GM's HOT **NEW LS3**

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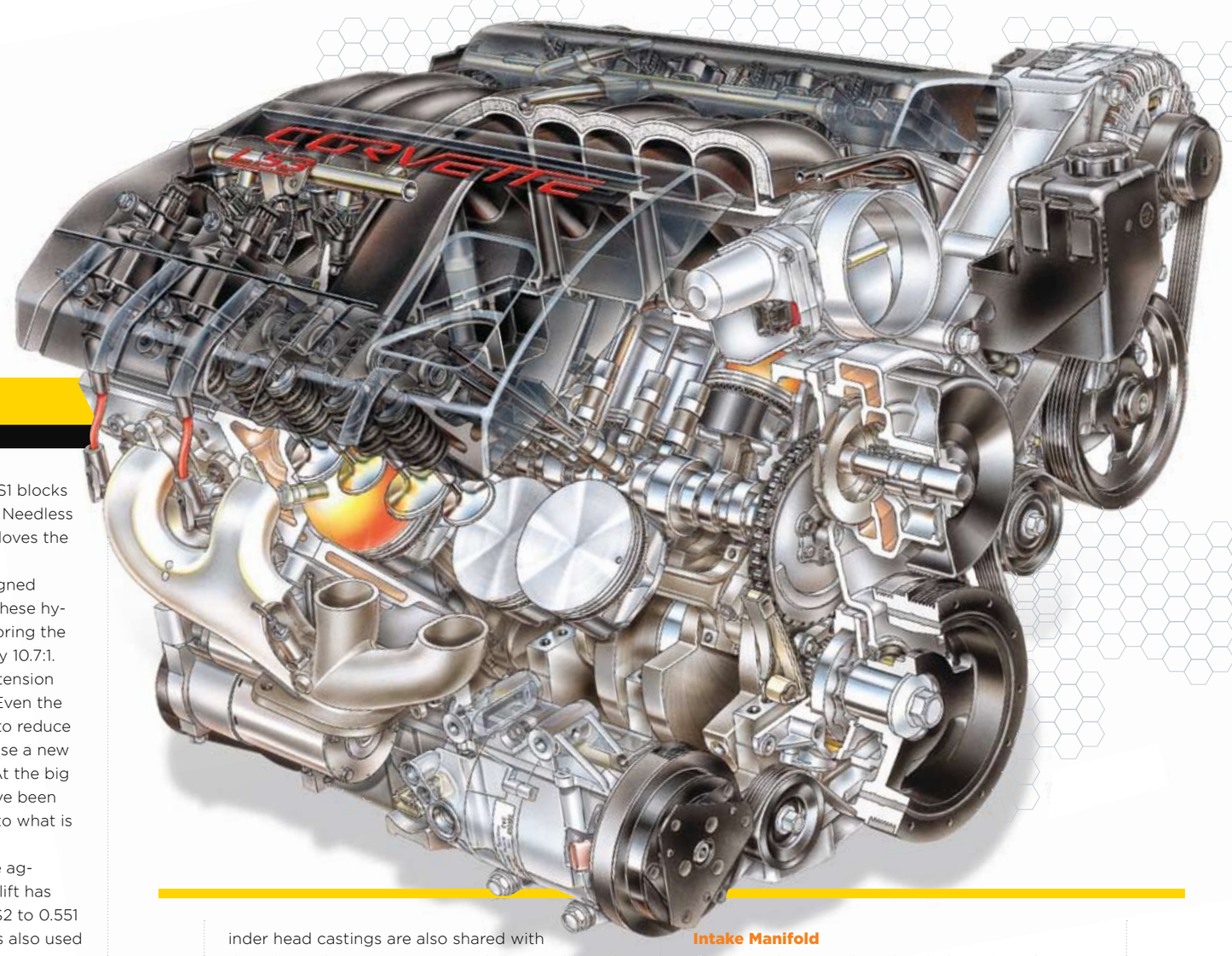
GM's 436-horse LS3

By **Tony Whatley** Photography **courtesy of GM**



Being a GM enthusiast, there is no doubt that you have been exposed to the buzz going on about the upcoming 2008 updates to the base model Corvette. With the 1997 introduction of the LSX-series engines, GM has continued to raise the bar every few years when it didn't seem possible to do so. The 5.7L LS1 debuted with a rating of 345 hp. Then along came the 6.0L LS2 in 2005 to bring the Corvette 400 hp under the hood. For 2008, we now have the new 6.2L LS3 engine: SAE rated to 436 hp and 428 lb-ft of torque! This provides enough motivation for the 2008 Corvette to reach 190-mph top speeds, which makes it the fastest base-model Corvette ever produced.

Short-block

The LS3 is still considered the GM Generation IV architecture small-block, and it shows a nice progression from the LS2, which it replaces. The new engine block is the same as the 6.2L L92 aluminum blocks found in the 2007 Escalade and Denali trucks. It has the typical cast-in iron cylinder sleeves, but the bore diameter has increased from the previous LS2's 4.00 inches up to 4.06 inches, which results in a displacement increase from 6.0 L to 6.2 L. Some casting and machining updates were made with the LS3/L92 block, resulting in 20 percent stronger bulkheads inside. It is interesting to note that all of the base model Corvette LSX engines have shared the same crankshaft stroke of 3.62 inches, and this remains with the LS3. By using some simple hot-rodder math, readers have probably figured out that these 4.06-inch cylinder bores can be used to build some relatively inexpensive 414ci stroker engines by just swapping in a 4.00-inch rotating assembly. Looking back in the LSX world a few years ago, it would have required costly resleeving of the 3.90-inch bore LS1 blocks to achieve displacements beyond 382 ci. Needless to say, the GM performance aftermarket loves the parts GM now offers over the counter.

Inside of the block, we find newly designed flat-top pistons with coated side skirts. These hypereutectic cast-aluminum pistons help bring the compression ratio to a pump-gas–friendly 10.7:1. The piston oil control rings have revised tension to handle the higher 6,600 rpm redline. Even the piston profile and pin bore were revised to reduce engine noise and vibration. The pistons use a new pin that is taper-bored to reduce mass. At the big end of the connecting rods, the bolts have been upgraded to 12.9-grade material, similar to what is used in the 505hp LS7.

GM also decided to use a slightly more aggressive camshaft in the LS3. The intake lift has increased from 0.521 inch found in the LS2 to 0.551 inch for the LS3. Slightly less overlap was also used for the LS3 cam.

Cylinder Heads

The biggest change between the LS2 and the LS3 is the introduction of rectangle port cylinder heads, which replace the popular "cathedral" port shape of the LSX head family. The LS3 borrows this performance technology from the C5-R and C6.R Corvette racing programs, where similar intake ports were developed and have dominated the race circuits. Rectangle ports first appeared on the 7.0L LS7 found in the 2006 Z06, and have now trickled down to little brother. This is definitely not a hand-me-down to complain about!

The intake port entrance is similar in design compared to the LS7 head, but the location and size of the ports are different enough to require LS3-specific intake manifolds. The aluminum LS3 cylinder head castings are also shared with the L92 truck engines mentioned above. Although the castings on the LS3/L92 are the same, the valvetrain is upgraded on the LS3 to handle higher rpm. Lightweight hollow-stem valves are used, along with LS6 valvesprings that can handle the higher intake lift found in the LS3 camshaft. The intake valve diameter has increased from 2.00 inches found in the LS2 to 2.16 inches for the LS3. Exhaust valve diameter has increased to 1.60 inches from 1.55 inches. In order to make room for the rectangle ports and the larger valve sizes, the rocker arms had to be offset 6 mm from center on the intake side. The exhaust side rockers remain unchanged from the previous LS2 design. All of these changes result in cylinder heads that flow over 17 percent more at the same peak flow lift of the previous LS2 casting, and they continue flowing at higher lifts where the LS2 port would stall.

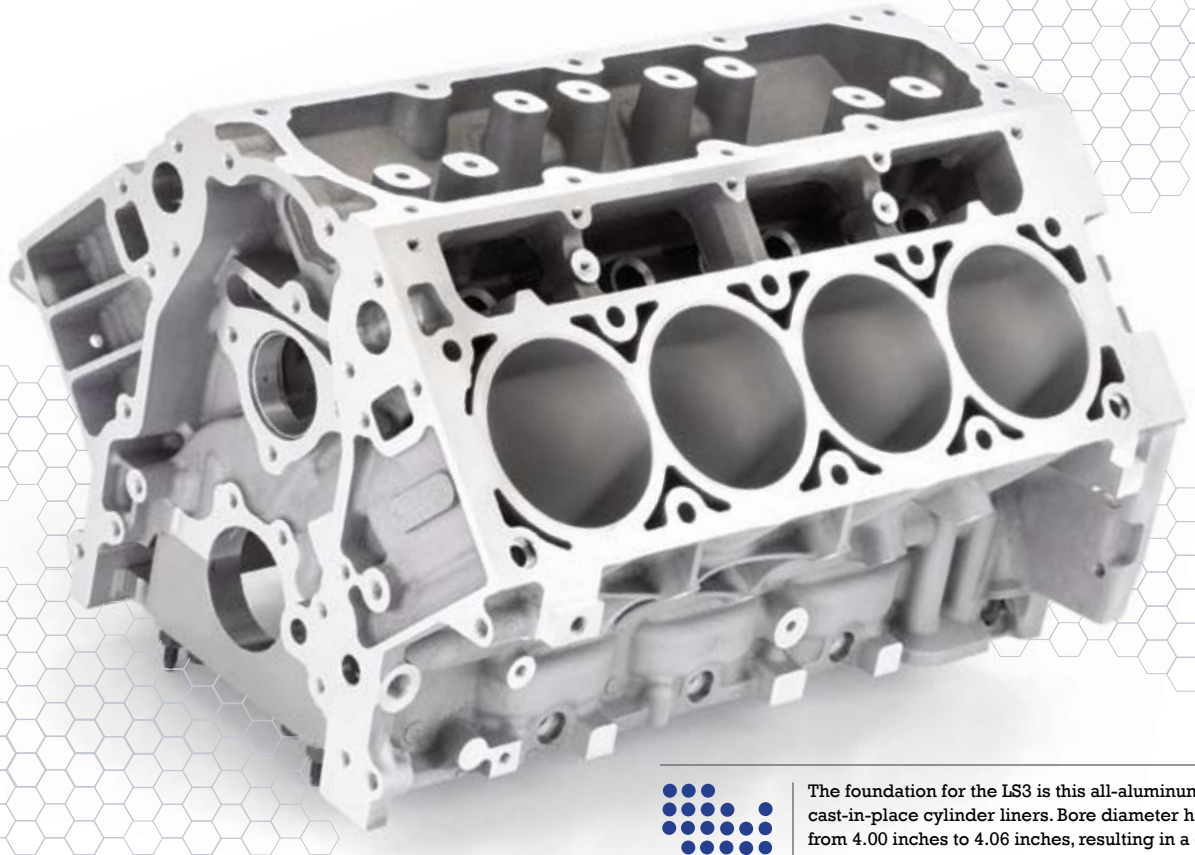
Intake Manifold

One item that isn't shared with the GM truck parts bin is the newly designed LS3 intake manifold. GM uses a lost-core process to manufacture the new composite plastic intake manifold. One unique development is a layer of sound insulation foam, contained inside of an area between the internal air runners and the external top shell. This results in less valvetrain and high-frequency noise transmitted to the passengers. Even the typical Corvette fuel rail beauty covers now have acoustic dampening material added underneath to reduce engine noise. Initial tests show the new LS3 intake design flows much more than the LS2 intake, but also does so with 2 percent less internal restriction. The fuel rail is identical to the LS2 fuel rail, but now LS7 fuel injectors are used to handle the power increase. The same 90mm diameter, four-bolt mounting-style throttle body is carried over from the LS2.

Summary

The most interesting aspect of these LS3 enhancements isn't how well they perform right off the dealer showroom, it is their potential in the modified engine aftermarket. The flow numbers seen from these LS3/L92 cylinder heads are only scratching the surface of potential when in factory form. The larger bore cylinders only make it easier to build more reliable and inexpensive stroker engines. The newer intake manifold is an improvement over the popular LS6 intake manifold bottleneck. Engine builders are using these heads and blocks to produce beasts making 700 hp on engine alone, and that is with very little development or experimental testing. It seems every year LSX world records are reset when GM releases new engines, which makes this a truly exciting time to be a part of the GM performance community. The real horsepower wars didn't happen in the 1960s—they are going on today!

An internal view of the crankcase shows newly revised areas that have been reinforced and machined in order to increase structural strength of the bulkheads.



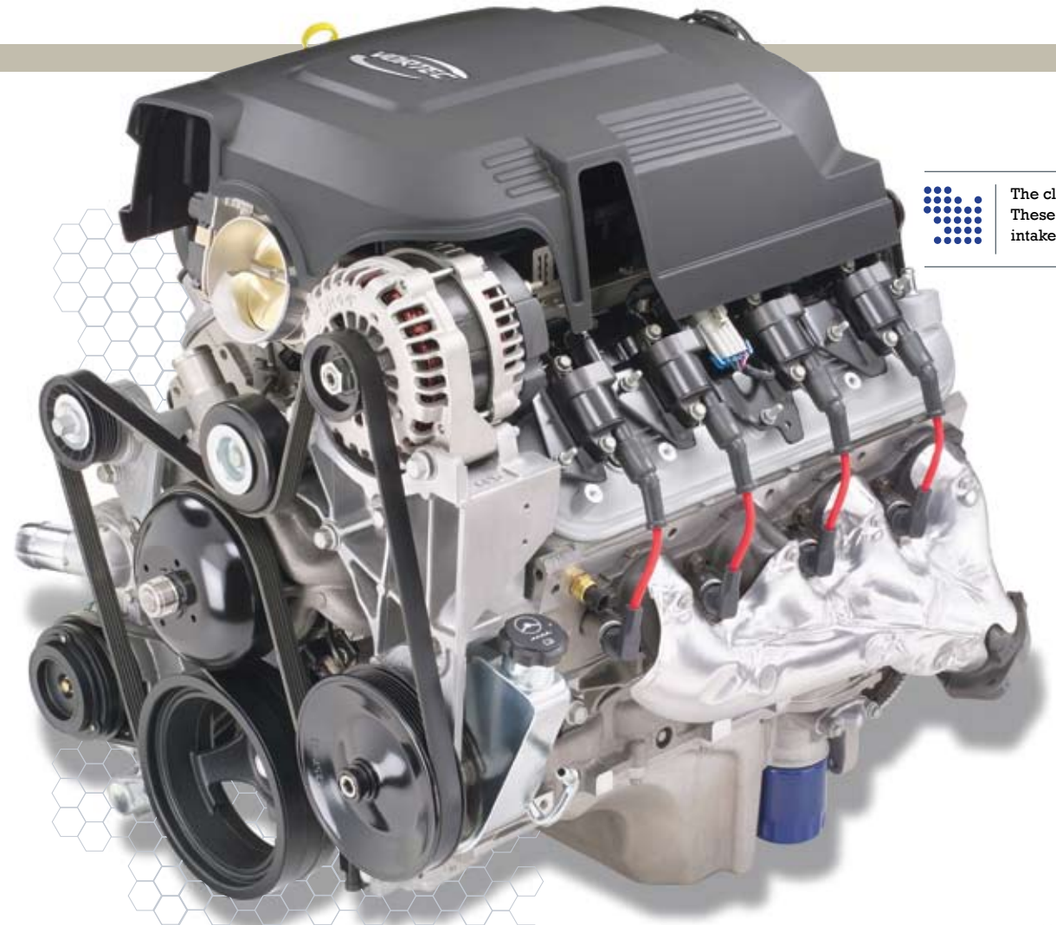
The foundation for the LS3 is this all-aluminum block with cast-in-place cylinder liners. Bore diameter has increased from 4.00 inches to 4.06 inches, resulting in a displacement gain from 6.0 L to 6.2 L. This block is also used for the L92 truck engines.

The LS3 incorporates a new rectangle-shaped intake port, which provides a more efficient and straighter flow path into the combustion chamber. The potential lockup in these factory castings is impressive. Valve diameters have also increased on both the intake and exhaust sides.

Here is a photo of a combustion chamber on the LS3/L92 cylinder head. These have a nice and shallow bowl design; this should help minimize valve shrouding on the intake flow.

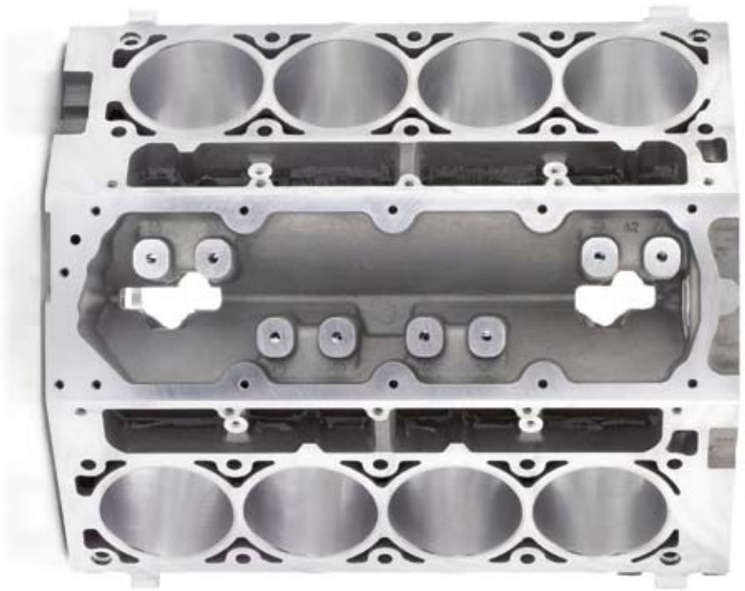
This is how the new LS3 intake port (right) compares with the previous LS2 intake port (left). The LS3 is elevated more on the entry and has a straighter path to the valve. There also seems to be more material around the bowl area—head porters will be glad!

In order to make room for the wider rectangle intake port and larger valve sizes, it was necessary to use 6mm offset rocker arms on the intake side. The exhaust rocker arms remain unchanged from the LS2. This rocker configuration is also used on the 7.0L LS7.



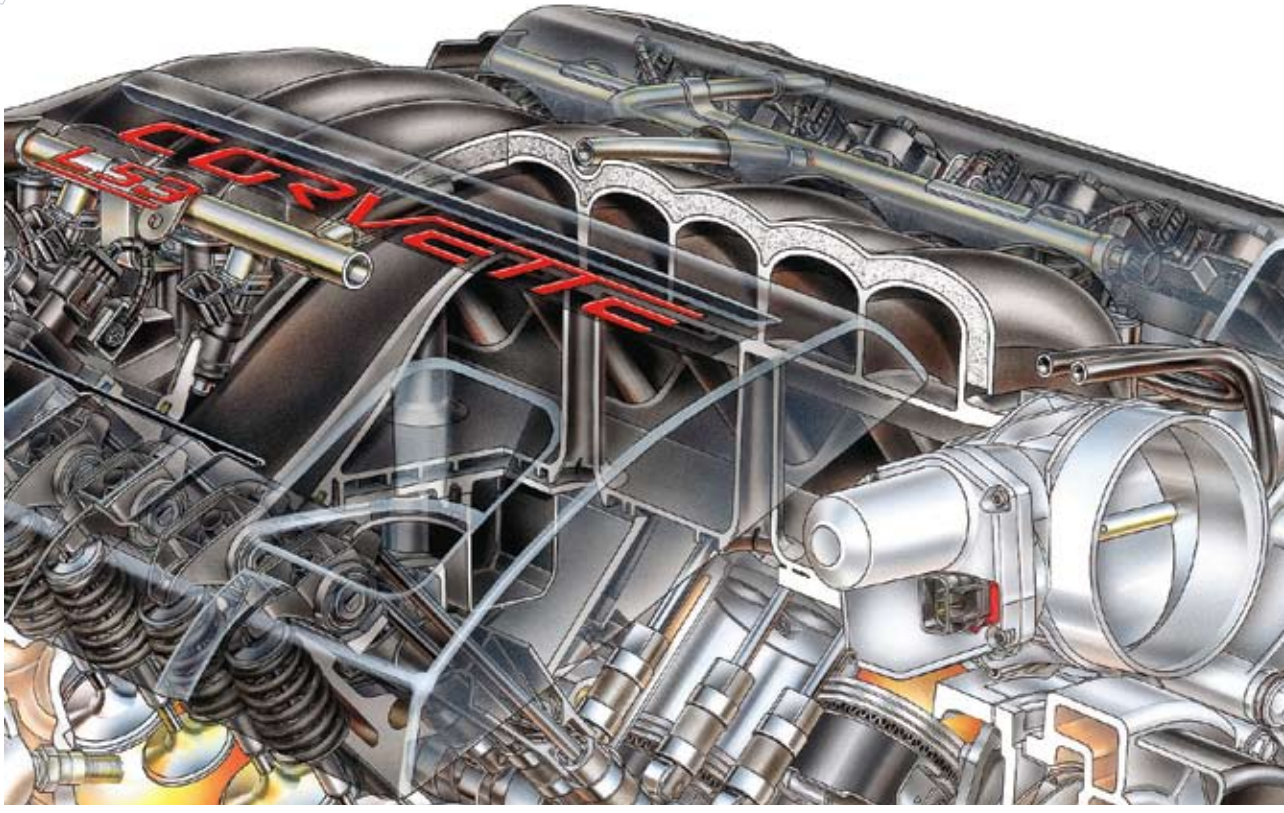
The closest sibling of the new LS3 is this 6.2L truck engine, found in the 2007 Escalade and Denali. These L92 engines utilize the same cylinder block and heads as the LS3. Of course, that tall truck intake manifold would never fit on a passenger car!

Shown here is an L92 camshaft assembly, with the cam-phaser gear attached at the front by a single bolt. We suspect the LS3 will use a similar single-bolt camshaft end gear as well.

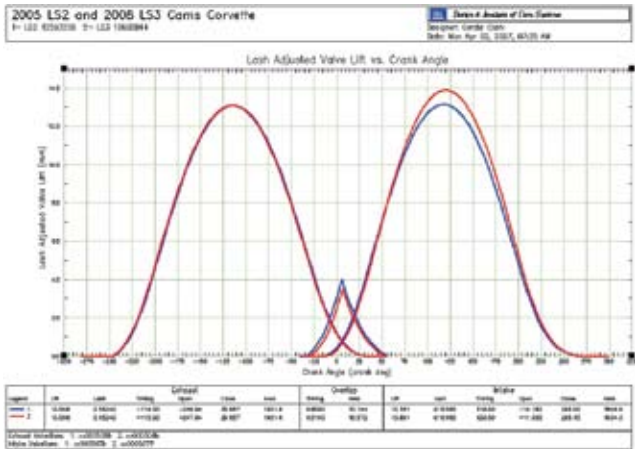


Another view of the LS3 cylinder block.

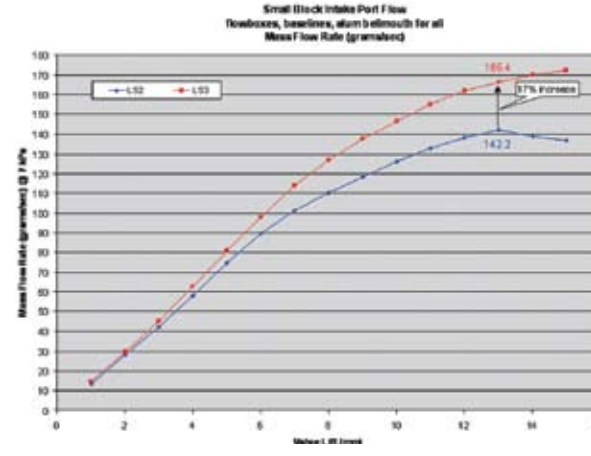
The full assembly view of the LS3 engine.



This cutaway drawing reveals the unique LS3 intake manifold design, incorporating a layer of acoustic dampening foam on top of the intake. This will help reduce engine valvetrain and high-frequency engine noise passing into the passenger cabin.



This graph shows the difference in cam designs between the LS2 (blue) and the LS3 (red). Note the higher lift on the intake side for the LS3 cam, as indicated on the right-side graph.



This chart compares the flowbench results between the LS2 intake port (blue) and the new LS3 intake port (red). That is quite a bit of improvement, as it appears that these LS3 heads will flow better than a ported version of an LS2 head!