

RELIABILITY REPORT
FOR
MAX15021ATI+T
PLASTIC ENCAPSULATED DEVICES

April 6, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Approved by
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Conclusion

The MAX15021ATI+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 MAX15021 is a dual-output, pulse-width-modulated (PWM), step-down DC-DC regulator with tracking (coincident and ratiometric) and sequencing options. The device operates from 2.5V to 5.5V and each output can be adjusted from 0.6V to the input supply (VAVIN). The MAX15021 delivers up to 4A (regulator 1) and 2A (regulator 2) of output current. This device offers the ability to adjust the switching frequency from 500kHz to 4MHz and provides the capability of optimizing the design in terms of size and performance. The MAX15021 utilizes a voltage-mode control scheme with external compensation to provide good noise immunity and maximum flexibility in selecting inductor values and capacitor types. The dual switching regulators operate 180° out-of-phase, thereby reducing the RMS input ripple current and thus the size of the input bypass capacitor significantly. The MAX15021 offers the ability to track (coincident or ratiometric) or sequence during power-up and powerdown operation. When sequencing, it powers up glitch-free into a prebiased output. Additional features include an internal undervoltage lockout with hysteresis and a digital soft start/soft-stop for glitch-free power-up and power-down. Protection features include lossless cycle-by-cycle current limit, hiccup-mode output short-circuit protection, and thermal shutdown. The MAX15021 is available in a space-saving, 5mm x 5mm, 28-pin TQFN-EP package and is specified for operation from -40°C to +125°C temperature range.

II. Manufacturing Information

A. Description/Function:	Dual, 4A/2A, 4MHz, Step-Down DC-DC Regulator with Tracking/Sequencing Capability
B. Process:	S45
C. Number of Device Transistors:	
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	China, Malaysia, Taiwan and Thailand
F. Date of Initial Production:	April 26, 2008

III. Packaging Information

A. Package Type:	28-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (2 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3185
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:	47°C/W
K. Single Layer Theta Jc:	2.1°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2.1°C/W

IV. Die Information

A. Dimensions:	90 X 128 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:	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 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:

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

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

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

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 TLWZAQ001H, D/C 0748)

The NQ04 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.

Table 1
Reliability Evaluation Test Results

MAX15021ATI+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	TLWZAQ001H, D/C 0748

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