RELIABILITY REPORT

FOR

MAX4823ETP+T

PLASTIC ENCAPSULATED DEVICES

June 10, 2015

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX4823ETP+T 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 MAX4822–MAX4825 8-channel relay drivers offer built-in kickback protection and drive +3V/+5V nonlatching or dual-coil-latching relays. Each independent open-drain output features a 2.7 (typ) on-resistance and is guaranteed to sink 70mA (min) of load current. These devices consume less than 300µA (max) quiescent current and have 1µA output off-leakage current. A Zener-kickback-protection circuit significantly reduces recovery time in applications where switching speed is critical. The MAX4822/MAX4824 feature a unique power-save mode where the relay current, after activation, can be reduced to a level just above the relay hold-current threshold. This mode keeps the relay activated while significantly reducing the power consumption. The MAX4822/MAX4823 feature a 10MHz SPI(tm)-/QSPI(tm)-MICROWIRE(tm)-compatible serial interface. Input data is shifted into a shift register and latched to the outputs when active-low CS transitions from low to high. Each data bit in the shift register corresponds to a specific output, allowing independent control of all outputs. The MAX4824/MAX4825 feature a 4-bit parallel-input interface. The first 3 bits (A0, A1, A2) determine the output address, and the fourth bit (LVL) determines whether the selected output is switched on or off. Data is latched to the outputs when active-low CS transitions from low to high. The MAX4822-MAX4825 feature separate set and reset functions, allowing turn-on or turn-off of all outputs simultaneously with a single control line. Built-in hysteresis (Schmidt trigger) on all digital inputs allows these devices to be used with slow-rising and falling signals, such as those from optocouplers or RC power-up initialization circuits. The MAX4822-MAX4825 are available in space-saving 4mm x 4mm, 20-pin thin QFN packages. They are specified over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	+3.3V/+5V, 8-Channel, Relay Drivers with Fast Recovery Time and Power-Save Mode
B. Process:	C6
C. Number of Device Transistors:	4139
D. Fabrication Location:	California
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	July 23, 2005

III. Packaging Information

A. Package Type:	20-pin TQFN 4x4
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:	#05-9000-1334
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:	59°C/W
K. Single Layer Theta Jc:	5.7°C/W
L. Multi Layer Theta Ja:	39°C/W
M. Multi Layer Theta Jc:	5.7°C/W

IV. Die Information

A. Dimensions:	66.1417X62.9921 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:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	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:	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:

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

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

$\lambda = 11.4 \times 10^{-9}$

$\lambda = 11.4$ 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 C6 Process results in a FIT Rate of 0.17 @ 25C and 2.89 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SUS1BA005B, D/C 0523)

The AS43-1 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

MAX4823ETP+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	48	0	SUS2BA005A, D/C 0522
	Biased	& functionality	48	0	SUS2AQ001E, D/C 0442
	Time = 192 hrs.				

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