

RELIABILITY REPORT

FOR

MAX17701ATG+

MAX17701ATG+T

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MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134



Sheena Karlyn Basinang
Engineer, Reliability



Ryan Wall
Manager, Reliability

Conclusion

The MAX17701 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.

Table of Contents

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

I. Device Description

A. General

The Himalaya series of voltage regulator ICs, power modules, and chargers enable cooler, smaller, and simpler power supply solutions. The MAX17701 is a high efficiency, high voltage, Himalaya synchronous, step-down, supercapacitor charger controller designed to operate over an input-voltage range of a 4.5V to 60V. The MAX17701 operates over a -40°C to +125°C industrial temperature range and charges a supercapacitor with a $\pm 4\%$ accurate constant current. After the supercapacitor is charged, the device regulates the no-load output voltage with $\pm 1\%$ accuracy. The output voltage is programmable from 1.25V up to (VDCIN - 4V).

The MAX17701 supercapacitor charger controller is designed to provide a holistic application solution requiring backup energy storage with a precise charging capability. The device uses an external nMOSFET to provide input supply-side short-circuit protection; thus, preventing supercapacitor discharge.

The MAX17701 provides a safety timer (TMR) feature to set the maximum allowed constant current (CC) mode charging time. The device features an uncommitted comparator, which can be used to detect an output overvoltage event (OVI) and prevent the supercapacitor from overcharging. The MAX17701 is available in a 24-pin 4mm x 4mm TQFN package with an exposed pad.

II. Manufacturing Information

A. Description/Function:	4.5V to 60V, Synchronous Step-Down Supercapacitor Charger Controller
B. Process:	S18
C. Device Count:	67000
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	May 26, 2020

III. Packaging Information

A. Package Type:	TQFN-CU
B. Lead Frame:	T2444+5C
C. Lead Finish:	Matte Tin
D. Die Attach:	EN4900G
E. Bondwire:	0.8 mil CuPd
F. Mold Material:	G700LA
G. Assembly Diagram:	05-101424
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:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	N/A
M. Multi Layer Theta Jc:	N/A

IV. Die Information

A. Dimensions:	81.1023X95.669 mils
B. Passivation:	SiN/SiO2

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 125°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate λ is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 2454 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 24.30 \times 10^{-9}$$

$$\lambda = 24.30 \text{ FITs (60\% confidence level @25°C)}$$

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>.

S18 cumulative process Fit

$$\lambda = 0.02 \text{ FITs (60\% confidence level @25°C)}$$

$$\lambda = 0.24 \text{ FITs (60\% confidence level @55°C)}$$

B. ESD and Latch-Up Testing

The MAX17701 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 ± 250 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results
MAX17701ATG+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C Biased Time = 192 hrs.	DC parameters & functionality	80	0	

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