

MC9S12C-Family

Product Proposal **16-Bit Microcontroller**

Based on Motorola's market-leading flash technology, members of the MC9S12C-Family deliver the power and flexibility of our 16 Bit core (CPU12) family to a whole new range of cost and space sensitive, general purpose Industrial and Automotive network applications. MC9S12C-Family members are comprised of standard on-chip peripherals including a 16-bit central processing unit (CPU12), up to 128K bytes of Flash EEPROM or ROM, up to 4K bytes of RAM, an asynchronous serial communications interface (SCI), a serial peripheral interface (SPI), an 8-channel 16-bit timer module (TIM), a 6-channel 8-bit Pulse Width Modulator (PWM), an 8-channel, 10-bit analog-to-digital converter (ADC) and up to one CAN 2.0 A, B software compatible module (MSCAN12). The MC9S12C-Family has full 16-bit data paths throughout. The inclusion of a PLL circuit allows power consumption and performance to be adjusted to suit operational requirements. In addition to the I/O ports available in each module, up to 10 dedicated I/O port bits are available with Wake-Up capability from STOP or WAIT mode. The MC9S12C-Family is available in 48, 52 and 80 pin QFP packages, with the 80 Pin version pin compatible to the HCS12 B and D- Family derivatives.

The C-Family includes ROM versions MC3S12C128/96/64/32/16 of all devices which provide a further cost reduction path for applications with high volume and stable code.

Features

- **16-bit HCS12 CORE**
 - HCS12 CPU
 - MMC (memory map and interface)
 - INT (interrupt control)
 - BDM (background debug mode)
 - DBG12 (enhanced debug12 module including breakpoints and change-of-flow trace buffer)
 - Multiplexed Expansion Bus (available only in 80 pin package version)
- **16-bit HCS12 CPU**
 - Upward compatible with M68HC11 instruction set
 - Interrupt stacking and programmer's model identical to M68HC11
 - Instruction queue
 - Enhanced indexed addressing
- **Wake-up interrupt inputs**
 - Up to 10-port bits available for wake up interrupt function
- **Memory options**
 - 16K, 32K, 64K, 96K and 128K Byte Flash EEPROM (erasable in 512-byte sectors) or
 - 16K, 32K, 64K, 96K and 128K Byte ROM
 - 2K and 4K Byte RAM
- **Analog-to-Digital Converters**
 - One 8-channel module with 10-bit resolution.
 - External conversion trigger capability
- **Up to one 1M bit per second, CAN 2.0 A, B software compatible modules**
 - Five receive and three transmit buffers

This document contains information on a new product. Specifications and information herein are subject to change without notice.



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- Flexible identifier filter programmable as 2 x 32 bit, 4 x 16 bit or 8 x 8 bit
- Four separate interrupt channels for receive, transmit, error and wake-up
- Low-pass filter wake-up function
- Loop-back for self test operation

• Timer Module (TIM)

- 16-bit Counter with 7-bit Prescaler
- 8 programmable input capture or output compare channels
- Simple PWM Mode
- Modulo Reset of Timer Counter
- 16-Bit Pulse Accumulator
- External Event Counting
- Gated Time Accumulation

• 6 PWM channels

- Programmable period and duty cycle
- 8-bit 6-channel or 16-bit 3-channel
- Separate control for each pulse width and duty cycle
- Center-aligned or left-aligned outputs
- Programmable clock select logic with a wide range of frequencies
- Fast emergency shutdown input

• Serial interfaces

- One asynchronous serial communications interface (SCI)
- One synchronous serial peripheral interface (SPI)

• CRG (Clock Reset Generator Module)

- Windowed COP watchdog,
- Real time interrupt,
- Clock monitor,
- Clock generation
- Reset Generation
- Phase-locked loop clock frequency multiplier
- Limp home mode in absence of external clock
- Low power 0.5 to 16 MHz crystal oscillator reference clock

• Operation frequency

- 32MHz equivalent to 16MHz Bus Speed for single chip
- 32MHz equivalent to 16MHz Bus Speed in expanded bus modes
- Option: 50MHz equivalent to 25MHz Bus Speed

• Internal 2.5V Regulator

- Supports an input voltage range from 3.3V-10% to 5.5V
- Low power mode capability
- Includes low voltage reset (LVR) circuitry
- Includes low voltage interrupt (LVI) circuitry

• 48-Pin LQFP, 52-Pin LQFP or 80-Pin QFP package

- Up to 58 I/O lines with 5V input and drive capability
- Up to 2 dedicated 5V input only lines (IRQ, XIRQ)
- 5V A/D converter inputs and 5V I/O

• Development support

- Single-wire background debug™ mode (BDM)
- On-chip hardware breakpoints
- Enhanced DBG12 debug features

Table 1 List of MC9S12C-Family members

Flash	ROM	RAM	Package	Device	CAN	SCI	SPI	A/D	PWM	Timer	I/O
128K	0	4K	48LQFP	MC9S12C128	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC9S12C128	1	1	1	8ch	6ch	8ch	35
			80QFP	MC9S12C128	1	1	1	8ch	6ch	8ch	60
96K	0	4K	48LQFP	MC9S12C96	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC9S12C96	1	1	1	8ch	6ch	8ch	35
			80QFP	MC9S12C96	1	1	1	8ch	6ch	8ch	60
64K	0	4K	48LQFP	MC9S12C64	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC9S12C64	1	1	1	8ch	6ch	8ch	35
			80QFP	MC9S12C64	1	1	1	8ch	6ch	8ch	60
32K	0	2K	48LQFP	MC9S12C32	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC9S12C32	1	1	1	8ch	6ch	8ch	35
			80QFP	MC9S12C32	1	1	1	8ch	6ch	8ch	60
32K	0	2K	48LQFP	MC9S12GC32	0	1	1	8ch	6ch	8ch	31
			52LQFP	MC9S12GC32	0	1	1	8ch	6ch	8ch	35
16K	0	2K	48LQFP	MC9S12GC16	0	1	1	8ch	6ch	8ch	31
			52LQFP	MC9S12GC16	0	1	1	8ch	6ch	8ch	35
0	128K	4K	48LQFP	MC3S12C128	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC3S12C128	1	1	1	8ch	6ch	8ch	35
			80QFP	MC3S12C128	1	1	1	8ch	6ch	8ch	60
0	96K	4K	48LQFP	MC3S12C96	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC3S12C96	1	1	1	8ch	6ch	8ch	35
			80QFP	MC3S12C96	1	1	1	8ch	6ch	8ch	60
0	64K	4K	48LQFP	MC3S12C64	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC3S12C64	1	1	1	8ch	6ch	8ch	35
			80QFP	MC3S12C64	1	1	1	8ch	6ch	8ch	60
0	32K	2K	48LQFP	MC3S12C32	1	1	1	8ch	6ch	8ch	31
			52LQFP	MC3S12C32	1	1	1	8ch	6ch	8ch	35
			80QFP	MC3S12C32	1	1	1	8ch	6ch	8ch	60
0	32K	2K	48LQFP	MC3S12GC32	0	1	1	8ch	6ch	8ch	31
			52LQFP	MC3S12GC32	0	1	1	8ch	6ch	8ch	35
0	16K	2K	48LQFP	MC9S12GC16	0	1	1	8ch	6ch	8ch	31
			52LQFP	MC9S12GC16	0	1	1	8ch	6ch	8ch	35

• **Pin out explanations:**

— I/O is the sum of ports capable to act as digital input or output.

For 80 Pin Versions:

Port A = 8, B = 8, E = 6 + 2 input only, J = 2, M = 6, P = 8, S = 4, T = 8, PAD = 8.

12 inputs provide Interrupt capability (P= 8, J = 2, IRQ, XIRQ)

For 52 Pin Versions:

Port A = 3, B = 1, E = 2 + 2 input only, M = 6, P = 3, S = 2, T = 8, PAD = 8.

5 inputs provide Interrupt capability (P= 3, IRQ, XIRQ)

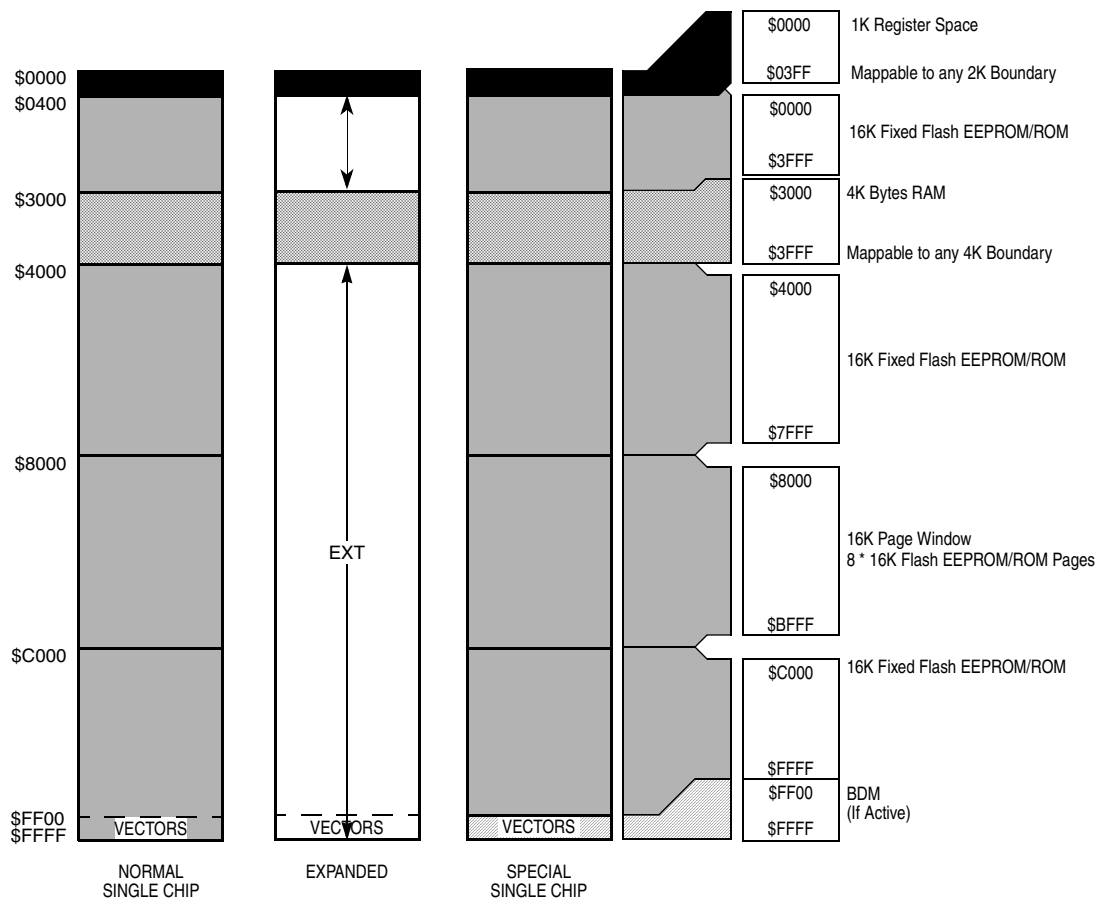
For 48 Pin Versions:

Port A = 1, B = 1, E = 2 + 2 input only, M = 6, P = 1, S = 2, T = 8, PAD = 8.

3 inputs provide Interrupt capability (P= 1, IRQ, XIRQ)



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The figure shows a useful map, which is not the map out of reset. After reset the map is:

\$0000 - \$03FF: Register Space
 \$0000 - \$0FFF: 4K RAM (only 3K visible \$0400 - \$0FFF)

Flash Erase Sector Size is 1024 Bytes

Figure 2 MCxS12C128 User Configurable Memory Map

Freescale Semiconductor, Inc.

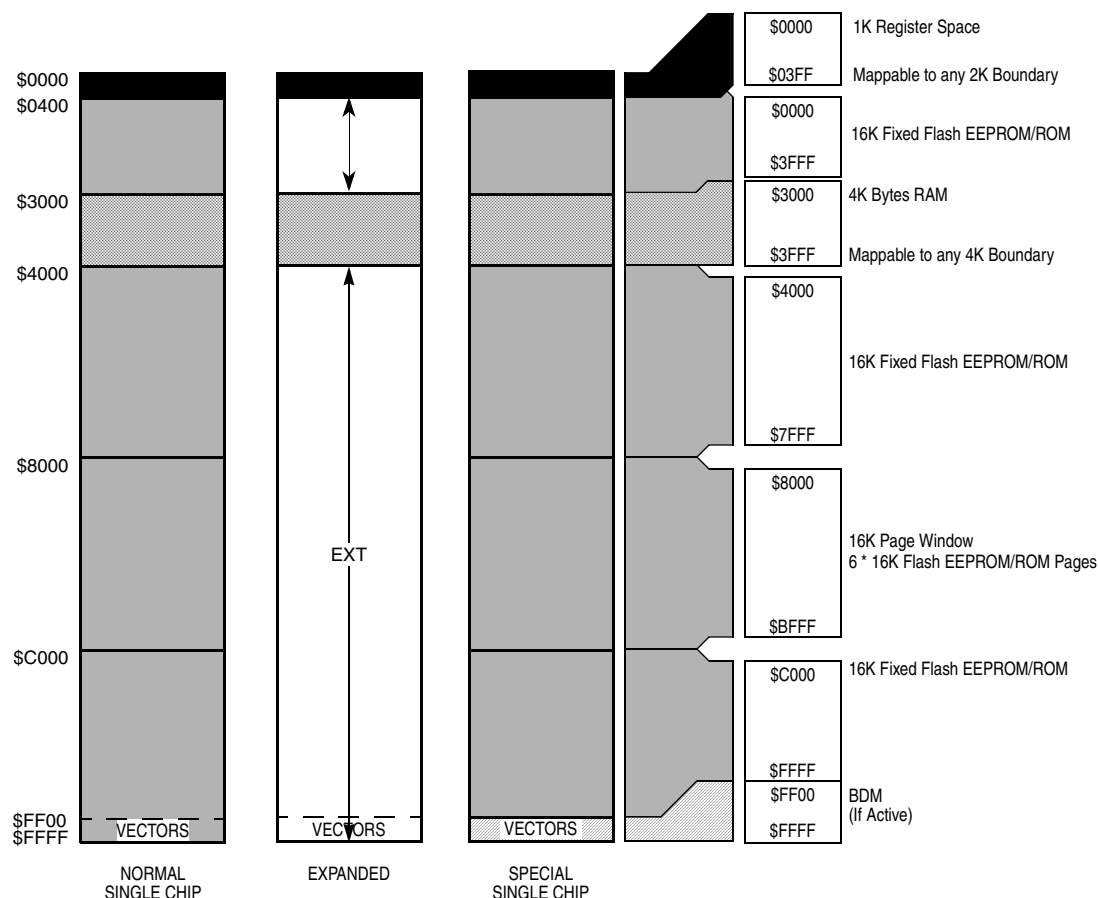
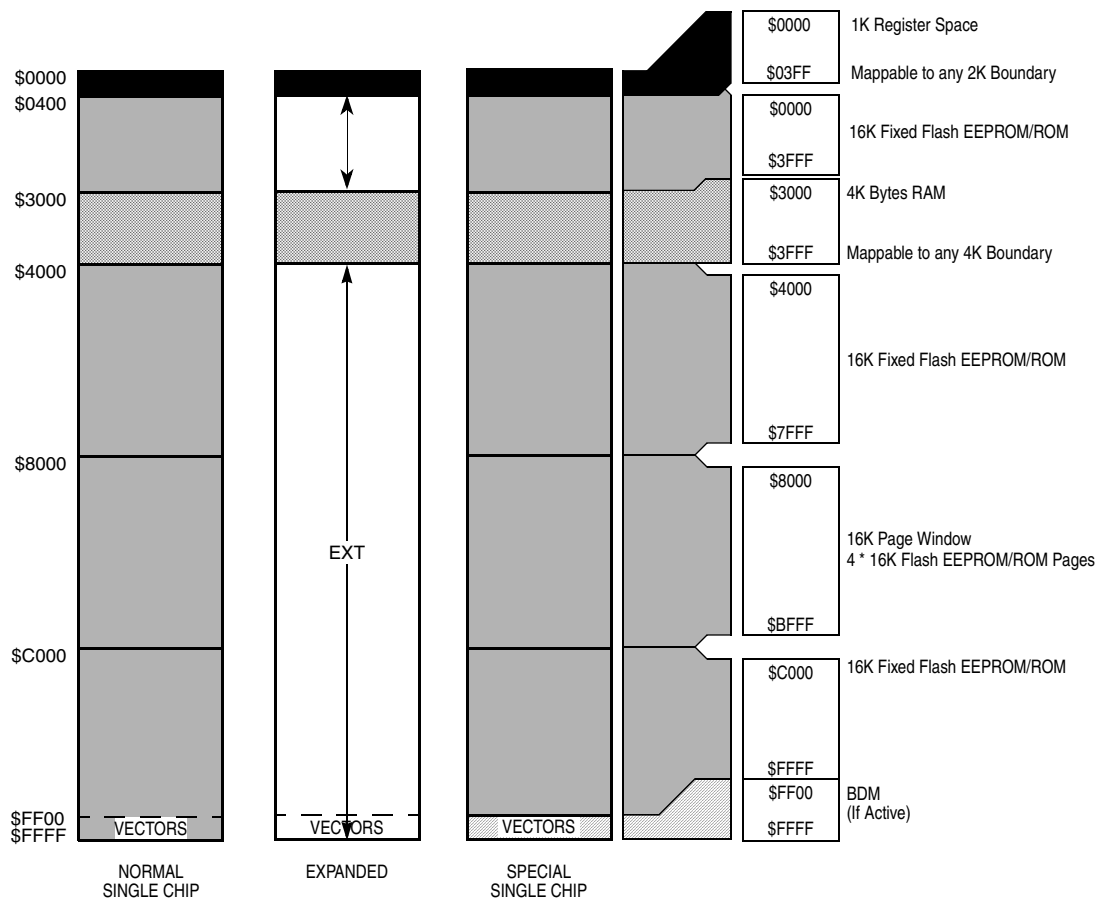


Figure 3 MCxS12C96 User Configurable Memory Map

Freescale Semiconductor, Inc.



The figure shows a useful map, which is not the map out of reset. After reset the map is:

\$0000 - \$03FF: Register Space
 \$0000 - \$0FFF: 4K RAM (only 3K visible \$0400 - \$0FFF)

Flash Erase Sector Size is 512 Bytes

Figure 4 MCxS12C64 User Configurable Memory Map

Freescale Semiconductor, Inc.

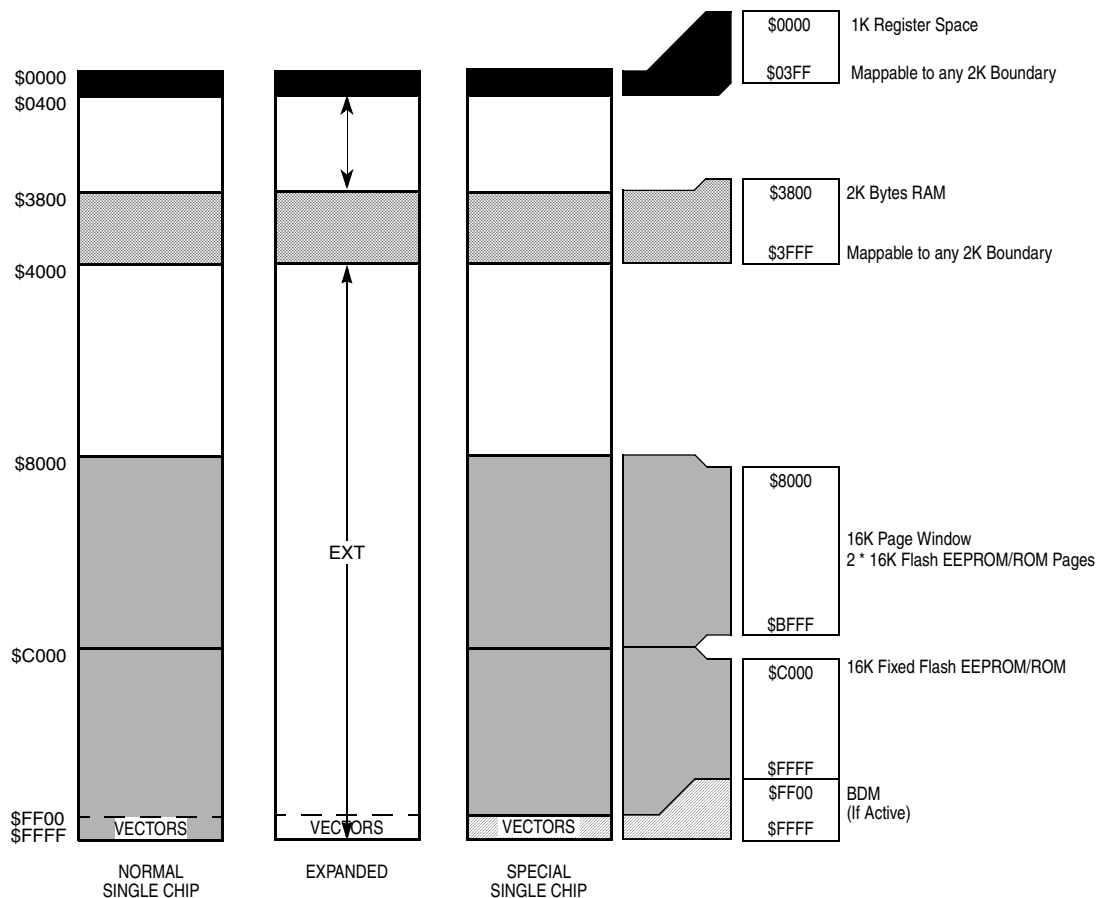


Figure 5 MCxS12C32 User Configurable Memory Map

Freescale Semiconductor, Inc.

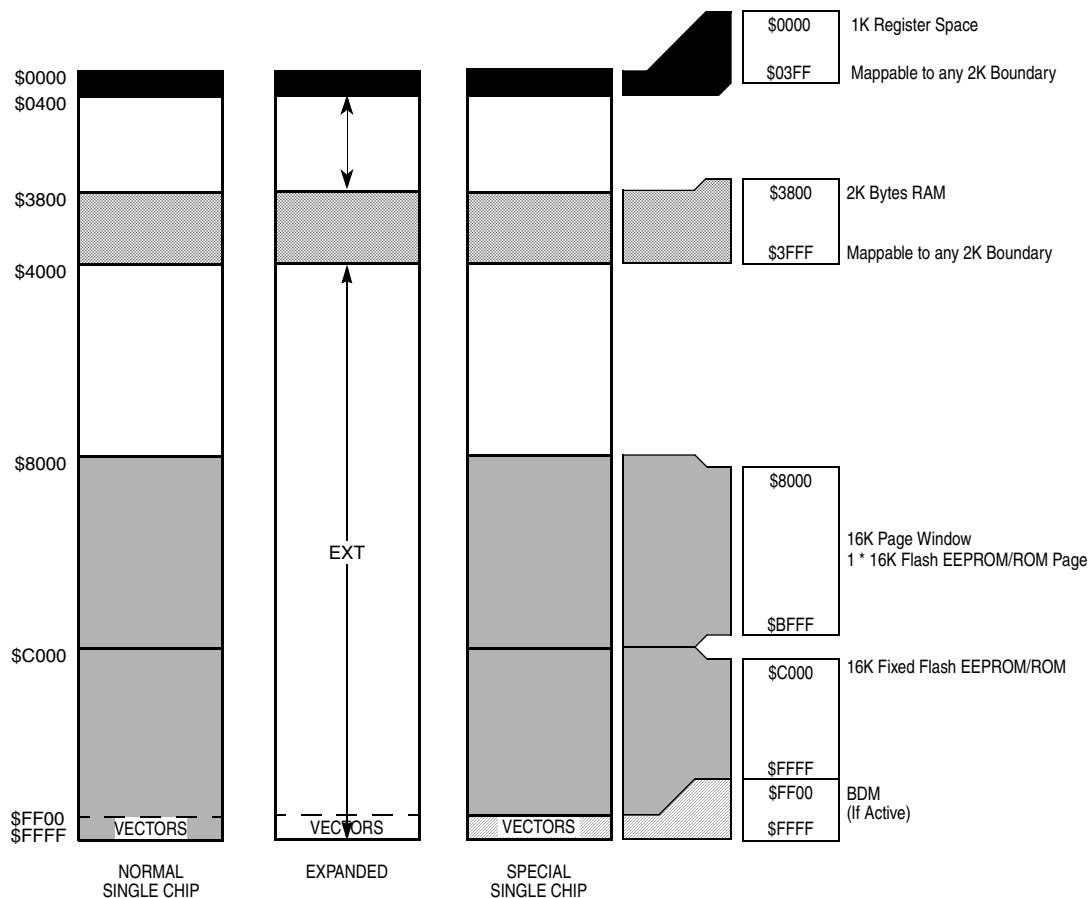
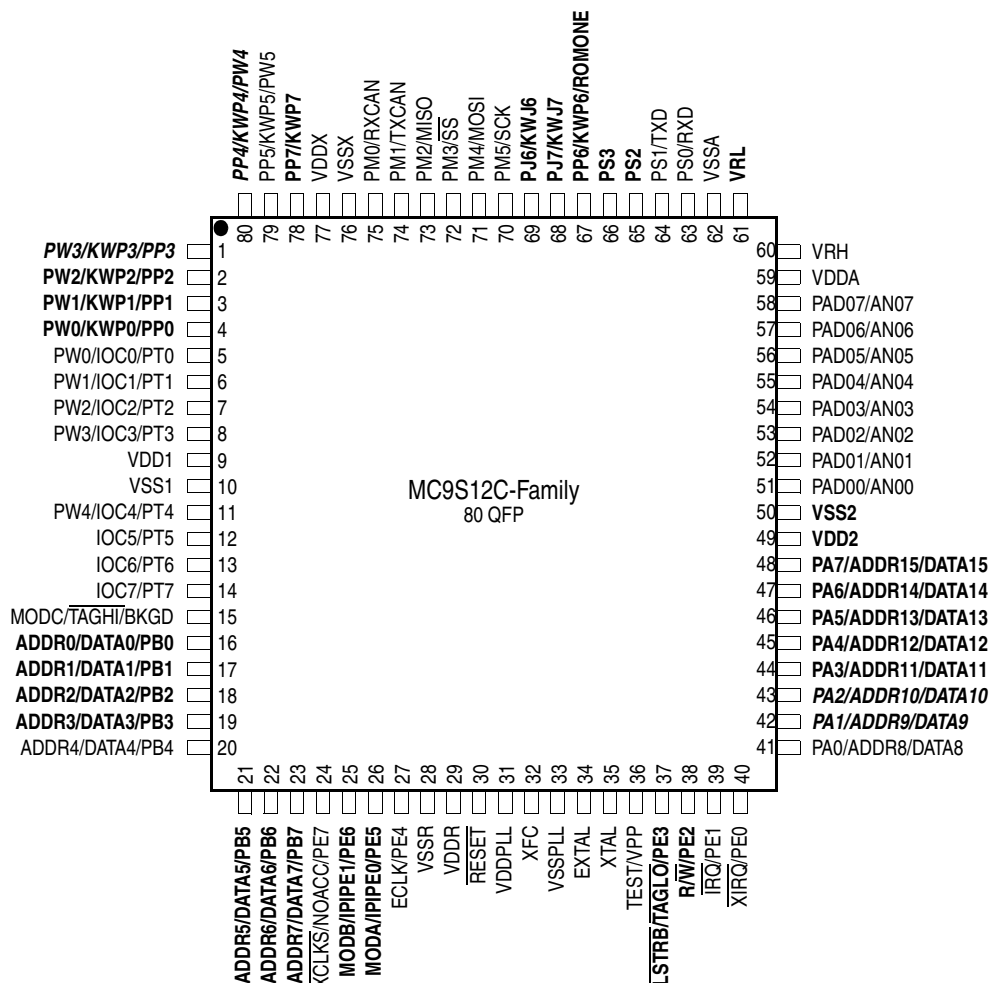


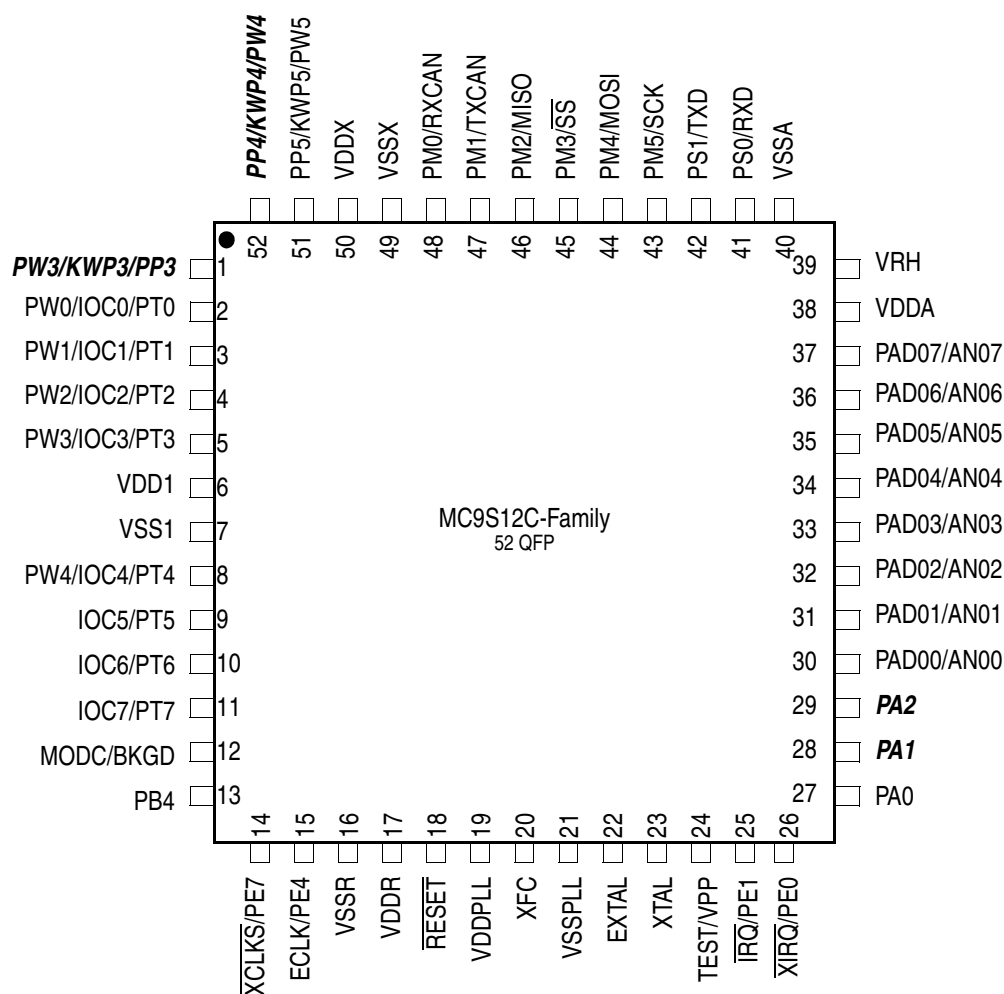
Figure 6 MCxS12C16 User Configurable Memory Map



Signals shown in **Bold** are not available on the 52 or 48 Pin Package
 Signals shown in **Bold Italic** are available in the 52, but not the 48 Pin Package

Figure 7 Pin Assignments in 80 QFP for MC9S12C-Family

!!! Pin-out is Subject to Change!!!



* Signals shown in **Bold** are not available on the 48 Pin Package

Figure 8 Pin assignments 52 QFP for MC9S12C-Family

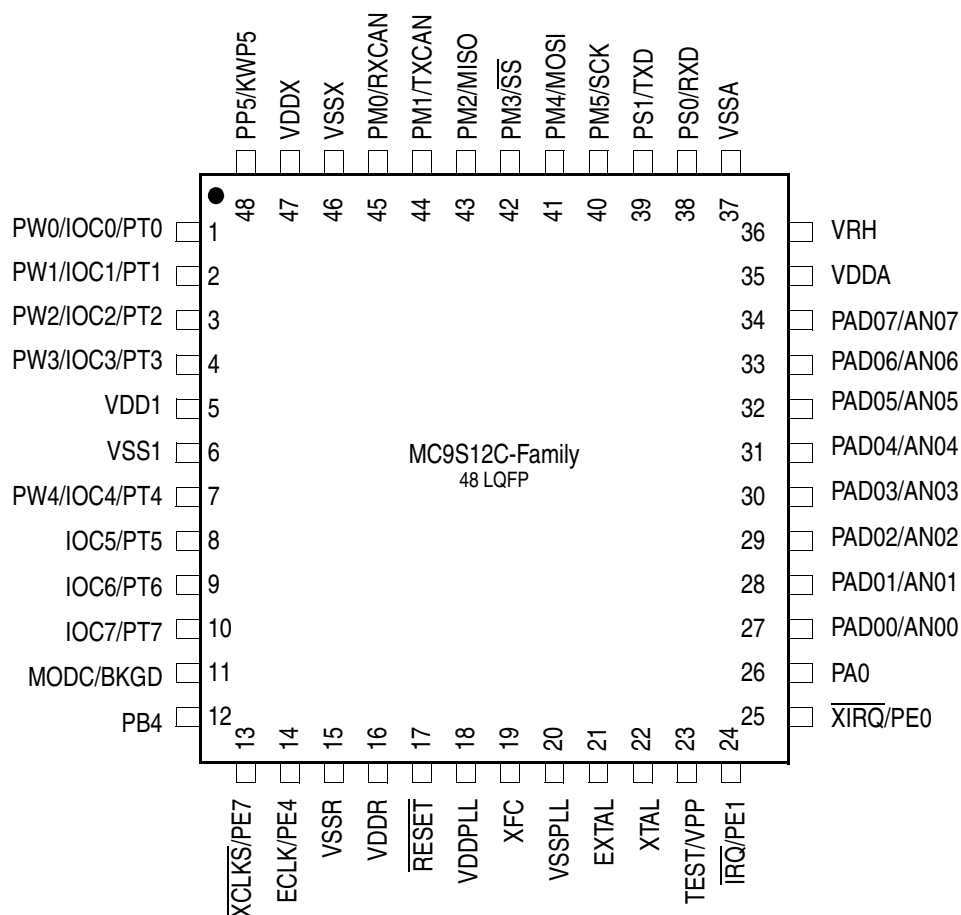


Figure 9 Pin Assignments in 48 LQFP for MC9S12C-Family

Package mechanical information

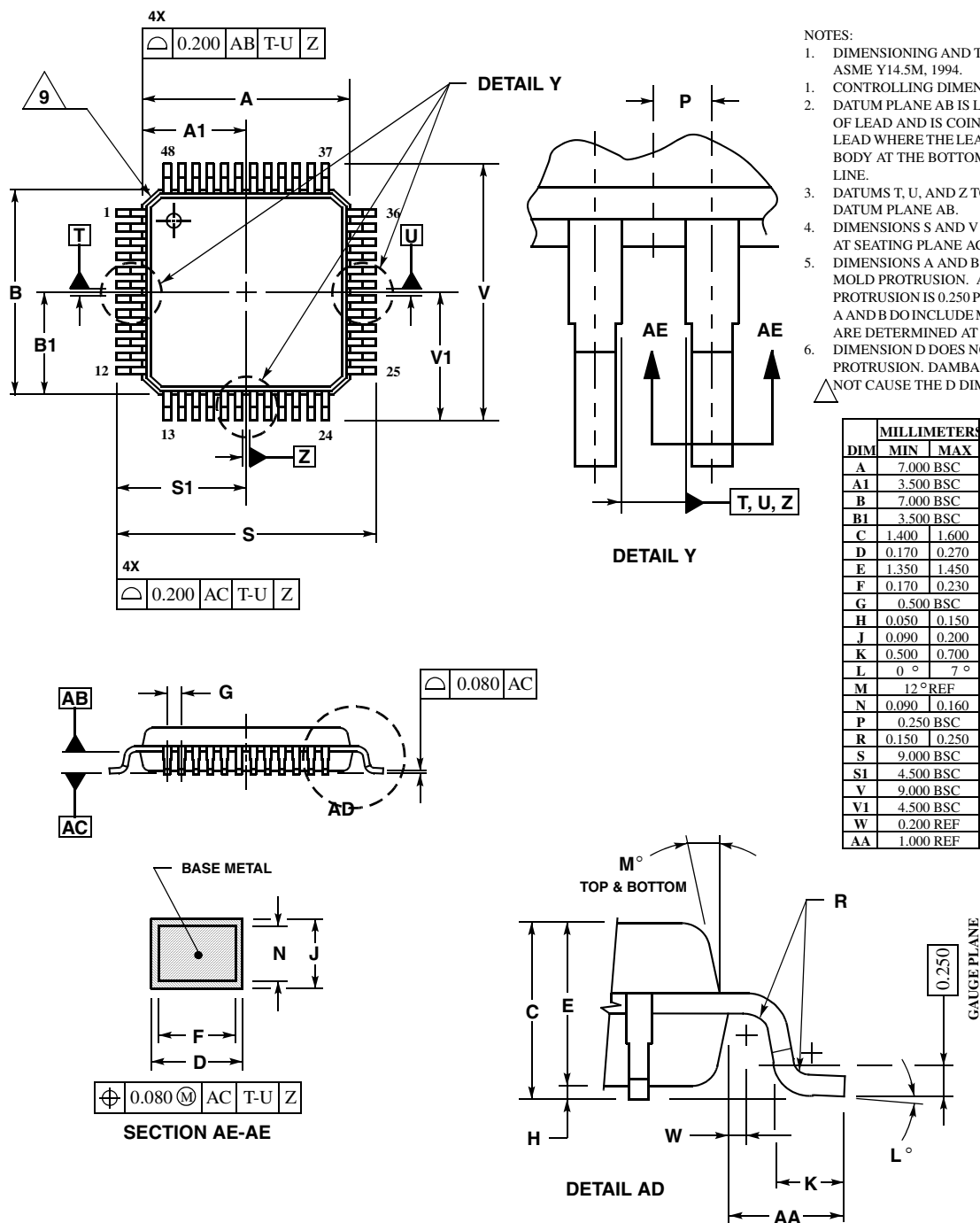


Figure 10 48-pin LQFP Mechanical Dimensions (case no.932-03 ISSUE F)

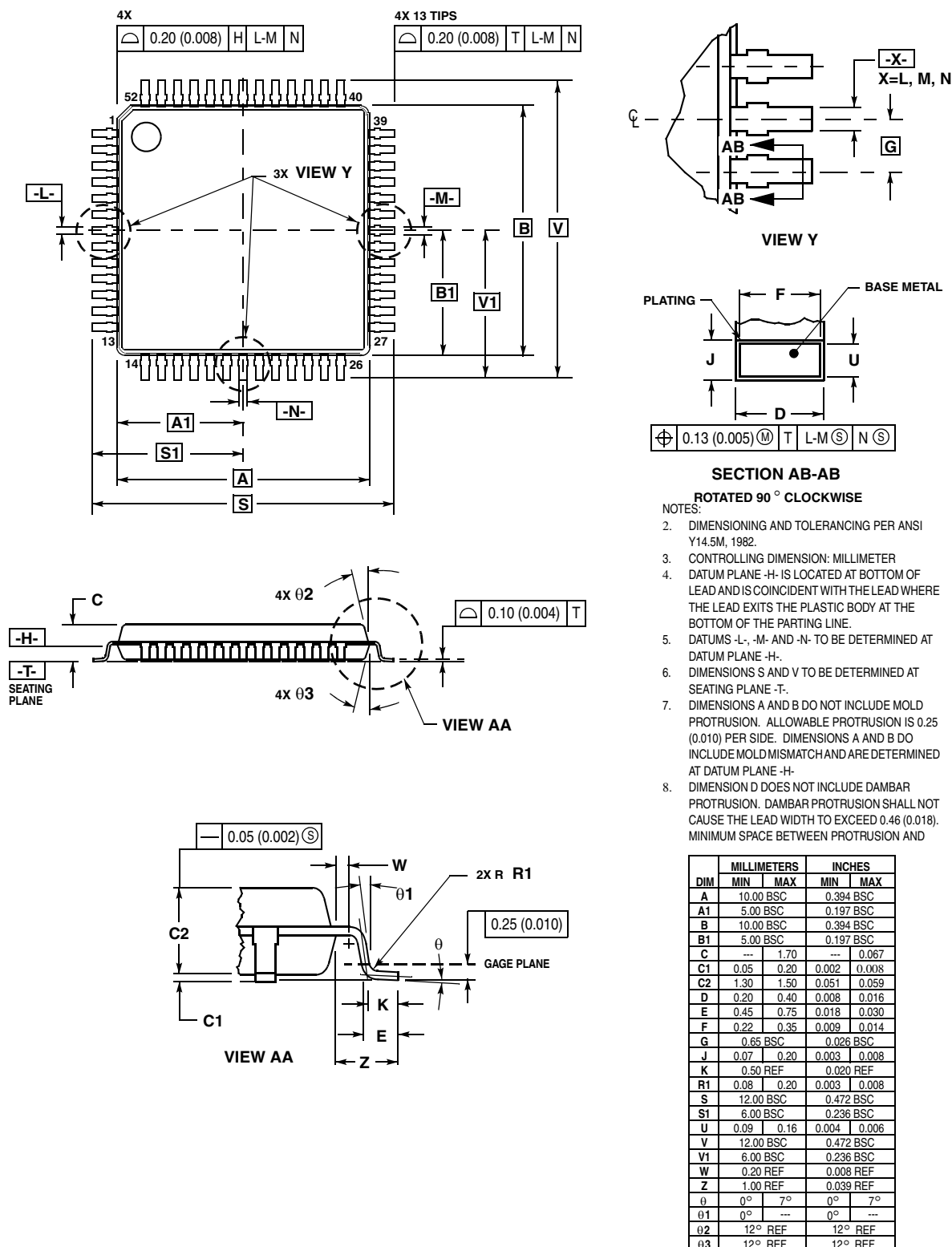


Figure 11 52-pin LQFP Mechanical Dimensions (case no. 848D-03)

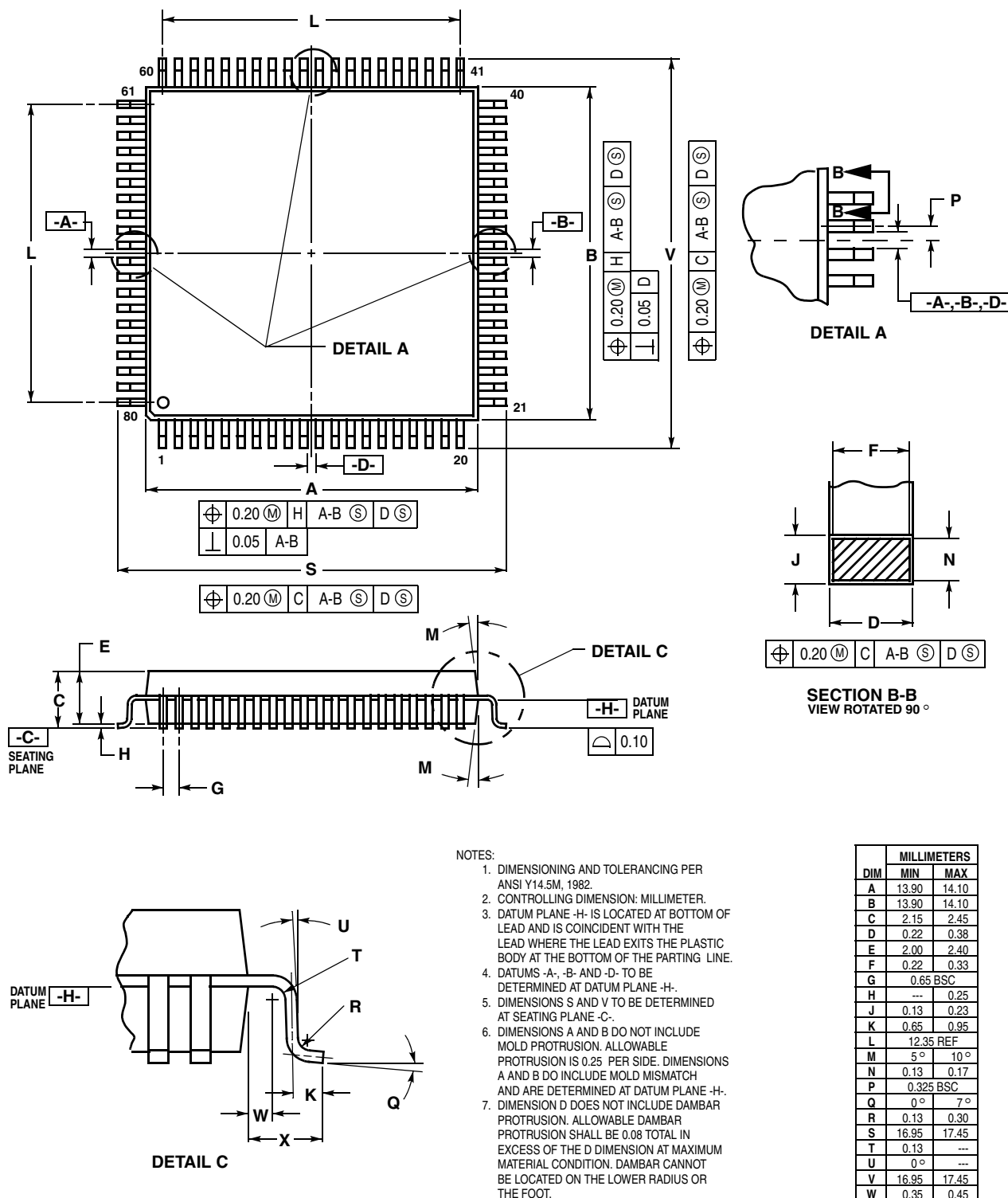


Figure 12 80-pin QFP Mechanical Dimensions (case no. 841B)

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