

RELIABILITY REPORT
FOR
MAX44211ETP+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

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Conclusion

The MAX44211ETP+ 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 MAX44211 is a low-distortion line driver customized for powerline communication (PLC) applications where high output current is needed to drive the isolation and coupling transformer under varying load conditions. The MAX44211 can be switched to implement all world standards, trading off improved linearity for increased quiescent current. The MAX44211 delivers a high 1.5A linear output current and provides peak-to-peak differential voltage swing of up to 36V. The MAX44211 features very low intermodulation and harmonic distortion ensuring they meet worldwide PLC standards. The MAX44211 features advanced diagnostics for temperature and output current monitoring. There are high temperature warning and over temperature shutdown functions. There is also a programmable current limit. The status of these diagnostics are indicated via two open-drain status outputs. The MAX44211 is designed to interface to powerlines that have wide ranging and variable loads and drive signals within the 9kHz to 500kHz frequency band. This device operates from a single supply and is available in a 4mm x 4mm, 20-pin TQFN package. The MAX44211 device is specified for operation from -40Å°C to +85Å°C.

II. Manufacturing Information

A. Description/Function:	High-Current Differential Line Driver for Powerline Communications
B. Process:	S18
C. Number of Device Transistors:	641
D. Fabrication Location:	California
E. Assembly Location:	Taiwan
F. Date of Initial Production:	September 9, 2015

III. Packaging Information

A. Package Type:	20L TQFN-CU
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Cu (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-5809
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	48°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	33°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	74.4094X101.9685 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.18um
F. Minimum Metal Spacing:	0.18um
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 78 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 14.1 \times 10^{-9}$$

$$\lambda = 14.1 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S18 Process results in a FIT Rate of 0.05 @ 25C and 0.93 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TBAA8Q002A, D/C 1503)

The OY92-0 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 and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX44211ETP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	78	0	TBAABQ002C, D/C 1519

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