RELIABILITY REPORT

FOR

MAX22088GTG+, MAX22088GTG+T

May 27, 2020

MAXIM INTEGRATED

160 RIO ROBLES

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Conclusion

The MAX22088 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 MAX22088 Homebus transceiver complies with the Homebus standard, where data and power are passed on one single pair of wires, while minimizing the need for external components. The MAX22088 eliminates the large external AC-blocking inductor typically required in bus powered applications and improves the signal quality to allow for longer cables. Additionally, the MAX22088 features an integrated 5V linear regulator to power system loads up to 70mA (max).

The MAX22088 supports passing power and data with speed up to, and exceeding, 200kbps. The MAX22088 features dynamic cable termination to improve the signal quality for applications with high data rates.

Additional features include adjustable receiver hysteresis, receiver thresholds and driver slew rate allow the MAX22088 to be used in a wide variety of systems.

Integrated protection (IEC 61000-4-2 ±8kV Contact and ±15kV Air-Gap ESD) ensures robust communication in harsh industrial environments. The MAX22088 is specified for operation over the -40°C to +105°C temperature range and is available in a compact 24-pin 4mm x 4mm TQFN package.

II. Manufacturing Information

A. Description/Function:	Homebus Transceiver
B. Process:	S18
C. Device Count:	3000
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	February 2020

III. Packaging Information

A. Package Type:	TQFN
B. Lead Frame:	CU194
C. Lead Finish:	Matte Tin
D. Die Attach:	EN4900G
E. Bondwire:	1 mil CuPd
F. Mold Material:	G700LA
G. Flammability Rating:	UL-94 (V-0 Rating)
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
I. Single Layer Theta Ja:	48 °C/W
J. Single Layer Theta Jc:	3 °C/W
K. Multi Layer Theta Ja:	36 °C/W
L. Multi Layer Theta Jc:	3 °C/W

IV. Die Information

A. Dimensions:	98.4252X98.4252 mils
B. Passivation:	SiO / SiN

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ryan Wall (Manager, Reliability) Michael Cairnes (Executive Director, Reliability) Bryan Preeshl (SVP 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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate λ is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192\ x\ 2454\ x\ 77\ x\ 2}$$ (Chi square value for MTTF upper limit)

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 25.2\ x\ 10^{-9}$$

$$\lambda = 25.2\ FITs\ (60\%\ confidence\ level\ @25°C)$$

Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at https://www.maximintegrated.com/en/support/qa-reliability/reliability/reliability-monitor-program.html.

S18 cumulative process data:

$$\lambda = 0.02\ FITs\ (60\%\ confidence\ level\ @25°C)$$
$$\lambda = 0.24\ FITs\ (60\%\ confidence\ level\ @55°C)$$

B. ESD and Latch-Up Testing

The MAX22088 has been found to have all pins able to withstand an HBM transient pulse of ±2500 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands ±250 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1

Reliability Evaluation Test Results

MAX22088GTG+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C Biased Time = 192 hrs.	DC parameters & functionality	77	0	

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