RELIABILITY REPORT

FOR

MAX15090BEWI+,

MAX15090BEWI+T,

MAX15090CEWI+,

MAX15090CEWI+T

October 3, 2015

Revised
October 9, 2020

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX15090B / MAX15090C successfully met 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

A. General

The MAX15090/MAX15090B/MAX15090C ICs are integrated solutions for hot-swap applications requiring the safe insertion and removal of circuit line cards from a live backplane. The devices integrate a hot-swap controller, 6mΩ power MOSFET, and an electronic circuit-breaker protection in a single package. The devices integrate an accurate current-sense circuitry and provide 220µA/A of proportional output current. The devices are designed for protection of 2.7V to 18V supply voltages. These devices implement a fold back current limit during startup to control inrush current lowering di/dt and keep the MOSFET operating under safe operating area (SOA) conditions. After the startup cycle is complete, on-chip comparators provide VariableSpeed/BiLevel^{tm} protection against short-circuit and overcurrent faults, and immunity against system noise and load transients. The load is disconnected in the event of a fault condition. The devices are factory calibrated to deliver accurate overcurrent protection with ±10% accuracy. During a fault condition, the MAX15090 latches off, while the MAX15090B/MAX15090C enters auto retry mode. The devices feature an IN to OUT short-circuit detection before startup. The devices provide a power-MOSFET GATE pin to program the slew rate during startup by adding an external capacitor. The devices have overvoltage/undervoltage input pins that can detect an overvoltage/undervoltage fault and disconnect the IN from the OUT. Additional features include internal over temperature protection, power-good output, and fault-indicator output. The MAX15090/MAX15090B/MAX15090C are available in a 28-bump, 2.07mm x 3.53mm, power wafer-level package (WLP) and are rated over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	2.7V to 18V, 12A, Hot-Swap Solution with Current Report Output
B. Process:	S18
C. Number of Device Transistors:	11259
D. Fabrication Location:	USA
E. Assembly Location:	Japan
F. Date of Initial Production:	June 28, 2015

III. Packaging Information

A. Package Type:	28-bump WLP HC
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:	#05-9000-5023
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:	42°C/W
M. Multi Layer Theta Jc:	7°C/W

IV. Die Information

A. Dimensions:	140.1574 X 82.6771 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.23 microns (as drawn)
F. Minimum Metal Spacing:	0.23 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Don Lipps (Manager, Reliability Engineering) 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 160 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 6.86 \times 10^{-9}$

$\lambda = 6.86$ F.I.T. (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

MAX15090 has been found to have all pins able to withstand an HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX15090EWI+/ MAX15090CEWI+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	MAX15090EWI+ SAIV5Q001
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	MAX15090CEWI+ JCGC7Q001

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

Revision History:

Rev. A (Oct. 2015)

- Initial Release

Rev. B (Oct. 2020)

- Added MFN fabrication site Life Test data and adjusted FIT (λ) accordingly.
- Updated cumulative process FIT