common polynomials CRC-CCITT, CRC-8, CRC-16, and CRC-32
    - CRC-CCITT: $X^{16} + X^{12} + X^5 + 1$
    - CRC-8: $X^8 + X^2 + X + 1$
    - CRC-16: $X^{16} + X^{15} + X^2 + 1$
    - CRC-32: $X^{32} + X^{26} + X^{23} + X^{22} + X^{16} + X^{12} + X^{11} + X^{10} + X^8 + X^7 + X^5 + X^4 + X^2 + X + 1$

- Clock Control
  - Flexible selection for different applications
  - Built-in 12 MHz OSC, can be trimmed to 0.25% deviation within all temperature range when turning on auto-trim function (system must have external 32.768 kHz crystal input) otherwise 12 MHz OSC has 2 % deviation within all temperarure range.
  - Low power 10 kHz OSC for watchdog and low power system operation
  - Supports one PLL, up to 120 MHz, for high performance system operation and USB application (48 MHz).
  - External 4~24 MHz crystal input for precise timing operation
  - External 32.768 kHz crystal input for RTC function and low power system operation
- GPIO
  - Three I/O modes:
    - Push-Pull output
    - Open-Drain output
    - Input only with high impendence
  - All inputs with Schmitt trigger
  - I/O pin configured as interrupt source with edge/level setting
  - Supports High Driver and High Sink I/O mode
  - Supports input 5V tolerance, except PA.0 ~ PA.7, PD.0 ~ PD.1 and PC.6 ~ PC.7
- Timer
  - Supports 4 sets of 32-bit timers, each with 24-bit up-counting timer and one 8-bit pre-scale counter
  - Independent Clock Source for each timer
  - Provides one-shot,periodic, output toggle and continuous operation modes
  - Internal trigger event to ADC, DAC and PDMA
  - Supports PDMA mode
  - Wake system up from Power-down mode

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  - CRC-CCITT: $X^{16} + X^{12} + X^5 + 1$
  - CRC-8: $X^8 + X^2 + X + 1$
  - CRC-16: $X^{16} + X^{15} + X^2 + 1$
  - CRC-32: $X^{32} + X^{26} + X^{23} + X^{22} + X^{16} + X^{12} + X^{11} + X^{10} + X^8 + X^7 + X^5 + X^4 + X^2 + X + 1$

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  - Independent Clock Source for each timer
  - Provides one-shot,periodic, output toggle and continuous operation modes
  - Internal trigger event to ADC, DAC and PDMA module
  - Supports PDMA mode
  - Wake system up from Power-down mode
- Watchdog Timer
  - Clock Source from LIRC (Internal 10 kHz Low Speed Oscillator Clock)

- ADC
  - 12-bit SAR ADC up to 2Msps conversion rate
  - Up to 12-ch single-ended input from external pin (PA.0 ~ PA.7 and PD.0 ~ PD.3)
  - Six internal channels from DAC0, DAC1, internal reference voltage (Int_VREF), Temperature sensor, AVDD, and AVSS
  - Supports three reference voltage sources from VREF pin, internal reference voltage (Int_VREF), and AVDD.
  - Single scan/single cycle scan/continuous scan
  - Each channel with individual result register
  - Only scan on enabled channels
  - Threshold voltage detection (comparator function)
  - Conversion start by software programming or external input
  - Supports PDMA mode
  - Supports up to four timer time-out events (TMR0, TMR1, TMR2, and TMR3) to enable ADC
- DAC
  - 12-bit monotonic output with 400K conversion rate
  - Supports three reference voltage sources from VREF pin, internal reference voltage (Int_VREF), and AVDD.
  - Synchronized update capability for two DACs (group function)
  - Supports up to four timer time-out events (TMR0, TMR1, TMR2 and TMR3), software or PDMA to trigger DAC to conversion
- SmartCard (SC)
  - Compliant to ISO-7816-3 T=0, T=1
  - Supports up to three ISO-7816-3 ports
  - Separates receive / transmit 4 bytes entry FIFO for data payloads
  - Programmable transmission clock frequency
  - Programmable receiver buffer trigger level
  - Programmable guard time selection (11 ETU ~ 266 ETU)
  - A 24-bit and two 8-bit time-out counter for Answer to Reset (ATR) and waiting times processing
  - Supports auto inverse convention function
  - Supports stop clock level and clock stop (clock keep) function
  - Supports transmitter and receiver error retry and error limit function
  - Supports hardware activation sequence process
  - Supports hardware warm reset sequence process
  - Supports hardware deactivation sequence process
  - Supports hardware auto deactivation sequence when detect the card is removal

### 3.2.4 NuMicro™ Nano130 Advanced Line Selection Guide

| Part No. | Flash (Kbytes) | SRAM (Kbytes) | Data Flash | ISP ROM (Kbytes) | I/O | Timer (32-bit) | Connectivity | | | | I2S | PWM (16-bit | ADC (12-bit) | RTC | EBI | IRC 10KHz 12MHz | PDMA | LCD | DAC (12-bit) | ISO-7816-3 | ISP ICP | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | UART | SPI | I2C | USB | | | | | | | | | | | | |
| NANO130SC2BN | 32K | 8K | Configurable | 4K | up to 47 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 7 | 7 | V | - | V | 8 | 4x31, 6x29 | 2 | 3 | V | LQFP64 |
| NANO130SD2BN | 64K | 8K | Configurable | 4K | up to 47 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 7 | 7 | V | - | V | 8 | 4x31, 6x29 | 2 | 3 | V | LQFP64 |
| NANO130SD3BN | 64K | 16K | Configurable | 4K | up to 47 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 7 | 7 | V | - | V | 8 | 4x31, 6x29 | 2 | 3 | V | LQFP64 |
| NANO130SE3BN | 128K | 16K | Configurable | 4K | up to 47 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 7 | 7 | V | - | V | 8 | 4x31, 6x29 | 2 | 3 | V | LQFP64 |
| NANO130KC2BN | 32K | 8K | Configurable | 4K | up to 86 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 8 | 8 | V | V | V | 8 | 4x40, 6x38 | 2 | 3 | V | LQFP128 |
| NANO130KD2BN | 64K | 8K | Configurable | 4K | up to 86 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 8 | 8 | V | V | V | 8 | 4x40, 6x38 | 2 | 3 | V | LQFP128 |
| NANO130KD3BN | 64K | 16K | Configurable | 4K | up to 86 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 8 | 8 | V | V | V | 8 | 4x40, 6x38 | 2 | 3 | V | LQFP128 |
| NANO130KE3BN | 128K | 16K | Configurable | 4K | up to 86 | 4x32-bit | 5 | 3 | 2 | 1 | 1 | 8 | 8 | V | V | V | 8 | 4x40, 6x38 | 2 | 3 | V | LQFP128 |

LQFP64 : 7x7, pitch 0.4 mm ; LQFP128 : 14x14, pitch 0.4 mm

Table 3-4 Nano130 Advanced Line Selection Table

## 3.3 Pin Configuration

### 3.3.1 NuMicro™ Nano100 Pin Diagrams

#### 3.3.1.1 NuMicro™ Nano100 LQFP 128-pin

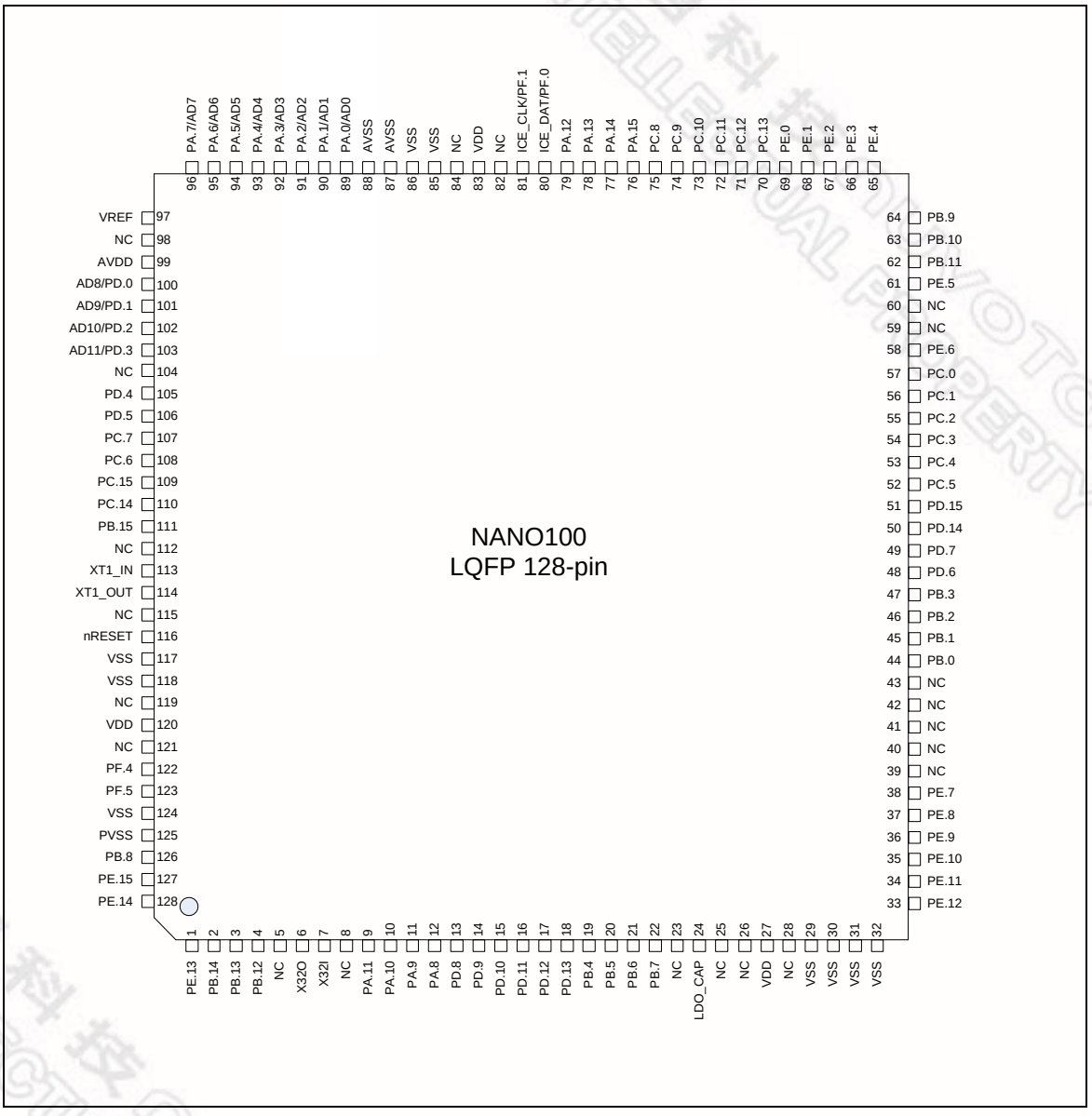



Figure 3-2 NuMicro™ Nano100 LQFP 128-pin Diagram

## 3.4 Pin Description

### 3.4.1 NuMicro™ Nano100 Pin Description

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP/QFN 48-pin | | | |
| 1 | | | PE.13 | **I/O** | General purpose digital I/O pin |
| 2 | 1 | | PB.14 | **I/O** | General purpose digital I/O pin |
| | | | INT0 | **I** | External interrupt0 input pin |
| | | | SC2_CD | **I** | SmartCard2 card detect pin |
| | | | SPI2_SS1 | **I/O** | SPI2 2nd slave select pin |
| 3 | 2 | | PB.13 | **I/O** | General purpose digital I/O pin |
| | | | EBI_AD1 | **I/O** | EBI Address/Data bus bit1 |
| 4 | 3 | 1 | PB.12 | **I/O** | General purpose digital I/O pin |
| | | | EBI_AD0 | **I/O** | EBI Address/Data bus bit0 |
| | | | FCLKO | **O** | Frequency Divider output pin |
| 5 | | | | | NC |
| 6 | 4 | 2 | X32O | **O** | External 32.768 kHz crystal output pin |
| 7 | 5 | 3 | X32I | **I** | External 32.768 kHz crystal input pin |
| 8 | | | | | NC |
| 9 | 6 | 4 | PA.11 | **I/O** | General purpose digital I/O pin |
| | | | I2C1_SCL | **I/O** | $I^2C1$ clock pin |
| | | | EBI_nRD | **O** | EBI read enable output pin |
| | | | SC0_RST | **O** | SmartCard0 RST pin |
| | | | SPI2_MOSI0 | **I/O** | SPI2 1st MOSI (Master Out, Slave In) pin |
| 10 | 7 | 5 | PA.10 | **I/O** | General purpose digital I/O pin |
| | | | I2C1_SDA | **I/O** | $I^2C1$ data I/O pin |
| | | | EBI_nWR | **O** | EBI write enable output pin |
| | | | SC0_PWR | **O** | SmartCard0 Power pin |
| | | | SPI2_MISO0 | **I/O** | SPI2 1st MISO (Master In, Slave Out) pin |
| 11 | 8 | 6 | PA.9 | **I/O** | General purpose digital I/O pin |
| | | | I2C0_SCL | **I/O** | $I^2C0$ clock pin |
| | | | SC0_DAT | **I/O** | SmartCard0 DATA pin(SC0_UART_RXD) |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP/QFN 48-pin | | | |
| | | | PWM0_CH2 | **I/O** | PWM0 Channel2 output |
| | | | EBI_AD15 | **I/O** | EBI Address/Data bus bit15 |
| | | | TC2 | **I** | Timer2 capture input |
| | | | UART0_RXD | **I** | UART0 Data receiver input pin |
| 78 | 39 | 27 | PA.13 | **I/O** | General purpose digital I/O pin |
| | | | PWM0_CH1 | **I/O** | PWM0 Channel1 output |
| | | | EBI_AD14 | **I/O** | EBI Address/Data bus bit14 |
| | | | TC1 | **I** | Timer1 capture input |
| | | | I2C0_SCL | **I/O** | $I^2C0$ clock pin |
| 79 | 40 | 28 | PA.12 | **I/O** | General purpose digital I/O pin |
| | | | PWM0_CH0 | **I/O** | PWM0 Channel0 output |
| | | | EBI_AD13 | **I/O** | EBI Address/Data bus bit13 |
| | | | TC0 | **I** | Timer0 capture input |
| | | | I2C0_SDA | **I/O** | $I^2C0$ data I/O pin |
| 80 | 41 | 29 | ICE_DAT | **I/O** | Serial Wired Debugger Data pin |
| | | | PF.0 | **I/O** | General purpose digital I/O pin |
| | | | INT0 | **I** | External interrupt0 input pin |
| 81 | 42 | 30 | ICE_CLK | **I** | Serial Wired Debugger Clock pin |
| | | | PF.1 | **I/O** | General purpose digital I/O pin |
| | | | FCLKO | **O** | Frequency Divider output pin |
| | | | INT1 | **I** | External interrupt1 input pin |
| 82 | | | | | NC |
| 83 | | | VDD | **P** | Power supply for I/O ports and LDO source for internal PLL and digital circuit |
| 84 | | | | | NC |
| 85 | | | VSS | **P** | Ground |
| 86 | | | VSS | **P** | Ground |
| 87 | 43 | 31 | AVSS | **AP** | Ground Pin for analog circuit |
| 88 | | | AVSS | **AP** | Ground Pin for analog circuit |
| 89 | 44 | 32 | PA.0 | **I/O** | General purpose digital I/O pin |

### 3.4.2 NuMicro™ Nano110 Pin Description

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| 1 | | | PE.13 | I/O | General purpose digital I/O pin |
| | | | LCD_SEG27 | O | LCD segment output 27 at LQFP128 |
| 2 | 1 | | PB.14 | I/O | General purpose digital I/O pin |
| | | | INT0 | I | External interrupt0 input pin |
| | | | SC2_CD | I | SmartCard2 card detect |
| | | | SPI2_SS1 | I/O | SPI2 2nd slave select pin |
| | | | LCD_SEG12 | O | LCD segment output 12 at LQFP64 |
| | | | LCD_SEG26 | O | LCD segment output 26 at LQFP128 |
| 3 | 2 | | PB.13 | I/O | General purpose digital I/O pin |
| | | | EBI_AD1 | I/O | EBI Address/Data bus bit1 |
| | | | LCD_SEG11 | O | LCD segment output 11 at LQFP64 |
| | | | LCD_SEG25 | O | LCD segment output 25 at LQFP128 |
| 4 | 3 | | PB.12 | I/O | General purpose digital I/O pin |
| | | | EBI_AD0 | I/O | EBI Address/Data bus bit0 |
| | | | FCLKO | O | Frequency Divider output pin |
| | | | LCD_SEG10 | O | LCD segment output 10 at LQFP64 |
| | | | LCD_SEG24 | O | LCD segment output 24 at LQFP128 |
| 5 | | | | | NC |
| 6 | 4 | | X32O | O | External 32.768 kHz crystal output pin |
| 7 | 5 | | X32I | I | External 32.768 kHz crystal input pin |
| 8 | | | | | NC |
| 9 | 6 | | PA.11 | I/O | General purpose digital I/O pin |
| | | | I2C1_SCL | I/O | I2C1 clock pin |
| | | | EBI_nRD | O | EBI read enable output pin |
| | | | SC0_RST | O | SmartCard0 RST pin |
| | | | SPI2_MOSI0 | I/O | SPI2 1st MOSI (Master Out, Slave In) pin |
| | | | LCD_SEG9 | O | LCD segment output 9 at LQFP64 |
| | | | LCD_SEG23 | O | LCD segment output 23 at LQFP128 |
| 10 | 7 | | PA.10 | I/O | General purpose digital I/O pin |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| 29 | 16 | | VSS | **P** | Ground |
| 30 | | | VSS | **P** | Ground |
| 31 | | | VSS | **P** | Ground |
| 32 | | | VSS | **P** | Ground |
| 33 | | | PE.12 | **I/O** | General purpose digital I/O pin |
| | | | UART1_CTSn | **I** | UART1 Clear to Send input pin |
| 34 | | | PE.11 | **I/O** | General purpose digital I/O pin |
| | | | UART1_RTSn | **O** | UART1 Request to Send output pin |
| 35 | | | PE.10 | **I/O** | General purpose digital I/O pin |
| | | | UART1_TXD | **O** | UART1 Data transmitter output pin |
| 36 | | | PE.9 | **I/O** | General purpose digital I/O pin |
| | | | UART1_RXD | **I** | UART1 Data receiver input pin |
| 37 | | | PE.8 | **I/O** | General purpose digital I/O pin |
| | | | LCD_SEG9 | **O** | LCD segment output 9 at LQFP128 |
| 38 | | | PE.7 | **I/O** | General purpose digital I/O pin |
| | | | LCD_SEG8 | **O** | LCD segment output 8 at LQFP128 |
| 39 | | | | | NC |
| 40 | | | | | NC |
| 41 | | | | | NC |
| 42 | | | | | NC |
| 43 | | | | | NC |
| 44 | 17 | | PB.0 | **I/O** | General purpose digital I/O pin |
| | | | UART0_RXD | **I** | UART0 Data receiver input pin |
| | | | SPI1_MOSI0 | **I/O** | SPI1 1st MOSI (Master Out, Slave In) pin |
| | | | LCD_SEG1 | **O** | LCD segment output 1 at LQFP64 (or as LD_COM5) |
| | | | LCD_SEG7 | **O** | LCD segment output 7 at LQFP128 |
| 45 | 18 | | PB.1 | **I/O** | General purpose digital I/O pin |
| | | | UART0_TXD | **O** | UART0 Data transmitter output pin |
| | | | SPI1_MISO0 | **I/O** | SPI1 1st MISO (Master In, Slave Out) pin |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| 61 | | | PE.5 | **I/O** | General purpose digital I/O pin |
| 62 | 30 | | PB.11 | **I/O** | General purpose digital I/O pin |
| | | | PWM1_CH0 | **I/O** | PWM1 Channel0 output |
| | | | TM3 | **O** | Timer3 external counter input |
| | | | SC2_DAT | **I/O** | SmartCard2 DATA pin(SC2_UART_RXD) |
| | | | SPI0_MISO0 | **I/O** | SPI0 1st MISO (Master In, Slave Out) pin |
| | | | LCD_V1 | **O** | Unit voltage for LCD charge pump circuit at LQFP64 |
| | | | LCD_V1 | **O** | LCD Unit voltage for LCD charge pump circuit at LQFP128 |
| 63 | 31 | | PB.10 | **I/O** | General purpose digital I/O pin |
| | | | SPI0_SS1 | **I/O** | SPI0 2nd slave select pin |
| | | | TM2 | **O** | Timer2 external counter input |
| | | | SC2_CLK | **O** | SmartCard2 clock pin(SC2_UART_TXD) |
| | | | SPI0_MOSI0 | **I/O** | SPI0 1st MOSI (Master Out, Slave In) pin |
| | | | LCD_V2 | **O** | LCD driver biasing voltage at LQFP64 |
| | | | LCD_V2 | **O** | LCD driver biasing voltage at LQFP128 |
| 64 | 32 | | PB.9 | **I/O** | General purpose digital I/O pin |
| | | | SPI1_SS1 | **I/O** | SPI1 2nd slave select pin |
| | | | TM1 | **O** | Timer1 external counter input |
| | | | SC2_RST | **O** | SmartCard2 RST pin |
| | | | INT0 | **I** | External interrupt0 input pin |
| | | | LCD_V3 | **O** | LCD driver biasing voltage at LQFP64 |
| | | | LCD_V3 | **O** | LCD driver biasing voltage at LQFP128 |
| 65 | | | PE.4 | **I/O** | General purpose digital I/O pin |
| | | | SPI0_MOSI0 | **I/O** | SPI0 1st MOSI (Master Out, Slave In) pin |
| 66 | | | PE.3 | **I/O** | General purpose digital I/O pin |
| | | | SPI0_MISO0 | **I/O** | SPI0 1st MISO (Master In, Slave Out) pin |
| 67 | | | PE.2 | **I/O** | General purpose digital I/O pin |
| | | | SPI0_CLK | **I/O** | SPI0 serial clock pin |
| 68 | | | PE.1 | **I/O** | General purpose digital I/O pin |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| 99 | 52 | | AVDD | **AP** | Power supply for internal analog circuit |
| 100 | | | PD.0 | **I/O** | General purpose digital I/O pin |
| | | | UART1_RXD | **I** | UART1 Data receiver input pin |
| | | | SPI2_SS0 | **I/O** | SPI2 1st slave select pin |
| | | | SC1_CLK | **O** | SmartCard1 clock pin(SC1_UART_TXD) |
| | | | AD8 | **AI** | ADC analog input8 |
| 101 | | | PD.1 | **I/O** | General purpose digital I/O pin |
| | | | UART1_TXD | **O** | UART1 Data transmitter output pin |
| | | | SPI2_CLK | **I/O** | SPI2 serial clock pin |
| | | | SC1_DAT | **I/O** | SmartCard1 DATA pin(SC1_UART_RXD) |
| | | | AD9 | **AI** | ADC analog input9 |
| 102 | | | PD.2 | **I/O** | General purpose digital I/O pin |
| | | | UART1_RTSn | | UART1 Request to Send output pin |
| | | | I2S_LRCLK | **I/O** | $I^2S$ left right channel clock |
| | | | SPI2_MISO0 | **I/O** | SPI2 1st MISO (Master In, Slave Out) pin |
| | | | SC1_PWR | **O** | SmartCard1 Power pin |
| | | | AD10 | **AI** | ADC analog input10 |
| 103 | | | PD.3 | **I/O** | General purpose digital I/O pin |
| | | | UART1_CTSn | | UART1 Clear to Send input pin |
| | | | I2S_BCLK | **I/O** | $I^2S$ bit clock pin |
| | | | SPI2_MOSI0 | **I/O** | SPI2 1st MOSI (Master Out, Slave In) pin |
| | | | SC1_RST | **O** | SmartCard1 RST pin |
| | | | AD11 | **AI** | ADC analog input11 |
| 104 | | | | | NC |
| 105 | | | PD.4 | **I/O** | General purpose digital I/O pin |
| | | | I2S_DI | **I** | $I^2S$ data input |
| | | | SPI2_MISO1 | **I/O** | SPI2 2nd MISO (Master In, Slave Out) pin |
| | | | SC1_CD | **I** | SmartCard1 card detect |
| | | | LCD_SEG35 | **AO** | LCD segment output 35 at LQFP10 |
| 106 | | | PD.5 | **I/O** | General purpose digital I/O pin |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| | | | I2S_DO | **O** | $I^2S$ data output |
| | | | SPI2_MOSI1 | **I/O** | SPI2 2nd MOSI (Master Out, Slave In) pin |
| | | | LCD_SEG34 | **AO** | LCD segment output 34 at LQFP128 |
| 107 | 53 | | PC.7 | **I/O** | General purpose digital I/O pin |
| | | | DA1_OUT | **AO** | DAC 1 output |
| | | | EBI_AD5 | **I/O** | EBI Address/Data bus bit5 |
| | | | TC1 | **I** | Timer1 capture input |
| | | | PWM0_CH1 | **O** | PWM0 Channel1 output |
| | | | LCD_SEG17* | **AO** | LCD segment output 17 at LQFP64 |
| 108 | 54 | | PC.6 | **I/O** | General purpose digital I/O pin |
| | | | DA0_OUT | **I** | DAC0 output |
| | | | EBI_AD4 | **I/O** | EBI Address/Data bus bit4 |
| | | | TC0 | **I** | Timer0 capture input |
| | | | SC1_CD | **I** | SmartCard1 card detect pin |
| | | | PWM0_CH0 | **O** | PWM0 Channel0 output |
| 109 | 55 | | PC.15 | **I/O** | General purpose digital I/O pin |
| | | | EBI_AD3 | **I/O** | EBI Address/Data bus bit3 |
| | | | TC0 | **I** | Timer0 capture input |
| | | | PWM1_CH2 | **O** | PWM1 Channel2 output |
| | | | LCD_SEG16 | **AO** | LCD segment output 16 at LQFP64 |
| | | | LCD_SEG33 | **AO** | LCD segment output 33 at LQFP128 |
| 110 | 56 | | PC.14 | **I/O** | General purpose digital I/O pin |
| | | | EBI_AD2 | **I/O** | EBI Address/Data bus bit2 |
| | | | PWM1_CH3 | **I/O** | PWM1 Channel3 output |
| | | | LCD_SEG15 | **AO** | LCD segment output 15 at LQFP64 |
| | | | LCD_SEG32 | **AO** | LCD segment output 32 at LQFP128 |
| 111 | 57 | | PB.15 | **I/O** | General purpose digital I/O pin |
| | | | INT1 | **I** | External interrupt1 input pin |
| | | | SNOOPER | **I** | Snooper pin |
| | | | LCD_SEG14 | **AO** | LCD segment output 14 at LQFP64 |

### 3.4.3 NuMicro™ Nano120 Pin Description

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128 | LQFP 64 | LQFP 48 | | | |
| 1 | | | PE.13 | **I/O** | General purpose digital IO pin |
| 2 | 1 | | PB.14 | **I/O** | General purpose digital IO pin |
| | | | INT0 | **I** | External interrupt0 input pin |
| | | | SC2_CD | **I** | SmartCard2 card detect |
| | | | SPI2_SS1 | **I/O** | SPI2 2nd slave select pin |
| 3 | 2 | | PB.13 | **I/O** | General purpose digital IO pin |
| | | | EBI_AD1 | **I/O** | EBI Address/Data bus bit1 |
| 4 | 3 | 1 | PB.12 | **I/O** | General purpose digital IO pin |
| | | | EBI_AD0 | **I/O** | EBI Address/Data bus bit0 |
| | | | FCLKO | **O** | Frequency Divider output pin |
| 5 | | | | | NC |
| 6 | 4 | 2 | X32O | **O** | External 32.768 kHz crystal output pin |
| 7 | 5 | 3 | X32I | **I** | External 32.768 kHz crystal input pin |
| 8 | | | | | NC |
| 9 | 6 | 4 | PA.11 | **I/O** | General purpose digital IO pin |
| | | | I2C1_SCL | **I/O** | I2C 1 clock pin |
| | | | EBI_nRD | **O** | EBI read enable output pin |
| | | | SC0_RST | **O** | SmartCard0 RST pin |
| | | | SPI2_MOSI0 | **I/O** | SPI2 1st MOSI (Master Out, Slave In) pin |
| 10 | 7 | 5 | PA.10 | **I/O** | General purpose digital IO pin |
| | | | I2C1_SDA | **I/O** | I2C 1 data I/O pin |
| | | | EBI_nWR | **O** | EBI write enable output pin |
| | | | SC0_PWR | **O** | SmartCard0 Power pin |
| | | | SPI2_MISO0 | **I/O** | SPI2 1st MISO (Master In, Slave Out) pin |
| 11 | 8 | 6 | PA.9 | **I/O** | General purpose digital IO pin |
| | | | I2C0_SCL | **I/O** | I2C 0 clock pin |
| | | | SC0_DAT | **I/O** | SmartCard0 DATA pin(SC0_UART_RXD) |
| | | | SPI2_CLK | **I/O** | SPI2 serial clock pin |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128 | LQFP 64 | LQFP 48 | | | |
| 27 | 15 | 11 | VDD | **P** | Power supply for I/O ports and LDO source |
| 28 | | | | | NC |
| 29 | 16 | 12 | VSS | **P** | Ground |
| 30 | | | VSS | **P** | Ground |
| 31 | | | VSS | **P** | Ground |
| 32 | | | VSS | **P** | Ground |
| 33 | | | PE.12 | **I/O** | General purpose digital IO pin |
| 34 | | | PE.11 | **I/O** | General purpose digital IO pin |
| 35 | | | PE.10 | **I/O** | General purpose digital IO pin |
| 36 | | | PE.9 | **I/O** | General purpose digital IO pin |
| 37 | | | PE.8 | **I/O** | General purpose digital IO pin |
| 38 | | | PE.7 | **I/O** | General purpose digital IO pin |
| 39 | | | | | NC |
| 40 | 17 | 13 | USB_VBUS | **USB** | POWER SUPPLY: From USB Host or HUB. |
| 41 | 18 | 14 | USB_VDD33_CAP | **USB** | Internal Power Regulator Output 3.3V Decoupling Pin |
| 42 | 19 | 15 | USB_D- | **USB** | USB Differential Signal D- |
| 43 | 20 | 16 | USB_D+ | **USB** | USB Differential Signal D+ |
| 44 | 21 | 17 | PB.0 | **I/O** | General purpose digital IO pin |
| | | | UART0_RXD | **I** | UART0 Data receiver input pin |
| | | | SPI1_MOSI0 | **I/O** | SPI1 1st MOSI (Master Out, Slave In) pin |
| 45 | 22 | 18 | PB.1 | **I/O** | General purpose digital IO pin |
| | | | UART0_TXD | **O** | UART0 Data transmitter output pin |
| | | | SPI1_MISO0 | **I/O** | SPI1 1st MISO (Master In, Slave Out) pin |
| 46 | 23 | 19 | PB.2 | **I/O** | General purpose digital IO pin |
| | | | UART0_nRTS | **O** | UART0 Request to Send output pin |
| | | | EBI_nWRL | **O** | EBI low byte write enable output pin |
| | | | SPI1_CLK | **I/O** | SPI1 serial clock pin |
| 47 | 24 | 20 | PB.3 | **I/O** | General purpose digital IO pin |
| | | | UART0_nCTS | **I** | UART0 Clear to Send input pin |

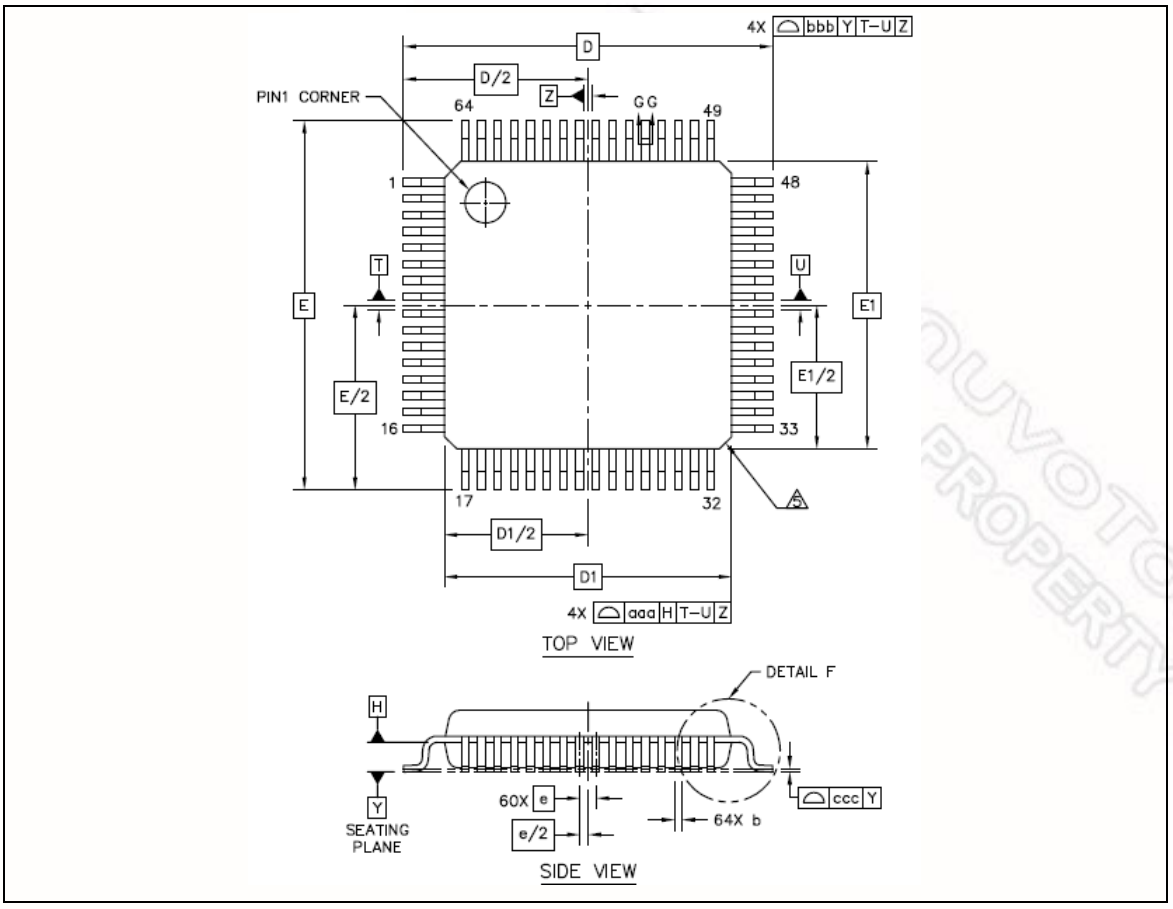
### 3.4.4 NuMicro™ Nano130 Pin Description

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| 1 | | | PE.13 | I/O | General purpose digital I/O pin |
| | | | LCD_SEG27 | O | LCD segment output 27 at LQFP128 |
| 2 | 1 | | PB.14 | I/O | General purpose digital I/O pin |
| | | | INT0 | I | External interrupt0 input pin |
| | | | SC2_CD | I | SmartCard2 card detect |
| | | | SPI2_SS1 | I/O | SPI2 2nd slave select pin |
| | | | LCD_SEG12 | O | LCD segment output 12 at LQFP64 |
| | | | LCD_SEG26 | O | LCD segment output 26 at LQFP128 |
| 3 | 2 | | PB.13 | I/O | General purpose digital I/O pin |
| | | | EBI_AD1 | I/O | EBI Address/Data bus bit1 |
| | | | LCD_SEG11 | O | LCD segment output 11 at LQFP64 |
| | | | LCD_SEG25 | O | LCD segment output 25 at LQFP128 |
| 4 | 3 | | PB.12 | I/O | General purpose digital I/O pin |
| | | | EBI_AD0 | I/O | EBI Address/Data bus bit0 |
| | | | FCLKO | O | Frequency Divider output pin |
| | | | LCD_SEG10 | O | LCD segment output 10 at LQFP64 |
| | | | LCD_SEG24 | O | LCD segment output 24 at LQFP128 |
| 5 | | | | | NC |
| 6 | 4 | | X32O | O | External 32.768 kHz crystal output pin |
| 7 | 5 | | X32I | I | External 32.768 kHz crystal input pin |
| 8 | | | | | NC |
| 9 | 6 | | PA.11 | I/O | General purpose digital I/O pin |
| | | | I2C1_SCL | I/O | I2C1 clock pin |
| | | | EBI_nRD | O | EBI read enable output pin |
| | | | SC0_RST | O | SmartCard0 RST pin |
| | | | SPI2_MOSI0 | I/O | SPI2 1st MOSI (Master Out, Slave In) pin |
| | | | LCD_SEG9 | O | LCD segment output 9 at LQFP64 |
| | | | LCD_SEG23 | O | LCD segment output 23 at LQFP128 |
| 10 | 7 | | PA.10 | I/O | General purpose digital I/O pin |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| 29 | 16 | | VSS | **P** | Ground |
| 30 | | | VSS | **P** | Ground |
| 31 | | | VSS | **P** | Ground |
| 32 | | | VSS | **P** | Ground |
| 33 | | | PE.12 | **I/O** | General purpose digital I/O pin |
| 34 | | | PE.11 | **I/O** | General purpose digital I/O pin |
| 35 | | | PE.10 | **I/O** | General purpose digital I/O pin |
| 36 | | | PE.9 | **I/O** | General purpose digital I/O pin |
| 37 | | | PE.8 | **I/O** | General purpose digital I/O pin |
| | | | LCD_SEG9 | **O** | LCD segment output 9 at LQFP128 |
| 38 | | | PE.7 | **I/O** | General purpose digital I/O pin |
| | | | LCD_SEG8 | **O** | LCD segment output 8 at LQFP128 |
| 39 | | | | | NC |
| 40 | 17 | | USB_VBUS | **USB** | POWER SUPPLY: From USB Host or HUB. |
| 41 | 18 | | USB_VDD33_CAP | **USB** | Internal Power Regulator Output 3.3V Decoupling Pin |
| 42 | 19 | | USB_D- | **USB** | USB Differential Signal D- |
| 43 | 20 | | USB_D+ | **USB** | USB Differential Signal D+ |
| 44 | 21 | | PB.0 | **I/O** | General purpose digital I/O pin |
| | | | UART0_RXD | **I** | UART0 Data receiver input pin |
| | | | SPI1_MOSI0 | **I/O** | SPI1 1st MOSI (Master Out, Slave In) pin |
| | | | LCD_SEG1 | **O** | LCD segment output 1 at LQFP64 (or as LCD_COM5) |
| | | | LCD_SEG7 | **O** | LCD segment output 7 at LQFP128 |
| 45 | 22 | | PB.1 | **I/O** | General purpose digital I/O pin |
| | | | UART0_TXD | **O** | UART0 Data transmitter output pin |
| | | | SPI1_MISO0 | **I/O** | SPI1 1st MISO (Master In, Slave Out) pin |
| | | | LCD_SEG0 | **O** | LCD segment output 0 at LQFP64 (or as LCD_COM4) |
| | | | LCD_SEG6 | **O** | LCD segment output 6 at LQFP128 |
| 46 | 23 | | PB.2 | **I/O** | General purpose digital I/O pin |
| | | | UART0_RTSn | **O** | UART0 Request to Send output pin |

| Pin No. | | | Pin Name | Pin Type | Description |
|---|---|---|---|---|---|
| LQFP 128-pin | LQFP 64-pin | LQFP 48-pin | | | |
| | | | LCD_SEG39* | **AO** | LCD segment output 39 at LQFP128 |
| 94 | 49 | | PA.5 | **I/O** | General purpose digital I/O pin |
| | | | AD5 | **AI** | ADC analog input5 |
| | | | EBI_AD8 | **I/O** | EBI Address/Data bus bit8 |
| | | | SC2_RST | **O** | SmartCard2 RST pin |
| | | | I2C0_SCL | **I/O** | $I^2C0$ clock pin |
| | | | LCD_SEG20* | **AO** | LCD segment output 20 at LQFP64 |
| | | | LCD_SEG38* | **AO** | LCD segment output 38 at LQFP128 |
| 95 | 50 | | PA.6 | **I/O** | General purpose digital I/O pin |
| | | | AD6 | **AI** | ADC analog input6 |
| | | | EBI_AD7 | **I/O** | EBI Address/Data bus bit7 |
| | | | TC3 | **I** | Timer3 capture input |
| | | | SC2_CLK | **O** | SmartCard2 clock pin(SC2_UART_TXD) |
| | | | PWM0_CH3 | **O** | PWM0 Channel3 output |
| | | | LCD_SEG19* | **AO** | LCD segment output 19 at LQFP64 |
| | | | LCD_SEG37* | **AO** | LCD segment output 37 at LQFP128 |
| 96 | | | PA.7 | **I/O** | General purpose digital I/O pin |
| | | | AD7 | **AI** | ADC analog input7 |
| | | | EBI_AD6 | **I/O** | EBI Address/Data bus bit6 |
| | | | TC2 | **I** | Timer2 capture input |
| | | | SC2_DAT | **I/O** | SmartCard2 DATA pin(SC2_UART_RXD) |
| | | | PWM0_CH2 | **O** | PWM0 Channel2 output |
| | | | LCD_SEG36* | **AO** | LCD segment output 36 output at LQFP128 |
| 97 | 51 | | VREF | **AP** | Voltage reference input for ADC |
| 98 | | | | | NC |
| 99 | 52 | | AVDD | **AP** | Power supply for internal analog circuit |
| 100 | | | PD.0 | **I/O** | General purpose digital I/O pin |
| | | | UART1_RXD | **I** | UART1 Data receiver input pin |
| | | | SPI2_SS0 | **I/O** | SPI2 1st slave select pin |
| | | | SC1_CLK | **O** | SmartCard1 clock pin(SC1_UART_TXD) |

### 4.3 LQFP64 (7x7x1.4 mm footprint 2.0 mm)



| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| TOTAL THICKNESS | | A | --- | --- | 1.6 |
| STAND OFF | | A1 | 0.05 | --- | 0.15 |
| MOLD THICKNESS | | A2 | 1.35 | 1.4 | 1.45 |
| LEAD WIDTH(PLATING) | | b | 0.13 | 0.18 | 0.23 |
| LEAD WIDTH | | b1 | 0.13 | 0.16 | 0.19 |
| L/F THICKNESS(PLATING) | | c | 0.09 | --- | 0.2 |
| L/F THICKNESS | | c1 | 0.09 | --- | 0.16 |
| | X | D | 9 BSC | | |
| | Y | E | 9 BSC | | |
| BODY SIZE | X | D1 | 7 BSC | | |
| | Y | E1 | 7 BSC | | |
| LEAD PITCH | | e | 0.4 BSC | | |
| | | L | 0.45 | 0.6 | 0.75 |
| FOOTPRINT | | L1 | 1 REF | | |
| | | θ | 0° | 3.5° | 7° |
| | | θ1 | 0° | --- | --- |
| | | θ2 | 11° | 12° | 13° |
| | | θ3 | 11° | 12° | 13° |
| | | R1 | 0.08 | --- | --- |
| | | R2 | 0.08 | --- | 0.2 |
| | | S | 0.2 | --- | --- |
| PACKAGE EDGE TOLERANCE | | aaa | 0.2 | | |
| LEAD EDGE TOLERANCE | | bbb | 0.2 | | |
| COPLANARITY | | ccc | 0.08 | | |
| LEAD OFFSET | | ddd | 0.07 | | |
| MOLD FLATNESS | | eee | 0.05 | | |