MISHIMOTO

ENGINEERING REPORT

2018+ Kia Stinger Performance Intercooler Kit | SKU: MMINT-STNGR-18

By Daniel Tafe, *Mishimoto Engineer*

REPORT AT A GLANCE

- **Goal:** Create a direct-fit performance intercooler that outperforms the stock intercooler.
- **Results:** The Mishimoto intercooler and piping reduced outlet air temperatures by 28°F (15.55°C) compared to the stock intercooler and piping when tested with the stock tune. When tested with a Stage 1 tune, the reduction in outlet air temperatures increased to 41°F (22.72°C). This reduction in outlet temperature led to max power gains of 8 hp and 8 ft-lbs of torque with the stock tune and 6 hp and 8 ft-lbs of torque with a Stage 1 tune.
- **Conclusion:** : The Mishimoto intercooler is a great upgrade for anyone looking to get the most performance out of their Kia Stinger.

CONTENTS

DESIGN OBJECTIVES

The design requirements assigned to this project are as follows:

- Create an intercooler that performs better than the stock intercooler.
- Mishimoto intercooler must not show a significant pressure loss when compared to the stock intercooler.

DESIGN AND FITMENT

We began the R&D process by evaluating the stock Kia Stinger intercooler to find potential room for improvement. The stock intercooler is a 3.50" thick, 9-row tube-and-fin design. The Mishimoto intercooler was designed as a much larger, 4.50" thick, 12-row bar-and-plate intercooler to increase the amount of cooling surface area and core volume. This design makes the Mishimoto intercooler 94% larger than the stock Kia Stinger intercooler. Figure 1 and 2 below show a comparison of overall core volumes and fin surface areas for the stock and Mishimoto intercoolers. Figure 3 shows a physical comparison of the stock intercooler and the Mishimoto intercooler. Figure 4 displays a visual comparison of the efficiency of the stock intercooler and the Mishimoto intercooler.

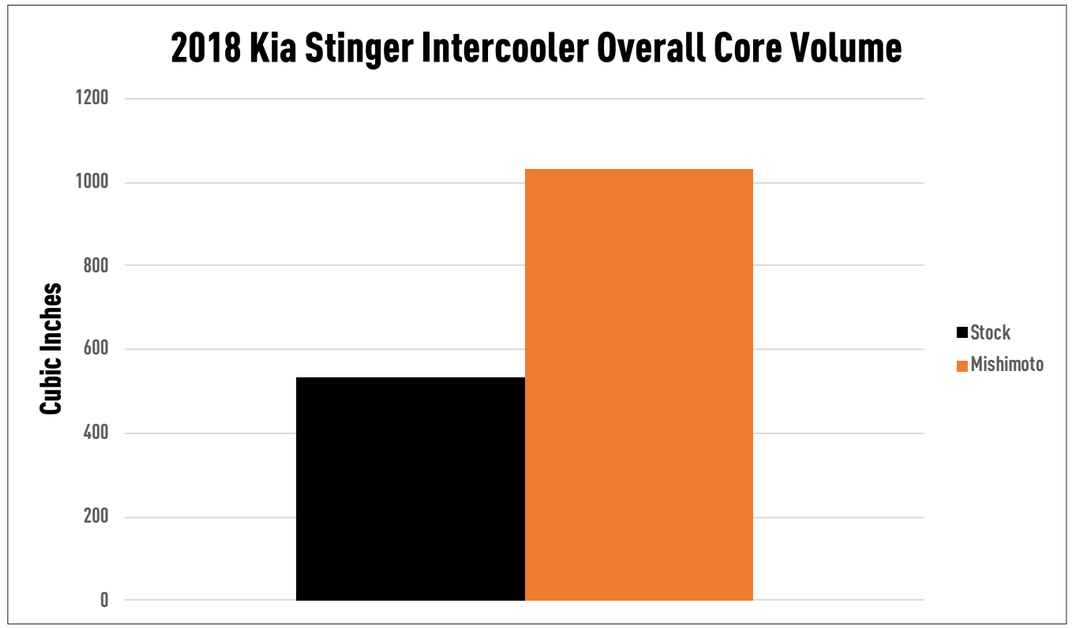

FIGURE 1: *The Mishimoto intercooler has a 94% increase in overall core volume compared to the stock intercooler..*

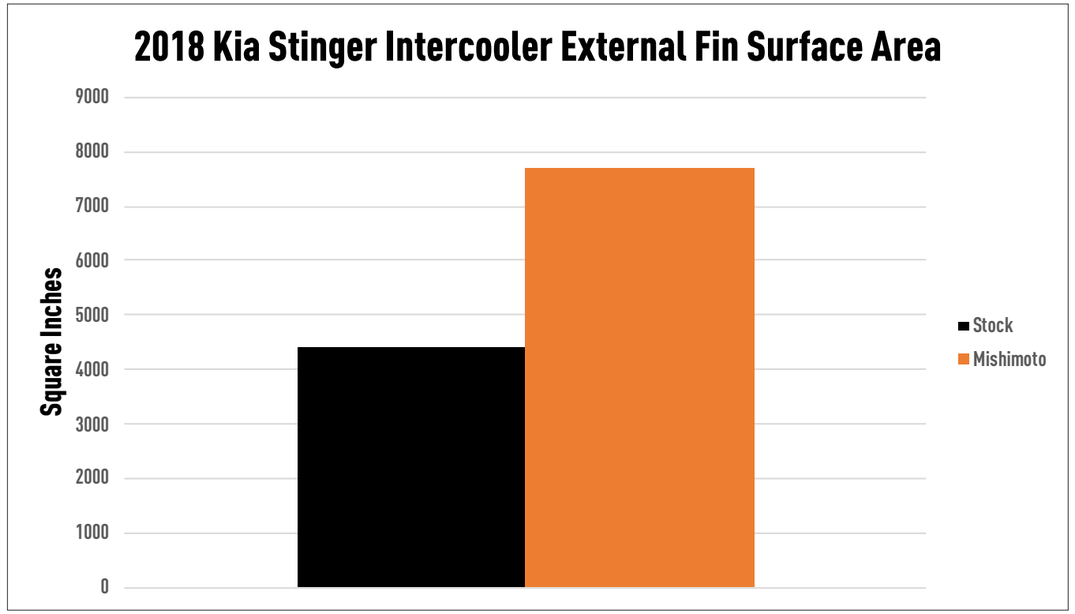

FIGURE 2: *The Mishimoto intercooler has a 74% increase in fin surface area over the stock intercooler.*

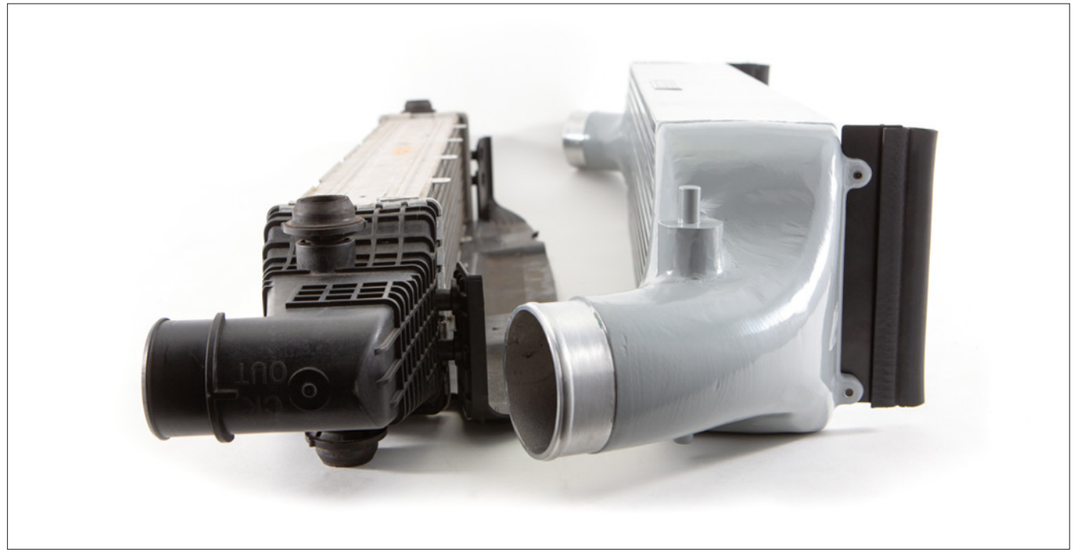

FIGURE 3: *Side view comparison of the stock intercooler to the Mishimoto intercooler.*

FIGURE 4: *Top view comparison of the stock intercooler to the Mishimoto intercooler.*

The intercooler piping was also evaluated, and a few areas were marked for improvement. One specific area that we concentrated on was improving the design of the BOV pipe. The Kia Stinger has two turbos that feed into one hot-side intercooler pipe. The two turbo outlets feed into the BOV pipe and exit as one. See Figures 5 and 6 for images showing the stock and Mishimoto BOV pipes. The internal dimensions were increased, and the geometry of the flow path was altered to increase flow and decrease pressure drop through the pipe.

FIGURE 5: *Comparison of the stock (bottom) and Mishimoto (top) BOV pipe.*

FIGURE 6: *Comparison of the stock (bottom) and Mishimoto (top) BOV pipe.*

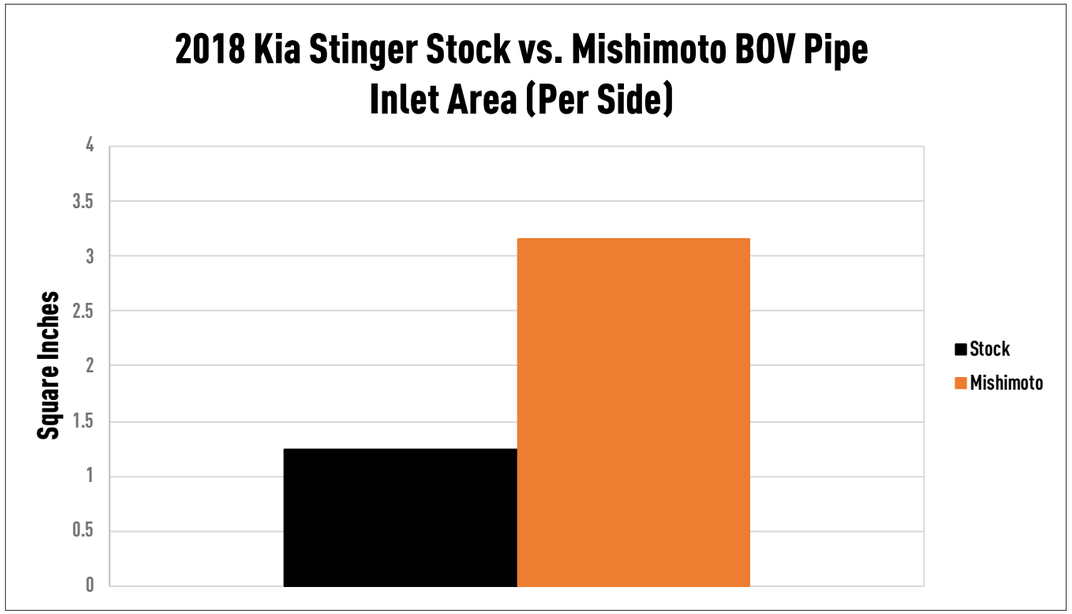

FIGURE 7: *The Mishimoto BOV pipe inlet area is 154% larger than the stock BOV pipe inlet.*

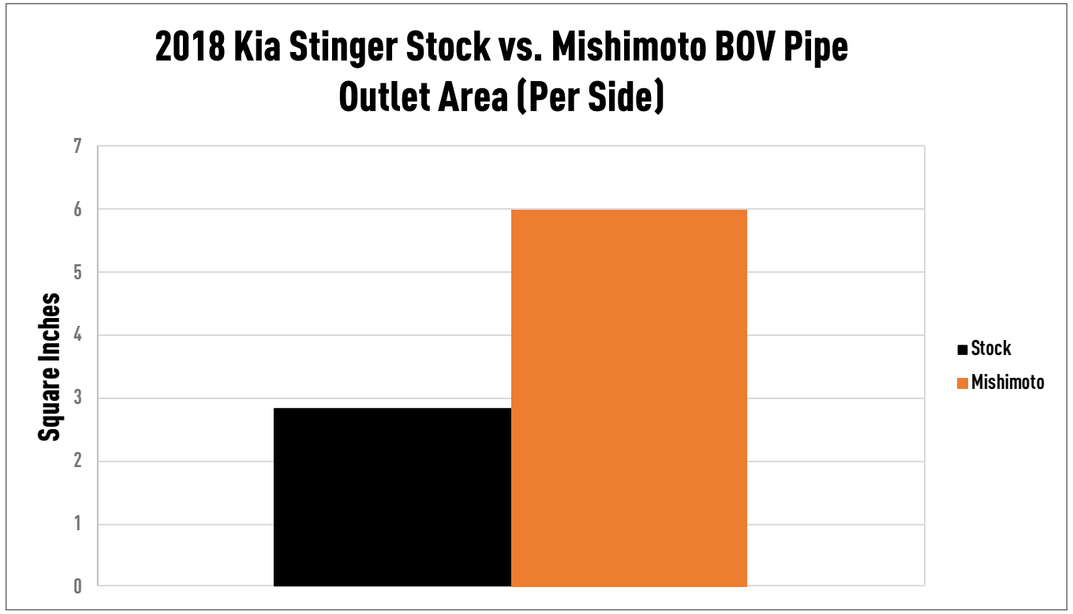

FIGURE 8: *The Mishimoto BOV pipe outlet area is 111% larger than the stock BOV pipe outlet.*

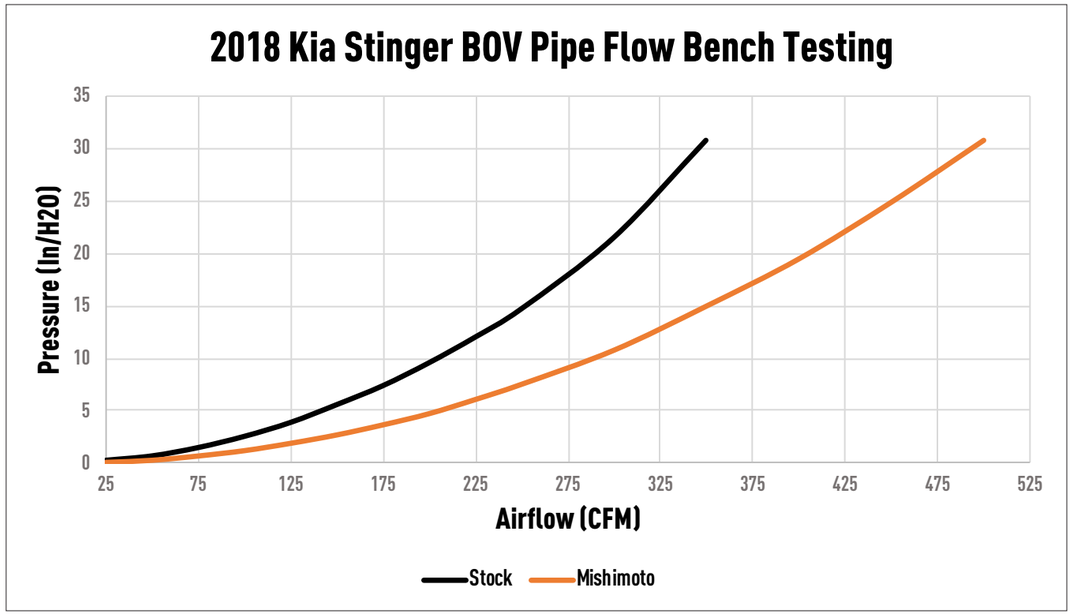

FIGURE 9: *The Mishimoto BOV pipe has a 51% reduction in pressure drop compared to the stock BOV pipe.*

APPARATUS

Air temperatures were taken with AEM intake air temperature sensors from the inlet and outlet of the Mishimoto intercooler. Boost pressure was also measured to ensure that no dramatic pressure drop will occur when installing the Mishimoto intercooler. A baseline of the temperature and pressure was recorded before the Mishimoto intercooler was installed. This allowed us to see how well the intercooler performed.

FIGURE 10: *: AEM AQ-1 Data Logging System.*

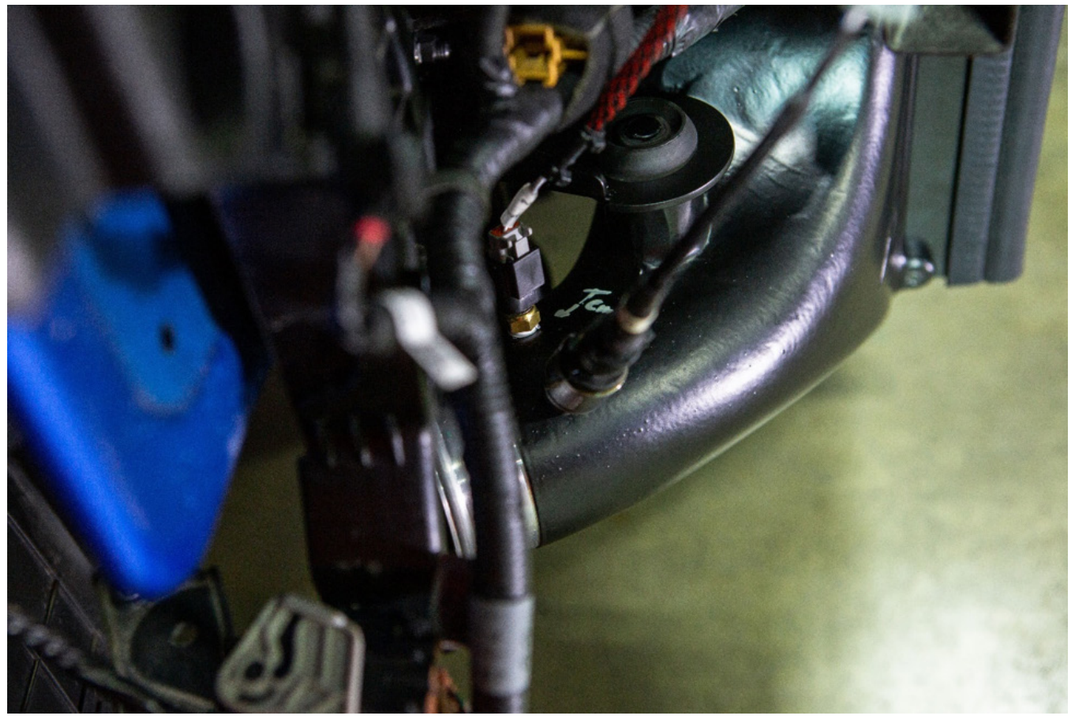

FIGURE 11: *Pressure and temperature sensors installed in the cold-side intercooler end tank.*

PERFORMANCE TESTING

A 2018 Kia Stinger GT1 was used to test each intercooler setup. The ambient temperature on the day of testing was approximately 70˚F (21˚C). To test the performance of the intercoolers, a Dynapack™ dynamometer was used to conduct consistent ramp tests.

The Kia Stinger was brought to an operating temperature of 185˚F (85˚C) by idling it on the dyno. Once the vehicle was at operating temperature, multiple dyno runs were conducted until consistent figures were recorded. The car was kept running between runs to maintain a consistent engine coolant temperature for every run. As a final test for each test configuration, dyno runs were made back-to-back with just 20 seconds between runs to simulate heat-soak conditions. The four configurations we tested were:

Configuration 1:
Stock intercooler with stock intercooler piping and a stock tune

Configuration 2:
Mishimoto intercooler with Mishimoto intercooler piping and a stock tune

Configuration 3:
Stock intercooler with stock intercooler piping and a Stage 1 tune

Configuration 4:
Mishimoto intercooler with Mishimoto intercooler piping and a Stage 1 tune

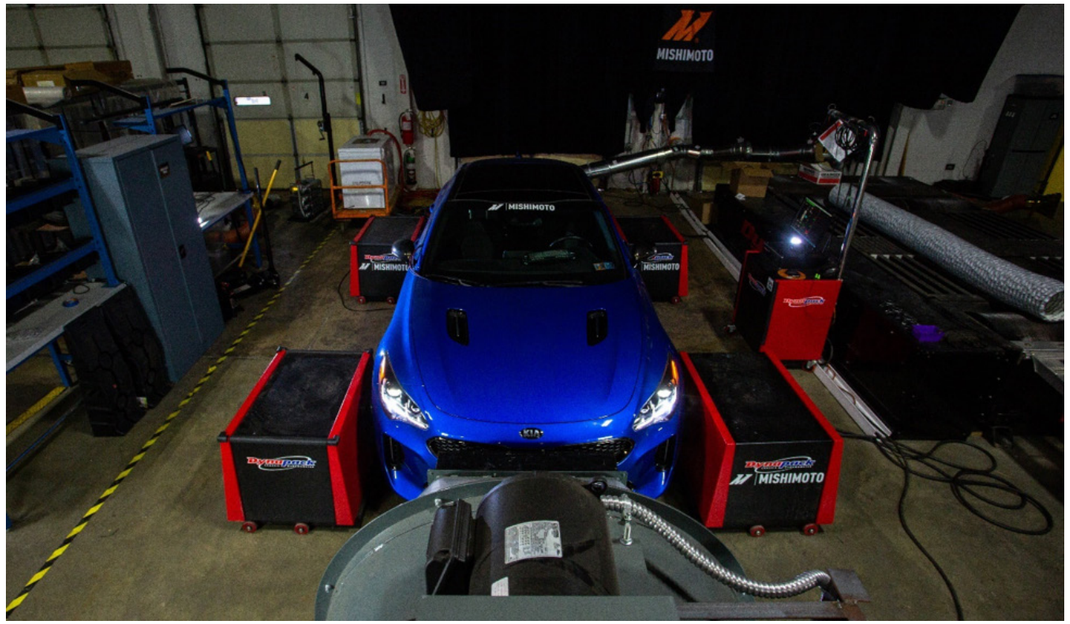

FIGURE 12: *A Dynapack dynamometer was used for vehicle testing.*

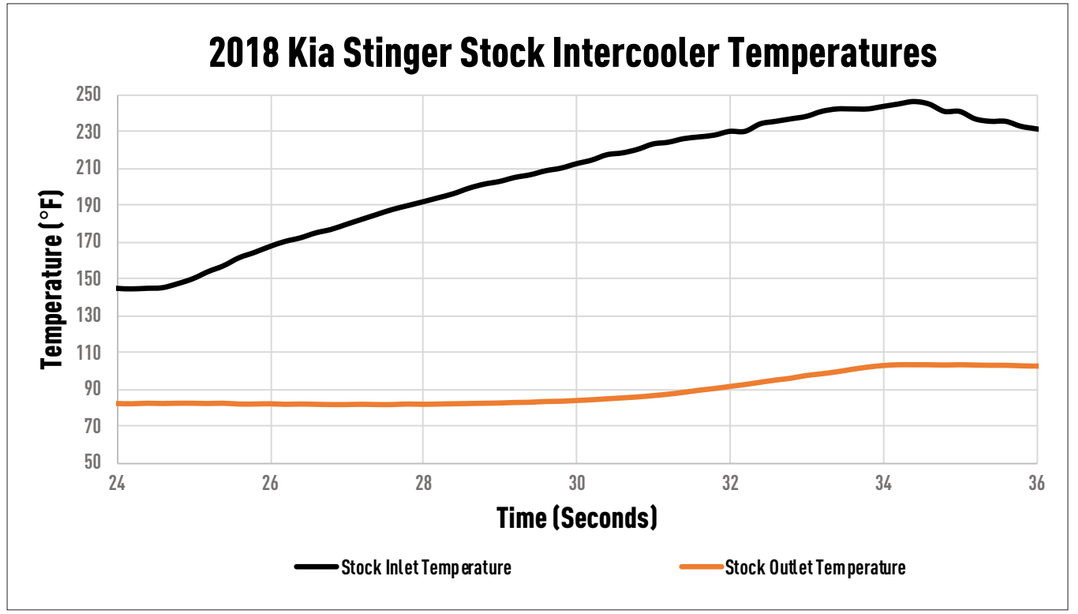

FIGURE 13: *Stock intercooler, stock piping, and stock tune inlet and outlet temperature data.*

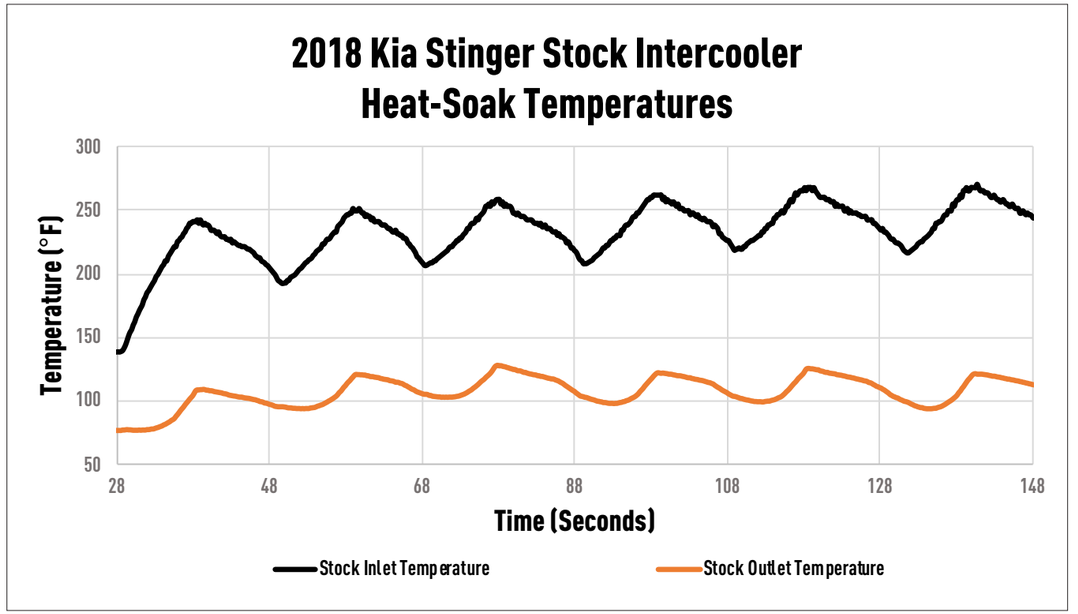

FIGURE 14: *Stock intercooler, stock piping, and stock tune inlet and outlet temperature data (heat-soak test).*

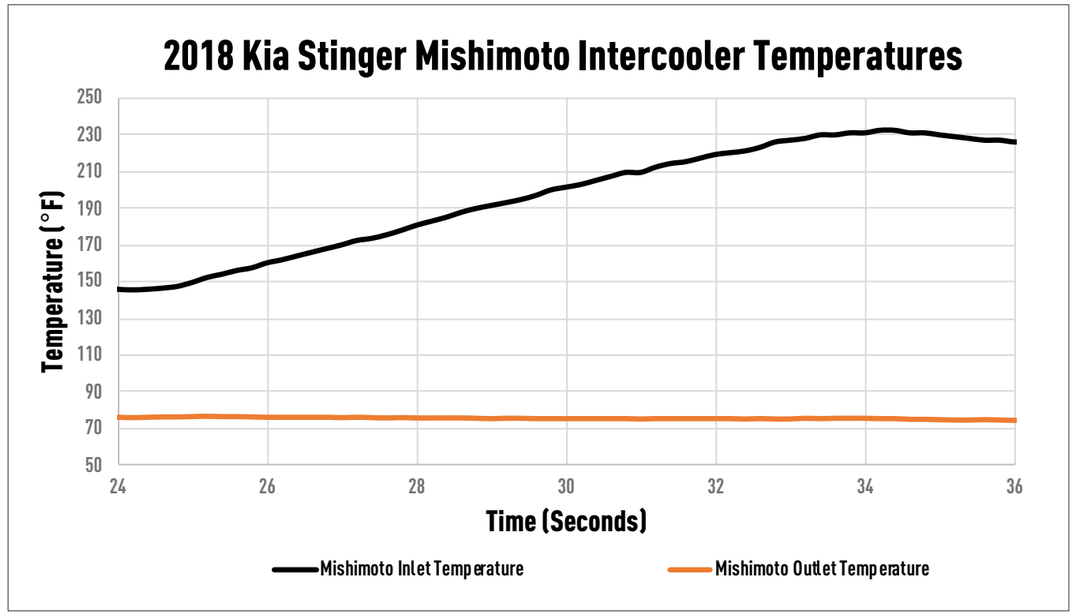

FIGURE 15: *Mishimoto intercooler and piping inlet and outlet temperature data.*

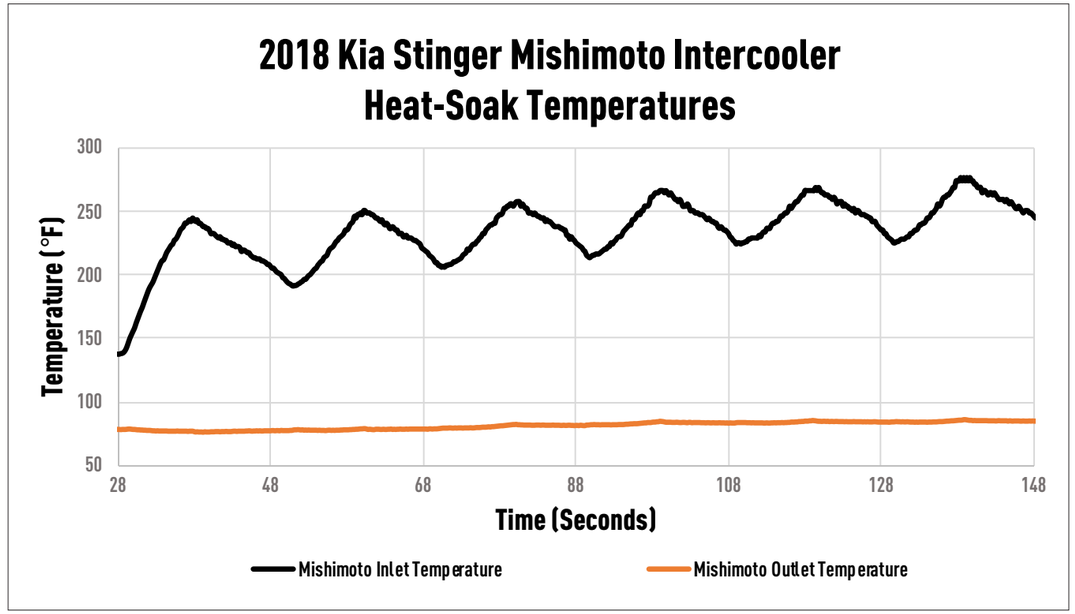

FIGURE 16: *Mishimoto intercooler and piping inlet and outlet temperature data (heat-soak test).*

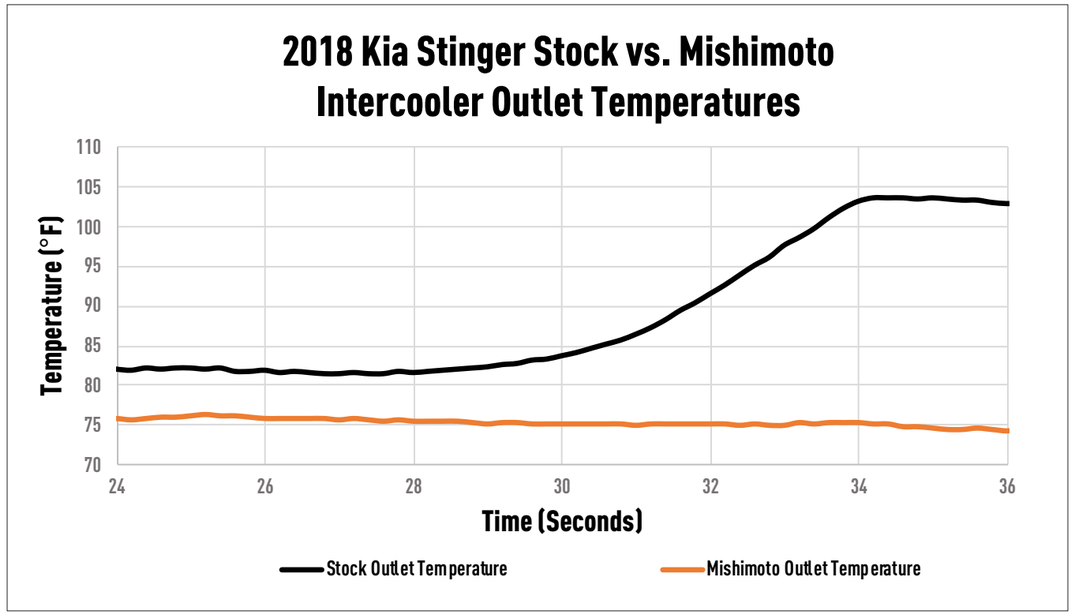

FIGURE 17: *The Mishimoto intercooler and piping reduced the outlet temperatures about 28˚F (15.55˚C) compared to the stock intercooler and piping.*

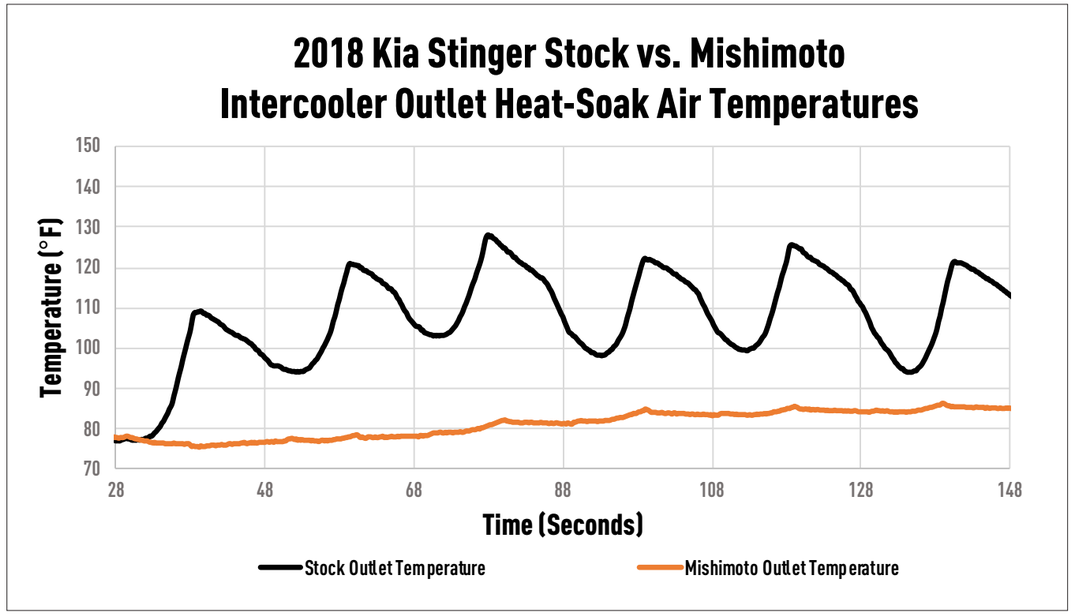

FIGURE 18: *The Mishimoto intercooler and piping reduced the outlet temperatures about 40˚F (22.22˚C) compared to the stock intercooler and piping*

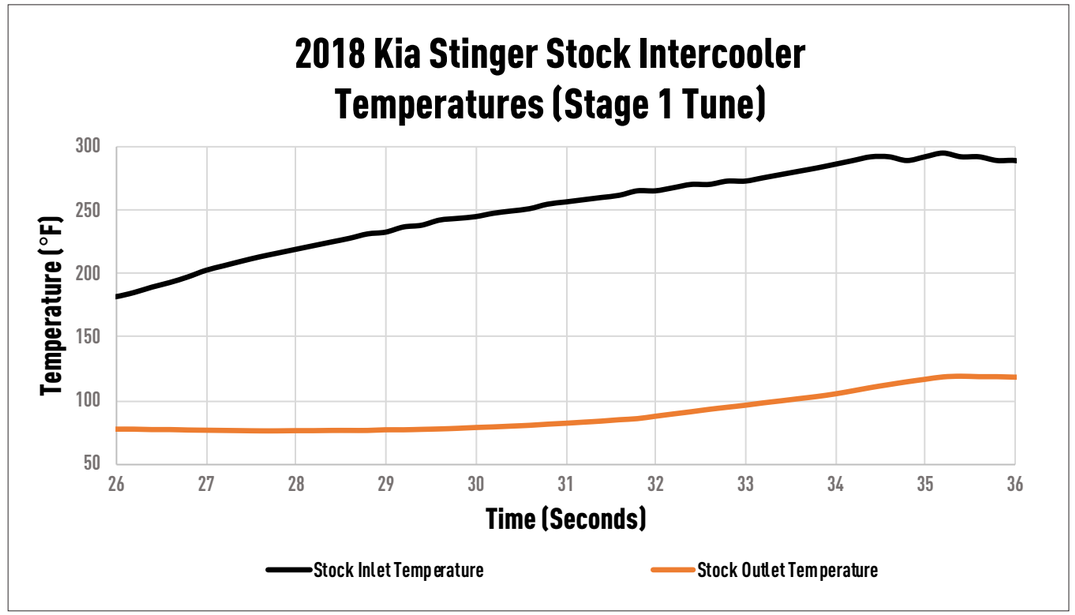

FIGURE 19: *Stock intercooler, stock piping, and stock tune inlet and outlet temperature data.*

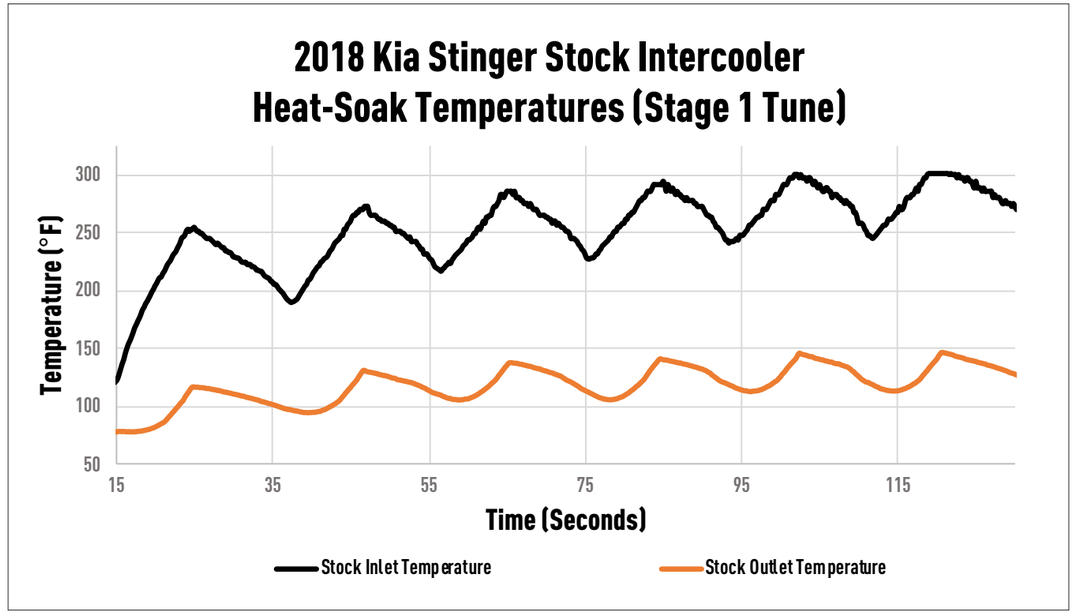

FIGURE 20: *Stock intercooler, stock piping, and stock tune inlet and outlet temperature data (heat-soak test).*

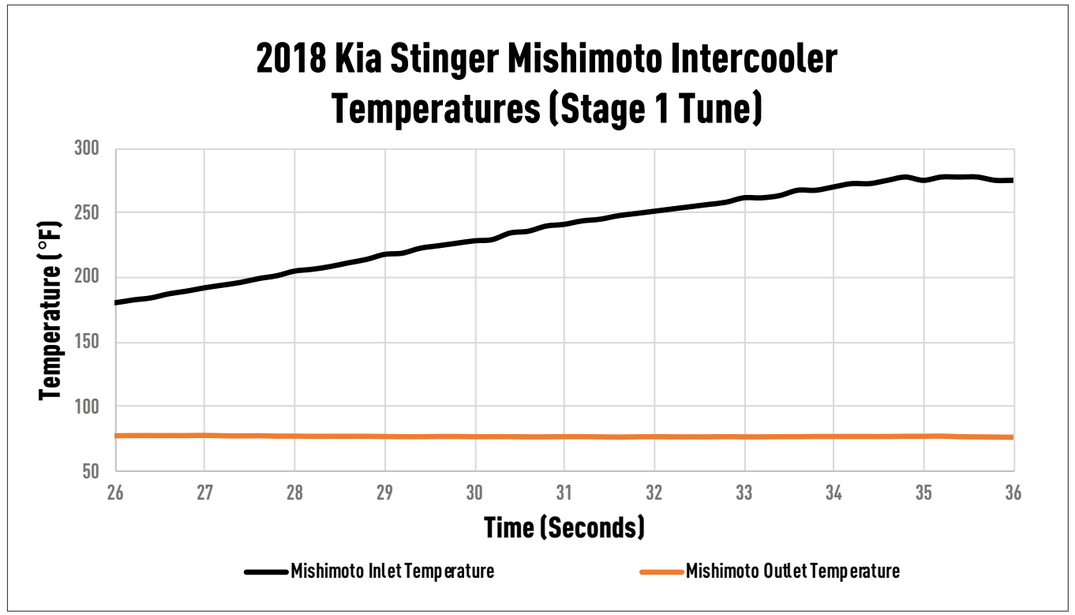

FIGURE 21: *Mishimoto intercooler and piping inlet and outlet temperature data.*

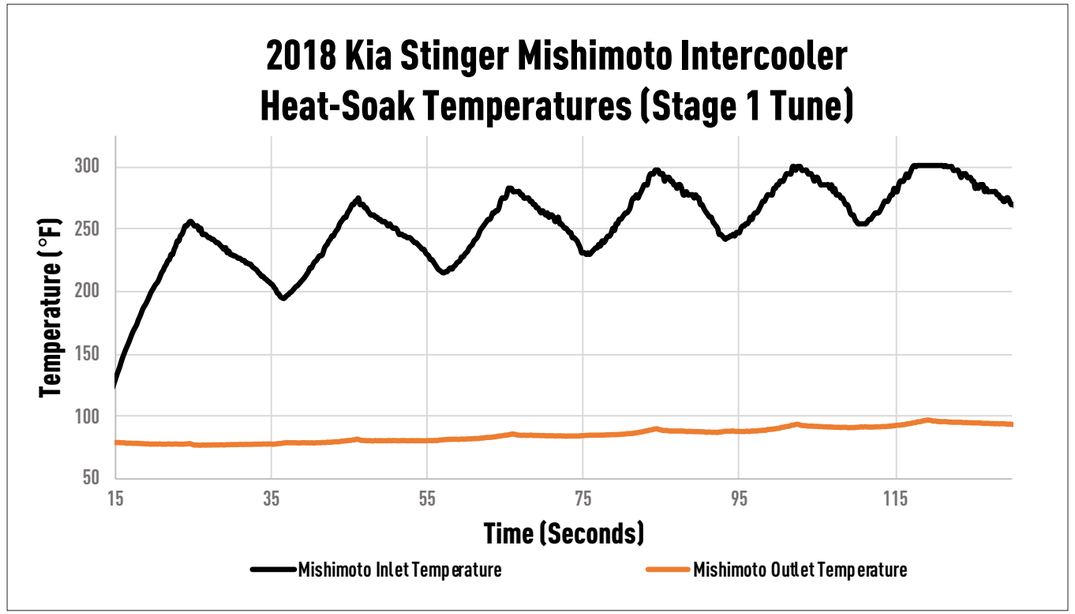

FIGURE 22: *Mishimoto intercooler and piping inlet and outlet temperature data (heat-soak test).*

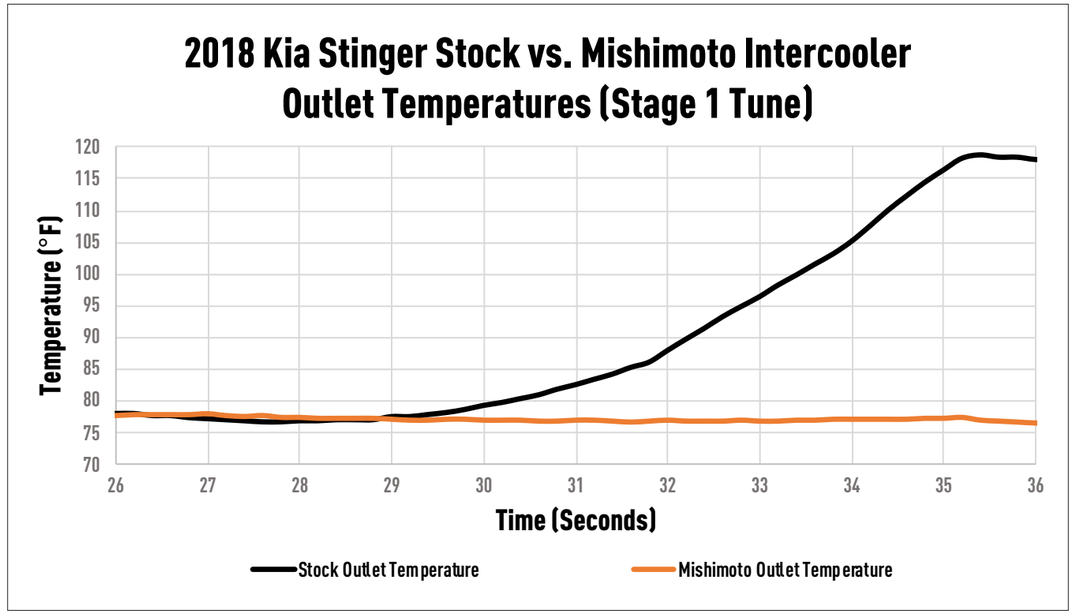

FIGURE 23: *The Mishimoto intercooler and piping reduced the outlet temperatures about 41˚F (22.72˚C) compared to the stock intercooler and piping.*

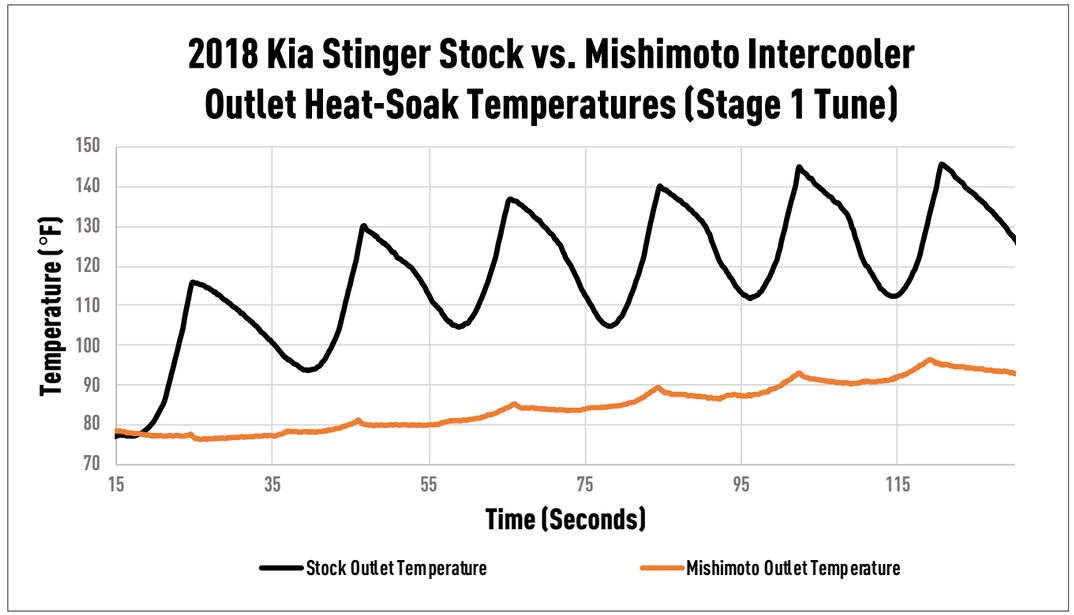

FIGURE 24: *The Mishimoto intercooler and piping reduced the outlet temperatures about 50˚F (27.78˚C) compared to the stock intercooler and piping.*

In comparison to the stock intercooler and piping, the Mishimoto intercooler and piping reduced the outlet temperature by 28˚F (15.55˚C). When tested with a Stage 1 tune, the reduction in outlet temperature increased to 41˚F (22.72˚C). This reduction in temperature is a result of the Mishimoto intercooler having a 74% increase in fin surface area and a 94% increase in overall core volume.

Along with temperatures, inlet and outlet pressures were monitored to ensure that the Mishimoto intercooler did not add a significant drop in boost pressure from inlet to outlet. A large decrease in boost pressure could cause strain on the turbos, as well as add additional heat into the engine cooling and intercooling system, which could result in a loss of horsepower.

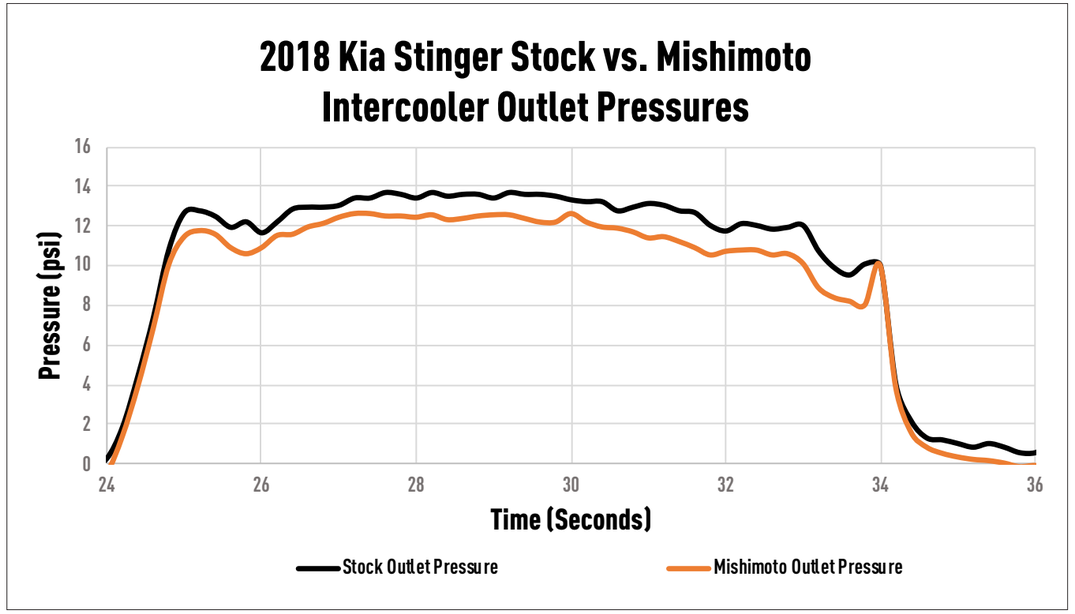

FIGURE 25: *The Mishimoto intercooler and piping had an additional 1.5 psi of boost pressure drop compared to the stock intercooler and piping.*

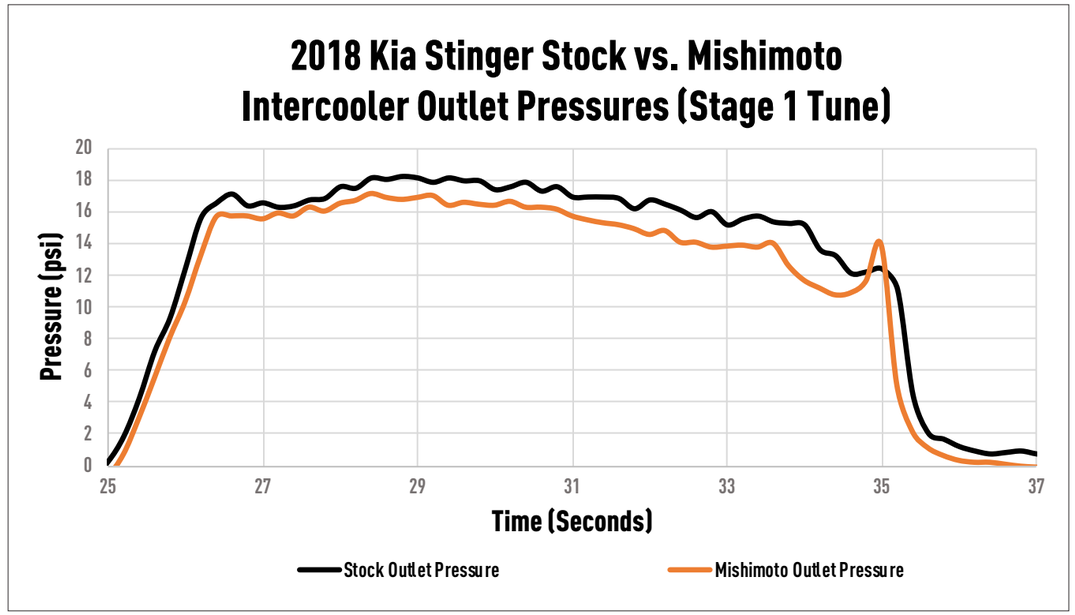

FIGURE 26: *The Mishimoto intercooler and piping had an additional 1.5 psi of boost pressure drop compared to the stock intercooler and piping with a Stage 1 tune.*

As seen in Figures 25 and 26, the Mishimoto intercooler and piping follows the outlet pressure curve to within 1.5 psi of the stock intercooler and piping. This is well within an acceptable range and will not have any adverse effects on the intercooling system of the Kia Stinger.

As a bonus to go along with the reduction in outlet temperatures, the Mishimoto intercooler and piping yielded max power gains of 8 hp and 8 ft-lbs of torque with the stock tune and 6 hp and 8 ft-lbs of torque with the Stage 1 tune. With a cooler intercooler charge, the engine can pack more air and fuel mix into the cylinders, which creates the potential to make a little extra power.

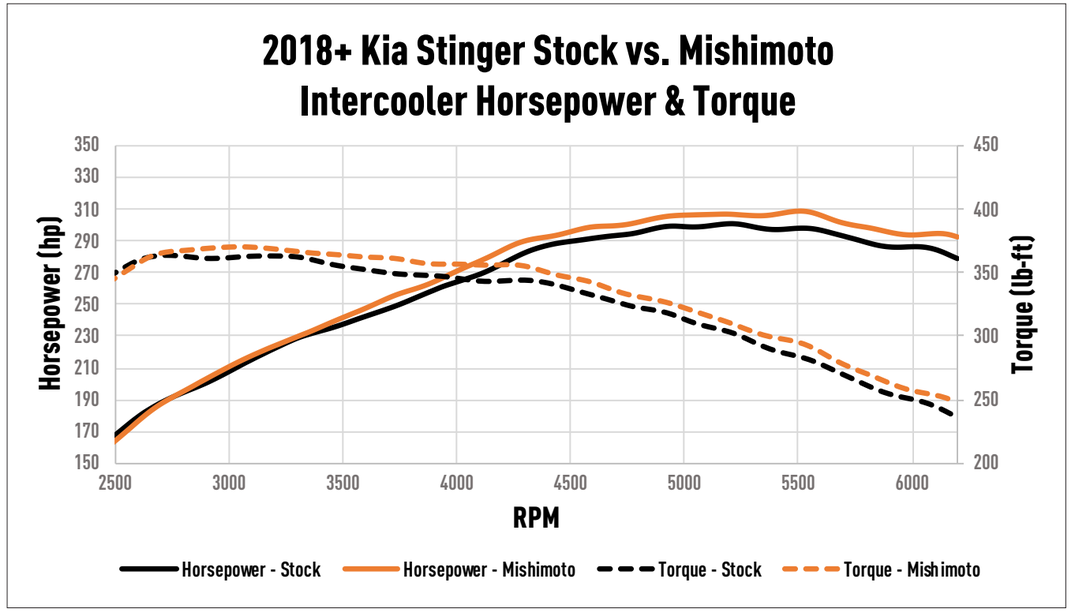

FIGURE 27: *The Mishimoto intercooler yielded a max gain of 8 hp and 8 ft-lbs of torque.*

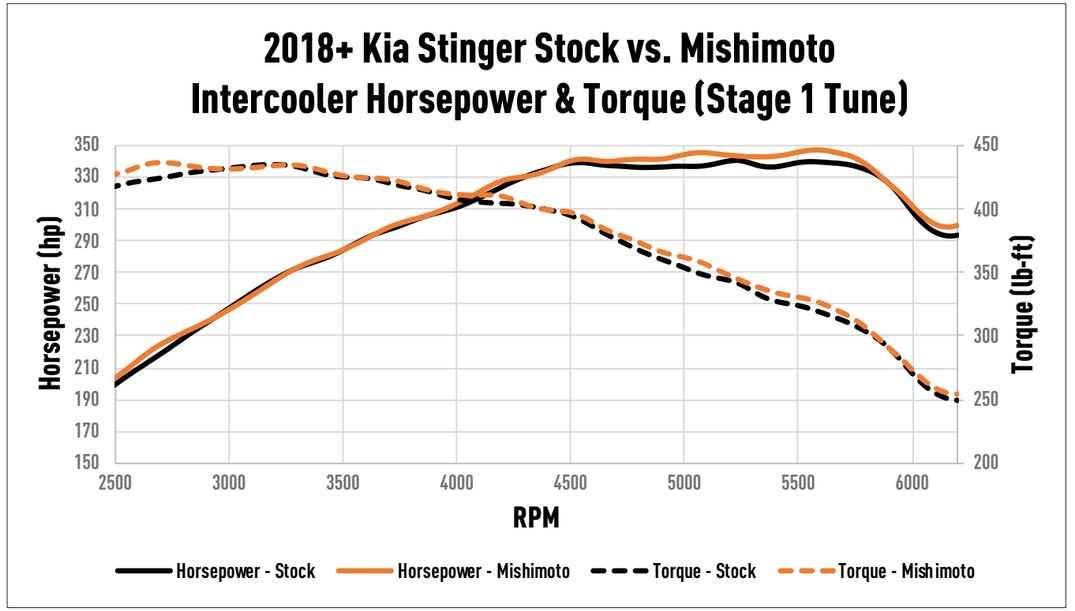

FIGURE 28: *The Mishimoto intercooler yielded a max gain of 6 hp and 8 ft-lbs of torque.*

FIGURE 29: *Mishimoto intercooler installed on the car.*

An intercooler's primary function is to keep charge-air temperatures low. If the air temperature entering the engine begins to climb, the ECU will reduce power to preserve engine longevity. A performance intercooler will aid in preventing this loss of power on a completely stock tune. The Mishimoto intercooler reduced outlet temperatures with a minimal increase in boost pressure drop, resulting in a slight gain in horsepower and torque with the stock tune. If an aftermarket tune is loaded onto the vehicle, additional gains can be expected because the tuner is able to compensate for the reduction in engine air temperature.

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