RELIABILITY REPORT

FOR MAX16064ETX+T

PLASTIC ENCAPSULATED DEVICES

October 5, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX16064ETX+T 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 MAX16064 is a fully integrated 4-channel digital power-supply controller and monitor IC that can be connected up to four power supplies to provide complete digital configurability. By interfacing to the power-supply reference input or feedback node, and the output enable, the MAX16064 takes control of the power supply to provide tracking, soft-start, sequencing, margining, and dynamic adjustment of the output voltage. Power-supply sequencing can be performed autonomously or controlled over the PMBus(tm) interface. Sequencing is controlled during power-down as well as power-up. Multiple MAX16064s can be combined to autonomously sequence more supplies. The sequencing order is stored in an external configuration EEPROM so sequence order changes can be reprogrammed without changing the PCB layout. The MAX16064 features an internal temperature sensor providing an additional level of system monitoring. Other features include a reset output and an SMBus(tm) alert output. Each channel of the MAX16064 includes an accurate 12-bit analog-to-digital converter (ADC) input and a differential amplifier for accurately monitoring and reporting the voltage at the load without being influenced by any difference in ground potentials. An integrated 12-bit digital-to-analog converter (DAC) can margin power supplies and dynamically adjust the output voltage using a closed-loop control system to provide an output-voltage accuracy of ±0.3%. The user-programmable registers provide flexible and accurate control of time events such as delay time and transition period, monitoring for overvoltage and undervoltage, overtemperature fault and warning handling. The closed-loop operation is also programmable to make sure the MAX16064 works with any existing power supply to provide superior regulation accuracy and accurate margining. The MAX16064 operates using a PMBus-compliant communication protocol. The device can be programmed using this protocol or with a free graphic-user interface (GUI) available from the Maxim website that significantly reduces development time. Once the configuration is complete, the results can be saved into an EEPROM or loaded into the device through PMBus at power-up. This allows remote configuration of any power supply using the MAX16064, replacing expensive recalls or field service. The MAX16064 can be programmed with up to 114 distinct addresses to support large systems. The MAX16064 is offered in a space-saving, 36-pin, lead-free, 6mm x 6mm TQFN package and is fully specified from -40°C to +85°C.

II. Manufacturing Information

A. Description/Function:	±0.3% Accurate, Quad, Power-Supply Controller with Active-Voltage Output Control and PMBus Interface
B. Process:	S45
C. Number of Device Transistors:	192267
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	July 24, 2009

III. Packaging Information

A. Package Type:	36-pin TQFN 6x6
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:	#05-9000-3357
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:	38°C/W
K. Single Layer Theta Jc:	1.4°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	1.4°C/W

IV. Die Information

A. Dimensions:	108 X 167 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:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Operations) 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.9 \times 10^{-9}$

$\lambda = 22.9$ 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 S45 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 SQRZBQ001B, D/C 0914)

The MT08 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX16064ETX+T

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	48	0	SQRZBQ001B, D/C 0914

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