

The Lexus IS F Engine: Power with a Purpose

The new Lexus IS F has 416 horsepower and 371 lb.-ft. of torque. Let those numbers wash over you for a minute.

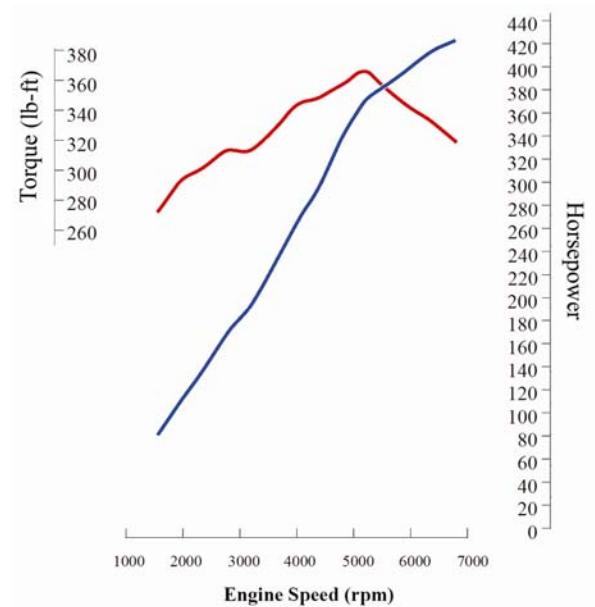
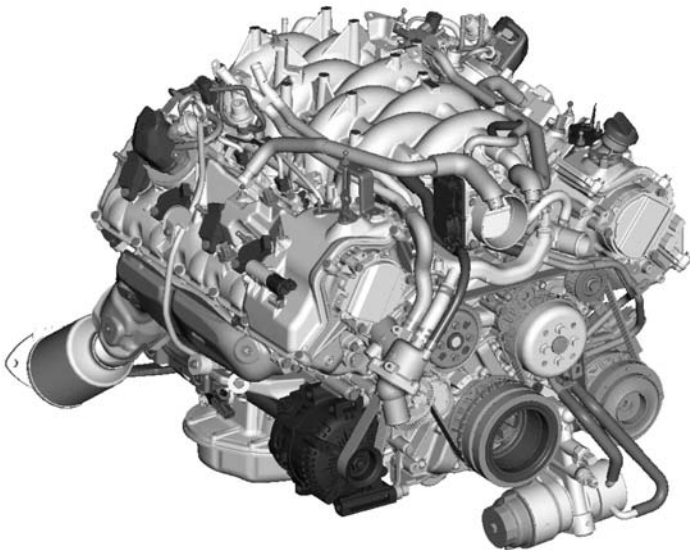
The oft-quoted horsepower number is where the “glamour” is and the new Lexus IS F clearly has it in abundance. High horsepower is often felt as a late rpm rush to redline partially because engine speed is such an important factor in creating horsepower.

But take a closer look at the second number, because it’s the less frequently-mentioned torque that can make you feel like you’ve been shot from a cannon when you bury the throttle coming off a corner, or when passing a big rig on a narrow two-lane. Big torque always quickens the pulse.

Now imagine a perfect marriage of great torque with a strong mid-to-high rpm surge as the horsepower is building to a crescendo. The upshot is an addictive acceleration rush (with a sound to match) that feels effortless, like it will never end—all very much intentional.

Of course, racetrack-scorching performance is only part of the story because this new Lexus engine oozes smart technology to help produce its abundant power with great efficiency, durability, low noise and minimal emissions.

Welcome to the IS F 5.0-liter V8 engine.



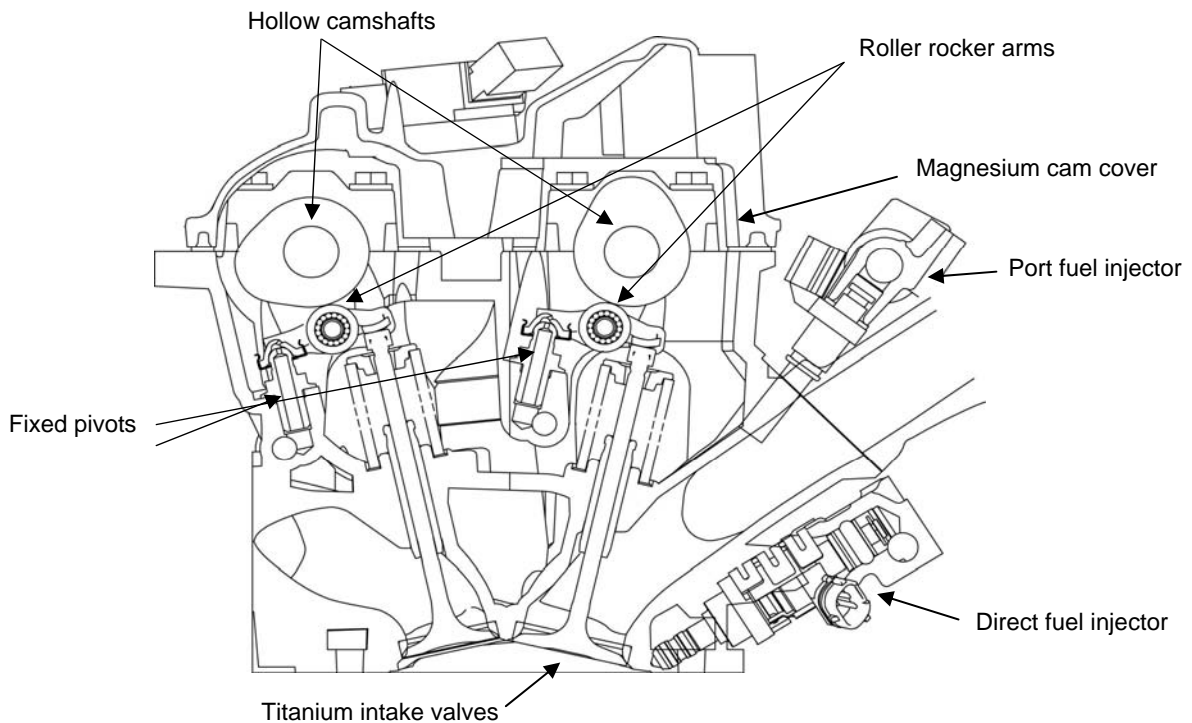
A Few Fast Facts

Basic specifications:

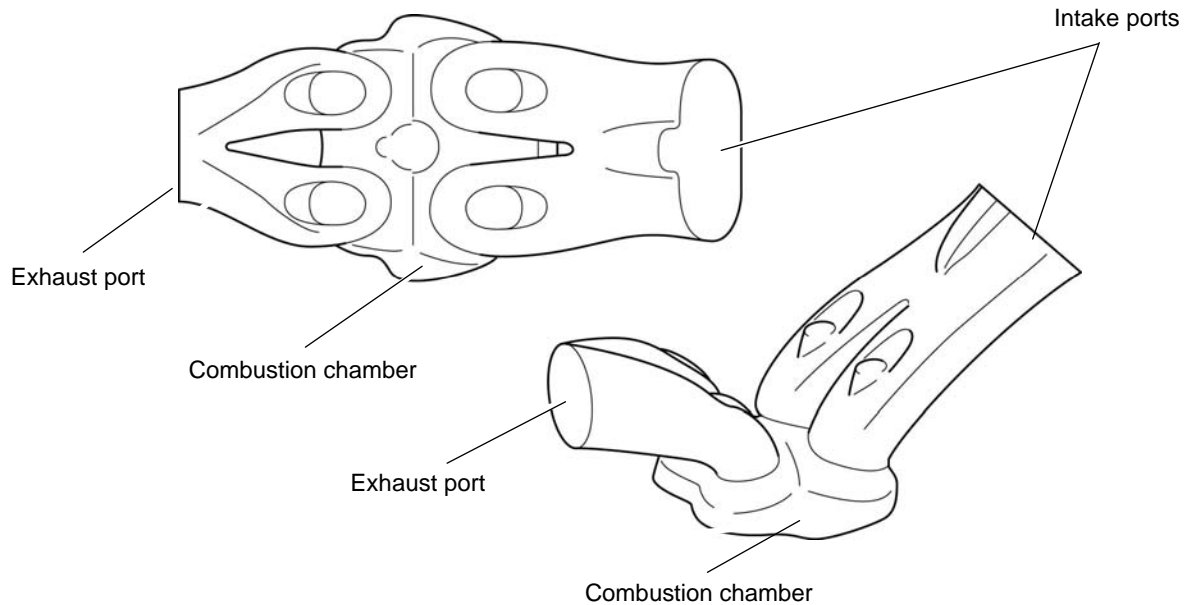
Engine designation	2UR-GSE
Engine type	90° DOHC V8
Engine block and cylinder head construction	Die cast aluminum alloy with steel cylinder liners
Valvetrain	32-valves Intake camshaft - Electric VVT-iE Exhaust camshaft - Hydraulic VVT-i Chain drive
Combustion chamber type	Pent roof
Induction system	Normally aspirated
Displacement (cc)	4968 (303.2 cu. In.)
Bore x stroke (mm)	94.0 x 89.5 (3.70 x 3.52 in.)
Compression ratio	11.8:1
Maximum horsepower (SAE)	416 @ 6600 rpm
Maximum torque (lb.-ft.)	371 @ 5200 rpm

A Head Full of Good Ideas

The IS F twin-cam aluminum 4-valve cylinder heads employ low-friction roller rocker arms that pivot on fixed points (no hydraulic lifters). The fixed pivot design helps ensure accurate valve operation. Due to their minimal weight, titanium intake valves are large in diameter. The camshafts are hollow for further weight reduction and mirror polished to minimize friction. The combination of low friction and light weight allows a high-lift, high speed valvetrain designed for performance and efficiency. To cap everything off (so to speak), the heads wear lightweight magnesium cam covers.

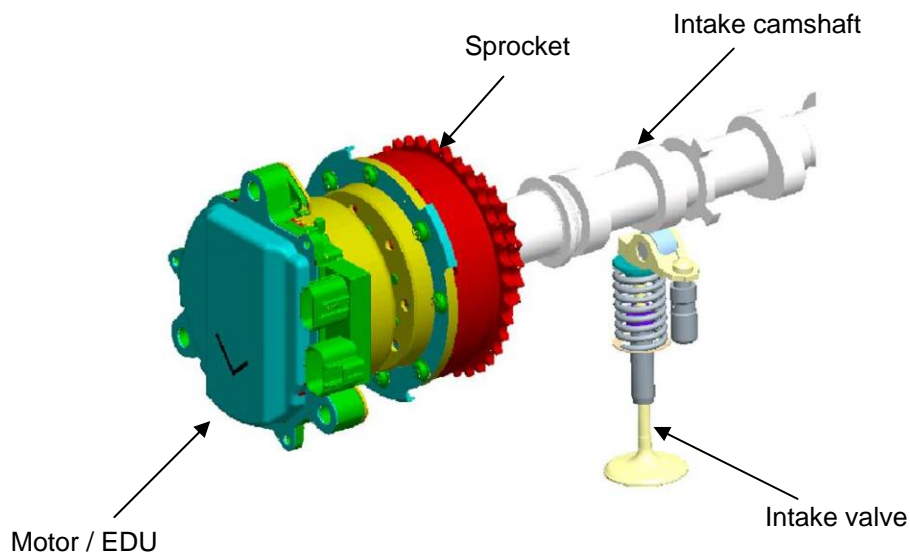


The intake and exhaust ports are optimized for performance as well. Intake pressure losses have been reduced and air intake volume maximized via careful port cross section and shape tuning. Emissions are reduced by careful shaping of the branch area to make it difficult for non-combusted gas to adhere.



More Variable VVT

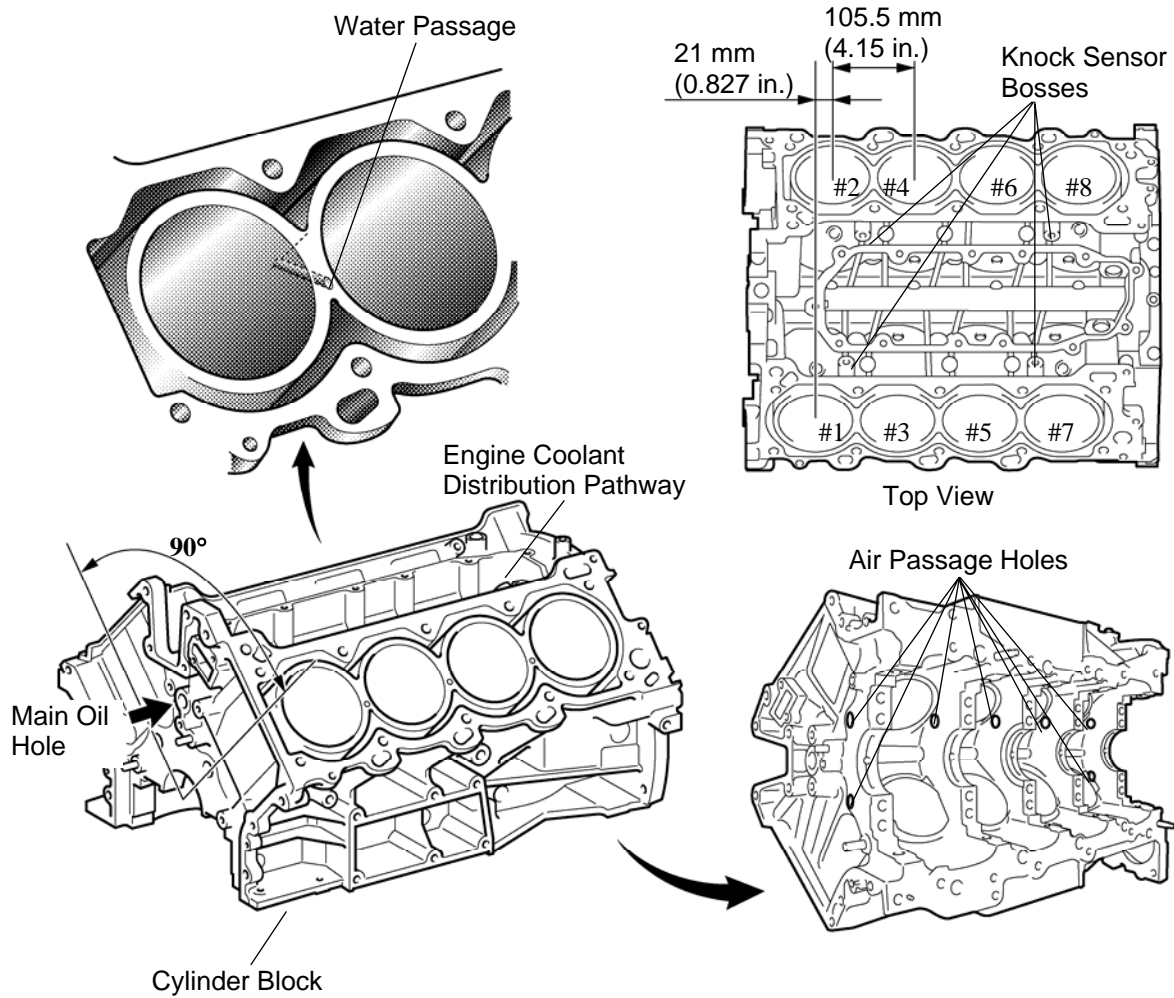
Lexus engines have used hydraulic-type variable valve timing for a number of years. The IS F uses a system recently introduced on the LS that provides important gains in the ability to precisely control camshaft timing. Known as VVT-iE, the system now uses electric motors to vary intake cam timing.



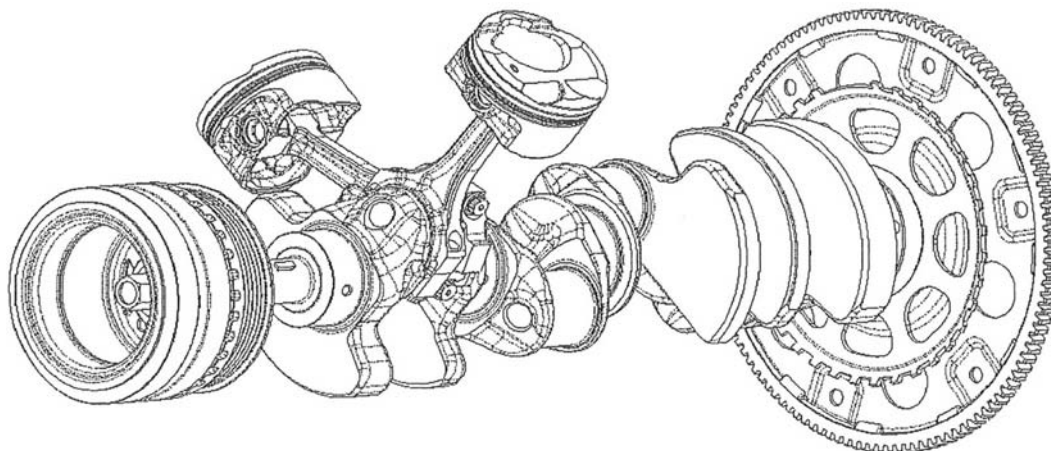
The use of electric motors expands the operation control range, especially at low rpm where hydraulic pressure may be insufficient to control cam timing by itself. The result is improved engine startup, performance and fuel efficiency with reduced emissions. Exhaust cams continue to use hydraulic actuation to vary timing.

The Cylinder Block – Horsepower Holding Cell

The robust, yet lightweight cylinder block is die cast in aluminum and uses thin-wall steel cylinder liners with careful attention to heat transfer and cooling which is enhanced by a liquid cooled oil cooler. Stiffening ribs are strategically positioned on the exterior of the block for rigidity. Four knock control sensors are installed in the V-bank to improve engine controllability.

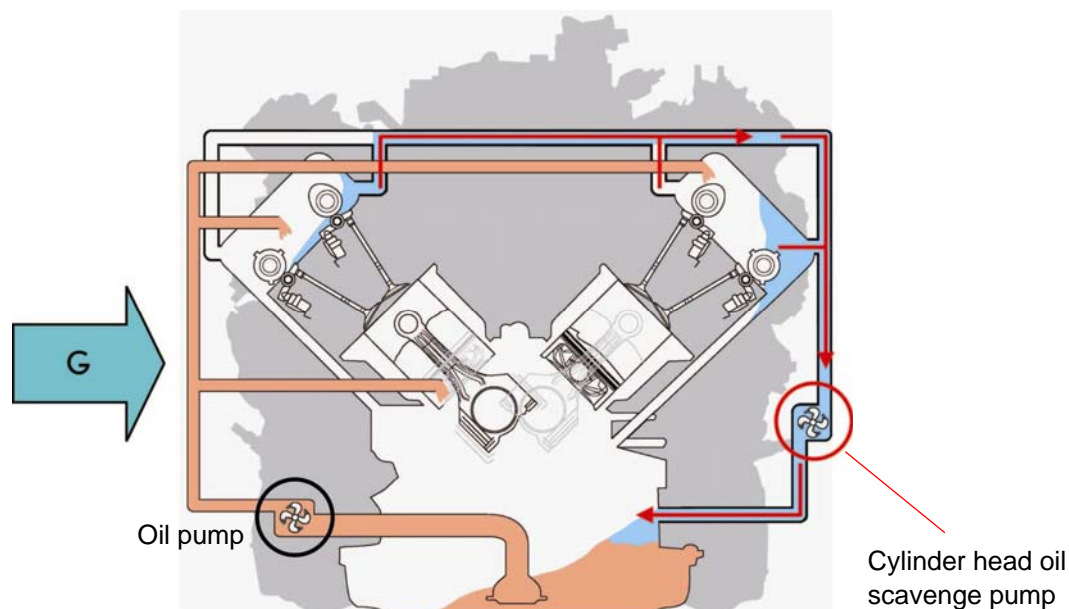


A high-strength forged steel crankshaft is used with counterweights and a double torsional damper to minimize vibration. Pistons are specially coated to reduce friction and their shape is optimized to enhance combustion and reduce noise. Compression ratio is 11.8:1. Connecting rods are forged from high-strength sintered iron alloy.



When Oil in a Corner is a Good Thing

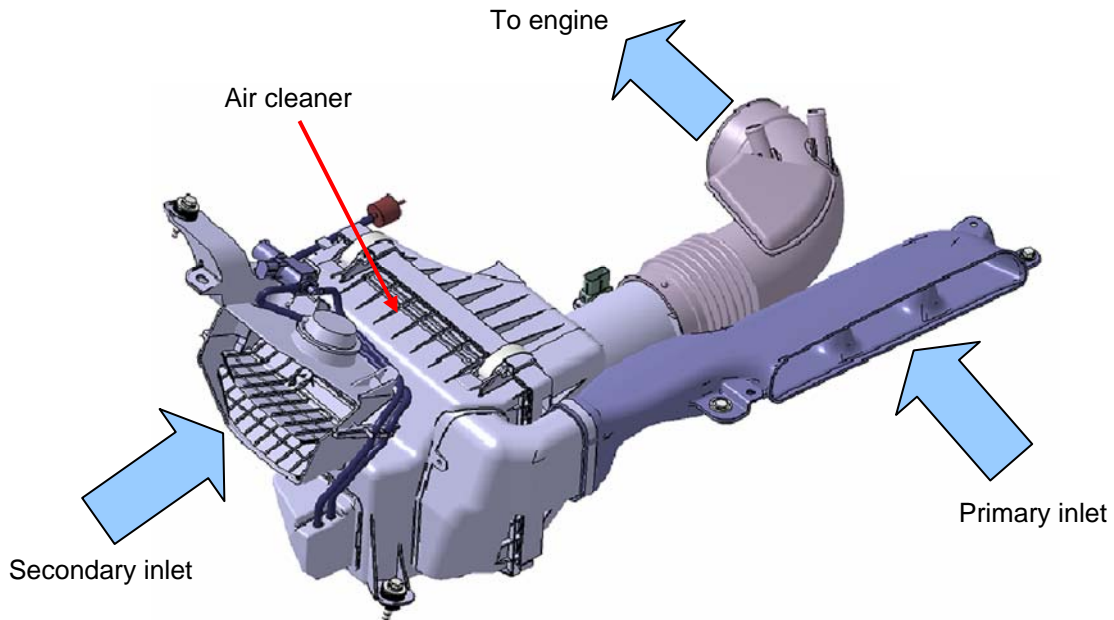
Keeping an ultra-high performance engine properly lubricated is crucial to engine durability. This can be especially difficult when the vehicle is driven on racetracks with frequent high-G cornering loads. To ensure consistent oil supply in these conditions, the IS F uses a dedicated pump to scavenge oil that could otherwise accumulate in the cylinder heads during hard cornering and return it to the oil pan.



Dual Air Intake (and Exhaust) System = Dual Personality

A remarkable air intake system was developed for the IS F that gives the engine a bit of a dual personality. The first is responsive and relatively quiet until about 3,600 rpm; then the beast seems to break its chains, unleashing all of its power with a menacing growl. You can of course throttle the beast but what fun is that?

The system works by employing primary and secondary inlets in two locations: The primary pulls air from just above the grille while the secondary inlet draws air from inside the right front wheel well.



At low speeds, air is taken only from the primary inlet, which promotes responsive yet smooth and relatively quiet operation. This makes the IS F more relaxing to drive in traffic, for example. The secondary inlet opens at 3,600 rpm, allowing substantially more air into the intake system and with it, all the rest of the IS F's considerable power--modulated by your right foot, of course. A low-restriction semi-dual exhaust system does its share in promoting engine airflow and adds a distinctive soundtrack as well.

Lexus engineers also spent considerable time tuning both intake and exhaust systems for throttle smoothness and sound quality. Their goals were to create a highly responsive, yet drivable car with a powerful, captivating sound devoid of uncomfortable peaks. The payoff is an engine with a charismatic split personality that always entertains when asked and never annoys.

