



**ARM Cortex®-M0**  
**32-bit Microcontroller**

**NuMicro™ M058S Series**  
**Product Brief**

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## TABLE OF CONTENTS

<b>1 GENERAL DESCRIPTION .....</b>	<b>3</b>
<b>2 FEATURES .....</b>	<b>4</b>
<b>3 PARTS INFORMATION LIST AND PIN CONFIGURATION .....</b>	<b>7</b>
3.1 NuMicro™ M058S Series Selection Guide.....	7
3.2 Pin Configuration.....	8
3.2.1 TSSOP20 pin.....	8
3.2.2 QFN 33-pin.....	9
3.2.3 LQFP 48-pin.....	10
3.2.4 LQFP 64-pin.....	11
<b>4 BLOCK DIAGRAM .....</b>	<b>12</b>
<b>5 PACKAGE DIMENSIONS.....</b>	<b>13</b>
5.1 TSSOP-20 (4.4x6.5 mm) .....	13
5.2 QFN-33 (5X5 mm <sup>2</sup> , Thickness 0.8mm, Pitch 0.5 mm) .....	14
5.3 LQFP-48 (7x7x1.4mm <sup>2</sup> Footprint 2.0mm) .....	15
5.4 LQFP-64 (7x7x1.4mm <sup>2</sup> Footprint 2.0mm) .....	16
<b>6 REVISION HISTORY.....</b>	<b>17</b>

NUMICRO™ M058S SERIES PRODUCT BRIEF



## 1 GENERAL DESCRIPTION

The NuMicro™ M058S is a 32-bit microcontroller with embedded ARM® Cortex®-M0 core for industrial control and applications which need rich communication interfaces. The Cortex®-M0 is ARM embedded processor with 32-bit performance and cost-effective microcontroller.

The NuMicro™ M058S can run up to 50 MHz. Thus, it can afford to support a variety of industrial control and applications which need high CPU performance. The NuMicro™ M058S has 4 KB flash, 4 KB data flash, 4 KB flash for the ISP, and 4 KB SRAM.

Many system level peripheral functions, such as I/O Port, Timer, UART, SPI, I<sup>2</sup>C, PWM, ADC, Watchdog Timer, and Brown-Out Detector, have been incorporated into the NuMicro™ M058S in order to reduce component count, board space and system cost. These useful functions make the NuMicro™ M058S powerful for a wide range of applications.

Additionally, the NuMicro™ M058S is equipped with IAP (In-Application Programming), ISP (In-System Programming) and ICP (In-Circuit Programming) functions, which allow the user to update the program memory without removing the chip from the actual end product.



## 2 FEATURES

- Core
  - ARM® Cortex®-M0 core runs up to 50 MHz.
  - One 24-bit system timer.
  - Supports low power sleep-mode.
  - A single-cycle 32-bit hardware multiplier.
  - NVIC for the 32 interrupt inputs, each with 4-levels of priority.
  - Supports Serial Wire Debug (SWD) interface and 2 watchpoints/4 breakpoints.
- Wide Operating Voltage Range: 2.5V to 5.5V
- Memory
  - 32 KB Flash for program memory (APROM)
  - 4 KB Flash for data memory (DataFlash)
  - 4 KB Flash for loader (LDROM)
  - 4 KB SRAM for internal scratch-pad RAM (SRAM)
- Clock Control
  - Programmable system clock source
  - 22.1184 MHz internal oscillator
  - 4~24 MHz external crystal input
  - 10 kHz low-power oscillator for Watchdog Timer and wake-up in Sleep mode
  - PLL allows CPU operation up to the maximum 50 MHz
- I/O Port
  - Up to 55 general-purpose I/O (GPIO) pins for LQFP-64 package
  - Four I/O modes:
    - ◆ Quasi bi-direction
    - ◆ Push-Pull output
    - ◆ Open-Drain output
    - ◆ Input only with high impedance
  - TTL/Schmitt trigger input selectable
  - I/O pin can be configured as interrupt source with edge/level setting
  - Configurable I/O mode after POR
- Timer
  - Provides four channel 32-bit timers, one 8-bit pre-scale counter with 24-bit up-timer for each timer.
  - Independent clock source for each timer.
  - 24-bit timer value is readable through TDR (Timer Data Register)
  - Provides one-shot, periodic and toggle operation modes.
  - Provide event counter function.
  - Provide external capture/reset counter function.
  - Additional functions:
    - ◆ Two more timer clock sources from external trigger and internal 10 kHz
    - ◆ TIMER wake-up function
    - ◆ External capture input source selected from TxEX
    - ◆ Toggle mode output pins selected from TxEX or TMx
    - ◆ Inter-Timer trigger mode
- WDT (Watchdog Timer)



- Multiple clock sources
  - Supports wake-up from Power-down or Sleep mode
  - Interrupt or reset selectable on watchdog time-out
  - Time-out reset delay period time can be selected
- WWDT (Window Watchdog Timer)
  - 6-bit down counter with 11-bit prescale for wide range window selected
- PWM
  - Up to two built-in 16-bit PWM generators, providing four PWM outputs or two complementary paired PWM outputs
  - Individual clock source, clock divider, 8-bit pre-scaler and dead-zone generator for each PWM generator
  - PWM interrupt synchronized to PWM period
  - 16-bit digital Capture timers (shared with PWM timers) with rising/falling capture inputs
  - Supports capture interrupt
  - Additional functions
    - ◆ Internal 10 kHz to PWM clock source
    - ◆ Polar inverse function
    - ◆ Center-aligned type function
    - ◆ Timer duty interrupt enable function
    - ◆ Two kinds of PWM interrupt period type selection
    - ◆ Two kinds of PWM interrupt duty type selection
    - ◆ Period/duty trigger ADC function
- UART
  - Programmable baud-rate generator
  - Buffered receiver and transmitter, each with 16 bytes FIFO
  - Optional flow control function (CTS and RTS)
  - Supports IrDA(SIR) function
  - Supports RS485 function
  - Supports LIN function
- SPI
  - Supports Master/Slave mode
  - Full-duplex synchronous serial data transfer
  - Provides 3 wire function
  - Variable length of transfer data from 8 to 32 bits
  - MSB or LSB first data transfer
  - Supports Byte Suspend mode in 32-bit transmission
  - Additional functions
    - ◆ PLL clock source
    - ◆ 4-level depth FIFO buffer for better performance and flexibility in SPI Burst Transfer mode
- I<sup>2</sup>C
  - Up to two sets of I2C device
  - Supports master/slave mode
  - Bidirectional data transfer between masters and slaves
  - Multi-master bus (no central master).



- Arbitration between simultaneously transmitting masters without corruption of serial data on the bus
- Serial clock synchronization allows devices with different bit rates to communicate via one serial bus.
- Serial clock synchronization can be used as a handshake mechanism to suspend and resume serial transfer.
- Programmable clocks allow versatile rate control.
- Supports multiple address recognition (four slave address with mask option)
- ADC
  - 12-bit SAR ADC
  - Up to 8-ch single-ended input or 4-ch differential input
  - Supports Single mode/Burst mode/Single-cycle Scan mode/Continuous Scan mode
  - Supports 2' complement/un-signed format in differential mode conversion results
  - Each channel with an individual result register
  - Supports conversion value monitoring (or comparison) for threshold voltage detection
  - Conversion started either by software trigger or external pin trigger
  - Additional functions
    - ◆ A/D conversion started by PWM center-aligned trigger or edge-aligned trigger
    - ◆ PWM trigger delay function
- ISP (In-System Programming) and ICP (In-Circuit Programming)
- IAP (In-Application Programming)
- One built-in temperature sensor with 1°C resolution
- BOD (Brown-out Detector)
  - With 4 levels: 4.4V/3.7V/2.7V/2.2V
  - Supports Brown-Out interrupt and reset option
- 96-bit unique ID
- LVR (Low Voltage Reset)
  - Threshold voltage levels: 2.0V
- Operating Temperature: -40°C ~85°C
- Packages:
  - Green package (RoHS)
  - 64-pin LQFP, 48-pin LQFP, 33-pin QFN, 20-pin TSSOP





### 3 PARTS INFORMATION LIST AND PIN CONFIGURATION

#### 3.1 NuMicro™ M058S Series Selection Guide

Part Number	APROM (KB)	RAM (KB)	Data Flash (KB)	ISP ROM (KB)	I/O	Timer (32-Bit)	Connectivity			PWM (16-bit)	ADC (12-bit)	WDT	WWDT	ISP/ICP/IAP	Package	Operating Temperature Range(°C)
							UART	SPI	I <sup>2</sup> C							
M058SFAN	32	4	4	4	14	4	1	1	1	2	√	√	√	TSSOP20	-40 to +85	
M058SZAN	32	4	4	4	26	4	1	1	1	2	5	√	√	√	QFN33	-40 to +85
M058SLAN	32	4	4	4	42	4	1	1	2	4	8	√	√	√	LQFP48	-40 to +85
M058SSAN	32	4	4	4	55	4	1	1	2	4	8	√	√	√	LQFP64	-40 to +85

Table 3.1-1 NuMicro™ M058S Series Selection Guide

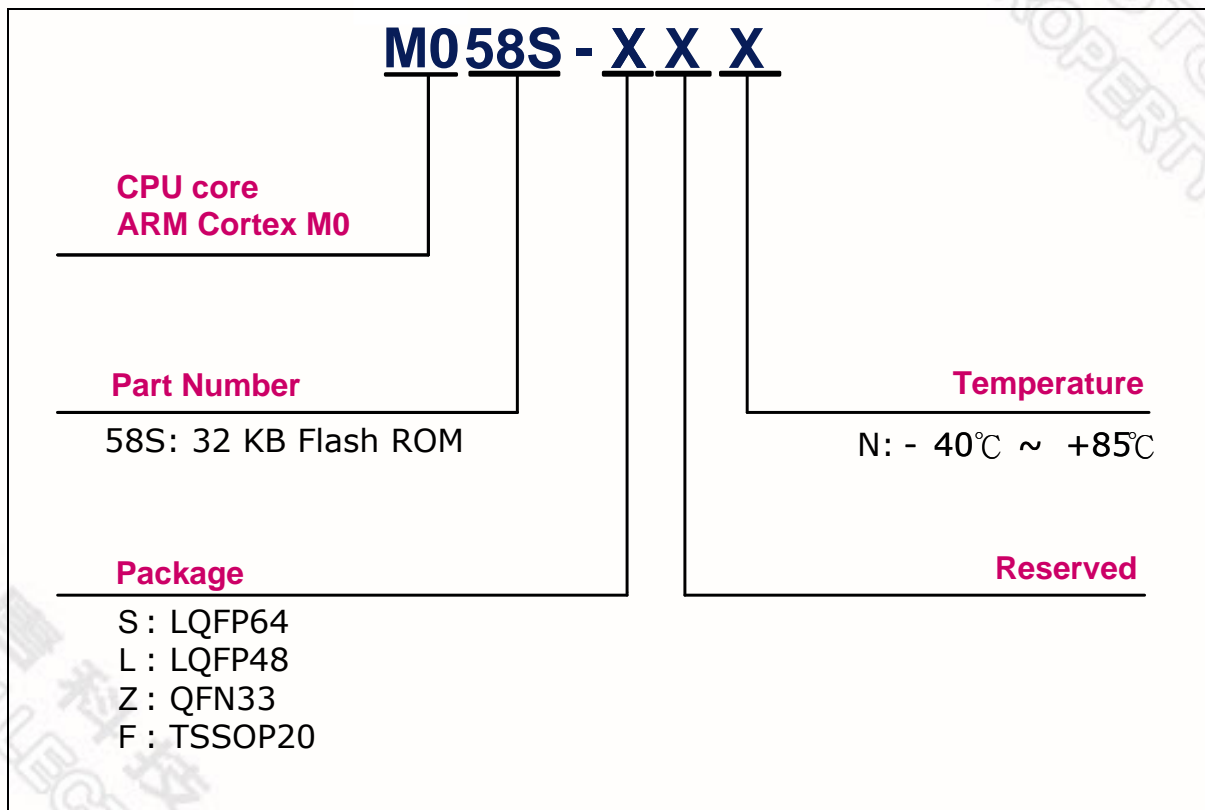


Figure 3.1-1 NuMicro™ M058S Series Selection Code



### 3.2 Pin Configuration

#### 3.2.1 TSSOP20 pin

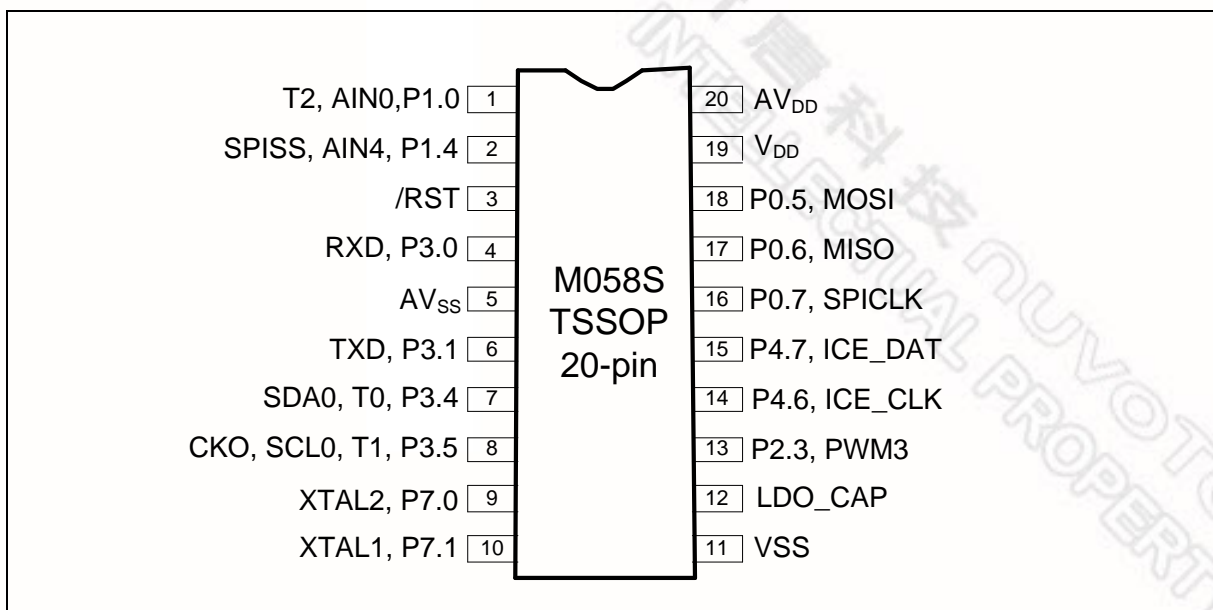


Figure 3.2-1 NuMicro™ M058S TSSOP20 Pin Diagram





3.2.2 QFN 33-pin

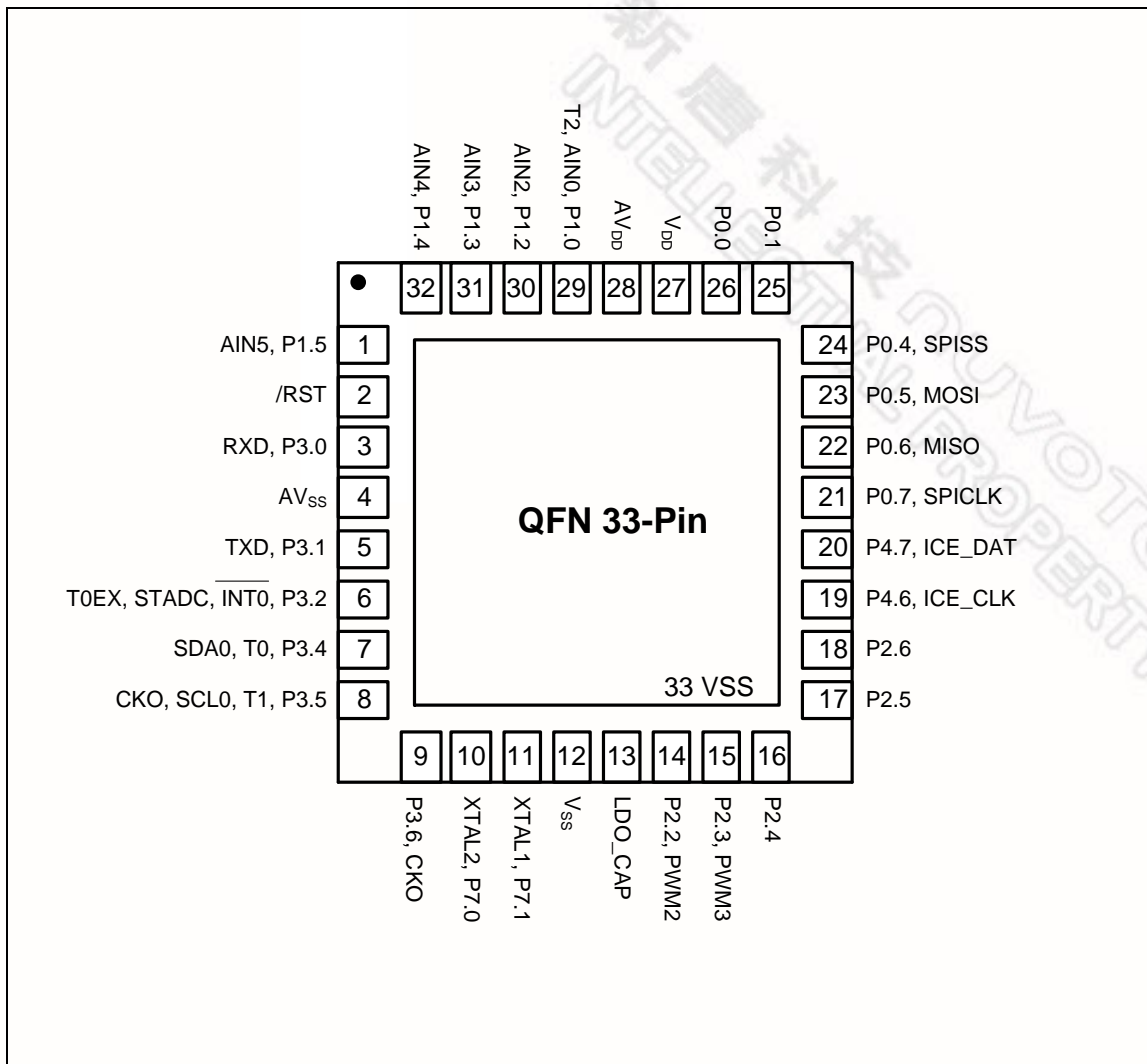


Figure 3.2-2 NuMicro™ M058S Series QFN-33 Pin Diagram



## 3.2.3 LQFP 48-pin

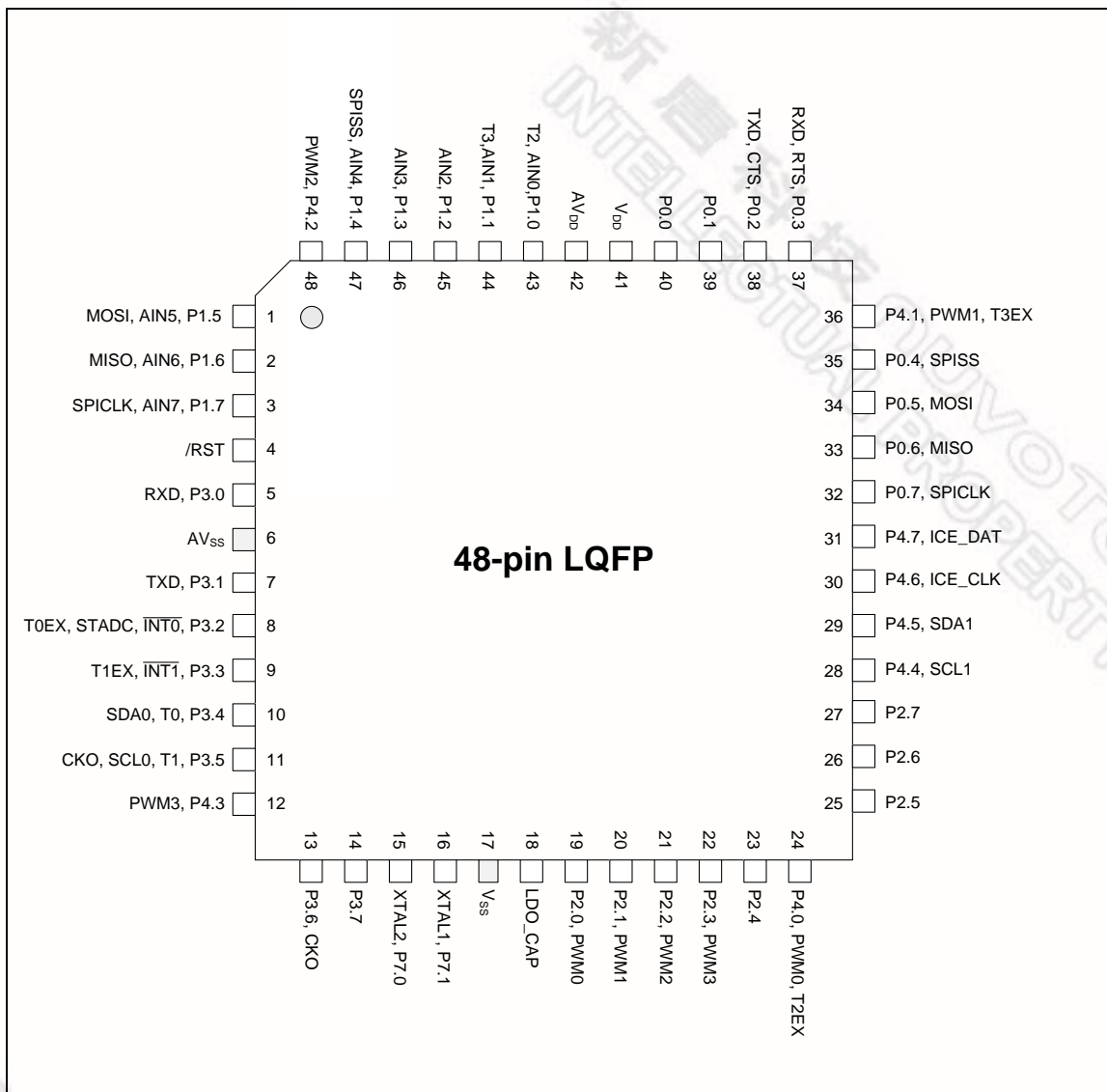


Figure 3.2-3 NuMicro™ M058S Series LQFP-48 Pin Diagram



3.2.4 LQFP 64-pin

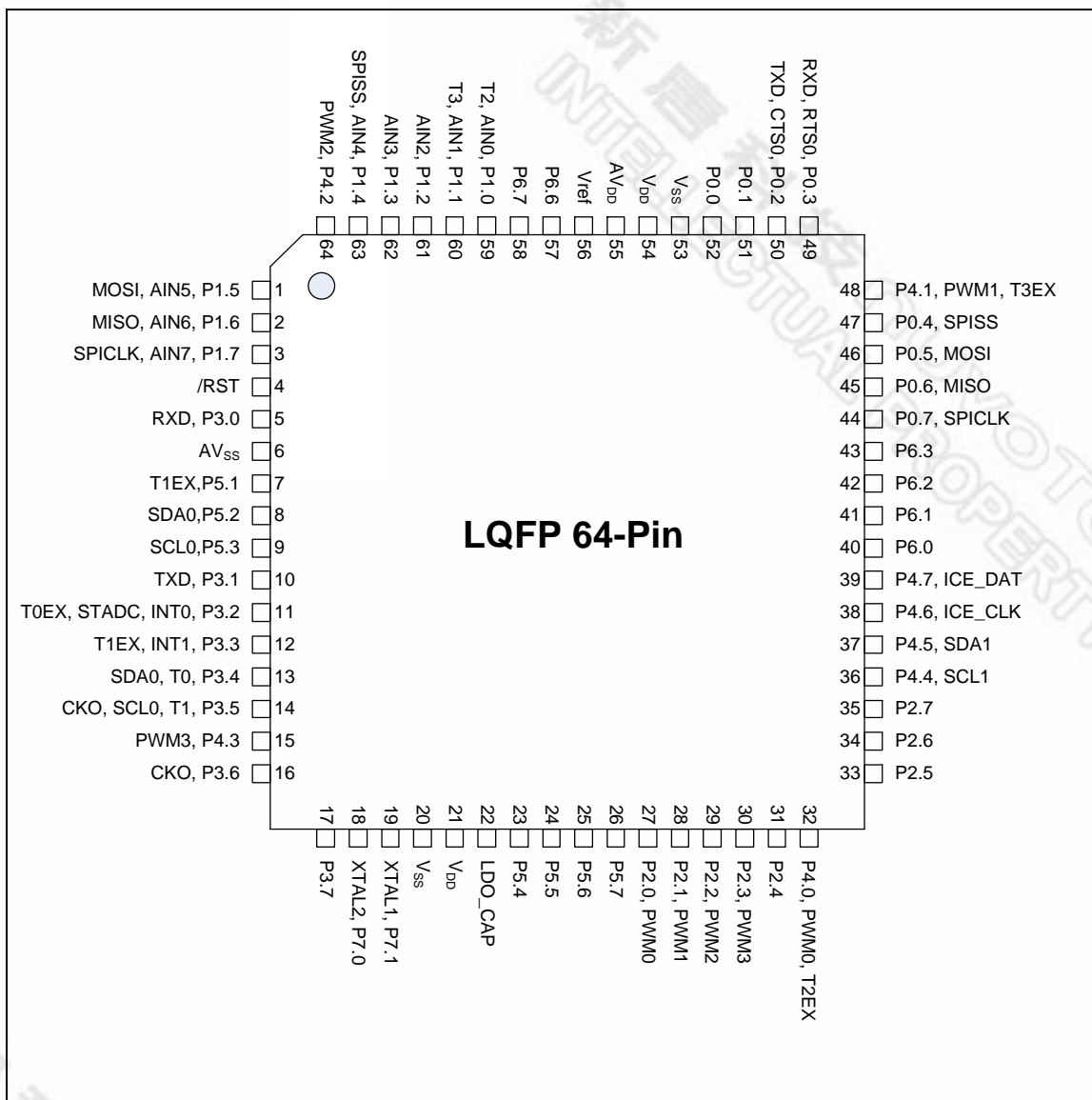


Figure 3.2-4 NuMicro™ M058S Series LQFP-64 Pin Diagram



4 BLOCK DIAGRAM

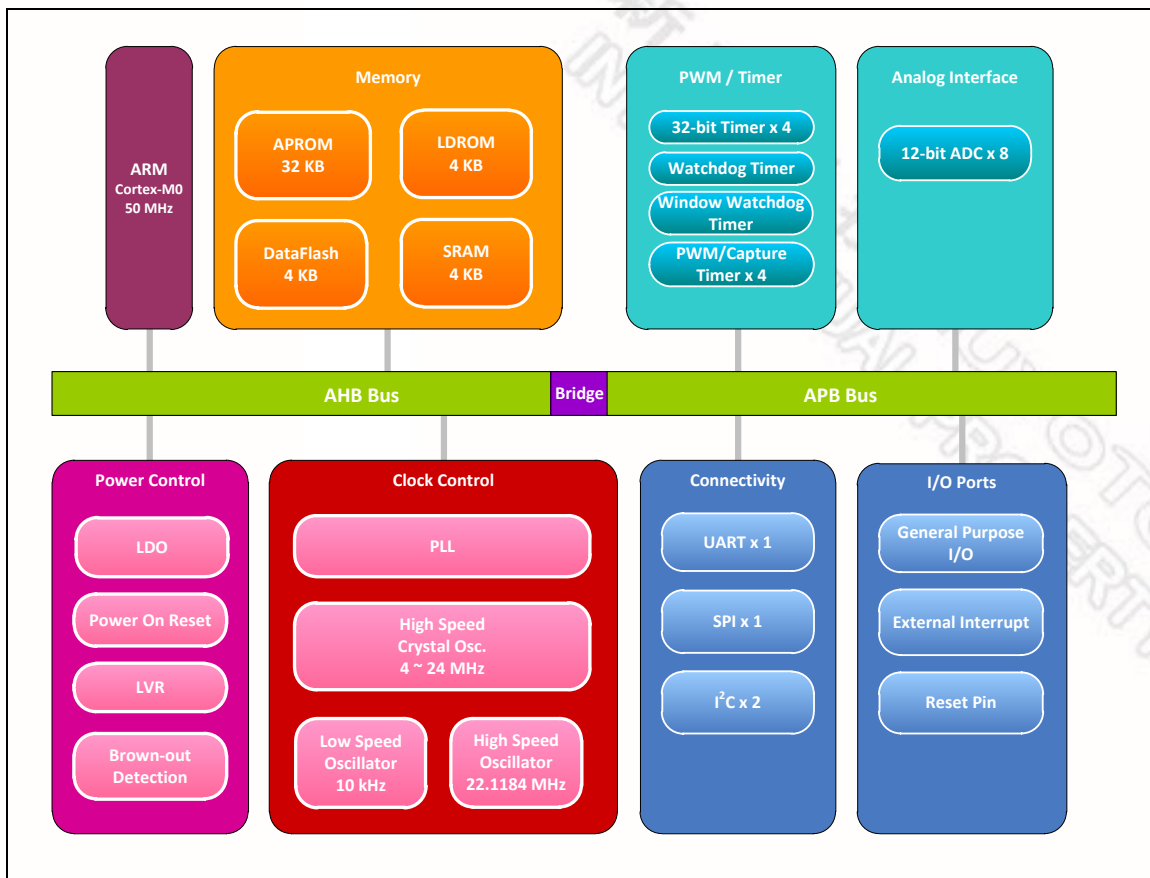


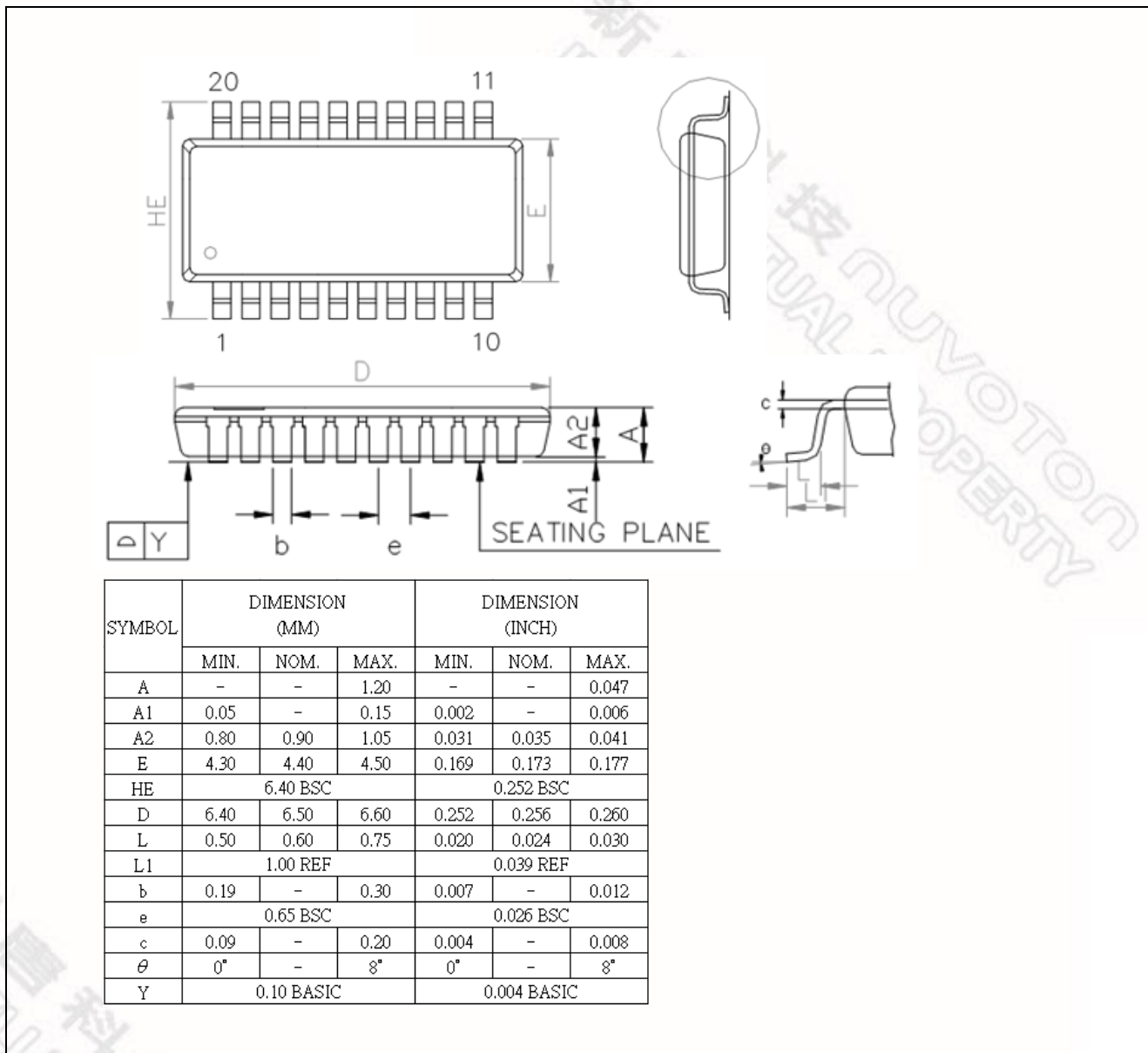
Figure 4-1 NuMicro™ M058S Block Diagram





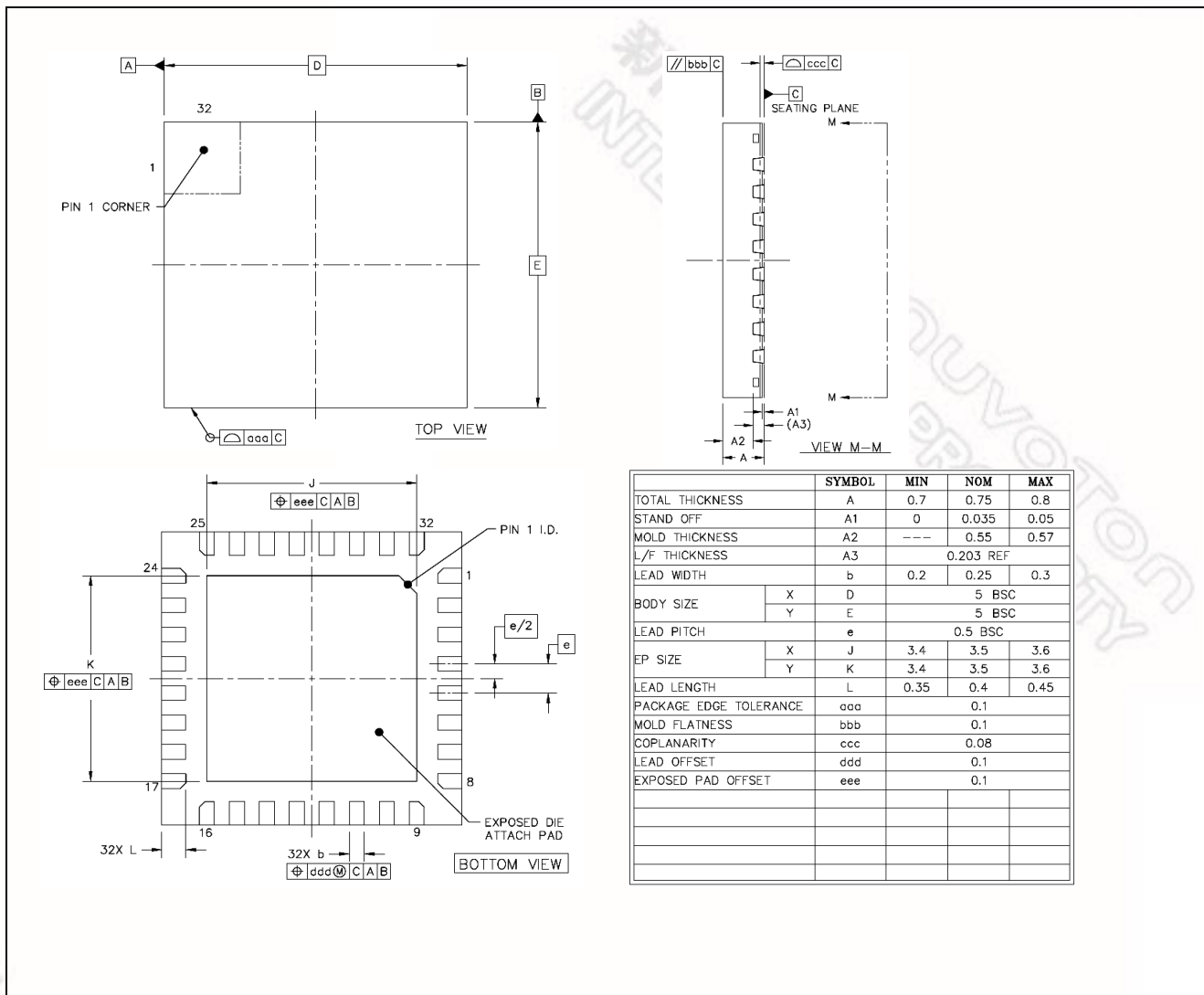
## 5 PACKAGE DIMENSIONS

### 5.1 TSSOP-20 (4.4x6.5 mm)





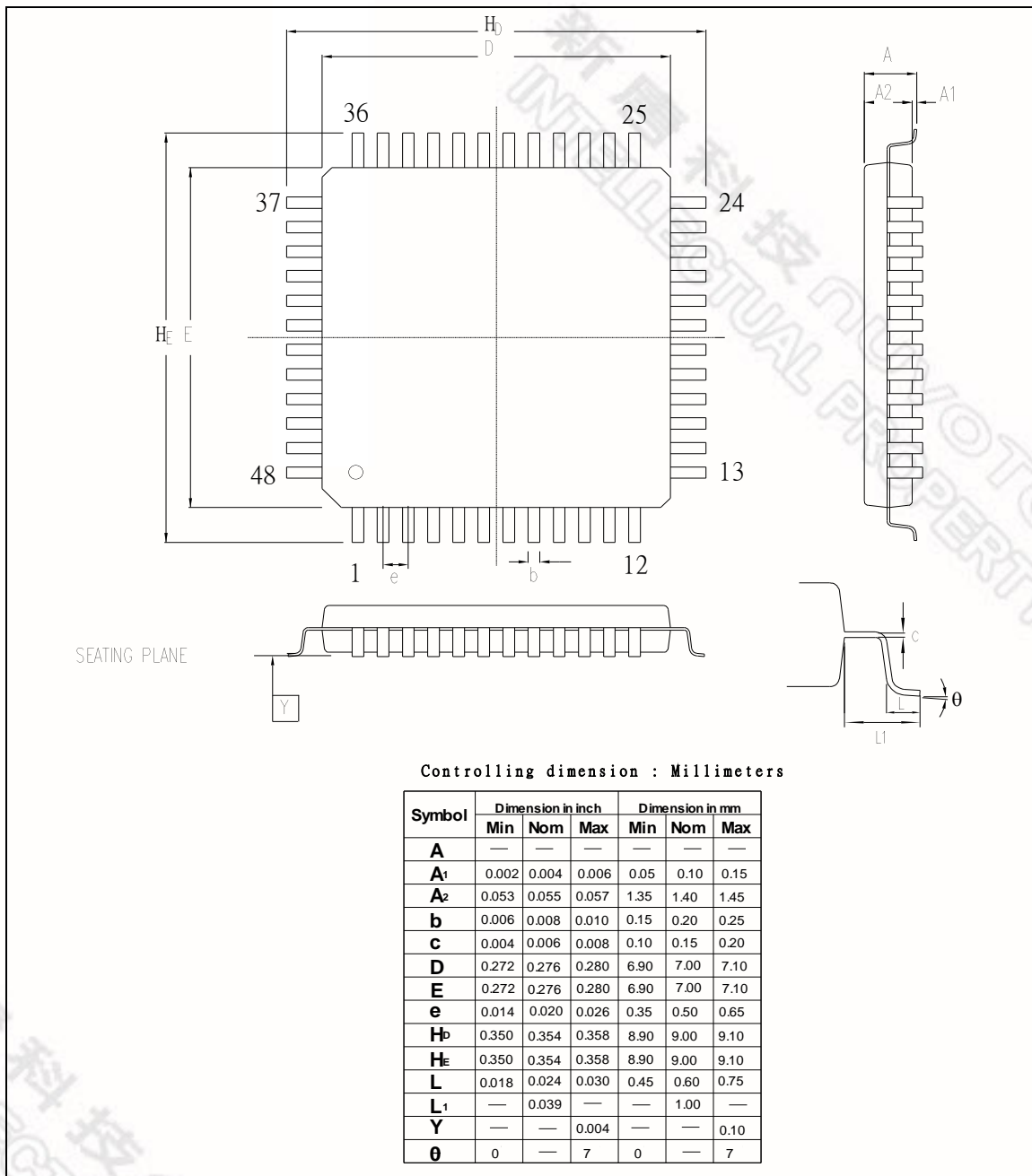
## 5.2 QFN-33 (5X5 mm<sup>2</sup>, Thickness 0.8mm, Pitch 0.5 mm)







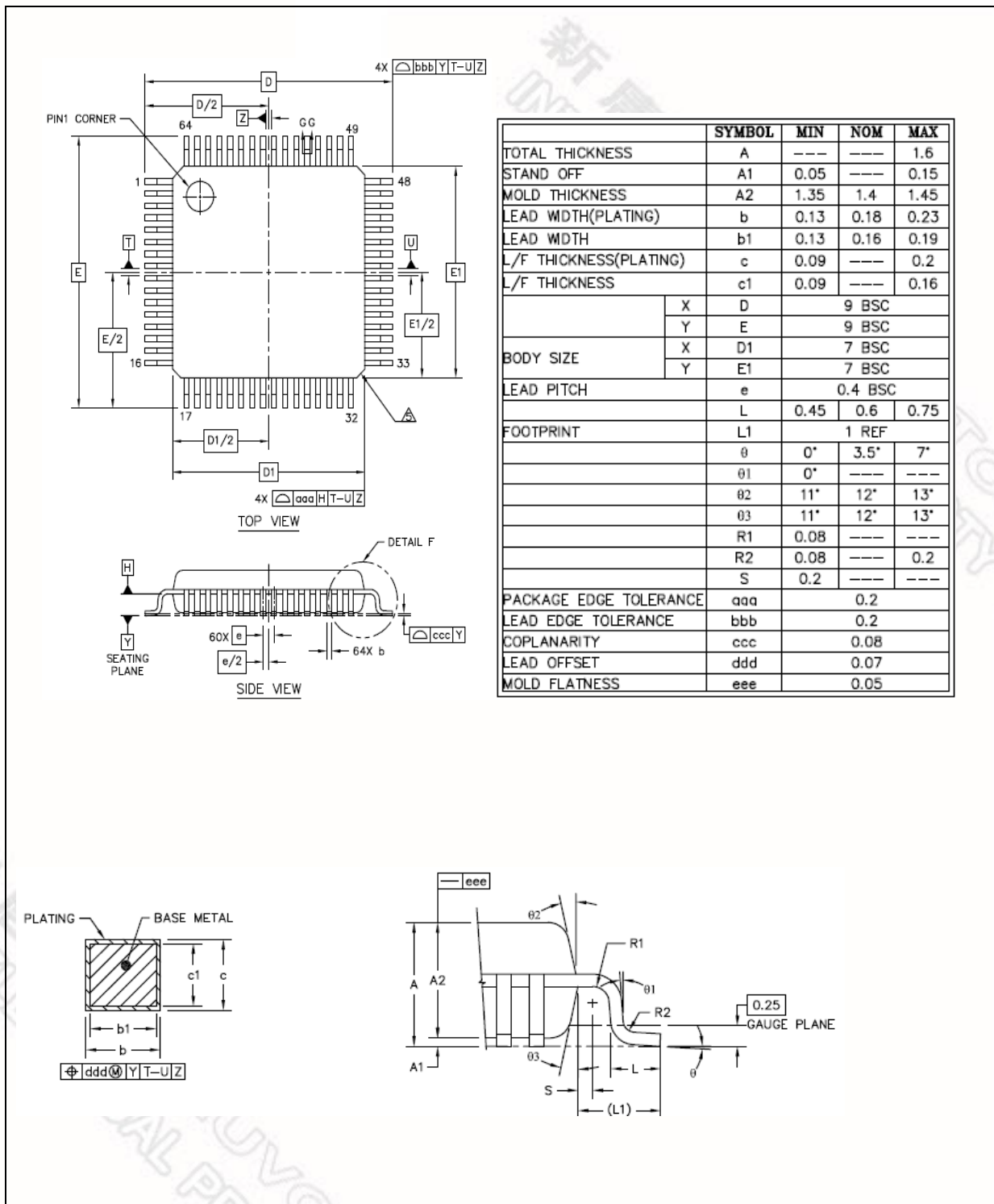
5.3 LQFP-48 (7x7x1.4mm<sup>2</sup> Footprint 2.0mm)



NUMICRO™ M058S SERIES PRODUCT BRIEF



5.4 LQFP-64 (7x7x1.4mm<sup>2</sup> Footprint 2.0mm)





## 6 REVISION HISTORY

Revision	Date	Description
1.00	Jun. 12, 2014	First version
1.01	Sep. 12, 2014	<ol style="list-style-type: none"><li>Adjusted the format of Table 3.1-1 NuMicro™ M058S Series Selection Guide.</li><li>Updated Figure 3.1-1 NuMicro™ M058S Series Selection Code.</li><li>Fixed typos and obscure descriptions.</li></ol>
1.02	Nov. 27, 2014	<ol style="list-style-type: none"><li>Fixed typos of Table 3.1-1 NuMicro™ M058S Series Selection Guide.</li></ol>



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