



RELIABILITY REPORT
FOR
MAX1454AUE/V+T
PLASTIC ENCAPSULATED DEVICES

January 10, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Quality Assurance
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Conclusion

The MAX1454AUE/V+T successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

Table of Contents

I.Device Description	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX1454 is a highly integrated analog sensor signal conditioner targeted for automotive applications. The device provides amplification, calibration, and temperature compensation to enable an overall performance approaching the inherent repeatability of the sensor. The fully analog signal path introduces no quantization noise in the output signal while enabling digitally controlled trimming of the output. Offset and span are calibrated with integrated 16-bit DACs, allowing sensors to be truly interchangeable. The device architecture includes a programmable sensor excitation, a 32-step programmable-gain amplifier (PGA), a 2K x 8 bits internal flash memory, four 16-bit DACs, and an on-chip temperature sensor. In addition to offset and span compensation, the device provides a unique temperature-compensation method for offset TC and FSO TC to provide a remarkable degree of flexibility while minimizing manufacturing costs. The device is packaged in a 16-pin TSSOP and covers the automotive AEC-Q100 Grade 1 temperature range of -40°C to +125°C.

II. Manufacturing Information

A. Description/Function:	Precision Sensor Signal Conditioner with Overvoltage Protection
B. Process:	S45 / TS25
C. Number of Device Transistors:	
D. Fabrication Location:	USA / Taiwan
E. Assembly Location:	Thailand
F. Date of Initial Production:	June 24, 2011

III. Packaging Information

A. Package Type:	16-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:	#31-4873
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:	106°C/W
K. Single Layer Theta Jc:	27°C/W
L. Multi Layer Theta Ja:	90°C/W
M. Multi Layer Theta Jc:	27°C/W

IV. Die Information

A. Dimensions:	100 x 25 mils	106 x 82 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)	
C. Interconnect:	Al/0.5%Cu	
D. Backside Metallization:	None	
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn) Metal1 = 0.32 / Metal2-4 = 0.4 microns (as drawn)	
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn) Metal1 = 0.32 / Metal2-4 = 0.4 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: Richard Aburano (Manager, Reliability Engineering)
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the S45 Process results in a FIT Rate of 0.06 @ 25C and 1.0 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NHGUAAFB, D/C 1140)

The SC24 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX1454AUE/V+T

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	80	0	NHGUAAFB, D/C 1140

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