RELIABILITY REPORT

FOR

MAX5290BEUD+

PLASTIC ENCAPSULATED DEVICES

October 7, 2014

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX5290BEUD+ successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

Table of Contents

I. Device Description

A. General

The MAX5290-MAX5295 dual, 12-/10-/8-bit, voltage-output digital-to-analog converters (DACs) offer buffered outputs and a 3µs maximum settling time at the 12-bit level. The DACs operate from a 2.7V to 5.25V analog supply and a separate 1.8V to 3.6V digital supply. The 20MHz 3-wire serial interface is compatible with SPI(tm), QSPI(tm), MICROWIRE(tm), and digital signal processor (DSP) protocol applications. Multiple devices can share a common serial interface in direct access or daisy-chained configuration. The MAX5290-MAX5295 provide two multifunctional, user-programmable, digital I/O ports. The externally selectable power-up states of the DAC outputs are either zero scale, midscale, or full scale. Software-selectable FAST and SLOW settling modes decrease settling time in FAST mode, or reduce supply current in SLOW mode. The MAX5290/MAX5291 are 12-bit DACs, the MAX5292/MAX5293 are 10-bit DACs, and the MAX5294/MAX5295 are 8-bit DACs. The MAX5290/MAX5292/MAX5294 provide unity-gain-configured output buffers, while the MAX5291/MAX5293/MAX5295 provide force-sense-configured output buffers. The MAX5290-MAX5295 are specified over the extended -40°C to +85°C temperature range, and are available in space-saving 4mm x 4mm, 16-pin thin QFN and 6.5mm x 5mm, 14-pin and 16-pin TSSOP packages.

II. Manufacturing Information

A. Description/Function:	Buffered, Fast-Settling, Dual, 12-/10-/8-Bit, Voltage-Output DACs
B. Process:	C6Y
C. Number of Device Transistors:	16756
D. Fabrication Location:	Japan
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	October 25, 2003

III. Packaging Information

A. Package Type:	14-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0408
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	110°C/W
K. Single Layer Theta Jc:	30°C/W
L. Multi Layer Theta Ja:	100.4°C/W
M. Multi Layer Theta Jc:	30°C/W

IV. Die Information

A. Dimensions:	89X89 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.6 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Don Lipps (Manager, Reliability Engineering) Bryan Preeshl (Vice President of QA)
B. Outgoing Inspection Level:	0.1% for all electrical parameters guaranteed by the Datasheet. 0.1% for all Visual Defects.
C. Observed Outgoing Defect Rate:	< 50 ppm
D. Sampling Plan:	Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 96 \times 2}$$ (Chi square value for MTTF upper limit)

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 11.45 \times 10^{-9}$

λ = 11.45 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the C6Y Process results in a FIT Rate of 0.17 @ 25C and 2.89 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot ICW0AA007B D/C 0325)

The DB13 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1

Reliability Evaluation Test Results

MAX5290BEUD+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	48	0	ICW4CA006A, D/C 0438
	Biased	& functionality	48	0	ICW1AA007B, D/C 0326
	Time = 192 hrs.				

Note 1: Life Test Data may represent plastic DIP qualification lots