

RELIABILITY REPORT
FOR
MAX17024ETD+T
PLASTIC ENCAPSULATED DEVICES

April 11, 2016

MAXIM INTEGRATED

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Conclusion

The MAX17024ETD+T successfully met 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 MAX17024 pulse-width modulation (PWM) controller provides high efficiency, excellent transient response, and high DC-output accuracy needed for stepping down high-voltage batteries to generate low-voltage core or chipset/RAM bias supplies in notebook computers. The output voltage can be controlled using the dynamic REFIN, which supports input voltages between 0 to 2V. The REFIN adjustability combined with a resistive voltage-divider on the feedback input allows the MAX17024 to be configured for any output voltage between 0 to $0.9 \times V_{IN}$. Maxim's proprietary Quick-PWM(tm) quick-response, constant-on-time PWM control scheme handles wide input/output voltage ratios (low-duty-cycle applications) with ease and provides 100ns "instant-on" response to load transients while maintaining a relatively constant switching frequency. Strong drivers allow the MAX17024 to efficiently drive large synchronous-rectifier MOSFETs. The controller senses the current across the sense resistor series with the synchronous rectifier to achieve highly accurate valley current-limit protection. The MAX17024 includes a voltage-controlled soft-start and soft-shutdown to limit the input surge current, provide a monotonic power-up (even into a precharged output), and provide a predictable power-up time. The controller also includes output undervoltage and thermal-fault protection. The MAX17024 is available in a tiny 14-pin, 3mm x 3mm TDFN package. For space-constrained applications, refer to the MAX17016 single step-down with 26V internal MOSFETs capable of supporting 10A continuous load. The MAX17016 is available in a small 40-pin, 6mm x 6mm TQFN package.

II. Manufacturing Information

A. Description/Function:	Single Quick-PWM Step-Down Controller with Dynamic REFIN
B. Process:	S45
C. Fabrication Location:	USA
D. Assembly Location:	Taiwan
E. Date of Initial Production:	October 27, 2007

III. Packaging Information

A. Package Type:	14-pin TDFN 3x3
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:	#05-9000-2868
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:	54°C/W
K. Single Layer Theta Jc:	8.3°C/W
L. Multi Layer Theta Ja:	41°C/W
M. Multi Layer Theta Jc:	8.3°C/W

IV. Die Information

A. Dimensions:	41 X 94 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:	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: Eric Wright (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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 216 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 5.1 \times 10^{-9}$$

$$\lambda = 5.1 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 0.49 @ 25°C and 8.49 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The PE04-1 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 +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX17024ETD+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	216	0	

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