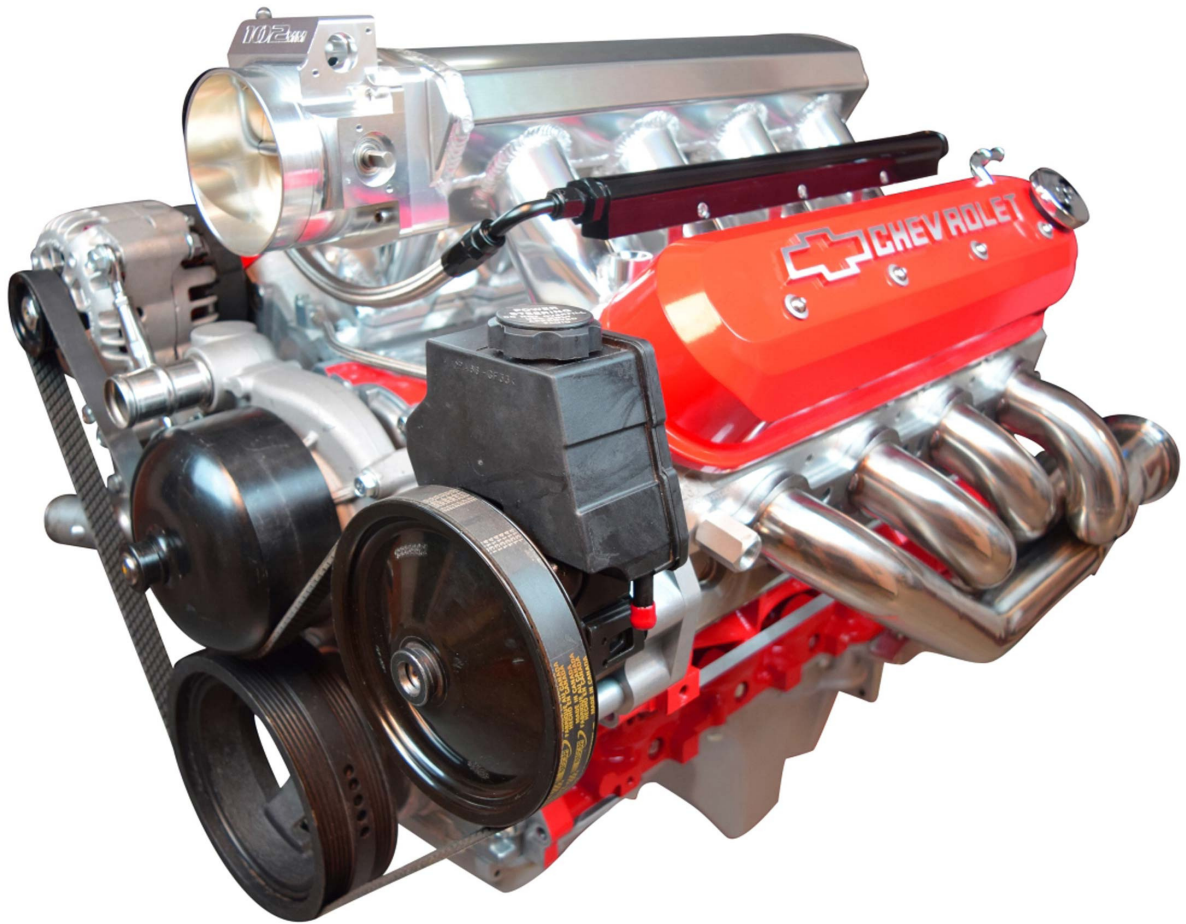


Complete LS Swap Guide

by ICT Billet LLC



For questions or to locate parts & accessories for your swap,
please call 316-300-0833 or visit our website at
www.ictbillet.com

Welcome to the LS Swap Guide presented by ICT Billet LLC

Below we will be touching on some of the key parts in your LS swap to give you a better understanding of how the different components all come together.

ICT Billet has many years and countless LS swaps under our belt, and we carry everything from LS swap mounts to adapters and wiring.

What we'll cover in this guide:

ACCESSORIES

- Crank Pulley (Harmonic Balancer)
- Water Pump
- Power Steering Pump
- Alternator
- A/C Compressor

ENGINE

- Gen III vs. Gen IV
- RPO Code Differences/ Specs
- Crankshaft Guide
- Intake Ports
- Ignition Coils
- Fuel Injectors
- Throttle Body
- Supercharger
- Torque Specs
- Oil Pan
- Wire Connectors
- Wiring Guide (Gen III DBC)
- Fittings

If you don't find the answer to your question in this guide, please contact us at 316-300-0833 or visit our website at www.ictbillet.com

LS Crank Pulley (Harmonic Balancer)

At ICT Billet, we design our brackets based off of three basic spacing principles

One of the most important steps of your swap is to identify the "spacing" needed. This "spacing" is determined by the crank pulley that you have, or will be getting.

Our spacing principles are as follows:

- (-1) Corvette/CTS-V/SS(sedan)/G8's crank pulleys are in this category. *(See image on following page for measurements)*
- (-2) 1998-2002 Camaro/GTO's crank pulleys are in this category. *(See image on following page for measurements)*
- (-3) All Truck/2010-2015 Camaro's crank pulleys are in this category. *(See image on following page for measurements)*

What does this mean for your swap project?

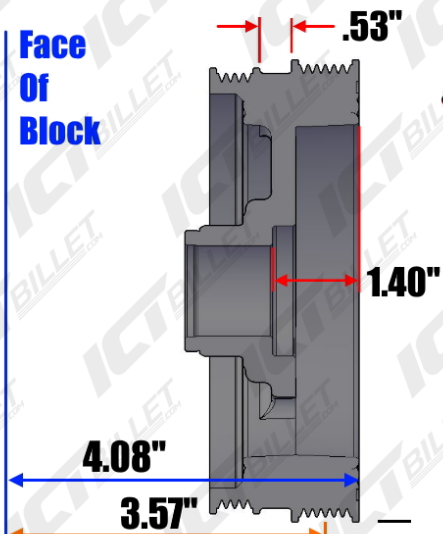
All of our systems function around this spacing concept to ensure the kit is a direct bolt up to your application for proper functionality.

We categorize our parts by a 6 digit part # with a (-) at the end. Depending on which application the bracket was designed for would determine the last digit.

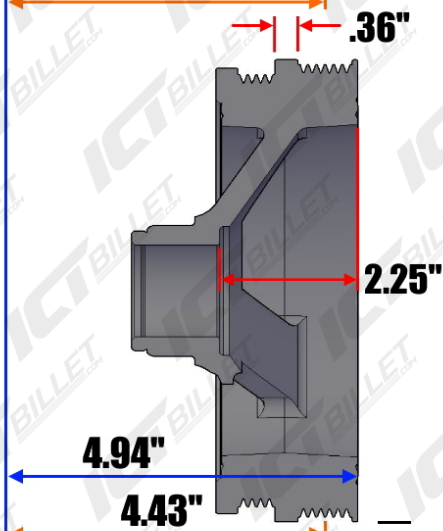
For example: Part# 551577-2 is a high mount alternator bracket for an LS1 Camaro. Part# 551577-3 is the same bracket system, but for a truck engine with stock crank pulley.

LS Crank Spacing Guide

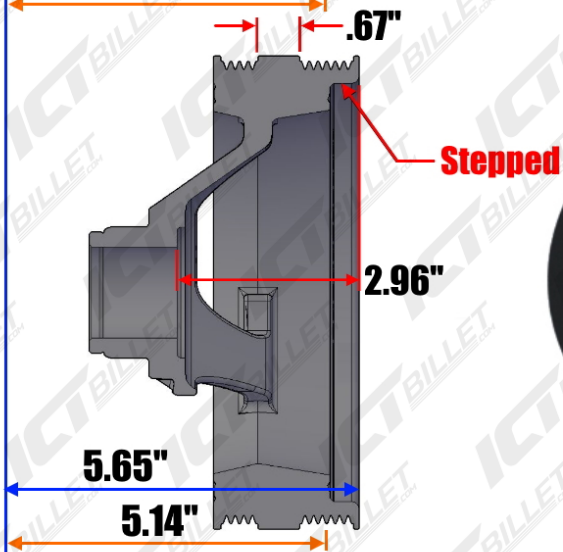
Face
Of
Block



Part #'s Ending In
-1
Corvette/CTS-V/SS/G8



Part #'s Ending In
-2
98-02 Camaro/GTO



Part #'s Ending In
-3
Truck/SUV/2010-Up Camaro

LS Water Pump

Our three basic spacing principles for crank pulleys applies to water pumps as well.

You can **NOT** use any water pump on any LS based engine. Yes they will bolt up, but spacing is very important, just the same as pulley size, ect. However there is more adaptation for the water pumps with our water pump spacers.

For example: You can use a (-2) spacing LS1 water pump on a (-3) 5.3 Truck engine.

What does this mean for your swap project?

The ability to use different style water pumps will allow the build to be more universal. Most swaps are done to be as cost effective as possible.

Instead of buying a brand new water pump for your spacing, you can use our water pump spacers to make the one you have work! Make sure to keep in mind where the heater hose will run into the water pump when deciding on what water pump to use, what intake manifold, which ICT Billet bracket to use, etc.

Refer to the image on the next page to determine which water pump will work best for your application.

LS Water Pump Guide

-1 Spacing



-2 Spacing



-3 Spacing



LS Power Steering Pump

The power steering pump and pulley follow the same spacing principle.

As you can see in the guide on the following page, the three pumps are noticeably different.

Keep in mind which power steering pump you have in conjunction with the rest of the accessory drive because pulley size comes in to play to make sure you have the correct length belt.

- (-1) 1997-2013 Corvette spacing
- (-2) 1998-2002 Camaro LS1 spacing
- (-3) 1999+ Truck spacing

What does this mean for your swap project?

We use these measurements at ICT Billet to design our power steering bracket kits. Understanding which power steering pump you either have (or will need) will make your swap easier.

We also offer a kit with a power steering delete, where in the place of the power steering pulley we include an idler pulley and an updated belt length for that application.

LS Power Steering Pump Guide

'97-'13 Corvette

GM#19318720



GM# 26046502 (reservoir)
GM# 12555222 (bracket)
GM# 15907878 (hose)



.664" shaft diameter



New Style

Old Style



GM# 12568997

GM# 12559890



'98-'02 Camaro

GM# 36P1568



.750" shaft diameter



GM# 12559885



'99+ Truck

GM# 15909830



.750" shaft diameter



Old Style

New Style



GM# 12605677



-Camaro and Truck pulleys NOT interchangeable

LS Alternator

Do you know which alternator you have, or will need? The most common is the 105 amp alternator found on truck engines. This alternator has the smallest casing and is what ICT Billet has used to create most of our alternator relocation brackets.

The biggest reason for needing an alternator relocation is because of experiencing a very tight fit in the engine compartment of the vehicle receiving the swap. Either that, or you plan to strap a turbo to your LS and need spacing to run the turbo system. Whichever reason you need to relocate the alternator, our alternator brackets will be able to take care of you.

What does this mean for your swap project?

Wherever you need to mount your alternator, ICT Billet brackets will be able to handle it. Keep in mind the size of the casing and where you want to put it. You can only use the smaller 105 casing if you are going to relocate to the passenger side head. The 145/160 casings are simply too big.

LS Alternator Guide

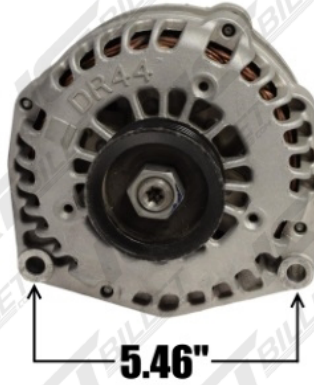
105 amp
GM# 88877278



145 amp
GM# 20881337



160 amp
GM# 88878264



**Corvette,
Camaro '10-'15,
G8, CTS-V, SS**
GM# 19134486



Extra Bolt Flange



LS A/C Compressor

Thinking of installing air conditioning on your swap? Most of our swap customers prefer to keep A/C on their vehicle. We make this easy at ICT Billet by providing a wide selection of brackets to mount your A/C compressor on trucks, cars, hotrods, etc, with options ranging from GM factory R4, BMW, Ford, Sanden 508, 7176, 708, HT6 and other types of compressors. At ICT Billet, we manufacture these brackets in-house to our precise dimensions using GM specs for a perfect, reliable fit every time.

Typically our customers have a factory LS style compressor that comes with their engine or in the vehicle they are using as a donor. We offer a bracket that will relocate this compressor due to most swap vehicles having clearance issues down low on the passenger side. We accomplish this by relocating the compressor to the passenger side head and converting the front pulley from a 4-rib to a 6-rib pulley and clutch. We will use one belt to run the entire serpentine system.

What does this mean for your swap project?

Integrating air conditioning into your swapped vehicle has never been easier. You can simply pick from one of our many A/C compressor brackets at ICT Billet. We have every combination of bracket you can think of and can get it to you quickly!

A/C COMPRESSOR GUIDE

SANDEN 508

(SAME BODY AS SANDEN 709)



SANDEN 7176



GM R4

(Pancake Style)
GM#: 1520227 (Camaro)
GM#: 1520185 (Truck)

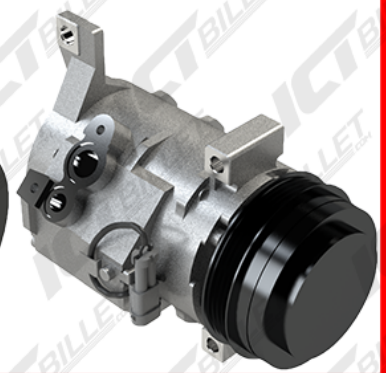


OEM LS TRUCK

GM#: 25891791



★ 89-92 Camaro R4 compressor
uses a larger pulley



LS Gen III vs Gen IV

One of the most misunderstood components is identifying what engine block you actually have. Make sure you know which generation LS based engine you're working with.

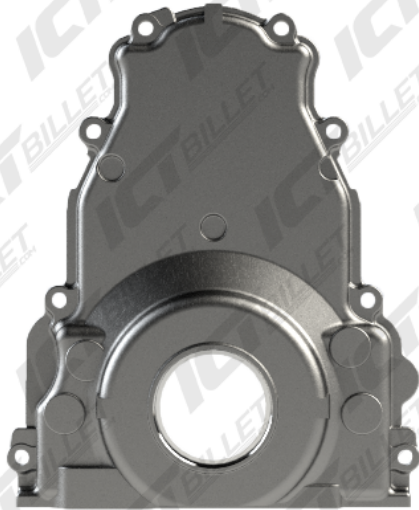
Even though most parts can interchange on LS Based engines, it's important to know the differences between a Generation 3 and Generation 4 LS engine.

There are many things that are different between these two generations of engines, causing you difficulty when it comes to figuring out what parts you need for your build.

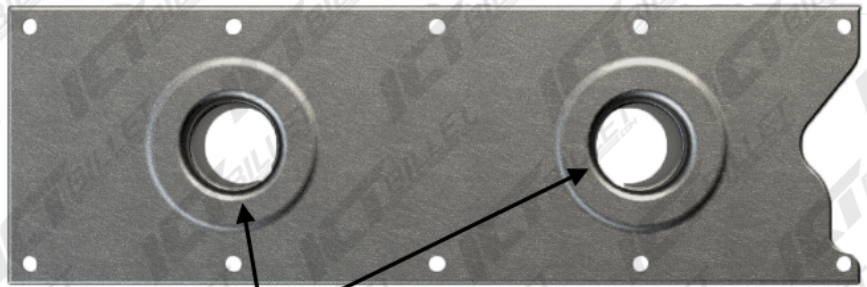
Refer to the image on the next page for a few visible differences between the Generation 3 and Generation 4 engines.

LS Gen 3 vs Gen 4 Comparison Guide

Gen 3

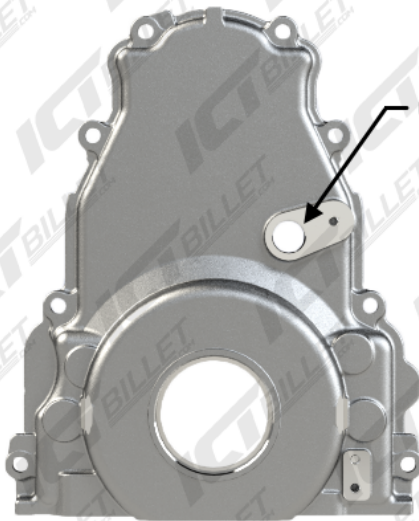


24 tooth reluctor wheel (crankshaft)
2 knock sensors in valley cover (see pic)
Camshaft Sensor (rear of block, behind valley cover)
10 bolt valley cover (see pic)
Crankshaft Sensor is BLACK in color (above starter)



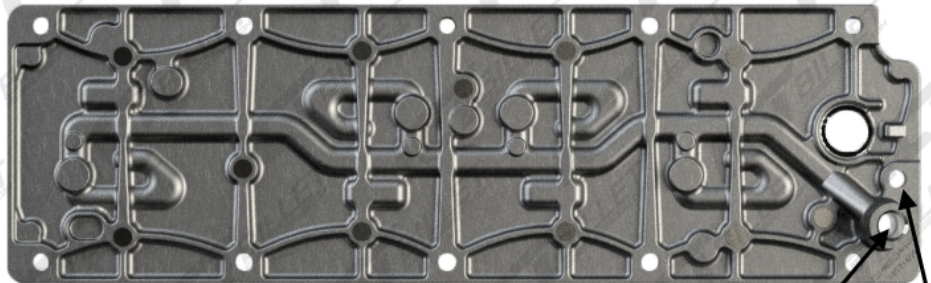
2 knock sensor holes
(has wires going down into the valley cover)

Gen 4



Camshaft Sensor

58 tooth reluctor wheel (crankshaft)
2 knock sensor along lower block (1ea side)
camshaft sensor in timing cover (see pic)
11 bolt valley cover (see pic)
Camshaft Sensor is GRAY in color (above starter)



Oil Pressure Sensor Port

Has 11th bolt

RPO Code Differences/Specs

What is an RPO code? This code is pretty much the DNA of your vehicle. These codes are what General Motors used as instructions to put together your vehicle back in the factory. The plant would see these codes and know which parts to include on the vehicle or which parts to leave off. On the following pages, you'll find a guide showing the RPO code (Engine Code) of GM LS based engines along with some differences between them.

What does this mean for your swap project?

The RPO code is important to you because these codes will help you decipher what exact engine you have, how much power there is, and what parts you need to make it work in your swap.

Not every LS based engine is a "Corvette motor". As cool as that would be, the same parts that work on said Corvette motor wouldn't work on other engines.

So to save everyone involved a headache and delaying your build, it's best to know what you have so that you can develop a game plan for the type of build you want to do.

Please review the RPO guide on the next page to check out the differences in the graph.

Gen III/IV/V	Years Offered	Engine Code (vin code)	Crank Pulley Offset for ICT Bracket	Vehicle	Australia or Other Vehicle	Displacement	Intake Port Shape	Iron-Aluminum / Block-Heads	Bore (in)	Stroke (in)	MAP Sensor	MAF Sensor	Throttle Body	Ignition Coil
III	2005-07	L33 (B)	-3	05-07 Truck		5.3	Cathedral	Aluminum	3.78	3.62	55573248	19351888	3-Bolt DBW	D514A or D510C
III	2002-07	L59 (Z)	-3	02-07 Truck		5.3	Cathedral	Iron/Alum. heads	3.78	3.62	12614973	19351885	3-Bolt DBC or DBW	D581 OR D585
III	2003-04	LM4 (P)	-3	SSR truck 03-04		5.3	Cathedral	Aluminum	3.78	3.62	12614973	19330121 or 19330122	3-bolt DBW	D581 OR D585
III	1999-07	LM7 (T)	-3	Truck		5.3	Cathedral	Iron/Alum. heads	3.78	3.62	12614973	19330121	3-bolt DBC	D581 OR D585
III	1999-08	LQ4 (U)	-3	99-07 Truck		6	Cathedral	Iron/Alum. heads	4	3.62	12614973	19330121	3-bolt DBC or DBW	D581 OR D585
III	2002-07	LQ9 (N)	-3	02-07 Truck		6	Cathedral	Iron/Alum. heads	4	3.62	12614973	19330121	3-bolt DBW	D581 OR D585
III	1999-07	LR4 (V)	-3	99-07 Truck		4.8	Cathedral	Iron/Alum. heads	3.78	3.3	12614973	19330121	3-bolt DBC or DBW	D581 OR D585
III	1997-04	LS1 (G)	-1, -2	97-04 Vette/98-02 Camaro & GTO 2004 only		5.7	Cathedral	Aluminum	3.9	3.62	12569240	19332972	3-Bolt DBC or DBW	D580
III	2001-05	LS6 (S)	-1	01-04 Z06 Corvette		5.7	Cathedral	Aluminum	3.9	3.62	12614970	19330121 or 19330122	3-Bolt DBC or DBW	D580
IV	2010-17	L20 (A)	-3	10-13 Truck, 10-17 Van		4.8	Cathedral	Iron/Alum. heads	3.78	3.3	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2007-09	L76 (Y)	1, 3	07-09 GB GT / 07-09 Truck		6	Rectangle	Aluminum	4	3.62	55573248	92281162 or 23256991	4-bolt DBW	D514A or D510C
IV	2011-17	L77 (Z)	-1	11-17 Caprice	Commodore VF 13-15 & VE 11-12	6	Rectangle	Aluminum	4	3.62	55573248	92281162	4-bolt DBW	D514A
IV	2007-08	L92 (B)	-3	07-08 Truck		6.2	Rectangle	Aluminum	4.06	3.62	12614973	19330125	4-Bolt DBW	D514A or D510C
IV	2010-14	L94 (F)	-3	10-14 Truck		6.2	Rectangle	Aluminum	4.06	3.62	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2010-17	L96 (G)	-3	Truck 10-17		6	Rectangle	Iron/Alum. heads	4	3.62	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2006-10	L98 (H)	-1	-----	Holden - SS thunder 06, 06-08 WM	6	Rectangle	Aluminum	4	3.62	55573248	92281162 or 23256991	4-bolt DBW	D514A or D510C
IV	2010-15	L99 (J)	-3	Camaro SS 10-15 (auto trans only)		6.2	Rectangle	Aluminum	4.06	3.62	55573248	15865791	4-bolt DBW	D514A or D510C
IV	2009-13	L9H (Z)	-3	09-13 Truck		6.2	Rectangle	Aluminum	4.06	3.62	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2011-19	LC8	-3	11-19 Truck/ Van		6	Cathedral	Iron/Alum. heads	4	3.62	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2007-14	LC9 (3)	-3	07-14 Truck		5.3	Cathedral	Aluminum	3.78	3.62	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2008-09	LFA (5)	-3	08-09 Hybrid Truck		6	Rectangle	Aluminum	4	3.62	12644228	92281162	4-Bolt DBW	D514A or D510C
IV	2005-09	LH6 (M)	-3	05-09 truck		5.3	Cathedral	Aluminum	3.78	3.62	12614973	19330121	4-Bolt DBW	D514A or D510C
IV	2008-09	LH8 (L)	-3	08-09 Truck		5.3	Cathedral	Aluminum	3.78	3.62	12644228	15865791	4-Bolt DBW	D514A
IV	2008-12	LMG (O)	-3	07-14 Truck		5.3	Cathedral	Iron/Alum. heads	4	3.62	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2005-07,09	LS2 (U)	1, 2, 3	05-07 Corvette, 06-07 CTS-V / -2 GTO 05-06 / -3 Trailblazer 06-09 / 05-06 SSR		6	Cathedral	Aluminum	4	3.62	12644228	19330121	4-Bolt DBW	D514A or D510C
IV	2008-17	LS3 (W)	1, 3	08-13 Corvette, 14-17 Chevy SS, 09 G8 GXP / 10-15 Camaro (manual trans only)	07-09 Holden HSV / VF	6.2	Rectangle	Aluminum	4.06	3.62	55573248	15865791	4-Bolt DBW	D514A or D510C
IV	2005-09	LS4 (C)	neither	FWD cars (Impala SS, Monte Carlo, GXP Grand Prix)		5.3	Cathedral	Aluminum	3.78	3.62	55573248	19330124	4-Bolt DBW	D514A or D510C
IV	2006-15	LS7 (E)	-1	06-13 Z06 Vette / 14-15 Camaro Z28/		7	Raised Square	Aluminum	4.125	4	12644569	15865791	4-Bolt DBW	D514A or D510C
IV	2009-13	LS9 (R/T)	-1	09-13 vette ZR1	2017 HSV GTSR W1	6.2	Rectangle	Aluminum	4.065	3.62	12592525	15865791	4-Bolt DBW	D514A or D510C
IV	2009-15	LSA (P)	-1	11-14 CTS-V (15 coupe ONLY)		6.2	Rectangle	Aluminum	4.06	3.62	12614970	19330122	4-Bolt DBW	D514A or D510C
IV	2007-09	LY2 (C)	-3	07-09 Truck		4.8	Cathedral	Iron/Alum. heads	3.78	3.3	12614973	92281162	4-Bolt DBW	D514A or D510C
IV	2007-09	LY5 (J)	-3	07-09 Truck		5.3	Cathedral	Iron/Alum. heads	3.78	3.62	12614973	92281162	4-Bolt DBW	D514A or D510C
IV	2007-10	LY6 (K)	-3	07-10 Truck		6	Rectangle	Iron/Alum. heads	4	3.62	12614973	23256991	4-Bolt DBW	D514A or D510C
IV	2010-13	LZ1 (J)	-3	10-13 Hybrid Truck		6	Rectangle	Aluminum	4	3.62	12644228	92281162	4-Bolt DBW	D514A or D510C
IV/V	none	LSX376	-1	-1 for crate engine		6.2	Rectangle	Aftermarket	4.06	3.62	N/A	N/A	N/A	N/A
IV/V	none	LSX454	-1	-1 for crate engine		7.4	Raised Square	Aftermarket	4.185	4.125	N/A	N/A	N/A	N/A
IV/V	none	LSX454R	-1	-1 for crate engine		7.4	Raised Square	Aftermarket	4.185	4.125	N/A	N/A	N/A	N/A
V	2018-up	L82	-3	18-up Truck		5.3	Square	Aluminum	3.78	3.62	12644228	12671620	12617792	D514A
V	2014-up	L83 (C)	-3	14-up Truck		5.3	Square	Aluminum	3.78	3.62	12644228	23262343	12617792	D514A or D510C
V	2019-up	L84	-3	19-up Truck		5.3	Square	Aluminum	3.78	3.62	12644228	12671620	12617792	D514A or D510C
V	2014-up	L86 (J)	-3	14-up Truck		6.2	Square	Aluminum	4.06	3.62	12644228	23262343	4-Bolt DBW	D514A
V	2019-up	L87	-3	19-up Truck		6.2	Square	Aluminum	4.06	3.62	12644228	12671620	12678312	D510C
V	2016-18	L88	-3	16-up Hybrid Truck		5.3	Square	Aluminum	3.78	3.62	12644228	23262343	12617792	D514A or D510C
V	2020-up	L8T	-3	Truck Heavy duty		6.6	Square	Iron/Alum. heads	4.06	3.86				
V	2014-up	LT1	-1, -2	14-19 Vette / 16-up Camaro SS		6.2	Square	Aluminum	4.06	3.62	12644228	23262344	4-Bolt DBW	D514A or D510C
V	2020-up	LT2		20-up corvette		6.2	Square	Aluminum	4.06	3.62				
V	2015-up	LT4	1, 2	14-19 Z06 Vette / 16-up CTS-V, 17-up ZL1 Camaro		6.2	Square	Aluminum	4.06	3.62	12644228	23262344	4-Bolt DBW	D514A or D510C
V	2019-up	LT5	-1	19 ZR1 corvette		6.2	Square	Aluminum	4.06	3.62	12644228	12676479	12669871	D510C
V	2015-up	LV3	heads on engine are in different	14-up Truck		V6 4.3	Square	Aluminum	3.92	3.62	12644228	23262343	12676296	D514A or D510C

LS Crankshaft Guide

Be careful when purchasing a flexplate and bolts for your swap. There is a special year ('99-'00) 6.0L LS that had a "long" crankshaft. That means the crankshaft projects .55" inches from rear cover lip, compared to the .13" inches from the standard length crankshaft. This may not seem like a lot of difference in measurement, but it is the difference between your swap mating up or not.

With the standard length crankshaft, you need a dished flexplate & NO spacer. With the long crankshaft, you need a flat flexplate & NO spacer. The spacers are for non-LS transmissions.

What does this mean for your swap project?

Mating whatever transmission you are using to your LS engine can be a very simple process or a very difficult one. Making sure you have all of the parts you need for your exact application will save you a ton of hassle.

A common swap is a 6.0L LS based engine because of their power and reliability. However, the 1999-2000 6.0L LS engines came with a long crankshaft. This long crankshaft will only work with a flat flexplate, rather than the dished plate you find on standard length crankshafts. Make sure to do your research on the engine you have. Your best bet is to get the RPO code for your engine or the VIN (Vehicle Identification Number) off your donor vehicle, and any GM dealership will be able to provide you with a build sheet containing all of the information you need on it. See the image on the following page that details the differences and the ICT Billet parts needed.

LS Crankshaft - Flexplate Guide **ICT BILLET** .COM

Standard Length Crankshaft

(with **dished** flexplate & **NO** spacer)
(**except** '99-'00 6.0L)

Standard Length Crankshaft

(except '99-'00 6.0L)

Crankshaft flange projects .13" inches from rear cover lip

ICT Billet Flexplate w/ Bolts (551346) or (551356X)

ICT Billet (551926) Flexplate Bolt Kit

ICT Billet (551165) Torque Converter Snout Adapter
Only for non-LS Transmissions

Optional GM Crankshaft Spacer 12563532 with Extended Length ICT Billet (551393) Flexplate Bolts

Long Crankshaft

('99-'00 6.0L **ONLY**)

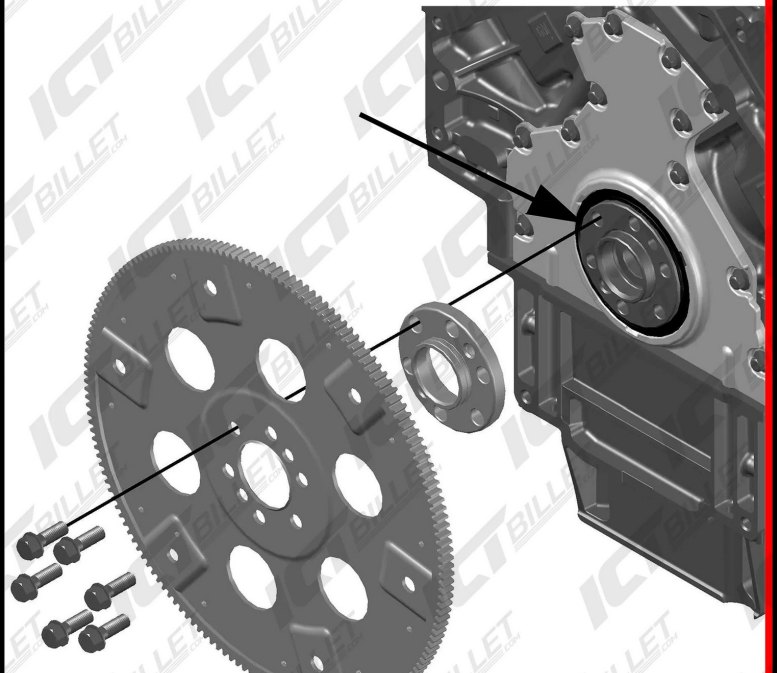
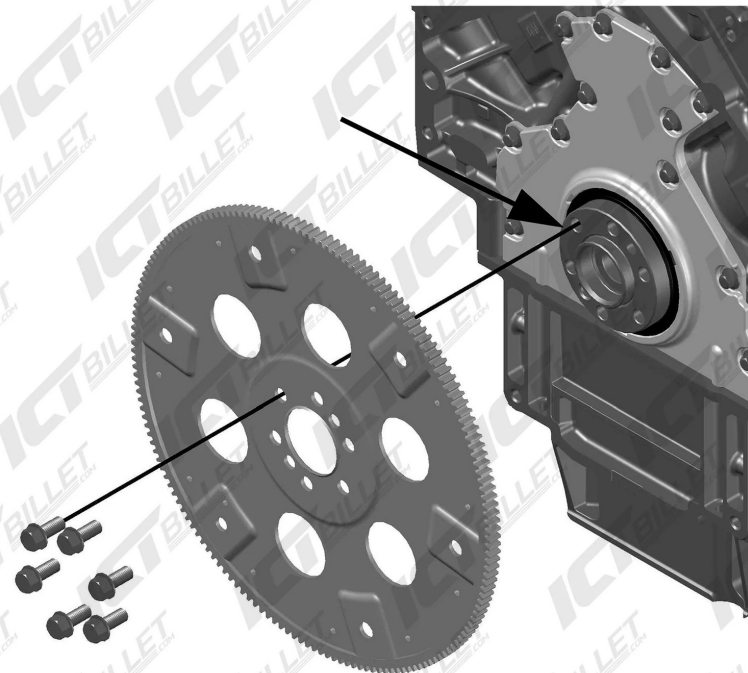
Crankshaft flange projects .55" inches from rear cover lip

Long Crankshaft

(with **flat** flexplate & **NO** spacer)
(**'99-'00 6.0L ONLY**)

Standard Length Crankshaft

(with **flat** flexplate & spacer)
(**'01-Up 6.0L**)



LS Intake Port

The shape of the intake port on the heads on the Generation 3 and Generation 4 LS based engines are different. Generation 3 heads have a cathedral port. Generation 4 heads have a rectangle port.

The difference between these heads is simple: the amount of cfm the heads can flow determines how efficient they are and how much power they can handle. The port of the head must also match the shape of the intake for proper air flow.

LS7 & LSX heads have a different bolt pattern which make their heads and intakes not very interchangeable with the rest of the LS family. The bolt holes are raised on the LS7 & LSX blocks, compared to the lower bolt holes on the Gen 3 & 4 heads.

What does this mean for your swap project?

At ICT Billet, we get a lot of phone calls asking if an LS7 intake will bolt onto an LS3 head because they received a killer deal on an LS7 FAST intake. Unfortunately, it will not fit due to the bolt holes not being in the same location, nor the port angle and shape.

Be sure to take a look at the port of your heads as well. In our LS intake manifold guide on the next page, we have included all of the possible LS engine RPO (engine code) codes possible. For example: the LS1 has a cathedral port head compared to the LS3, which has a rectangle port head. At ICT Billet, we make adapters that will allow fitment of various LS cylinder heads to a variety of intake manifolds.

LS Engine Intake Port Guide

ANGLED TOP

CATHEDRAL PORT

LS1, LS2, LS6, LR4, LM7, L59, LM4,
L33, LQ4, LQ9, LY2, L20, LH6, LY5,
LMG, LC9, LS4, LH8



RECTANGLE PORT

LS3, L99, LSA, L94, L76, L77, L96,
L98, L92, L9H, LY6, LFA, LZ1, LS9,
LSX



BOLT HOLES TOWARDS
BOTTOM OF PORT

RAISED PORT

LS7, LSX



BOLT HOLES IN
CENTER OF PORT

LS Ignition Coils

Ignition coils are pretty straight forward. They provide the spark to your spark plugs by a signal from your Engine Control Module (ECM). On General Motors engines, the ignition coils are located on the valve covers. At ICT Billet, we make a coil relocation set that will allow you to move those coils to a remote location and clean up the top end of your engine.

What does this mean for your swap project?

Being able to relocate your ignition coils will open up the top side of the engine for things like our ICT Billet Valve Covers! We also sell products like harness extensions and cut-to-fit spark plug wires. We make the relocation process as painless and universal as possible.

The first thing you need to know is which ignition coils you have or will need for your swap. Refer to the image on the next page to identify your coils.

LS/LT Ignition Coil Guide

D510C

LS3, Gen V LT engines
12570616



D581

Square
12563293



D514A

Round (LS and Gen V LT)
12573190



D585

"Heat Sink"
19005218



Side Mounted

D580

LS1
12558948



Smaller bolt pattern

Holley Smart

556-112
Only fits our "Holley"
designated coil brackets



Has black sides



Has yellow sides



Side Mounted



LS Fuel Injectors

Do you know which fuel injector you want to use with your swap? How about what type of fueling you need? Are you looking for something simple or a high flow application?

No matter what need you have for fueling, we have spacers and harness adapters at ICT Billet that allow you to use pretty much any combination you can think of. Keep in mind not every injector is the correct height or size to fit in any intake and fuel rail.

What does this mean for your swap project?

Your option for a factory style LS based fuel injector can now interchange into your intake and fuel rail combination. For example: you can now use LS3 injectors on your LS1, LS2, and LS truck intakes! This comes in handy when you have an application that needs a little more fueling, but you don't want to spend \$1K on injectors.

We also sell the harness adapters that allow the injectors to have a simple plug and play functionality with no need to worry about splicing and soldering wires.

At ICT Billet, we are seeing a growing number of LS2 intakes swapped onto a truck motor extremely well when using our adapters. We can now use an LS truck injector on either an LS1 or LS2 intake. It's all a very easy and clean installation as well. All of the hard work has been done, you just have to install o-rings, set in rails, bolt together and tune!

See the following image to get a better understanding of what injectors can fit where.

LS Throttle Body

Different generations of LS based engines came with different styles of throttle body. They got better in time, more efficient and easier to tune. Some have an IAC (idle air control) valve in the throttle body itself that controls idle airflow. The newer blades do not. Rather, they control idle airflow by just tipping the blade to a commanded point.

What does this mean for your swap project?

You have multiple options when it comes to choosing the throttle body for your application. The earlier models are a three bolt type, meaning they bolt to the intake only using three bolts. The newer generation throttle bodies are 4 bolt.

Different vehicles also have different sized throttle bodies, and many aftermarket companies sell even bigger throttle bodies like the 102 mm. We make all kinds of adapters to allow virtually any throttle body to work with your application at ICT Billet. We offer spacers, harness extensions, and adapters that let you run a three bolt to a 4 bolt intake, or a 4 bolt throttle body to a three bolt intake.

Supercharger

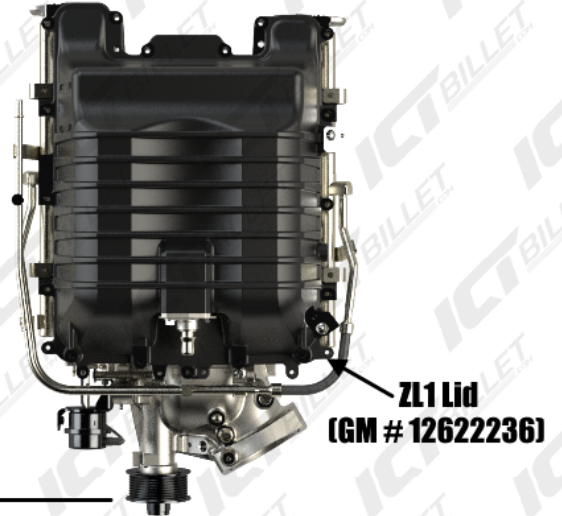
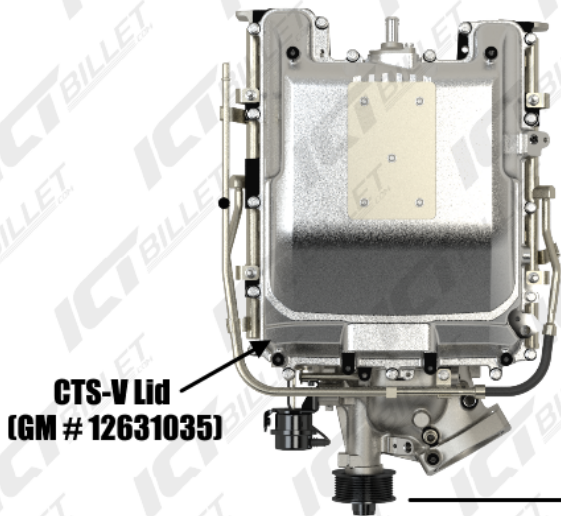
Planning to strap an awesome LSA blower on top of your LS engine? At ICT Billet, we make an LSA supercharger swap kit that will integrate the blower into a 6rib serpentine system. This kit is designed for truck spacing, which is the only way to make it work with how far the pulley sticks out. We also make other parts that will make your swap easier!

What does this mean for your swap project?

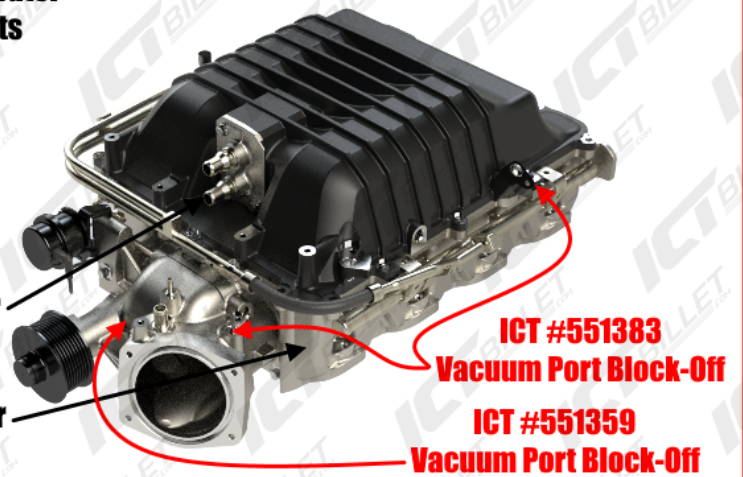
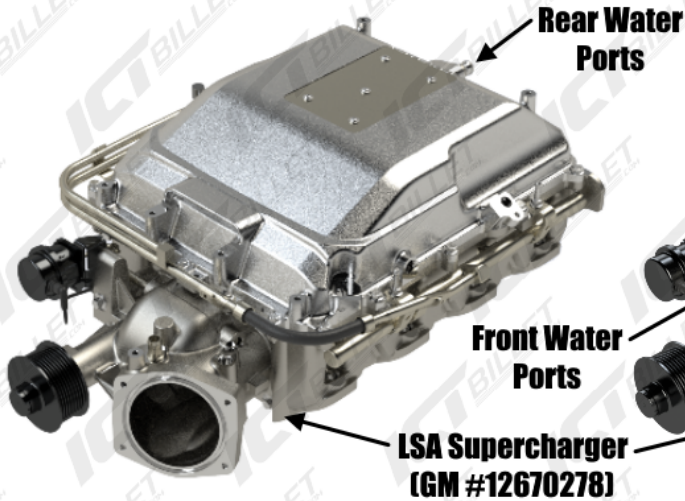
At ICT Billet, we've gone through the legwork of testing the LSA swap. Our goal is to make things as simple and universal as possible. The LSA blower on the ZL1 Camaro has front facing water ports, while the LSA blower off the CTS-V has rear facing water ports. Keep that in mind when you are planning your swap. Internally they are the same - same displacement, everything. A lot of our customers opt to have the snouts ported by machine shops and pick up some good horsepower with them as well!

LSA Supercharger Guide

LSA (1.9L) CTS-V & Camaro ZL1



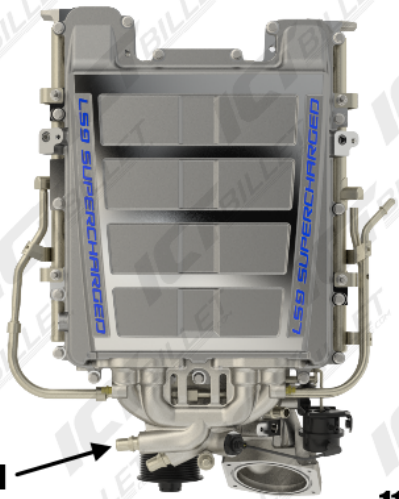
Same Pulley Offset



Both CTS-V and Camaro ZL1
Use the Same Crank Pulley
(GM #12674581)

LS9 Supercharger Guide

**LS9 (2.3L)
Corvette ZR1**



**Front Angled
Water Ports**



**11-Rib
Supercharger Pulley**

**LS9 Supercharger Kit
(Full Supercharger Assembly)
(GM #19244103)**

**6-Rib Alt,
And A/C Belt**



**11-Rib Supercharger,
Power Steering, and
Water Pump Belt**



**ONLY LS9 Uses
This Crank Pulley
(GM #12675716)**



LS Torque Specs

On the following page, you'll find the torque specs of LS based engines. These are the stock bolt torque specs. If you are running ARP bolts, then make sure to refer to the instructions that came with the bolts for their specific torque specs

The far right column located on the image shows a degree section. This means the bolts that are being used in that application are Torque To Yield (TTY). TTY bolts are one time use only because they stretch after they have been torqued. These bolts allow more clamping force when two metals are expanding and contracting. The bolt will move with it instead of fighting against it and potentially breaking.

What does this mean for your swap project?

This LS Engine Torque Specs guide is a one stop shop to answer common questions on the torque specs of these bolts. No more just sending her home with two ugga's. These engines are making a ton of horsepower on stock bottom ends, but its the small things that will allow them to keep being efficient and reliable for you. It's important to be smart with your build. Refer to the guide on the next page for the torque specs!

LS Engine Torque Specs

<u>Item</u>	<u>lb-in</u>	<u>ft-lb</u>	<u>degree</u>
Camshaft Retainer Plate	--	18	--
Camshaft Sprocket	--	26	--
Connecting Rod	--	--	75°
Crankshaft Balancer.	--	37	+ 140°
Crankshaft Bearing caps			
Inner bolts - First pass in sequence	--	15	+ 80°
Side bolts	--	18	--
Outside bolts - First pass in sequence	--	15	+ 53°
Crankshaft Sensor bolt	--	18	--
Cylinder Head Bolts - M11 bolts (first)	--	22	+ 90°+ 50°
Cylinder Head Bots - M8 bolts (last)	--	22	--
Exhaust Manifold	--	18	--
Flywheel / Flexplate	--	74	--
Fuel Rail bolts	89	--	--
Intake Manifold	89	--	--
Oil Pan M8 bolts	--	18	--
Oil Pan M6 bolts	106	--	--
Rear Main Cover	--	18	--
Rocker Arm.	--	22	--
Timing Cover.	--	18	--
Valley Cover	--	18	--
Valve Cover.	106	--	--
Water Pump	--	22	--
Thermostat Housing.	--	11	--

LS Oil Pan

The oil pan is most commonly an issue when swapping an LS engine into a vehicle that was not designed for one. The reason is that the clearance and the way the front suspension systems were designed are different.

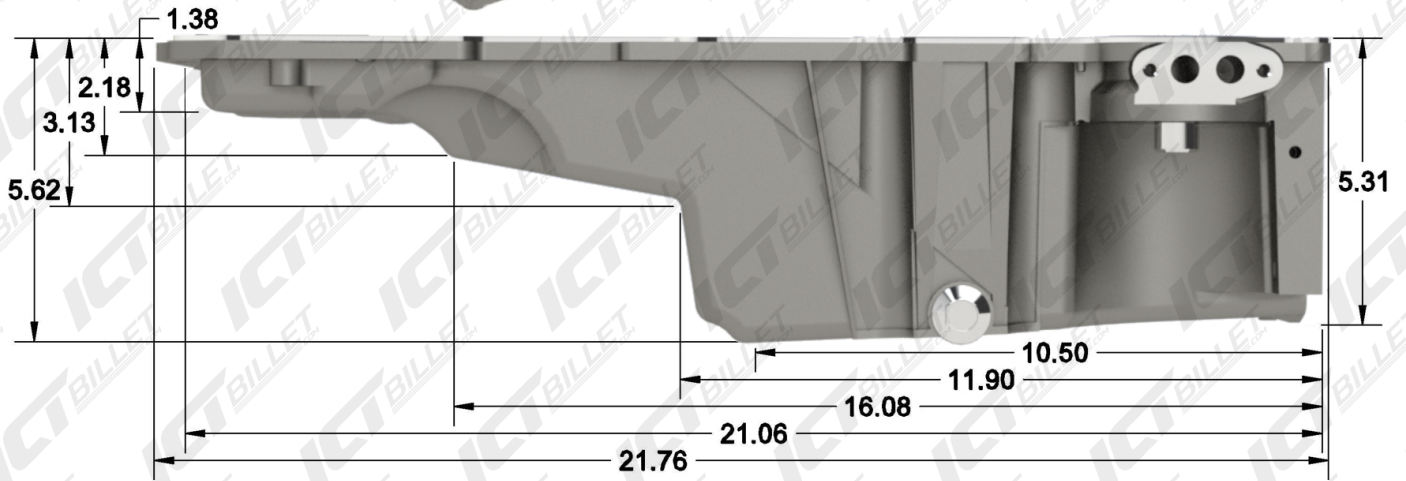
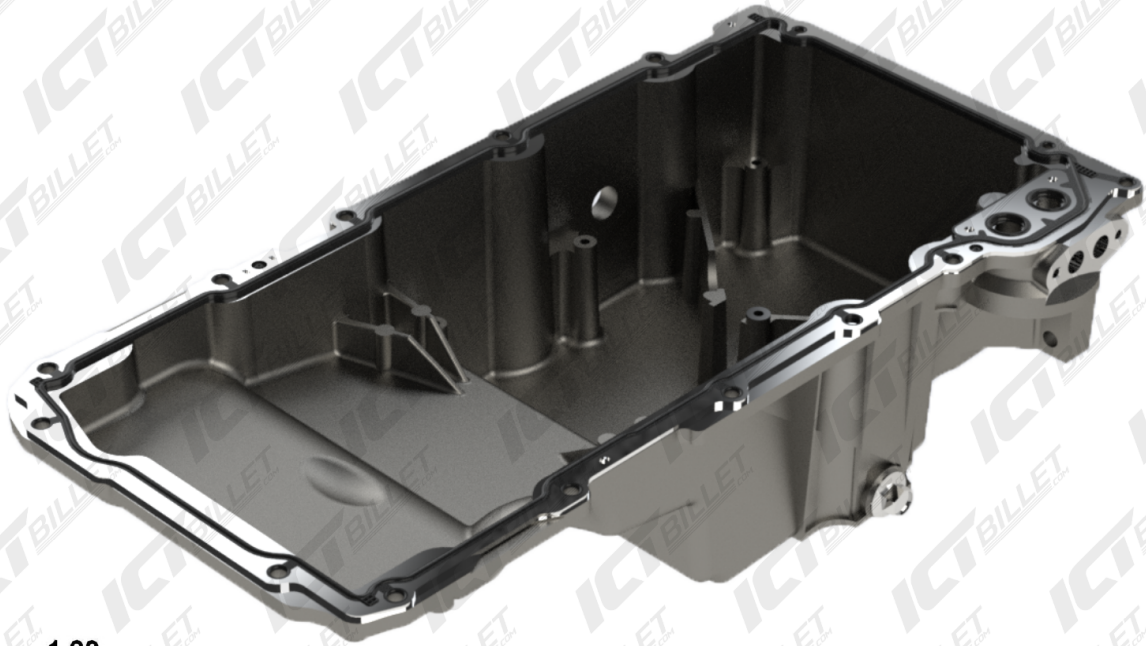
At ICT Billet, we have seen customers do many things in this situation. You can opt for a new modern front suspension system, or you can notch out what you need to to make it work.

The LS Oil Pan Guides on the following pages will show you some key differences as well as measurements on the LS based engine oil pans.

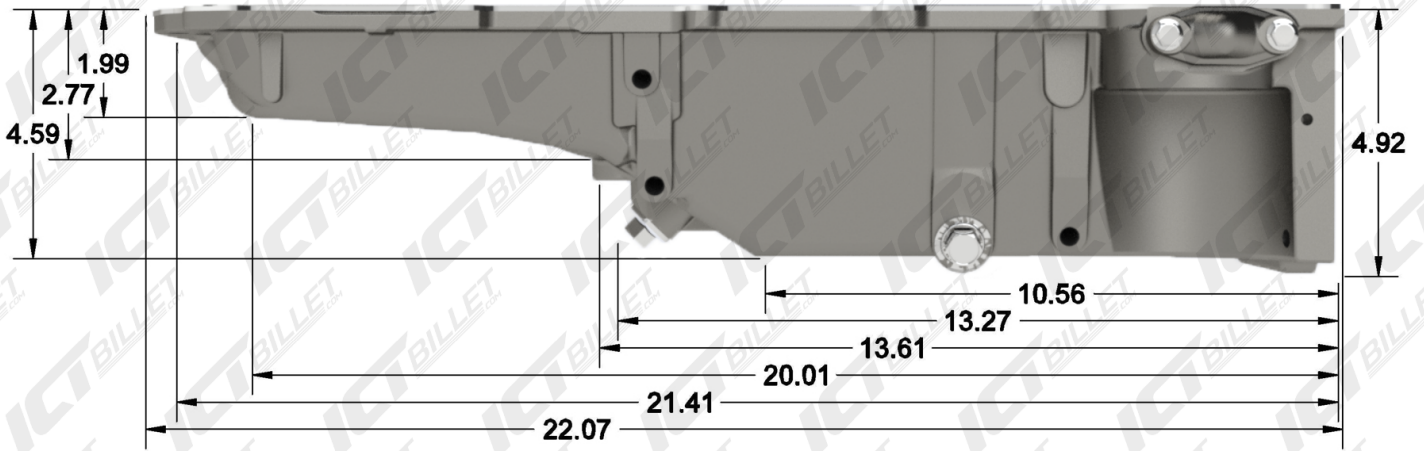
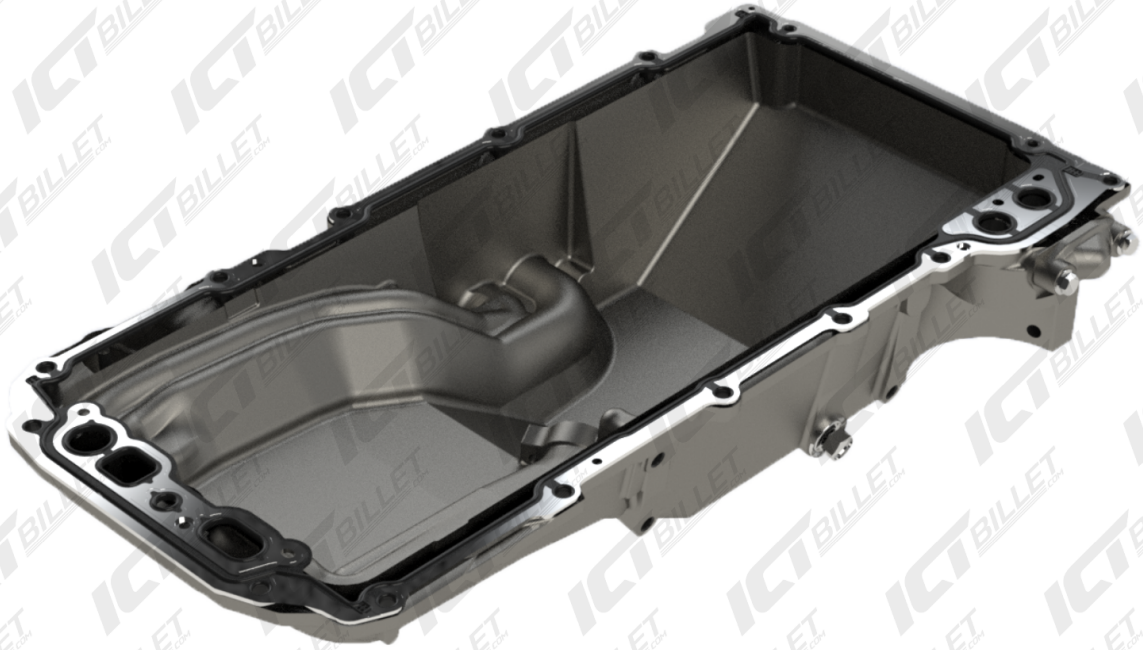
What does this mean for your swap project?

An LS engine will probably not drop right into your '72 C10 without some sort of front suspension work. The most common thing to do is to switch to a k-member and Mustang II front suspension system that will allow your swap to steer and ride like a modern vehicle. We make many accessories for oil pans at ICT Billet. Refer to the LS Oil Pan Guides on the following pages to find great information that will help you make a decision on which oil pan you would like to use in your swap.

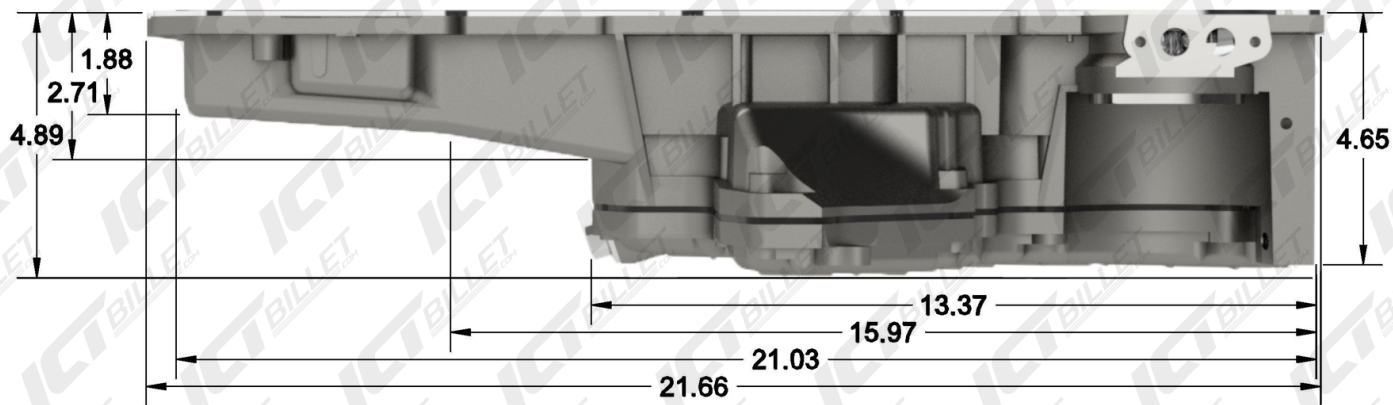
F-Body Camaro/Firebird LS1



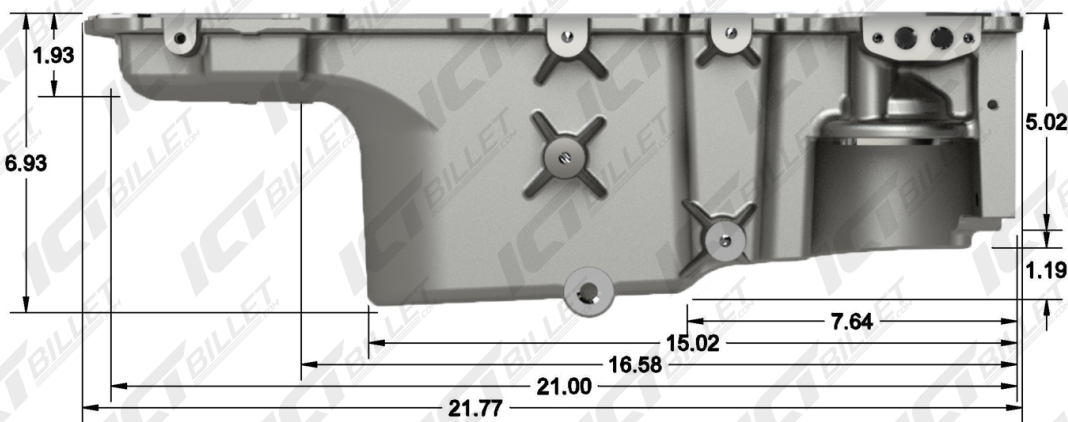
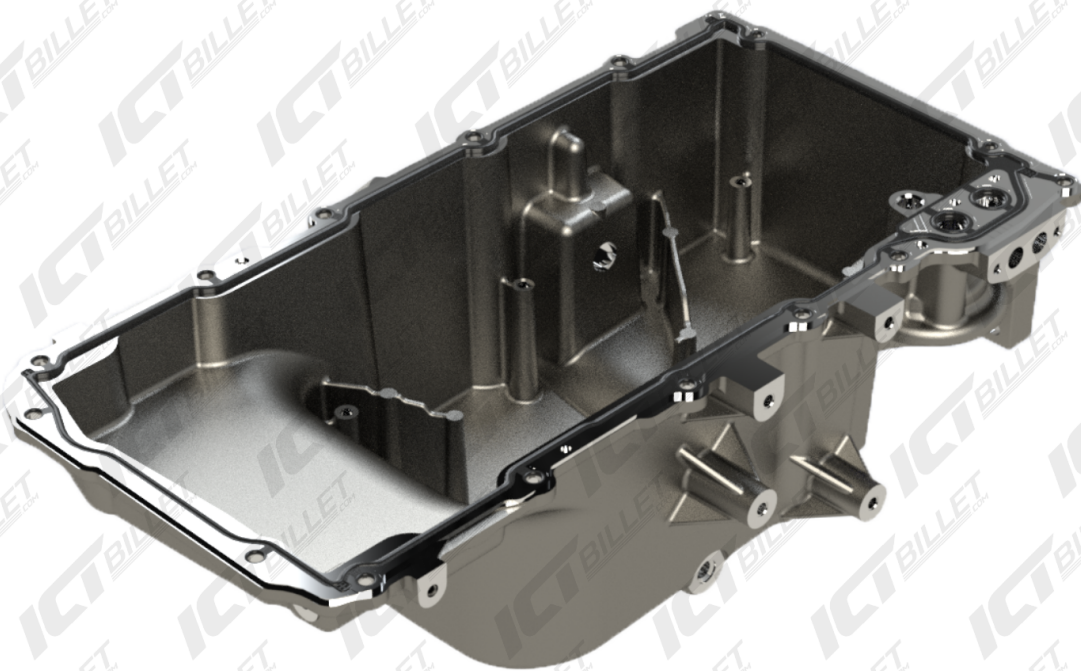
Corvette LS3, LS7, LS9



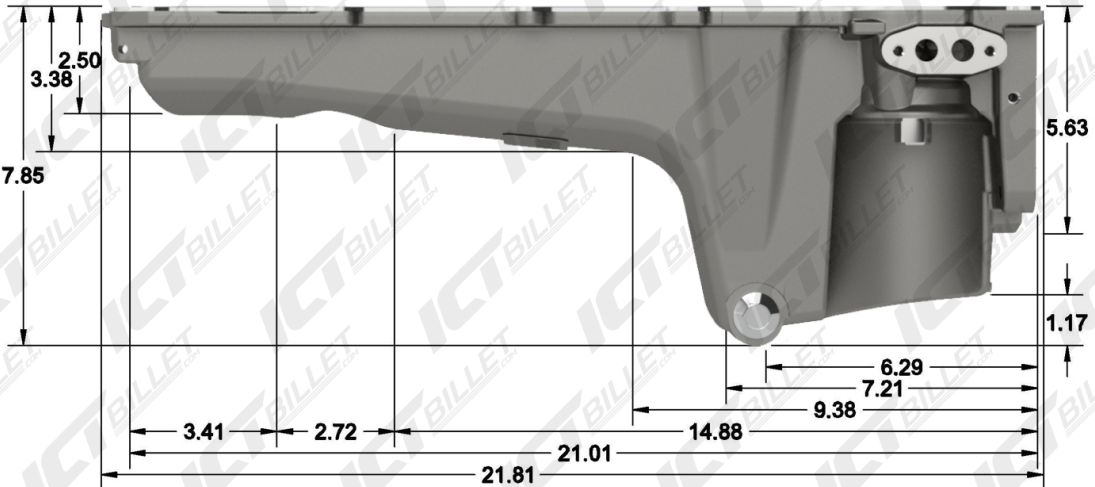
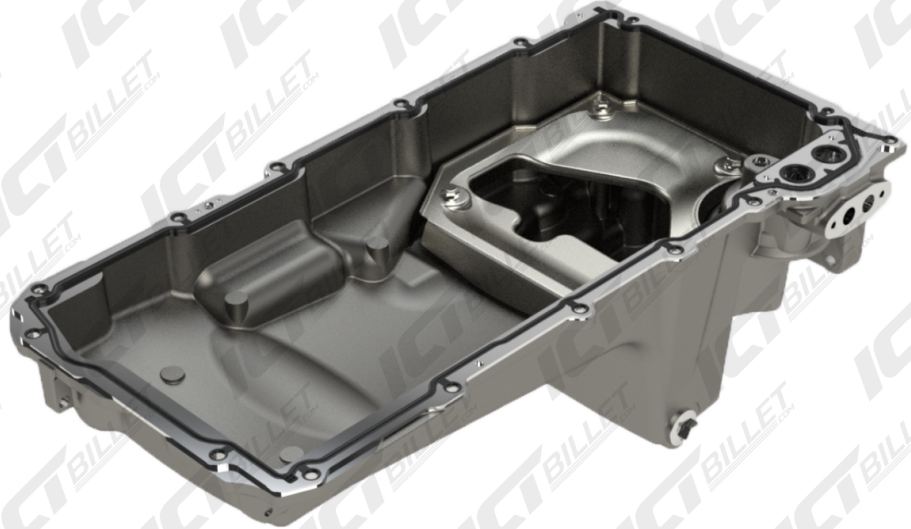
Corvette LS1



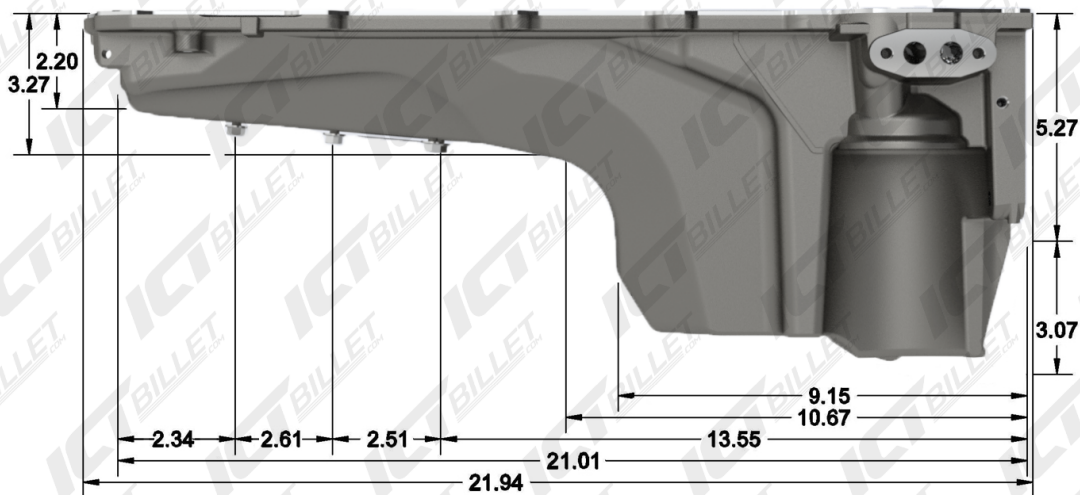
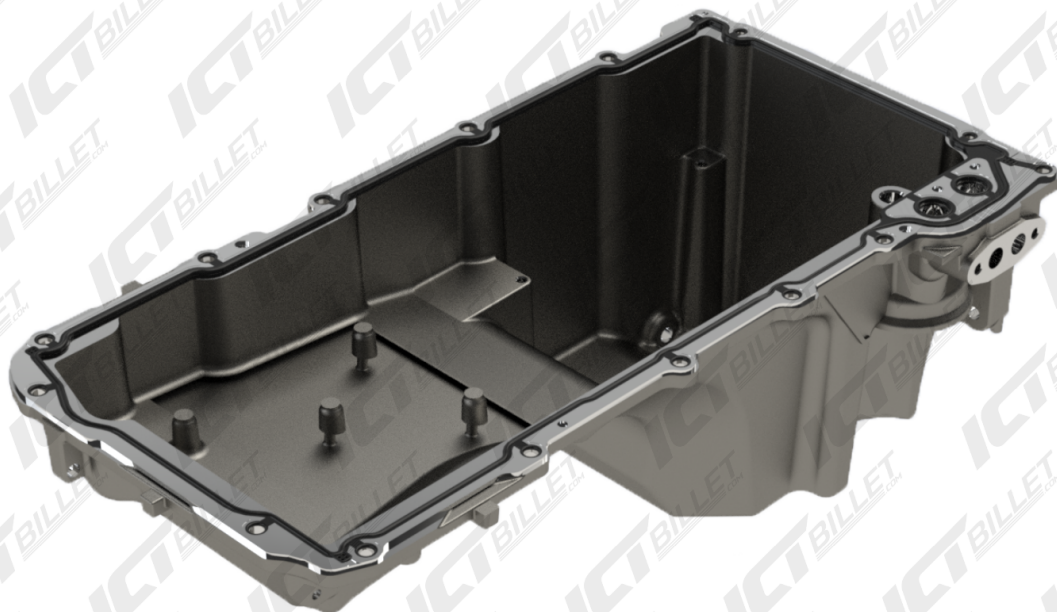
5TH Gen Camaro L99



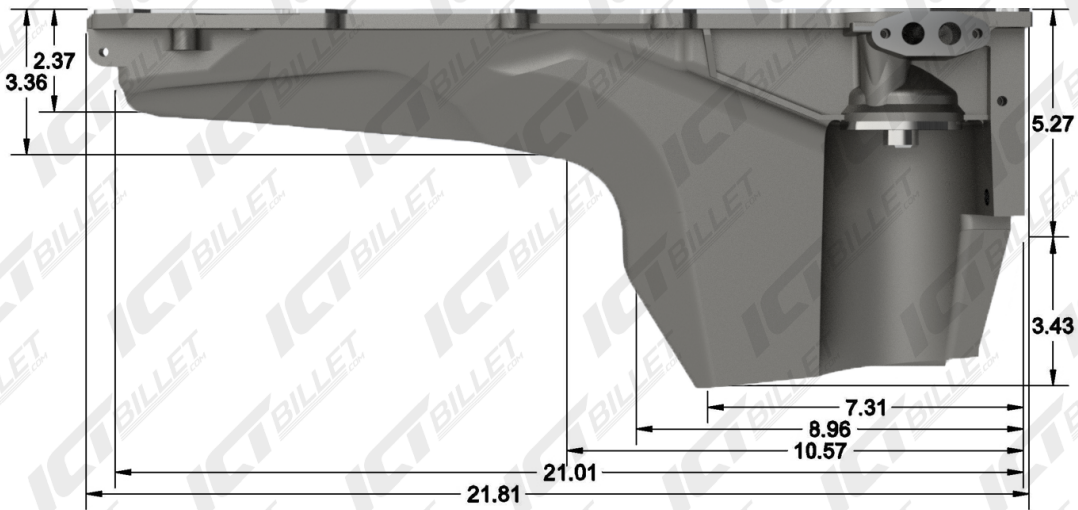
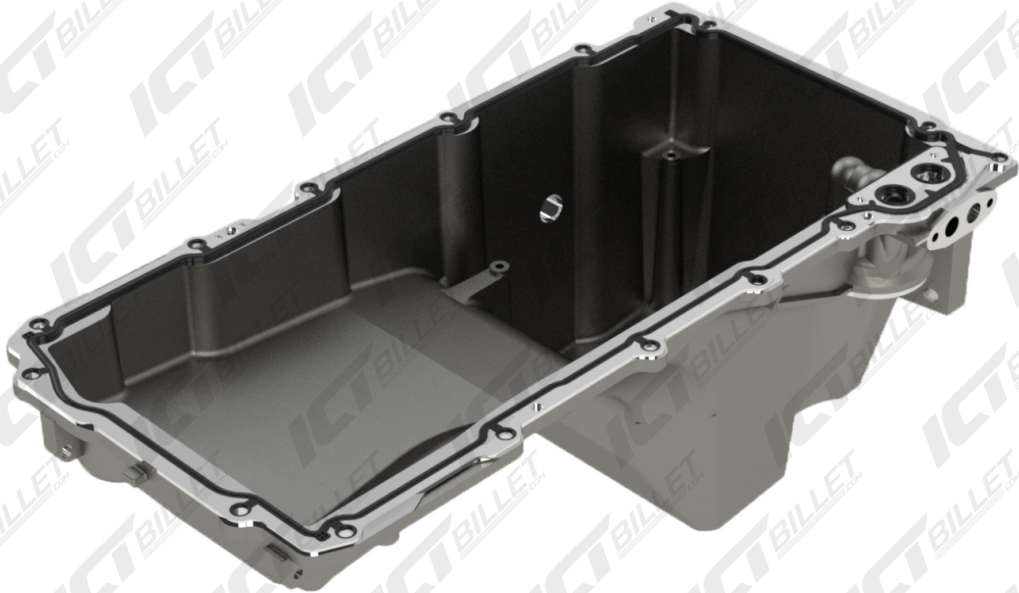
**08-10 Hummer H3, 09 Colorado/GMC LH8
ICT 551107 Muscle Car Oil Pan**



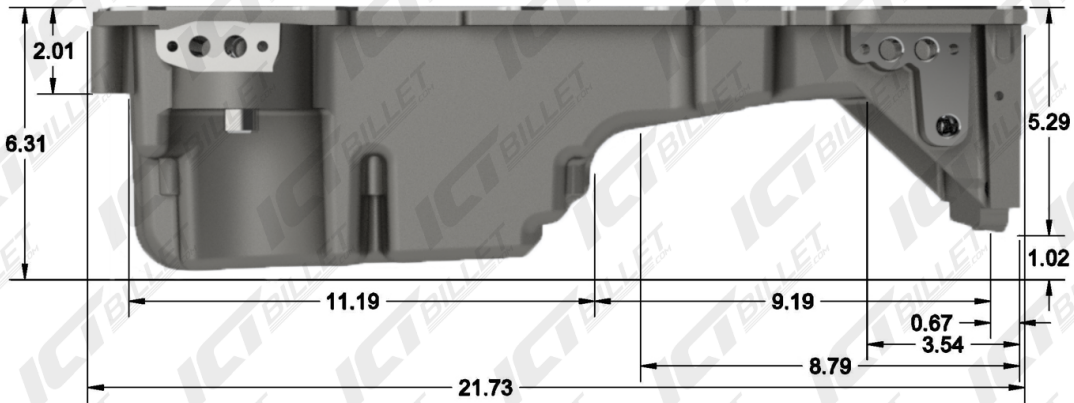
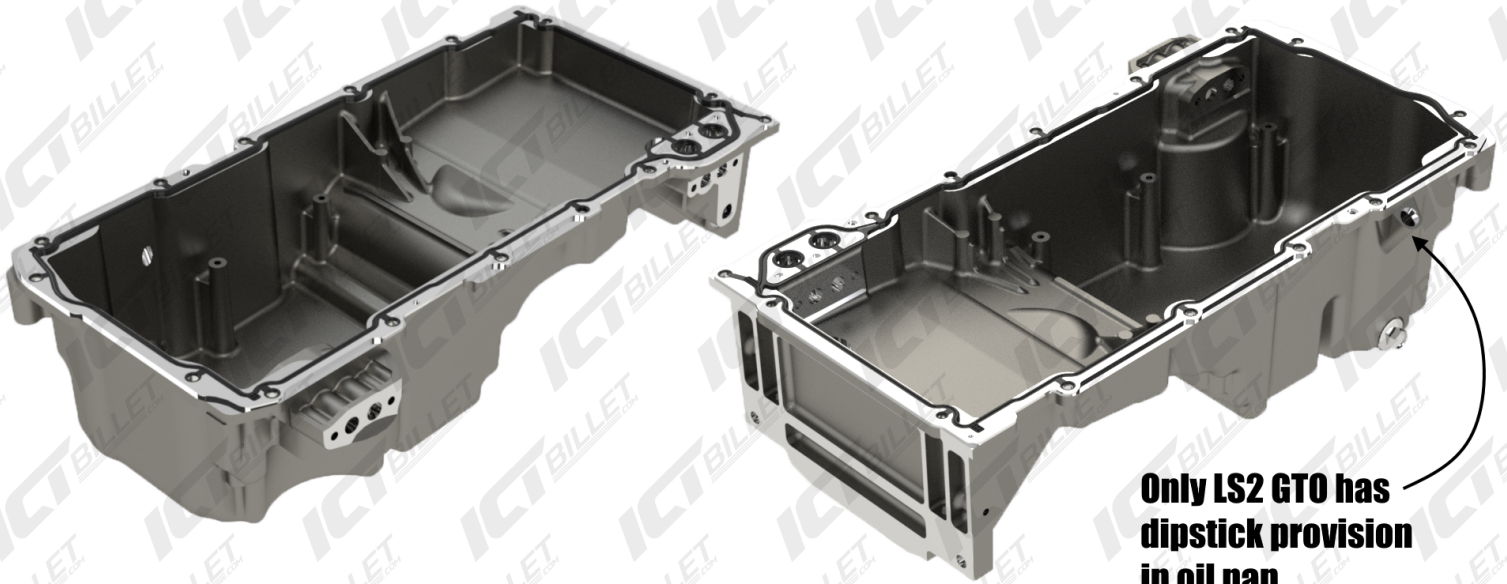
07-09 Truck, 08-09 Pontiac G8 GT L76



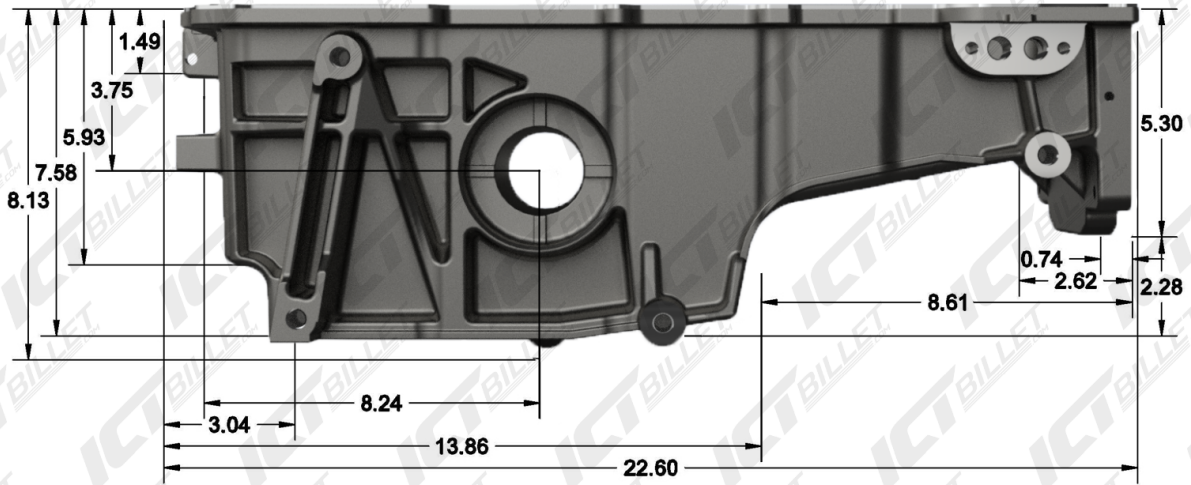
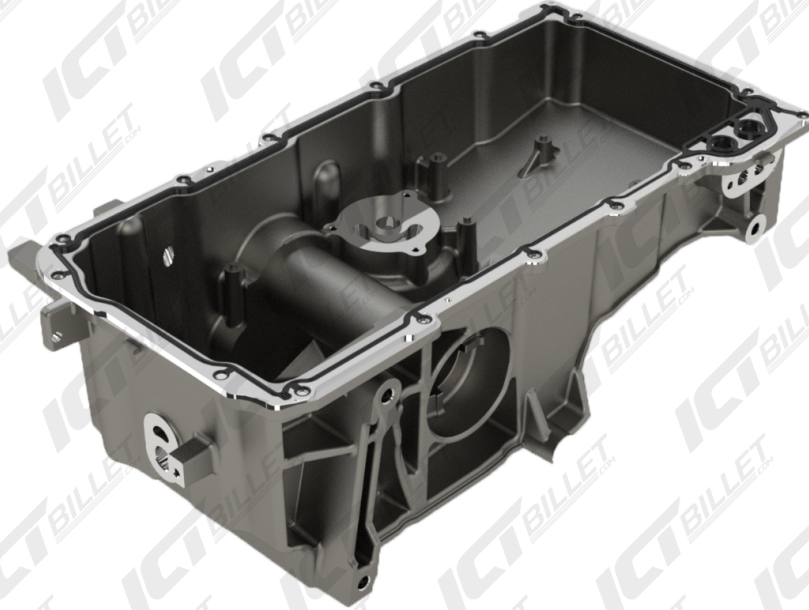
99-07 Truck/SUV LM7



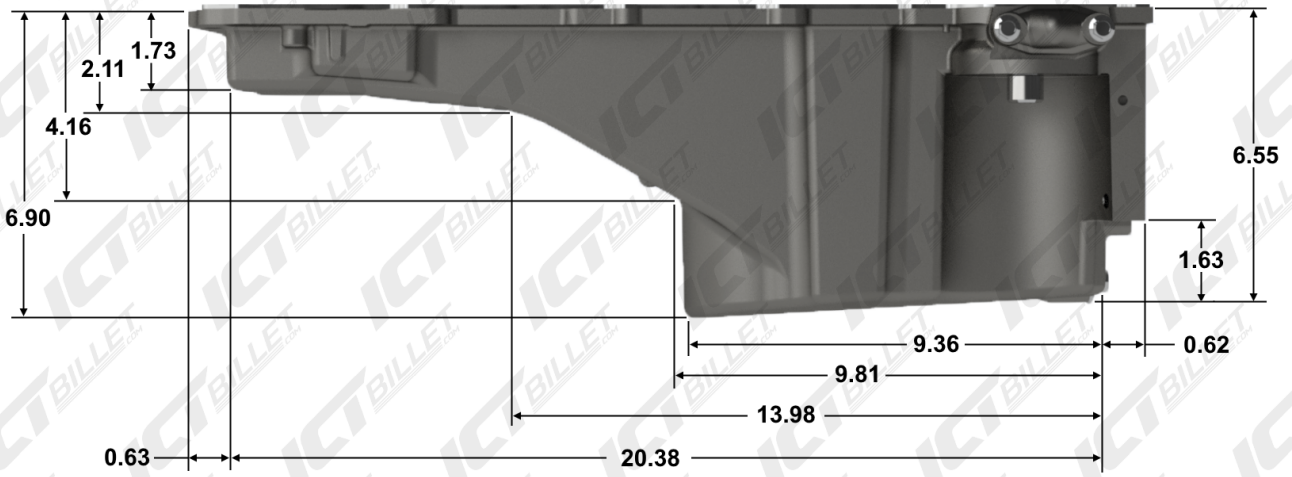
GTO LS2



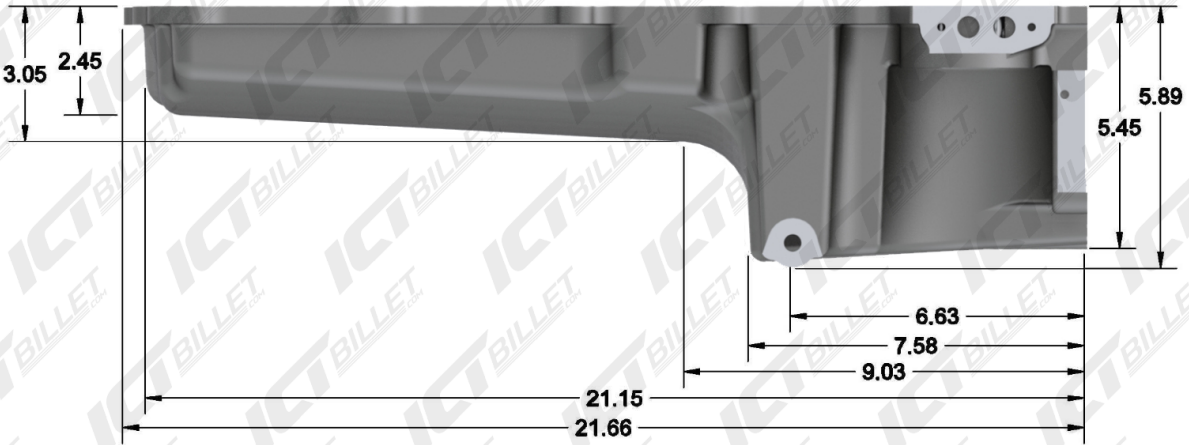
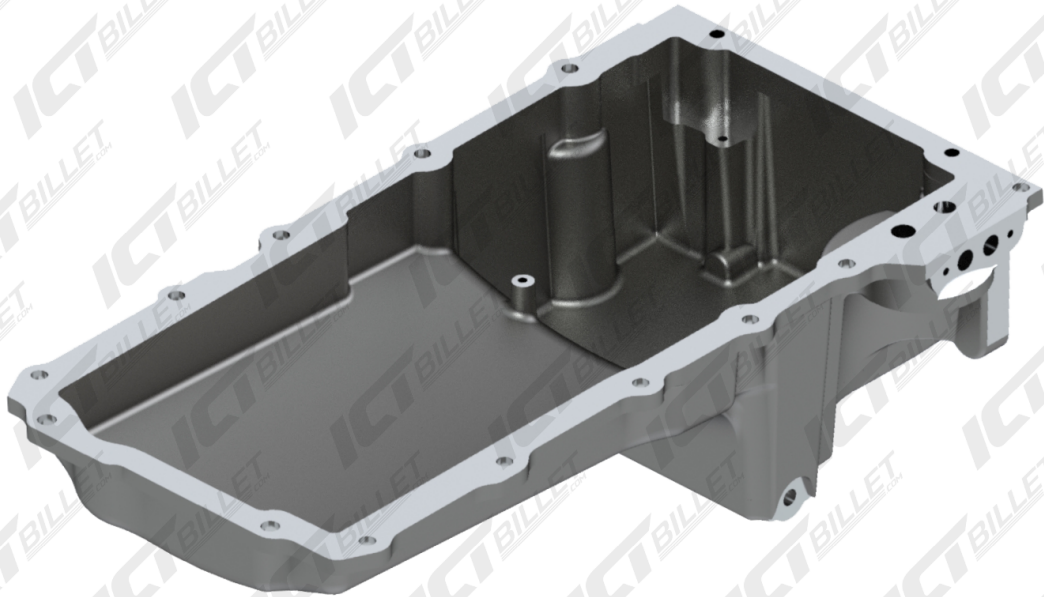
LS2 TRAILBLAZER



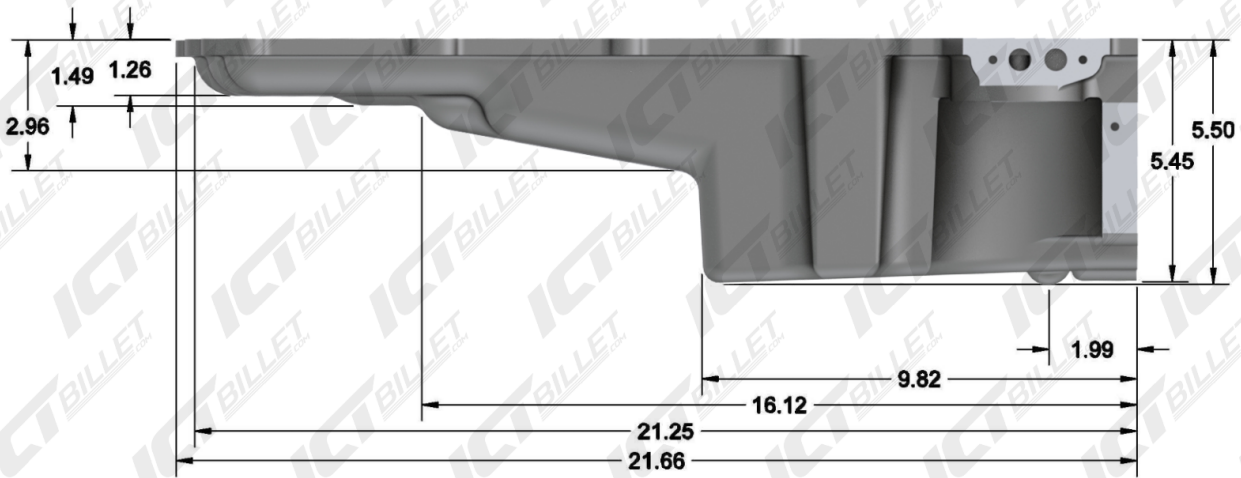
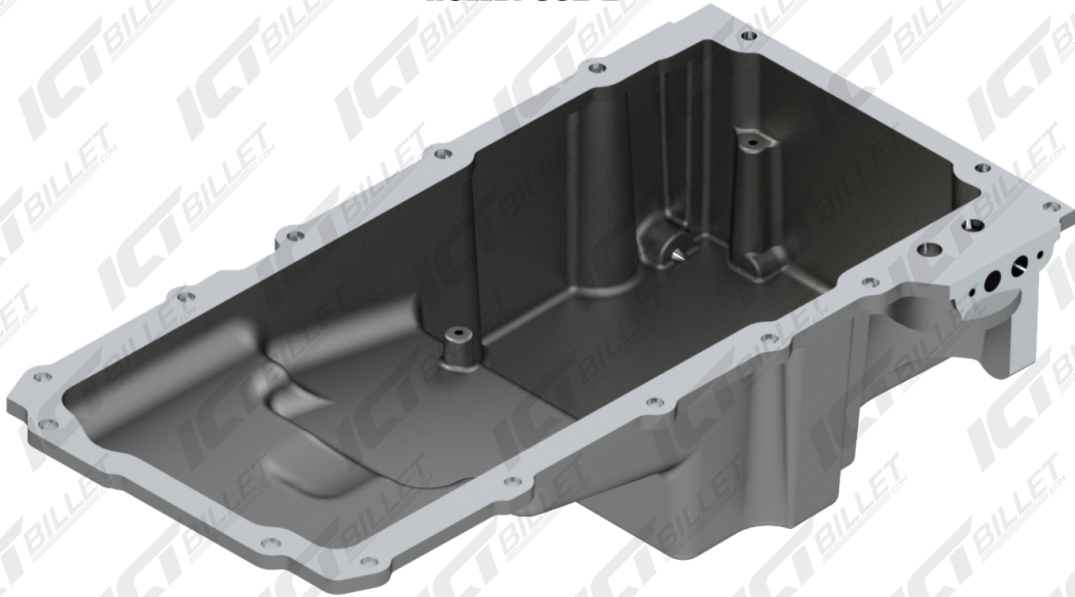
LS6 CTS-V



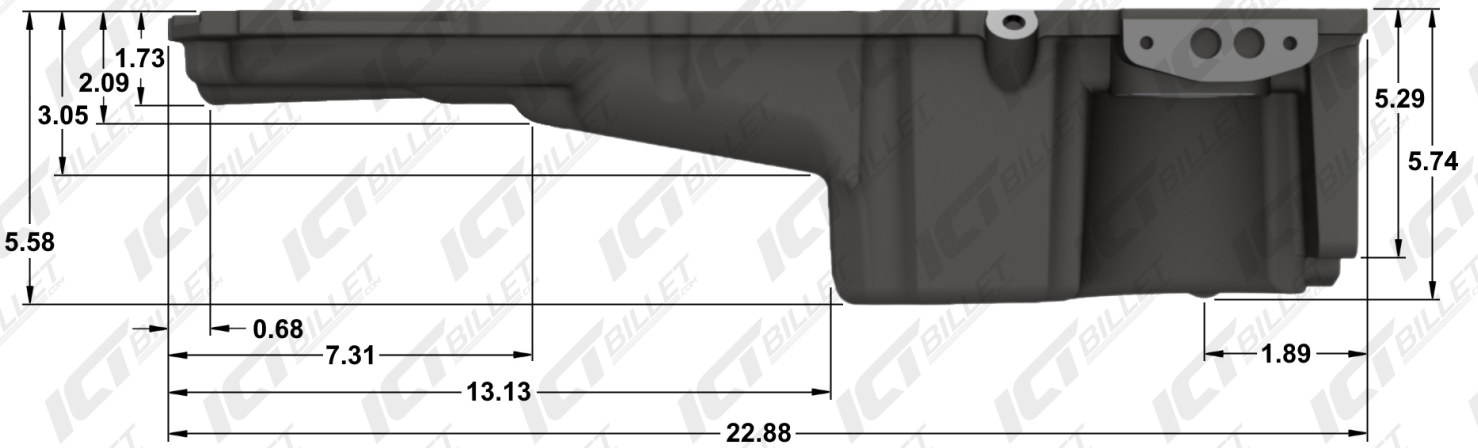
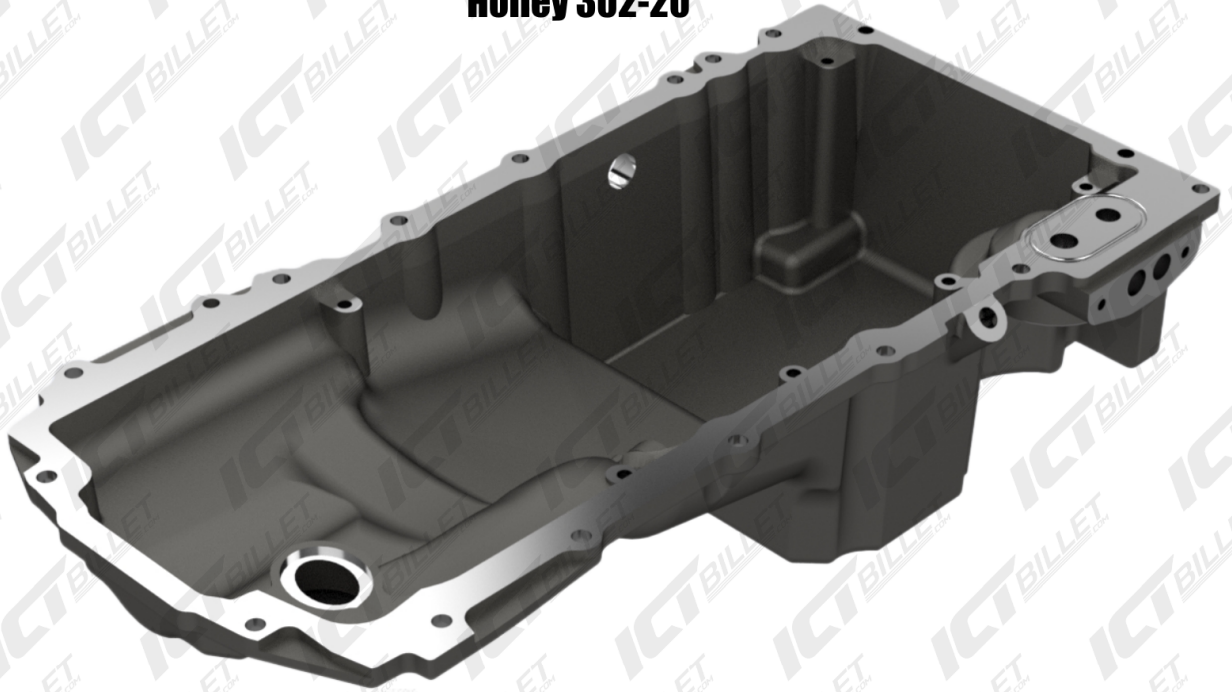
HOLLEY 302-1



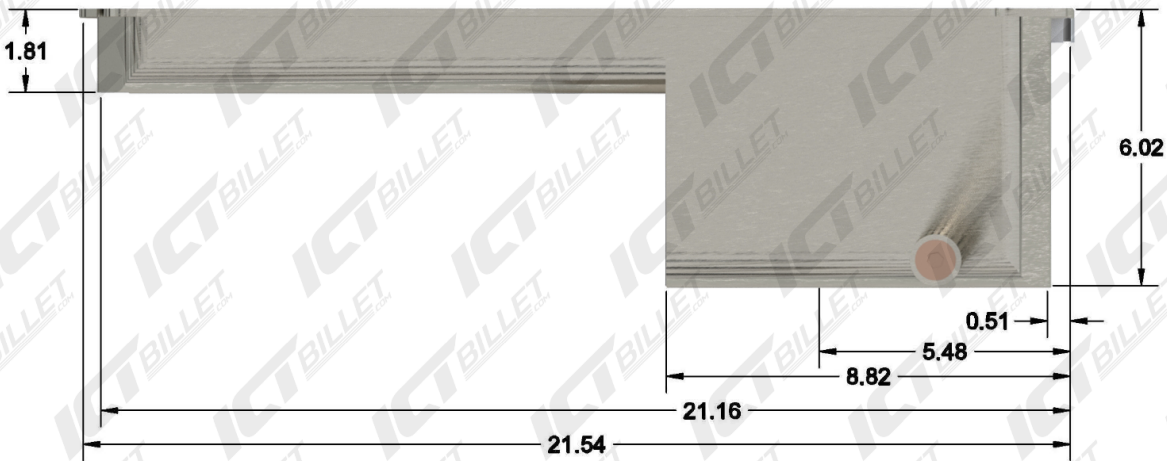
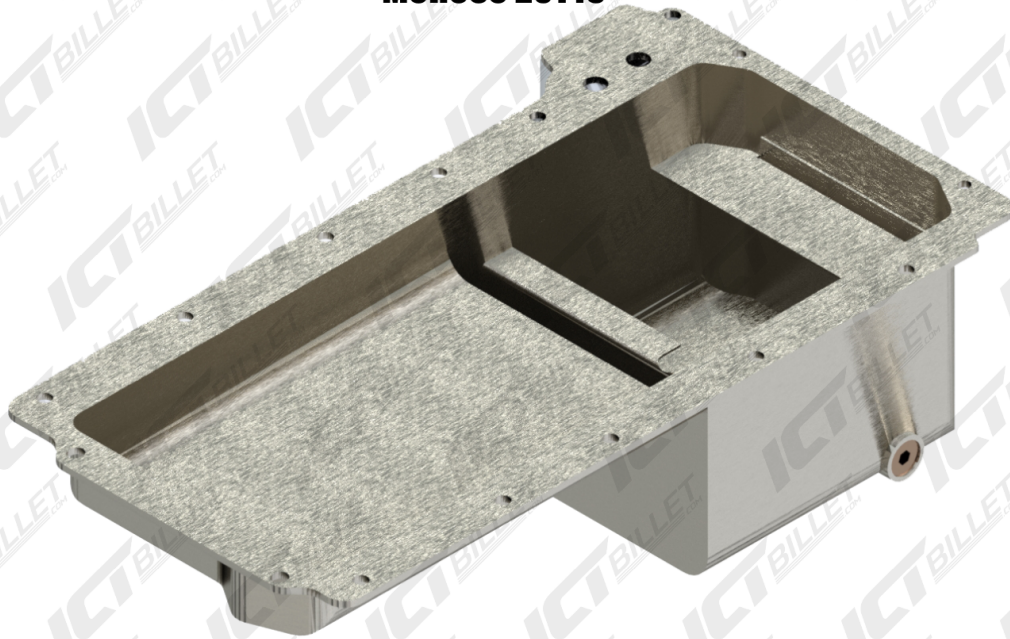
HOLLEY 302-2



Holley 302-20



MOROSO 20145



LS Wire Connectors

LS Wire Connectors

ICT **BILLET**
LLC



A/C Compressor - GM / Vortec / R4
Pigtail: WPACV30
Extension: WEACV30-24



Alternator - 4 pin
Pigtail: WPALT30
Extension: WEALT30-36



Alternator - 2 pin
Pigtail: WPALT40
Extension: WEALT40-36



Coil Harness
Male-Pigtail: WPCLM30



Coil Harness
Female-Pigtail: WPCLF30



Ignition Coil - D510C, D581, D514A, D585C
Pigtail: WPCIL30



Ignition Coil - D580 (LS1 Coil Only)
Pigtail: WPCIL31



Crankshaft Position Sensor Gen 3
Pigtail: WPCPK30
Extension: WECKP30-36



Crankshaft Position Sensor Gen 4
Pigtail: WPCPK40
Extension: WEACKP40-36



Camshaft Position Sensor Gen 3
Pigtail: WPCMP30
Extension: WECAM30-48



Camshaft Position Sensor Gen 4
Pigtail: WPCMP40
Extension: WECAM30-48



Coolant Temperature Sensor - 2 wire
Pigtail: WPCTS30
Extension: WECTS30-36



Coolant Temperature Sensor - 3 wire
Pigtail: WPCTS33
Extension: WETPS30-24



ECM Engine Computer Connector
Blue/Green: WPECM30BG
Blue/Red: WPECMBR



Fuel Injector EV1/Jetronic (LS1)
Pigtail: WPINJ30



Fuel Injector Multec/Mini Delphi Truck
Pigtail: WPINJ31



Fuel Injector USCAR (LS3)
Pigtail: WPINJ40



Idle Air Control Valve
Pigtail: WPIAC30
Extension: WEIAC30-24



Intake Air Temperature Sensor
Pigtail: WPIAT30
Extension: WEIAT30-24



Knock Sensor LS1
Pigtail: WPKN010



Knock Harness Gen 3 - Female
Pigtail: WPKN030
Extension: WEKNO30-36



Knock Sensor Gen 4
Pigtail: WPKN040



MAF Sensor Gen 3 - 5 wire
Pigtail: WPMAF30
Extension: WEMAF30-24



MAF Sensor Gen 3 - 3 wire
Pigtail: WPMAF31
Extension: WEMAF31-48



MAF Sensor Gen 4 Truck Tube Style
Pigtail: WPMAF40
Extension: WEMAF40-48



MAF Sensor Gen 4 Truck Cartridge Style
Pigtail: WPMAF41
Extension: WEMAF41-48

LS Wire Connectors (cont...)



MAF Sensor LS3 Gen 4
Pigtail: WPMAF43
Extension: WEMAF43-48



MAP Sensor Gen 3
Pigtail: WPMAP30
Extension: WEMAP30-24



MAP Sensor Gen 4
Pigtail: WPMAP40
Extension: WEMAP40-24



OBD2 Dash Diagnostic Port 4-wire
Pigtail: WPOBD30



Oil Pressure Sensor DBC
Pigtail: WPOIL30



Oil Pressure Sensor DBW
Pigtail: WPOIL33



Oil Pressure Sensor Gen 4
Pigtail: WPOIL40



Oxygen Sensor Flat 4-wire - Female
Pigtail: WPOXY30



Oxygen Sensor Flat 4-wire - Male
Pigtail: WPOXY31



Oxygen Sensor Square 1-keyway - Male
Pigtail: WPOXY32



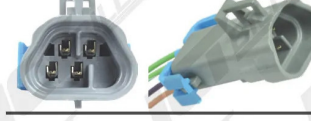
Oxygen Sensor Square 1-keyway - Female
Pigtail: WPOXY34



Oxygen Sensor Square 2-Keyway - Male
Pigtail: WPOXY33



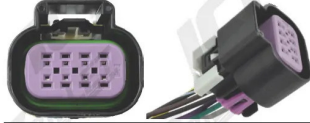
Oxygen Sensor Square 2-keyway - Female
Pigtail: WPOXY35



Oxygen Sensor Trapezoid - Male
Pigtail: WPOXY36



Oxygen Sensor Trapezoid - Female
Pigtail: WPOXY37



Throttle Body 8-Wire Gen 3
Pigtail: WPTHB30
Extension: WETHB30-12



Throttle Body 6-Wire Gen 4
Pigtail: WPTHB40
Extension: WETHB40-12



Throttle Pedal Position Sensor
Pigtail: WPAPP40
Extension: WEAPP40-72



Throttle Position Sensor
Pigtail: WPTPS30
Extension: WETPS30-24



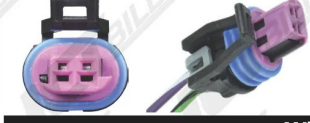
Transmission Harness
4L60/65/70E: WPTRA36
4L80E: WPTRA38



Transmission Neutral Safety Switch
Pigtail: WPNSS30



Transmission Range PRNDL Sensor
Pigtail: WPTRR30



Transmission Vehicle Speed Sensor
Pigtail: WPVSS30

Wire Adapters

- | | |
|------------|------------------------------------------------------|
| WAALT30-6 | 4-Pin Alternator to 2-Pin High-amp 6" |
| WAALT30-36 | 4-Alternator to 2-pin High-amp 36" |
| WAALT40-6 | 2-Pin Alternator High-amp to 4-Pin 6" |
| WAALT40-36 | 2-Pin Alternator High-amp to 4-Pin 36" |
| WACAM40-6 | Gen 4 Camshaft Position Sensor Adapter 6" |
| WACKP30-6 | Gen 4 Crank Position Sensor to Gen 3 Harness 6" |
| WACKP40-6 | Gen 3 Crank Position Sensor to Gen 4 Harness 6" |
| WAINJ30 | Jetronic EV1 to Mini Delphi Multec 2 Fuel Injector |
| WAINJ31 | Jetronic EV1 to USCAR EV6 Fuel Injector |
| WAINJ32 | Mini Delphi Multec 2 to USCAR EV6 Fuel Injector |
| WAINJ33 | Jetronic EV1 to Jetronic EV1 Fuel Injector |
| WAINJ40 | USCAR EV6 to Mini Delphi Multec 2 Fuel Injector |
| WAINJ41 | USCAR EV6 to Jetronic EV1 Fuel Injector |
| WAMAF30-60 | Gen 3 MAF, IAT Sensor Breakout Harness |
| WAMAF31-6 | Gen 3 3-wire MAF to 5-wire IAT Breakout Harness |
| WAMAF32-6 | Gen 3 3-wire MAF to 5-wire LS3 Card Style MAF-IAT |
| WAMAF33-6 | Gen 3 MAF-IAT to Gen 4 LS3 Card Style MAF-IAT |
| WAMAF40-6 | Gen 4 Truck Tube Style MAF to LS3 Card Style MAF-IAT |
| WAMAF41-6 | Gen 4 Truck Card Style to LS3 Card Style |
| WAMAF42-6 | Gen 4 MAF-IAT Breakout Harness |
| WAMAP30-6 | Gen 3 Vehicle to 3-bar Brick Style MAP Sensor |
| WAMAP31-6 | Gen 3 Vehicle to Gen 4 Bosch Style MAP Sensor |
| WAMAP40-6 | Gen 4 Vehicle to Gen 3 MAP Sensor |
| WAT5630 | T56 Skip Shift Eliminator |
| WATRA30-18 | 4L60E to 4L80E Transmission |
| WATRA31-18 | 4L70E to 4L80E Transmission |
| WAVVT40-10 | VVT to NON-VVT Camshaft Sensor Connector |

LS Fittings

During your swap, you may notice a need to make things work together that you might not have thought of before. Using fittings will allow you to do that - either a remote water pump, a turbo feed and return line, or even transmission cooler lines, engine oil cooler lines, ect. The list goes on.

These fitting will make your LS swap a lot easier, and they look great too. There are different sizes of fittings all tailored to your needs. There are also different thread types. Some have o-rings, some do not. There are fittings that go on the ends of hoses, while some get threaded onto fuel lines.

What does this mean for your swap project?

Getting all of the components of your swap to work together is sometimes tough. The factory fuel lines are not very universal because they are made to fit the exact vehicle they are in.

So how will you get fuel to your engine?

You can simply get -8 fuel line along with a few 8an fittings and make it happen. Utilizing these different types of fittings will make your swap go easier and also become very reliable. See the image on the next page to take a look at the differences in fittings and how they can work in your application.

NPT Thread Sizing Chart



AN Thread Sizing Chart

