

RELIABILITY REPORT
FOR
MAX16024LTB+
(MAX16023/MAX16024)
PLASTIC ENCAPSULATED DEVICES

December 2, 2008

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX16024LTB+ 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.

Table of Contents

I.Device Description	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX16023/MAX16024 low-power battery-backup circuits with a regulated output are capable of delivering up to 100mA output current. The MAX16023/MAX16024 include a low-dropout regulator, a microprocessor (μ P) reset circuit, and a battery switchover circuit. Additional available features include a manual reset, a power-fail comparator, and a battery-on indicator. These devices reduce the number of external components to minimize board space and improve reliability.

The MAX16023/MAX16024 are ideally suited for providing power for backing up critical memory such as static random-access memory (SRAM) or real-time clocks (RTCs). The regulated output is powered by V_{CC} when it is present and switches over to the backup power during brownout. The MAX16023/MAX16024 accept an input voltage from 1.53V to 5.5V and provide fixed standard output voltages of 1.2V, 1.8V, 2.5V, 3.0V, and 3.3V. The MAX16024 offers the ability to externally set the output voltage using a resistive divider. All outputs are available with push-pull or open-drain configurations.

The MAX16023 offers a power-fail comparator for monitoring an additional voltage or for providing an early power-fail warning. Another feature includes a manual-reset input (MAX16023/MAX16024). The MAX16024 also features a battery-on indicator and chip-enable gating function.

The MAX16023/MAX16024 are offered in 8- and 10-pin TDFN packages and are fully specified from -40°C to $+85^{\circ}\text{C}$ temperature range.

II. Manufacturing Information

A. Description/Function:	Battery-Backup Circuits with Regulated Output Voltage
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	Texas
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	7/26/2008

III. Packaging Information

A. Package Type:	10-pin TDFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 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:	54°C/W
K. Single Layer Theta Jc:	8.5°C/W
L. Multi Layer Theta Ja:	41°C/W
M. Multi Layer Theta Jc:	8.5°C/W

IV. Die Information

A. Dimensions:	63 X 88 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
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 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 96 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 11.2 \times 10^{-9}$$

$$\lambda = 11.2 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 B8 Process results in a FIT Rate of 2.71 @ 25C and 17.30 @ 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 MS98-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114-D. Latch-Up testing per JESD78 has shown that this device withstands an I-Test of +/-250mA and a V-Test of +/-1.5 VccMax.

Table 1
Reliability Evaluation Test Results

MAX16024LTB+

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	96	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