



**FORD PERFORMANCE  
PARTS**

# TECHNICAL REFERENCE

## **2011-2019 5.0L Coyote Improvements**





The 2015 model year marked the first major design changes for the 5.0L Coyote engine since its introduction in 2011. In 2018 the 5.0L Coyote engine was thoroughly reworked, featuring dual-fuel, high pressure direct injection combined with low-pressure port fuel injection technology for increased power and efficiency. To date, the 2018-2019 Coyote offers the most amount of differences when compared to 2011-2017 versions of the past. To help distinguish between the difference generations of engines the Gen 1, Gen 2, and Gen 3 designations are used:

**Gen 1** – 2011-2014 MY Mustang GT

**Gen 2** – 2015-2017 MY Mustang GT,

Ford Performance **M-6007-M50A**

**Gen 3** – 2018-2019 MY Mustang GT,

Ford Performance **M-6007-M50C**

The improvements to 2015 Coyote (or Gen 2 Coyote) focus on allowing it to breathe better. The improvements, many of which are derived from the lessons learned in developing the special-edition 2012-2013 Mustang BOSS 302, allow for better breathing, especially at higher engine speeds.

### Gen 2 Coyote improvements over Gen 1:

- Larger intake valves
- Larger exhaust valves
- Revised intake camshafts
- Revised exhaust camshafts
- Stiffer valve springs to ensure that the valves close completely at high RPM

- New cylinder-head casting, including revised ports that provide a straighter path to the valves for less-restrictive intake and exhaust flow and combustion chamber modifications to accommodate larger valves
- Sinter forged connecting rods that were used on the BOSS 302 engine that are more durable for high-rpm operation
- Redesigned piston tops with deeper cutouts to clear the new larger valves
- Rebalanced forged crankshaft that supports higher-rpm operation
- A new intake manifold features charge motion control valves to partially close off port flow at lower engine speeds. This increases the air charge tumble and swirl for improved air-fuel mixing, resulting in better fuel economy, idle stability, and lower emissions
- On the intake side, variable camshaft timing now has mid-lock phasers allowing better control of the valve timing over a broader range of engine RPM



Gen 2



## Gen 3 Coyote improvements over Gen 1, Gen 2:

- Larger bores to allow for larger valves
- PTWA (Plasma Transferred Wire Arc) cylinder bores as found on the GT350 5.2L
- Larger intake valves
- Larger exhaust valves
- Revised higher lift intake camshafts
- Revised higher lift exhaust camshafts
- Stiffer valve springs to allow for a higher maximum rpm of 7500rpm
- All new, stronger cylinder-head casting, including further revised ports from Gen 2 resulting in flow characteristics approaching the CNC'd ports in the GT350 5.2L.
- Sinter forged connecting rods carried over from the BOSS 302 engine and Gen 2 Coyote
- Higher compression 12:1 pistons with deeper cutouts to clear the new larger valves
- Rebalanced forged crankshaft that supports higher-rpm operation
- A new revised, higher flowing intake manifold with the same CMCV feature as introduced on Gen 2
- Dual fuel system – Direct Injection and Port Fuel systems which allow for a higher compression ratio, maximizing performance and fuel efficiency
- On the intake side, variable camshaft timing mid-lock phasers carry over from Gen 2. The Exhaust phasers migrate to an in-cylinder head oil control valve for better control at all speeds and loads

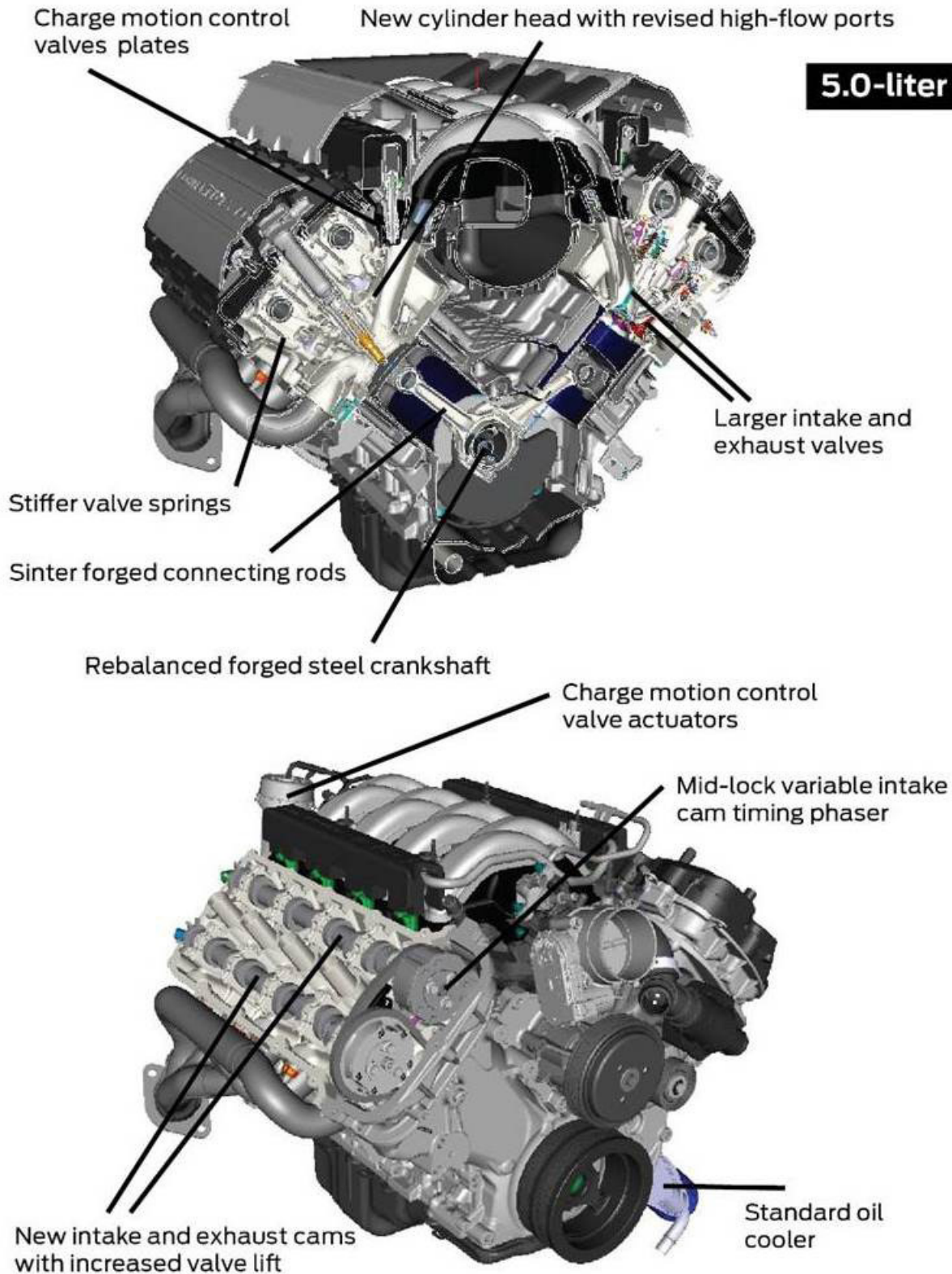


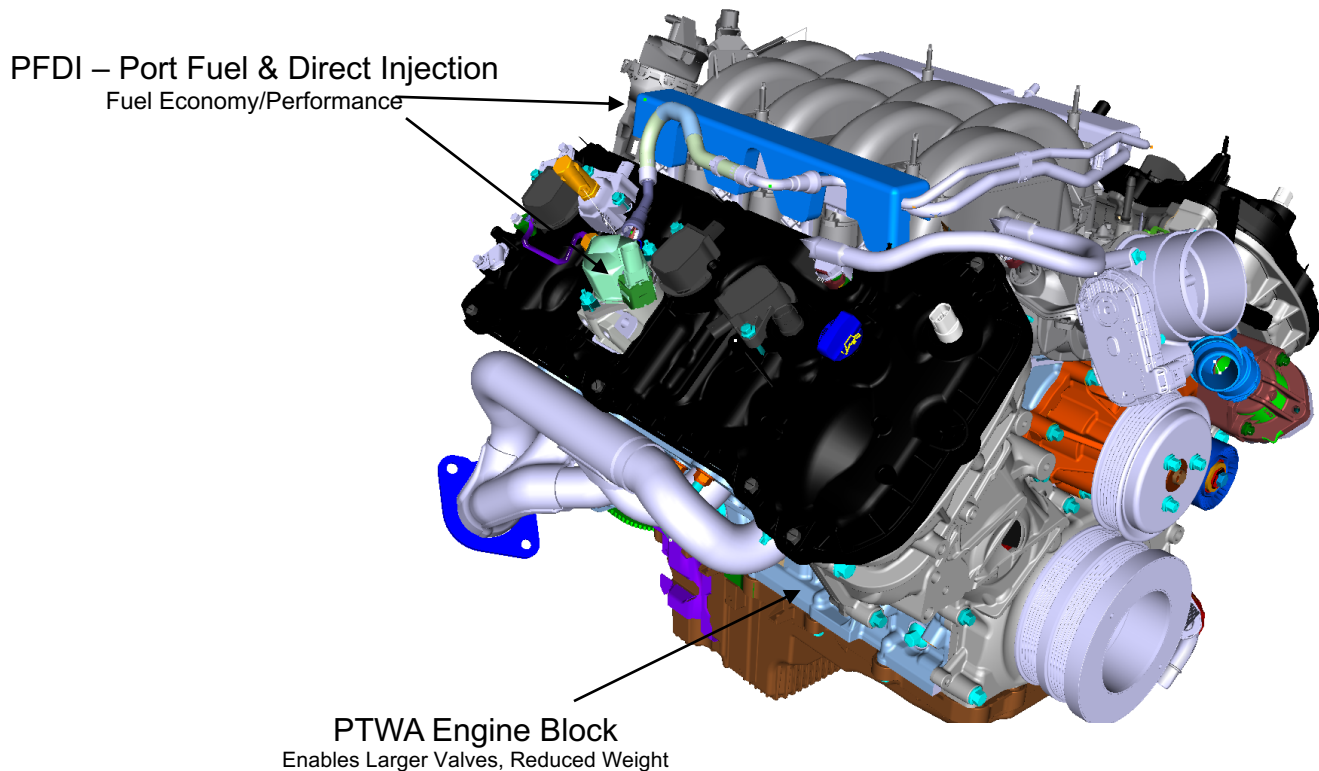
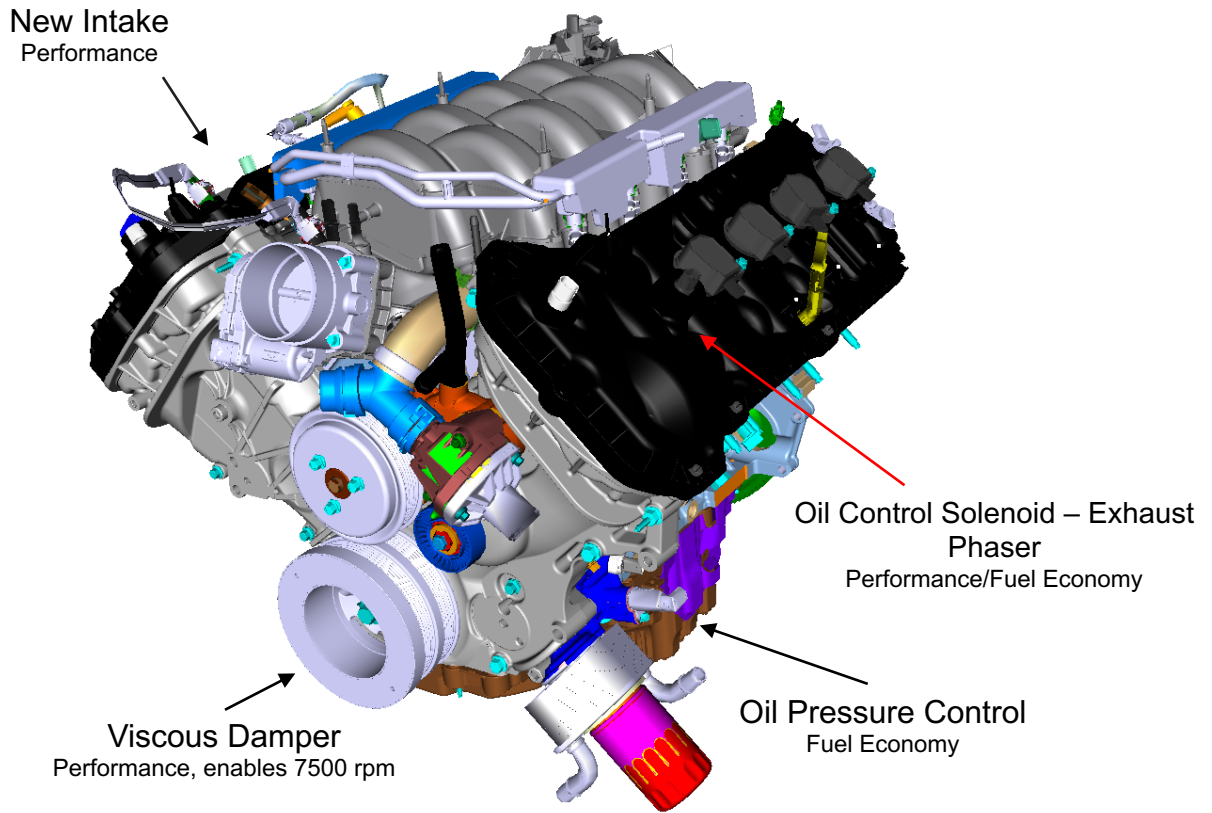
Gen 2



Gen 3









**Cylinder Heads:** The 2015–2017 Coyote (Gen 2) cylinder heads have improved ports and larger valves – and flow as good as the 2012–2013 BOSS 302 CNC ported heads. The Gen 2 heads can be used on the Gen 1 Coyote block as long as the 2015 Head Gasket is used due to the oil feed hole, check piston to valve clearance.

- Head Gasket & Head Bolt Kit  
**PN - M-6067-M50**
- Gen 1 camshafts can be used in the Gen 2 heads on a Gen 1 block with Gen 1 timing chains and phasers

**Camshafts:** The Gen 2 camshafts are 13mm lift on the intake and exhaust, which is 1mm of added lift vs. the Gen 1 Coyote

- Gen 2 camshafts must be used with the Gen 2 chain-drive and phasers

**Chain-drive:** The Gen 2 phasers, primary chain, and crank-sprocket are a matched set and cannot be interchanged with Gen 1 chain-drive. Also, VCT bolts are new for Gen 2 chain-drive due to bolt clearance to VCT solenoids

- Gen 2 Chain Drive Kit  
**PN - M-6004-A5015**

### Valve Springs

- Gen 2 valve springs are higher pressure than the standard Gen 1 spring – and are the same valve spring as used on the 2012–2013 Boss 302 Coyote engines
- BOSS 302R Valve Springs  
**PN – M-6513-M50BR**

### Gen 2 Head Gasket – unrestricted oil passage for VCT operation

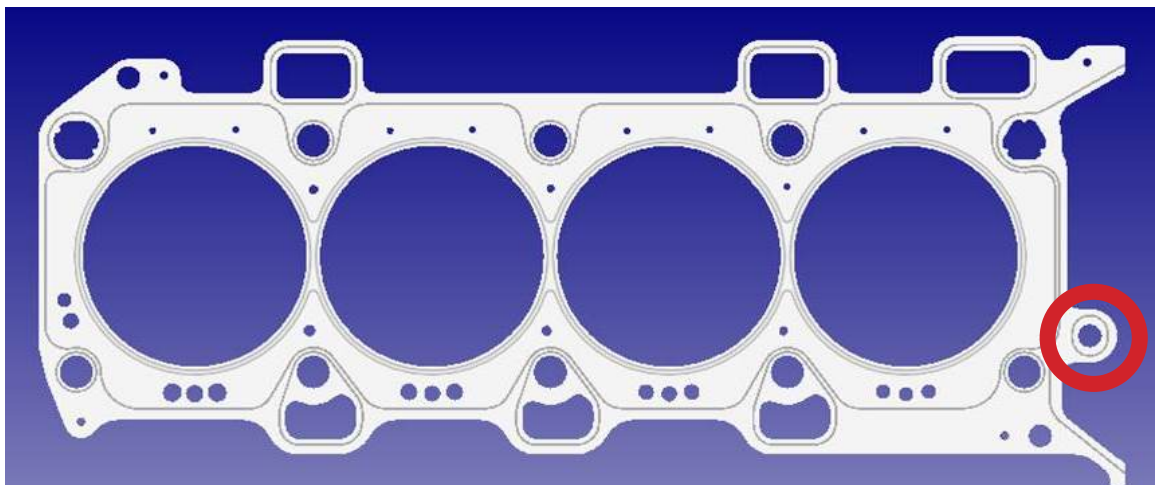


FIGURE 1



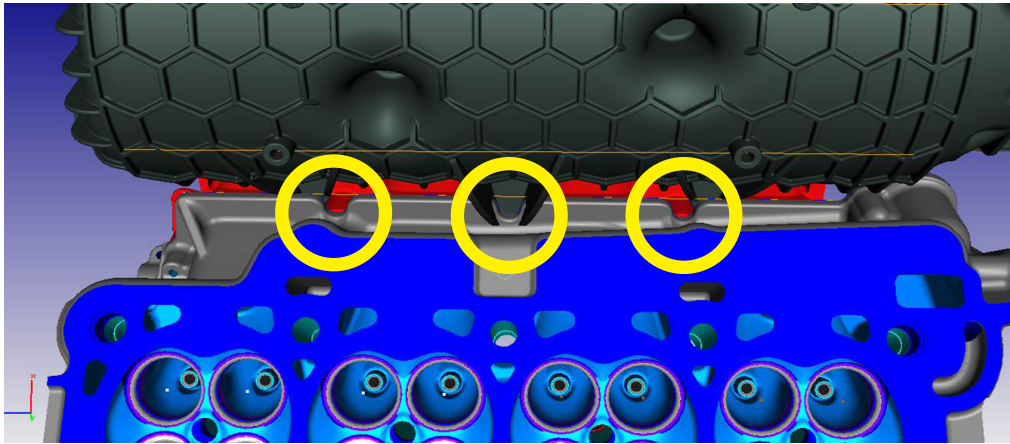


**Intake manifold:** The Gen 2 intake manifold will fit Gen 1 engine, however no appreciable performance gains have been found

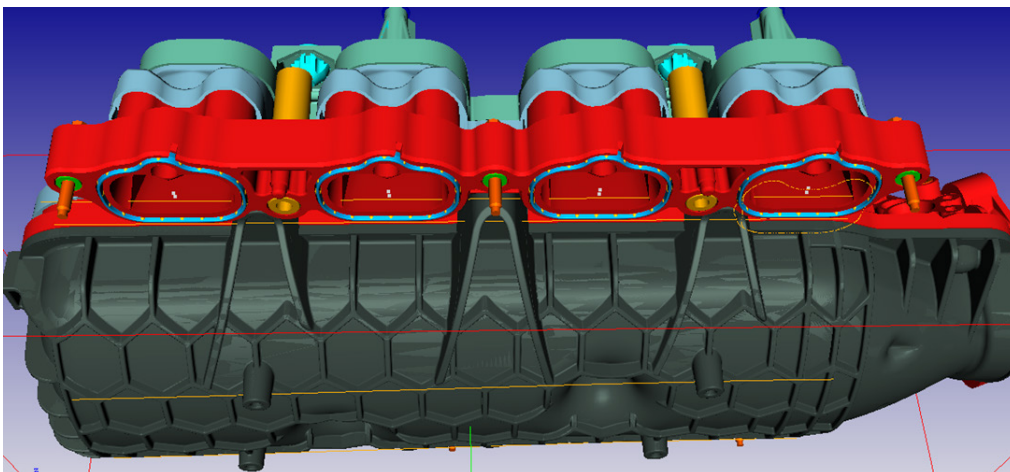
- The Gen 2 intake now has CMCV (charge motion control valves) for emissions and low speed idle quality

- Gen 1 intake manifolds can be used on the Gen 2 heads/engine with minor modifications to the manifold shown in Figure 2

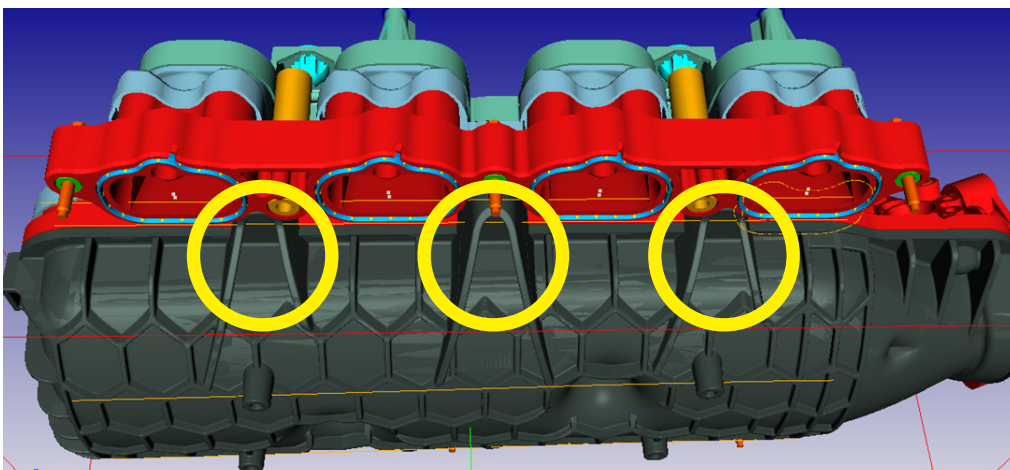
Figure 2



*Gen 1 Intake interferes with Gen 2 Head in these locations on each side. These can be removed*



*Gen 1 Intake Manifold*

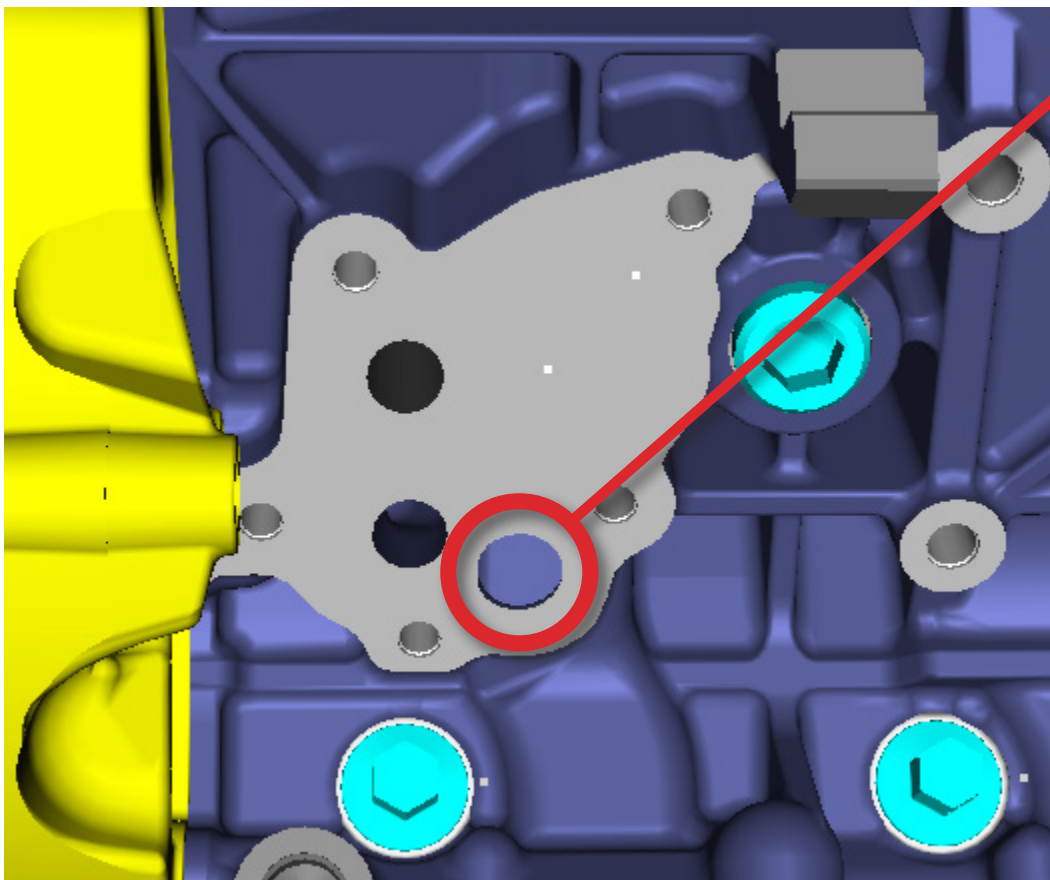


*Gen 1 Intake Manifold ribbing will contact the Gen 1 cylinder head in the areas circled*



**Engine block:** Gen 2 block has an added oil return and requires the matching Gen 2 OFA (oil filter adapter)

- Gen 2 block can be used for builds with Gen 1 or 2 components as long as the Gen 2 OFA is used
- Gen 2 block uses 11MM head bolts



*Added return passage for diverted oil from oil filter adapter*





**Cylinder Heads:** The 2018-2019 Coyote, Gen 3 cylinder heads have further improved ports and larger valves – and flow as nearly as well as the GT350 5.2L CNC ported heads.

**Camshafts:** The Gen 3 camshafts are 14mm lift on the intake and exhaust, which is 1mm of added lift vs. the Gen 2 Coyote, and 2mm over Gen 1

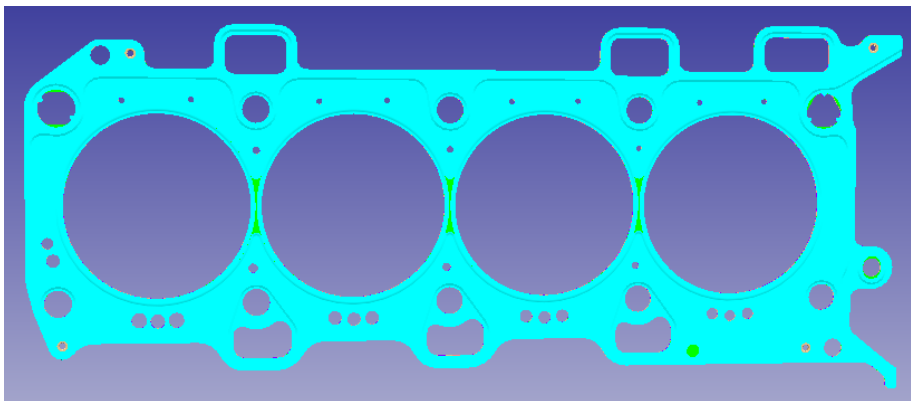
- Gen 3 camshafts must be used with the Gen 3 chain-drive and phasers
- The exhaust camshaft #1 journal is also larger to accommodate seals which prevent oil leakage from the phaser during operation

**Chain-drive:** The Gen 3 Coyote uses Gen 2 intake phasers, primary chains, secondary chains and crank sprocket. The exhaust phasers are new for Gen 3 and are attached with a single bolt.

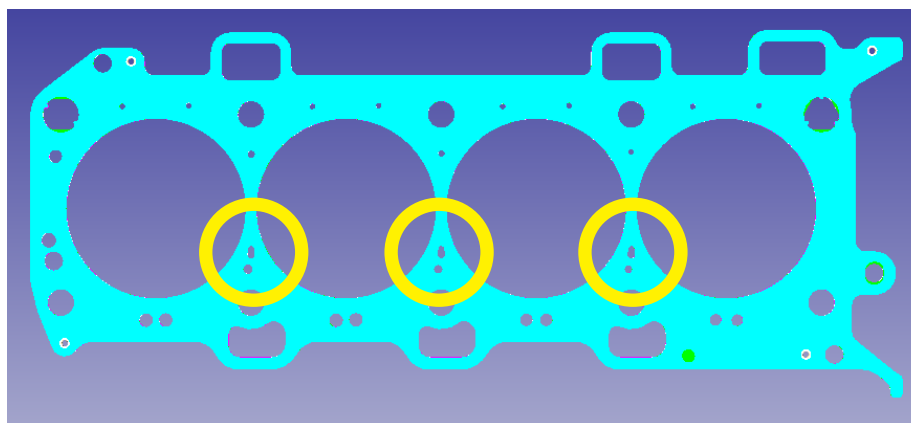
- Gen 3 Chain Drive Kit  
**PN - M-6004-A5018**

### Valve Springs

- Gen 3 valve springs are higher pressure and have a taller installed height than Gen 2



Gen 2



Bridge Cooling Holes  
in Head Gasket, Gen 2  
to Gen 3 Comparison

Gen 3



	<b>Gen 1 5.0L Coyote</b>	<b>Gen 2 5.0L Coyote</b>	<b>Gen 3 5.0L Coyote</b>
<b>Fuel Injection</b>	Port Fuel	Port Fuel	Direct & Port Fuel
<b>Bore Diameter (mm)</b>	92.2	92.2	93
<b>Stroke (mm)</b>	92.7	92.7	92.7
<b>Firing Order</b>	1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2
<b>Compression Ratio</b>	11.0:1	11.0:1	12.0:1
<b>Peak Torque (lb-ft)</b>	390 @ 4250 rpm	400 @ 4250 rpm	420 @ 4250 rpm
<b>Peak Power (hp)</b>	420 @ 6500 rpm	435 @ 6500 rpm	460 @ 6500 rpm
<b>Maximum RPM</b>	7,000	7,000	7,500
<b>Engine Weight (lb-without accessories)</b>	431	431	425
<b>Crankshaft</b>	Forged cross-plane	Forged cross-plane	Forged cross-plane
<b>Pistons</b>	Cast	Cast	Cast
<b>Piston Dome CC Volume</b>	3.472cc	4.451cc (deeper valve relief)	8.411cc (raised dome)
<b>Connecting Rod Weight (g)</b>	582	618	618
<b>Connecting Rod Length (mm)</b>	150.7	150.7	150.7
<b>Cylinder Heads</b>	Al319 Material	Al319 Material	AS7GU Material
<b>Valve Material (int/exh)</b>	Hollow Chrome/Na filled Chrome	Hollow Chrome/Na filled Chrome	Hollow Chrome/Na filled Chrome
<b>Valve Diameter (mm)</b>	Int 37.0/Exh 31.0	Int 37.3/Exh 31.8	Int 37.7/Exh 32
<b>Valve Lift (mm)</b>	Int 12.0/Exh 12.0	Int 13.0/Exh 13.0	Int 14.0/Exh 14.0
<b>Valve Spring Load (closed/open N)</b>	265/650	300/760	293/813
<b>Variable Cam Timing Phaser</b>		mid-lock intake	mid-lock intake, oil control valve actuated exh phaser
<b>Intake Manifold</b>	non-CMCV	added CMCV	added CMCV
<b>Throttle Body Diameter (mm)</b>	80	80	80
<b>Oil Pan</b>	Steel -8 qt capacity w/filter	Steel -8 qt capacity w/filter	Composite -10 qt capacity w/filter