



RELIABILITY REPORT FOR
MAX14828
PLASTIC ENCAPSULATED DEVICES

June 28, 2017

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX14828 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 MAX14828 integrates the high-voltage functions commonly found in industrial sensors. The MAX14828 features one ultra low-power driver (C/Q) with active reverse-polarity protection. An auxiliary digital input is provided to allow firmware updates through a UART interface. Transient protection is simplified due to high voltage tolerance allowing the use of micro TVS. The device features a flexible control interface. Pin-control logic inputs allow for operation with switching sensors that do not use a microcontroller. For sensors that use a microcontroller, an SPI interface is available with extensive diagnostics. For IO-Link operation, a UART interface is provided, allowing interfacing to the microcontroller UART. Finally, a multiplexed UART/SPI option allows using one serial microcontroller interface for shared SPI and UART interfaces. The device includes on-board 3.3V and 5V linear regulators for low-noise analog/logic supply rails. The MAX14828 is available in a (4mm x 4mm) 24-pin TQFN package and a (2.5mm x 2.5mm) wafer-level package (WLP) and is specified over the extended -40°C to +125°C temperature range.

II. Manufacturing Information

A. Description/Function:	Low-Power, Ultra-Small IO-Link Device Transceiver	
B. Process:	S18	
C. Number of Device Transistors:	44115	
D. Fabrication Location:	USA	
E. Assembly Location:	Taiwan, Thailand	Taiwan
F. Date of Initial Production:	June 21, 2017	

III. Packaging Information

A. Package Type:	24-pin TQFN	25-bump WLP
B. Lead Frame:	Copper	N/A
C. Lead Finish:	100% matte Tin	N/A
D. Bondwire:	CuPd (1 mil dia.)	None
E. Mold Material:	Epoxy with silica filler	None
F. Assembly Diagram:	#05-9000-5978	#05-9000-5970
G. Flammability Rating:	Class UL94-V0	Class UL94-V0
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 1
I. Single Layer Theta Ja:	48°C/W	N/A°C/W
J. Single Layer Theta Jc:	3°C/W	N/A°C/W
K. Multi Layer Theta Ja:	36°C/W	43.98°C/W
L. Multi Layer Theta Jc:	3°C/W	N/A°C/W

IV. Die Information

A. Dimensions:	100X100 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Minimum Metal Width:	0.23 microns (as drawn)
E. Minimum Metal Spacing:	0.23 microns (as drawn)
F. Isolation Dielectric:	SiO ₂
G. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Eric Wright (Reliability Engineering)
Brian Standley (Manager, Reliability)
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 0.40 @ 25C and 6.96 @ 55C (0.8 eV, 60% UCL)

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

The RV07-1 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX14828

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	

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