

RELIABILITY REPORT FOR MAX14914ATE+T PLASTIC ENCAPSULATED DEVICES

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## **MAXIM INTEGRATED**

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#### Conclusion

The MAX14914ATE+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 MAX14914 is a high-side/push-pull driver that operates as both an industrial digital output (DO) and an industrial digital input (DI). The MAX14914 is specified for operation with supplies up to 40V. The high-side switch current is resistor settable from 135mA (min) to 1.3A (min). The high-side drivers on-resistance is 120m (typ) at 125°C ambient temperature. Optional push-pull operation allows driving of cables and fast discharge of load capacitance. The output voltage is monitored and indicated through the active-low DOI\_LVL pin for safety applications.

The MAX14914 complies with Type 1, Type 2, or Type 3 input characteristics when configured for DI operation.

#### II. Manufacturing Information

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High-Side Switch with Settable Current-Limiting, Push-Pull Driver Option, and

Digital Input Configuration

S18

23262

Japan

Taiwan, Thailand

December 20, 2016

- A. Description/Function:
- B. Process:
- C. Number of Device Transistors:
- D. Fabrication Location:
- E. Assembly Location:
- F. Date of Initial Production:

#### **III.** Packaging Information

A. Package Type:	16-pin TQFN 4x4						
B. Lead Frame:	Copper						
C. Lead Finish:	100% matte Tin						
D. Die Attach:	Conductive						
E. Bondwire:	Au (1.3 mil dia.)						
F. Mold Material:	Epoxy with silica filler						
G. Assembly Diagram:	#05-100328						
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:	59.3°C/W						
K. Single Layer Theta Jc:	5.7°C/W						
L. Multi Layer Theta Ja:	40°C/W						
M. Multi Layer Theta Jc:	5.7°C/W						
IV. Die Information							

- A. Dimensions:B. Passivation:C. Interconnect:
  - D. Backside Metallization:
  - E. Minimum Metal Width:
  - F. Minimum Metal Spacing:
  - G. Isolation Dielectric:
  - H. Die Separation Method:

87.7953X87.7953 mils Si<sub>3</sub>N<sub>4</sub>/SiO<sub>2</sub> (Silicon nitride/ Silicon dioxide) Al/0.5%Cu with Ti/TiN Barrier None 0.23 microns (as drawn) 0.23 microns (as drawn) SiO<sub>2</sub> Wafer Saw



#### V. Quality Assurance Information

Α.	Quality Assurance Contacts:	Eric Wright (Reliability Engineering) Brian Standley (Manager, Reliability) Bryan Preeshl (Vice President of QA)
В.	Outgoing Inspection Level:	<ul><li>0.1% for all electrical parameters guaranteed by the Datasheet.</li><li>0.1% for all Visual Defects.</li></ul>
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 ( $\lambda$ ) is calculated as follows:

 $\lambda = \underbrace{1}_{\text{MTTF}} = \underbrace{1.83}_{192 \text{ x} 4340 \text{ x} 80 \text{ x} 2}$ (Chi square value for MTTF upper limit) (where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

x = 13.7 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 RV09-0 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

### MAX14914ATE+T

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

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