

RELIABILITY REPORT  
FOR  
MAX7307ALB+  
PLASTIC ENCAPSULATED DEVICES

April 1, 2010

**MAXIM INTEGRATED PRODUCTS**

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<b>Approved by</b>

Quality Assurance
T. J. [unclear], Reliability Engineering

## Conclusion

The MAX7307ALB+ 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 MAX7306/MAX7307 I<sup>2</sup>C-/SMBus(tm)-compatible, serial-interfaced peripherals feature four level-translating I/Os and operate from a 1.62V to 3.6V power supply. The MAX7307 features a port supply (VLA) that allows level translation on I/O ports to operate from a separate power supply from 1.4V to 5.5V. The MAX7306 features an address select input (AD0) to allow up to four unique slave addresses. The MAX7306/MAX7307 ports P2, P3, and P4 can be configured as inputs, push-pull outputs, and open-drain outputs. Port P1 can be configured as a general-purpose input, open-drain output, or an open-drain active-low INT output. Ports P2 and P3 can be configured as OSCIN and OSCOUT, respectively. The MAX7306/MAX7307 include an internal oscillator for PWM, blink, and key debounce, or to cascade multiple MAX7306/MAX7307s. The external clock can be used to set a specific PWM and blink timing. The active-low RST input asynchronously clears the 2-wire interface and terminates a bus lockup involving the MAX7306/MAX7307. All ports configured as output feature 33-step PWM, allowing any output to be set from fully off, 1/32 to 31/32 duty cycle, to fully on. All output ports also feature LED blink control, allowing blink periods of 1/8 second, 1/4 second, 1/2 second, 1, 2, 4, or 8 seconds. Any port can blink during this period with a 1/16 to 15/16 duty cycle. The MAX7306/MAX7307 are specified over the -40°C to +125°C temperature range and are available in 10-pin µDFN (2mm x 2mm) and 10-pin µMAX® packages.

**II. Manufacturing Information**

A. Description/Function:	SMBus/I <sup>2</sup> C Interfaced 4-Port, Level-Translating GPIOs and LED Drivers
B. Process:	S45
C. Number of Device Transistors:	
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Thailand
F. Date of Initial Production:	XXXXXXXXXXXXXXXXXXXX   XXXXX

**III. Packaging Information**

A. Package Type:	10-pin uDFN
B. Lead Frame:	Substrate
C. Lead Finish:	Gold
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2566
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:	n/a
K. Single Layer Theta Jc:	n/a
L. Multi Layer Theta Ja:	198.6°C/W
M. Multi Layer Theta Jc:	122.1°C/W

**IV. Die Information**

A. Dimensions:	58 X 45 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:	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 <sub>2</sub>
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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 11 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 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 DX07 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX7307ALB+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
<b>Moisture Testing</b> (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (Note 2)				
Temperature Cycle	-55°C/125°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