

RELIABILITY REPORT

FOR

MAX32655GXG+
MAX32655GXG+T

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MAXIM INTEGRATED

160 RIO ROBLES
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Conclusion

The MAX32655 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 MAX32655 microcontroller (MCU) is an advanced system-on-chip featuring an Arm® Cortex®-M4F CPU for efficient computation of complex functions & algorithms that is qualified to operate at a temperature range of -40°C to +105°C. The SoC integrates power regulation and management with a Single Inductor Multiple Output (SIMO) buck regulator system. The latest generation Bluetooth 5.2 Low Energy (LE) radio, supporting LE Audio, Angle of Arrival (AoA) and Angle of Departure (AoD) for direction finding, long-range (coded) and high-throughput modes.

The device offers large onboard memory with 512KB flash and 128KB SRAM, with optional error correction coding on one 32KB SRAM bank. This 32KB bank can be optionally retained in backup mode. An 8KB user OTP area is available and 8 bytes are retained, even during power down.

Many high-speed interfaces are supported on the device including multiple QSPI, UART and I2C serial interfaces, and one I2S port for connecting to an audio codec. An eight-input, 10-bit ADC is available to monitor analog input from external analog sources.

The device is available in 81-CTBGA (9x9, 8mm x 8mm, 0.8mm pitch) and a 63-WLP (8x8, 3.132mm x 3.252mm, 0.35mm pitch).

II. Manufacturing Information

A. Description/Function:	Low-power ARM Cortex-M4F Microcontroller w/ Bluetooth 5
B. Process:	TS40EF
C. Device Count:	22000000
D. Fabrication Location:	Taiwan
E. Assembly Location:	Taiwan
F. Date of Initial Production:	July 9, 2020

III. Packaging Information

A. Package Type:	CTBGA-CU
B. Lead Frame:	N/A
C. Lead Finish:	BT Green
D. Die Attach:	AB2025D
E. Bondwire:	0.8 mil CUPd
F. Mold Material:	KE-G1250
G. Assembly Diagram:	05-101686
H. Flammability Rating:	N/A
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	41.49 °C/W
M. Multi Layer Theta Jc:	10.81 °C/W

IV. Die Information

A. Dimensions:	124.5826X129.3 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 2454 \times 80 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 24.3 \times 10^{-9}$$

$$\lambda = 24.3 \text{ FITs (60\% confidence level @25°C)}$$

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>.

TS40 cumulative process Fit

$$\lambda = 1.50 \text{ FITs (60\% confidence level @25°C)}$$

$$\lambda = 18.03 \text{ FITs (60\% confidence level @55°C)}$$

B. ESD and Latch-Up Testing

The MAX32655 has been found to have all pins able to withstand an HBM transient pulse of ± 1500 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
MAX32655GXG+

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	80	0	

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