RELIABILITY REPORT

FOR

MAX16152ABAD+
MAX16152ABAD+T

May 21, 2020

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

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Conclusion

The MAX16152 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 MAX16152/MAX16153/MAX16154/MAX16155 ultra-low-current supervisory circuits monitor a single system supply voltage and the integrity of code execution by a microprocessor or microcontroller. These supervisors assert the reset output whenever the V_{CC} supply voltage is greater than the minimum operating voltage, but less than the reset threshold. After the supply voltage rises above the reset threshold, the reset output remains asserted for the reset timeout period, and then de-asserts. Reset voltage thresholds are available from 1.50V to 5.0V in approximately 100mV increments.

A watchdog timer circuit monitors microprocessor or microcontroller activity. During normal operation, the microprocessor or microcontroller should repeatedly toggle the watchdog input (WDI) before the supervisor's watchdog timeout period elapses to confirm that the system is executing code properly. If the microprocessor or microcontroller does not provide a valid watchdog input transition before the timeout period expires, the supervisor asserts a watchdog (active-low WDO) output to signal that the system is not executing code as expected. The watchdog output pulse can be used to reset the microprocessor or microcontroller, or it may be used to interrupt the system to warn of execution errors. The MAX16152 and MAX16153 feature a manual reset input (active-low MR) to allow an external pushbutton or logic signal to initiate a reset pulse. The MAX16154 and MAX16155 feature a logic input (WD_EN) that allows the system to enable and disable the watchdog function.

II. Manufacturing Information

A. Description/Function:	nanoPower Supervisor and Watchdog Timer
B. Process:	S18
C. Device Count:	24250
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	August 2019

III. Packaging Information

A. Package Type:	WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	N/A
E. Bondwire:	N/A
F. Mold Material:	N/A
G. Assembly Diagram:	05-101247
H. Flammability Rating:	N/A
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	95.15 °C/W
M. Multi Layer Theta Jc:	N/A

IV. Die Information

A. Dimensions:	50X33.8583 mils
B. Passivation:	Si_3N_4/SiO_2

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ryan Wall (Manager, Reliability) Michael Cairnes (Executive Director, Reliability) Bryan Preeshl (SVP 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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate λ is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192\ x\ 2454\ x\ 77\ x\ 2}$$ (Chi square value for MTTF upper limit)

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 25.25\ x\ 10^{-9}$$

$$\lambda = 25.25\ FITs\ (60\%\ confidence\ level\ @25°C)$$

Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at https://www.maximintegrated.com/en/support/qa-reliability/reliability/reliability-monitor-program.html.

S18 cumulative process data:

$$\lambda = 0.02\ FITs\ (60\%\ confidence\ level\ @25°C)$$
$$\lambda = 0.24\ FITs\ (60\%\ confidence\ level\ @55°C)$$

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

The MAX16152 has been found to withstand an HBM transient pulse of +/- 2500 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands +/- 250 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1

Reliability Evaluation Test Results

MAX16155ABAD+ (Note 1)

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 2)					
	Ta = 125C Biased Time = 192 hrs.	DC Parameters & functionality	77	0	R40776

Note 1: MAX16155ABAD+ and MAX16152ABAD+ are the same silicon

Note 2: Life Test Data may represent plastic DIP qualification lots.