



RELIABILITY REPORT  
FOR  
MAX17003AETJ+  
PLASTIC ENCAPSULATED DEVICES

June 30, 2011

**MAXIM INTEGRATED PRODUCTS**

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<b>Approved by</b>
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## Conclusion

The MAX17003AETJ+ 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 MAX17003A/MAX17004A are dual step-down, switch-mode, power-supply (SMPS) controllers with synchronous rectification, intended for main 5V/3.3V power generation in battery-powered systems. Fixed-frequency operation with optimal interleaving minimizes input ripple current from the lowest input voltages up to the 26V maximum input. Optimal 40/60 interleaving allows the input voltage to go down to 8.3V before duty-cycle overlap occurs, compared to 180° out-of-phase regulators where the duty-cycle overlap occurs when the input drops below 10V. Output current sensing provides peak current-limit protection, using either an accurate sense resistor or using lossless inductor DCR current sensing. A low-noise mode maintains high light-load efficiency while keeping the switching frequency out of the audible range. An internal, fixed 5V, 100mA linear regulator powers up the MAX17003A/MAX17004A and their gate drivers, as well as external keep-alive loads. When the main PWM regulator is in regulation, an automatic bootstrap switch bypasses the internal linear regulator, providing current up to 200mA. An additional adjustable linear-regulator driver with an external pnp transistor can be used with a secondary winding to provide a 12V supply, or powered directly from the main outputs to generate low-voltage outputs as low as 1V. Independent enable controls and power-good signals allow flexible power sequencing. Voltage soft-start gradually ramps up the output voltage and reduces inrush current, while soft-discharge gradually decrease the output voltage, preventing negative voltage dips. The MAX17003A/MAX17004A feature output undervoltage and thermal-fault protection. The MAX17003A also includes output overvoltage-fault protection. The MAX17003A/MAX17004A are available in a 32-pin, 5mm x 5mm thin QFN package. The exposed backside pad improves thermal characteristics for demanding linear keep-alive applications.

## II. Manufacturing Information

A. Description/Function:	High-Efficiency, Quad Output, Main Power-Supply Controllers for Notebook Computers
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	April 21, 2007

## III. Packaging Information

A. Package Type:	32-pin TQFN 5x5
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:	#05-9000-1604 / A
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:	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:	109 X 108 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 141 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 7.8 \times 10^{-9}$$

$$\lambda = 7.8 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (ESD lot TXW6BA015C D/C 1018, Latch-up lot TXW1CQ001A D/C 0613)

The PD44-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-400V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX17003AETJ+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C	DC Parameters	47	0	TXW4BA015A, D/C 0719
	Biased	& functionality	47	0	TXW0GA014A, D/C 0629
	Time = 192 hrs.		47	0	SXW0DQ003B, D/C 0552

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