TMS570LC4355BZWTQQ1 Flash Programming Validation Report

September 6, 2016

Validation report of the Algocraft WriteNow tool on TMS570LC4355BZWTQQ1 for the BMW B11 (rev A) application, programmed in Shanghai, China on 10/28/2015.

Dear Sir or Madam:

Texas Instruments provides validation of the programming of TMS570 FLASH based microcontrollers in two parts. The first part is a review of the programming implementation and flow. The second part is a comparison of the threshold voltages of the new programming tool with an already validated such as Texas Instruments CCS. This document provides the validation results for the TMS570LC4355BZWTQQ1 parts programmed using WriteNow.

A review of the programming implementation and flow has resulted in no critical findings; TI did provide recommendation to Algocraft which will be implemented in software version 01.20.01.00. The WriteNow tool using software 01.09.17.00 is implemented using F021 Flash API version 2.01.01 with a system frequency of 48MHz using an 8MHz crystal oscillator. The flash API is given a frequency of 48MHz. The Flash API is the current release for this routine. TI recommends updating to Algocraft WriteNow version 01.20.00.00 or newer before going to production; repeated validation will not need required in this case.

The second part of the validation is a comparison of the thresholds. This is also done in two steps. The first step is verifying that the parts programmed at Algocraft on the programming equipment have valid levels. For this step, the four parts programmed using the WriteNow tool were measured internally for the voltage level of programmed bits and bit cell currents of erased bits. Expected values for the “zero” bits should be at or above the program verify reference. The expected value for the “one” bits should be at or above the erase verify reference. The samples provided by the WriteNow tool had no deviation to this requirement.

The second step of the threshold validation is comparing the threshold on the same parts with the same code when programmed by a previously validated tool. The parts were erased and then reprogrammed using Texas Instruments Code Composer Studio v6.1.1 with F021 Flash API version 2.01.01. The thresholds recorded are expected to correlate within one standard deviation of the validated tool. The minimum “one’s” and “zero’s” the average “one’s” and “zero’s” and the standard deviations of the ones and zeros were compared for each of the four samples.

All values correlated within the requirements between the tools. The maximum deviation on min Vt0 was 14 indices, the maximum deviation on average Vt0 was 3 indices, the maximum deviation on Bcc1 min was 10 indices and the maximum deviation on Bcc1 average was 3 indices.

This data indicates proper programming of the TMS570LC4355BZWTQQ1 with WriteNow tool. The data is summarized in Table 1 below.

Process Role	Name	Email
Code Reviewer	Vishwanathan Reddy	vishwanath.reddy@ti.com
Code Profiler	Pallavi Kulkarni	p-kulkarni@ti.com
CQE	Tim Nagel	nagel@ti.com

Table 1 - Data Summary

	ECU1	ECU2	ECU3	ECU4
Configuration	TMS570LC43xx	TMS570LC43xx	TMS570LC43xx	TMS570LC43xx
ASIC #	77169302	77169302	77169302	77169302
Flow Byte	0x7a18	0x7a18	0x7a18	0x7a18
Lot	63324	63324	63324	63324
Wafer	3	3	3	3
X	17	22	7	9
Y	25	2	21	7
Symbolization	TMS570LC4355BZWTQQ1	TMS570LC4355BZWTQQ1	TMS570LC4355BZWTQQ1	TMS570LC4355BZWTQQ1
Date Time Stamp	15-Dec-03 18:08:15	15-Dec-02 18:08:16	15-Dec-09 14:02:45	15-Dec-01 18:30:14

Profile Difference	ECU1	ECU2	ECU3	ECU4
Largest Vt_Min Delta	7	14	12	11
Largest Vt_Mean Delta	1	3	2	1
Largest Bcc_Min Delta	7	10	7	8
Largest Bcc_Mean Delta	3	3	2	2

Margin to Reference	ECU1	ECU2	ECU3	ECU4
Lowest Vt_Min Delta to Reference	59	65	44	48
Lowest Bcc_Min Delta to Reference	25	11	10	1