

RELIABILITY REPORT  
FOR  
MAX14832ETB+T  
PLASTIC ENCAPSULATED DEVICES

January 21, 2015

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

|                         |
|-------------------------|
| <b>Approved by</b>      |
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| Quality Assurance       |
| Reliability Engineering |

## Conclusion

The MAX14832ETB+T 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 MAX14832 is a 24V, 100mA driver for industrial binary sensors. The device is configurable through one-time programming (OTP) and integrates the common high-voltage circuitry needed for industrial binary sensors into a single-device solution. Integrated transient protection meets IEC60255-5 surges up to  $\pm 1.3\text{kV}$ . The output of the device can be configured for high-side (pnp), low-side (nnp), or push-pull operation through OTP. Additionally, the device features an OTP option for the internal low-dropout (LDO) regulator, allowing the user to select a 3.3V or 5V output, as well as an option to configure the device for sensors with normally open (NO) or normally closed (NC) logic. Also configurable during OTP is the timing of the power-on reset (POR) delay. OTP programming options are performed with the sensor interface pins (VCC, DO, and GND) using the 1-Wire® interface protocol. The MAX14832 operates from a wide 4.75V to 34V supply and is available in a 10-pin TDFN-EP (3mm x 3mm) package. The device functions over the extended  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  temperature range.

## II. Manufacturing Information

|                                  |   |
|----------------------------------|---|
| A. Description/Function:         | One-Time Programmable Industrial Sensor Output Driver |
| B. Process:                      | S18   |
| C. Number of Device Transistors: | 30499   |
| D. Fabrication Location:         | USA   |
| E. Assembly Location:            | Taiwan, China, Thailand                               |
| F. Date of Initial Production:   | March 13, 2014  |

## III. Packaging Information

|  |                          |
|--|--------------------------|
| A. Package Type:   | 10-pin TDFN 3x3          |
| B. Lead Frame:   | Copper                   |
| C. Lead Finish:  | 100% matte Tin           |
| D. Die Attach:   | Conductive               |
| E. Bondwire:   | Au (1 mil dia.)          |
| F. Mold Material:  | Epoxy with silica filler |
| G. Assembly Diagram:   | #05-9000-5264            |
| H. Flammability Rating:  | Class UL94-V0            |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 1                  |
| J. Single Layer Theta Ja:  | 54°C/W                   |
| K. Single Layer Theta Jc:  | 9°C/W                    |
| L. Multi Layer Theta Ja:   | 41°C/W                   |
| M. Multi Layer Theta Jc:   | 9°C/W                    |

## IV. Die Information

|                            |   |
|----------------------------|---|
| A. Dimensions:             | 62.9921 X 79.9212 mils  |
| B. Passivation:            | Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide) |
| C. Interconnect:           | Al/0.5%Cu with Ti/TiN Barrier   |
| D. Backside Metallization: | None  |
| E. Minimum Metal Width:    | 0.23 microns (as drawn)   |
| F. Minimum Metal Spacing:  | 0.23 microns (as drawn)   |
| G. Bondpad Dimensions:     |   |
| H. Isolation Dielectric:   | SiO <sub>2</sub>  |
| I. Die Separation Method:  | Wafer Saw   |

## V. Quality Assurance Information

- |                                   |   |
|-----------------------------------|---|
| A. Quality Assurance Contacts:    | Don Lipps (Manager, Reliability Engineering)<br>Bryan Preeshl (Vice President of QA)            |
| B. Outgoing Inspection Level:     | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) 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 0.05 @ 25°C and 0.93 @ 55°C (0.8 eV, 60% UCL)

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

The RU73-0 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 +/-250mA and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX14832ETB+T**

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

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