



RELIABILITY REPORT
FOR
MAX13175EETU+T
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Conclusion

The MAX13175EETU+T 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 MAX13171E along with the MAX13173E/ MAX13175E, form a complete pin-selectable data terminal equipment (DTE) or data communication equipment (DCE) interface port that support the V.28 (RS-232), V.10/V.11 (RS-449/V.36, RS-530, RS-530A, X.21), and V.35 protocols. The MAX13171E transceivers carry the high-speed clock and data signals, while the MAX13173E transceivers carry the control signals. The MAX13171E can be terminated by the MAX13175E pin-selectable resistor termination network. The MAX13175E contains six pin-selectable, multiprotocol cable termination networks. The MAX13171E/MAX13173E have an internal charge pump and low-dropout transmitter output stages that allow V.10-, V.11-, V.28-, and V.35-compliant operation from a single supply. The MAX13171E/MAX13173E feature a no-cable mode that reduces supply current and disables all transmitter and receiver outputs (high impedance). Short-circuit current limiting and thermal shutdown circuitry protects the receiver and transmitter outputs against excessive power dissipation. The MAX13171E/MAX13173E have extended ESD protection for all the transmitter outputs and receivers inputs. The MAX13171E/MAX13173E/MAX13175E operate over the +3.135V to +5.5V supply range and are available in 5mm x 7mm, 38-pin TQFN packages. These devices operate over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	Multiprotocol, Pin-Selectable Data Interface Chipset
B. Process:	B8
C. Number of Device Transistors:	5471
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan and Thailand
F. Date of Initial Production:	July 24, 2009

III. Packaging Information

A. Package Type:	38-pin TQFN 5x7
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:	#05-9000-3321
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:	38°C/W
K. Single Layer Theta Jc:	1°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	1°C/W

IV. Die Information

A. Dimensions:	123 X 195 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.8 / Metal2 = 1.2 microns (as drawn)
F. Minimum Metal Spacing:	Metal1-2 = 1.2 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)
Don Lipps (Manager, Reliability Engineering)
Bryan Preeshl (Vice President 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 135C 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)

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the B8 Process results in a FIT Rate of 0.02 @ 25C and 0.29 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TPVYCQ002B, D/C 0923)

The RU27-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V 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

MAX13175EETU+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	TPVZCQ002G, D/C 0927

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