RELIABILITY REPORT

FOR

MAX17085BETL+

PLASTIC ENCAPSULATED DEVICES

September 6, 2012

MAXIM INTEGRATED PRODUCTS

160 Rio Robles

San Jose, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX17085BETL+ 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 MAX17085B is an all-in-one notebook power solution integrating a multichemistry battery charger, dual fixed output Quick-PWM(tm) step-down controllers, and dual keep-alive linear regulators: Charger: The high-frequency (~1.4MHz) multichemistry battery charger uses a current-mode, fixed inductor current ripple architecture that significantly reduces component size and cost. Low-offset sense amplifiers allow the use of low-value sense resistors for charging and input current limit. The charger uses n-channel switching MOSFETs. Adjustable charge current, charge voltage, and cell selection allow for flexible use with different battery packs. Charge current is set by an analog control input, or a PWM input. High-accuracy current-sense amplifiers provide fast cycle-by-cycle current-mode control to protect against short circuits to the battery and respond quickly to system load transients. Additionally, the charger provides a high-accuracy analog output that is proportional to the adapter current. An integrated charge pump controls an n-channel adapter selector switch. The charge pump remains active even when the charger is off. When the adapter is absent, a p-channel MOSFET selects the battery. Main SMPS: The dual Quick-PWM step-down controllers with synchronous rectification generate the 5V and 3.3V main power in a notebook. Low-side MOSFET sensing provides a simple low-cost, highly efficient valley current-limit protection. The MAX17085B also includes output undervoltage, output overvoltage, and thermal-fault protection. Separate enable inputs for each SMPS and a combined open-drain power-good output allow flexible power sequencing. Voltage soft-start reduces inrush current, while passive shutdown discharges the output through an internal switch. Fast transient response, with an extended on-time feature reduces output capacitance requirements. Selectable pulse-skipping mode and ultrasonic mode improve light-load efficiency. Ultrasonic mode operation maintains a minimum switching frequency at light loads, minimizing audible noise effects. Dual LDO Regulators: An internal 5V/100mA LDO5 with switchover can be used to either generate the 5V bias needed for power-up or other lower power "always-on" suspend supplies. Another 3.3V/50mA LDO3 provides "always-on" power to a system microcontroller.

II. Manufacturing Information

A. Description/Function:	Integrated Charger, Dual Main Step-Down Controllers, and Dual LDO Regulators
B. Process:	S4
C. Number of Device Transistors:	22865
D. Fabrication Location:	Texas
E. Assembly Location:	Taiwan, China, Thailand
F. Date of Initial Production:	January 21, 2010

III. Packaging Information

A. Package Type:	40L TQFN
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:	#05-9000-3196 / C
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	45°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	96 X 96 mils
B. Passivation:	Si_3N_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:	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:	
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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 47 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.4 \times 10^{-9}$

$\lambda = 23.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 S4 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TNRXDQ003C D/C 0941)

The PE41-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500V 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

MAX17085BETL+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	47	0	TNRXDQ003G, D/C 1046

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