MACOM Technology Solutions Inc.
100 Chelmsford Street
Lowell, Massachusetts 01851
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19 March 2018

Digi-Key Corporation
701 Brooks Ave South
Thief River Falls, Minnesota 56701

ATTN: Quality/Purchasing Manager

Subject: Change in Moisture Sensitivity Level (MSL) – MAAM-011186 family

PCN #: PCN-01123

Dear Valued Customer:

The goal of MACOM Technology Solutions is to continually deliver high quality products and services that meet our customers' needs. We strive to offer products that are industry leading in terms of performance, delivery, safety and value.

In accordance with these goals, this communication is to inform you that MACOM has upgraded the Moisture Sensitivity Level (MSL) from MSL 3 to MSL1 on the following devices. The purpose of this change is to increase the floor life of these devices which reduces the amount of special handling and processing required by the end user.

MAAM-011186
MAAM-011186-TR1000
MAAM-011186-TR3000

You are receiving this notice because you have purchased the above products in the past two years. Details of the change are on the following pages.

Please contact your local sales representative if you have any questions or require additional information.

Sincerely,

Loren Reifsteck
U.A. Quality Manager
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MACOM
Partners in RF & Microwave

PCN Number: PCN-01123		**PCN Date:** March 19, 2018
Title: Change in Moisture Sensitivity Level (MSL) – MAAM-011186 family		
Date of change: March 2018 **Proposed last Ship Date:**		**Estimated Sample Availability/ Qualification Completion:** On request
Change Classification:	**Major** ☐	**Minor** ■
Change Type:		
Assembly Site ☐	Design ☐	Electrical Specification ☐
Test Site ☐	Assembly Process ☐	Mechanical Specification ☐
Test Process ☐	Assembly Materials ☐	Packing/Shipping/Labeling ■
PCN Details		
Description of Change:		
Upgrading the Moisture Sensitivity Level of the parts from MSL 3 to MSL 1.		
Reason for Change:		
This change will extend the floor life of the parts and require less handling and special processing by the customer. Material will be processed and packaged per JEDEC J-STD-033.		
Products Affected:		
MAAM-011186, MAAM-011186-TR1000, MAAM-011186-TR3000		
Anticipated impact on Fit, Form, Function:		
There will be no impact on fit, form, function, or reliability by this change.		
Changes to product identification resulting from this PCN:		
None.		
Material Declaration updated due to this change:		Yes ☐ No ■

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MACOM
Partners from RF to Light

MSL Evaluation

MAAM-011186

7.0 x 7.0 x 0.9 mm 48 Lead PQFN Package

QTR-0460

1. Summary

This document describes the MSL Evaluation results for the MAAM-011186, an integrated 2 stage differential amplifier with embedded digital step attenuator (DSA) assembled in a lead-free 7.0 x 7.0 x 0.9 mm 48 lead PQFN package. The MAAM-011186 has been previously qualified by similarity to several products using the same semiconductor processes and assemblies. This qualification was performed to extend the rating of the product to MSL 1.

The MAAM-011186 meets MACOM Technology Solutions reliability requirements and is released for production with a JEDEC J-STD-020 MSL 1 moisture sensitivity level classification.

2. Scope

The qualification was performed to validate the plastic package assembly reliability to an MSL1 package rating. The results of this report are not limited to the specific product described herein; they apply to a family of products designed at MACOM which use the same wafer fabrication process and/or package assembly.

3. Reference Documents

3.1. MAAM-011186 Preliminary Datasheet Revision V2
3.2. JEDEC J-STD-020 “Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices”
3.3. JESD22-A113 “Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing”
3.4. JESD47 “Stress-Test-Driven Qualification of Integrated Circuits”
3.5. MIL-STD-883 “Department of Defense Test Method Standard, Microcircuit”
3.6. GR-357-CORE Generic Requirements for Assuring Component Reliability – Component and Component Manufacturer Qualification Practice

4. Product Description and Information

The MAAM-011186 is an integrated 2 stage differential amplifier with embedded digital step attenuator (DSA) assembled in a lead-free 7 mm 48-lead PQFN package. This amplifier provides excellent linearity and high output power with greater than 30 dB MER for 64 QAM modulation with 39 channels and 52 dBmV per channel. Gain in the minimum attenuation state is typically 39 dB. The internal DSA offers 31.5 dB attenuation range with 0.5 dB steps. This device is optimized for high output power and low current from 8 V bias but can also be operated from 5 V bias with flexibility to adjust DC current with external components. The module provides a power down function for each of the amplifier stages. This amplifier is ideally suited for use in CATV reverse path applications.

Each device is 100% RF tested to ensure performance compliance. The part is fabricated using an efficient pHEMT process.

4.1 Die Information

Die Size:	2.24 x 0.98 mm
Die Thickness:	8 mil
Fabrication Process:	0.6 µm CMOS (X-FAB)
Mask ID:	37809
Die Size:	0.72 x 1.2 mm
Die Thickness:	8 mil
Fabrication Process:	2.0 µm HBT
Mask ID:	4064
Die Size:	1.86 x 1.47 mm
Die Thickness:	8 mil
Fabrication Process:	0.5 µm pHEMT (IS)
Mask ID:	1866
Die Size:	1.17 x 1.45 mm
Die Thickness:	8 mil
Fabrication Process:	2.0 µm HBT
Mask ID:	4065

4.2 Assembly and Package Information

Package Style:	PQFN
Assembly Manufacturer:	Unisem (Malaysia)
Package Body Dimensions:	7.0 x 7.0 x 0.9 mm
Lead Count:	48
Leadframe Material:	194 Cu
Substrate Material:	N/A
D/A Pad Size:	5.5 x 5.5 mm
D/A Plating:	NiPdAuAg (RT-PPF)
Lead Pitch:	0.5 mm
Lead Finish:	NiPdAuAg
Die Attach:	Abletherm 2700HT
Die Coat:	N/A
Wirebond:	1.0 mil Gold Wire

Package Material: Sumitomo EME-G770HCD
Marking Method: Laser

5. MSL Evaluation Requirements

Qualification testing has been performed to validate the reliable operation of MACOM products manufactured using a GaAs MMIC process. Tests are included to specifically address failure mechanisms related to humidity storage and reflow assembly.

5.1 General Information

Qualification Vehicle: MAAM-011186

Lot ID

Lot	1	2
Fab Lot ID	901	202
Date Code	1617	1619

Qualification Tests

Test	Conditions	End Points	Fail/SS	Result
Preconditioning (JESD22-A113) (J-STD-020)	MSL 1, 85°C/85%RH	Bake 125°C 24Hrs Moisture Soak 168Hrs 3x Reflow	0 / 160	Pass
Destructive Physical Analysis (DPA) (MIL-STD-883)	X-ray, C-SAM, Visual inspection, Die shear, Bond pull, solderability	N/A	0 / 6	Pass

6. Analysis of Results

6.1 Preconditioning/Moisture Sensitivity Level (MSL) Classification

Description Preconditioning is performed to simulate the effects of board assembly on moisturized packages, prior to reliability testing. During preconditioning, test samples are subjected to temperature dry bake, moisture soaking, solder reflow simulation, and electrical test before reliability testing. Preconditioning is performed before Temperature Cycling and Temperature Humidity Bias stressing. MSL stressing is performed to identify the classification level of nonhermetic surface mounted devices that may be sensitive to moisture-induced stress so that they can be properly packaged, stored, and handled to avoid damage during assembly solder reflow attachment and/or repair operations. JESD22-A113 is used as a guideline.

Results No failures were observed either visually or electrically. This indicates that the devices may be safely handled, stored, assembled, and reworked per the tested MSL conditions.

6.2 Destructive Physical Analysis (DPA)

Description X-ray, CSAM, internal visual inspection and external visual inspection of devices are performed to verify the physical integrity of the assembled integrated circuit. For this product we also performed bond pull testing and die shear testing. The appropriate test methods specified by MIL-STD-883 were used as guidelines for these tests.

Results All physical dimensions and workmanship were within specification and showed no significant variation. This data indicates that the process is uniform and is in statistical control.

Revision History

Rev - released 13 March 2018, Bradley Mikesell

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