Figure 8-12. Bus Fault: Entering Sleep Mode with Bus Stuck Dominant Fault, Clearing, and Wake Up

8.3.22.5 Thermal Shutdown

The TLIN1431x-Q1 has multiple thermal sensors in the device to monitor the junction temperature of the die. The V_{CC} LDO, LIN transmitter, and high side switch/LIMP cells are monitored. Depending upon which cell's junction temperature are exceeded will determine the action taken by the device. Exceeding the maximum junction temperature for the LIN transmitter or LDO will cause the LIN transmitter into the recessive state and turns off the V_{CC} regulator. The nRST pin is pulled to ground during a LIN or V_{CC} LDO TSD event. Once the over temperature fault condition has been removed and the junction temperature has cooled beyond the hysteresis temperature, the transmitter can be re-enabled. Exceeding the max junction temperature of the high side switch or LIMP cells will cause the cells to be turned off.

In pin control mode, a TSD event on the LIN transceiver or V_{CC} LDO causes the device enters a fail-safe mode. Once the TSD fault has been removed and a wake event takes place, the device enters restart mode. If a wake event takes place and the TSD fault has not cleared, the device enters sleep mode immediately. Exceeding the max junction temperature for the high side switch and LIMP high side switch cause the switches to be turned off until junction temperature falls below T_{SDF}.

In SPI mode, there are two interrupts that can be set due to a thermal event. If the LIN transceiver or V_{CC} LDO junction temperature is exceeded, the TSD_VCC_LIN interrupt is set and the devices takes the action previously described. If the high side switch or LIMP high side switch max junction temperature is exceeded, the TSD_HSS_LIMP interrupt is set. The device takes the action previously described. In SPI mode, the device defaults to support fail-safe mode. The device enters fail-safe mode upon an TSD_VCC_LIN event and LIMP is turned on (see Figure 8-25). Exiting fail-safe mode is the same as when the device is pin controlled. When fail-safe mode is disabled, the device enters sleep mode upon a TSD_VCC_LIN event.

8.3.22.6 Under-voltage on V_{SUP}

The device monitors V_{SUP} for two low voltage thresholds, UV_{SUP} and V_{nPOR}. When V_{SUP} drops below UV_{SUPF} and is above V_{nPORF}, the device is in an under-voltage power state. Once V_{SUP} ramps above UV_{SUPR}, the device enters restart mode and turns on the V_{CC} LDO, see Restart Mode. When V_{SUP} drops below V_{nPORF}, the device goes into a power off state. Once V_{SUP} ramps above V_{nPORR}, the device prepares the digital core to wake up. The device waits for V_{SUP} to rise above UV_{SUPR} and then turns on the V_{CC} LDO. Once V_{SUP} and V_{CC} are above their under-voltage levels, the device enters Init mode, see Init Mode. The described under-voltage events are also considered brown out events and more information can be found at Device Brownout information.

8.3.22.7 Unpowered Device and LIN Bus

In automotive applications, some LIN nodes in a system can be unpowered (ignition supplied) while others in the network remains powered by the battery. The device has extremely low unpowered leakage current from the bus, so an unpowered node does not affect the network or load it down.