RELIABILITY REPORT

FOR

MX7537JN+

PLASTIC ENCAPSULATED DEVICES

May 16, 2017

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

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Conclusion

The MX7537JN+ 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.

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I. Device Description

A. General

The Maxim MX7537/MX7547 contain two 12-bit current-output multiplying digital-to-analog converters (DAC) in a single package. Input level shifters, data registers and control logic make microprocessor interfacing straight forward. Operation is from a single +12V to +15V power supply maintaining TTL, 74HC and 5V CMOS logic compatibility. The MX7547 accepts active-low CSA, active-low CSB, active-low WR control signals and 12 data inputs for DAC selection and full parallel data loading. The MX7537 receives data in 2 bytes, using a right justified 8+4 format. A0, A1, active-low CS, active-low WR and UPD signals provide full control for DAC selection and data loading. Each of the DACs in the MX7537/MX7547 provides 4-quadrant multiplication capabilities and separate reference input and feedback resistor pins. The MX7537 additionally makes available separate AGND pins for applications where each DAC is biased at a difference voltage. Since both DACs are on a single monolithic chip, matching and temperature tracking between them is excellent. Gain error is specified at less than ±1 LSB, and 12-bit linearity and monotonicity are guaranteed over the full operating temperature ranges. Maxim's MX7537 and MX7547 are available in narrow 24-lead 0.3" DIP and Wide SO, as well as, 28-pin-lead PLCC packages.

II. Manufacturing Information

A. Description/Function:	CMOS, Parallel Loading, Dual, 12-Bit Multiplying DAC
B. Process:	SG5
C. Fabrication Location:	USA
D. Assembly Location:	Philippines
E. Date of Initial Production:	Pre 1997

III. Packaging Information

A. Package Type:	24-pin PDIP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0401-0365
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:	75°C/W
K. Single Layer Theta Jc:	30°C/W
L. Multi Layer Theta Ja:	N/A°C/W
M. Multi Layer Theta Jc:	N/A°C/W

IV. Die Information

A. Dimensions:	157X137 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	5.0 microns (as drawn)
F. Minimum Metal Spacing:	5.0 microns (as drawn)
G. Isolation Dielectric:	SiO_2
H. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Eric Wright (Reliability Engineering) Brian Standley (Manager, Reliability) 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 480 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 2.29 \times 10^{-9}$

$\lambda = 2.29$ 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 SG5 Process results in a FIT Rate of 0.12 @ 25C and 2.04 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The DA11-1 die type has been found to have all pins able to withstand an HBM transient pulse of +/-1500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-50mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MX7537JN+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	480	0	

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