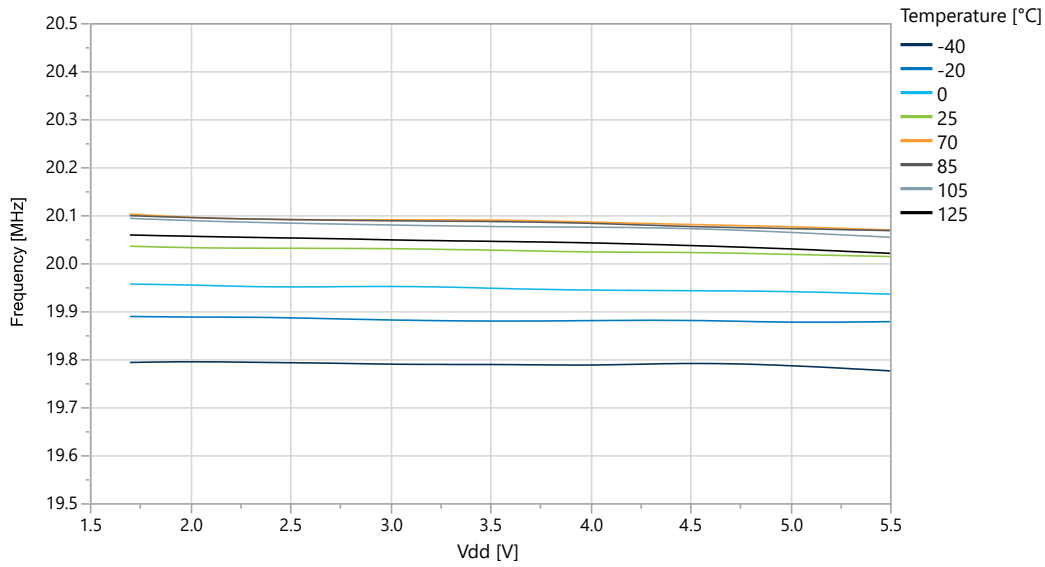


Figure 5-69. OSC20M Internal Oscillator: Frequency vs. V_{DD}



5.8 OSCULP32K Characteristics

Figure 5-70. OSCULP32K Internal Oscillator Frequency vs. Temperature

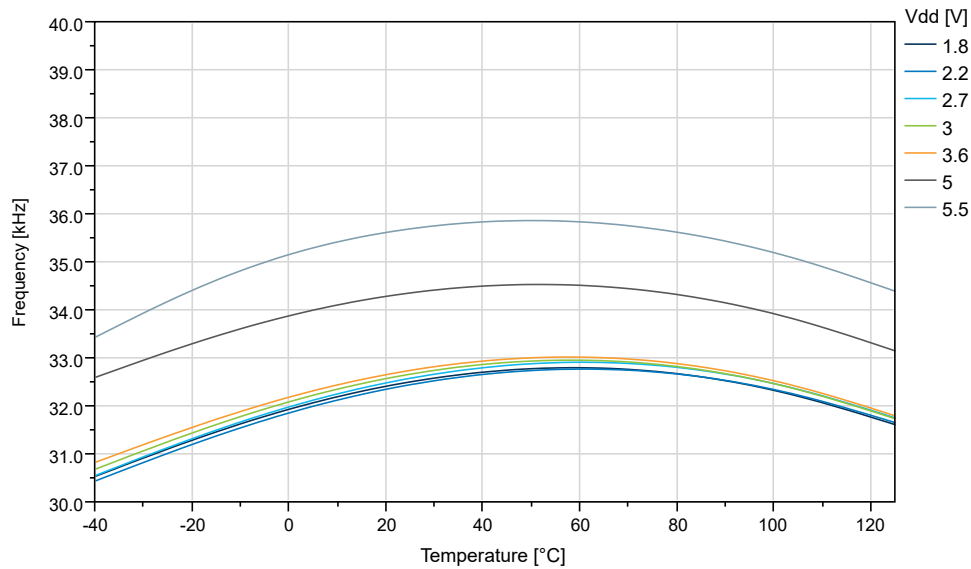
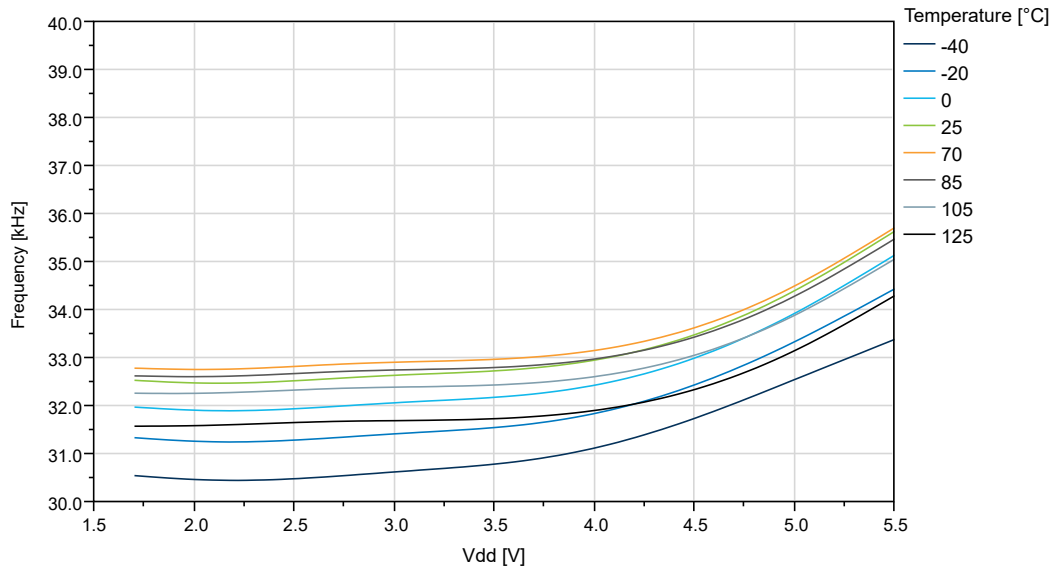


Figure 5-71. OSCULP32K Internal Oscillator Frequency vs. V_{DD}

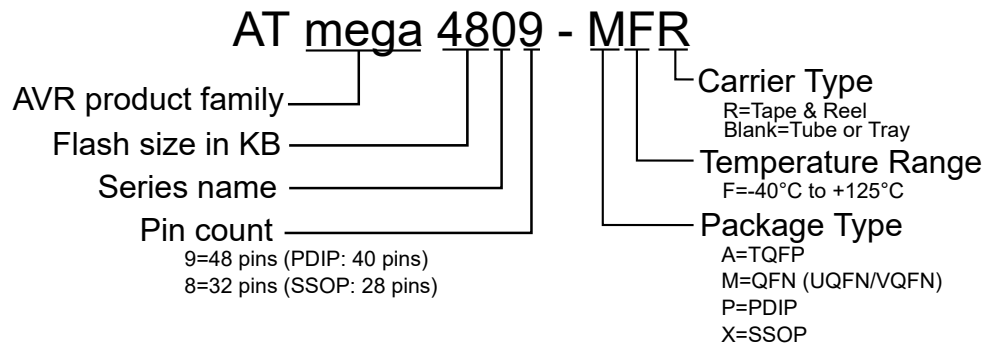


6. Ordering Information

- Available ordering options can be found by:
 - Clicking on one of the following product page links:
 - [ATmega809 Product Page](#)
 - [ATmega1609 Product Page](#)
 - [ATmega3209 Product Page](#)
 - [ATmega4809 Product Page](#)
 - Searching by product name at microchipdirect.com
 - Contacting your local sales representative

Figure 6-1. Product Identification System

To order or obtain information, for example on pricing or delivery, refer to the factory or the listed sales office.



Note: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

7. Online Package Drawings

For the most recent package drawings:

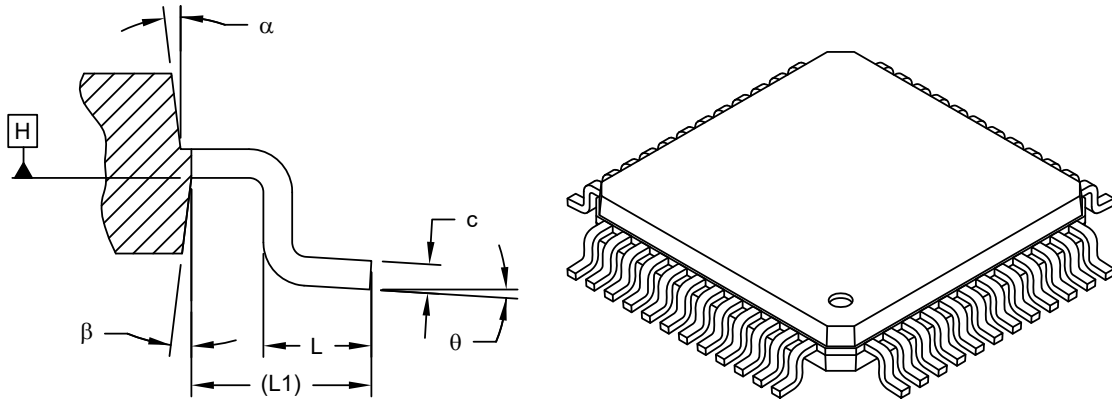
1. Go to <http://www.microchip.com/packaging>.
2. Go to the package type specific page, for example VQFN.
3. Search for either Drawing Number or Style to find the most recent package drawings.

Table 7-1. Drawing Numbers

Package Type	Drawing Number	Style
UQFN48	C04-153	MV
TQFP48	C04-300	PT

48-Lead Thin Quad Flatpack (PT) - 7x7x1.0 mm Body [TQFP]

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



SECTION A-A

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Leads	N	48		
Lead Pitch	e	0.50 BSC		
Overall Height	A	-	-	1.20
Standoff	A1	0.05	-	0.15
Molded Package Thickness	A2	0.95	1.00	1.05
Foot Length	L	0.45	0.60	0.75
Footprint	L1	1.00 REF		
Foot Angle	φ	0°	3.5°	7°
Overall Width	E	9.00 BSC		
Overall Length	D	9.00 BSC		
Molded Package Width	E1	7.00 BSC		
Molded Package Length	D1	7.00 BSC		
Lead Thickness	c	0.09	-	0.16
Lead Width	b	0.17	0.22	0.27
Mold Draft Angle Top	α	11°	12°	13°
Mold Draft Angle Bottom	β	11°	12°	13°

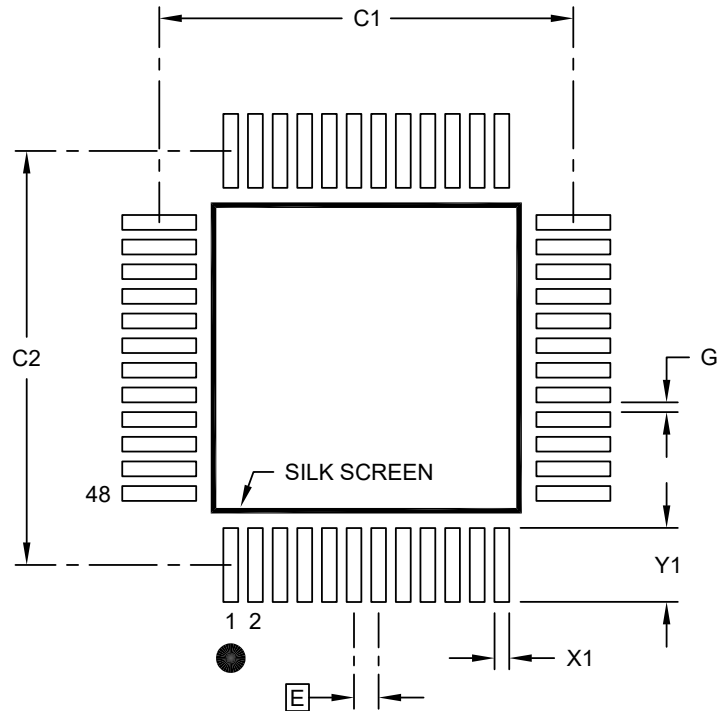
Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Chamfers at corners are optional; size may vary.
- Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25mm per side.
- 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.
- Datums **A-B** and **D** to be determined at center line between leads where leads exit plastic body at datum plane **H**

Microchip Technology Drawing C04-300-PT Rev A Sheet 2 of 2

48-Lead Thin Quad Flatpack (PT) - 7x7x1.0 mm Body [TQFP]

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



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E		0.50 BSC	
Contact Pad Spacing	C1		8.40	
Contact Pad Spacing	C2		8.40	
Contact Pad Width (X48)	X1			0.30
Contact Pad Length (X48)	Y1			1.50
Distance Between Pads	G	0.20		

Notes:

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

Microchip Technology Drawing C04-2300-PT Rev A

Table 8-1. Device and Package Maximum Weight

140	mg
-----	----

ATmega809/1609/3209/4809 – 48-pin

Package Drawings

Table 8-2. Package Characteristics

Moisture Sensitivity Level	MSL3
----------------------------	------

Table 8-3. Package Reference

JEDEC Drawing Reference	MS-026
J-STD-609 Material Code	e3

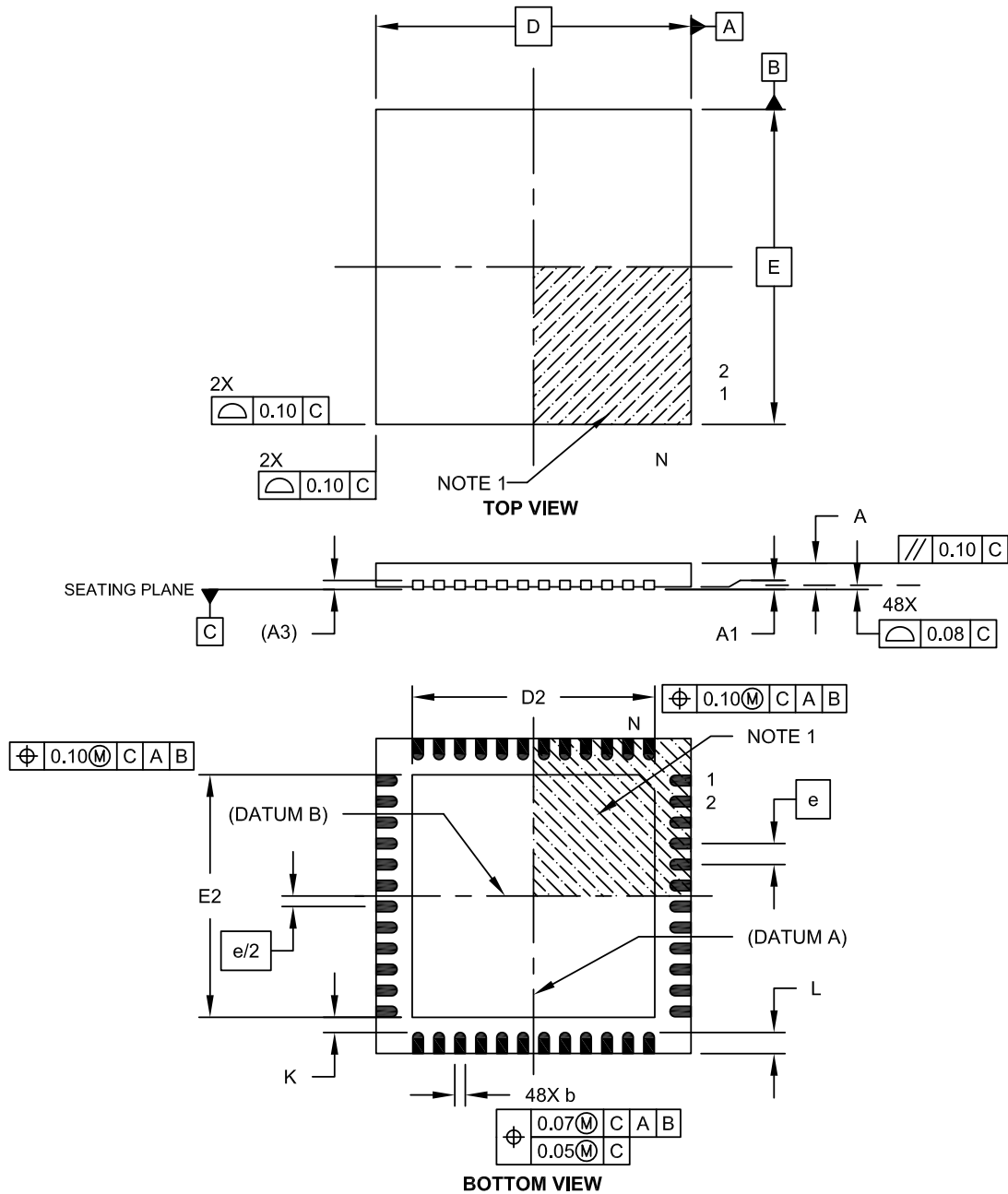
Table 8-4. Package Code

Y8X

8.2 48-Pin UQFN

48-Lead Plastic Ultra Thin Quad Flat, No Lead Package (MV) – 6x6x0.5 mm Body [UQFN]

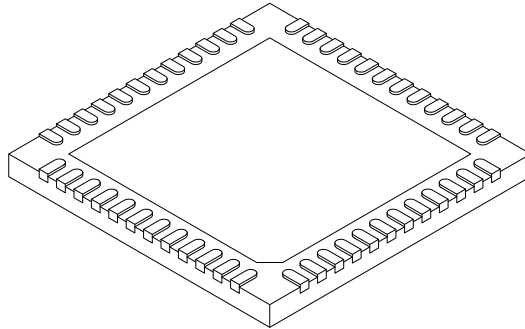
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-153A Sheet 1 of 2

48-Lead Plastic Ultra Thin Quad Flat, No Lead Package (MV) – 6x6x0.5 mm Body [UQFN]

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 Pins	N		48		
Pitch	e		0.40 BSC		
Overall Height	A		0.45	0.50	0.55
Standoff	A1		0.00	0.02	0.05
Contact Thickness	A3		0.127 REF		
Overall Width	E		6.00 BSC		
Exposed Pad Width	E2		4.45	4.60	4.75
Overall Length	D		6.00 BSC		
Exposed Pad Length	D2		4.45	4.60	4.75
Contact Width	b		0.15	0.20	0.25
Contact Length	L		0.30	0.40	0.50
Contact-to-Exposed Pad	K		0.20	-	-

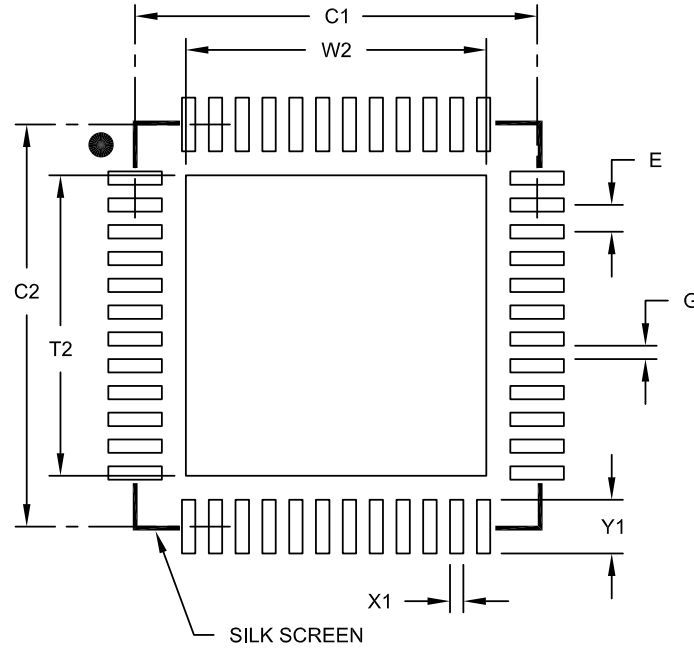
Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated.
- 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 C04-153A Sheet 2 of 2

48-Lead Ultra Thin Plastic Quad Flat, No Lead Package (MV) - 6x6 mm Body [UQFN]
With 0.40 mm Contact Length

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	0.40 BSC		
Optional Center Pad Width	W2			4.45
Optional Center Pad Length	T2			4.45
Contact Pad Spacing	C1		6.00	
Contact Pad Spacing	C2		6.00	
Contact Pad Width (X28)	X1			0.20
Contact Pad Length (X28)	Y1			0.80
Distance Between Pads	G	0.20		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2153A

Table 8-5. Device and Package Maximum Weight

TBD	mg
-----	----

ATmega809/1609/3209/4809 – 48-pin

Package Drawings

Table 8-6. Package Characteristics

Moisture Sensitivity Level	MSL1
----------------------------	------

Table 8-7. Package Reference

JEDEC Drawing Reference	MO-220
J-STD-609 Material Code	e3

Table 8-8. Package Code

R7X

9. Conventions

9.1 Memory Size and Type

Table 9-1. Memory Size and Bit Rate

Symbol	Description
KB	kilobyte ($2^{10} = 1024$)
MB	megabyte ($2^{20} = 1024 \times 1024$)
GB	gigabyte ($2^{30} = 1024 \times 1024 \times 1024$)
b	bit (binary '0' or '1')
B	byte (8 bits)
1 kbit/s	1,000 bit/s rate (not 1,024 bit/s)
1 Mbit/s	1,000,000 bit/s rate
1 Gbit/s	1,000,000,000 bit/s rate
word	16-bit

9.2 Frequency and Time

Table 9-2. Frequency and Time

Symbol	Description
kHz	1 kHz = 10^3 Hz = 1,000 Hz
KHz	1 KHz = 1,024 Hz, 32 KHz = 32,768 Hz
MHz	1 MHz = 10^6 Hz = 1,000,000 Hz
GHz	1 GHz = 10^9 Hz = 1,000,000,000 Hz
ms	1 ms = 10^{-3} s = 0.001s
μs	1 μs = 10^{-6} s = 0.000001s
ns	1 ns = 10^{-9} s = 0.000000001s

10. Data Sheet Revision History

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

10.1 Rev.B - 03/2019

Chapter	Changes
Entire Document	• Added ATmega809/ATmega1609 • Updated <i>Electrical Characteristics</i> section and <i>Typical Characteristics</i> section • Added package drawing for UQFN • Updated package drawing for TQFP

10.2 Rev. A - 02/2018

Initial release.

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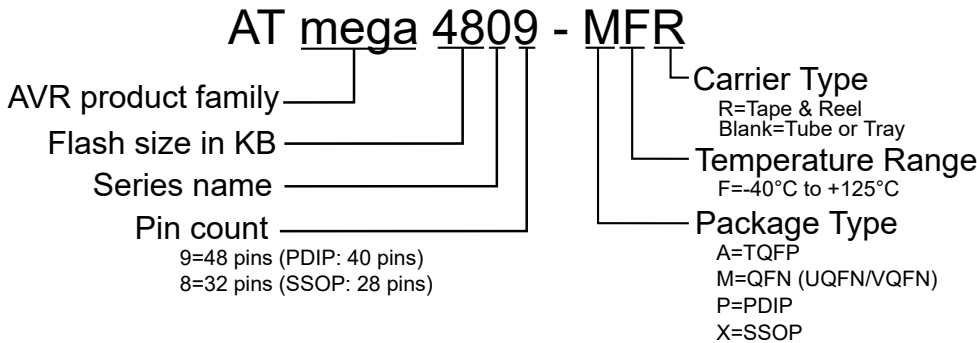
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