

2007 Shelby GT500 Powertrain

2007 SHELBY GT500: BIG BLOCK POWER

- With 500 hp, the 2007 Shelby GT500 is the most powerful factory-built Mustang ever
- 5.4-liter V-8 features 32 valves, supercharger and water-to-air intercooler
- Aluminum heads sourced from Ford GT deliver optimum air flow
- 6-speed manual transmission provides gearing for performance driving



Just as the big-block GT500 from 1968 was a step up from the GT350, the 2007 Ford Shelby GT500's 500-horsepower, 5.4-liter V-8 is a step up from the 4.6-liter V-8 used in yesterday's SVT Mustang Cobra.

Not coincidentally, the 2007 Shelby GT500 sports the largest displacement engine installed in a volume version of the Mustang since 1973.

The 1995 SVT Mustang Cobra R used a 5.8-liter 300-horsepower overhead valve V-8, and 250 units were produced. The 2000 SVT Mustang Cobra R used a 385-horsepower 5.4-liter dual overhead cam V-8, and a limited run of 300 cars was produced.

While the big block, overhead cams and four valves per cylinder contribute significantly to the 500-horsepower output of the 2007 Shelby GT500's 5.4-liter V-8, a Roots-type supercharger and intercooler are the icing on the cake. In fact, the configuration is similar to the Ford GT supercar, offering the right combination of classic Ford big-block power and modern technology. Using the Ford GT as a blueprint, SVT has given the GT500 more total horsepower than any factory Mustang in the car's celebrated history.

"The Shelby GT500 delivers on the essence of two great names in Ford performance – a mix of SVT's modern-day experience with supercharging and the Shelby GT500's heritage of big-block power," says Jay O'Connell, SVT chief vehicle engineer.

Supercharged 500-Horsepower

With the stout cast-iron, 5.4-liter Triton V-8 engine as a starting point, the Shelby GT500 adds a Roots-type 8.5-pounds-per-square-inch Eaton supercharger and water-to-air intercooler.

"A screw-type supercharger that we use in the Ford GT gives you a little more top end, and the Roots type is a little fatter in the midrange," says O'Connell. Given that the GT500 will be used as a daily driver far more than the Ford GT is, it's the ideal choice."

Adding forced-induction power is more than just a bolt-on proposition. The engine's internals need upgrading for the sake of strength and durability. To that end, the Shelby GT500's powerplant benefits from unique connecting rods and forged pistons to handle the extra strain on the lower end of the block.

"The entire induction system is unique," says O'Connell. "That includes the intake, intercooler, fuel supply – everything."

The all-new intake manifold helps to channel the supercharged fuel-air mixture into the cylinders. The low-profile manifold design also effectively packages the entire induction system under the GT500's special air-extractor hood. Fuel comes from a dual-bore electronic throttle body borrowed from Ford's 6.8-liter V-10 truck engine program.

To manage heat produced by 500 horses, engineers devised a set of GT500 specific features, including an air-extractor hood, a high-capacity aluminum radiator, an intercooler mounted below the blower, a loop-style power-steering cooler and an oil-to-water stacked-dish engine oil cooler.

4-Valve Heads from Ford GT

While supercharging is a key element in the Shelby GT500's ability to generate so much horsepower, another major contributing component is the design of cast-aluminum, four-valve cylinder heads sourced from the Ford GT supercar.

Machining changes are incorporated into the outside ends of the heads and to the left rear cam cap to fit the engine into the Mustang chassis.

Developed specifically for supercharged applications, these high-performance heads use high-flow ports and specially calibrated dual-overhead camshafts to deliver optimum engine "breathing" along with surprisingly good fuel efficiency and emissions.

The cams and valvetrain are specific to the Shelby GT500. The cam drive system is unique and designed to fit into the Mustang engine compartment, which is narrower than the Ford GT's. The oil pan and windage tray are the wet-sump setup from the Mustang GT. The Ford GT uses a dry-sump arrangement.

Powered by SVT

To enthusiasts, the real beauty of any performance car rests with its engine. That idea certainly wasn't lost on Carroll Shelby because Mustangs that bore his name have traditionally brought his unique sense of style and personality directly into the engine compartment. One Shelby signature feature – special finned-valve covers embossed with "COBRA Powered By Ford" – soon became the envy of many Ford V-8 owners.

The GT500 is equipped with special "Powered by SVT" finned-cam covers to hint at the beauty of all those horses lurking in the engine below. Mated to the Ford GT 4-valve cylinder heads are unique exhaust manifolds that help to better scavenge spent gases out of the cylinders and into the custom-tuned mufflers and dual-exhaust system.

And the aggressive exhaust note, which is unobtrusive in everyday driving situations, was truly

custom tuned.

"More than 40 different muffler tunings were tested, measured and evaluated to come up with the right sound," says William Woebkenberg, an engineer with SVT.

A special device called a "tuned exhaust crossover" was incorporated to create the special sound. Unlike the H-pipe design used by the Mustang GT, the Shelby GT500 uses an X-shape stamping to create the desired sound and increase power output through dynamic scavenging.

6-Speed Gearbox

The gearbox used by the 2007 Shelby GT500 also is a rarity. Few transmissions exist in the marketplace today that can handle the torque loads generated by the supercharged GT500, so engineers are opting to stick with the proven heavy-duty performance of the TR6060 6-speed manual gearbox.

The GT500 employs an upgraded version of the T-56, which first appeared in the 2000 SVT Mustang Cobra R, powered by a naturally aspirated 5.4-liter V-8 with 385 horsepower, and later in the supercharged 2003 SVT Mustang Cobra whose DOHC 4.6-liter produced 390 horses. For the Shelby GT500, the six-speed manual will be geared to make the most of the supercharged 5.4-liter's broad power band.

Then and Now

Performance cars have evolved dramatically since their heyday in the 1960s. In terms of safety, efficiency and refinement, today's street machines totally outperform their elder muscle car colleagues in nearly all categories. Yet the story is seldom told about the tremendous gains made in reducing emissions while increasing overall power output.

The fact is, the GT500 is easily twice as powerful as the hottest V-8 package offered when Mustang was first introduced – yet still produces from 100 to 300 times fewer emissions. Additionally, today's modern "MOD" V-8 powertrain enjoys a nearly 60-percent increase in average fuel economy compared to corresponding Ford products produced 30 years ago.

Back in the so-called Muscle Car era, driving a street beast with more than 400 horsepower was a dicey proposition. When dual carburetors, progressive linkage and dual-point ignitions were part of the equation, performance came with a price – drivability. Running too lean or too rich – or with the timing or spark out of adjustment -- could mean it would misfire or "carbon up", sometimes with thick black smoke coming from the tailpipe. Worse yet was fuel economy, with most of the big, high-powered V-8s at the time netting anywhere from six to 10 miles per gallon in typical driving.

Ford's "MOD" V-8 family of engines makes more power than any Ford motors of the past, yet tops 20 mpg on the highway and meet the government's LEV-II tailpipe emissions standards.

Multi-valve Engine Technology

Modern, race-derived technology provides an interesting power comparison: The GT500 with a 5.4-liter, DOHC, supercharged V-8 produces better than 100 horsepower more with nearly 100 fewer cubic inches. Compare that with the 1967 Shelby GT500's 355-horsepower, 428-cubic-inch-displacement, big-block V-8.

The GT500 uses cylinder heads with four valves per cylinder and double overhead cams for optimum engine "breathing." Using multiple valves per cylinder provides the engine with a more efficient airflow, generating higher peak horsepower. As an additional benefit, multi-valve engines better utilize the air-and-fuel mixture in the cylinders with less waste and unburned fuel vapor. Also, multi-valve engines are better suited to help scavenge exhaust gases out of the cylinder after

combustion is complete for more power with cleaner tailpipe emissions.

In addition, supercharging produces the peak horsepower of a much larger-displacement, naturally aspirated engine. Yet, at lower throttle applications, the smaller displacement enabled by supercharging consumes less fuel, resulting in increased fuel economy and lower emissions.

As a result, the 2007 Shelby GT500 is designed not only to be the most powerful Mustang from the factory – but also one of the cleanest.