



Performance Evaluation  
of a 2013 Chevrolet  
Malibu 6T40  
Transmission

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**NCAT – National Center for Advanced Technology**

*National Vehicle and Fuel Emissions Laboratory – Office of Transportation and Air Quality  
U.S. Environmental Protection Agency*

**TEST:** Performance Evaluation of a 2013 Chevrolet Malibu 6T40 Transmission  
**PROGRAM:** NCAT/ASD Light-Duty Greenhouse Gas Test Program  
**PROJECT:** MTE Transmission Benchmarking  
**PROJECT ENGINEERS:** Andrew Moskalik

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**PURPOSE OF TEST**

The purpose of this testing is to characterize the performance of a 2013 Chevrolet Malibu 6T40 transmission, in particular to generate efficiency and spin loss data that may be used in the ALPHA (Advanced Light-Duty Powertrain & Hybrid Analysis) model.

**SUPPORTING DOCUMENTATION**

This data packet contains the following files:

<i>GM 6T40 Final Transmission Testing Report by FEV.pdf</i>	Final report prepared by FEV Engine Technology under EPA Contract EP-C-12-014, describing test procedures performed by FEV on the 6T40 transmission.
<i>GM 6T40 Final Transmission Testing Report Presentation by FEV.pdf</i>	Final presentation prepared by FEV Engine Technology under EPA Contract EP-C-12-014, describing test procedures performed by FEV on the 6T40 transmission.
<i>GM 6T40 Loaded Efficiency Results (FEV).xls</i>	Transmission test stand data file containing transmission efficiency as a function of gear, input speed, input load, temperature, and line pressure.
<i>GM 6T40 Shiftmap Data (FEV).xls</i>	Vehicle data file containing vehicle speed and pedal position at transmission shift points.
<i>GM 6T40 Spin Loss Results (FEV).xls</i>	Transmission test stand data file containing required input torque to spin transmission as a function of gear, speed, temperature, and line pressure.
<i>GM 6T40 Torque Converter Test Results (FEV).xls</i>	Transmission test stand data file containing torque converter speed and torque ratios.
<i>SAE 2015-01-1140 Benchmarking and Modeling a Conventional Mid-Size Car.pdf</i>	An SAE paper that describes the utilization of the Chevrolet Malibu engine data for modeling a conventional mid-size car using ALPHA

**TEST ARTICLE**

The transmission used in this project was a GM 6T40 FWD 6-speed automatic transmission removed from a 2013 Chevrolet Malibu 2.5L, VIN 1G11B5SA2DF147935.

## **TEST METHODOLOGY**

EPA contracted FEV engine technologies under EPA contract EP-C-12-014 to complete benchmarking of the GM 6T40 transmission. The benchmarking activities encompassed areas:

- Perform vehicle break-in following the manufacturer's recommendations over a combination of city and highway driving
- Gathering in-vehicle data to create upshift and downshift maps
- Conduct loaded efficiency testing on a transmission test stand
- Conduct spin loss testing on a transmission test stand
- Measure torque converter efficiency

The test setup, test methodology, and summary results are detailed in the accompanying final report authored by FEV, *GM 6T40 Final Transmission Testing Report by FEV.pdf*.

## **DATA SET**

The data obtained by FEV are given in the four accompanying data files:

- *GM 6T40 Loaded Efficiency Results (FEV).xls*: This file contains efficiency in each gear as a function of input speed and load. Efficiencies are given at two different transmission oil temperatures (37 °C and 93 °C) and at 10 bar line pressure.
- *GM 6T40 Shiftmap Data (FEV).xls*: This file contains the points used to construct the transmission shift maps for both the upshifts and downshifts. These points are given as a function of vehicle speed and ECU-reported pedal position.
- *GM 6T40 Spin Loss Results (FEV).xls*: This file contains spin losses in each gear as a function of input speed. Efficiencies are given at two different transmission oil temperatures (37 °C and 93 °C) and at two different line pressures (5 bar and 10 bar).
- *GM 6T40 Torque Converter Test Results (FEV).xls*: This file contains torque converter torque ratios (and associated K factors) as a function of speed ratio.

## **RESULTS**

A summary of the final results are included in FEV's final report, *GM 6T40 Final Transmission Testing Report by FEV.pdf*. Additional detailed results are included in the associated presentation, *GM 6T40 Final Transmission Testing Report Presentation.pdf*.

## **DISCUSSION AND DATA USAGE**

In general, the transmission data produced in this testing are robust and can be used for any purpose. The benchmarking results from this testing were provided to the ALPHA model to perform full vehicle simulations over several drive cycles and vehicle road loads. Additional details pertaining to this modeling and the results obtained are described in the attached SAE paper *SAE 2015-01-1140 Benchmarking and Modeling a Conventional Mid-Size Car.pdf*.