

EXCLUSIVE TEST

"Understandin' this car is very simple," explains straight-talking John Coletti, manager of Special Vehicle Engineering (SVE) at Ford Motor Company. "This car is the ultimate-aspiration street Mustang. You couldn't want it to have anything else; cause there's really nothing else to want."

From its multihued carbon-fiber-encrusted body and high-rev 5.4-liter, supercharged, alcohol-burning DOHC V-8, to the fully independent, pushrod rear suspension and huge Indy-style disc brakes, this 175-mph rocket features the absolute best hardware begged, borrowed, or stolen from Ford's internal advanced-engineering groups.

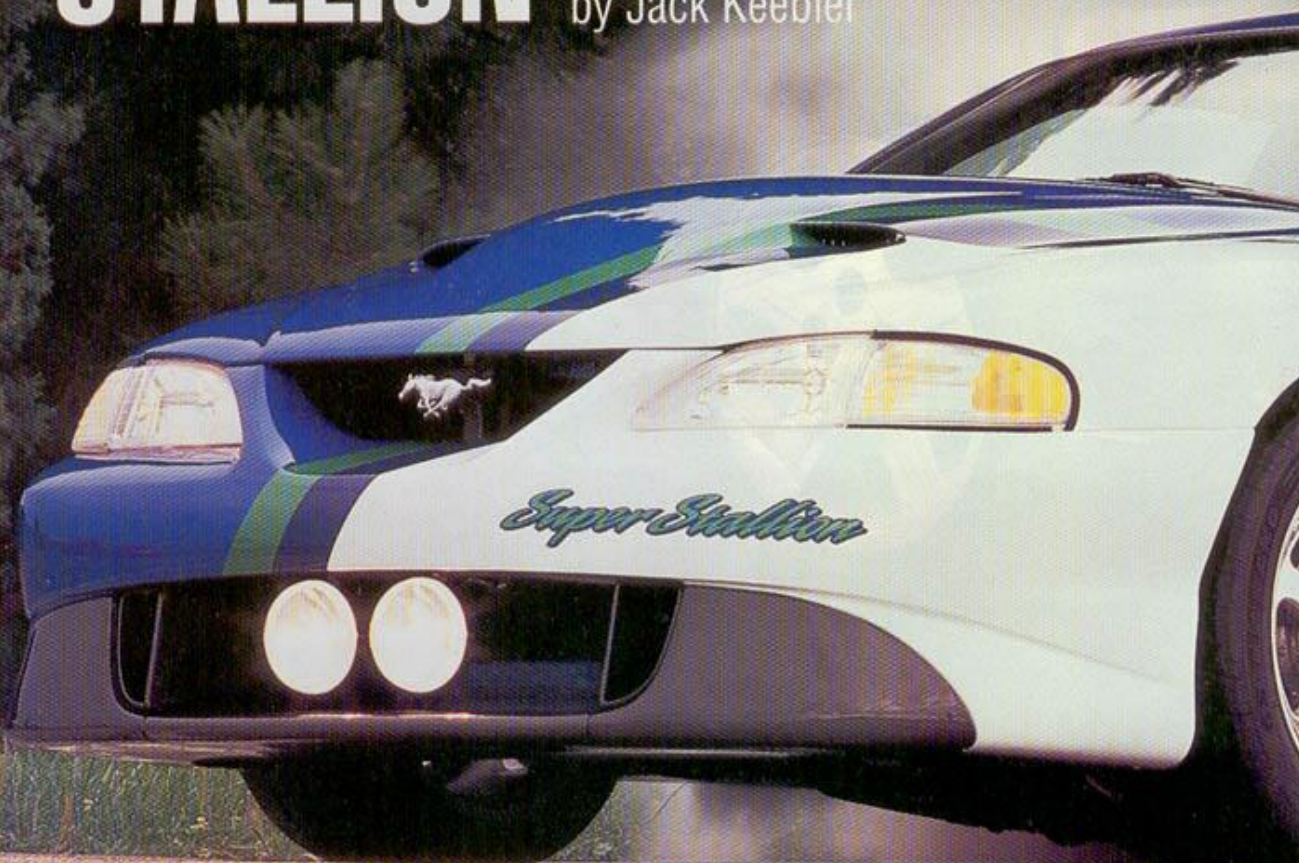
The "Super Stallion" was carefully assembled by Ford's elite SVE team, working in a small, secretive hideaway on the gritty outskirts of Dearborn, Michigan. These enthusiastic designers and engineers created the fire-breather to start a tremor, and perhaps send a trickle of fear-scented sweat, down the collective spines of sports

car builders worldwide. This is a welded-steel wake-up call to company insiders and outsiders: Street performance is a language clearly spoken inside Blue Oval garages.

FORD'S 590-HP SUPER STALLION

More specifically, this Super Stallion Mustang is also a factory-performance showcase for this year's Specialty Equipment Manufacturer's Association (SEMA) show in Las Vegas, Nevada. So, not only did it have to look hot, it had to have exceptional performance.

THE ULTIMATE FACTORY-BUILT,
STREET-LEGAL MUSTANG
by Jack Keebler



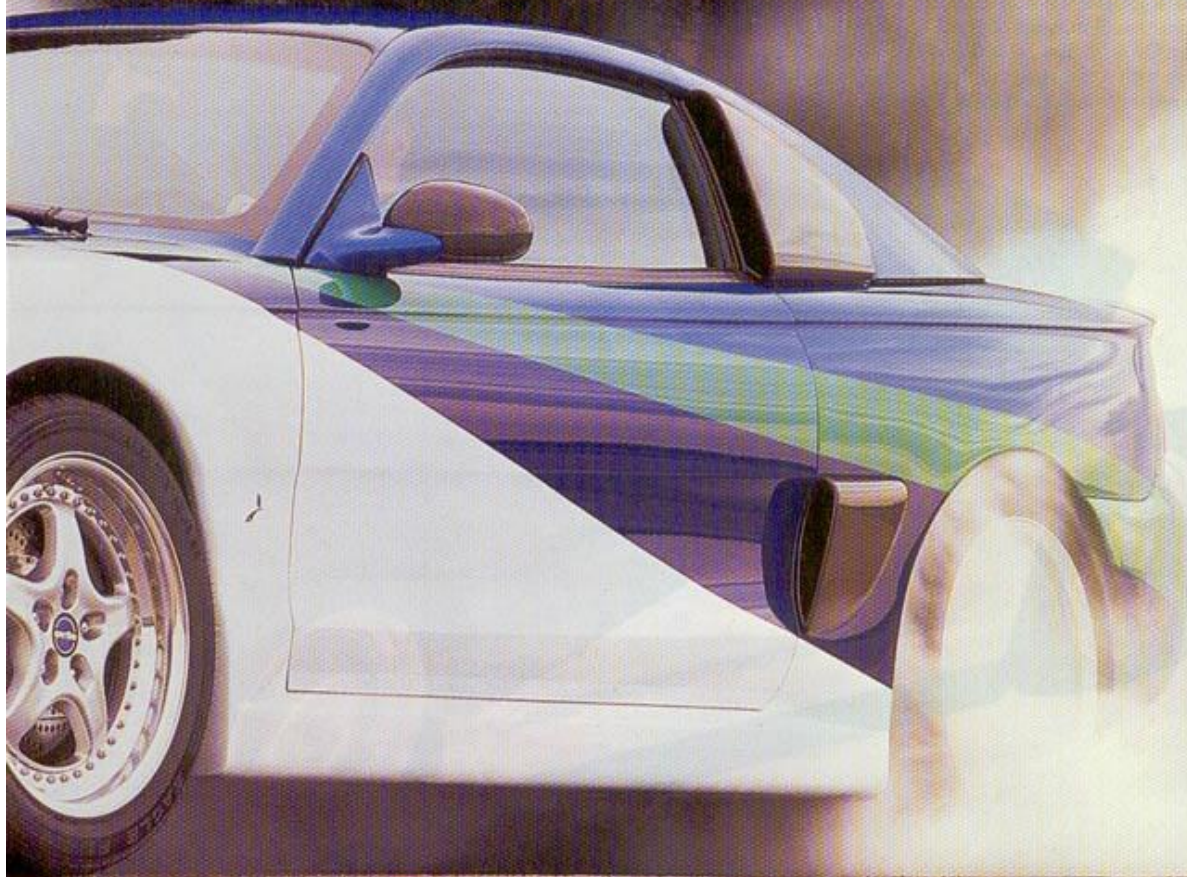
Although easily as powerful and technically sophisticated as many pure-blood race machines, this is not a one-off, tube-frame toy destined to bash fenders on an oval, fry a quarter mile of asphalt for an endless summer, or bend a thousand high-g corners at some road course in Europe. Rather, the Super Stallion is the street-legal Mustang that Ford Engineering would uncork for American highways—if Ford corporate sights ever locked onto competitive targets like the Dodge Viper GTS, Chevrolet Corvette, or even international prey like the all-conquering Porsche Turbo S. For this month's issue, *Motor Trend* was granted a detailed, exclusive track test of Ford's ultra-trick pony.

GREEN HORSES... 590 OF 'EM

Coletti's engineering team has come up with an interesting recipe for raw power that combines bits off hot-rodding's parts shelf with a significant slice of inspired environmentally friendly invention.

Lift the twin air-scooped hood on a sunny day, and your retinas will be fried into submission by polished aluminum, sparkling chrome fasteners, and neatly arranged braided bright stainless hoses. And lurking under all the 30-weight jewelry, the main ingredient is a cast-iron 5.4-liter V-8 truck block sucking mega cubic feet of air through a set of prototype DOHC aluminum heads. These feature what Coletti likes to describe as "unique" port geometry for max flow capacity.

PHOTOGRAPHY BY DAVID FREERS



Pop the bulging hood and your eyes feast on a brightly polished intake tract and cam covers, braided stainless hoses, and a hard-pumping 2.1-liter supercharger bolted to a nearly 600-horsepower V-8.



But the basic 5.4-liter (330-cube) Modular V-8 used in the F-150 pickup and other Ford light-duty trucks is a SOHC engine. How did SVE engineers develop a set of twin-cam heads for this engine so quickly? The 5.4 is basically a long-stroke version of the Modular 4.6, with the same cylinder bore size, so this potent 5.4's heads closely mimic those of a DOHC 4.6-liter Cobra engine with some small amount of grinding and tweaks for a fit. We hope to get back to you soon with a test report on how this cleverness relates to a production Mus-

tang with a DOHC 5.4-liter V-8.

Air starts on its journey through this engine at twin, carbon-fiber cold-air scoops tucked into either side of the front grille opening. Individually, the composite snorkels ram the air back through K&N filters located in the front fenders and into howitzer-size aluminum pipes. From each pipe, it's pulled into separate 80mm mass-air-flow sensors and then into a belt-driven Garrett 2.1-liter supercharger. (The supercharger has an electro-hydraulic clutch activated by a console-mounted on/off switch to maximize fuel economy when you're not out to feed on Ferraris.)

After being squeezed to a maximum of 10 psi by the blower (and

picking up a considerable amount of compression heating), the hot-charged air dives into a custom-built air-to-water intercooler located down inside the hand-fabricated intake plenum. (The small, highly efficient intercooler's plumbing runs forward to a grille-mounted radiator.) And from this point, things really start to get tricky.

An interesting aside: Ford Motor Company claims to be North America's industry leader in environmentally friendly, flexible-fuel vehicles. In fact, this past





Designers kept the interior nearly Cobra-level stock, except for a custom-made console and leather and carbon fiber trim. The front leather-covered buckets are special Lear units that attach the belts directly to the seats for improved comfort.

June, it announced plans to build and sell approximately 250,000 vehicles that can run on either pure gasoline or a cocktail mix of up to 85 percent ethyl alcohol and 15 percent gasoline, known by the eco-righteous as E85. And so, to trumpet that fact to the earth-friendly buying public and gain the additional power from the higher octane in ethanol-blended fuels, the Super Stallion features alcohol-sensing electronics similar to those developed for Ford's flex-fuel production vehicles. (Ethyl alcohol, or ethanol, is derived primarily from corn and grains versus methanol, which also is blended into some gasolines, but is produced from coal or natural gas.

The fact that ethanol comes from bio-mass mate-

rial makes it an earth-friendly renewable energy source.)

The Super Stallion's in-line fuel sensor tells the engine's ignition advance system, the fuel-rate delivery electronics, and the supercharger's boost-bleeding wastegate about the fuel's current alcohol percentage. For instance, running an appropriate ignition-advance curve, 93 octane unleaded, and 8 pounds of boost, the engine makes 545 horsepower at 6000 rpm. But with a fill of more knock-resistant E85, boost levels can be safely dialed up to 10 psi. And then, according to John Moore, a product design engineer with Ford's SVE group, an extra 45 horses ride the engine's horsepower peak. That's 590 snake-stompin' ponies.

Imagine asphalt-scorching acceleration that strains your neck muscles, smokes the tires for over 300 yards, noticeably twists the unibody, bends engine mounts, and challenges even lightning-quick shiftmeisters to beat the electronic rev limiter to second gear.

This is no Sunday driver, with 590 horses straining at the tether, it's all you can do just to keep this beast pointed more or less straight during any acceleration attempt. At idle, it shakes the ground like a Boss 429 Mustang with a full-race cam, cackling with explosive exhaust pulses and setting off every car alarm in the county. The way to a fast time is to launch this pony at no more than 1600 rpm, gently feeding in the throttle as the big 265/40ZR18 Goodyears churn at the edge of traction. Full throttle is impossible until you're well into third gear, but it's still one helluva handful to drive. With a bit of practice, you'll whittle your 0-60-mph times down to 4.2 seconds and annihilate the quarter mile in 12.7 seconds at 112.8 mph, spinning the tires virtually all the way.

Inside, an A-post-mounted gauge has a needle that reads in the red for fuel-efficient vacuum, blue for gasoline boost levels, and green for the higher alcohol-fuels boost. Effectively, the alcohol sensor allows safe refueling at any gasoline pump. If a slurp of E85 isn't available, boost, ignition timing, and injection rates are bumped back. This is actually critically important, since only about 60 stations in the United States currently offer E85.

Adding this dual-fuel capability requires some driving adjustments and posed a few challenges beyond just finding an E85 pump. First, although ethanol-blended fuel has a higher octane rating than gasoline, it also has roughly half as many calories (heat energy) per gallon. Effectively, that means that, when the 15.4-gallon fuel tank is filled primarily with corn squeezin's, your driving range drops to about half that of a tank of energy-dense gasoline. Second, fuel line sizes had to go from 0.375 to 0.50 inch to deliver enough of the wet stuff for a pedal-to-the-metal traffic merge or a righteous burn-out. Even the tank return line from the pressure regulator had to be upsized from 0.25 to 0.375 inch. And finally, instead of using just a single high-flow injector, the power-pumping 5.4 requires two injectors to properly spritz each cylinder. For some flow-rate perspective, the potent 305-horsepower 4.6-liter-powered Mustang Cobra runs a single 110-liter/hour in-tank fuel pump. The extra-thirsty Stallion requires two 190 liter/hour flex-fuel-compatible pumps.

Of course, what goes in must also come out. Big plumbing upstream of the combustion-chamber flame fronts means big plumbing downstream. Exhaust pulses out of each port and into a 1.75-inch stainless runner and then into a 3-inch collector. Bolted downstream of each collector is a giant Walker catalytic converter with a 3-inch inlet and outlet. Exhaust gas is then pushed further aft and semi-tamed by dual Walker Race Magnum mufflers. And finally, burnt gas is belched out through a stainless oval tip that passes through the rear end's lower fascia. Trust us, given the performance and sound levels at the test track, there are no backpressure problems here.

Power from the 5.4 V-8 surges from the crank and flywheel through a mechanically actuated 10.5-inch McLeod dual-disc clutch and into a special Borg Warner T56 six-speed transmission, similar to that in the Dodge Viper. Engine muscle moves from there through the





Ultimate go requires premium, racing-style four-wheel-disc stopping muscle. Squeezing the whoa pedal activates anti-lock-controlled eight-piston, four-pad Brembo calipers in front and four-piston, two-pad calipers in the rear. The 13-inch front rotors are cross-drilled and slotted. In back are 12-inch cross-drilled discs.

beefy subframe-mounted custom-built aluminum differential housing and out to the gargantuan Goodyear Eagle F1s through the axle halfshafts. The F1s are mounted on 18x9.5-inch Speedline Aliseo three-piece aluminum wheels.

BODY DOUBLE

While Ford Design painstakingly put the Stallion's body in proper shape with hot-rodging levels of detail, a second "mule" Mustang body was used and abused by SVE to tune and prove out the experimental driveline and suspension pieces. These parts were then pulled from the butt-kicked mule car and finally installed in the artfully crafted Stallion body.

The arresting exterior graphics package, rendered by world-famous designer, Larry Shinoda (creator of the original Boss Mustang graphics), features BASF Deep Metallic Blue, Green, and Pearl White paints. To give the car a fresh look while maintaining the integrity of the production Mustang's face, designers used the standard headlamps and front fenders. But a unique, lightweight front fascia was created with a carbon fiber lower intake and dual, center-mounted 115-watt PIAA rally-driving lights. The humped hood is also a slick carbon-fiber piece with twin Mach I-style scoops in the front edge and a wide air-extractor slot across its rear edge in the low-pressure area at the windshield's base.

Looking at the body sides, there are one-off rocker moldings bonded directly to the sheetmetal to enhance the car's low-profile



Hidden under the package tray between the trunk and rear seats is the heart of the independent rear suspension: two sideways coil-over units with bell cranks and pushrods operating on the polished, forged-aluminum lower control arms.

appearance. And the standard sideview mirrors have been pitched for swoopy carbon fiber units. Unfortunately, at speed, they shake so much that the view of trailing traffic becomes a lively, colorful, and utterly useless blur.

Designers made the Mustang's signature lower body-side ducts functional so that air could be grabbed for rear-disc brake cooling. Other cooling features are the 13-inch-wide carbon fiber scoops positioned over each rear quarter-window opening. These scoops duct air directly to the in-board rear suspension parts.

While the Mustang team had the Stallion on a lift, an underbody beautification program took place. The entire floorpan and engine bay were sprayed with high-gloss blue urethane, and all the aluminum suspension pieces have been buffed to a mirror-like gleam.

But do you notice anything missing? We wondered about the lack of door handles and a stout rollcage. The Mustang's cheapo-looking outside handles have been neatly replaced by keyfob-controlled solenoids. But the cage, a relatively normal chassis-stiffening and roll-over pre-

caution in an almost 600-horsepower car, is absent because as one Ford engineer put it, "John Coletti just hates rollbars."

From the rear, there's no mistaking that this Mustang is special. The rear bumpers have been bobbed. And there's an extra-large ducktail spoiler grafted onto the rear decklid. In addition, the quarter panels have been tweaked out so they don't taper quite as much where they normally meet the plastic fascia. And in combination with the wide rubber, this subtle change gives the car a more menacing stance. Can you say Mustang ZR1? Ah, such sacrilege.

THE INSIDE STORY

The interior of the Stallion appears to be fairly close to that of a stock Cobra. But there are a few notable differences.

First, the black leather buckets in front are experimental units. Look closely and you see that the seatbelts are attached directly to the hefty seat frames, rather than to the B-posts and floor. And the seats themselves are attached to robust cross-members under the floor.

These seats also have a second interesting trick. Ford engineers call it "active seat bolsters." A side-load sensor connected to a seat microprocessor automatically moves the backrest bolsters in and out on fast turns to better support passengers during high-g cornering.

Because this car is also Coletti's development vehicle, installed in the car's head-



liner above the rearview mirror is an electronic Vericom performance-evaluation unit for measuring performance. The tasteful finishing touch on the interior's door panels, center console, and instrument-panel surround are custom-made, carbon fiber pieces that nicely accent the pleasingly plain interior. A final piece of powerful hardware inside the car is the nine-speaker 630-watt sound system. Drivers will need every watt to hear music over the rowdy engine roar.

"So why didn't you install a vehicle-navigation system?" we asked Coletti. "This is a car to get lost in," he patiently explained. "No navigation devices. Maybe if I were doing an Expedition. But no cell phones, no faxes, and no global-positioning nonsense. I'll know where I am. And I'll know where I'm going, when I'm driving this car."

INDEPENDENT ACTION

Coletti says his guys wanted to move this Mustang beyond the harshly sprung live-axle Mustangs of street tuners and road racers who sacrifice road isolation for ultimate handling. The SVE folks wanted it all: ride and tenacious cornering grip, whatever the surface conditions. But the solution couldn't tear up the current platform's floorpan (they're thinking production possibilities).

So the Advanced Technology Group under Neil Ressler, vice president of Advanced Vehicle Technology, came up with a clever design using a billet-aluminum cradle that carries two Koni double-adjustable coil-over units mounted on their sides and attached to huge bell cranks. This cradle is then mounted in the vehicle's trunk under the rear package tray and attached to two crossmembers. The shock units attach to the bell cranks and long pushrods attached to the other side of the cranks go through the floor to communicate with each axle's forged aluminum short and long arms.

The rear windows have been sacrificed for huge scoops that jam air back into

what SVE engineers call "the fish tank," a plexiglass housing that surrounds the rear shock units to quiet and protect them. The heated air is then exhausted through the floorpan holes for the suspension pushrods.

Up front, the original MacPherson struts were tossed. Engineers had several problems that only a short- and long-arm suspension would solve. The first was getting a better ride over small road irregularities. The second problem was keeping the wider tire contact patches in better communion with the road by reducing camber-angle changes. The third problem was eliminating the tall, inner-fender strut towers for some additional engine-bay room. The DOHC 5.4 and its heavy-breathing hardware needed additional space to stretch out.

To stop this alcohol-burning missile, Ford went to the Brembo competition parts catalog. The front rotors are absolutely monstrous two-piece, cross-drilled, and slotted 13-inch vented discs each squeezed by eight pistons and four pads. In back, things are almost as serious with four-piston Brembos putting the bite on 12-inch vented rotors. And making sure that just the right amount of grip gets transferred at the huge contact patches, the electronic and hydraulic hardware from a Mustang Cobra's Bosch anti-lock system was slipped into place. They do their job well, halting the marauding Mustang from 60 mph in just 116 feet—time after time with zero fade.

Although this one-off pony is an expensive engineering study, a less-radical version could make sense for production.

Our final impression: For heavy-metal pilgrims who worship everywhere at the altar of speed, the Super Stallion is an impressive icon of driving enthusiasm. The trick will be for Coletti and crew to convince Ford's top execs to let it compete against the Vette and Viper on America's mean streets.

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TECH DATA

FORD SUPER STALLION

GENERAL

Location of final assembly	Allen Park, Mich.
Body style	2-door, 4-pass.
EPA size class	Subcompact
Drivetrain layout	Front engine, rear drive
Airbag	Dual

POWERTRAIN

Engine type	90-degree V-8, cast-iron block and aluminum heads
Bore x stroke, in./mm	3.55x4.17/90.2x105.8
Displacement, ci/cc	330/5409
Compression ratio	8.2:1
Valve gear	DOHC, 4 valves/cyl.
Fuel/induction system	Sequential multiport w/dual injectors/supercharger w/air-to-water intercooler

Horsepower, hp @ rpm, SAE net	gasoline/E85 alcohol
	545 @ 6000/590 @ 6000
Torque, lb-ft SAE net	497 @ 4750
Horsepower/liter, gasoline/E85 alcohol	101.2/109.0
Redline, rpm	6000
Transmission type	6-speed manual
Axle ratio	4.10:1
Final-drive ratio	2.06:1
Recommended fuel	Gasoline/E85 ethyl alcohol

DIMENSIONS

Wheelbase, in./mm	101.5/2578
Track, f/r, in./mm	60.5/61.25 / 1537/1556
Length, in./mm	185.0/4699
Width, in./mm	71.8/1824
Height, in./mm	52.0/1321
Base curb weight, lb	4080
Weight distribution, f/r, %	55/45
Cargo capacity, cu ft	8.5
Fuel capacity, gal.	15.4
Weight/power ratio, lb/hp	7.5:1

CHASSIS

Suspension, f/r	Upper and lower control arms, double-adjustable shocks and coil springs, anti-roll bar/Upper and lower control arms, coil-over, double adjustable shocks, anti-roll bar
Steering type	Rack and pinion, power assist
Ratio	14.7:1
Turns, lock to lock	2.4
Turning circle, ft.	38.3
Brakes, f/r	Vented, slotted, cross-drilled discs/vented, cross-drilled discs
Wheels, in.	18 x 9.5, aluminum
Tires	Goodyear Eagle F1, P265/40ZR18

PERFORMANCE

Acceleration, sec	
0-30 mph	1.9
0-40 mph	2.6
0-50 mph	3.5
0-60 mph	4.3
0-70 mph	5.6
0-80 mph	6.8
0-90 mph	8.5
0-100 mph	10.2
Standing quarter mile, sec/mph	12.7/112.8
Braking, 60-0 mph, ft.	116
Lateral acceleration, g	0.92
Speed through 600-ft slalom, mph	69.0
EPA fuel economy, mpg city/hwy	N/A
Est. Range, city/hwy, miles	N/A

PRICE

Price as tested	Undisclosed
www.ford.com	