RELIABILITY REPORT

FOR

MAX17028GTJ+

PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

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Conclusion

The MAX17028GTJ+ 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 MAX17028 is a 1-phase Quick-PWM™ step-downVID power-supply controller for Intel notebook CPUs. The Quick-PWM control provides instantaneous response to fast load current steps. Active voltage positioning reduces power dissipation and bulk output capacitance requirements and allows ideal positioning compensation for tantalum, polymer, or ceramic bulk output capacitors. The MAX17028 is intended for two different notebook CPU/GPU core applications: either bucking down the battery directly to create the core voltage, or else bucking down the +5V system supply. The single-stage conversion method allows this device to directly step down high-voltage batteries for the highest possible efficiency. Alternatively, 2-stage conversion (stepping down the +5V system supply instead of the battery) at higher switching frequency provides the minimum possible physical size. A slew-rate controller allows controlled transitions between VID codes. A thermistor-based temperature sensor provides programmable thermal protection. A current monitor provides an analog output current proportional to the processor load current. The MAX17028 implements both the Intel IMVP-6.5 CPU core specifications (V3P3 = 3.3V), as well as the Intel GMCH graphics core specifications (V3P3 =GND). The 17028 is available in a 32-pin, 5mm x 5mm, TQFN package.

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II. Manufacturing Information

A. Description/Function:	1-Phase Quick-PWM Intel IMVP-6.5/GMCH Controller
B. Process:	S4
C. Number of Device Transistors:	10146
D. Fabrication Location:	Texas
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	2008

III. Packaging Information

A. Package Type:	32-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2634
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:	1.7°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	77 X 73 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/0.5% Cu
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

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V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering) Bryan Preeshl (Managing Director 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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 96 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 11.2 \times 10^{-9}$

λ = 11.2 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com/. Current monitor data for the S4 Process results in a FIT Rate of 4.6 @ 25C and 79.2 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The PE11-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250mA per JESD78.

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Table 1
Reliability Evaluation Test Results

MAX17028GTJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	96	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data

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