RELIABILITY REPORT

FOR

MAX13020ASA+

PLASTIC ENCAPSULATED DEVICES

January 28, 2016

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

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Conclusion

The MAX13020ASA+ 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 MAX13020/MAX13021 ±60V fault-protected low-power local interconnect network (LIN) transceivers are ideal for use in automotive network applications where high reliability is required. The devices provide the interface between the LIN master/slave protocol controller, and the physical bus described in the LIN 2.0 specification package and SAE J2602 specification. The devices are intended for in-vehicle subnetworks with a single master and multiple slaves. The extended fault-protected voltage range of ±60V on the LIN bus line allows for use in +12V, +24V, and +42V automotive applications. The devices allow communication up to 20kbaud, and include slew-rate limited transmitters for enhanced electromagnetic emissions (EME) performance. The devices feature a low-power 4µA sleep mode and provide wake-up source detection. The MAX13020 is a pin-to-pin replacement and is functionally compatible with the Philips TJA1020. The MAX13021 includes enhanced bus dominant clamping fault management for reduced quiescent current during LIN bus shorts to GND. The MAX13020/MAX13021 are available in the 8-pin SO package, and operate over the -40°C to +125°C automotive temperature range.

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II. Manufacturing Information

A. Description/Function:	±60V Fault-Protected LIN Transceivers
B. Process:	BCD8
C. Number of Device Transistors:	2766
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand, Philippines, Malaysia
F. Date of Initial Production:	April 22, 2006

III. Packaging Information

A. Package Type:	8-pin SOIC (N)
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2112
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:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	128.4°C/W
M. Multi Layer Theta Jc:	36°C/W

IV. Die Information

A. Dimensions:	145X85 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 microns (as drawn)
G. Bondpad Dimensions:	.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

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V. Quality Assurance Information

A. Quality Assurance Contacts: 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000 \times 4340 \times 225 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 0.94 \times 10^{-9}$

λ = 0.94 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 BCD8 Process results in a FIT Rate of 0.04 @ 25C and 0.65 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NP10B3003C, D/C 0608)

The RU07 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

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Table 1
Reliability Evaluation Test Results

MAX13020ASA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	80	0	JP11DA005A, D/C 1152
	Biased	& functionality	97	0	JP11DQ003A, D/C 1152
	Time = 1000 hrs.		48	0	NP10B3003, D/C 0608

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

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