

RELIABILITY REPORT
FOR
MAX17114ETM+T
PLASTIC ENCAPSULATED DEVICES

May 7, 2013

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Richard Aburano
Quality Assurance
Manager, Reliability Engineering

Conclusion

The MAX17114ETM+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

Table of Contents

I.Device Description	IV.Die Information
II.Manufacturing Information	V.Quality Assurance Information
III.Packaging Information	VI.Reliability Evaluation
.....Attachments	

I. Device Description

A. General

The MAX17114 generates all the supply rails for thin-film transistor liquid-crystal display (TFT LCD) TV panels operating from a regulated 12V input. It includes a step-down and a step-up regulator, a positive and a negative charge pump, an operational amplifier, a high-accuracy, high-voltage gamma reference, and a high-voltage switch control block. The MAX17114 can operate from input voltages from 8V to 16.5V and is optimized for an LCD TV panel running directly from 12V supplies. The step-up and step-down switching regulators feature internal power MOSFETs and high-frequency operation allowing the use of small inductors and capacitors, resulting in a compact solution. The step-up regulator provides TFT source driver supply voltage, while the step-down regulator provides the system with logic supply voltage. Both regulators use fixed-frequency current-mode control architectures, providing fast load-transient response and easy compensation. A current-limit function for internal switches and output-fault shutdown protects the step-up and step-down power supplies against fault conditions. The MAX17114 provides soft-start functions to limit inrush current during startup. In addition, the MAX17114 integrates a control block that can drive an external p-channel MOSFET to sequence power to source drivers. The positive and negative charge-pump regulators provide TFT gate-driver supply voltages. Both output voltages can be adjusted with external resistive voltage-dividers. A logic-controlled, high-voltage switch block allows the manipulation of the positive gate-driver supply. The MAX17114 includes one high-current operational amplifier designed to drive the LCD backplane (VCOM). The amplifier features high output current ($\pm 200\text{mA}$), fast slew rate ($45\text{V}/\mu\text{s}$), wide bandwidth (20MHz), and rail-to-rail outputs. Also featured in the MAX17114 is a high-accuracy, high-voltage adjustable reference for gamma correction. The MAX17114 is available in a small (7mm x 7mm), ultra-thin (0.8mm), 48-pin, TQFN-EP package and operates over the -40°C to $+85^{\circ}\text{C}$ temperature range.

II. Manufacturing Information

A. Description/Function:	Multi-Output Power Supply with VCOM Amplifier and High-Voltage Gamma Reference for LCD TVs
B. Process:	S45
C. Number of Device Transistors:	21572
D. Fabrication Location:	USA or Taiwan
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	July 24, 2009

III. Packaging Information

A. Package Type:	48-pin TQFN 7x7
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3605
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:	36°C/W
K. Single Layer Theta Jc:	1°C/W
L. Multi Layer Theta Ja:	25°C/W
M. Multi Layer Theta Jc:	1°C/W

IV. Die Information

A. Dimensions:	110 X 110 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.4 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 1524 \times 345 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 1524 = Temperature Acceleration factor assuming an activation energy of 0.7eV)

$$\lambda = 9.1 \times 10^{-9}$$

$$\lambda = 9.1 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the S45 Process results in a FIT Rate of 0.2 @ 25C and 3.4 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot FURWCQ001C, D/C 1119)

The PF58 die type has been found to have all pins able to withstand a transient pulse of

ESD-HBM:	+/- 2500V per JEDEC JESD22-A114
ESD-CDM:	+/- 750V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX17114ETM+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	48	0	TURZCQ001A, D/C 0906
	Biased	& functionality	142	0	TURZEA282A, D/C 1052
	Time = 192 hrs.		155	0	FURWCQ002C, D/C 1119

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