

RELIABILITY REPORT  
FOR  
MAX4810CTN+  
PLASTIC ENCAPSULATED DEVICES

January 7, 2010

**MAXIM INTEGRATED PRODUCTS**

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<b>Approved by</b>
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## Conclusion

The MAX4810CTN+ 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 MAX4810/MAX4811/MAX4812 integrated circuits generate high-voltage, high-frequency, unipolar or bipolar pulses from low-voltage logic inputs. These dual pulsers feature independent logic inputs, independent high-voltage pulser outputs with active clamps and independent high-voltage supply inputs. The MAX4810/MAX4811/MAX4812 feature a 9  $\Omega$  output impedance for the high-voltage outputs, and a 27  $\Omega$  impedance for the active clamp. The high-voltage outputs are guaranteed to provide 1.3A output current. All devices use three logic inputs per channel to control the positive and negative pulses and active clamp. Also included are two independent enable inputs. Disabling EN ensures the output MOSFETs are not accidentally turned on during fast power-supply ramping. This allows for faster ramp times and smaller delays between pulsing modes. A low-power shutdown mode reduces power consumption to less than 1 $\mu$ A. All digital inputs are CMOS compatible. The MAX4810 includes clamp output overvoltage protection, while the MAX4811 features both pulser output and clamp output overvoltage protection. The MAX4812 does not provide overvoltage protection. See the *Ordering Information/Selector Guide* in the full data sheet. The MAX4810/MAX4811/MAX4812 are available in a 56-pin (7mm x 7mm), TQFN exposed-pad package and are specified over the 0°C to +70°C commercial temperature range.

## II. Manufacturing Information

A. Description/Function:	Dual, Unipolar/Bipolar, High-Voltage Digital Pulsers
B. Process:	BCD250
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	7/25/2008

## III. Packaging Information

A. Package Type:	56-pin TQFN 7x7
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:	#05-9000-3028
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:	36°C/W
K. Single Layer Theta Jc:	0.8°C/W
L. Multi Layer Theta Ja:	25°C/W
M. Multi Layer Theta Jc:	0.8°C/W

## IV. Die Information

A. Dimensions:	206 X 218 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 1.5µm / Metal2 = 3.0µm
F. Minimum Metal Spacing:	Metal1 = 1.5µm / Metal2 = 3.0µm
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## 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 shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) 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)

$$\lambda = 22.4 \times 10^{-9}$$
$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 BCD250 Process results in a FIT Rate of 0.43 @ 25C and 7.42 @ 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 AJ43 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX4810CTN+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
<b>Moisture Testing</b> (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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