

2005 Mustang Convertible Chassis



*"Mustang is all about driving – that's really where the rubber meets the road. This all-new chassis does everything better – accelerate, turn, stop – while making the most of the powerful new 300-horsepower engine. It's a driving experience that is best summed up in one word: Mustang."
– Phil Martens, Group Vice President, Product Creation*

For the 2005 Mustang convertible, Ford engineers designed the underbody from the beginning as a convertible – giving it more than twice the torsional stiffness of its predecessor and making it the quietest and most solid Mustang convertible ever built.

DONE LIGHT, DONE RIGHT

The typical convertible can weigh as much as 300 pounds more than its hardtop counterpart – but not all of that additional weight is due to the power top motor and mechanism. Much of it, in fact, is the result of structural bracing added to maintain body integrity lost through the removal of the fixed roof.

That added weight affects handling – and usually forces chassis engineers to retune the front and rear suspensions by changing spring rates to make up for the increased mass of the vehicle. But when the Mustang engineering team sat down to design the new coupe and convertible simultaneously, it considered where a convertible would require the most strength and how commonality with the coupe could be integrated into the car's basic structure.

The engineers were able to design body joints and a rocker panel that helped the convertible attain stiffness goals without tacking on extra braces that would have added weight and cost. A quieter and smoother ride was part of the payoff as well. The result is that the 2005 Mustang convertible V-6 and V-8 are only 175 pounds heavier than the coupe requiring only subtle changes to suspension tuning or geometry. That means the convertible driving experience will be far closer to that of the coupe's than ever before.

LOFTY BENCHMARKS FOR SUSPENSION PRECISION

Engineers carefully examined Ford's global suspension design philosophy before they laid out the Mustang's suspension. They used lessons learned from the award-winning Lincoln LS to create the new Mustang's chassis design.

They decided to use a coil-over MacPherson strut front suspension with reverse "L" lower control arms made of lightweight I-section steel. The L-shaped lower control arms offer advantages over

A-arms or wishbone-shaped suspension components, combining surefooted handling with ride comfort.

A firm bushing was positioned where the shorter leg of the L-arm connects with the chassis to control side-to-side motion and quicken steering response. The fore-and-aft movements are directed through a softer, compliant bushing at the longer, rear L-arm leg, which dampens road shocks. This isolation is a direct benefit of the reverse L-configuration of the control arms.

Springs are mounted over the MacPherson struts in a coil-over-shock configuration. This layout allows the shocks to dampen forces in the same section as the spring, cutting friction and enabling more precise shock-valve tuning. A tubular stabilizer bar – 34 millimeters in diameter on the GT convertible and 28.6 millimeters for V-6 versions – helps limit body roll.

At the core of Mustang's advanced new front suspension is groundbreaking manufacturing technology used to produce steel control arms that actually weigh less than some comparable cast-aluminum designs. Employed for the first time in a production vehicle, this technique allows two C-section stampings to be assembled back-to-back with welded seams. This creates an I-section profile that offers an exceptional strength-to-weight ratio.

Material is efficiently moved toward the edges of the control arms for increased stiffness, while the center is kept thin to minimize weight. Reducing unsprung weight – components that are positioned below the springs and shocks – improves the suspension's response to abrupt changes, like pavement seams. The result is a greater feeling of connection to the road.

"Having too much unsprung weight is like trying to play basketball in ski boots," says Tom Barnes, Vehicle Engineering Manager. "Keeping the unsprung weight low gives the suspension the quickness to stay firmly planted on the road."

REAR SUSPENSION BASED ON A SOLID NEW DESIGN

Working on a clean sheet of paper, Mustang's engineering team could have selected any type of setup at the rear, including an independent suspension. So why choose a solid rear axle? The answer lies in Mustang's position as America's sports car.

"We talked to a lot of Mustang owners when we were developing this program," says Hau Thai-Tang, chief engineer. "They are a very passionate group, and a lot of them told us – very strongly – that the all-new Mustang must have a solid rear axle."

Although a mainstay of muscle car design, the solid axle hasn't always been viewed as its strong suit. Early hopped-up sedans often overwhelmed their leaf-spring live axles, which weren't designed for the demands of performance driving.

The slender leaf springs were prone to sway in hard maneuvers and to wind up and "hop" the rear wheels under full throttle. The tendency of the low-grip bias-ply tires of the day to lose traction and "burn rubber" actually was a blessing in disguise, as it took pressure off the suspension. For 40 years, mainstream Mustangs have featured ever-improving solid rear axle designs.

For 2005, Mustang's rear suspension takes a completely different approach to combat wheel hop. Engineers opted for a three-link architecture with a Panhard rod that provides precise control over



The 2005 Mustang convertible refines both the MacPherson strut front and solid rear axle designs to their ultimate executions. The result is great driving dynamics with signature, straight-line Mustang performance.

the rear axle. A central torque control arm is fastened to the upper front end of the differential, while trailing arms are located near each end of the axle.

A lightweight, tubular Panhard rod is parallel to the axle and attached at one end to the body and at the other to the axle. It stabilizes the rear axle side-to-side as the wheels move through jounce and rebound. It also firmly controls the axle during hard cornering.

Constant-rate coil springs and outboard shocks are tuned for a firm yet compliant ride. The shocks are located on the outside of the rear structural rails, near the wheels, reducing the level effect of the axle and allowing a more precise and slightly softer tuning of the shock valves.

The Mustang GT incorporates a separate rear stabilizer bar to reduce body lean further.

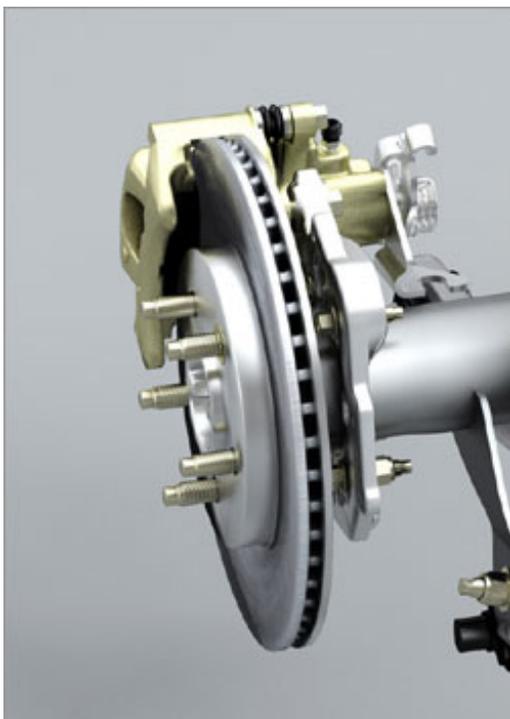
Previous Mustangs used a simplified rear suspension linkage that acted on composite force vectors. By using separate longitudinal and lateral links in the all-new Mustang, engineers could isolate the forces acting on the rear axle and tune the bushings accordingly. As a result, the axle is more precisely controlled throughout its range of motion. Road shocks are isolated and damped, and the solid lateral control of the rear axle reduces body sway and improves control and stability over mid-corner bumps, known to induce a condition called "bump-steer."

The solid rear axle offers several other advantages that play to Mustang's strengths. It is robust, maintains constant track, toe-in and camber relative to the road surface, and it keeps body roll well under control.

In short, the Mustang's sophisticated rear geometry provides handling precision and performance worthy of a modern muscle car. But that doesn't mean all of the roadgoing exuberance has been dialed out of the new model. Keeping enthusiasts in mind, Ford chassis and powertrain engineers worked together to make sure owners of the new Mustang can still "chirp" the rear tires when the spirit moves them.

BIG BRAKES PUT A STOP TO ALL OF THIS

Bigger usually means better when it comes to brakes, but that's only part of the story behind the Mustang convertible's sophisticated standard four-wheel-disc brake system.



Along with Mustang GT's biggest-ever rotors and stiffest calipers comes a new, 4-channel anti-lock braking system (ABS) that enhances braking performance. In addition to helping prevent wheel lock-up, the new system has electronic brake force distribution (EBD), which distributes braking power to the wheels where it can be used most effectively.

Dual-piston aluminum floating front calipers clamp down on 316-millimeter (12.4-inch) front brake discs on GT models – an increase of more than 15 percent in rotor size. On the GT, the brakes have 14 percent more swept area than those of the previous model. These rotors are 30 millimeters thick and are ventilated to provide consistent stopping power, even under the strain of excessive heat induced by repeated hard braking. The payoff comes in shorter stopping distances, better pedal feel and longer pad and rotor life.

The V-6 Mustangs get 293-millimeter (11.5-inch) ventilated rotors that also are 30 millimeters thick. This represents a 16 percent increase in rotor size over the brakes of the previous

V-6 model.

In the rear, the brake rotors are 300 millimeters (11.8 inches) in diameter – more than 12 percent larger than the previous Mustang – and 19 millimeters thick. Rear rotors are vented on both the GT and V-6. Single-piston calipers sweep 18 percent more area than the rear brakes on the previous Mustang. When it comes to total stopping power, brakes in the new Mustang GT are bigger – and clamp with more force – than any other regular-production Mustang in history.

GRIPPING PROFILE: New Mustang wheels and tires

No muscle car deserves the title unless suited up with the proper wheels and tires, and the new Mustang convertible won't leave the factory half-dressed. The array of wheels available on the Mustang is engineered to meet demanding performance requirements.

The standard 17-inch wheels on Mustang GT are eight inches wide and equipped with Pirelli P235/55ZR-17 W-speed-rated all-season performance tires for year-round driving.

V-6 models have seven-inch-wide, 16-inch wheels. As with the Mustang GT, all-season rubber is standard, with a slightly higher profile T-rated BF Goodrich tire, sized at P215/65R-16. These tires are designed to offer long wear without compromising performance.

In concert with the ABS and traction control systems, the new all-season tires make Mustang convertible far more practical in rain, ice or snow. On dry pavement, they provide an exceptionally engaging driving experience with high overall grip and good steering response.

Aesthetically, street rodders have long known that larger wheels and tires better fill the car's wheel wells, adding meat to the muscle. The 2005 Mustang convertible's tires boast more sidewall than many other sports cars, enhancing the muscle car look and providing a better match for this vehicle's blend of power and handling.