RELIABILITY REPORT

FOR

MAX15301ETJ+

PLASTIC ENCAPSULATED DEVICES

November 7, 2014

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX15301ETJ+ 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 MAX15301 is a full featured, flexible, efficient, automatically compensated digital point-of-load controller with advanced power management and telemetry features. Using advanced algorithms, the MAX15301 achieves the highest levels of efficiency and transient response over the full range of operating conditions. The MAX15301 is based on Maxim's patented InTune(™) automatically compensated, state-space controller. The InTune technology autonomously compensates for unknown loop conditions yielding good transient response while ensuring stability. The InTune compensator's control law is valid over the complete control surface. This eliminates the need for users to determine and set thresholds associated with transitioning from linear to nonlinear modes. Additionally, the InTune controller is the only PWM controller that accounts for duty-cycle saturation effects ensuring accurate small-signal and large-signal loop response. The advanced feature of the digital controller implementation reduces the number of output capacitors needed to meet system requirements resulting in more efficient, smaller footprint, cost-effective solutions. The MAX15301 includes an advanced, high-efficiency driver for external MOSFET gate drive. This driver features adaptive nonoverlap timing to optimize efficiency. Unlike competing drivers, the InTune driver continuously adapts to changes in load, voltage, and current. An on-board PMBus-compliant serial bus enables the MAX15301 to communicate with a system supervisory host controller for monitoring and advanced fault management. The MAX15301 is available in a 32-lead TQFN-EP package and operates over the -40°C to +85°C temperature range.

II. Manufacturing Information

    A. Description/Function: InTune Automatically Compensated Digital PoL Controller with Driver and PMBus Telemetry

    B. Process: TS18 / S18

    C. Number of Device Transistors:

    D. Fabrication Location: Taiwan and USA

    E. Assembly Location: Taiwan, Thailand

    F. Date of Initial Production: June 24, 2011

III. Packaging Information

    A. Package Type: 32L TQFN Hybrid

    B. Lead Frame: Copper

    C. Lead Finish: 100% matte Tin

    D. Die Attach: Conductive

    E. Bondwire: Au (1 mil dia.)

    F. Mold Material: Epoxy with silica filler

    G. Assembly Diagram: #31-4877

    H. Flammability Rating: Class UL94-V0

    I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C   1

    J. Single Layer Theta Ja: 47°C/W

    K. Single Layer Theta Jc: 1.7°C/W

    L. Multi Layer Theta Ja: 29°C/W

    M. Multi Layer Theta Jc: 1.7°C/W

IV. Die Information

    A. Dimensions: 75.1x140.1 mils / 44.5x125.2 mils

    B. Passivation: Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)

    C. Interconnect: Al/0.5%Cu

    D. Backside Metallization: None

    E. Minimum Metal Width: Metal1 = 0.23 / Metal2-4 = 0.28 / Metal5 = 0.44 microns (as drawn)
                                               Metal1 = 0.23 / Metal2-3 = 0.28 / Metal 4 = 2.6 microns (as drawn)

    F. Minimum Metal Spacing: Metal1 = 0.23 / Metal2-4 = 0.28 / Metal5 = 0.46 microns (as drawn)
                                               Metal1 = 0.23 / Metal2-3 = 0.28 / Metal 4 = 3.0 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 90C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000 \times 260.5 \times 238 \times 2} \quad \text{(Chi square value for MTTF upper limit)}$$

(where 260.5 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 14.8 \times 10^{-9}$

$\lambda = 14.8$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the TS18 / S18 Process results in a FIT Rate of 0.11 @ 25C and 1.87 @ 55C (0.8 eV, 60% UCL).

    B. E.S.D. and Latch-Up Testing (ESD lot NAJP1BC3 D/C 1320, Latch-Up lot NHITAADA4 D/C 1125)

The LC06 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 2500V per JEDEC JESD22-A114
ESD-CDM:	+/-750V per JEDEC JESD22-C101
ESD-MM:	+/-200V per JEDEC JESD22/A115

Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX15301ETJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 90°C	DC Parameters	78	0	NAJP1AQ3, D/C 1312
	Biased	& functionality	80	0	NAJP1AQ2, D/C 1312
	Time = 1000 hrs.		80	0	NAJP1AQ1, D/C 1312

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