RELIABILITY REPORT

FOR

MAX15158AATJ+
MAX15158AATJ+T
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PLASTIC ENCAPSULATED DEVICES

November 6, 2018

MAXIM INTEGRATED

160 RIO ROBLES

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Conclusion

The MAX15158/MAX15158A 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

MAX15158/MAX15158A is a high-voltage multiphase boost controller designed to support up to two MOSFET drivers and four external MOSFETs in single-phase or dual-phase boost/inverting-buck-boost configurations. Two devices can be stacked up for quad-phase operation. The output voltage of MAX15158 can be dynamically set through the 1V to 2.2V reference input (REFIN) for modular design support. For MAX15158A the REFIN pin is removed, and the internal 2.0V reference voltage is selected by default.

The switching frequency is controlled either through an external resistor setting the internal oscillator or by synchronizing the regulator to an external clock. The device is designed to support 120kHz to 1MHz switching frequencies. The controller has a dedicated enable/input undervoltage-lockout (EN/UVLO) pin to configure for flexible power sequencing.

MAX15158/MAX15158A has a dedicated RAMP pin to adjust internal slope compensation. The device features adjustable hiccup peak current protection. The device incorporates current sense amplifiers to accurately measure the current of each phase across external sense resistors to implement accurate phase current sharing. The controller is also protected against output overvoltage, input undervoltage and thermal shutdown.

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II. Manufacturing Information

A. Description/Function:	High-Voltage Multiphase Boost Controller
B. Process:	S18
C. Device Count	67799
D. Fabrication Location:	Japan
E. Assembly Location:	Thailand
F. Date of Initial Production:	October 12, 2018

III. Packaging Information

A. Package Type:	TQFN
B. Lead Frame:	Cu194
C. Lead Finish:	Matte Tin
D. Die Attach:	AB8200T
E. Bondwire:	Au (1.00 mil dia.)
F. Mold Material:	G770HCD
G. Assembly Diagram:	05-100932
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:	47 °C/W
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	36 °C/W
M. Multi Layer Theta Jc:	3 °C/W

IV. Die Information

A. Dimensions:	94.4882X94.4882 mils
B. Passivation:	SiO_2/Si_3N_4

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V. Quality Assurance Information

A. Quality Assurance Contacts:	Norbert Gerena (Engineer, Reliability) Brian Standley (Manager, 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:

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

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

$$\lambda = 24.31\ x\ 10^{-9}$$

$$\lambda = 24.31\ FITs\ (60\%\ confidence\ level\ @25°C)$$

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

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

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

The MAX15158 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.

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Table 1
Reliability Evaluation Test Results

MAX15158ATJ+

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

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

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