

RELIABILITY REPORT
FOR
MAX7057ASE+
PLASTIC ENCAPSULATED DEVICES

March 24, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

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| Approved by |
| Ken Wendel |
| Quality Assurance |
| Director, Reliability Engineering |

Conclusion

The MAX7057ASE+ 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 MAX7057 frequency-programmable UHF transmitter is designed to transmit ASK/FSK data at a wide range of frequencies from 300MHz to 450MHz. The MAX7057 has internal tuning capacitors at the output of the power amplifier that are programmable for matching to an antenna or load. This allows the user to change to a new frequency and match the antenna at the new frequency simultaneously. The MAX7057 transmits at a data rate up to 100kbps nonreturn-to-zero (NRZ) (50kbps Manchester coded). Typical transmitted power into a 50 load is +9.2dBm with a +2.7V supply. The device operates from +2.1V to +3.6V and typically draws under 12.5mA of current in FSK mode (8.5mA in ASK mode) when the antenna-matching network is designed to operate over the 315MHz to 433.92MHz frequency range. For narrower operating frequency ranges, the matching network can be redesigned to improve efficiency. The standby current is less than 1 μ A at room temperature. The MAX7057 reference frequency from the crystal oscillator is multiplied by a fully integrated fractional-N phase-locked loop (PLL). The multiplying factor of the PLL is set by a 16-bit number, with 4 bits for integer and 12 bits for fraction; the multiplying factor can be anywhere between 19 and 28. The 12-bit fraction in the synthesizer sets a tuning resolution equal to the reference frequency divided by 4096; frequency deviation can be set as low as \pm 2kHz and as high as \pm 100kHz. The fractional-N synthesizer eliminates the problems associated with oscillator-pulling FSK signal generation. The MAX7057 has a serial peripheral interface (SPI(tm)) for selecting all the necessary settings. The MAX7057 is available in a 16-pin SO package and is specified to operate in the -40°C to +125°C automotive temperature range.

II. Manufacturing Information

| | |
|----------------------------------|--|
| A. Description/Function: | 300MHz to 450MHz Frequency-Programmable ASK/FSK Transmitter |
| B. Process: | 0.35um |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | Taiwan |
| E. Assembly Location: | Carsem Malaysia, Hana Thailand, ATP Philippines, UTL Thailand, Unisem Malaysia |
| F. Date of Initial Production: | April 25, 2008 |

III. Packaging Information

| | |
|--|--------------------------|
| A. Package Type: | 16-pin SOIC (N) |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive Epoxy |
| E. Bondwire: | Au (1.0 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | # |
| H. Flammability Rating: | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 1 |
| J. Multi Layer Theta Ja: | 82.2°C/W |
| K. Multi Layer Theta Jc: | 32°C/W |

IV. Die Information

| | |
|----------------------------|---------------------------------|
| A. Dimensions: | 64 X 64 mils |
| B. Passivation: | Silicon Dioxide/Silicon Nitride |
| C. Interconnect: | Al/Cu |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 0.35 um |
| F. Minimum Metal Spacing: | 0.35 um |
| G. Bondpad Dimensions: | 5 mil. Sq. |
| H. Isolation Dielectric: | Silicon Dioxide |
| I. Die Separation Method: | 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:

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

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

$$\lambda = 22.4 \times 10^{-9}$$

$\lambda = 22.4$ 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 TS352P3M Process results in a FIT Rate of 0.43 @ 25C and 7.50 @ 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 LF08 die type has been found to have all pins able to withstand a HBM transient pulse of 2500 per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of 250.

Table 1
Reliability Evaluation Test Results

MAX7057ASE+

| 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