

RELIABILITY REPORT  
FOR  
MAX14872ETC+T  
PLASTIC ENCAPSULATED DEVICES

December 24, 2014

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

<b>Approved by</b>
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## Conclusion

The MAX14872ETC+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 MAX14870/MAX14872 motor drivers provide a small, low-power and simple solution for driving and controlling brushed DC motors and relays with voltages between 4.5V and 36V. Very low driver on-resistance reduces power dissipation. These drivers feature a charge-pump-less design for reduced external components and low supply current. Integrated fast-decay current regulation allows user-adjustable peak startup motor currents and requires minimal external components. A separate voltage-sense input (SNS) reduces current sensing errors due to parasitic trace resistance. The MAX14870/MAX14872 features shoot-through protection and internal free-wheeling diodes that absorb inductive motor currents. Driver outputs are short-circuit-protected from shorts to ground, to the supply, and between M1 and M2. An active-low FAULT output signals thermal overload and over currents during fault conditions. The MAX14870 has PWM and direction-control inputs, while the MAX14872 has forward and reverse inputs for direction control. See the Function Tables in the data sheet. The MAX14870 and MAX14872 are available in a 12-pin (3mm x 3mm) TDFN-EP package and operate over the -40°C to +85°C temperature range.

## II. Manufacturing Information

A. Description/Function:	Compact 4.5V to 36V Full-Bridge DC Motor Drivers
B. Process:	S18
C. Number of Device Transistors:	3007
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	September 26, 2014

## III. Packaging Information

A. Package Type:	12-pin TDFN
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:	#05-9000-5530
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:	63°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:	66.9291 X 95.6693 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 (lot EATA1Q001C, D/C 1420)

The RU97-0 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2000V 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

**MAX14872ETC+T**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	EATA2Q002E, D/C 1420

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