



Apple at Work

# Apple Silicon



## Seriously powerful silicon.

The Apple M2 chip starts the second generation of Apple's M-series chips and extends the remarkable features of M1. With industry-leading power efficiency, a unified memory architecture, and custom technologies, this new chip brings even more performance and capabilities to business users. Apple silicon has transformed the Mac lineup, bringing unbelievable performance and battery life with its breakthrough system on a chip (SoC) architecture. Combining the CPU, GPU, I/O, Neural Engine, and more into a single SoC with unified memory, this architecture means that all Mac computers are way faster, cooler, and more power efficient.

### More Speed for All Your Apps

M2 is built using an enhanced second-generation 5-nanometer technology. It features over 20 billion transistors — 25 percent more than M1. And its 16-core Neural Engine is capable of executing up to 15.8 trillion operations per second to accelerate machine learning tasks. Up to 24GB of high-performance unified memory gives the CPU and GPU shared access to a larger memory pool. And the 100GB/s memory bandwidth — 50 percent more than M1 — makes multitasking and running multiple business apps superfluid.

### Faster Power-Efficient Performance

The M2 chip is a game changer for business productivity. With higher performance per watt, systems with M2 have exceptional battery life — up to 18 hours on MacBook Air with M2. And they run cool and quietly, even when you're editing enormous Microsoft Excel spreadsheets or participating in long video conferences. The new CPU features faster performance cores paired with a larger cache, while the efficiency cores have been significantly enhanced for even greater performance gains. Together, these cores deliver 18 percent greater multithreaded performance than M1, so M2 can rip through CPU-intensive tasks using very little power.<sup>1</sup>

The CPU in M2 provides nearly twice the performance of the comparable 10-core PC laptop chip at the same power level, and it delivers the peak performance of the PC chip while using just a quarter of the power.<sup>2</sup> And compared with a 12-core PC laptop chip — which needs dramatically more power to deliver increased performance and is therefore found in thicker, hotter, noisier systems with less battery life — M2 provides nearly 90 percent of the peak performance while using just one-fourth of the power.<sup>3</sup>

M2 also features Apple's next-generation GPU with up to 10 cores — two more than M1. Combined with a larger cache and higher memory bandwidth, the 10-core GPU provides a big boost in graphics performance, delivering up to 25 percent higher performance than M1 at the same power level and up to 35 percent better than M1 at their max power.<sup>1</sup> Compared with the integrated graphics of the latest PC laptop chip, the GPU in M2 delivers 2.3x faster performance at the same power level, and it matches the peak performance of the PC laptop chip using a fifth of the power.<sup>2</sup>

### The M1 Family

The M1, M1 Pro, M1 Max, and M1 Ultra chips provide a range of performance and capabilities across MacBook Air, MacBook Pro, iMac, Mac mini, and Mac Studio. With a giant leap in performance per watt and incredible value, every Mac with Apple silicon is transforming the way business users work.

For example, when compared with a best-selling PC notebook that businesses purchase in the same price range, MacBook Air with M1 offers up to 2x faster Excel performance, up to 50 percent faster web application responsiveness, up to 2x faster browser graphics performance, and up to 2x longer battery life when video conferencing with Zoom on a single charge.<sup>4</sup>

### macOS, Apple Silicon, and Apps

macOS is designed for Apple silicon. The combination of macOS Monterey and Apple silicon delivers breakthrough performance and productivity. And macOS Ventura, coming this October, will take full advantage of Apple silicon to make the things you do most on Mac even better. It will offer amazing new features and capabilities — including Stage Manager, Handoff coming to FaceTime, and Continuity Camera — that bring you powerful new ways to get more done, share and collaborate in your favorite apps, and get the most out of your other Apple devices. Ventura will also include big updates to Safari, Mail, Messages, Spotlight, and more.

Mac computers powered with Apple silicon have access to the largest collection of apps ever for Mac, including iPhone and iPad apps that can run on Mac and universal apps that unlock the full power of M-series chips. Over 10,000 apps and plug-ins have been optimized for Apple silicon, including common business apps such as Microsoft 365, Cisco Webex, and Slack.

### Apple Silicon and the Environment

Mac computers with Apple silicon require less energy for customers to use, helping meet Apple's high standards for product energy efficiency. And M-series chips are designed efficiently, reducing the energy needed to build them. Today, Apple is carbon neutral for global corporate operations — and by 2030, Apple plans to have net-zero climate impact across the entire business, which includes manufacturing supply chains and all product life cycles. This means that every chip Apple creates, from design to manufacturing, will be 100 percent carbon neutral.

1. Testing conducted by Apple in May 2022 using preproduction 13-inch MacBook Pro systems with Apple M2, 8-core CPU, 10-core GPU, and 16GB of RAM; and production 13-inch MacBook Pro systems with Apple M1, 8-core CPU, 8-core GPU, and 16GB of RAM. Performance measured using select industry-standard benchmarks. Performance tests are conducted using specific computer systems and reflect the approximate performance of MacBook Pro. 2. Testing conducted by Apple in May 2022 using preproduction 13-inch MacBook Pro systems with Apple M2, 8-core CPU, 10-core GPU, and 16GB of RAM. Performance measured using select industry-standard benchmarks. 10-core PC laptop chip performance data from testing Samsung Galaxy Book2 360 (NP730QED-KATUS) with Core i7-1255U and 16GB of RAM. Performance tests are conducted using specific computer systems and reflect the approximate performance of MacBook Pro. 3. Testing conducted by Apple in May 2022 using preproduction 13-inch MacBook Pro systems with Apple M2, 8-core CPU, 10-core GPU, and 16GB of RAM. Performance measured using select industry-standard benchmarks. 12-core PC laptop chip performance data from testing MSI Prestige 14 Evo (A12M-011) with Core i7-1260P and 16GB of RAM. Performance tests are conducted using specific computer systems and reflect the approximate performance of MacBook Pro. 4. Testing conducted by Apple in May 2021 using production MacBook Air systems with Apple M1 chip, 7-core GPU, and macOS Big Sur, as well as production Intel Core i5-based PC systems with Intel Iris Xe Graphics and the latest version of Windows 10 available at the time of testing. Best-selling system based on commercial sales data from indirect B2B retailers in the United States for PC laptops in the same price range from January 2020 to April 2021. Productivity application performance tested using Microsoft Excel for Mac Version 16.48 and Microsoft Excel for Windows Version 2103. Web browsing performance tested using Speedometer 2.0 and prerelease MotionMark 1.2 performance benchmarks tested with Safari 14.1 on macOS Big Sur and Chrome v.89.0.4389.90 on Windows 10, with WPA2 Wi-Fi network connection. Battery life performance tested using Zoom Version 5.6.1, with equivalent display brightness settings for all units, and microphone and camera enabled. All claims depend on usage, settings, network configuration, and many other factors; actual results will vary. Performance tests are conducted using specific computer systems and reflect the approximate performance of MacBook Air and selected PC model.