

RELIABILITY REPORT
FOR
MAX22190ATJ+
MAX22190ATJ+T
PLASTIC ENCAPSULATED DEVICES

August 31, 2018

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

A handwritten signature in black ink, appearing to read 'Gerena'.

Norbert Paul Gerena
Engineer, Reliability

A handwritten signature in black ink, appearing to read 'Standley'.

Brian Standley
Manager, Reliability

Conclusion

The MAX22190 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 MAX22190 is an IEC 61131-2 compliant Industrial Digital Input device. MAX22190 translates eight, 24V current-sinking, industrial inputs to a serialized SPI-compatible output that interfaces with 3V to 5.5V logic. A current setting resistor allows the MAX22190 to be configured for Type 1, Type 2, or Type 3 inputs. Field wiring is verified for proximity switches, by a second threshold detector on each input. When wire-break is enabled, the FAULT output is asserted and a register flag set if the input current drops below the wire-break threshold for more than 20ms. Additional diagnostics that assert FAULT include: over temperature, low 24V field supply, 24V field supply missing, CRC communication error, etc.

II. Manufacturing Information

A. Description/Function:	Octal Industrial Digital Input with Diagnostics
B. Process:	S18
C. Device Count:	29427
D. Fabrication Location:	Japan
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 12, 2018

III. Packaging Information

A. Package Type:	TQFN-Cu
B. Lead Frame:	Cu194
C. Lead Finish:	Matte Tin
D. Die Attach:	AB8200T
E. Bondwire:	1.00 mil Au
F. Mold Material:	G770HCD
G. Assembly Diagram:	05-100635
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:	47 °C/W
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	36 °C/W
M. Multi Layer Theta Jc:	3 °C/W

IV. Die Information

A. Dimensions:	74.8031x72.4409 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂

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:

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

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

$$\lambda = 24.31 \times 10^{-9}$$

$$\lambda = 24.31 \text{ FITs (60\% confidence level @25°C)}$$

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>.

S18 Quarterly Process FIT from Q2FY18

$$\lambda = 0.2 \text{ FITs (60\% confidence level @25°C)}$$

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

The MAX22190 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

MAX22190ATJ+

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.