

RELIABILITY REPORT
FOR
MAX13172ECAI+
PLASTIC ENCAPSULATED DEVICES

April 13, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Conclusion

The MAX13172ECAI+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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I. Device Description

A. General

The MAX13172E is a four-driver/four-receiver multiprotocol transceiver that operates from a single +5V supply in conjunction with the MAX13170E and MAX13174E. The MAX13172E, along with the MAX13170E and the MAX13174E, form a complete software-selectable data terminal equipment (DTE) or data communication equipment (DCE) interface port that supports the V.28 (RS-232), V.10/V.11 (RS-449/V.36, EIA-530, EIA-530A, X.21, RS-423), and V.35 protocols. The MAX13172E transceiver carries serial-interface control signaling, while the MAX13170E carries the high-speed clock and data signals. Typically, the MAX13170E is terminated using the MAX13174E.

The MAX13172E is available in a 5.3mm x 10.2mm, 28-pin SSOP package and operates over the 0°C to +70°C commercial temperature range.

II. Manufacturing Information

A. Description/Function:	+5V Multiprotocol, Software-Selectable Clock Transceiver
B. Process:	B8
C. Number of Device Transistors:	4585
D. Fabrication Location:	Texas
E. Assembly Location:	ATP Philippines, Carsem Malaysia
F. Date of Initial Production:	April 26, 2008

III. Packaging Information

A. Package Type:	28-pin SSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	105°C/W
K. Single Layer Theta Jc:	23.9°C/W

IV. Die Information

A. Dimensions:	124 X 215 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Ken Wendel (Director, Reliability Engineering)
Bryan Preeshl (Managing Director 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.4 \times 10^{-9}$$

$\lambda = 22.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the B8 Process results in a FIT Rate of 2.71 @ 25C and 17.30 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The RU26 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX13172ECAI+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2) Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data