RELIABILITY REPORT

FOR

MAX7360ETL+

PLASTIC ENCAPSULATED DEVICES

August 26, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX7360ETL+ 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 MAX7360 I²C-interfaced peripheral provides microprocessors with management of up to 64 key switches, with an additional eight LED drivers/GPIOs that feature constant-current, PWM intensity control, and rotary switch control options. The key-switch drivers interface with metallic or resistive switches with on-resistances up to 5k . Key inputs are monitored statically, not dynamically, to ensure low-EMI operation. The MAX7360 features autosleep and autowake modes to further minimize the power consumption of the device. The autosleep feature puts the device in a low-power state (1µA typ) after a sleep timeout period. The autowake feature configures the MAX7360 to return to normal operating mode from sleep upon a keypress. The key controller debounces and maintains a FIFO of keypress and release events (including autorepeat, if enabled). An interrupt (active-low INTK) output can be configured to alert keypresses, as they occur, or at maximum rate. There are eight open-drain I/O ports, which can be used to drive LEDs. The maximum constant-current level for each open-drain port is 20mA. The intensity of the LED on each open-drain port can be individually adjusted through a 256-step PWM control. An input port pair (PORT6, PORT7) can be configured to accept 2-bit gray code inputs from a rotary switch. In addition, if not used for key-switch control, up to six column pins can be used as general-purpose open-drain outputs (GPOs) for LED drive or logic control. The MAX7360 is offered in a 40-pin (5mm x 5mm) thin QFN package with an exposed pad, and a small 36-bump wafer level package (WLP) for cell phones, pocket PCs, and other portable consumer electronic applications. The MAX7360 operates over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	I²C-Interfaced Key-Switch Controller and LED Driver/GPIOs with Integrated ESD Protection
B. Process:	S45
C. Number of Device Transistors:	98586
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	4/25/2009

III. Packaging Information

A. Package Type:	40-pin TQFN 5x5
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:	#05-9000-3631
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:	45°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	1.7°C/W

IV. Die Information

A. Dimensions:	105 X 105 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al 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:	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 (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)

$\lambda = 32.5 \times 10^{-9}$

λ = 32.5 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/. Cumulative monitor data for the S3 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 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 DX48 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 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

MAX7360ETL+

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	48	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