Chronology of Principal Events

July, 2015	Suzuki Motor Corporation (SMC) received a Field Technical Information Report (FTIR) from its Japanese distributor about a Kizashi driver that experienced warning light illumination while driving on the freeway and then stopped the vehicle on the shoulder of the freeway because the speed had dropped. SMC collected the Transmission Control Module (TCM) for investigation by the supplier. The supplier checked the internal data and found a history of the Continuously Variable Transmission (CVT) fluid temperature reaching 140°C or higher, causing temperature protection control operation and reduced vehicle speed. SMC supposed that the CVT fluid temperature increase above 140°C was due to vehicle usage conditions and decided to monitor information from the field.
May, 2016	SMC received one FTIR from its Japanese distributor and one FTIR from Suzuki Motor of America, Inc. (SMAI). SMC collected the TCMs and asked the supplier to begin an investigation.
June, 2016	SMC received two FTIRs from SMAI. During its investigation of collected TCMs, the supplier found that the resistance value of the shunt resistor mounted on the TCM board was high, and found that cracks were generated between the resistor element and the lead frame.
July, 2016	SMC received two additional FTIRs from SMAI. Since some vehicles had experience warning light illumination and reduced speed, SMC and the supplier decided to conduct an evaluation in the U.S. The following factors were found to cause the CVT fluid temperature to rise: (1) CVT fluid deterioration; (2) CVT fluid overfill; and (3) abnormal current output from the TCM to the solenoid that controls CVT fluid pressure. SMC confirmed that factors (1) and (2) could be improved by replacing the transmission fluid and adjusting the fluid level to the LOW level. SMC confirmed that factor (3) could be improved by replacing the TCM. SMC understood that the current output to the solenoid became abnormal due to the abnormal resistance value of the shunt resistor.

August to September, 2016	SMC received three additional FTIRs from SMAI. To identify the cause of the reported problems, the supplier analyzed the cross section of the shunt resistor and found that the diffusion layer (an alloy layer at the joint surface formed when dissimilar metals are bonded) was about twice as thick as normal at the crack occurrence site.
October to December, 2016	SMC received four additional FTIRs from SMAI. To investigate the cause of the crack, SMC investigated the manufacturing process of the shunt resistor and the manufacturing process of the TCM, but SMC could not identify the root cause.
January and February, 2017	To observe the behavior of the vehicle at the time of failure, SMC induced a failure condition while driving on a chassis dynamometer and observed that acceleration became difficult in addition to a decrease in vehicle speed. To evaluate how CVT temperature protection control can affect vehicle drivability in an actual traffic environment, driving tests were conducted in the U.S. on February 12-17. SMC found that during temperature protection control operation, driving in actual traffic conditions could be difficult.
January to March, 2017	SMC received two additional FTIRs. The supplier investigated three manufacturing processes that involved application of heat. They were not able to find any problem with the applied temperature, the work methods that were used, or variations in the diffusion layer width.
April to May, 2017	SMC received one additional FTIR. The supplier confirmed that shunt resistance problems were observed primarily for shunt resistors manufactured between June 2012 and August 2012. SMC looked for any changes in the manufacturing process, but could not find any abnormalities.
June, 2017	After investigating TCMs with shunt resistance problems again, it was confirmed that there was a gap due to soldering failure (solder peeling) in the soldered portion between the resistor element and the lead frame. It was also observed that cracks were developing from the end of the gaps. According to the supplier’s survey, it was found that the change in thickness of the diffusion layer in the cracked shunt resistor was a

	secondary effect and not the cause of the problem. As a result of an increase in reports from the field, SMC issued a Service Bulletin to distributors so that dealers could properly repair two problems that could cause vehicles to enter the temperature protection control mode: (1) deteriorated transmission fluid, and (2) CVT control malfunction.
July, 2017	SMC received one additional FTIR. SMAI issued a Service Bulletin to its Service Providers based on the bulletin describe above that was issued by SMC.
July to September, 2017	SMC received one additional FTIR. As a result of investigating the shunt resistors in TCMs collected from the field and shunt resistor samples that were kept by the supplier for each manufacturing lot, the supplier found gaps due to soldering abnormalities during two shunt resistor manufacturing periods: from June to September in 2012 and 2013.
October to December, 2017	SMC received one additional FTIR. The supplier used Fault Tree Analysis (FTA) to identify possible factors that can cause gaps due to poor soldering. Based on the FTA, the supplier was able to identify manufacturing factors that could cause unsoldered areas to occur during the relevant manufacturing period. The factors that were identified are storage of lead frames under a combination of storage time and humidity conditions that could lead to unsoldered areas. The supplier reproduced shunt resistor production based on the above factors and were able to reproduce gaps similar to those seen in shunt resistors with shunt resistance problems collected from the field. The supplier also conducted temperature/current cycling tests and were able to reproduce the formation of cracks from both ends of the gaps.
January to April, 2018	SMC received one additional FTIR. The supplier conducted additional manufacturing reproduction tests based on the identified manufacturing factors and was able to confirm the manufacturing period during which shunt resistors that may have unsoldered areas were produced.

May 10, 2018	SMC decided to conduct a recall for vehicles that are equipped with a TCM that may have a manufacturing defect. SMAI has received 13 warranty claims between July 2016 and August 2017 that appear to be related to this issue.