Product Change Notification / SYST-12WUIM914

Date:

16-Nov-2021

Product Category:

8-bit Microcontrollers

PCN Type:

Document Change

Notification Subject:

ERRATA - ATmega48A/PA/88A/PA/168A/PA/328/P Silicon Errata and Data Sheet Clarification

Affected CPNs:

SYST-12WUIM914_Affected_CPN_11162021.pdf
SYST-12WUIM914_Affected_CPN_11162021.csv

Notification Text:

SYST-12WUIM914

Microchip has released a new Product Documents for the ATmega48A/PA/88A/PA/168A/PA/328/P Silicon Errata and Data Sheet Clarification of devices. If you are using one of these devices please read the document located at ATmega48A/PA/88A/PA/168A/PA/328/P Silicon Errata and Data Sheet Clarification

Notification Status: Final

Description of Change: 1. Added data sheet clarifications:
- Ordering Information
- Package Information

Impacts to Data Sheet: None

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 16 Nov 2021

NOTE: Please be advised that this is a change to the document only the product has not been changed.

Markings to Distinguish Revised from Unrevised Devices: N/A

Attachments:

ATmega48A/ PA/ 88A/ PA/ 168A/ PA/ 328/ P Silicon Errata and Data Sheet Clarification

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Affected Catalog Part Numbers (CPN)

ATMEGA48PA-15MZ
ATMEGA48PA-15MZV01
ATMEGA48PA-15AZ
ATMEGA48PA-15AZV03
ATMEGA88PA-15AZT
ATMEGA88A-PU
ATMEGA88PA-PU
ATMEGA88PA-MMH
ATMEGA88A-MMH
ATMEGA88A-MU
ATMEGA88PA-MU
ATMEGA88PA-AU
ATMEGA88A-AU
ATMEGA88PA-AUA6
ATMEGA88PA-PN
ATMEGA88PA-MMN
ATMEGA88PA-MN
ATMEGA88PA-AN
ATMEGA88PA-MMNR
ATMEGA88PA-MNR
ATMEGA88PA-ANR
ATMEGA88PA-MMUR
ATMEGA88PA-MMHR
ATMEGA88A-MMHR
ATMEGA88A-MUR
ATMEGA88PA-MUR
ATMEGA88PA-MURA6
ATMEGA88PA-AUR
ATMEGA88PA-AURA3
ATMEGA88A-AUR
ATMEGA88PA-15MZ
ATMEGA88PA-15MZV03
ATMEGA88PA-15MZV04
ATMEGA88PA-15MZV05
ATMEGA88PA-15MZV06
ATMEGA88PA-15MZV07
ATMEGA88PA-15AZ
ATMEGA88PA-15AZV01
ATMEGA88PA-15AZV02
ATMEGA168PA-15AZT
ATMEGA168PA-15AZTV02
ATMEGA168A-PU
ATMEGA168PA-PU
ATMEGA168PA-MMH
ATMEGA168A-MMH
ATMEGA168PA-MU

ATMEGA168A-MU
ATMEGA168PA-MUA2
ATMEGA168PA-AU
ATMEGA168A-AU
ATMEGA168PA-PN
ATMEGA168PA-MN
ATMEGA168PA-AN
ATMEGA168PA-MNR
ATMEGA168PA-ANR
ATMEGA168PA-MMHR
ATMEGA168A-MMHR
ATMEGA168PA-MUR
ATMEGA168A-MUR
ATMEGA168PA-MURA2
ATMEGA168PA-AUR
ATMEGA168A-AUR
ATMEGA168PA-15MZ
ATMEGA168PA-15MZV01
ATMEGA168PA-15MZV03
ATMEGA168PA-15MZV04
ATMEGA168PA-15AZ
ATMEGA328P-PU
ATMEGA328-PU
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ATMEGA328-MMH
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ATMEGA328-MU
ATMEGA328P-MUA2
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ATMEGA328P-AU
ATMEGA328P-PN
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ATMEGA328P-MNR
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ATMEGA328P-MMHR
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ATMEGA328P-15MZ
ATMEGA328P-15AZ
ATMEGA48A-PU
ATMEGA48PA-PU
ATMEGA48PA-MMH
ATMEGA48A-MMH
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ATMEGA48PA-MU
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ATMEGA48PA-AU
ATMEGA48PA-PN
ATMEGA48PA-MMN
ATMEGA48PA-MN
ATMEGA48PA-AN
ATMEGA48PA-MMNR
ATMEGA48PA-MNR
ATMEGA48PA-ANR
ATMEGA48PA-MMHR
ATMEGA48A-MMHR
ATMEGA48A-MUR
ATMEGA48PA-MUR
ATMEGA48A-AUR
ATMEGA48PA-AUR
ATMEGA48PA-AURB0

ATmega48A/PA/88A/PA/168A/PA/328/P

Silicon Errata and Data Sheet Clarifications

Introduction

The ATmega48A/PA/88A/PA/168A/PA/328/P devices you have received conform functionally to the current device data sheet (www.microchip.com/DS40002061), except for the anomalies described in this document. The erratas described in this document will likely be addressed in future revisions of the ATmega48A/PA/88A/PA/168A/PA/328/P devices.

Note:

- This document summarizes all the silicon errata issues from all revisions of silicon, previous as well as current.

1. Silicon Issue Summary

Legend

- Erratum is not applicable.

X Erratum is applicable.

Peripheral	Short Description	Valid for Silicon Revision								
		ATmega48A/PA		ATmega88A/PA		ATmega168A/PA		ATmega328/P		
		Rev. D (1)	Rev. E	Rev. F (1)	Rev. G	Rev. E (1)	Rev. L	Rev. A	Rev. B	Rev. D
System Clock and Clock Options	2.2.1. Unstable 32 kHz Oscillator	-	-	-	-	-	-	X	X	-
TWI	2.3.1. TWI Data Setup Time Can Be Too Short	X	X	X	X	X	X	-	-	X
Analog Comparator	2.4.1. Analog MUX Can Be Turned Off When Setting the ACME Bit	X	X	X	X	X	X	X	X	X

Note:

1. This revision is the initial release of the silicon.

The following silicon revisions were never released to production:

- ATmega168A/PA
  - Rev. F-K
- ATmega328/P
  - Rev. C

2. Silicon Errata Issues

2.1 Errata Details

-	Erratum is not applicable.
X	Erratum is applicable.

2.2 System Clock and Clock Options

2.2.1 Unstable 32 kHz Oscillator

The 32 kHz oscillator does not work as a system clock and if it used as an asynchronous timer, it is inaccurate.

Work around

None.

Affected Silicon Revisions

ATmega48A/PA	
Rev. D	Rev. E
-	-

ATmega88A/PA	
Rev. F	Rev. G
-	-

ATmega168A/PA	
Rev. E	Rev. L
-	-

ATmega328/P		
Rev. A	Rev. B	Rev. D
X	X	-

2.3 TWI - Two-Wire Interface

2.3.1 TWI Data Setup Time Can Be Too Short

When running the device as a TWI slave with a system clock above 2 MHz, the data setup time for the first bit after ACK may, in some cases, be too short. This may cause a false start or stop condition on the TWI line.

Work around

Insert a delay between setting TWDR and TWCR.

Affected Silicon Revisions

ATmega48A/PA	
Rev. D	Rev. E
X	X

ATmega88A/PA	
Rev. F	Rev. G
X	X

ATmega168A/PA	
Rev. E	Rev. L
X	X

ATmega328/P		
Rev. A	Rev. B	Rev. D
-	-	X

2.4 AC - Analog Comparator

2.4.1 Analog MUX Can Be Turned Off When Setting the ACME Bit

If the ACME (Analog Comparator Multiplexer Enabled) bit in ADCSRB is set while MUX3 in ADMUX is '1' (ADMUX[3:0]=1xxx), all MUXs are turned off until the ACME bit is cleared.

Work around

Clear the MUX3 bit before setting the ACME bit.

Affected Silicon Revisions

ATmega48A/PA	
Rev. D	Rev. E
X	X

ATmega88A/PA	
Rev. F	Rev. G
X	X

ATmega168A/PA	
Rev. E	Rev. L
X	X

ATmega328/P		
Rev. A	Rev. B	Rev. D
X	X	X

3. Data Sheet Clarifications

The following typographic corrections and clarifications are to be noted for the latest version of the device data sheet (www.microchip.com/DS40002061).

Note: Corrections are shown in **bold**. Where possible, the original bold text formatting has been removed for clarity.

3.1 Ordering Information

A clarification has been made to tables titled 'Package Type' for all devices documented in the data sheet:

- A note to the 32M1-A row was added informing that the package type can be delivered in two different styles

Package Type	
32A	32-lead, (1.0 mm) Plastic Thin Quad Flat Package (TQFP)
28M1	28-pad, 4 x 4 x 1.0 body, Lead Pitch 0.45 mm Very Thin Plastic Quad Flat No-Lead (VQFN)
32M1-A(1)	32-pad, 5 x 5 x 1.0 body, Lead Pitch 0.50 mm Thin Plastic Quad Flat No-Lead (VQFN)
28P3	28-lead, 0.300" Wide, Skinny Plastic Dual Inline Package (SPDIP)

1. **This package type can be delivered with two different styles with reference numbers 'C04-21400' (punched) and 'C04-21395' (sawn) as shown in section 3.2.1 - 32M1-A. For PCB layouts, it is recommended to take both *recommended land patterns* into consideration.**

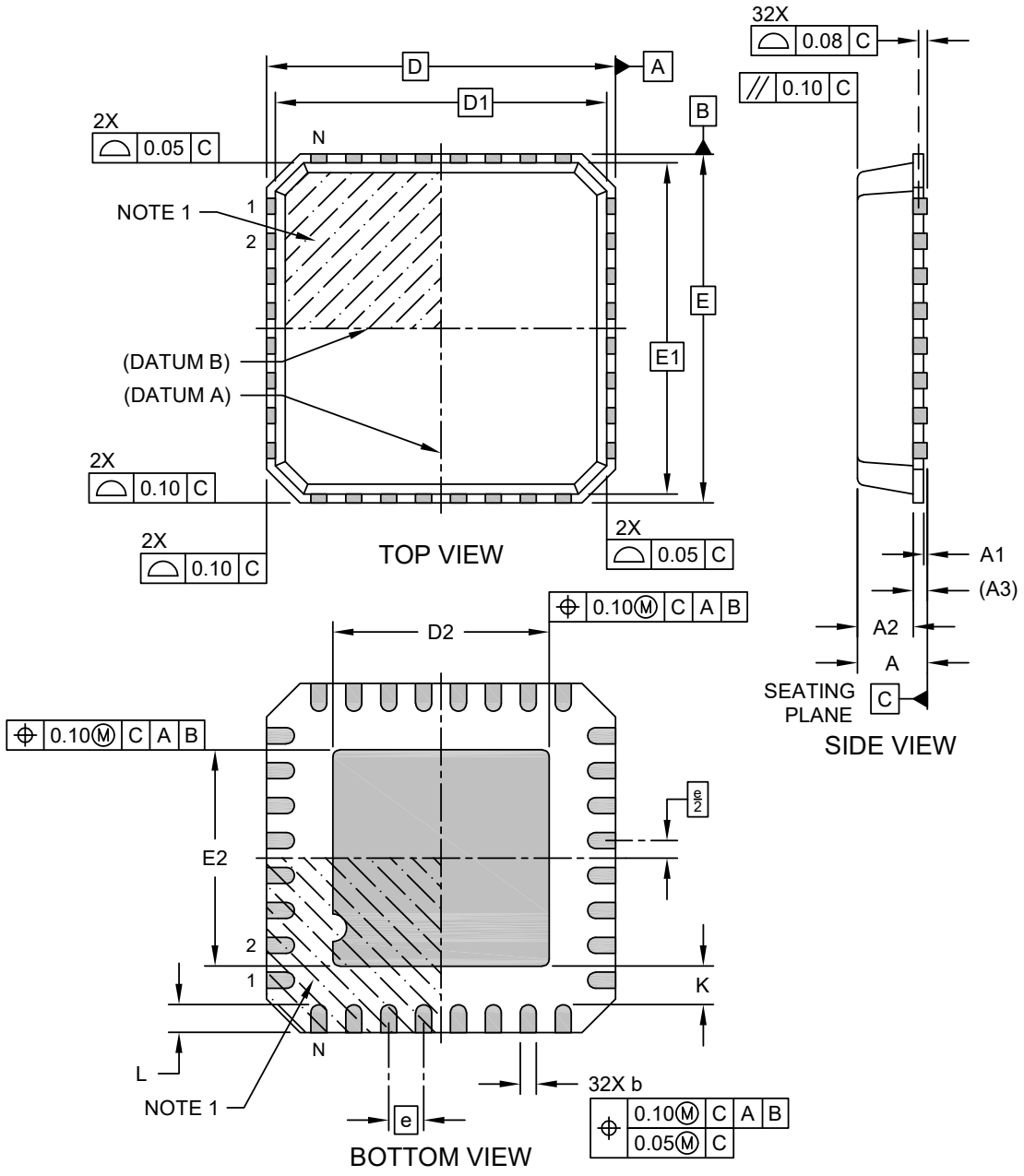
3.2 Package Information

A clarification about the other package style available for package type 32M1-A has been added to the 32M1-A section.

3.2.1 32M1-A

32-Lead Thin Plastic Quad Flat, No Lead Package (S4B) - 5x5 mm Body [VQFN] Punch Singulated; 3.10x3.10 mm Exposed Pad

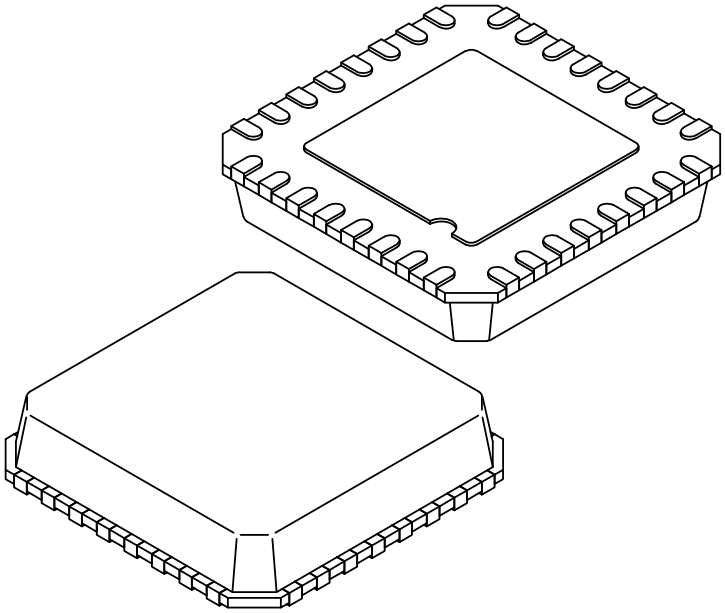
Note:	For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-21400 Rev B Sheet 1 of 2

32-Lead Thin Plastic Quad Flat, No Lead Package (S4B) - 5x5 mm Body [VQFN] Punch Singulated; 3.10x3.10 mm Exposed Pad

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		32	
Pitch	e		0.50 BSC	
Overall Height	A	0.80	0.85	1.00
Standoff	A1	0.00	0.02	0.05
Mold Cap Thickness	A2	-	0.65	0.70
Terminal Thickness	A3		0.20 REF	
Overall Length	D		5.00 BSC	
Mold Cap Length	D1		4.75 BSC	
Exposed Pad Length	D2	2.95	3.10	3.25
Overall Width	E		5.00 BSC	
Mold Cap Width	E1		4.75 BSC	
Exposed Pad Width	E2	2.95	3.10	3.25
Terminal Width	b	0.18	0.23	0.30
Terminal Length	L	0.30	0.40	0.50
Terminal-to-Exposed-Pad	K	0.20	-	-

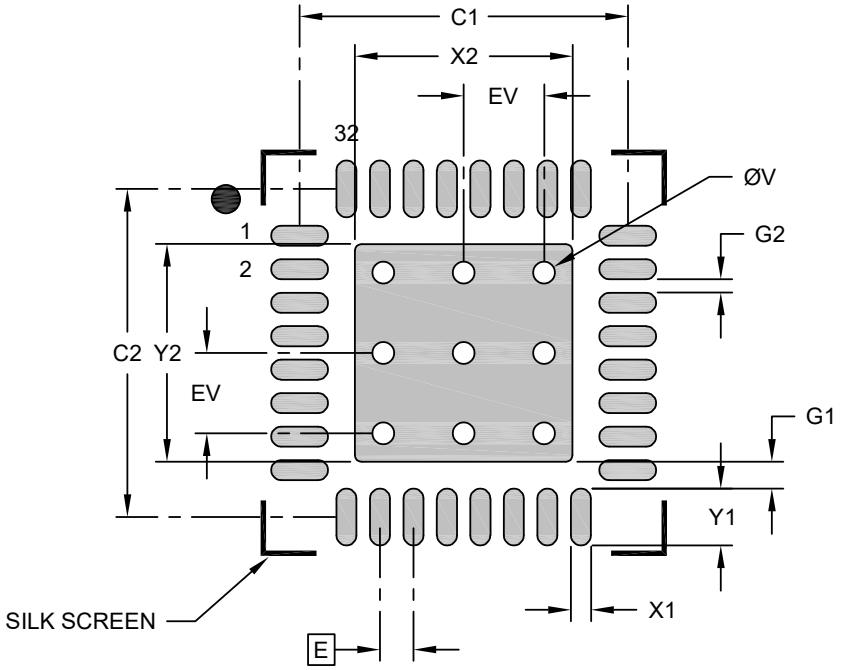
Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is punch singulated
3. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-21400 Rev B Sheet 2 of 2

32-Lead Thin Plastic Quad Flat, No Lead Package (S4B) - 5x5 mm Body [VQFN] Punch Singulated; 3.10x3.10 mm Exposed Pad

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		0.50 BSC	
Optional Center Pad Width	X2			3.25
Optional Center Pad Length	Y2			3.25
Contact Pad Spacing	C1		4.90	
Contact Pad Spacing	C2		4.90	
Contact Pad Width (X32)	X1			0.30
Contact Pad Length (X32)	Y1			0.85
Contact Pad to Center Pad (X32)	G1	0.40		
Contact Pad to Contact Pad (X28)	G2	0.20		
Thermal Via Diameter	V		0.33	
Thermal Via Pitch	EV		1.20	

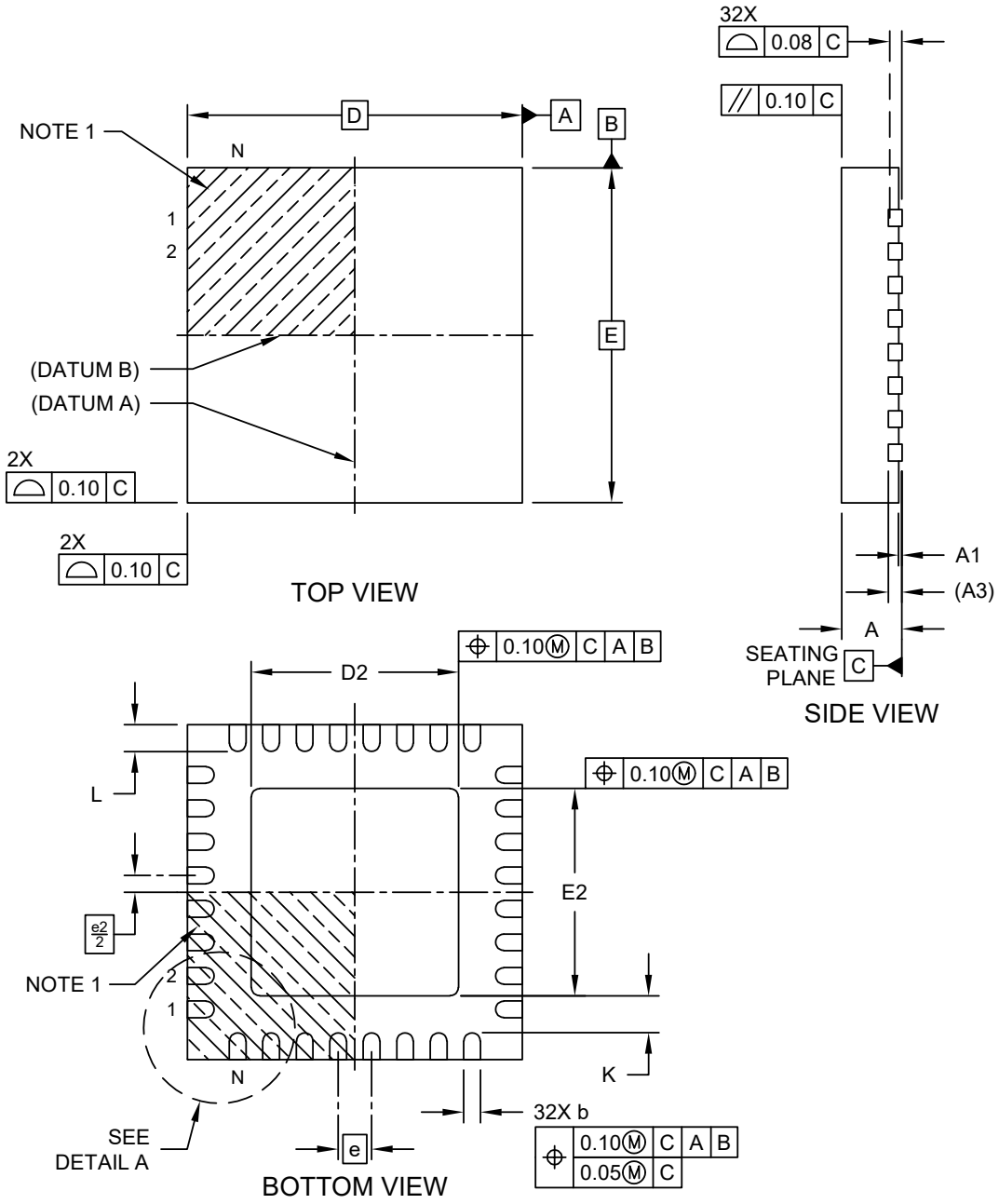
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-23400 Rev B

32-Lead Very Thin Plastic Quad Flat, No Lead Package (UBB) - 5x5x0.9 mm Body [VQFN] With 3.1x3.1 mm Exposed Pad; Atmel Legacy Global Package Code ZMF

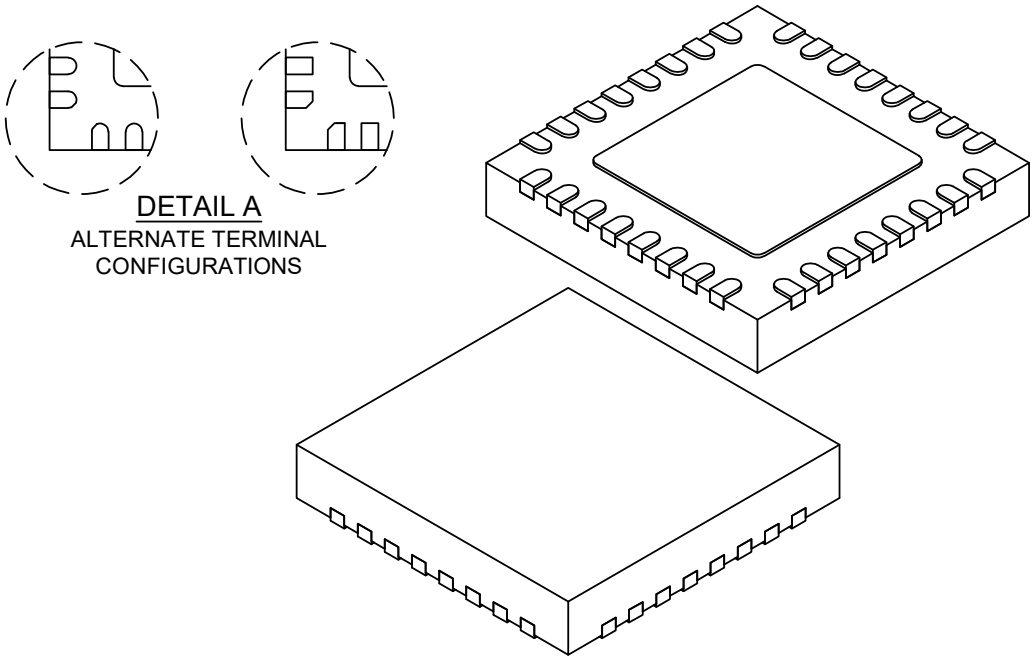
Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-21395-UBB Rev C Sheet 1 of 2

32-Lead Very Thin Plastic Quad Flat, No Lead Package (UBB) - 5x5x0.9 mm Body [VQFN] With 3.1x3.1 mm Exposed Pad; Atmel Legacy Global Package Code ZMF

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		32	
Pitch	e		0.50 BSC	
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	0.02	0.05
Terminal Thickness	A3		0.203 REF	
Overall Length	D		5.00 BSC	
Exposed Pad Length	D2	3.00	3.10	3.20
Overall Width	E		5.00 BSC	
Exposed Pad Width	E2	3.00	3.10	3.20
Terminal Width	b	0.18	0.25	0.30
Terminal Length	L	0.30	0.40	0.50
Terminal-to-Exposed-Pad	K	0.20	-	-

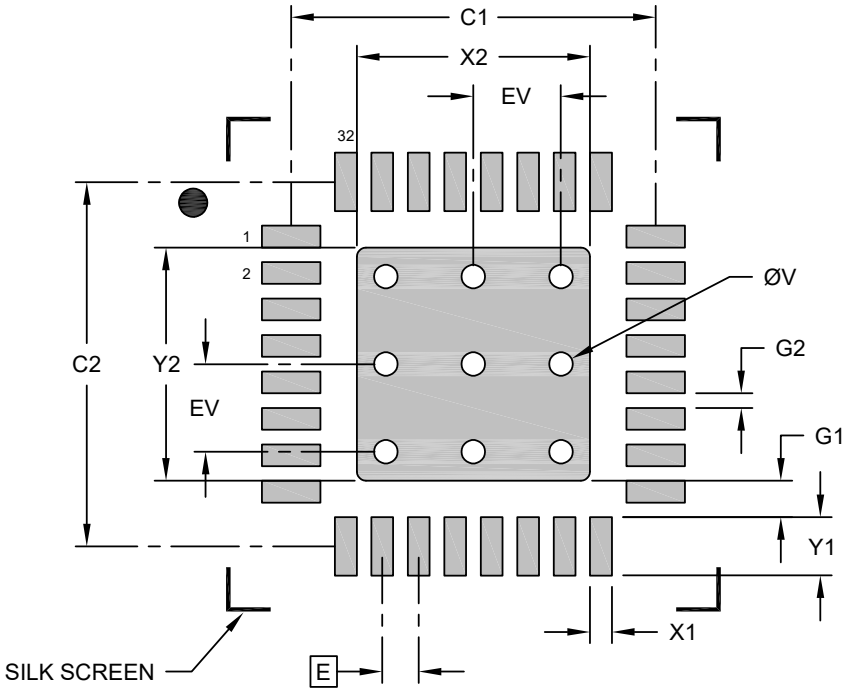
Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-21395-UBB Rev C Sheet 2 of 2

32-Lead Very Thin Plastic Quad Flat, No Lead Package (UBB) - 5x5x0.9 mm Body [VQFN] With 3.1x3.1 mm Exposed Pad; Atmel Legacy Global Package Code ZMF

Note:	For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Center Pad Width	X2			3.20
Center Pad Length	Y2			3.20
Contact Pad Spacing	C1		5.00	
Contact Pad Spacing	C2		5.00	
Contact Pad Width (X32)	X1			0.30
Contact Pad Length (X32)	Y1			0.80
Contact Pad to Center Pad (X32)	G1	0.20		
Contact Pad to Contact Pad (X28)	G2	0.20		
Thermal Via Diameter	V		0.33	
Thermal Via Pitch	EV		1.20	

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-23395-UBB Rev C

4. Document Revision History

Note: The data sheet clarification document revision is independent of the die revision and the device variant (last letter of the ordering number).

4.1 Revision History

Doc Rev.	Date	Comments
B	11/2021	Added data sheet clarifications: • Ordering Information • Package Information
A	09/2020	Initial document release. • Content moved from the data sheet and restructured to the new document template • Updated the die revision list to reflect die revisions in production

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