Pentium

Pentium

Produced	From 1993 to current
Common manufacturer(s)	• Intel
Max. CPU clock rate	60 MHz to 3.8 GHz
FSB speeds	60 MHz to 1333 MT/s
Min. feature size	0.8 μm to 32 nm
Instruction set	x86, x86-64
Microarchitecture	P5 P6 NetBurst Core Nehalem Sandy Bridge
Cores	1-2
Predecessor	Intel 80486
Socket(s)	• Various
Core name(s)	• Various

Pentium is a brand used for a series of x86-compatible microprocessors produced by Intel. In its most current form, a Pentium processor is a consumer-level product with a two-star rating[1], above the low-end Atom and Celeron products but below the faster Core i3, i5 and i7 lines as well as the high-end Xeon processors.

The name Pentium is originally derived from the Greek word *pente* (πέντε), meaning 'five' (as the series was Intel's 5th generation microarchitecture, the P5), and the Latin ending *-ium*. The current Pentium processors only share the name but are in fact based on the same processor chips that are used in the Intel Core but are typically used with a lower clock frequency, a partially disabled L3 cache and some of the advanced features such as Hyper-threading and Virtualization disabled.

Overview

During development Intel generally identifies processors with codenames, such as *Prescott, Willamette, Coppermine, Katmai, Klamath* or *Deschutes*. These usually become widely known,[2] even after the processors are given official names on launch.

Brand	Microarchitecture	Desktop	Laptop	Server
Pentium **Pentium OverDrive**	P5	P5 (0.8 μm) P54C (0.6 μm) P54CS (0.35 μm)		
Pentium MMX **Pentium OverDrive MMX**		P55C (0.35 μm) Tillamook (0.25 μm)		
Pentium Pro	P6			P6 (0.5 μm) P6 (0.35 μm)
Pentium II **Pentium II Xeon** **Pentium II OverDrive** **Mobile Pentium II**		Klamath (0.35 μm) Deschutes (0.25 μm)	Tonga (0.25 μm) Dixon (0.25 μm)	Drake (0.25 μm)
Pentium III **Pentium III Xeon** **Mobile Pentium III** **Pentium III M**		Katmai (0.25 μm) Coppermine (180 nm) Tualatin (130 nm)	Coppermine (180 nm) Tualatin(130 nm)	Tanner (0.25 μm) Cascades (180 nm)
Pentium 4 **Pentium 4 Extreme Edition**	NetBurst	Willamette (180 nm) Northwood (130 nm) Gallatin (130 nm) Prescott-2M (90 nm) Prescott (90 nm) Cedar Mill (65 nm)	Northwood (130 nm) Prescott (90 nm)	Rebranded as Xeon
Pentium D **Pentium Extreme Edition**		Smithfield (90 nm) Presler (65 nm)		
Pentium M	P6 based		Banias (90 nm) Dothan (65 nm)	
Pentium Dual-Core			Yonah (65 nm)	
	Core	Allendale (65 nm) Wolfdale-3M (45 nm)	Merom-2M (65 nm)	
Pentium		Wolfdale-3M (45 nm)	Penryn-3M (45 nm)	
	Nehalem	Clarkdale (32 nm)	Arrandale" (32 nm)	
	Sandy Bridge	Sandy Bridge (32 nm)		

History

The original Pentium branded CPUs were expected to be named 586 or i586, to follow the naming convention of previous generations (286, i386, i486). However, as the company wanted to prevent their competitors from branding their processors with similar names, as AMD had done with their Am486, Intel attempted to file a trademark on the name in the United States, only to be denied because a series of numbers was not considered distinct.

Following Intel's previous series of 8086, 80186, 80286, 80386, and 80486 microprocessors, the company's first P5-based processor was released as the original Intel Pentium on March 22, 1993. Due to its success, the Pentium brand would continue through several generations of high-end processors beyond the original. In 2006, the Pentium brand briefly disappeared from Intel's roadmaps,[3][4] only to re-emerge in 2007.[5]

In 1998, Intel introduced the Celeron[6] brand for low-priced microprocessors. With the 2006 introduction of the Intel Core brand as the company's new flagship line of processors, the Pentium series was to be discontinued. However, due to a demand for mid-range dual-core processors, the Pentium brand was re-purposed to be Intel's mid-range processor series, in between the Celeron and Core series, continuing with the Pentium Dual-Core line.[7]

In 2009, the "Dual-Core" suffix was dropped, and new x86 microprocessors started carrying the plain *Pentium* name again.

Pentium-branded processors

P5 microarchitecture based

The original **Pentium** and **Pentium MMX** processors were the superscalar follow-on to the 80486 processor and were marketed from 1993 to 1999. Some versions of these were available as Pentium OverDrive that would fit into older CPU sockets.

Pentium

Core	Process	Frequency	L1 Cache	FSB	Socket	Release date
P5	0.8 μm	60–66 MHz	16 KB	60–66 MHz	Socket 4	March 1993
P54C	0.6 μm	75–120 MHz	16 KB	50–66 MHz	Socket 5	October 1994
P54CS	0.35 μm	133–200 MHz	16 KB	60–66 MHz	Socket 7	June 1995
P55C	0.35 μm	120–233 MHz	32 KB	60–66 MHz	Socket 7	March 1995
Tillamook	0.25 μm	166–300 MHz	32 KB	66 MHz	Socket 7	August 1997

P6 microarchitecture based

In parallel with the P5 microarchitecture, Intel developed the **P6 microarchitecture** and started marketing it as the **Pentium Pro** for the high-end market in 1995. It introduced out-of-order execution and an integrated second level cache on dual-chip processor package. The second P6 generation replaced the original P5 with the **Pentium II** and rebranded the high-end version as **Pentium II Xeon**. It was followed by a third version called the **Pentium III** and **Pentium III Xeon**, respectively. The Pentium II line added the MMX instructions that were also present in the Pentium MMX.

Versions of these processors for the Laptop market were initially called **Mobile Pentium II** and **Mobile Pentium III**, later versions were called **Pentium III-M**. Starting with the Pentium II, the Celeron brand was used for low-end versions of most Pentium processors with a reduced feature set such as a smaller cache or missing power management features.

Pentium Pro

Core	Process	Frequency	L2 Cache	FSB	Socket	Release date
P6	0.5 μm	150 MHz	256 KB	60–66 MHz	Socket 8	November 1995
P6	0.35 μm	166–200 MHz	256–1024 KB	60–66 MHz	Socket 8	

Pentium II

Core	Process	Frequency	L2 Cache	FSB	Socket	Release date
Klamath	0.35 μm	233–300 MHz	512 KB	66 MHz	Slot 1	May 1996
Deschutes	0.25 μm	266–450 MHz	512 KB	66–100 MHz	Slot 1	January 1998
Tonga	0.25 μm	233–300 MHz	512 KB	66 MHz	MMC-2	April 1998
Dixon	0.25 μm	266–366 MHz	256 KB	66 MHz	MMC-2	

Pentium III

Core	Process	Frequency	L2 Cache	FSB	Socket	Release date
Katmai	0.25 μm	450–600 MHz	512 KB	100–133 MHz	Slot 1	February 1999
Coppermine	0.18 μm	400–1130 MHz	256 KB	100–133 MHz	Slot 1, Socket 370, BGA2, μPGA2	October 1999
Tualatin	0.13 μm	700–1400 MHz	512 KB	100–133 MHz	Socket 370, BGA2, μPGA2	

Netburst microarchitecture based

In 2000, Intel introduced a new microarchitecture called **NetBurst**, with a much longer pipeline enabling higher clock frequencies than the P6 based processors. Initially, these were called **Pentium 4** and the high-end versions have since been called just Xeon. As with Pentium III, there are both **Mobile Pentium 4** and **Pentium 4 M** processors for the laptop market, with Pentium 4 M denoting the more power-efficient versions. Enthusiasts version of the Pentium 4 with the highest clock frequency were called **Pentium 4 Extreme Edition**.

The **Pentium D** was the first multi-core Pentium, integrating two Pentium 4 chips in one package and was also available as the enthusiast **Pentium Extreme Edition**.

Pentium 4

Core	Process	Clock Speeds	L2 Cache	FSB Speeds	Socket	Release Date
Willamette	180 nm	1.3–2.0 GHz	256 KB	400 MT/s	Socket 423, Socket 478	November 2000
Northwood	130 nm	1.6–3.4 GHz	512 KB	400–800 MT/s	Socket 478	January 2002
Gallatin	130 nm	3.2–3.46 GHz	512 KB + 2 MB L3	800–1066 MT/s	Socket 478, LGA 775	November 2003
Prescott	90 nm	2.4–3.8 GHz	1 MB	533–800 MT/s	Socket 478, LGA 775	February 2004
Prescott-2M	90 nm	2.8–3.8 GHz	2 MB	800–1066 MT/s	LGA 775	February 2005
Cedar Mill	65 nm	3.0–3.6 GHz	2 MB	800 MT/s	LGA 775	January 2006

Pentium D

Core	Process	Clock Speeds	L2 Cache	FSB Speeds	Socket	Release Date
Smithfield	90 nm	2.66–3.2 GHz	2 MB	533–800 MT/s	Socket T	May, 2005
Smithfield XE	90 nm	3.2 GHz	2 MB	800 MT/s	Socket T	May, 2005
Presler	65 nm	2.8–3.6 GHz	4 MB	800 MT/s	Socket T	January, 2006
Presler XE	65 nm	3.46–3.73 GHz	4 MB	1066 MT/s	Socket T	January, 2006

Pentium M microarchitecture based

In 2003, Intel introduced a new processor based on the P6 microarchitecture called **Pentium M**, which was much more power efficient than the Mobile Pentium 4, Pentium 4 M and Pentium III M. Dual-core version of the Pentium M was developed under the code name Yonah and sold under the marketing names Core Duo and **Pentium Dual-Core**. Unlike Pentium D, it integrated both cores on a single chip. From this point, the Intel Core brand name was used for the mainstream Intel processors and the Pentium brand became a low-end version between Celeron and Core. All Pentium M based designs including Yonah are for the mobile market.

Pentium M

Core	Process	Frequency	L1 Cache	L2 Cache	FSB	Socket	Release date
Banias	130 nm	900–1700 MHz	64 KB	1 MB	400 MT/s	Socket 479	March 2003
Dothan	90 nm	1.00–2.26 GHz	64 KB	2 MB	400–533 MT/s	FC-uBGA	June 2004

Pentium Dual-Core

Core	Process	Clock Speeds	L1 Cache	L2 Cache	FSB Speeds	Socket	Release date
Yonah	65 nm	1.6–1.86 GHz	64 KB	1 MB	533 MT/s	Socket M	January 2007

Core microarchitecture based

The **Pentium Dual-Core** name continued to be used when the Yonah design was extended with 64 bit support, now called the **Core microarchitecture**. This microarchitecture eventually replaced all NetBurst based processors across the four brands, Celeron, Pentium, Core and Xeon. Pentium Dual-Core processors based on the Core microarchitecture use the Allendale and Wolfdale-3M designs for desktop processors and Merom-2M for mobile processors.

Pentium Dual-Core

Core	Process	Clock Speeds	L1 Cache	L2 Cache	FSB Speeds	Socket	Release date
Merom-2M	65 nm	1.46–2.16 GHz	64 KB	1 MB	533–667 MT/s	Socket P	Q4 2007
Allendale	65 nm	1.6–2.4 GHz	64 KB	1 MB	800 MT/s	Socket 775	June 2007
Wolfdale-3M	45 nm	2.2–2.7 GHz	64 KB	2 MB	800 MT/s	Socket 775	August 2008

Pentium (2009)

Core	Process	Clock Speeds	L1 Cache	L2 Cache	FSB Speeds	Socket	Release date
Wolfdale-3M	45 nm	2.8–3.2 GHz	64 KB	2 MB	1066 MT/s	Socket 775	May 2009
Penryn-3M	45 nm	2.0–2.3 GHz	64 KB	1 MB	800 MT/s	Socket P	January 2009
Penryn-3M ULV	45 nm	1.3–1.5 GHz	64 KB	2 MB	800 MT/s	BGA 956	September 2009
Penryn-L ULV [1]	45 nm	1.3–1.4 GHz	64 KB	2 MB	800 MT/s	BGA 956	May 2009

Codename	Brand Name	Model (list)	Cores	L2 Cache	Socket	TDP
Allendale	Pentium Dual-Core	E2xxx	2	1 MB	LGA 775	65 W
Merom-2M	Mobile Pentium Dual-Core	T2xxx T3xxx	2	1 MB	Socket P	35 W
Wolfdale-3M	Pentium Dual-Core	E2xxx	2	1 MB	LGA 775	65 W
		E5xxx		2 MB		
	Pentium	E6xxx				
Penryn-3M	Mobile **Pentium**	T4xxx	2	1 MB	Socket P	35 W
		SU4xxx		2 MB	µFC-BGA 956	10 W
Penryn-L		SU2xxx	1			5.5 W

In 2009, Intel changed the naming system for Pentium processors, renaming the Wolfdale-3M based processors to **Pentium**, without the Dual-Core name and introduced new single- and dual-core processors based on Penryn under the Pentium name.

The Penryn core is the successor to the Merom core and Intel's 45 nm version of their mobile series of Pentium microprocessors. The FSB is increased from 667 MHz to 800 MHz and the voltage is lowered. Intel released the first Penryn Core, the Pentium T4200, in December, 2008. In June 2009, Intel released the first single-core processor to use the Pentium name, a Consumer Ultra-Low Voltage (CULV) Penryn core called the Pentium SU2700.

In September 2009, Intel introduced the Pentium SU4000 series together with the Celeron SU2000 and Core 2 Duo SU7000 series, which are dual-core CULV processors based on Penryn-3M and using 800 MHz FSB. The Pentium SU4000 series has 2 MB L2 cache but is otherwise basically identical to the other two lines.

Nehalem microarchitecture based

The Nehalem microarchitecture was introduced in late 2008 as a successor to the Core microarchitecture, and in early 2010, a new **Pentium** G6950 processor based on the **Clarkdale** design was introduced based on the **Westmere** refresh of Nehalem, which were followed by the mobile P6xxx based on Arrandale a few months later.

Core	Process	Clock Speeds	L2 Cache	L3 Cache	I/O Bus	Socket	Release date
Clarkdale	32 nm	2.8 GHz	512 KB	3 MB	DMI	Socket 1156	January 2010
Arrandale	32 nm	1.2-1.86 GHz	512 KB	3 MB	DMI	Socket 988 BGA	Q2 2010

Codename	Brand name	L3 Cache	Socket	TDP	Features
Clarkdale	Pentium G6xxx	3 MB	LGA 1156	73 W	Integrated GPU
Arrandale	Pentium P6xxx	3 MB	LGA 1156	35 W	Integrated GPU
	Pentium U5xxx		BGA	18 W	

On January 7, 2010, Intel launched a new Pentium model using the Clarkdale chip in parallel with other desktop and mobile CPUs based on their new Westmere microarchitecture. The first model in this series is the Pentium G6950. The Clarkdale chip is also used in the Core i3-5xx and Core i5-6xx series and features a 32 nm process (as it is based on the Westmere microarchitecture), integrated memory controller and 45 nm graphics controller and a third-level cache. In the Pentium series, some features of Clarkdale are disabled. Compared to Core i3, it lacks Hyper-Threading and the graphics controller in the Pentium runs at 533 MHz, while in the Core i3 i3-5xx series they run at 733 MHz. Dual Video Decode that enables Blu-ray picture-in picture hardware acceleration is disabled as well as Deep Color and xvYCC support. The memory controller in the Pentium supports DDR3-1066 max and the Core i3 i3-5xx series supports DDR3-1333 max. The L3 cache is also 1 MB less than in the Core i3-5xx series.

Sandy Bridge microarchitecture based

The Sandy Bridge microarchitecture was released in the Pentium line on May 22, 2011.

- [a]All models share the following details: 2 cores, 2 logical processors (4 on Pentium 3xx with Hyper-threading), CPUID signature 206A7, family 6 (06h), model 42 (02Ah), stepping 7 (07h)
- [b]TLB / cache 64-byte Prefetching; Data TLB0 2-MB or 4-MB pages, 4-way associative, 32 entries; Data TLB 4-KB Pages, 4-way set associative, 64 entries; Instruction TLB 4-KB Pages, 4-way set associative, 128 entries, L2 TLB 1-MB, 4-way set associative, 64-byte line size; Shared 2nd-level TLB 4 KB pages, 4-way set associative, 512 entries.
- [c]All models feature: On-chip Floating Point Unit, Enhanced Intel SpeedStep Technology (EIST), Intel 64, XD bit (an NX bit implementation), Intel VT-x, Smart Cache.
- [d]All models support: *MMX, SSE, SSE2, SSE3, SSSE3, SSE4.1, SSE4.2*
- [e]HD Graphics (Sandy Bridge) contain 6 EUs as well as HD Graphics 2000, but does not support the following technologies: Intel Quick Sync Video, InTru 3D, Clear Video HD, Wireless Display, and it doesn't support 3D Video or 3D graphics acceleration.

Codename	Brand name[a]	L3 Cache[b]	Socket	TDP	Features[c],[d]
Sandy Bridge	Pentium 3xx	3 MB	LGA 1155	15 W	Hyper-threading, ECC
	Pentium B9xx	2 MB	rPGA988B	35 W	Integrated GPU
	Pentium G6xxT[10]	3 MB 8-way set associative Line size 64 bytes	LGA 1155	35 W	Integrated GPU[e]
	Pentium G6xx[11]			65 W	
	Pentium G8xx[12] [13]	3 MB 12-way set associative Line size 64 bytes			

Pentium compatible Intel processors

Due to its prominence, the term "Pentium compatible" is often used to describe any x86 processor that supports the IA-32 instruction set and architecture. Even though they do not use the Pentium name, Intel also manufacturers other processors based on the Pentium series for other markets. Most of these processors share the core design with one of the Pentium processor lines, usually differing in the amount of CPU cache, power efficiency or other features. The notable exception is the Atom line, which is an independent design.

- Celeron, a low-end version
- Core, the mainstream version including Core 2 and Core i7, now placed above Pentium
- Xeon, a high-end version used in servers and workstations
- A100 (discontinued), an ultra-mobile version of Pentium M
- EP80579, A system-on-a-chip based on Pentium M
- Atom, current ultra-mobile processors

References

[1] "Intel Processor Rating" (http://www.intel.com/en_uk/consumer/products/processors/ratings.htm). . Retrieved 2011-11-21.
[2] Names of processors (http://www.ece.iastate.edu/~morris/cs570/name.html)
[3] "Intel "Conroe-L" Details Unveiled" (http://www.dailytech.com/article.aspx?newsid=4252). DailyTech. . Retrieved 2007-08-16.
[4] The multicore era is upon us - CNET Asia (http://asia.cnet.com/reviews/pcperipherals/0,39051168,61998152-8,00.htm)
[5] "Intel to unify product naming scheme" (http://www.tgdaily.com/content/view/33234/122/). TG Daily. . Retrieved 2007-08-12.
[6] "Microprocessor Hall of Fame" (http://web.archive.org/web/20070706032836/http://www.intel.com/museum/online/hist_micro/hof/
). Intel. Archived from the original (http://www.intel.com/museum/online/hist_micro/hof/) on 2007-07-06. . Retrieved 2007-08-11.
[7] Brown, Rich; Michelle Thatcher (23 April 2008). "The multicore era is upon us: How we got here − Where we stand today" (http://asia.
cnet.com/reviews/pcperipherals/0,39051168,61998152-5,00.htm). *CNET Asia*. . Retrieved 2009-04-18.
[8] Shilov, Anton. "Intel Readies Pentium E2000-Series Processors" (http://www.xbitlabs.com/news/cpu/display/20061115223825.html).
X-bit labs. . Retrieved 2007-08-15.
[9] "Intel to unify product naming scheme" (http://www.tgdaily.com/content/view/33234/122/). TG Daily. . Retrieved 2007-08-15.
[10] "CPU ID: SR05T Intel Pentium Dual-Core G620T" (http://www.cpu-world.com/sspec/SR/SR05T.html). cpu-world.com. . Retrieved 5
August 2011.
[11] "SR05R Intel Pentium Dual-Core G620" (http://www.cpu-world.com/sspec/SR/SR05R.html). cpu-world.com. . Retrieved 6 August
2011.
[12] "SR05P Intel Pentium Dual-Core G840" (http://www.cpu-world.com/sspec/SR/SR05P.html). cpu-world.com. . Retrieved 6 August
2011.
[13] "SR05Q (Intel Pentium Dual-Core G850)" (http://www.cpu-world.com/sspec/SR/SR05Q.html). cpu-world.com. . Retrieved 6 August
2011.