
Application Note Environmental Data related to UMS products

GaAs Monolithic Microwave IC

1. Introduction

UMS is a key supplier of microwave products for high performance systems to be used from Military, Space or Automotive or Telecommunication infrastructures. According to its ISO14001 certification, UMS puts a lot of effort to offer to customers environmentally friendly products. As such, UMS propose products in chip form but also packaged solutions mainly based on QFN (Quad Flat No Lead) according to JEDEC MO220J.

So, this application note describes these environmental aspects and gives numerical data on the CHA3666 well representative of the UMS products.

2. Environmental Aspects

Through the UMS Environmental Policy part of its ISO14001 certification, UMS takes care of the environment by reducing its natural resources consumption, its waste production and by preventing any pollution whatever the German or the French plant.

Beyond the legal requirements, UMS is engaged in an active way to fulfill the requirements with the suppliers and the customers.

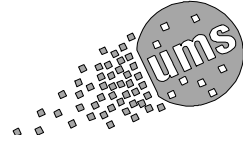
Moreover and according to its Environmental Analysis based on the Life Cycle Analysis on two products UMS has emphasized some way of improvement on the products with some Significant Environmental Aspects.

Consequently, UMS has integrated in the specifications targets of its products the reduction of the chip area, the package size and/or the DC consumption as a trade-off with the main specifications of the products

3. Product Identification

3.1. Chip product

The UMS logo and the part number are marked on the chip as well as the naming of the accesses according to the datasheet of the product. The mechanical data are also described in the datasheet while the thermal management is detailed in the Application Note AN0018.

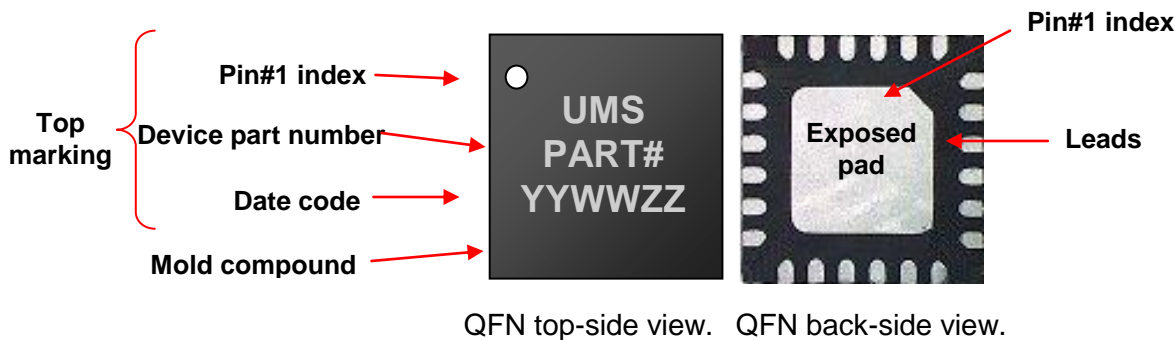


3.2. Packaged product

The QFN packages are LASER marked on top-side as shown below. The package top marking includes a Pin#1 index and three lines of text used for the device identification.

- ✓ Line 1: UMS logo.
- ✓ Line 2: device part number.
- ✓ Line 3: date code
 - YY stands for the two last digits of the assembly year.
 - WW stands for the week in the assembly year (from 01 to 52).
 - ZZ are two optional characters used internally at UMS for lot identification.

Remark: In some cases, samples or prototypes can be marked with white ink.



The mechanical data are described in the datasheet while the thermal management is detailed in the Application Note AN0018 and the assembly recommendations in the Application Note AN0017.

4. Composition / Material

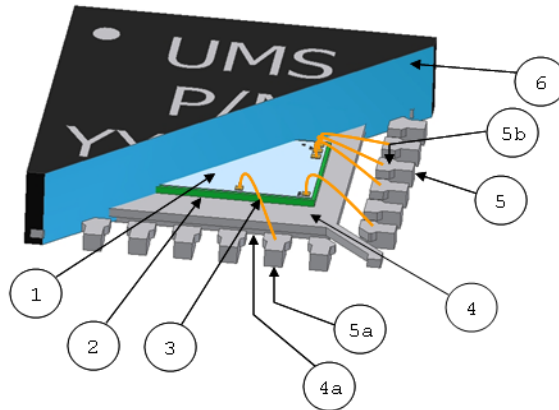
4.1. Chip product

Based on the phase-in substances list as called on the ECHA website and referred by its CAS number, UMS chips are composed of Gallium Arsenide with gold plating on the backside of the products as presented in the table below for the CHA7115.

Component	Material name	Substance name	CAS number	Substance mass (mg)	Substance (% w/w)
MMIC chip	Gallium Arsenide	GaAs	1303-00-0	5.637	83
	Gold	Au	7440-57-5	1.174	17

4.2. Packaged product

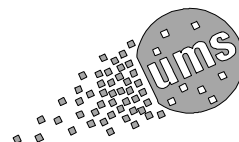
The UMS QFN plastic packages are compliant with RoHS directive (2011/65/EC). The list of the materials constituting the product is given in the table hereafter.



No.	Name	Material	Note
1	MMIC	GaAs	
2	Die attach	Epoxy resin with silver filler	
3	Bonding Wire	Gold	
4	Frame	Copper (C194) with Sn external finish	Sn finish on back side, see 4a
4a	Frame external Sn finish	Matte tin (Sn), thickness 400 µinch	Package's exposed surfaces only
5	Lead	Copper (C194) with Sn external finish	Sn finish on back side, see 5a Ag finish on top side, see 5b
5a	Lead external Sn finish	Matte tin (Sn), thickness 400 µinch	Package's exposed surfaces only
5b	Lead bond pad Ag finish	Silver spots (Ag), thickness <40 µinch max.	Lead's internal bond area
6	Mold Resin	Multi-Aromatic Resin (Br/Sb free)	

The main fractions of material are typically as presented below for the CHA3666-QAG:

Fraction / material	Amount (mg)	% of total weight
MMIC	1,312	2,75 %
Mould Compound	11,959	25,09 %
Die Attach	0,193	0,40 %
Lead frame	13,035	27,34 %
Gold wire	0,073	0,15 %
Lead finish	0,647	1,36 %
Total Weight	27,22	56,71 %



5. Environmental Data

5.1. Chemical data

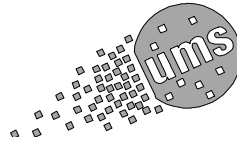
With this CHA3666-QAG Low Noise Amplifier, the ingredients are as follows:

Component	Material name	Substance name	CAS number	Substance mass (mg)	Substance (% w/w)
MMIC chip	Gallium Arsenide	GaAs	1303-00-0	1,145	83
	Gold	Au	7440-57-5	0,167	17
Mould compound (Sumitomo)	Silica fused	SiO2	60676-86-0	10,966	91,7
	Epoxy Resin	Trade secret	-	0,478	4,0
	Phenol Resin	Trade secret	-	0,478	4,0
	Carbon black	C	1333-86-4	0,036	0,3
Die Attach (Ablebond 2815A)	Silver	Ag	-	0,164	85,0
	Acrylate Resin	Proprietary	-	0,015	8,0
	2-n-Butoxyethyl Acetate	CH ₃ COOCH ₂ CH ₂ O(CH ₂) ₃ CH ₃	112-07-2	0,007	3,5
	2-(2-n-Butoxyethoxy)ethyl Acetate	CH ₃ CO ₂ CH ₂ CH ₂ OCH ₂ CH ₂ O(CH ₂) ₃ CH ₃	124-17-4	0,007	3,5
Lead frame	Copper	Cu	7440-50-8	12,652	97,5
	Iron	Fe	7439-89-6	0,305	2,35
	Zinc	Zn	7440-66-6	0,016	0,12
	Phosphor	P	7723-14-0	0,004	0,03
	Silver	Ag	7440-22-4	0,058	-
Bond wire	Gold	Au	7440-57-5	0,073	99,99
Lead finish	Tin	Sn	7440-31-5	0,647	100,0

5.2. Product Environmental Profile

Following the Life Cycle Analysis of the CHA3666-QAG and taking into account the ISO standards, a Product Environmental Profile (available on request) has been established so that the complete shipping including the packing is composed as in the tables below for delivery in tube or on reel:

for 100 QFN in tube	Amount (g)	% of total weight
MMIC GaAs	0,12	0,25 %
Compound, Die attach	1,2	2,52 %
Metals	1,4	0,44 %
Plastics	35	11,09 %
Packing, cardboard box	280	88,05 %
Total Weight	318	Recyclability : 79%



for 300 QFN in reel	Amount (g)	% of total weight
MMIC GaAs	0,36	0,76 %
Compound, Die attach	3,6	0,602 %
Metals	4,2	0,702 %
Plastics	350	58,53 %
Packing, cardboard box	240	40,11 %
Total Weight	598	Recyclability : 79%

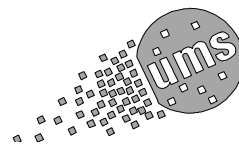
Extracted from the Life Cycle Analysis, the environmental impacts of the CHA3666-QAG should be representatives for other parts which consist of a homogenous environmental family (same Front-End, same QFN encapsulation, same Back-End).

Evaluation of the environmental impacts of the referred product is reported for the different steps of the life cycle: Manufacturing, Distribution, Use and End of Life.

Impact Indicator	Unit	Total	Manufacturing %	Distribution %	Use %	End of Life %
Raw Material Depletion	1 / year	5,27 E-16	40	< 1	59	< 1
Energy Depletion	MJoule	336,3	16	< 1	83	< 1
Water Depletion	liter	65,8	33	< 1	65	< 1
Global Warming	kg eq CO2	17,4	17	< 1	82	< 1
Ozone Depletion	mg eq CFC11	1,3	5	< 1	94	< 1
Air Toxicity	m3	3 207 625	13	< 1	85	< 1
Photochemical Ozone Creation	g eq C2H4	6,07	18	< 1	81	< 1
Air Acidification	g eq H+	2,6	13	< 1	86	< 1
Water Toxicity	liter	5223	33	< 1	66	< 1
Water Eutrophisation	g eq PO43-	0,27	83	< 1	15	< 1
Hazardous Waste Production	kg	0,304	24	< 1	75	< 1

For the impact indicators, the extrapolation rule for the other products than the referred product should be proportional to:

- ✚ MMIC weight
- ✚ MMIC consumption
- ✚ Package weight
- ✚ Time usage for the operational part (10 years in Use for the CHA3666-QAG)



6. Health Hazard Information

Primary route of entry: Inhalation, Skin, Ingestion

Acute effects of exposure:

- + Inhalation: may cause slight irritation with the mould compound substances in case of broken package but lack of sufficient data
- + Skin: may cause slight irritation with the mould compound substances in case of broken package but lack of sufficient data
- + Ingestion: may cause slight to moderate irritation of the gastrointestinal tract. Immediately give plenty of water. Get immediate medical attention.

7. Ecological Information

Due to the presence of Gallium Arsenide, the UMS products must be considered at the end of their life as a Specific Industrial Waste (or Dangerous Waste) and so, eliminated following the local, national and/or international regulations.

For that purpose, information in Data Base, Material Data Sheet or specific document is supplied to the customer in order for him to comply in particular with the DEEE directive N°2002/96 or the VHU directives N°2000/53 & 2011/37.

8. Fire Information

The UMS products can release very low quantities of chemical gases when in touch with flames at high temperature.

9. Handling and Storage

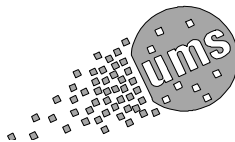
Care must be taken to handle the UMS products in order to preserve the package integrity and avoid scattering of mould compound particles.

The storage area must be compatible with the humidity grade of the product (Moisture Sensitivity Level) and with an ambient temperature in the range specified in the datasheet of the UMS product.

The UMS products must be taken away from the radiation sources or incompatible substances. They have to be stored in the original packing.

10. Exposure and Use

The UMS products should be *exclusively* used for the purpose detailed in the datasheet following the presented assembly considerations completed by the information of the Application Notes AN0018 for "Thermal Management" and AN0017 for "Moulded Plastic QFN Packages" available on the Web site.



11. Transport information

After the shipment, the UMS products should be kept and stored in the original packing with the adequate conditions (see above § 9) until it has to be assembled in the final unit, the subassembly or the equipment.

12. Regulatory Information

The UMS products are compliant with the Directive N°2011/65/EC on the Restriction of the Use of Certain Hazardous Substances (RoHS) which restricts the use of lead, mercury, hexavalent chromium, polybrominated biphenyls, polybrominated diphenylethers (1000ppm) and cadmium (100ppm).


The UMS products, considered as articles by the REACH (Registration, Evaluation, Authorization of Chemicals) Directive N°1907/2006, are compliant with this regulation. And UMS has taken reasonable actions to ensure through its Supply Chain that the UMS products will be compliant in relation with the Candidate List regularly updated by European Chemical Agency on http://echa.europa.eu/chem_data/candidate_list_en.asp.





UMS takes care also of the packing of the products so that the delivery should be compliant with the Directive N°94/62 which restricts the sum of lead, cadmium, mercury and hexavalent chromium to less than 100ppm of the weight of the packing.




Actions have also been taken during the fabrication of the wafers on the German plant to be compliant with the directive N°2006/122 so that the wafers don't contain any trace of perfluorooctane sulfonates (PFOS).

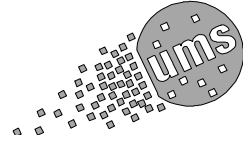
13. Hazard classes and Categories

According to the regulation N°1272/2008 on the "Globally Harmonised System of Classification and Labelling of the Chemicals" UMS products are concerned by the rubric Arsenic Compounds and some rubrics in relation with the Lead frame and the Die Attach materials; so the following Hazard Classes have been raised even if the involved quantities per product are very low:

-  H228: Flammable solids, category 1

-  H301: Oral - Acute toxicity category 3
-  H312: Dermal - Acute toxicity category 4
-  H331: Inhalation - Acute toxicity category 3
-  H332: Inhalation - Acute toxicity category 4

-  H400: Hazardous to the aquatic environment, *acute*, category 1
-  H410: Hazardous to the aquatic environment, *chronic*, category 1
-  H421: Hazardous to the aquatic environment, *chronic*, category 3



14. Other Information

All information appearing herein is based on data obtained from the manufacturers and/or recognized technical sources. While the information is believed to be accurate, UMS makes no representations as to its accuracy or sufficiency. Conditions of use are beyond UMS control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling and disposal of the product.

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