RELIABILITY REPORT

FOR

MAX1813EEI+

PLASTIC ENCAPSULATED DEVICES

August 18, 2013

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX1813EEI+ 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 MAX1813 step-down controller is intended for core CPU DC-DC converters in notebook computers. The controller features a dynamically adjustable output (5-bit DAC), ultra-fast transient response, high DC accuracy, and high efficiency necessary for leading-edge CPU core power supplies. Maxim's proprietary Quick-PWM™ quick-response, constant-on-time PWM control scheme handles wide input/output voltage ratios with ease and provides 100ns “instant-on” response to load transients while maintaining a relatively constant switching frequency. The MAX1813 is designed specifically for CPU core applications requiring a voltage-positioned supply. The voltage-positioning input (VPCS), combined with a high-DC-accuracy control loop, is used to implement a power supply that modifies its output set point in response to the load current. This arrangement decreases full-load power dissipation and reduces the required number of output capacitors. The output voltage can be dynamically adjusted through the 5-bit digital-to-analog converter (DAC) inputs over a 0.600V to 2V range. The MAX1813 includes an internal multiplexer that selects between three different DAC code settings. The first two inputs are controlled by five digital input pins (D0-D4). The third input is used for the suspend mode and controlled by two 4-level input pins (S0, S1). Output voltage transitions are accomplished with a proprietary precision slew-rate control that minimizes surge currents to and from the battery while guaranteeing “just-in-time” arrival at the new DAC setting. The MAX1813's 28V input range enables single-stage buck conversion from high-voltage batteries for the maximum possible efficiency. Alternatively, the controller's high-frequency capability combined with two-stage conversion (stepping down the +5V system supply instead of the battery) allows the smallest possible physical size. The MAX1813 is available in a 28-pin QSOP package.

II. Manufacturing Information

A. Description/Function:	Dynamically-Adjustable, Synchronous Step-Down Controller with Integrated Voltage Positioning
B. Process:	S12
C. Number of Device Transistors:	
D. Fabrication Location:	USA
E. Assembly Location:	Malaysia, Philippines and Thailand
F. Date of Initial Production:	April 27, 2001

III. Packaging Information

A. Package Type:	28-pin QSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-2301-0110
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:	93°C/W
K. Single Layer Theta Jc:	27°C/W
L. Multi Layer Theta Ja:	79.3°C/W
M. Multi Layer Theta Jc:	27°C/W

IV. Die Information

A. Dimensions:	141 X 86 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.8 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:	Richard Aburano (Manager, Reliability Engineering) 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:

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

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

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

λ = 13.9 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 S12 Process results in a FIT Rate of 0.03 @ 25C and 0.5 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot N1W0CA054F, D/C 1142)

The PY64 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78, except pin 3 (SKP/$\overline{SHDN}$) which passes +100mA/-25mA.

Table 1

Reliability Evaluation Test Results

MAX1813EEI+

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	79	0	N1W0CA004A, D/C 0305

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