RELIABILITY REPORT

FOR

MAX17088ETX+

PLASTIC ENCAPSULATED DEVICES

February 12, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX17088ETX+ 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 MAX17088 (MAX8798) includes a high-performance step-up regulator, a high-speed operational amplifier, a digitally-adjustable VCOM calibration device with non-volatile memory and an I2C interface, and a high-voltage level-shifting scan driver. The device is optimized for thin film transistor (TFT) liquid crystal display (LCD) applications. The MAX17088 is the successor to the MAX8798. The step-up DC-DC converter provides the regulated supply voltage for panel source driver ICs. The converter is a 1.2MHz current-mode regulator with an integrated 20V n-channel power MOSFET. The high switching frequency allows the use of ultra-small inductors and ceramic capacitors. The current-mode control architecture provides fast transient response to pulsed loads typical of source driver loads. The step-up regulator features soft-start, and current limit. The high-current operational amplifier is designed to drive the LCD backplane (VCOM). The amplifier features high output current (±150mA), fast slew-rate (45V/ìs), wide bandwidth (20MHz), and rail-to-rail inputs and outputs. The programmable VCOM calibrator is externally attached to the VCOM amplifier"s resistive voltage divider and sinks a programmable current to adjust the VCOM output voltage level. An internal 7-bit digital-to-analog converter (DAC) controls the sink current. The DAC is ratiometric relative to BOOST and is guaranteed to be monotonic over all operating conditions. The calibrator IC includes an MTP to store the desired VCOM voltage level. The 2-wire I2C interface between the LCD panel and the programming circuit minimizes panel connector pin count and simplifies production equipment. The high-voltage level-shifting scan driver is designed to drive the TFT panel gate drivers. Its 3 outputs swing 65V (maximum) between +45V (maximum) to –25V (minimum) and can swiftly drive capacitive loads. To save power, the 2 complementary outputs are designed to allow charge sharing during state changes. The MAX17088 is available in a 36-pin (6mm x 6mm) thin QFN package with a maximum thickness of 0.8mm for ultra-thin LCD panels.

II. Manufacturing Information

A. Description/Function:	Internal-Switch Boost Regulator with Integrated 3-Channel Scan Driver, VCOM Calibrator, and Operational Amplifier for TFT LCD
B. Process:	S4
C. Number of Device Transistors:	15137
D. Fabrication Location:	California
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	October 11, 2007

III. Packaging Information

A. Package Type:	36-pin TQFN 6x6
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Nonconductive 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:	49°C/W
K. Single Layer Theta Jc:	16.7°C/W
L. Multi Layer Theta Ja:	36.7°C/W
M. Multi Layer Theta Jc:	16.7°C/W

IV. Die Information

A. Dimensions:	87 X 87 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 46 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.3 \times 10^{-9}$

$\lambda = 23.3$ 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 S4 Process results in a FIT Rate of 0.28 @ 25C and 4.85 @ 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 PF34 die type has been found to have all pins able to withstand a transient pulse of

HBM: +/- 2KV Per JESD22-A114
CDM: +/- 750V per JESD22-C101
MM: +/-200V per JESD22-A115

Latch-Up testing has shown that this device withstands a current of +/-100 mA, 1.5x VCCMax Overvoltage per JESD78.

Table 1
Reliability Evaluation Test Results

MAX17088ETX+

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	46	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