RELIABILITY REPORT

FOR

MAX15023ETG+

PLASTIC ENCAPSULATED DEVICES

August 28, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Richard Aburano
Quality Assurance
Manager, Reliability Operations

Conclusion

The MAX15023ETG+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim"s continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim"s quality and reliability standards.

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I. Device Description

A. General

The MAX15023 dual, synchronous step-down controller operates from a 5.5V to 28V or 5V ±10% input voltage range and generates two independent output voltages. Each output is adjustable from 85% of the input voltage down to 0.6V and supports loads of 12A or higher. Input voltage ripple and total RMS input ripple current are reduced by interleaved 180° out-of-phase operation. The MAX15023 offers the ability to adjust the switching frequency from 200kHz to 1MHz with an external resistor. The MAX15023's adaptive synchronous rectification eliminates the need for external freewheeling Schottky diodes. The device also utilizes the external low-side MOSFET's on-resistance as a current-sense element, eliminating the need for a current-sense resistor. This protects the DC-DC components from damage during output overloaded conditions or output short-circuit faults without requiring a current-sense resistor. Hiccup-mode current limit reduces power dissipation during short-circuit conditions. The MAX15023 includes two independent power-good outputs and two independent enable inputs with precise turn-on/turn-off thresholds, which can be used for supply monitoring and for power sequencing. Additional protection features include cycle-by-cycle, low-side, sink peak current limit, and thermal shutdown. Cycle-by-cycle, low-side, sink peak current limit prevents reverse inductor current from reaching dangerous levels when the device is sinking current from the output. The MAX15023 also allows prebiased startup without discharging the output and features adaptive internal digital soft-start. This new proprietary feature enables monotonic charging of externally large output capacitors at startup, and achieves good control of the peak inductor current during hiccup-mode short-circuit protection. The MAX15023 is available in a space-saving and thermally enhanced 4mm x 4mm, 24-pin TQFN-EP package. The device operates over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	Wide 4.5V to 28V Input, Dual-Output Synchronous Buck Controller
B. Process:	S4
C. Number of Device Transistors:	8327
D. Fabrication Location:	Texas
E. Assembly Location:	ASAT China, ISPL Philippines, UTL Thailand, Unisem Malaysia
F. Date of Initial Production:	7/26/08

III. Packaging Information

A. Package Type:	24-pin TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	48°C/W
K. Single Layer Theta Jc:	2.7°C/W
L. Multi Layer Theta Ja:	36°C/W
M. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	89 X 89 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering) Bryan Preeshl (Managing Director 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48\ 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.4 \times 10^{-9}$

$\lambda = 22.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com/. Current monitor data for the S4 Process results in a FIT Rate of 4.6 @ 25C and 79.2 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The NQ05 die type has been found to have all pins able to withstand a HBM transient pulse of

HBM ESD: +/-2500V per JESD22-A114
MM ESD: +/-250V per JESD22-A115
CDM ESD: +/-750V per JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCmax OverVoltage.

Table 1
Reliability Evaluation Test Results

MAX15023ETG+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data