

RELIABILITY REPORT

FOR

MAX14722ATP+  
MAX14722ATP+T

PLASTIC ENCAPSULATED DEVICES

November 8, 2018

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

A handwritten signature in black ink, appearing to read 'Gerena'.

Norbert Paul Gerena  
Engineer, Reliability

A handwritten signature in black ink, appearing to read 'Standley'.

Brian Standley  
Manager, Reliability

## Conclusion

The MAX14722 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 MAX14721–MAX14723 adjustable overvoltage, undervoltage, and overcurrent protection devices guard systems against overcurrent faults in addition to positive overvoltage and reverse-voltage faults. When used with an optional external p-channel MOSFET, the devices also protect downstream circuitry from voltage faults up to +60V, -60V (for -60V external pFET rating). The devices feature a low, 76mΩ, on-resistance integrated FET. During startup, the devices are designed to charge large capacitances on the output in a continuous mode for applications where large reservoir capacitors are used on the inputs to downstream devices. Additionally, the MAX14721–MAX14723 feature a dual-stage, current-limit mode in which the current is continuously limited to 1x, 1.5x, and 2x the programmed limit, respectively, for a short time after startup. This enables faster charging of large loads during startup.

**II. Manufacturing Information**

A. Description/Function:	High-Accuracy, Adjustable Power Limiters
B. Process:	S18
C. Device Count	22179
D. Fabrication Location:	Japan
E. Assembly Location:	Taiwan
F. Date of Initial Production:	December 15, 2014

**III. Packaging Information**

A. Package Type:	TQFN
B. Lead Frame:	Cu194
C. Lead Finish:	Matte Tin
D. Die Attach:	EN4900G
E. Bondwire:	Cu (2.00 mil dia.)
F. Mold Material:	G700LA
G. Assembly Diagram:	05-9000-5795
H. Flammability Rating:	UL-94 (V-0 Rating)
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	48 °C/W
K. Single Layer Theta Jc:	2 °C/W
L. Multi Layer Theta Ja:	32 °C/W
M. Multi Layer Theta Jc:	3 °C/W

**IV. Die Information**

A. Dimensions:	109.8425X87.7953 mils
B. Passivation:	SiO <sub>2</sub> /Si <sub>3</sub> N <sub>4</sub>

## V. Quality Assurance Information

- |                                   |  |
|-----------------------------------|--|
| A. Quality Assurance Contacts:    | Norbert Gerena (Engineer, Reliability)<br>Brian Standley (Manager, Reliability)<br>Bryan Preeshl (SVP of QA) |
| B. Outgoing Inspection Level:     | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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  $\lambda$  is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 79 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 13.9 \times 10^{-9}$$

$$\lambda = 13.9 \text{ FITs (60\% confidence level @25°C)}$$

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>.

Epson S18 Quarterly Process FIT from Q2FY18

$$\lambda = 0.2 \text{ FITs (60\% confidence level @25°C)}$$

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

The MAX14722 has been found to have all pins able to withstand an HBM transient pulse of +/- 2500 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands +/- 100 mA current injection and supply overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results  
MAX14721ATP+T (MAX14722ATP+ QBS)

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	79	0	

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