

RELIABILITY REPORT
FOR
MAX30112EWG+T
WAFER LEVEL DEVICES

January 21, 2018

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

 Eric Wright Reliability Engineer	 Brian Standley Manager, Reliability
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Conclusion

The MAX30112EWG+T 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 MAX30112 is a complete optical pulse oximetry and heart rate detection integrated analog front-end. The MAX30112 has a high-resolution, optical readout signal-processing channel with built-in ambient light cancellation, as well as high-current LED driver DACs, to form a complete optical readout signal chain. With external LED(s) and photo diode(s), the MAX30112 offers the lowest power, highest performance heart rate detection solution for wrist applications. The MAX30112 operates on a 1.8V main supply voltage, with a separate 3.1V to 5.25V LED driver power supply. The device supports a standard I2C compatible interface, as well as shutdown modes through the software with near-zero standby current, allowing the power rails to remain powered at all times.

II. Manufacturing Information

A. Description/Function:	Optimized Pulse-Oximeter and Heart Rate AFE for Wearable Health
B. Process:	S18
C. Number of Device Transistors:	331434
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	June 7, 2017

III. Packaging Information

A. Package Type:	24-bump WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	None
E. Bondwire:	N/A (N/A mil dia.)
F. Mold Material:	None
G. Assembly Diagram:	#05-100293
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:	N/A°C/W
K. Single Layer Theta Jc:	N/A°C/W
L. Multi Layer Theta Ja:	53.04°C/W
M. Multi Layer Theta Jc:	N/A°C/W

IV. Die Information

A. Dimensions:	78.7401X110.2362 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Minimum Metal Width:	0.23 microns (as drawn)
E. Minimum Metal Spacing:	0.23 microns (as drawn)
F. Isolation Dielectric:	SiO ₂
G. 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:

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

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

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

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

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 S18 Process results in a FIT Rate of 0.40 @ 25C and 6.96 @ 55C (0.8 eV, 60% UCL)

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

The OS53 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2000V 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

MAX30112EWG+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	

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