

## Truck Powertrain Summary<sup>(1)</sup>

Vehicle	Engine	Fuel Delivery System	Automatic Transmission
F-150	2.7L EcoBoost 24V DOHC V6	Gasoline Direct-injection	6R80E
	3.5L Ti-VCT 24V DOHC V6	SEFI	6R80E
	3.5L EcoBoost 24V DOHC V6	Gasoline Direct-injection	6R80E
	5.0L Ti-VCT 32V DOHC V8	SEFI	6R80E
2016 F-650/F-750	6.8L 30V SOHC V10	SEFI	6R140
2016 F-650/F-750	6.7L Power Stroke V8 Turbo Diesel	Direct-injection	TBD
Super Duty Pickups F-250/F-350/F-450	6.2L 16V SOHC FFV V8	SEFI	6R140
	6.7L Power Stroke V8 Turbo Diesel	Direct-injection	6R140
Super Duty Chassis Cabs F-350/F-450/F-550	6.2L 16V SOHC FFV V8	SEFI	6R140
	6.7L Power Stroke V8 Turbo Diesel	Direct-injection	6R140
	6.8L 30V SOHC V10	SEFI	5R110
Transit	3.2L Power Stroke I-5 Diesel	Direct-injection	6R80
	3.5L EcoBoost 24V DOHC V6 with Ti-VCT	Gasoline Direct-injection	6R80
	3.7L Ti-VCT 24V DOHC FFV V6	SEFI	6R80
Transit Connect	1.6L EcoBoost 16V DOHC I-4	Gasoline Direct-injection	6F35
	2.5L iVCT 16V DOHC I-4	SEFI	6F35

(1) See Ordering Guide for specific applications and availability.

(2) Sequential multipoint electronic fuel injection.

### Truck Engines

#### 1.6L EcoBoost 16V DOHC I-4 (Transit Connect)

- Optional on Van XL and XLT
- Optional on Wagon XLT with SWB only
- 6-speed SelectShift automatic transmission is standard

#### Key Features and Benefits

- Delivers a broad, flat torque curve with maximum torque through the powerband for sustained acceleration
- Twin independent variable camshaft timing (Ti-VCT) on both the intake and exhaust cams is continuously adjusted to keep the engine running at maximum efficiency as the engine speed and torque change
- Dual overhead camshaft (DOHC), lightweight aluminum cylinder heads with 4 valves per cylinder
- Aluminum engine block and cylinder heads help reduce weight to aid fuel economy
- Low-noise camshaft belt drive system contributes to reduced NVH and improved durability
- Gasoline direct-injection. See the Engineering Insight on page 2–51
- Single turbocharger. See the Engineering Insight on page 2–51
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2–58
- Smart charging alternator. See the Engineering Insight on page 2–58

Specifications	
Type	16V DOHC I-4
Displacement	1.6L (97.4 CID)
Horsepower (SAE net)	178 @ 5700 rpm <sup>(1)</sup>
Torque	184 lb.-ft. @ 2500 rpm
Compression Ratio	10.0:1
Bore and Stroke (in.)	3.11 x 3.20
Engine Block Material	Aluminum
Cylinder Head Material	Aluminum
Main Bearings	5
Valve Lifters	Direct-acting mechanical bucket
Fuel Delivery	Gasoline direct-injection
Fuel (minimum)	87-octane regular unleaded, 91+-octane recommended

(1) Using 93-octane fuel.

- Intercooler to reduce incoming air temperature
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

## Truck Engines cont'd

### 1.6L EcoBoost 16V DOHC I-4 (Transit Connect) cont'd

ENGINEERING INSIGHT
EcoBoost Gasoline Direct-injection
<p><b>What It Is</b></p> <ul style="list-style-type: none"> <li>The key technology behind the performance capability and efficiency of the EcoBoost engines</li> </ul> <p><b>How It Works</b></p> <ul style="list-style-type: none"> <li>Fuel is injected directly into the combustion chamber of each cylinder by solenoid-controlled high-pressure injectors, compared to traditional fuel delivery where fuel is mixed with intake air prior to entering the chamber                             <ul style="list-style-type: none"> <li>Fuel is pumped from the tank to the engine compartment at a normal pressure of around 200 psi</li> <li>A camshaft-driven high-pressure fuel pump increases fuel pressures of up to 2150 psi, depending on the demands of the engine</li> </ul> </li> <li>Direct-injection fuel injectors are located inside the combustion chamber</li> <li>Each injector delivers a precise fuel spray into each cylinder, allowing a higher compression ratio, to help improve engine performance and reduce fuel consumption</li> <li>An electronic control system varies the timing and intensity of the fuel delivery according to the engine's operating conditions</li> </ul> <p><b>Key Benefits</b></p> <ul style="list-style-type: none"> <li>Precise control of the fuel provides:                             <ul style="list-style-type: none"> <li>Increased protection against engine knock/detonation to help allow for improved performance and excellent transient response</li> <li>Great balance of performance and fuel economy</li> </ul> </li> </ul>

ENGINEERING INSIGHT
EcoBoost Turbocharger
<p><b>What It Is</b></p> <ul style="list-style-type: none"> <li>A turbocharger uses otherwise wasted energy from the engine's exhaust to rotate a turbine wheel</li> </ul> <p><b>How It Works</b></p> <ul style="list-style-type: none"> <li>The turbine wheel is coupled to a compressor that pressurizes air coming into the engine — this is called “boost” and allows the engine to breathe in air as if it were larger in displacement since more air is “forced” into the intake</li> <li>The more air an engine breathes, the more power it generates</li> </ul> <p><b>Key Benefits</b></p> <ul style="list-style-type: none"> <li>Compact design and low NVH (noise, vibration and harshness) characteristics</li> <li>Drivers will feel an immediate response when they step on the accelerator</li> <li>Broad, flat torque curve</li> <li>The turbocharger has been “rightsized” for <b>power and efficiency</b></li> </ul>

### Truck Engines cont'd

#### 2.5L iVCT 16V DOHC I-4 (Transit Connect)

- Standard on all models
- 6-speed SelectShift automatic transmission is standard

#### Key Features and Benefits

- Provides power-on-demand for strong off-the-line performance and midrange acceleration
- Intake variable camshaft timing (iVCT) allows the intake camshaft to alter the opening and closing events of the intake valves, based on engine speed and load. Timing is adjusted to provide enhanced performance and/or fuel economy, depending on the operating point of the engine
- Intake manifold volume enhanced relative to engine displacement to provide enhanced throttle response
- Dual overhead camshaft (DOHC) design helps improve engine breathing and performance by using 4 valves per cylinder
- Aluminum cylinder head with 4-valves-per-cylinder structure
  - Intake ports designed to enhance airflow and fuel/air mixing for efficient internal combustion at light loads
  - Exhaust ports improve flow and help contribute to low emissions
- Exhaust manifold designed for enhanced flow for better performance
- Balance shaft helps lessen engine vibration for V6-like smooth performance
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2–58
- Smart charging alternator. See Engineering Insight on page 2–58
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2–57
- Sequential multiport electronic fuel injection enhances the fuel delivery system by providing fuel at precisely the right moment for enhanced performance
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

Specifications	
Type	4-cylinder, in-line dual overhead camshaft, 16-valve
Displacement	2.5L (152 CID)
Horsepower (SAE net)	169 @ 6000 rpm
Torque	171 lb.-ft. @ 4500 rpm
Compression Ratio	9.7:1
Bore and Stroke (in.)	3.50 x 3.94
Engine Block Material	Aluminum
Cylinder Head Material	Aluminum
Main Bearings	5
Valve Lifters	Mechanical non-hydraulic bucket-type system
Fuel Delivery	Sequential multiport electronic fuel injection
Fuel (minimum)	87-octane regular unleaded

## Truck Engines cont'd

### 2.7L EcoBoost 24V DOHC V6 (F-150)

- XL and XLT
  - Standard on 4x2 with 157" or 163" WB
  - Optional on 4x2/4x4 with 122", 141" or 145" WB
  - Not available on 4x4 with 157" or 163" WB
- Lariat
  - Standard on 4x2/4x4 145" WB (500A and 501A)
  - Standard on 4x2 with 157" or 163" WB
  - Not available on 4x4 with 157" or 163" WB
- 6-speed automatic with tow/haul mode, SelectShift capability and Progressive Range Select are standard

#### Key Features and Benefits

- Calibrated specifically for truck applications
- All-new engine logic adjusts operating parameters on the fly to provide enhanced efficiency and performance
- Auto Start-Stop feature automatically shuts down the engine when the vehicle has stopped (except when towing or in 4WD)
- Lightweight compact design helps deliver an impressive combination of power and efficiency
- Compacted graphite iron (CGI)/aluminum block saves weight while providing strength
  - Same material used in the Ford 6.7L Power Stroke V8 turbo diesel engine
- First use of fracture split main-bearing caps, which create a superior fit between the cap and engine block for reduced crankshaft friction to help enhance efficiency
- All-new aluminum cylinder heads feature water-cooled integrated exhaust manifolds
- Reverse cooling system helps lower the exhaust temperature at the turbochargers, contributing to more power
- Variable displacement oil pump reduces internal engine friction to enhance fuel efficiency
  - Precisely controls the amount of oil delivered during all driving conditions
- Intake and exhaust variable cam timing improves torque while helping lower emissions
- Lightweight, durable composite intake manifold
- Piston-cooling jets help improve oil warm-up and maintain cooler piston temperatures for improved durability
- Piston connecting rods use an offset I-beam that provides strength to manage peak engine power levels while reducing weight for better responsiveness
- Cartridge-style oil filter integrated into top of the engine for easy service

Specifications	
Type	6-cylinder V6, dual overhead cam shaft, 24-valve with Ti-VCT EcoBoost
Displacement	2.7L (164 CID)
Horsepower (SAE net)	325 @ 5750 rpm <sup>(1)(2)</sup>
Torque	375 lb.-ft. @ 3000 rpm <sup>(1)</sup>
Compression Ratio	10.0:1
Bore and Stroke (in.)	3.27 x 3.27
Engine Block Material	CGI/Aluminum
Cylinder Head Material	Aluminum
Main Bearings	4
Valve Lifters	Roller finger follower
Fuel Delivery	Direct-injection
Fuel (minimum)	87-octane regular unleaded

(1) Ford preliminary data. Numbers may change in future.

(2) Using 91-octane fuel.

- Parallel twin turbochargers. See the Engineering Insight on page 2–58
- Cast-iron camshafts
- Twin independent variable camshaft timing (Ti-VCT) on both the intake and exhaust cams is continuously adjusted to keep the engine running at maximum efficiency as the engine speed and torque change, helping enhance fuel economy and performance
- Gasoline direct-injection. See the Engineering Insight on page 2–51
- Smart charging alternator. See the Engineering Insight on page 2–58
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2–58
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2–57
- Electronic throttle control (ETC) helps deliver seamless and consistent engine response
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

### Truck Engines cont'd

#### 3.2L Power Stroke I-5 Turbo Diesel (Transit)

- Optional on all models; not available on Transit-150 Wagon or Transit-350 LWB Van
- 6-speed automatic transmission with SelectShift capability is standard

#### Key Features and Benefits

- Capable of operating on B20 biodiesel fuel
  - B20 is a blend of 20% biodiesel and 80% petroleum-based fuel
  - Biodiesel is safe to handle, biodegradable and produces less air pollutants than 100% petroleum-based diesel fuel
- Durable, rigid sand-cast gray iron cylinder block
- Aluminum cylinder head with dual overhead cams and 4 valves per cylinder
- Cast-aluminum, low-friction coated pistons with piston-cooling jets
  - Piston-cooling oil jets help improve oil warm-up and maintain cooler piston temperatures for improved fuel economy and durability
- Cast-iron crankshaft, forged connecting rods and aluminum alloy bearings
- Water-cooled high-performance electric-controlled Exhaust Gas Recirculation (EGR) valve
- Variable nozzle turbocharger with electronic actuation
- Integrated diesel oxidation catalyst (DOC) and diesel particulate filter (DPF) help save space
- Cast ductile iron exhaust manifold for heavy-duty operation and durability
- High-pressure common-rail fuel injection
  - Utilizes piezo injector technology to deliver fuel at 26,100 psi
  - Delivers up to 5 fuel injections per combustion cycle for excellent throttle response, fuel efficiency and NVH characteristics
  - Delivers quiet operation throughout the entire rpm range (similar to gasoline-engine noise levels)
  - Helps the Power Stroke I-5 meet the latest diesel emissions standards
- Quick-start glow plugs help provide smooth and fast engine starts, even in extremely cold conditions
- Injection-molded and friction-welded polyamide intake manifold and electronic throttle body

Specifications	
Type	Diesel, Inline 5-cylinder, dual overhead camshaft, 20-valve
Displacement	3.2L (195 CID)
Horsepower (SAE net)	185 @ 3000 rpm
Torque	350 lb.-ft. @ 1500-2500 rpm
Compression Ratio	15.8:1
Bore and Stroke (in.)	3.54 x 3.96
Engine Block Material	Cast Iron
Cylinder Head Material	Aluminum
Main Bearings	TBD
Valve Lifters	TBD
Fuel Delivery	High-pressure common-rail
Fuel (minimum)	ULSD Diesel, B20 biodiesel (20% of less biodiesel)

- Engine-hour meter
- Organic Acid Technology (OAT) orange engine coolant. See the Engineering Insight on page 2–62
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

## Truck Engines cont'd

### 3.2L Power Stroke I-5 Turbo Diesel (Transit) cont'd

#### Exhaust Gas Recirculation (EGR)

- Recycles combustion gases in the exhaust system as the first defense against NOx
- A two-step cooling process allows the EGR to recycle exhaust gases into the intake at a much lower temperature
- A cooler temperature means a higher efficiency in recycling the exhaust gases and less oxygen in the mix
- Less oxygen helps reduce the formation of NOx in the exhaust

#### Diesel Oxidation Catalyst (DOC)

- The first step in the exhaust aftertreatment process and could be referred to as the cleaning and heating step
- Converts and oxidizes hydrocarbons into water and carbon dioxide
- Provides and promotes heat into the exhaust system to help increase the conversion efficiency

#### Diesel Exhaust Fluid (DEF)

- A solution comprised of 32.5% high-purity urea and 67.5% demineralized water
- The urea in the solution breaks down into ammonia when injected into the exhaust stream
- DEF is clear, nontoxic and safe to handle
- Stored in a 5-gallon reservoir tank located near the fuel tank
  - DEF tank, supply module and supply line are heated to help prevent the freezing of DEF and keep it in a liquid state
  - DEF tank includes temperature and fluid level sensors
- DEF tank fill is located next to the diesel fuel filler
- DEF is widely available in 1- and 2.5-gallon bottles

#### Selective Catalytic Reduction (SCR)

- The second step in the exhaust aftertreatment process, primarily where NOx is removed from the exhaust stream
- Located between the DOC and the DPF in the exhaust system
- Uses a liquid chemical reactant, diesel exhaust fluid (DEF)
- DEF dosing module sprays a fine mist of DEF into the exhaust stream to react with the NOx in the exhaust as it passes through the SCR catalyst
  - When heated, DEF splits into ammonia and carbon dioxide

- These molecules are atomized and vaporized and evenly distributed into the exhaust flow
- Once the DEF solution is combined with the exhaust flow, chemical reactions convert the ammonia and NOx into water and harmless nitrogen

#### Diesel Particulate Filter (DPF)

- The last step in the exhaust aftertreatment process and designed to scrub any remaining soot from the exhaust
  - Soot can be described as the black smoke seen in diesel exhaust
- Located in the exhaust system, after the SCR
- Periodically cleans itself through a process known as “regeneration,” which is similar to a small incinerator burning off trapped particulates
  - Passive regeneration naturally burns off soot when exhaust temperatures are high enough
  - Active regeneration (forced burn-off) occurs as needed, depending on operational use

**NOTE:** For more specific information about the regeneration process, please refer to the Maintenance and Specifications section of the Diesel Engine Supplement.

#### Ultra Low Sulfur Diesel (ULSD) Fuel

- ULSD fuel MUST be used in the 3.2L Power Stroke diesel engine to allow the emissions control system, including the diesel particulate filter (DPF), to operate properly
- ULSD fuel may be used in pre-2007 diesel engines
- Sulfur level reduced by 97% compared to conventional diesel from maximum of 500 parts per million (ppm) to 15 ppm

#### Diesel Engine Oil Requirement

- Oil that meets American Petroleum Institute (API) service category
- Motorcraft SAE 5W-40 Super Duty Diesel Motor Oil XO-5W-40-QSD is required for the 3.2L Power Stroke diesel engine to operate properly and must be used to keep the engine warranty in effect
- For severe duty service and the use of biodiesel fuel (B6-B20), use SAE 5W-40 API CJ-4
- Refer to the owner manual for more information



### Truck Engines cont'd

#### 3.5L Ti-VCT 24V DOHC V6 (F-150)

- Standard on XL and XLT 4x2/4x4; not available with 157" or 163" WB
- 6-speed automatic transmission with tow/haul mode is standard with this engine

#### Key Features and Benefits

- Flex-fuel (E85) capable. See the Engineering Insight
- Twin independent variable camshaft timing (Ti-VCT) on both the intake and exhaust cams is continuously adjusted to keep the engine running at maximum efficiency as the engine speed and torque change, helping enhance fuel economy and performance
- Strong, lightweight die-cast aluminum block
- Lightweight aluminum cylinder heads have 4 valves per cylinder to help improve performance
- Intake was designed as a system, all the way from air inlet to the intake valves, to create enhanced flow for peak power and to broaden the torque curve
- Forged-steel, fully counterweighted crankshaft for strength and durability
- High-temperature alloy, cast aluminum pistons with low-friction coating
- Smart charging alternator. See the Engineering Insight on page 2-58
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2-58
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2-57
- Low-maintenance spark plugs are rated for 100,000 miles of use under normal driving conditions
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

Specifications	
Type	6-cylinder, 60° V6, dual overhead camshaft, 24-valve
Displacement	3.5L (213 CID)
Horsepower (SAE net)	282 @ 6250 rpm <sup>(1)</sup>
Torque	253 lb.-ft. @ 4250 rpm <sup>(1)</sup>
Compression Ratio	10.8:1
Bore and Stroke (in.)	3.64 x 3.45
Engine Block Material	Aluminum
Cylinder Head Material	Aluminum
Main Bearings	4
Valve Lifters	Direct-acting mechanical bucket
Fuel Delivery	Sequential multiport electronic fuel injection
Fuel (minimum)	87-octane regular unleaded/E85

(1) Ford preliminary data. Numbers may change in the future.

ENGINEERING INSIGHT
Flex-fuel (E85) Capability
<p><b>What It Is</b></p> <ul style="list-style-type: none"> <li>• A feature that allows an engine to operate on E85 fuel — a blend of 85% ethanol fuel and 15% unleaded gasoline</li> </ul> <p><b>How It Works</b></p> <ul style="list-style-type: none"> <li>• Engine can run on E85 fuel, regular unleaded gasoline or any combination of the two in the same fuel tank</li> <li>• The blend of fuel(s) is detected by electronic sensors</li> <li>• The resulting blend is burned in the combustion chamber as fuel injection and spark timing are adjusted automatically</li> </ul> <p><b>Key Benefit</b></p> <ul style="list-style-type: none"> <li>• Made from renewable resources</li> <li>• Lower emission of greenhouse gases</li> </ul>



## Truck Engines cont'd

### 3.5L EcoBoost 24V DOHC V6 (F-150)

- Optional on all models; not available with the 122" WB
- 6-speed automatic transmission with SelectShift capability is standard with this engine

#### Key Features and Benefits

- 90% of peak torque is available from 1700 to 5000 engine rpm
- Dual overhead camshaft (DOHC), lightweight aluminum cylinder heads with 4 valves per cylinder and direct-acting mechanical valvetrain
- Die-cast aluminum engine block is strong, yet lightweight
- Piston-cooling jets help improve oil warm-up and maintain cooler piston temperatures for enhanced efficiency and durability
- Forged-steel, fully counterweighted crankshaft for strength and durability
- Gasoline direct-injection. See the Engineering Insight on page 2–51
- Parallel twin turbochargers. See the Engineering Insight on page 2–58
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2–58
- Smart charging alternator. See the Engineering Insight on page 2–58
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2–57
- Electronic throttle control (ETC) helps deliver seamless and consistent engine response
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

Specifications	
Type	6-cylinder, dual overhead camshaft, 24-valve with Ti-VCT, EcoBoost
Displacement	3.5L (213 CID)
Horsepower (SAE net)	365 @ 5000 rpm
Torque	420 @ 2500 rpm
Compression Ratio	10.0:1
Bore and Stroke (in.)	3.64 x 3.45
Engine Block Material	Aluminum
Cylinder Head Material	Aluminum
Main Bearings	4
Valve Lifters	Direct-acting mechanical bucket
Fuel Delivery	Direct-injection
Fuel (minimum)	87-octane regular unleaded

#### Truck-specific Features

- Twin independent variable camshaft timing (Ti-VCT) on both the intake and exhaust cams is continuously adjusted to keep the engine running at maximum efficiency as the engine speed and torque change, helping enhance fuel economy and performance
- Intake and exhaust camshafts enhanced for fuel economy and performance
- Cast exhaust manifolds for heavy-duty operation and durability
- Enhanced torque capability and durability
- Cooling system enhanced for engine coolant flow

### ENGINEERING INSIGHT

#### Fail-Safe Engine Cooling System

##### What It Is

- A feature designed to help protect the engine from potential damage due to loss of coolant

##### How It Works

- If the engine overheats, the engine will switch from normal all-cylinder operation to alternating cylinder operation
- The non-powered cylinders act as air pumps to help cool the powered cylinders
- The vehicle will continue to operate, but with limited engine power
- Driving distance is limited by a number of factors including vehicle load, outside temperature and road conditions

##### Key Benefit

- Allows the driver to travel a short distance to obtain service or reach a service facility

### Truck Engines cont'd

#### 3.5L EcoBoost 24V DOHC V6 (F-150) cont'd

##### ENGINEERING INSIGHT

###### EcoBoost Twin Turbochargers

###### What It Is

- A turbocharger uses otherwise wasted energy from the engine's exhaust to rotate a turbine wheel

###### How It Works

- The turbine wheel is coupled to a compressor that pressurizes air coming into the engine — this is called “boost” and allows the engine to breathe in air as if it were larger in displacement since more air is “forced” into the intake
- The more air an engine breathes, the more power it generates

###### Key Benefits

- Compact design and low NVH (noise, vibration and harshness) characteristics
- Less engine compartment heat
- Turbo lag is virtually eliminated — the turbos will spool up faster than a single-turbo engine and allow the 3.5 EcoBoost V6 to reach peak power faster than a single-turbo design
- Drivers will feel an immediate response when they step on the accelerator

##### ENGINEERING INSIGHT

###### Aggressive Deceleration Fuel Shutoff (ADFSO)

###### What It Is

- A feature which temporarily interrupts fuel delivery and consumption when the vehicle normally slows down while maintaining normal engine operation

###### How It Works

- Uses the transmission to keep the engine running at low, more fuel-efficient operating level whenever possible
- Normal fuel delivery resumes when the vehicle reaches a low speed or when the driver accelerates

###### Key Benefits

- Excellent driveability is maintained by Ford proprietary software that integrates this technology with powertrain operation
- Is automatic and requires no interaction from the driver
- Helps maximize fuel economy

##### ENGINEERING INSIGHT

###### Smart Charging Alternator

###### What Smart Charging Is

- A standard feature that controls charging system voltage during vehicle acceleration and deceleration, helping to enhance fuel efficiency

###### How It Works

- An alternator provides charging (current) via a pulley and belt operated by the engine. To create current, a mechanical load is exerted onto the belt and felt by the engine. The more current there is, the more torque is applied
- Smart charging decreases alternator output during vehicle acceleration and increases output during vehicle braking or deceleration
  - Since there is no additional engine accessory belt load to energize the battery, less fuel is used by the engine
- By controlling voltage during acceleration and braking or deceleration, efficiency is increased
- Communicates with the ADFS0 (aggressive deceleration fuel shutoff) system to ensure the battery is being adequately charged

###### Key Benefit

- Helps the engine consume less fuel

## Truck Engines cont'd

### 3.5L EcoBoost 24V DOHC V6 (F-150) cont'd

ENGINEERING INSIGHT
The Intercooler
<p>The intercooler is designed to remove some of the heat generated by the action of the twin turbochargers compressing the incoming air charge prior to entering the engine intake system. The intercooler is typically located at the front of the vehicle within the airstream so that ambient air can flow over the outer plates and fins, helping cool the charge air inside the intercooler. This action generates a cooler, dense intake charge and increases the ability of the engine to produce torque and horsepower as well as promotes more thorough combustion with reduced emissions.</p> <p>The intercooler works on the same principle as the cooling system radiator. In this case it's warm air inside the intercooler being cooled by outside air passing over the fins and tubes rather than warm water inside the radiator being cooled by the outside airstream. In both cases, trying to maintain the optimum operating temperature is the goal, resulting in enhanced efficiency.</p>

### 3.5L EcoBoost 24V DOHC V6 with Ti-VCT (Transit)

- Standard on all DRW Van and Wagon models
- Optional on all SRW Van and Wagon models
- 6-speed automatic transmission with SelectShift capability is standard

#### Key Features and Benefits

- Dual overhead camshaft (DOHC), lightweight aluminum cylinder heads with 4 valves per cylinder and direct-acting mechanical valvetrain enhances engine breathing
- Die-cast aluminum engine block is strong, yet lightweight
- Piston-cooling jets help improve oil warm-up and maintain cooler piston temperatures for enhanced efficiency and durability
- Forged-steel, fully counterweighted crankshaft for strength and durability
- Gasoline direct-injection. See the Engineering Insight on page 2-51
- Parallel twin turbochargers. See the Engineering Insight on page 2-58
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2-58
- Smart charging alternator. See the Engineering Insight on page 2-58
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2-57
- Electronic throttle control (ETC) helps deliver seamless and consistent engine response
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

Specifications	
Type	6-cylinder V6, dual overhead camshaft, 24-valve
Displacement	3.5L (213 CID)
Horsepower (SAE net)	310 @ 5500 rpm <sup>(1)</sup>
Torque	400 lb.-ft. @ 2500 rpm
Compression Ratio	10.0:1
Bore and Stroke (in.)	3.64 x 3.41
Engine Block Material	Aluminum
Cylinder Head Material	Aluminum
Main Bearings	4
Valve Lifters	Direct-acting mechanical bucket
Fuel Delivery	Direct-injection
Fuel (minimum)	87-octane regular unleaded

(1) Using 93-octane fuel.

#### Truck-specific Features

- Twin independent variable camshaft timing (Ti-VCT) on both the intake and exhaust cams is continuously adjusted to keep the engine running at maximum efficiency as the engine speed and torque change, helping enhance fuel economy and performance
- Intake and exhaust camshafts enhanced for fuel economy and improved performance
- Cast exhaust manifolds for heavy-duty operation and durability
- Enhanced cooling system helps improve engine coolant flow

### Truck Engines cont'd

#### 3.7L Ti-VCT 24V DOHC FFV V6 (Transit)

- Standard on all SRW models
- 6-speed automatic transmission with SelectShift capability is standard

#### Key Features and Benefits

- Flex-fuel (E85) capable. See the Engineering Insight on page 2-56
- Twin independent variable camshaft timing (Ti-VCT) on both the intake and exhaust cams is continuously adjusted to keep the engine running at maximum efficiency as the engine speed and torque change, helping enhance fuel economy and performance
- Strong, yet lightweight die-cast aluminum block
- Dual overhead camshaft (DOHC), lightweight aluminum cylinder heads with 4 valves per cylinder
- Aluminum engine block and cylinder heads help to reduce weight to aid fuel efficiency
- Piston-cooling oil jets help improve oil warm-up and cooling, and help maintain cooler piston temperatures
- Forged-steel, fully counterweighted crankshaft for strength and durability
- Smart charging alternator. See the Engineering Insight on page 2-58
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2-58
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2-57
- Electronic throttle control (ETC) helps deliver seamless and consistent engine response
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

Specifications	
Type	6-cylinder, dual overhead camshaft, 24-valve with Ti-VCT
Displacement	3.7L (226 CID)
Horsepower (SAE net)	275 @ 6000 rpm
Torque	260 lb.-ft. @ 4000 rpm
Compression Ratio	10.5:1
Bore and Stroke (in.)	3.76 x 3.41
Engine Block Material	Aluminum
Cylinder Head Material	Aluminum
Main Bearings	4
Valve Lifters	Direct-acting mechanical bucket
Fuel Delivery	Sequential multiport electronic fuel injection
Fuel (minimum)	87-octane regular unleaded/E85

## Truck Engines cont'd

### 5.0L Ti-VCT 32V DOHC V8 (F-150)

- XL
  - Standard on 4x4 with 157" or 163" WB
  - Optional on 4x2 with 157" or 163" WB
  - Optional on 4x2/4x4 with 122", 141" or 145" WB
- XLT
  - Standard on 4x4 with 157" or 163" WB
  - Optional on 4x2/4x4 with 122" or 141" WB (300A and 301A)
  - Optional on 4x2/4x4 with 145" WB
  - Optional on 4x2 with 157" or 163" WB
- Lariat
  - Standard on 4x4 with 157" or 163" WB (500A and 501A)
  - Standard on 4x2/4x4 with 145" or 157" WB (502A)
  - Optional on 4x2/4x4 with 145" WB (300A and 301A)
  - Optional on 4x2 with 157" or 163" WB (300A and 301A)
- Standard on all King Ranch and Platinum models
- 6-speed automatic transmission with tow/haul mode, SelectShift capability and Progressive Range Select are standard with this engine

#### Key Features and Benefits

- Flex-fuel (E85) capable. See the Engineering Insight on page 2–56
- Combination of features and technologies helps provide outstanding performance
- Twin independent variable camshaft timing (Ti-VCT) on both the intake and exhaust cams is continuously adjusted to keep the engine running at maximum efficiency as the engine speed and torque change, helping enhance fuel economy and performance
- Strong, yet lightweight die-cast aluminum block
- Dual overhead camshaft (DOHC), lightweight aluminum cylinder heads with 4 valves per cylinder
- Aluminum engine block and cylinder heads help to reduce weight to aid fuel efficiency
- Forged-steel, fully counterweighted crankshaft for strength and durability
- Smart charging alternator. See the Engineering Insight on page 2–58
- Aggressive deceleration fuel shutoff (ADFSO). See the Engineering Insight on page 2–58
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2–57

Specifications	
Type	8-cylinder, dual overhead camshaft, 32-valve with Ti-VCT
Displacement	5.0L (302 CID)
Horsepower (SAE net)	385 @ 5750 rpm
Torque	387 @ 3850 rpm
Compression Ratio	10.5:1
Bore and Stroke (in.)	3.63 x 3.65
Engine Block Material	Aluminum
Cylinder Head Material	Aluminum
Main Bearings	4
Valve Lifters	Roller finger follower
Fuel Delivery	Sequential multiport electronic fuel injection
Fuel (minimum)	87-octane regular unleaded/E85

- Electronic throttle control (ETC) helps deliver seamless and consistent engine response
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

#### Truck-specific Features

- New mid-lock variable cam timing enhances fuel economy while maintaining tow-friendly torque
- Cast-iron exhaust manifolds for heavy-duty operation and durability
- 10.5:1 compression ratio for improved low-speed torque and towing capability

### Truck Engines cont'd

#### 6.2L 16V SOHC FFV V8 (Super Duty Pickups and Chassis Cabs)

- Standard on Super Duty Pickups F-250/F-350, all models
- Standard on Super Duty Chassis Cabs F-350, all models
- Heavy-duty TorqShift 6-speed SelectShift automatic transmission is standard on Super Duty Pickups
- Heavy-duty TorqShift 6-speed SelectShift automatic transmission with tow/haul mode is standard on Super Duty Chassis Cabs F-350 with this engine

#### Key Features and Benefits

- Flex-fuel (E85)-capable. See the Engineering Insight on page 2–56
- Large-bore architecture
  - Helps improve engine breathing with larger intake and exhaust valves
  - Allows for a shorter stroke design for faster engine speeds (higher engine rpm) and increased horsepower
- Single overhead camshaft (SOHC) valvetrain with roller-rocker shafts allows for enhanced camshaft design to help provide low-speed torque delivery
- SOHC valvetrain enhances intake and exhaust port layout and helps improve engine breathing
- Dual-equal variable camshaft timing enhances the opening and closing of the intake and exhaust valves during the combustion cycle for a balance of power, fuel efficiency and emissions
- Two spark plugs per cylinder
  - Help efficiently burn the air/fuel mixture in each cylinder to help increase torque delivery and fuel efficiency
  - Help maintain a smooth idle quality
- Dual knock sensors
  - Allow the spark timing of each cylinder to be enhanced in real time throughout the engine speed range
- Efficient engine crankcase breathing helps improve torque capability at higher engine speeds
- Piston cooling jets help improve oil warm-up and maintain cooler piston temperatures for improved durability, especially under heavy-duty operating conditions
- Organic Acid Technology (OAT) orange engine coolant. See the Engineering Insight
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2–57
- Electronic throttle control (ETC) helps deliver seamless and consistent engine response
- Oil-Life Minder displays the remaining oil-life in the instrument cluster message center

Specifications	
Type	8-cylinder, single overhead camshaft, 16-valve
Displacement	6.2L (379 CID)
Horsepower (SAE net)	385 @ 5500 rpm (under 10,000 lbs. GVWR) 316 @ 4179 rpm (over 10,001 lbs. GVWR)
Torque	405 lb.-ft. @ 4500 rpm (under 10,000 lbs. GVWR) 397 lb.-ft. @ 4179 rpm (over 10,001 lbs. GVWR)
Compression Ratio	9.8:1
Bore and Stroke (in.)	4.02 x 3.74
Engine Block Material	Cast iron
Cylinder Head Material	Aluminum
Main Bearings	5
Valve Lifters	Hydraulic lash adjusters
Fuel Delivery	Sequential multiport electronic fuel injection
Fuel (minimum)	87-octane regular unleaded/E85

#### ENGINEERING INSIGHT

##### Organic Acid Technology (OAT) Engine Coolant

Customers should know Super Duty vehicles (gasoline engine and diesel engine equipped) feature Organic Acid Technology (OAT) engine coolant. The most obvious trait of the engine coolant is the orange color, but there are key maintenance items the customer should be made aware of:

- OAT coolant should be replenished at 105,000 miles, under normal operating conditions
- Antifreeze and anti-corrosion protection of the coolant should be tested and the hoses should be inspected every 15,000 miles
- Mixing any other traditional engine coolants will greatly reduce the operating characteristics of the OAT engine coolant or may cause engine damage that could jeopardize provisions of the engine warranty



## Truck Engines cont'd

### 6.7L Power Stroke V8 Turbo Diesel (Super Duty Pickups and Chassis Cabs, including 2016 F-650/F-750)

- Standard on Super Duty Pickups F-450, all models; optional on Super Duty Pickups, all models
- Standard on Super Duty Chassis Cabs F-450/F-550 Lariat; optional on Super Duty Chassis Cabs F-350, all models
- Heavy-duty TorqShift 6-speed SelectShift automatic transmission is standard on Super Duty Pickups
- Heavy-duty TorqShift 6-speed SelectShift automatic transmission with tow/haul mode is standard on Super Duty Chassis Cabs F-450/F-550 Lariat; optional on XL, XLT and F-350 Lariat
- TorqShift heavy-duty 6-speed automatic transmission is standard on Super Duty Chassis Cabs F-650/F-750 models

#### Key Features and Benefits

- The cleanest Power Stroke diesel engine ever
- Capable of operating on B20 biodiesel fuel
  - B20 is a blend of 20% biodiesel and 80% petroleum-based fuel
  - Biodiesel is safe to handle, biodegradable and produces less air pollutants than 100% petroleum-based diesel fuel
- Compacted graphite iron (CGI) deep-skirt engine block and aluminum cylinder heads help reduce weight while maintaining maximum strength for the horsepower and torque capacity of the Power Stroke V8
  - First North American use of CGI in a Super Duty-class vehicle
  - CGI is stronger than traditional cast iron
- Aluminum cylinder heads
  - Help reduce weight
  - Feature dual water jackets for enhanced cooling and increased strength
  - Six-head-bolt design helps improve sealing and maintain cylinder integrity
- Unique inboard exhaust design
  - An automotive industry first for a modern production diesel engine
  - Helps reduce exhaust system volume and heat transfer to the engine compartment
  - Helps improve throttle response
  - Helps improve NVH (noise, vibration and harshness) characteristics

Specifications	
Type	Diesel, 8-cylinder, overhead valve, 32-valve
Displacement	6.7L (406 CID)
Horsepower (SAE net)	440 @ 2800 rpm (Super Duty Pickups) 300 @ 2800 rpm (Super Duty Chassis Cabs) 270 @ 2400 rpm 300 @ 2500 rpm 330 @ 2600 rpm (F-650/F-750 Chassis Cabs)
Torque	860 lb.-ft. @ 1600 rpm (Super Duty Pickups) 660 lb.-ft. @ 1600 rpm (Super Duty Chassis Cabs) 675 lb.-ft. @ 1600 rpm 700 lb.-ft. @ 1800 rpm 725 lb.-ft. @ 1800 rpm (F-650/F-750 Chassis Cabs)
Compression Ratio	16.2:1
Bore and Stroke (in.)	3.90 x 4.25
Engine Block Material	Compacted graphite iron (CGI)
Cylinder Head Material	Aluminum
Main Bearings	5
Valve Lifters	Hydraulic roller followers with push rods/rocker arms
Fuel Delivery	High-pressure common-rail
Fuel (minimum)	ULSD Diesel, B20 biodiesel (20% of less biodiesel)

- New, larger turbocharger accommodates a higher airflow to produce more power and enhance high altitude performance
  - Single compressor wheel forces air into the engine's cylinders to enhance performance, especially at high altitude where the air is thinner than sea level
  - Wastegate and wastegate controls are eliminated because the turbo operates at lower peak pressure than the previous model
- Redesigned turbo oil and cooling lines enhance sealing
- High-pressure common-rail fuel injections
  - Delivers up to 5 fuel injections per combustion cycle for excellent throttle response, efficiency and NVH characteristics
  - New high-pressure fuel pump with increased cam stroke helps deliver more fuel when needed to provide more power — without impacting fuel economy



### Truck Engines cont'd

#### 6.7L Power Stroke V8 Turbo Diesel (Super Duty Pickups and Chassis Cabs, including 2016 F-650/F-750) cont'd

- Efficiency improvements ensure customers experience similar performance in fuel economy
  - New fuel injector tips enhance fuel atomization, resulting in enhanced combustion, lower NVH, cleaner emissions and reduced buildup of fuel deposits on the valves over time
  - Delivers quiet operation throughout the entire rpm range (similar to gasoline-engine noise levels)
- Increased crankshaft strength and new lower-friction polymer-coated crankshaft main bearings enhance durability
- New 4-layer exhaust manifold gasket enhances durability
- Quick-start glow plugs help provide quick engine starts, even in extremely cold conditions
- Organic Acid Technology (OAT) orange engine coolant. See the Engineering Insight on page 2–62
- Intelligent Oil-Life Monitor uses actual engine and vehicle operating conditions to calculate oil change service intervals of up to 1 year or 10,000 miles; see the vehicle owner manual for maintenance details

#### Exhaust Gas Recirculation (EGR)

- Recycles combustion gases in the exhaust system to help reduce NOx emissions
- A two-step cooling process allows the EGR to recycle exhaust gases into the intake at a much lower temperature
- A cooler temperature means a higher efficiency in recycling the exhaust gases and less oxygen in the mix
- Less oxygen helps reduce the formation of NOx in the exhaust

#### Diesel Oxidation Catalyst (DOC)

- The first step in the exhaust aftertreatment process and could be referred to as the cleaning and heating step
- Converts and oxidizes hydrocarbons into water and carbon dioxide
- Provides and promotes heat into the exhaust system to help increase the conversion efficiency

#### Diesel Exhaust Fluid (DEF)

- A solution comprised of 32.5% high-purity urea and 67.5% demineralized water
- The urea in the solution breaks down into ammonia when injected into the exhaust stream
- DEF is clear, nontoxic and safe to handle

- Stored in a 5-gallon reservoir tank located near the fuel tank
  - DEF tank, supply module and supply line are heated to help prevent the freezing of DEF and keep it in a liquid state
  - DEF tank includes temperature and fluid level sensors
- DEF tank fill is located next to the diesel fuel filler
- DEF is widely available in 1- and 2.5-gallon bottles

#### Selective Catalytic Reduction (SCR)

- The second step in the exhaust aftertreatment process, primarily where NOx is removed from the exhaust stream
- Located between the DOC and the DPF in the exhaust system
- Uses a liquid chemical reactant, diesel exhaust fluid (DEF)
- DEF dosing module sprays a fine mist of DEF into the exhaust stream to react with the NOx in the exhaust as it passes through the SCR catalyst
  - When heated, DEF splits into ammonia and carbon dioxide
- These molecules are atomized and vaporized and evenly distributed into the exhaust flow
- Once the DEF solution is combined with the exhaust flow, chemical reactions convert the ammonia and NOx into water and harmless nitrogen

#### Diesel Particulate Filter (DPF)

- The last step in the exhaust aftertreatment process and designed to scrub any remaining soot from the exhaust
  - Soot can be described as the black smoke seen in diesel exhaust
- Located in the exhaust system, after the SCR
- Periodically cleans itself through a process known as “regeneration,” which is similar to a small incinerator burning off trapped particulates
  - Passive regeneration naturally burns off soot when exhaust temperatures are high enough
  - Active regeneration (forced burn-off) occurs as needed, depending on operational use

**NOTE:** For more specific information about the regeneration process, please refer to the Maintenance and Specifications section of the Diesel Engine Supplement.

## Truck Engines cont'd

### 6.7L Power Stroke V8 Turbo Diesel (Super Duty Pickups and Chassis Cabs, including 2016 F-650/F-750) cont'd

#### Ultra Low Sulfur Diesel (ULSD) Fuel

- ULSD fuel MUST be used in the 6.7L Power Stroke diesel engine to allow the emissions control system, including the diesel particulate filter (DPF), to operate properly
- ULSD fuel may be used in pre-2007 diesel engines
- Sulfur level reduced by 97% compared to conventional diesel from a maximum of 500 parts per million (ppm) to 15 ppm

### 6.8L 30V SOHC V10 (Super Duty Chassis Cabs, including 2016 F-650/F-750)

- Standard or optional on F-450/F-550, F-650, F53 Motorhome Chassis and F59 Stripped Chassis
- TorqShift 5-speed automatic transmission is standard on F-450/F-550
- Heavy-duty TorqShift 6-speed automatic transmission is standard on F-650

#### Key Features and Benefits

- 3 valves per cylinder design
  - Includes two intake valves and one exhaust valve
  - Allows the engine to “breathe” almost as well as high-performance 4-valve designs but without the additional weight and complexity
- Short/long intake runner design
  - Features long runners for lower engine rpm operation to speed up airflow and provide maximum torque, while the short runner design is used at higher engine rpm to provide unrestricted high-velocity air intake for efficient cylinder filling and maximum power

#### Diesel Engine Oil Requirement

- Oil that meets American Petroleum Institute (API) service category
- CJ-4/CJ-4SM is required for the 6.7L Power Stroke diesel engine to operate properly
- CJ-4/CJ-4SM service standard oil must be used to keep the engine warranty in effect
- CJ-4/CJ-4SM oil may be used in pre-2007 engines

Specifications	
Type	10-cylinder, 90° V, single overhead camshaft, 30-valve
Displacement	6.8L (415 CID)
Horsepower (SAE net)	362 @ 4750 rpm (Super Duty Chassis Cabs) TBD (F-650/F-750 Chassis Cabs)
Torque	457 lb.-ft. @ 3250 rpm (Super Duty Chassis Cabs) TBD (F-650/F-750 Chassis Cabs)
Compression Ratio	9.2:1
Bore and Stroke (in.)	3.55 x 4.17
Engine Block Material	Cast Iron
Cylinder Head Material	Aluminum
Main Bearings	6
Valve Lifters	Hydraulic lash adjuster with roller follower
Fuel Delivery	Sequential multiport electronic fuel injection
Fuel (minimum)	87-octane regular unleaded

- Organic Acid Technology (OAT) engine coolant. See the Engineering Insight on page 2–62
- Fail-Safe Engine Cooling System. See the Engineering Insight on page 2–57

### Truck Transmissions

#### TorqShift 5-speed Automatic (F-Series Super Duty F-450/F-550, F53 and F59)

- Transmission code 5R110

#### Key Features and Benefits

- 5-speed gearbox and control system are designed and engineered to help provide smoother shifts. The transmission features high 1st- and 2nd-gear ratios to launch a vehicle loaded with cargo more quickly and smoothly
- TorqShift's control system monitors the engine, transmission, vehicle speed and driver inputs to help enhance shift performance
- Selectable tow/haul mode further enhances control by tailoring the upshift schedule for enhanced performance during these more demanding activities
- Tow/haul mode also senses when conditions call for increased engine braking and automatically schedules the appropriate downshift
- Grade-braking feature functions in concert with speed control to help maintain the desired vehicle speed while descending grades
- TorqShift's control body employs electronic solenoids to manage the transmission's clutch elements, eliminating the variability experienced with more conventional hydraulic spring/valve systems
- Solenoids are placed close to the clutches, thereby minimizing response time
- The transmission has a large pump to promote better lubrication and cooling
- A filter screen is employed to help prevent contamination impacting the solenoids

#### Additional Highlights

- Torque capability: torque converter is designed to maximize the low-speed torque capability of the powertrain
- During peak operating range, this transmission is capable of delivering maximum engine torque to the drive wheels

Gear Ratios (to :1)	
1st	3.11
2nd	2.20
3rd	1.55
4th	1.00
5th	0.71
Reverse	2.88
Standard Final Drive Ratio	3.73

## Truck Transmissions cont'd

### 6-speed Automatic with SelectShift Capability (Transit)

- Transmission code 6R80

#### Key Features and Benefits

- Engine power is matched with gears to provide better performance and smoother shifts
- More gears provide better fuel economy
- Full electronic solenoid control of clutch elements
- SelectShift manual mode
- Tow/haul mode reduces gear hunting, improves power delivery and uses engine braking to help control vehicle speed when descending hills
  - Especially useful when hauling or towing a heavy load
- Progressive Range Select allows the driver to reduce the range of available transmission gears while operating in Drive mode to limit the number of gears available for road and load conditions
  - Range select mode is engaged by pressing either the **+** or **-** switch on the transmission shift knob

#### Manual Mode

- Allows driver to manually upshift or downshift the transmission without using a clutch
- Engaged by moving the shifter to the Manual (M) position
- Gear selection is shown in the instrument cluster
- Engine-speed matching helps provide fast and smooth downshifts
- Includes Second-gear Start mode
  - When engaged, the vehicle will start off from a stop in second gear instead of first
  - There is much less torque output starting out in second gear, helping provide improved traction while driving in slippery conditions
- Manual mode disables Overdrive Cancel and Grade Assist modes
- To prevent the engine from running at too low an rpm, SelectShift may automatically make some downshifts

Gear Ratios (to :1)	
1st	4.17
2nd	2.34
3rd	1.52
4th	1.14
5th	0.87
6th	0.69
Reverse	3.40
Standard Final Drive Ratio	3.73

- Although SelectShift may automatically perform some downshifts, it will allow the driver to downshift at any time as long as the engine will not be damaged from over-revving
  - After the transmission is placed in manual control with SelectShift, the vehicle will remain in this mode until the gearshift lever is moved, from Manual (M) back to Drive (D)
  - Engine damage may occur if excessive engine revving is held without shifting

#### Thumb Switch Operation

- Manual mode switch is located on the left side of the transmission shift knob
- To manually upshift, push the **+** portion of the switch
- To manually downshift, press the **-** portion of the switch

### Truck Transmissions cont'd

#### 6-speed Automatic (F-150)

- Transmission code 6R80E
  - Includes tow/haul mode with 3.5L Ti-VCT FFV V6 engine
  - Includes tow/haul mode, SelectShift Capability and Progressive Range Select with 2.7L EcoBoost V6, 3.5L EcoBoost V6 and 5.0L Ti-VCT FFV V8 engines

#### Key Features and Benefits

- Enhanced to work well with all F-150 engines
- Engine power is matched with gears to provide better performance and smoother shifts
- Refined to help enhance efficiency
  - Low friction materials used in clutch plates
  - Efficient pump performance with improved line pressure regulation
  - Thermal valve optimization provides faster heat-up of transmission fluid for better operating efficiency
- More gears help provide enhanced fuel economy
- Full electronic solenoid control of clutch elements

#### SelectShift Manual Mode

- Allows driver to manually upshift or downshift the transmission without using a clutch
- Engaged by moving the shifter to the Manual (M) position
- Gear selection is shown in the instrument cluster
- Engine-speed matching helps provide fast and smooth downshifts
- Includes Second-gear Start mode
- Manual mode disables Overdrive Cancel and Hill Start Assist modes
- To prevent the engine from running at too low an rpm, SelectShift may automatically make some downshifts
- Although SelectShift may automatically perform some downshifts, it will allow the driver to downshift at any time as long as the engine will not be damaged from over-revving
  - After the transmission is placed in manual control with SelectShift, the vehicle will remain in this mode until the gearshift lever is moved, from Manual (M) back to Drive (D)
  - Engine damage may occur if excessive engine revving is held without shifting

#### Thumb Switch Operation

- Manual mode switch is located on the left side of the transmission shift knob
- To manually upshift, push the + portion of the switch
- To manually downshift, press the – portion of the switch

#### Tow/Haul Mode

- Reduces gear hunting, improves power delivery and uses engine braking to help control vehicle speed when descending hills
- Especially useful when hauling or towing a heavy load

#### Progressive Range Select

- Allows driver to reduce the range of available transmission gears while operating in Drive mode to limit the number of gears available for road and load conditions
- Range Select mode is engaged by pressing either the + or – switch on the transmission shift knob

Gear Ratios (to :1)	
1st	4.17
2nd	2.34
3rd	1.52
4th	1.14
5th	0.87
6th	0.69
Reverse	3.40
Standard Final Drive Ratio	3.55

## Truck Transmissions cont'd

### 6-speed SelectShift Automatic (Transit Connect)

- Transmission code 6F35
- Standard on all models

#### Key Features and Benefits

- Engineered for high quality and quiet operation
  - Hard-finish gears for precise fit help reduce gear whine
  - Die-cast aluminum housing helps reduce noise
  - Enhanced pump porting helps reduce transmission fluid pressure “ripple” and noise
- Transmission fluid is “filled for life” to help lower cost of ownership

#### Sport Mode

- Allows driver to manually upshift or downshift the transmission without using a clutch
- Engaged by moving the shifter to the Sport (S) position and pushing the thumb switch
- Gear selection is shown in the instrument cluster
- Engine-speed matching helps provide fast and smooth downshifts
- Includes Second-gear Start mode
  - When engaged, the vehicle will start off from a stop in second gear instead of first
  - There is much less torque output starting out in second gear, helping provide improved traction while driving in slippery conditions
- Sport mode disables Overdrive Cancel and Hill Start Assist modes
- To prevent the engine from running at too low an rpm, SelectShift may automatically make some downshifts
- Although SelectShift may automatically perform some downshifts, it will allow the driver to downshift at any time as long as the engine will not be damaged from over-revving
  - After the transmission is placed in manual control with SelectShift, the vehicle will remain in this mode until the gear shift lever is moved from Sport (S) back to Drive (D)
  - Engine damage may occur if excessive engine revving is held without shifting

#### Sport Mode Operation

- Thumb switch located on the left side of the transmission shift knob
- To manually upshift, push the + portion of the switch
- To manually downshift, press the – portion of the switch
- Provides additional grade (engine) braking and extends lower gear operation to enhance performance for uphill climbs, hilly terrain or mountainous areas. This will increase engine rpm during engine braking
- Provides additional lower gear operation through the automatic transmission shift strategy
- Transmission shift logic will inhibit top gears when driver fully backs out of accelerator pedal
- Gears are selected more quickly and at higher engine speeds

#### Gear Ratios (to :1)

1st	4.58
2nd	2.96
3rd	1.91
4th	1.44
5th	1.00
6th	0.75
Reverse	2.94
Final Drive Ratio	3.21 (2.5L) 3.06 (1.6L)



### Truck Transmissions cont'd

#### Heavy-duty TorqShift 6-speed SelectShift Automatic (Super Duty Pickups and F-350/F-450/F-550 Chassis Cabs)

- Transmission code 6R140

#### Key Features and Benefits

- Engineered for greater internal operating efficiency and increased efficiency compared to the 5-speed TorqShift automatic transmission
- Torque converter design maximizes low-speed torque output
- Robust gearsets and a three-plate, two-stage torque converter help reduce turbine noise when the converter is locked
- Large fluid pump provides superior lubrication and cooling
- High-capacity fluid filter helps extend the fluid change interval to 150,000 miles
- Pure electronic shift controls work with the electronic throttle control of the engine to enhance shifts and vehicle performance and responsiveness
- Transmission can be equipped with power takeoff (PTO) port — must specify order code 62R

#### Manual Mode

- With the gear shift lever in Manual (M), the transmission offers SelectShift capability
- Driver shifts manually with gear shift lever-mounted switches
  - Pressing the + button will upshift the transmission
  - Pressing the – button will downshift the transmission
- Sequential gear engagement does not require operating a clutch

#### Progressive Range Select

- Range Select Mode is engaged by pressing +/- rocker switch on the gear shift lever
- Allows driver to reduce the range of available transmission gears while operating in Drive Mode to limit the number of gears available for road and load conditions
- Message center displays current transmission gear as well as the gears the transmission is available to shift into

#### Tow/Haul Mode

- Tow/haul mode with integrated engine brake (6.7L diesel only) gives drivers even greater control when traveling downhill
  - Helps reduce the use of service brakes, lengthening service intervals and minimizing maintenance costs
- Helps eliminate unwanted frequency of gear shifting on steep uphill grades and allows engine braking to maintain or reduce vehicle speed and assist the driver in controlling the vehicle when descending a steep grade

#### Live-Drive Power Takeoff (PTO) Provision

- Available on 6.7L Power Stroke V8 Turbo Diesel-equipped vehicles only; option code 62R must be ordered to get a PTO gear and port
- Features an output linked directly to the engine crankshaft providing “live” PTO operation anytime the engine is running, regardless of vehicle speed
- Provides the capability to power PTO-driven accessories such as dump bodies, sprayer pumps, generators, salt spreaders and snowplows with maximum flexibility
- Available upfitter switches may be used as PTO control switches

#### Gear Ratios (to :1)

1st	3.97
2nd	2.31
3rd	1.51
4th	1.14
5th	0.85
6th	0.67
Reverse	3.12
Standard Final Drive Ratio	3.73 (Pickups) 3.73 (Chassis Cabs)

#### TorqShift Heavy-duty 6-speed Automatic (2016 Super Duty F-650/F-750 Chassis Cabs)

- Transmission code TBD
- Robust gearsets strengthened with extra pinion gears for medium-duty service
- New torque converter designed to handle increased engine horsepower and torque
- Three-plate, two-stage torque converter with new damper for medium-duty service
- Large fluid pump provides superior lubrication and cooling
- High-capacity fluid filter helps extend the fluid change interval to 150,000 miles
- Pure electronic shift controls work with the electronic throttle control (ETC) of the engine to enhance shifts, vehicle performance and efficiency
- Transmission can be equipped with power takeoff (PTO) port
  - Order code 41A must be used on diesel engine-equipped models
  - Order code 41B must be used on gasoline engine-equipped models