RELIABILITY REPORT

FOR

MAX1513ETP+
(MAX1514)

PLASTIC ENCAPSULATED DEVICES

November 7, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX1513ETP+ 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 MAX1513/MAX1514 provide complete power-supply solutions for active-matrix thin-film transistor (TFT) liquid-crystal displays (LCDs). Both devices include a high-performance step-up regulator controller, three linear- regulator controllers, and an adjustable delay block for startup sequencing. The MAX1513 includes an additional linear-regulator controller and a high-performance buffer amplifier. The MAX1513/MAX1514 can operate from 2.7V to 5.5V input supplies and provide overload protection with timer delay latch on all the regulated outputs. The step-up regulator controller drives an external N-channel MOSFET to generate the regulated supply voltage for the panel source-driver ICs. Its current-mode control architecture provides fast transient response to pulsed loads. The high switching frequency (up to 1.5MHz) allows the use of ultra-small inductors and ceramic capacitors while achieving efficiencies over 85% using lossless current sensing. The internal soft-start limits the input surge current during startup. The gate-on and gate-off linear-regulator controllers of the MAX1513/MAX1514 provide regulated TFT gate-on and gate-off supplies. The gate-on supply is activated after an adjustable delay following the step-up regulator. The logic linear-regulator controller can be used to create a low-voltage logic supply. The gamma linear-regulator controller of the MAX1513 can be used to generate a gamma-correction reference supply or another generalpurpose supply rail. The MAX1513's high-performance buffer amplifier can drive the LCD backplane (VCOM) or the gamma-correction divider string. The MAX1513/MAX1514 are available in 4mm x 4mm 20-pin thin QFN packages with a maximum thickness of 0.8mm, suitable for ultra-thin LCD panel design.

II. Manufacturing Information

A. Description/Function:	TFT-LCD Power-Supply Controllers
B. Process:	B8
C. Number of Device Transistors:	0
D. Fabrication Location:	Texas
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	October 25, 2003

III. Packaging Information

A. Package Type:	20-pin TQFN 4x4
B. Lead Frame:	Copper Alloy
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0613
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°C/W
K. Single Layer Theta Jc:	5.7°C/W
L. Multi Layer Theta Ja:	39°C/W
M. Multi Layer Theta Jc:	5.7°C/W

IV. Die Information

A. Dimensions:	83 X 83 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/Cu (Cu = 0.5%)
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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (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 PD41 die type has been found to have all pins able to withstand a HBM transient pulse of +/-200 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of 250 mA.

Table 1
Reliability Evaluation Test Results

MAX1513ETP+

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