RELIABILITY REPORT

FOR

MAX5661GCB+

PLASTIC ENCAPSULATED DEVICES

June 11, 2015

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX5661GCB+ 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.

Table of Contents

I. Device Description

A. General

The MAX5661 single 16-bit DAC with precision high-voltage amplifiers provides a complete solution for programmable current and voltage-output applications. The output amplifiers swing to industry-standard levels of ±10V (voltage output) or source from 0mA (or from 4mA) to 20mA (current output). The voltage output (OUTV) drives resistive loads greater than 2k and capacitive loads of up to 1.2µF. Voltage-output force-sense connections compensate for series protection resistors and field-wiring resistance. Short-circuit protection on the voltage output limits output current to 10mA (typ) sourcing or -11.5mA (typ) sinking. The current output (OUTI) drives resistive loads up to 37.5V (max) and inductive loads up to 1H. The MAX5661 provides either a current output or a voltage output. Only one output is active at any given time, regardless of the configuration. The MAX5661 voltage output operates with ±13.48V to ±15.75V supplies (VDDV, VSSV) and the current output operates with a single +13.48V to +40V supply (VDDI). A +4.75V to +5.25V digital supply (VCC) powers the rest of the internal circuitry. A buffered reference input accepts an external +4.096V reference voltage. Update the DAC outputs using software commands or the asynchronous active-low LDAC input. An asynchronous active-low CLR input sets the DAC outputs to the value stored in the clear register or to zero. The active-low FAULT output asserts when the DAC's current output is an open circuit, the DAC's voltage output is a short circuit, or when the active-low CLR input is low. The MAX5661 communicates through a 4-wire 10MHz SPI-/QSPI(tm)-/MICROWIRE(tm)-compatible serial interface. The DOUT output allows daisy chaining of multiple devices. The MAX5661 is available in a 10mm x 10mm, 64-pin, LQFP package and operates over the -40°C to +105°C temperature range.

II. Manufacturing Information

A. Description/Function:	Single 16-Bit DAC with Current and Voltage Outputs for Industrial Analog Output Modules
B. Process:	HV3
C. Number of Device Transistors:	8433
D. Fabrication Location:	Oregon
E. Assembly Location:	Texas, Korea, Taiwan
F. Date of Initial Production:	January 20, 2007

III. Packaging Information

A. Package Type:	64-pin LQFP
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:	#05-9000-3302
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	40°C/W
M. Multi Layer Theta Jc:	8°C/W

IV. Die Information

A. Dimensions:	170X285 mils
B. Passivation:	Si_3N_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 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 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: 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

$\lambda = 22.9 \times 10^{-9}$
λ = 22.9 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 HV3 Process results in a FIT Rate of 0.08 @ 25C and 1.41 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NWS1E3001D, D/C 0821)

The DB21-1 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

Table 1
Reliability Evaluation Test Results

MAX5661GCB+

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	NWS1CA005B, D/C 0639

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