RELIABILITY REPORT

FOR

MAX22505GTG+

PLASTIC ENCAPSULATED DEVICES

July 17, 2018

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Norbert Paul Gerena
Engineer, Reliability

Brian Standley
Manager, Reliability

Conclusion

The MAX22505 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 MAX22505 is designed to protect a USB port on commercial and industrial equipment against damage due to faulty or incorrectly wired power supplies. The USB port is protected against connection to typical 24VDC or 24VAC systems with a max data line protection of ±40.7V and power/ground line protection up to ±50V. VBUS, ground and connector shield connections can be configured for any level of ESD, burst, and surge protection by choosing external components. USB data D+ and D- are protected by external diode clamps to VBUS and GND, allowing for the lowest possible insertion loss while providing high ESD and Burst protection. The MAX22505 is housed in a 24-pin, 4mm x 4mm TQFN package with exposed pad and is specified for operation over the -40°C to +105°C temperature range.

II. Manufacturing Information

A. Description/Function:	±40V High-Speed USB Port Protector
B. Process:	S18
C. Device Count:	16650
D. Fabrication Location:	Japan
E. Assembly Location:	Thailand/Taiwan
F. Date of Initial Production:	March 29, 2018

III. Packaging Information

A. Package Type:	TQFN-Cu
B. Lead Frame:	Cu194
C. Lead Finish:	Matte Tin
D. Die Attach:	AB8200T/EN4900G
E. Bondwire:	Cu w/ Pd
F. Mold Material:	G770HCD/G700LA
G. Assembly Diagram:	05-100643
H. Flammability Rating:	UL-94 (V-0 Rating)
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	48 °C/W
K. Single Layer Theta Jc:	3 °C/W
L. Multi Layer Theta Ja:	36 °C/W
M. Multi Layer Theta Jc:	3 °C/W

IV. Die Information

A. Dimensions:	74.41x77.56 mils
B. Passivation:	SiO_2/Si_3N_4

V. Quality Assurance Information

A. Quality Assurance Contacts:	Norbert Gerena (Engineer, Reliability) Brian Standley (Manager, 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:

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

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

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

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

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 Quarterly Process FIT from Q1FY18

$$\lambda = 0.1\ FITs\ (60\%\ confidence\ level\ @25°C)$$

B. E.S.D. and Latch-Up Testing

The MAX22505 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 +/- 100 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX22505GTG+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 125C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	

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