RoHS Declaration

for

IGBT Modules and IPM Products

e-Front runners

June 2005

Fuji Electric Device Technology Company Limited
Semi-Conductor Factory, Semi-Conductor Division

C-MIST Consultants to Fuji Electric Device Technology Limited

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RoHS Declaration

1. INTRODUCTION

The European Parliament is acting to protect and improve the environment and protect human health by utilising resources prudently and rationally. To achieve this objective two Directives have been introduced.

1) RoHS (Restrictions of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment)

2) WEEE (Waste Electrical and Electronic Equipment)

Fuji Electric Device Technology Co Ltd (FDT) and Fuji Electric Scotland Ltd (FDTS) are amongst the pioneering organisations that are committed to the implementation of the RoHS Directive and its related regulations.

This document "RoHS Declaration" provides information with regard to two types of our products; the Integrated Gate Bipolar Transistor (IGBT modules) and the Integrated Power Module (IPM products).

Please note that this Declaration does not cover our other products and modules which are not mentioned in this document.

2. OBJECTIVES

As part of FDT and FDTS Policy of improvement of the environment and reduction of waste, particularly hazardous substances, we are committed to the implementation of the RoHS and WEEE directives.

This document explains our Declaration towards the implementation of the RoHS directive. The objective is to provide technical information and understanding of our Transition Phase towards products becoming completely free of the hazardous substances which are restricted by the RoHS Directive.

3. THE RoHS DIRECTIVE

The Restrictions of the Use of Certain Hazardous Substances (RoHS) Directive 2002/95/EC will become effective by the 1st July 2006. The Directive contains prohibitions and reductions of the following materials in certain products as follows:

(a) Heavy metals:
- Lead
- Mercury
- Cadmium
- Hexavalent Chromium (Chromium VI)

(b) Flame Retardants in plastic:
- Polybrominated Biphenyls (PBB)
- Polybrominted Diphenyl Ether (PBDE)

4. UNDERTAKING

The UK and other European countries are in the process of finalising their RoHS Regulations. A number of definitions and technical details remain to be clarified.

During our Transition Phase we will have to produce both RoHS compliant and non-RoHS compliant products for clients in different markets. To ensure that our undertakings are accurate with respect to the RoHS compliant products, particularly during the Transition Phase, we have carried out a risk assessment on the possible cross-contamination of the products during the manufacturing process. Although every effort will be made to reduce and/or remove such risk, it is impossible to guarantee that some degree of unintentional cross-contamination will not take place during the Transition Phase.

5. MAXIMUM CONCENTRATION VALUE (MCV)

We will start production of the hazardous substances-free IGBT modules and IPM products from mid-2005. This will allow our clients time to phase in these new modules and products by 1st July 2006. However, since during the Transition Phase there will be the risk of unintentional cross-contamination in the manufacturing process, we clarify our undertaking as follows:

1. We refer to the Maximum Concentration Value (MCV) as the total weight of the Restricted Hazardous Substance (lead or its compounds) expressed as a percentage of the total weight of the soldering material used within each module or product. However, the total weight of possible cross-contamination in each product is negligible. Nevertheless, during an inspection check, if spot sampling is used, the results may show high concentrations of contamination in a small spot. Such results are obviously misleading as these do not contravene the spirit of the RoHS directive in terms of reducing the quantities of hazardous material overall.

   Based on the above explanation we define MCV as the total weight of lead contaminant as percentage of the soldering material used in each module or product.

2. The MCVs as expressed in the UK draft regulations for the Restricted Hazardous Substances are:

   - Cadmium and its compounds; 0.01wt% in the homogeneous material
   - Hexavalent chromium and its compounds; 0.1wt% in the homogeneous material
   - Lead and its compounds; 0.1wt% in the homogeneous material
   - Mercury and its compounds; 0.1wt% in the homogeneous material
   - PBB (Polybrominated Biphenyls); 0.1wt% in the homogeneous material
   - PBDE (Polybrominated Diphenyl Ethers); 0.1wt% in the homogeneous material

   The concentration of Cadmium, Hexavalent Chromium, Lead, Mercury and their components, Polybrominated Biphenyl and Polybrominated Diphenyl Ethers will be reduced to a figure well below the above values and possibly zero percent.

6. PROCESS RISK ASSESSMENT

We have carried out a Risk Assessment identifying the risk of Restricted Hazardous Substances being used.

A possible unintentional cross-contamination risk was identified and a number of control measures have been implemented.

7. CROSS CONTAMINATION DURING TRANSITION PHASE

IGBT modules or IPM products are made up of a number of homogeneous materials or components (see Appendix 1, Fig 1).

We will source components that fully comply with requirements of the RoHS directive. However, during the process of manufacturing the modules or products, an unintentional cross-contamination of lead solder/plating (UCC) might occur. The UCC is due to the possible scattering, attachment or transcription of solder.

However, since the MCV, as explained previously, of the possible cross-contaminated components would be well below the maximum requirements of the RoHS directive the effect of the risk of cross-contamination is considered to be insignificant.

8. REPLACEMENT MATERIALS

The hazardous substances currently used in the IGBT modules and IPM products and their replacement materials are shown below:

Substance Currently Used	Points of Use	Replacement Substance
Hexavalent chromium and its compounds	Plating of case rings, nuts and screws	Trivalent chromium plating
Lead and its compounds	Soldering on Insulation boards - metal base, terminal soldering points	Tin/silver type solder
	Solder plating on terminals	Tin type solder

Details of replacement materials will be clarified and included in the specifications. The modules and products which conform to the RoHS Directive will be identified by changes to drawing and part numbers.

9. INSPECTION AND TESTING

9.1 Inspection at Component Level

The methods of inspection, testing and monitoring are as follows:

Inspection at component level (for certain hazardous substances, which may enter terminal cases)

- Hexavalent chromium plating (nuts, rings, screws)

  Action -Each plating manufacturer executes quantitative analysis using absorptiometer.

- Solder plating (terminal plating)

  Actions - Each plating manufacturer executes quantitative analysis using fluorescent X-ray techniques. Each terminal case supplier acquires relevant data and records accordingly e.g. in engineering information.

- Solder (Additional Items)

  Actions - A sample from a lot requires quantitative analysis using fluorescent X-ray techniques as defined in the Process Flow.

9.2 Inspection at Product Level

We will execute sampling inspection of finished products for quantitative analysis of solder plating on terminal surfaces. Fuji will determine the inspection frequency in correspondence to the risk and will specify it in the production process flow.

10. MARKING

Products that are RoHS compliant will be given a different device number to those products that are not RoHS compliant. This will be achieved by adding 50 to the last two digits as shown in the following examples:

(i) Current model name (non-RoHS compliant): 7MBR25A-120
Future model name (RoHS compliant): 7MBR25A-120-50

(ii) Current model name (non-RoHS compliant): 7MBR25A-120-01
Future model name (RoHS compliant): 7MBR25A-120-51

(iii) Current model name (non-RoHS compliant): 7MBR25A-120-13
Model name after change (RoHS compliant): 7MBR25A-120-63

11. SUPPLIERS' DECLARATIONS

Our suppliers will be required to provide a signed declaration that their products will not contain restricted hazardous substances in accordance with the RoHS directive. Suppliers will be required to adopt a system whereby the distinction between RoHS compliant and non-RoHS compliant products are easily identifiable.

APPENDIX 1

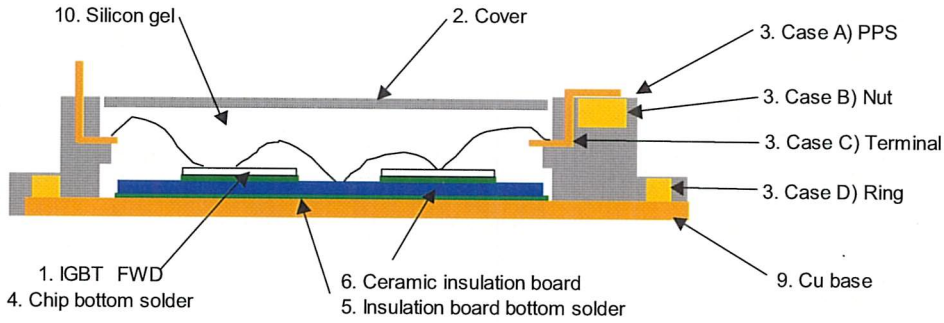

Figure 1: Module Structure

Table 1: List of Components

	Material name	Location	Principal raw material, surface treatment, etc.	Certain hazardous substances	Alternative material	Method for analysis	Frequency of analysis	Remarks
1	IGBT/FWD		Si	Not applicable				
2	Cover		PPS	Not applicable				
3	Terminal case	A) Resin	PPS	Not applicable				
		B) Nut	Steel Hexavalent Cr plating	6+Cr Hexavalent Cr	Trivalent Cr	Adsorptiometer	Each plating lot	Entry of numerical value in delivery note
		C) Terminal	Cu Solder plating	Pb	Sn solder plating	X-ray Fluorescence	Each plating lot	Entry of numerical value in delivery note
		D) Ring	Cu Hexavalent Cr plating	Hexavalent Cr	Trivalent Cr	Adsorptiometer	Each plating lot	Entry of numerical value in delivery note
4	Chip bottom solder		SnAg type solder	Not applicable				
5	Solder between insulation board bottom and base		Sn60Pb	Pb	SnAg type solder	X-ray Fluorescence	Each lot	Entry of numerical value in delivery note
6	Ceramic insulation board	Cu foil Ceramics	Cu Alumina	Not applicable				
8	Aluminum wire		AL	Not applicable				
9	Copper base	Cu material Ni plating	Cu Ni	Not applicable				
10	Silicon gel		Silicon	Not applicable				
11	Adhesive		Silicon	Not applicable				

REVISION STATUS INDICATOR				
REV	SECTION	DESCRIPTION	DATE	ORIGINATOR
1	All	Original	June-2005	C-MIST Director

RoHS Declaration Approval			
C-Mist Director		Date	June 2005
FDT : Industrial Application Division Manager		Date	June 2005
FDTS Managing Director		Date	June 2005