

= MacBook Pro =

The MacBook Pro ( sometimes abbreviated MBP ) is a line of Macintosh portable computers introduced in January 2006 by Apple Inc . , now in its third generation . Replacing the PowerBook G4 , the MacBook Pro was the second model to be announced in the Apple ? Intel transition , after the iMac . It is the high @-@ end model of the MacBook family and is currently produced with 13- and 15 @-@ inch screens . A 17 @-@ inch version was available for sale in April 2006 .

The first generation MacBook Pro appeared externally similar to the PowerBook G4 , but used the Intel Core processors instead of PowerPC G4 chips . The 15 @-@ inch model was introduced first , in January 2006 ; the 17 @-@ inch model followed in April . Both received several updates and Core 2 Duo processors later that year .

The computer 's second generation , known as the " unibody " model , has a more tapered design and a casing made from a single block of aluminum . It debuted in October 2008 as the 15 @-@ inch MacBook Pro and the 13 @-@ inch aluminum unibody MacBook . The following January brought the design to the 17 @-@ inch model , along with the built @-@ in battery that joined the rest of the MacBook Pro line in June , during which Apple also absorbed the plastic exterior 13 " Macbook into the MacBook Pro line . Subsequent updates brought upgraded Intel Core i5 and i7 processors and introduced Intel 's Thunderbolt technology .

Apple released the third generation of MacBook Pro in June 2012 with a 15 @-@ inch screen . At the same time , the 17 @-@ inch variant was discontinued , and slightly updated versions of the previous generation 13- and 15 @-@ inch unibody models were announced and sold in parallel . While dimensionally smaller than its predecessor , the similarly styled third generation model retained a unibody design . The most substantial differences in the third generation MacBook Pro are the fitting of a significantly higher resolution Retina Display , the elimination of the optical drive , and replacement of hard disk drives with solid @-@ state drives . A 13 @-@ inch third generation MacBook Pro was released in October 2012 .

= = First generation = =

The original 15 @-@ inch MacBook Pro was announced on January 10 , 2006 by Steve Jobs at the Macworld Conference & Expo . The 17 @-@ inch model was unveiled on April 24 , 2006 . The first design is largely a carryover from the PowerBook G4 , but uses Intel Core CPUs instead of PowerPC G4 chips . The 15 @-@ inch MacBook Pro weighs the same as the 15 @-@ inch aluminum PowerBook G4 , but is 0 @.@ 1 inches ( 0 @.@ 25 cm ) deeper , 0 @.@ 4 inches ( 1 @.@ 0 cm ) wider , and 0 @.@ 1 inches ( 0 @.@ 25 cm ) thinner . Other changes from the PowerBook include a built @-@ in iSight webcam and the inclusion of MagSafe , a magnetic power connector designed to detach easily when pulled to prevent the entire laptop from being pulled off a surface . Both features were later brought over to the MacBook . In order to fit into the slimmer MacBook Pro , the optical drive is half the speed of the one in the PowerBook G4 and cannot write to dual layer DVDs .

Both the original 15- and 17 @-@ inch model MacBook Pros come with ExpressCard / 34 slots , which replace the PC Card slots found in the PowerBook G4 . All pre @-@ unibody 15 @-@ inch models have two USB 2 @.@ 0 ports and one FireWire 400 port , while the 17 @-@ inch models have three USB 2 @.@ 0 ports as well as one FireWire 400 port . When first introduced , the MacBook Pro did not come with FireWire 800 or S @-@ Video ports , although FireWire 800 was added in the next 15 @-@ inch model revision and is present in every version of the 17 @-@ inch design . S @-@ Video capability can be attained through the use of a DVI to S @-@ Video adapter . External displays with up to a 2 @,@ 560 × 1 @,@ 600 pixel resolution are supported through a dual @-@ link DVI port . All models include a built @-@ in Gigabit Ethernet port , Bluetooth 2 @.@ 0 , and 802.11a / b / g . Later models include support for the draft 2 @.@ 0 specification of 802.11n and Bluetooth 2 @.@ 1 .

= = = Updates = = =

Apple refreshed the entire MacBook Pro line on October 24 , 2006 to include Intel Core 2 Duo processors . Memory capacity was doubled for each model , to 1 GB on the low @-@ end 15 @-@ inch and 2 GB for the high @-@ end 15- and 17 @-@ inch models . FireWire 800 was added to the 15 @-@ inch models . Hard drive capacity was increased , although video card options stayed the same . The MacBook Pro line received a second update on June 5 , 2007 with new Nvidia Geforce 8600M GT video cards and faster processor options . LED backlighting was added to the 15 @-@ inch model 's screen , and its weight was reduced from 5 @. @ 6 pounds ( 2 @. @ 5 kg ) to 5 @. @ 4 pounds ( 2 @. @ 4 kg ) . Furthermore , the speed of the front @-@ side bus was increased from 667 MHz to 800 MHz . On November 1 , 2007 , Apple added the option of a 2 @. @ 6 GHz Santa Rosa platform Core 2 Duo CPU as well as reconfigured hard drive options .

On February 26 , 2008 , the MacBook Pro line was again updated . LED backlighting was added as an option for the 17 @-@ inch model . Processors were updated to " Penryn " cores , which are built on the 45 nanometer process ( 65 nanometer " Merom " cores were previously used ) , and hard drive and memory capacities were increased . Multi @-@ touch capabilities , first introduced with the MacBook Air earlier that year , were brought over to the MacBook Pro 's trackpad . When the 15 @-@ inch unibody MacBook Pro was introduced on October 14 , 2008 , the pre @-@ unibody model with the same screen size was discontinued , while the 17 @-@ inch pre @-@ unibody model continued to be sold . The original case design was discontinued on January 6 , 2009 , when the 17 @-@ inch MacBook Pro was also updated with unibody construction .

= = = Reception = = =

Some reviewers applauded the MacBook Pro for its doubling or tripling the speed of the PowerBook G4 in some areas . For example , the 3D rendering program Cinema 4D XL was 3 @. @ 3 times as fast ( 2 @. @ 3 times faster ) , and its boot @-@ up time was more than twice as quick . The MacBook Pro generally outperformed the PowerBook G4 in performance analyzer utility tests Xbench and Cinebench . Reviewers lauded the screen 's maximum brightness , 67 percent higher than the PowerBook G4 ; the excellent horizontal viewing angles ; the matte options ; and the bright , crisp , and true colors . Although the screen offered fewer vertical pixels ( 1 @, @ 440 × 900 in the MacBook Pro instead of 1 @, @ 440 × 960 in the PowerBook ) , one reviewer called the screen " nothing less than stellar " . Reviewers praised the new MagSafe power adapter , although one reviewer said it disconnected too easily in some instances . They also praised the backlit keyboard , large trackpad , and the virtually silent operation of the machine . The new laptop also offered better wireless performance .

One reviewer criticized the decision to underclock the ATI Mobility Radeon X1600 graphics card by about 30 percent its original speed . The notebook was also noted for running hot . Users complained that upgrading system memory was harder than in older Apple notebooks . Since the dimensions for the 15 @-@ inch MacBook Pro were tweaked slightly from the 15 @-@ inch PowerBook G4 , older accessories such as notebook sleeves did not work with the new models . Some users noted a slight flickering when the screen was on lower brightness settings . Apple increased the battery capacity by 10 Wh , going from 50 in the PowerBook G4 to 60 , but the more powerful Core Duo CPU required more power . Battery life therefore remained about the same as in previous models , at three @-@ plus hours .

= = = Technical specifications = = =

= = 2nd generation ( unibody ) = =

On October 14 , 2008 , in a press event at company headquarters , Apple officials announced a new 15 @-@ inch MacBook Pro featuring a " precision aluminum unibody enclosure " and tapered sides similar to those of the MacBook Air . Designers shifted the MacBook Pro 's ports to the left

side of the case , and moved the optical disc drive slot from the front to the right side , similar to the MacBook . The new MacBook Pros had two new video cards : the Nvidia GeForce 9600M GT with either 256 or 512 MB of dedicated memory and a GeForce 9400M with 256 MB of shared system memory . Although the FireWire 400 port was removed , the FireWire 800 port was retained . The DVI port was replaced with a Mini DisplayPort receptacle . The original unibody MacBook Pro came with a user @-@ removable battery ; Apple claimed five hours of use , with one reviewer reporting results closer to four on a continuous video battery stress test . Apple said that the battery would hold 80 percent of its charge after 300 recharges .

= = = Design = = =

The unibody @-@ construction MacBook Pro largely follows the styling of the original aluminum iMac and the MacBook Air and is slightly thinner than its predecessor , albeit wider and deeper due to the widescreen display . The screen is high @-@ gloss , covered by an edge @-@ to @-@ edge reflective glass finish , while an anti @-@ glare matte option is available in the 15- and 17 @-@ inch models in which the glass panel is removed . The entire trackpad is usable and acts as a clickable button . The trackpad is also larger than the first generation model 's , giving more room for scrolling and multi @-@ touch gestures . When the line was updated in April 2010 , inertial scrolling was added , making the scrolling experience much like that of the iPhone and iPad . The keys , still backlit , are now that of Apple 's now @-@ standard sunken keyboard with separated black keys .

= = = Updates = = =

During the MacWorld Expo keynote on January 6 , 2009 , Phil Schiller announced a 17 @-@ inch MacBook Pro with unibody construction . This version diverged from its 15 @-@ inch sibling with an anti @-@ glare " matte " screen option ( with the glossy finish standard ) and a non user @-@ removable lithium polymer battery . Instead of traditional round cells inside the casing , the lithium @-@ ion polymer batteries are shaped and fitted into each laptop to maximally utilize space . Adaptive charging , which uses a chip to optimize the charge flow to reduce wear and tear , extends the battery 's overall life . Battery life for the 17 " version is quoted at eight hours , with 80 percent of this charge remaining after 1 @, @ 000 charge @-@ discharge cycles .

At Apple 's Worldwide Developers Conference ( WWDC ) on June 8 , 2009 , it was announced that the 13 @-@ inch unibody MacBook would be upgraded and re @-@ branded as a MacBook Pro , leaving only the white polycarbonate MacBook in the MacBook line . It was also announced that the entire MacBook Pro line would use the non user @-@ removable battery first introduced in the 17 @-@ inch MacBook Pro . The updated MacBook Pro 13- and the 15 @-@ inch would each have up to a claimed seven hours of battery life , while the 17 @-@ inch would keep its eight @-@ hour capacity . Some sources even reported up to eight hours of battery life for the 13- and 15 @-@ inch MacBook Pros during casual use , while others reported around six hours . Like the 17 @-@ inch MacBook Pro , Apple claims that they will last around 1 @, @ 000 charge cycles while still containing 80 percent of their capacity . Graphics card options stayed the same from the previous release , although the 13 @-@ inch and the base model 15 @-@ inch , came with only the GeForce 9400M GPU . The screens were also improved , gaining a claimed 60 percent greater color gamut . All of these mid 2009 models also included a FireWire 800 port and all except the 17 @-@ inch models would receive an SD card slot . The 17 @-@ inch model would retain its ExpressCard / 34 slot . For the 13 @-@ inch MacBook Pro , the Kensington lock slot was moved to the right side of the chassis . In August 2009 , Apple extended the " matte " anti @-@ glare display option to the 15 @-@ inch MacBook Pro .

On April 13 , 2010 , Intel Core i5 and Core i7 CPUs were introduced in the 15- and 17 @-@ inch models , while the 13 @-@ inch retained the Core 2 Duo with a speed increase . The power brick was redesigned and a high @-@ resolution display ( of 1 @, @ 680 × 1 @, @ 050 ) was announced as an option for the 15 @-@ inch models . The 13 @-@ inch gained an integrated Nvidia GeForce 320M graphics processing unit ( GPU ) with 256 MB of shared memory , while the 15- and 17 @-@

inch models were upgraded to the GeForce GT 330M , with either 256 or 512 MB of dedicated memory . The 15- and 17 @-@ inch models also have an integrated Intel GPU that is built into the Core i5 and i7 processors . The 15 @-@ inch model also gained 0 @. @ 1 pounds ( 0 @. @ 045 kg ) . Save for a third USB 2 @. @ 0 slot , all the ports on the 17 @-@ inch MacBook Pro are the same in type and number as on the 15 @-@ inch version . All models come with 4 GB of system memory that is upgradeable to 8 GB . Battery life was also extended further in this update , to an estimated ten hours for the 13 @-@ inch and 8 ? 9 hours on the 15- and 17 @-@ inch MacBook Pros . This was achieved through both greater power efficiency and adding more battery capacity . One reviewer reported about six hours of battery life through a continuous video battery stress test in the 15 @-@ inch and another , who called the battery life " unbeatable , " reported nearer to eight in the 13 @-@ inch through their " highly demanding battery drain test " .

Thunderbolt technology , Sandy Bridge dual core Intel Core i5 and i7 ( on the 13 @-@ inch model ) or quad @-@ core i7 ( on the 15- and 17 @-@ inch models ) processors , and a high definition FaceTime camera were added on February 24 , 2011 . Intel HD Graphics 3000 come integrated with the CPU , while the 15- and 17 @-@ inch models also utilize AMD Radeon HD 6490M and Radeon HD 6750M graphics cards . Later editions of these models , following the release of OS X Lion , replaced the dashboard ( F4 ) key with a launchpad key . The chassis bottoms are also engraved differently from the 2010 models . The Thunderbolt serial bus platform can achieve speeds of up to 10 Gbit / s , which is up to twice as fast as the USB 3 @. @ 0 specification , 20 times faster than the USB 2 @. @ 0 specification , and up to 12 times faster than FireWire 800 . Apple says that Thunderbolt can be used to drive displays or to transfer large quantities of data in a short amount of time .

On June 11 , 2012 , Apple showcased its upgraded Mac notebooks , OS X Mountain Lion , and iOS 6 at the Worldwide Developers Conference ( WWDC ) in San Francisco . The new MacBook Pro models were updated with Ivy Bridge processors and USB 3 @. @ 0 ports , and the default RAM on premium models was increased to 8 GB . Following this announcement , the 17 @-@ inch model was discontinued . After a media event on October 22 , 2013 Apple discontinued all second generation MacBook Pros except for the entry @-@ level 2 @. @ 5 GHz 13 @-@ inch model .

= = = Reception = = =

Some reviewers praised the new laptop 's performance and compact size , the quality of the screen , and sturdy unibody build , which allowed easier upgrading of internal components as compared to the original models . Some reviewers also noted that the new MacBook Pro ran more quietly and at cooler temperatures than first generation machines . Others , however , criticized the amount of heat generated by the new design .

Reviewers lamented the loss of a matte screen option for the 2008 unibody MacBook Pro , noting the reflectiveness of the screen in sunlight , even when its brightness was turned all the way up . CNET 's Dan Ackerman commented of the mid @-@ 2009 models : " According to Apple , the new display offers a wider color gamut , and the screen certainly looks bright and colorful , but we wish the same matte @-@ screen option offered on the 17 @-@ inch MacBook Pro was available across the line ... While the LED screen means a thinner lid and some battery life benefits , the edge @-@ to @-@ edge glass covering the entire display panel grabs stray light rays with ease , making the glossy screen hard to see in some lighting conditions . " By 2011 , matte screens were offered for both the 15 " and 17 " models . Furthermore , the addition of Mini DisplayPort instead of the more popular HDMI was criticized . The relatively low number of ports and lower end technical specifications when compared to similarly priced laptops from other brands were also bemoaned .

Laptop Magazine 's Michael Prospero praised the 2010 15 @-@ inch model 's display , calling it " bright and crisp " . He further commented , " While reflections from the glossy display weren 't overwhelming , it 's also nice to know there 's an antiglare option ? though only for the higher resolution display . Still , colors were bright , blacks were deep and dark , and viewing angles were excellent both vertically and horizontally . " He also lauded the quality of the iSight webcam , the responsiveness of the touchpad , the microphone and speakers , as well as the performance of the

new CPUs for the 15 " model and the long battery life . Complaints included the price of the laptop , the low number of USB ports , and the lack of HDMI .

CNET praised the automatic graphics switching features of the 15- and 17 @-@ inch 2010 models as well as the graphics cards themselves . Acclaim was also given to the Core i5 and i7 CPUs , the multi @-@ touch trackpad , and the addition of audio capabilities to the Mini DisplayPort video output . They also called for the addition of HDMI and the Blu @-@ ray optical disc format , saying that most other computers in the MacBook Pro 's price range possessed these features . CNET also criticized the option of a higher resolution screen in the 15 @-@ inch model , saying that " the higher @-@ resolution screen should be included by default . "

= = = Technical specifications = = =

Since the RAM and the hard drive on some generations of MacBook Pro are user serviceable parts , there are aftermarket modifications to enhance the system with up to 16GB of DDR3 @-@ 1600 RAM ( maximum capacity and frequency depend on the hardware in question ) , 7200 @-@ rpm hard drives or third party SSDs .

= = = Early and Late 2011 model GPU Issues = = =

Early and Late 2011 models reportedly suffer from manufacturing problems leading to overheating , graphical issues , and eventually complete GPU and logic board failure . A thread was opened on the Apple Support community that reached more than 12 @, @ 000 posts and 4 @, @ 000 @, @ 000 visits ( Feb 2015 ) . A similar but nonidentical issue affected iMac GPUs which were later recalled by Apple . The problem was covered by many articles in Mac @-@ focused magazines , starting late 2013 throughout 2014 . In August 2014 the law firm Whitfield Bryson & Mason LLP had begun investigating the problem to determine if any legal claim exists . On October 28 , 2014 , the firm announced that it has filed a class @-@ action lawsuit in a California federal court against Apple . The lawsuit will cover residents residing in both California and Florida who have purchased a 2011 MacBook Pro notebook with an AMD graphics card . The firm is also investigating similar cases across the United States . On February 20 , 2015 , Apple instituted the " MacBook Pro Repair Extension Program for Video Issues " . This " will repair affected MacBook Pro systems , free of charge . "

= = 3rd generation ( Retina ) = =

On June 11 , 2012 at the Apple Worldwide Developers Conference in San Francisco , Apple introduced the third generation MacBook Pro , marketed as the " MacBook Pro with Retina display " to differentiate it from the updated second generation models of the previous generation released the same day . The new model includes Intel 's third generation Core i7 processors ( Ivy Bridge microarchitecture ) , USB 3 @. @ 0 , and a high @-@ resolution 15 @. @ 4 " IPS 2880 × 1800 @-@ pixel Retina Display . Other new or changed features include a second Thunderbolt port , an HDMI port , and a new thinner MagSafe port , dubbed the " MagSafe 2 " . Apple introduced a 13 @-@ inch version on October 23 , 2012 with specifications similar but slightly inferior to the 15 @-@ inch version 's , such as less powerful processors .

The new models omit Ethernet and FireWire 800 ports , though Apple offers Thunderbolt adapters for both interfaces . They also omit a SuperDrive , making the 15 @-@ inch model Apple 's first professional notebook since the PowerBook 2400c to ship without a built @-@ in optical drive . Instead of a hard disk drive , the new models ship with a solid state drive housed in a proprietary flash module design rather than a 2 @. @ 5 " notebook drive . Apple also claims improved speakers and microphones and a new system for cooling the notebook with improved fans . The new case design does not have a Kensington lock slot , so alternative products are required to physically secure the computer .

The Retina models also have fewer user @-@ accessible upgrade or replacement options than

previous MacBooks . Unlike in previous generations , the memory is soldered onto the logic board and is therefore not upgradable . The solid state drive is not soldered and can be replaced with a larger unit . The battery is glued into place ; attempts to remove it may destroy the battery and / or trackpad . The entire case uses proprietary pentalobe screws and cannot be disassembled with standard tools . While the battery is glued in , recycling companies have stated that the design is only " mildly inconvenient " and does not hamper the recycling process .

On February 13 , 2013 , Apple announced updated prices and processors for the MacBook Pro with Retina Display and increased the RAM of the high @-@ end 15 @-@ inch model to 16 GB .

On October 22 , 2013 , Apple updated the line with Intel 's Haswell processors and Iris Graphics , 802.11ac Wi @-@ Fi , Thunderbolt 2 , and PCIe @-@ based flash storage . The chassis of the 13 @-@ inch version was slightly slimmed to 0 @.@ 71 inches ( 18 mm ) to match the 15 @-@ inch model . The lower @-@ end 15 @-@ inch model only included integrated graphics while the higher @-@ end model continued to include a discrete Nvidia graphics card in addition to integrated graphics . Support for 4K video output via HDMI was added but limited the maximum number of external displays from three to two . On July 29 , 2014 Apple announced updated prices and processors for the Haswell MacBook Pro with Retina Display .

On March 9 , 2015 , the 13 @-@ inch model was updated with Intel Broadwell processors , Iris 6100 graphics , faster flash storage , increased battery life , and a Force Touch trackpad . On May 19 , 2015 , the 15 @-@ inch model was also updated with similarly fast flash storage , increased battery life , the Force Touch trackpad , and an AMD Radeon R9 discrete graphics card on the higher @-@ end model . The higher @-@ end 15 @-@ inch model also added support for dual @-@ cable output to 5120 × 2880 displays . The 15 @-@ inch models were released with the same Intel Haswell processors and Iris Pro graphics as the 2014 models due to a delay in shipping the newer Broadwell quad @-@ core processors .

== = Design == =

The Retina Display MacBook Pro largely follows the design of the previous generation with its aluminum enclosure and separated black keys . The most apparent body changes are a thinner chassis and a display with a redesigned hinge and thinner bezel and the removal of the internal optical drive . The power button is moved from the upper right corner of the chassis onto the keyboard , taking the place of the optical disc eject button . At 0 @.@ 71 inches ( 18 mm ) thick , the 15 @-@ inch model is 25 percent thinner than its predecessor . The model name , i.e. Macbook Pro , is not longer placed at the bottom of the screen bezel , instead , it is found on the underside of the chassis , similar to an iOS device . This is the first Macintosh laptop to not have a model name on its bezel .

== = Reception == =

The third generation MacBook Pro received positive reviews of the Retina Display , flash storage and power . It was criticized , however , for its high price and lack of an Ethernet port and optical drive . Roman Loyola of Macworld said that the Retina MacBook Pro was " groundbreaking " and made people " rethink how they use technology . " He praised the inclusion of USB 3 @.@ 0 and the slimmer body . Dan Ackerman of CNET commented " I 've previously called the 15 @-@ inch MacBook Pro one of the most universally useful all @-@ around laptops you can buy . This new version adds to that with HDMI , faster ports , and more portability . But it also subtracts from that with its exclusion of an optical drive and Ethernet port , plus its very high starting price . The Pro and Retina Pro are clearly two laptops designed for two different users , and with the exception of all @-@ day commuters who need something closer to a MacBook Air or ultrabook , one of the two branches of the MacBook Pro family tree is still probably the most universally useful laptop you can buy . "

Joel Santo Domingo of PC Magazine gave the MacBook Pro an " Editor 's Choice " rating . He praised " brilliant Retina display " the thin design , port selection and speedy storage , and

highlighted the expandability via Thunderbolt ports which support up to seven devices each . David Pogue of The New York Times praised the 15 @-@ inch model 's screen , keyboard , sound , start @-@ up time , cosmetics , battery life , storage , and RAM capacity . They criticized the lack of a SuperDrive , pricing , and the MagSafe 2 power connector 's lack of backwards compatibility with the older MagSafe design .

Since the battery is glued in and cannot be easily disassembled for recycling ( an EPEAT requirement ) , Apple received criticisms about the machine 's ability to be recycled . Greenpeace spokesman Casey Harrell said Apple " has pitted design against the environment ? and chosen design . They 're making a big bet that people don 't care , but recycling is a big issue . " Wired also criticized Apple 's recyclability claims , stating " [ t ] he design may well be comprised of ' highly recyclable aluminum and glass ' ? but my friends in the electronics recycling industry tell me they have no way of recycling aluminum that has glass glued to it like Apple did with both this machine and the recent iPad . "

The Retina Display on the MacBook Pro have been criticized for " image retention , " specifically for displays manufactured by LG .

= = = Technical specifications = = =

= = Software and operating systems = =

The OS X operating system has been pre @-@ installed on all MacBook Pros since release , starting with version 10 @.@ 4 @.@ 4 ( Tiger ) . Along with OS X , iLife has also shipped with all systems , beginning with iLife ' 06 .

The MacBook Pro comes with the successor to BIOS , Extensible Firmware Interface ( EFI ) 1 @.@ 1 . EFI handles booting differently from BIOS @-@ based computers , but provides backwards compatibility , allowing dual and triple boot configurations . In addition to OS X , the Microsoft Windows operating system is installable on Intel x86 @-@ based Apple computers . Officially , this is limited to both 32 @-@ bit and 64 @-@ bit versions of Windows XP , Vista , 7 , 8 , and 10 with the necessary hardware drivers included with the Boot Camp software . Other x86 operating systems such as Linux are also unofficially supported . This is made possible by the presence of the Intel architecture as provided by the CPU and the BIOS emulation Apple has provided on top of EFI .

As the MacBook Pro uses a different hardware platform than earlier PowerPC ( PPC ) -based Macintoshes , versions of OS X prior to Lion can run PPC applications only via the Rosetta emulator , which exacts some performance penalty , cannot emulate some lower @-@ level PPC code , and does not support 64 @-@ bit ( G5 specific ) PPC features . Rosetta is not present in Lion and later , so PPC applications cannot be run under those versions of OS X.

= = Timeline of the MacBook family = =