RELIABILITY REPORT

FOR

MAX22446CAWE+
MAX22446CAWE+T

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MAXIM INTEGRATED

160 RIO ROBLES

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Conclusion

The MAX22446 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 MAX22444–MAX22446 are reinforced, fast, lowpower 4-channel digital galvanic isolators using Maxim's proprietary process technology. These devices transfer digital signals between circuits with different power domains, using as little as 0.74mW per channel at 1Mbps (1.8V supply). All of the devices in the family feature reinforced isolation for a withstand voltage rating of 5kVRMS for 60 seconds.

The MAX22444–MAX22446 family offers all possible unidirectional channel configurations to accommodate any 4-channel design, including SPI, RS-485, and digital I/O applications. Output enable for the A side of the MAX22445R/S/U/V is active-low, making them ideal for isolating a port on a shared SPI bus since the CS signal can directly enable the MISO signal on the isolator. All other output enables in the MAX22444-MAX22446 family are the traditional active-high.

All channels on the MAX22444–MAX22446M/N are always enabled, however, the default state of the outputs of these devices is selectable.

Devices are available with a maximum data rate of either 25Mbps or 200Mbps, and with outputs that are either default-high or default-low. The default is the state the output assumes when the input is either not powered or is opencircuit. See the Ordering Information and Product Selector Guide for suffixes associated with each option. Independent 1.71V to 5.5V supplies on each side of the isolator also make the devices suitable for use as level translators.

All of the devices in the MAX22444–MAX22446 family are available in a 16-pin wide-body SOIC package with 8mm of creepage and clearance. The package material has a minimum comparative tracking index (CTI) of 400V, which gives it a group II rating in creepage tables. All devices are rated for operation at ambient temperatures of -40°C to +125°C.

II. Manufacturing Information

A. Description/Function:	Reinforced, Fast, Low-Power, Four-Channel Digital Isolators
B. Process:	S18 (Hybrid)
C. Device Count:	N/A
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	January 3, 2019

III. Packaging Information

A. Package Type:	SOIC HYBRID (W)
B. Lead Frame:	Cu194
C. Lead Finish:	Matte Tin
D. Die Attach:	EN4900G
E. Bondwire:	1 mil Au
F. Mold Material:	CEL8240GK
G. Assembly Diagram:	05-100796
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:	N/A
M. Multi Layer Theta Jc:	N/A

IV. Die Information

A. Dimensions:	N/A
B. Passivation:	SiN/SiO2

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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192\ x\ 2454\ x\ 80\ x\ 2}$$ (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 cumulative process Fit

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

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

B. ESD and Latch-Up Testing

The MAX22446 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

MAX22445FAWE+ (Note 1)

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 2)	Ta = 125°C Biased Time = 192 hrs.	DC parameters & functionality	80	0	

Note 1: MAX22445FAWE+ is the same silicon as MAX22446CAWE+.

Note 2: Life Test Data may represent plastic DIP qualification lots.