

RELIABILITY REPORT
FOR
MAX14578AEEWC+T
PLASTIC ENCAPSULATED DEVICES

November 2, 2012

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX14578AEEWC+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.

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I. Device Description

A. General

The MAX14578E/MAX14578AE are USB charger detectors compliant with USB Battery Charging Revision 1.1. The USB charger-detection circuitry detects USB standard downstream ports (SDPs), USB charging downstream ports (CDPs), or dedicated charger ports (DCPs), and controls an external lithium-ion (Li+) battery charger. The devices implement USB Battery Charging Revision 1.1-compliant detection logic including data contact detection, D+/D- short detection, charging downstream port identification, and optional USB dead-battery charging support. Dead-battery charging support features a 45-minute (max) charge timer and weak battery voltage monitor controlled by I²C communication (MAX14578E only.) The MAX14578AE features an enable (active-low EN) input and an LDO output. In addition, the internal USB switch is compliant to Hi-Speed USB, full-speed USB, and low-speed USB signals. The devices feature low on-resistance, low on-resistance flatness, and very low capacitance. The devices also feature high-ESD protection up to ±15kV Human Body Model on the CD+ and CD- pins. In addition, the MAX14578E/MAX14578AE feature Apple and Sony charger detection that allows identification of resistor-divider networks on D+/D-. The MAX14578E/MAX14578AE are available in both a 12-bump, 0.4mm pitch, 1.3mm x 1.68mm WLP package and 16-pin TQFN package, and operate over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	USB Battery Charger Detectors
B. Process:	S18
C. Number of Device Transistors:	32215
D. Fabrication Location:	California
E. Assembly Location:	Japan
F. Date of Initial Production:	March 25, 2011

III. Packaging Information

A. Package Type:	12 bmp WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	N/A
E. Bondwire:	N/A (N/A mil dia.)
F. Mold Material:	None
G. Assembly Diagram:	#05-9000-4237 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	N/A°C/W
K. Single Layer Theta Jc:	N/A°C/W
L. Multi Layer Theta Ja:	73°C/W
M. Multi Layer Theta Jc:	N/A°C/W

IV. Die Information

A. Dimensions:	64.9606 X 50 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.18µm
F. Minimum Metal Spacing:	0.18µm
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{600 \times 4340 \times 44 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 8.0 \times 10^{-9}$$

$$\lambda = 8.0 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S18 Process results in a FIT Rate of 0.40 @ 25C and 6.96 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SS0YBQ001B D/C 1050)

The AL21-1 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

MAX14578AEEWC+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 600 hrs.	DC Parameters & functionality	44	0	SS0YBQ001E, D/C 1050

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