

RELIABILITY REPORT
FOR
MAX6934ATH+ / MAX6934AQH+
PLASTIC ENCAPSULATED DEVICES

January 16, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Approved by
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Conclusion

The MAX6934ATH+ / MAX6934AQH+ 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 MAX6922/MAX6932/MAX6933/MAX6934 multi-output, 76V, vacuum-fluorescent display (VFD) tube drivers that interface a VFD tube to a microcontroller or a VFD controller, such as the MAX6850–MAX6853. The MAX6922/MAX6934 have 32 outputs, while the MAX6932 has 27 outputs, and the MAX6933 has 28 outputs. All devices are also suitable for driving telecom relays. Data is input using standard 4-wire serial interface (CLOCK, DATA, LOAD, BLANK) compatible with other VFD drivers and controllers. For easy display control, the active-high BLANK input forces all driver outputs low, turning the display off, and automatically puts the IC into shutdown mode. Display intensity may also be controlled by directly pulse-width modulating the BLANK input. The MAX6922/MAX6932/MAX6934 have a serial interface data output, DOUT, allowing any number of devices to be cascaded on the same serial interface. The MAX6932/MAX6933/MAX6934 have a negative supply voltage input, VSS, allowing the drivers' output swing to be made bipolar to simplify filament biasing in many applications. The MAX6922 is available in a 44-pin PLCC package, the MAX6932 and MAX6933 are available in 36-pin SSOP packages, and the MAX6934 is available in 44-pin PLCC and TQFN packages. Maxim also offers a 12-output VFD driver (MAX6920) and 20-output VFD drivers (MAX6921/MAX6931).

II. Manufacturing Information

A. Description/Function:	27-, 28-, and 32-Output, 76V, Serial-Interfaced VFD Tube Drivers
B. Process:	BCD250
C. Number of Device Transistors:	
D. Fabrication Location:	USA
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	January 24, 2004

III. Packaging Information

A. Package Type:	44-pin TQFN 7x7	44-pin PLCC
B. Lead Frame:	Copper	Copper
C. Lead Finish:	100% matte Tin	100% matte Tin
D. Die Attach:	Conductive	Conductive
E. Bondwire:	Au (1 mil dia.)	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1040	#05-9000-1039
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 3
J. Single Layer Theta Ja:	37°C/W	75°C/W
K. Single Layer Theta Jc:	1°C/W	21°C/W
L. Multi Layer Theta Ja:	27°C/W	°C/W
M. Multi Layer Theta Jc:	1°C/W	°C/W

IV. Die Information

A. Dimensions:	153 X 126 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 = 1.0 / Metal2 = 3.0 microns as drawn
F. Minimum Metal Spacing:	Metal1 = 2.0 / Metal2 = 3.0 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 BCD250 Process results in a FIT Rate of 0.43 @ 25C and 7.42 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NQP1AQ001B, D/C 0348)

The DW75-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 1000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of 250mA.

Table 1
Reliability Evaluation Test Results
MAX6934ATH+/ MAX6934AQH+

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	NQP1AQ001B, D/C 0348

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