



# **CHEMICAL CONTENT OF SEMICONDUCTOR PACKAGING**

**3<sup>rd</sup> Edition**

**Issued by Corporate Environment Support Group  
with the contribution of Corporate Package Development**

**September 2004**

---



*Information provided in this booklet is believed to be accurate and reliable. It can be changed at any time without prior notice. It represents the best of our visibility on the materials used for our products, based upon application of our TQEM corporate procedures. No liability is assumed as a result of use or application by the customer of such information. Disclosure and publication of this information does not imply any legal binding commitment, including grant of licenses or integration of any product specifications.*

**USE IN LIFE SUPPORT DEVICES OR SYSTEMS MUST BE EXPRESSLY AUTHORIZED**

STMicroelectronics PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF STMicroelectronics.

As used herein:

1. Life support devices or systems are those which (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided with the product, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can reasonably be expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.





## TABLE OF CONTENTS

FOREWORD	page 5	
INTRODUCTION	6	
SUBSTANCES NOT USED BY STMicroelectronics (Banned)	10	
DETAIL SUBSTANCES NOT USED BY STMicroelectronics	11	
SUBSTANCES NOT USED BY STMicroelectronics - Declaration examples	27	
CERTIFICATE OF COMPLIANCE	29	
SUBSTANCES CURRENTLY PRESENT IN STMicroelectronics PRODUCTS	30	
PACKAGE FAMILY MATERIAL DECLARATIONS	32	
Description	Types	
Plastic axial diode	R6 - D015 - D0201 - ...	33
Surface mount diode in melf packages	MELF - MINIMELF	35
Power schottky and rectifier diode	ISOTOP	37
Trisil, transil and schottky diodes in plastic packages	SMA - SMB - SMC - STMITE	39
Thyristors	RD91	41
Small signal transistors in metal can packages	T05 - T018 - T039 - ...	43
Power products in T03 packages	T03 - T03 JUMBO	45
Small signal transistors in T092 package	T092	47
Small outline transistors and diodes – low power	SOT23 - SOT89 - SOT223 - ...	49
Small outline transistors and diodes – high power	SOT93 - SOD93 - TOP3 - ...	51
Surface mount devices medium power transistors	DPAK - D2PAK - PPAK - ...	53
Through hole package medium power transistors	IPAK - I2PAK - SOT32 - SOT82 - ...	55
Medium/high power transistor/thyristor isolated packages	ISO220 - T0247 - ISO218	
	SOT93 - MAX220 - IS05 - IS07	57
GBU package	GBU	59
R.F. hermetic packages with stud	S016 - S027	61
R.F. ceramic packages with stud	M122 - M130 - ...	63
R.F. hermetic flanged packages	M105 - M112 - S038 - ...	65
R.F. studless ceramic packages	M115 - M123 - S051 - ...	67
R.F. ceramic flanged packages	M 103 - M111 - M165 - ...	69
Ceramic dual in line package	CERDIP 8 - 22 - 24 - ...	71
Frit-seal ceramic package with bulls-eye (lens)	FDIP 20 - 24 - 28 - ...	73
Side brazed ceramic dual in line package with and without lens	CERDIP 8 - 14 - 16 - ...	75





J leaded chip carrier	JLCC 24 - 44 - 52	77
Ceramic leaded chip carrier	CLCC 28 - 32 - 36 - ...	79
Ceramic quad flat packages	CQFP 44 - 52 - 64 - ...	81
Ceramic pin grid array	CPGA 64 - 68 - 84 - ...	83
Dual in line plastic packages – frame 0.25	PDIP 8 - 14 - 16 - ...	85
Power dual in line plastic packages – frame 0.40	PDIP 8 - 16 - 18 - ...	87
Shrink dual in line plastic packages	SDIP 24 - 30 - 32 - ...	89
P-dip zeropower/timekeeper	PDIP 24 - 28	91
Small outline plastic packages	S08 - 14 - 16 - ...	93
Shrink small outline plastic packages	SSOP 14 - 16 - 20 - ...	95
Power SO packages	POWSO 10 - 16 - 20 - ...	97
T0220 packages	T0220	101
Multiwatt	MW	103
Pentawatt, heptawatt	PW - HPW	105
Flexiwatt packages	FW 15 - 21 - 25 - ...	107
Clipwatt packages	CW 8 - 11 - 15 - ...	109
Single in line plastic packages	SIL&SIP 2 - 3 - 4 - ...	111
Plastic leaded chip carrier	PLCC 20 - 28 - 32 - ...	113
Thin quad flat packages	TQFP 32 - 44 - 68 - ...	115
Low quad flat packages	LQFP 32 - 44 - 48 - ...	117
Plastic quad flat packages	PQFP 32 - 44 - 52 - ...	120
High quad packages	HIQUAD 64 - 92	123
Thin small outline packages – frame Cu	TSOP 28 - 32 - 40 - ...	125
Thin small outline packages – frame Alloy42	TSOP 28 - 32 - 40 - ...	127
Thin small small outline packages	TSSOP 8 - 14 - 16 - ...	129
Low profile ball grid array packages	LBGA 36 - 48 - 64 - ...	131
Thin fine pitch ball grid array packages	TFBGA 16 - 24 - 36 - ...	133
Low profile fine pitch ball grid array packages	LFBGA 24 - 36 - 40 - ...	137
Plastic ball grid array packages	PBGA 144 - 156 - 177 - ...	140
Very-thin-profile fine pitch ball grid array packages	VFPGA 44 - 46 - 47 - ...	143
Very thin fine pitch quad flat package no lead	VFQFPN 14 - 16 - 20 - ...	145
Flip chip CSP	FLIP CHIP 5 - 6 - 8 - ...	147
Micromodule (potting or molding process)	D5 - D7 - D10	149
Micromodule with metal ring	D35 - D45	151



## FOREWORD

*"One of the major challenges facing the world community as it seeks to replace unsustainable development patterns with environmentally sound and sustainable development is the need to activate a sense of common purpose on behalf of all sectors of society. The chances of forging such a sense of purpose will depend on the willingness of all sectors to participate in genuine socialpartnership and dialogue, while recognizing the independent roles, responsibilities and special capacities of each"*

*Agenda 21, Earth's Action Plan, Chapter 27*

Waste can be harmful to Environment, therefore a more and more increasing number of companies are committed to minimize the environmental effects of their activities development reducing the waste disposed of in landfills by increasing the practice of reusing or recycling. This will have the beneficial effect to reduce also the use of virgin materials and resources.

The booming development of electronic products has sharply increased the quantities of Waste from Electrical and Electronic Equipment (WEEE), amplifying the problem of their disposal.

The solution can be found only through a modern Design For Environment (DFE) with a big attention addressed to recycling and disassembly.

STMicroelectronics, already firmly convinced that it is mandatory to be at the forefront of ecological commitment, cannot forget to help its Customers in their efforts to search for the best DFE of their electronic equipment by making available to them all the necessary detailed information on its products.

Best regards.

Giuliano Boccaletti  
Corporate Environment Support Group Director  
STMicroelectronics

Enrico Galbiati  
Corporate Environment Program Leader  
STMicroelectronics





## INTRODUCTION

This booklet reports synthetically the chemical and physical characteristics of STMicroelectronics' packages in order to provide customers information about use, product safety and disposal of products manufactured by us. This booklet is mainly constituted of tables. Each table includes a package family (Package Weight List). A family is composed of packages with similar structural process and chemical-physical material composition. This organization of data will help readers to find more easily information on the package of interest, since STMicroelectronics produces more than 20,000 types of diodes, transistors, integrated circuits and subsystems (modules) assembled in more than 800 packages with plastic, ceramic, glass or metallic cases.

### EXPLANATION OF THE TABLES

Package Weight List includes the package family while Product Material Sheet displays the relevant family Material Composition; Shipping Material table gives information on packing materials used for shipping components to Customers.

#### 1) PACKAGE WEIGHT LIST

- This table shows for each package family: weight (mg), body size (mm) and packing quantity.
- The weight of a single package may be slightly different for different devices with the same package, if the die size and the relevant wire bond lengths are different. Difference may also depend on process tolerances. However, these differences are practically negligible.
- Major differences may occur, however, if packages contain different leadframe types. Differences in leadframe weight may be due to the material used (Copper, Alloy42), the thickness or the die pad size. Different leadframe types may be used on the same package type for different silicon die size or for different levels of power dissipation.
- The body dimension is the dimension of the package that contains the Silicon die.
- The typical dimensions reported here are for reference only. The relevant data sheets must be used for the updated and guaranteed dimensions and any other relevant data.
- The Bulk quantity (Box quantity) is a number of devices packed in a container (Box) that contains a defined number of "base" quantity (tube, tray, tape & reel, etc). It is also for reference only and may be changed by STMicroelectronics without updating this booklet.

#### 2) PRODUCT MATERIAL SHEET

This table shows the Material Composition of the representative group package, broken down on the following categories:

- **Encapsulation Materials**
- **Chip**
- **Metallic Parts**
- **Other**



• **Encapsulation Materials**

The package encapsulation materials are mainly:

- a) Plastic
- b) Ceramic
- c) Metal

a) Plastic

The plastics used by STMicroelectronics are mainly transfer-mold epoxy cresol novolac (ECN-Epoxy resin). The filler of these resins is SiO<sub>2</sub> (about 70%). The epoxy resins used by STMicroelectronics contain Antimony trioxide (Sb<sub>2</sub>O<sub>3</sub>) as flame retardant synergist and TetraBromoBisphenol-A (TBBA) as flame retardants. After curing, the tetrabromobisphenol-A is no longer free because it is incorporated into the epoxy polymer. The Product Material Sheets report the percentage of Bromine (TBBA) in the epoxy polymer (about 1%) and the amount of Antimony trioxide (about 2%). The flammability of all the epoxy resins used by STMicroelectronics meets the Standard UL94-V0 requirements. (See also point 2 of page 27)

b) Ceramic

The ceramic used by STMicroelectronics for the RF transistors is BeO (alternative ceramic already available for a large part of these products) and is Alumina (Al<sub>2</sub>O<sub>3</sub>) for the integrated circuits.

c) Metal

The materials used by STMicroelectronics for the metallic packages are usually Alloy 42, Nickel, Iron and Copper.

• **Chip**

The active part of each device is a silicon chip doped at atomic levels (some tens of ppb) with Phosphorus, Boron and Arsenic. The back of the die can be raw or metallized mainly with thin layers of Titanium, or Gold, or Nickel in order to enhance the die capacity to bond to the header or to the leadframe.

• **Metallic Parts**

The heatspreaders and the leadframes of plastic packages can be composed of Alloy 42 or Copper alloys. The Copper alloys are a combination of Copper with a small amount of alloying elements such as Ag, Co, Fe, Zn, P. Alloy 42 is an alloy of Iron with 42% Nickel. The materials used by STMicroelectronics for the metallic packages are usually:

- header- Iron and/or Copper
- cup - Iron/Nickel or Nickel
- leads - Alloy 42





• **Other**

The inks (marking) used by STMicroelectronics for metallic, plastic, glass or ceramic packages are mainly epoxy resins with dyes. No fluid inks containing organic Tin are used by STMicroelectronics. However, inks marking is going to be totally substituted by laser marking.

**3) SHIPPING MATERIALS**

Our commitment to Environment is extended also to packing materials. Information related to specific chemical substances not present in packing materials can be found in the “Additional information on packing material” section. This section is focusing on several packing materials for which the restricted presence of particular heavy metals is well identified.

The cardboard boxes used to ship products consist primarily of natural fibers which are suitable for recycling as indicated by the RESY symbol marked on the outer package (RESY is an European-based paper recycling organization).

Outer boxes: natural recyclable carton with DIN symbol “RESY” sign and all printings in black (no heavy metals and/or organic Tin). This material is biodegradable.

Inner boxes: natural recyclable carton with DIN symbol “RESY” sign. All printings in black (no heavy metals and/or organic Tin) and carbonized coating inside (ESD protection). This material is biodegradable.

Packing of STMicroelectronics products is achieved mainly in the following ways:

Tape & Reels, Trays and Tubes. The reels are made of polystyrene, a thermoplastic derived by polymerizing styrene, a petroleum by-product. Since the polystyrene reels show strength and durability to protect the products, these reels have particular features that allow them to be reused.

Trays used to ship our products are designed in accordance with JEDEC (Joint Electronics Devices Engineering Council) recommendations and are generally made with thermoset plastics with heat resistance characteristics, such as carbon fiber modified polysulfone (MPSU).

Similar to reels, the trays also show properties that allow for their reuse. Obviously, reuse of plastics will avoid waste from entering landfills and prevent the creation of hazardous emissions (dioxins and furans) caused by improper burning of certain plastics. Tubes are made of polyvinylchloride (PVC), a thermoplastic derived by polymerizing vinyl chloride. PVC is a material that is recyclable by approved plastic recycling vendors. To reduce environmental impact, STMicroelectronics strongly recommends to establish local procedures to allow for recycling of paper packing materials and the reuse or recycling of plastic packing materials. STMicroelectronics materials meet the European Parliament and Council Directive 94/62 requirements.

Most of packing are made with one material and a very high percentage of them are biodegradable.





### 3a) Additional information on packing materials

- Substances involved: Cadmium (Cd), Lead (Pb), Mercury (Hg) and Hexavalent chromium (CrVI)
- Packing material includes: Cartons to package products and general packing for Part transportation like tapes, reels, tubes, bags, staples, sheets, wraps, paints, inks, labels, cushions, wooden frames, corrugated cardboard, vinyl ties, cushioning materials, foil, trays, stopper and nail tubes, etc.
- Allowable concentrations: Less than 100 ppm as an allowable total-concentration level of the four a.m. heavy metals. Less than 5 ppm as an allowable cadmium-concentration in packing materials.

### DISPOSAL

Products at the end of their life as well as any scrap must be disposed of following the local and national legal and regulating provisions. STMicroelectronics suggests to dispose of these products with the best and appropriate available technology (for instance: precious metal recovery processes).





## SUBSTANCES NOT USED BY STMicroelectronics (Banned)

STMicroelectronics has adopted 5 ppm as the maximum Threshold Limit Value (TLV) either for detection limit and accidental errors of measurement equipment or for impurities (traces) existing in the natural world. Unless otherwise specified, concentration level below TLV of 5 ppm's is tolerated. See further details in Corporate Specifications 0115767 and 7527689. Copy of these Specs. can be requested to ST Corporate Environment and/or to ST Sales Offices.

- |                                  |  |
|----------------------------------|--|
| 1) Heavy Metals                  | 1a - Cadmium and cadmium compounds<br>1b - Lead and lead compounds<br>1c - Mercury and mercury compounds<br>1d - Hexavalent chromium compounds   |
| 2) Chlorinated organic compounds | 2a - Polychlorinated biphenyls (PCB) compounds<br>2b - Polychlorinated naphthalenes (PCN)<br>2c - Chlorinated paraffins (CP)<br>2d - Mirex (Perchlordecone)<br>2e - Other chlorinated organic compounds        |
| 3) Brominated organic compounds  | 3a - Polybrominated biphenils (PBB) compounds<br>3b - Polybrominated diphenylethers (PBDE)<br>3c - Tetrabromobisphenol-A-bis-(2, 3-dibromopropylether) (TBBP-A-bis)<br>3d - Other brominated organic compounds |
| 4) Organic tin compounds         | 4a - Tributyl tin compounds,<br>4b - Triphenyl tin compounds   |
| 5) Asbestos                      |  |
| 6) Azo compounds                 |  |
| 7) Formaldehyde                  |  |
| 8) Ozone depleting subst         | 8a - Chlorofluorocarbons (CFC)<br>8b - Hydrochlorofluorocarbons (HCFC)   |
| 9) Residual monomers             |  |
| 10) Benzene                      |  |

**DETAIL OF SUBSTANCES NOT USED BY STMicroelectronics****1a - CADMIUM AND CADMIUM COMPOUNDS**

<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Cadmium	7440-43-9	Cd	Connection materials, surface treatment
Cadmium alloys			Low melting point solder, fuses,
Cadmium oxide	1306-19-0	CdO	Pigments, alkaline batteries, and materials for chemical synthesis
Cadmium chloride	10108-64-2	CdCl <sub>2</sub>	Plating bath, the stabilizers used for vinyl chloride
Cadmium sulfide	1306-23-6	CdS	Pigments, paints, inks, and light elements for semiconductors
Cadmium nitrate	10325-94-7	Cd(NO <sub>3</sub> ) <sub>2</sub>	Coloring agents, batteries, and photographs
Cadmium nitrate tetrahydrate	10022-68-1	Cd(NO <sub>3</sub> ) <sub>2</sub> · 4H <sub>2</sub> O	
Cadmium sulfate	10124-36-4	CdSO <sub>4</sub>	NiCd batteries
Cadmium stearate	2223-93-0	Cd(C <sub>18</sub> H <sub>35</sub> O <sub>2</sub> ) <sub>2</sub>	The stabilizers used for vinyl Chloride

**1b - LEAD AND LEAD COMPOUNDS**

Lead (Pb) allowable concentration:

a- Less than 100 ppm as the sum of concentration level with other heavy metals (Cd, Hg, CrVI) in packing materials

b- Less than 100 ppm in epoxy resins and copper leadframes

<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Lead (II) oxide	1317-36-8	PbO	Pigments, rubber vulcanization accelerators, and solid lubricants. Allowed when used as sealing glass





<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Lead (IV) oxide	1309-60-0	PbO <sub>2</sub>	Lead-acid batteries, rubber curing agents, and materials for pigments
Dilead trioxide	Pb <sub>2</sub> O <sub>3</sub>		
Lead (II, IV) oxide	1314-41-6	Pb <sub>3</sub> O <sub>4</sub>	Pigments, lead-acid batteries, glass, and paints
Lead azide	13424-46-9	PbN <sub>6</sub>	
Lead (II) fluoride	7783-46-2	PbF <sub>2</sub>	Special optical glass, pigments
Lead (II) chloride	7758-95-4	PbCl <sub>2</sub>	
Lead (IV) chloride	13463-30-4	PbCl <sub>4</sub>	
Lead (II) iodide	10101-63-0	PbI <sub>2</sub>	Bronze, printing, and photographs
Lead (II) sulfide	1314-87-0	PbS	Infrared ray detectors in which semiconductor elements are utilized
Lead (II) cyanide	592-05-2	Pb(CN) <sub>2</sub>	Antirust pigments
Lead fluoroborate	13814-96-5	Pb(BF <sub>4</sub> ) <sub>2</sub>	Plating bath, anticorrosive surface Treatment
Lead fluosilicate	25808-74-6	PbSiF <sub>6</sub>	Plating bath, lead refinement
Lead nitrate	10099-74-8	Pb(NO <sub>3</sub> ) <sub>2</sub>	Optical glass
Lead carbonate	598-63-0	PbCO <sub>3</sub>	
Lead Hydroxycarbonate	1344-36-1	(PbCO <sub>3</sub> ) <sub>2</sub> Pb(OH) <sub>2</sub>	Pigments, vinyl chloride stabilizers
Lead perchlorate	13637-76-8	Pb(ClO <sub>4</sub> ) <sub>2</sub>	
Lead (II) sulfate	7446-14-2; 15739-80-7	PbSO <sub>4</sub>	Pigments, rubber compounding ingredients, vinyl chloride stabilizers, and batteries
Lead oxide sulfate	12202-17-4	Pb <sub>4</sub> S <sub>07</sub>	Pigments
Lead (II) phosphate	7446-27-2	Pb <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	Stabilizers for plastics



<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Lead thiocyanate	592-87-0	Pb(SCN) <sub>2</sub>	Stain, matches
Lead (II) acetate, Trihydrate	6080-56-4	Pb(CH <sub>3</sub> COO) <sub>2</sub> · 3H <sub>2</sub> O	
Lead (II) acetate	301-04-2	Pb(CH <sub>3</sub> COO) <sub>2</sub> .	
Lead (IV) acetate	546-67-8	Pb(CH <sub>3</sub> COO) <sub>4</sub>	
Lead oleate	1120-46-3	Pb[CH <sub>3</sub> (CH <sub>2</sub> ) <sub>7</sub> CH= CH(CH <sub>2</sub> ) <sub>7</sub> COO] <sub>2</sub>	Lubricants, curing agents, etc.
Lead stearate	7428-48-0	Pb(C <sub>17</sub> H <sub>35</sub> COO) <sub>2</sub>	Lubricants, stabilizers for vinyl chloride
Lead (II) Metaborate	10214-39-8	Pb(BO <sub>2</sub> ) <sub>2</sub> · H <sub>2</sub> O	Desiccants for paints
Lead metasilicate	11120-22-2; 22569-74-0	PbSiO <sub>3</sub>	Desiccants for paints
Lead antimonite	13510-89-9	Pb <sub>3</sub> (SbO <sub>4</sub> ) <sub>2</sub>	Pigments, coloring agents for glass
Lead arsenate (1:1)	7784-40-9	PbHAsO <sub>4</sub>	
Lead (II) arsenite	10031-13-7	Pb(AsO <sub>2</sub> ) <sub>2</sub>	Pesticides
Lead chromate; chrome yellow	7758-97-6	PbCrO <sub>4</sub>	Pigments, paints, and inks
Lead molybdate	10190-55-3	PbMoO <sub>4</sub>	Pigments
Calcium plumbate	12013-69-3	Ca <sub>2</sub> PbO <sub>4</sub>	Oxidizers
Tetramethyl lead	75-74-1	Pb(CH <sub>3</sub> ) <sub>4</sub>	
Tetraethyl lead	78-00-2	Pb(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub>	



**1c – MERCURY AND MERCURY COMPOUNDS**

<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Mercury	7439-97-6	Hg	Electrodes, mercury lamps Allowed for resistivity measurements on epitaxial layer
Mercury alloys; Amalgam	15829-53-5		
Mercury (I) oxide	15829-53-5	Hg <sub>2</sub> O	
Mercury (II) oxide	21908-53-2	HgO	Mercury cells, preservatives
Mercury (I) chloride	10112-91-1	Hg <sub>2</sub> Cl <sub>2</sub>	Electrodes, pigments
Mercury (II) chloride	7487-94-7	HgCl <sub>2</sub>	Metal etching, batteries and preservatives
Mercury (II) nitrate	10045-94-0	Hg(NO <sub>3</sub> ) <sub>2</sub>	Felt, catalysts
Mercury (I) sulfate	7783-35-9	Hg <sub>2</sub> SO <sub>4</sub>	Batteries
Mercury (II) fulminate	628-86-4	Hg(ONC) <sub>2</sub>	
Mercury (II) acetate	1600-27-7	Hg(CH <sub>3</sub> COO) <sub>2</sub>	
Methylmercury salts	22967-92-6	C <sub>2</sub> H <sub>5</sub> HgX; X=Cl, Br, I, OH, etc.	Fungicides
Ethymercury salts		C <sub>2</sub> H <sub>5</sub> HgX; X=Cl, Br, I, OH, etc.	Preservatives, disinfectants
Propylmercury salts		C <sub>3</sub> H <sub>7</sub> HgX; X=Cl, Br, I, OH, etc.	
Phenylmercury salts		C <sub>6</sub> H <sub>5</sub> HgX; X=Cl, Br, I, OH, etc.	Preservatives, Disinfectants
Methoxyethyl-mercury salts		CH <sub>3</sub> OC <sub>2</sub> H <sub>4</sub> HgX; X=Cl, Br, I, OH, etc	Disinfectants, Fungicides



Name	CAS No.	Chemical formula	Main purposes
Dialkylmercury		R <sub>2</sub> Hg; R=alkyl group (C <sub>n</sub> H <sub>2n+1</sub> )	
Diphenylmercury	587-85-9	(C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> Hg	

**1d – HEXAVALENT CHROMIUM COMPOUNDS**

Name	CAS No.	Chemical formula	Main purposes
Chromium (VI) oxide; Chromium trioxide	1333-82-0	CrO <sub>3</sub>	Pigments, catalysts, Plating, tanning
Lithium chromate	14307-35-8	Li <sub>2</sub> CrO <sub>4</sub>	Corrosion prevention
Sodium chromate	7775-11-3	Na <sub>2</sub> CrO <sub>4</sub>	Antirust, tanning
Potassium chromate	7789-00-6	K <sub>2</sub> CrO <sub>4</sub>	Pigments, inks, and tanning
Potassium Chlorochromate	16037-50-6	K[CrO <sub>3</sub> Cl]	
Ammonium Chromate	7788-98-9	(NH <sub>4</sub> ) <sub>2</sub> CrO <sub>4</sub>	Photographs, catalysts
Copper chromate	13548-42-0	CuCrO <sub>4</sub>	
Magnesium Chromate	13423-61-5	MgCrO <sub>4</sub>	Antirust, surface treatment
Calcium chromate	13765-19-0	CaCrO <sub>4</sub>	Pigments, inks, and tanning
Strontium chromate	7789-06-2	SrCrO <sub>4</sub>	Pigments, antirust
Barium chromate	10294-40-3	BaCrO <sub>4</sub>	Pigments, corrosion prevention, and coloring agents for ceramics
Lead chromate; chrome yellow	7758-97-6	PbCrO <sub>4</sub>	Pigments, paints, and inks
Zinc chromate	13530-65-9	ZnCrO <sub>4</sub>	Pigments, anticorrosives





Name	CAS No.	Chemical formula	Main purposes
Sodium dichromate; sodium bichromate	10588-01-9	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Pigments, photographs, tanning, corrosion prevention
Potassium dichromate; potassium bichromate	7788-50-9	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Pigments, photographs, batteries, plating, tanning
Ammonium dichromate; ammonium bichromate	7789-09-5	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Pigments, photographs, catalysts
Calcium dichromate; calcium bichromate	14307-33-6	CaCr <sub>2</sub> O <sub>7</sub>	Catalysts, corrosion prevention
Zinc dichromate; zinc bichromate	7789-12-0	ZnCr <sub>2</sub> O <sub>7</sub>	Pigments

**2a – POLYCHLORINATED BYPHENYLS (PCB)/TERPHENYLS (PCT)**

Name	CAS No.	Chemical formula	Main purposes
PCB; polychlorinated Biphenyls	1336-36-3 11097-69-1 11096-82-5	C <sub>12</sub> H <sub>10-x</sub> Cl <sub>x</sub> (x =1 - 10)	Lubricants, oils
PCT; polychlorinated Terphenyls	61788-33-8		

**2b – POLYCHLORINATED NAPHTHALENES (PCN)**

Name	CAS No.	Chemical formula	Main purposes
Polychlorinated Naphthalenes		C <sub>10</sub> H <sub>8-x</sub> Cl <sub>x</sub> (x ≥ 3)	Lubricants, paints, preservatives
Trichloronaphthalenes	1321-65-9	C <sub>10</sub> H <sub>5</sub> Cl <sub>3</sub>	
Tetrachloronaphthalenes	1335-88-2	C <sub>10</sub> H <sub>4</sub> Cl <sub>4</sub>	
Pentachloronaphthalenes	1321-64-8	C <sub>10</sub> H <sub>3</sub> Cl <sub>5</sub>	





Name	CAS No.	Chemical formula	Main purposes
Octachloronaphthalenes	2234-13-1	C <sub>10</sub> Cl <sub>8</sub>	

**2c - Chlorinated paraffins (CP) (C10-13, Cl = 50 wt% or more)**

Name	CAS No.	Chemical formula	Main purposes
Short-chain Chlorinated Paraffins (SCCP's)	71011-12-6		Plasticizers, flame retardants
C10-13, Cl ≥ 50 wt%	108171-26-2		
	61788-76-9		
	63449-39-85422-92-085535-84-8		

**2d - Mirex (Perchlordecone)**

Name	CAS No.	Chemical formula	Main purposes
Mirex (Perchlordecone); Dodecachlorooctahydro-1, 3, 4-metheno-2H-cycrobuta (cd) pentalene	2385-85-5	C <sub>10</sub> Cl <sub>12</sub>	Pesticides, fungicides, flame retardants

**2e - Others:**

Name	CAS No.	Chemical formula
1, 1, 1, 2 Tetrachloroethane	630-20-6	C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>
1, 1, 2, 2, Tetrachloroethane	79-34-5	CHCl <sub>2</sub> CHCl <sub>2</sub>
1, 1- Dichloroethylene (vinylidene chloride)	75-35-4 (allowed in Front End processes as a cleaning agent)	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>
Pentachloroethane	76-01-7	C <sub>2</sub> HCl <sub>5</sub>





Name	CAS No.	Chemical formula
Tetrachloromethane (Carbon Tetrachloride – CCL4)	56-23-5	
1, 1, 1 - Trichloroethane	71-55-6	
1, 1, 2 - or 1, 2, 2 - Trichloroethane	79-00-5	C2H3Cl3
1, 2 - Dichloroethane (Ethylene Dichloride)	107-06-2	CH2ClCH2Cl
3, 3 - Dichlorobenzidine	91-94-1	
Dichloromethane (Methylene Chloride)	75-09-2 (allowed at Labs level only)	
Methyl Chloromethyl Ether (Chloromethyl Methyl Ether)	107-30-2	
Tetrachloroethylene (Perchloroethylene)	127-18-4	CCl2CCl2
Trichloroethylene (TCE)	79-01-6	CHClCCl2
Trichloromethane (Chloroform) N,N-Bis(2-chloroethyl)	67-66-3	CHCl3
2-naphthylamine	494-03-1	
Bis(chloromethyl)ether	542-88-1	

### 3a - Polybrominated biphenyls (PBB)

Name	CAS No.	Chemical formula	
Polybrominated biphenyls	59536-65-1	67774-32-7	Flame retardants
	13654-09-6	36355-01-8	
	61288-13-9	92-86-4	
	40088-45-7	2113-57-7	
	59080-40-9	92-66-0	
	64258-03-3	2052-07-5	

**3b - Polybrominated diphenylethers (PBDE)**

<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Polybromodiphenyl ether; polybromodiphenyloxiide; polybrominated biphenyl ethers; PBDE; PBDO; PBBE		$C_{12}H_{10-x}Br_xO$ (x =1-10)	Flame retardants
Decabromodiphenyl ether; decabromodiphenyloxiide; DBDPE; DBDPO	1163-19-5	$C_{12}Br_{10}O$	Flame retardants (for PE, ABS, and polyester)
Octabromodiphenyl ether; Octabromodiphenyloxiide	32536-52-0	$C_{12}H_2Br_8O$	Flame retardants (for ABS, HIPS, and LDPE)
Hexabromodiphenyl ether; Hexabromodiphenyloxiide	36483-60-0	$C_{12}H_4Br_6O$	Flame retardants
Pentabromodiphenylehter; Pentabromodiphenyloxiide	32354-81-9	$C_{12}H_5Br_5O$	Flame retardants
Bromobiphenyl ether	101-55-3		
Dibromobiphenyl ether	2050-47-7		
Heptabromobiphenyl ether	68928-80-3		
Nonabromobiphenyl ether	63936-56-1		
Tetrabromobiphenyl ether	40088-46-9		
Tribromobiphenyl ether	49690-94-0		

**3c - Tetrabromobisphenol-A-bis (2, 3 - dibromopropylether) TBBPA-A-bis (Commercial name FR-720)**

<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Tetrabromobisphenol-A-bis- (2, 3 dibromopropylether) (TBBP-A-bis)	21850-44-2	$C_{21}H_{10}Br_8O_2$	Flame retardants



**3d - Others**

<b>Name</b>	<b>CAS No</b>	<b>Main purposes</b>
1. Halogenated diphenyl methanes		
1a. Monomethyldibromo Diphenylmethane (DBBT)	99788-47-8	Residues during the manufacture of polymers
1b. Monomethyldichloro Diphenylmethane	81161-70-8	Residues during the manufacture of polymers
1c. Monomethyltetrachloro Diphenylmethane	76253-60-6	Residues during the manufacture of polymers
2. PBT's Polybrominated terphenyls	various	Additive in plastics and textiles
2a. Tris (2, 3 - dibromopropyl) Phosphate (TRIS) (TRIS-BP)	126-72-7	Flame retardant
3. Red Phosphorous	7723-14-0	Flame retardant in plastic

**4a – Tributyl tin compounds, triphenyl tin compounds**

<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Tributyl tin bromide	1461-23-0	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> SnBr	Disinfectants
Bis (tributyl tin) oxide	56-35-9	(C <sub>24</sub> H <sub>5</sub> ) <sub>4</sub> O <sub>2</sub> Sn <sub>2</sub>	Disinfectants
Triphenyl tin	668-34-8	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> Sn	Disinfectants
Triphenyl tin bromide		(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> SnBr	Disinfectants
Triphenyl tin chloride	639-58-7	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> SnCl	Disinfectants
Triphenyl tin hydroxide	76-87-9	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> SnOH	Disinfectants
Triphenyl tin N, N' dimethyldithiocarbamate	1803-12-9	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> Sn(CH <sub>3</sub> ) <sub>2</sub> NCS <sub>2</sub>	



Name	CAS No.	Chemical formula	Main purposes
Triphenyl tin fluoride (fentin fluoride)	379-52-2	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> SnF	
Triphenyl tin acetate (fentin acetate)	900-95-8	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> SnOCOCH <sub>3</sub>	
Triphenyl tin fatty acid salts	18380-71-7		
Triphenyl tin chloroacetate	7094-94-2	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> SnOCOCH <sub>2</sub> Cl	
Tributyl tin methacrylate	2155-70-6	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> SnC <sub>4</sub> H <sub>5</sub> O <sub>2</sub>	
Bis (tributyl tin) fumarate	6454-35-9	C <sub>2</sub> H <sub>2</sub> (COO) <sub>2</sub> [(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> Sn] <sub>2</sub>	
Tributyl tin fluoride	1983-10-4	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> SnF	
Bis (tributyl tin) 2, 3-dibromosuccinate	31732-71-5	[(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> Sn] <sub>2</sub> C <sub>2</sub> H <sub>2</sub> (BR) <sub>2</sub> (COO) <sub>2</sub>	
Tributyl tin acetate	56-36-0	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> SnOCOCH <sub>3</sub>	
Tributyl tin laurate	3090-36-6	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> SnC <sub>12</sub> H <sub>23</sub> O <sub>2</sub>	
Bis (tributyl tin) phthalate	4782-29-0	(C <sub>6</sub> H <sub>4</sub> )(COO) <sub>2</sub> [(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> Sn] <sub>2</sub>	
Tributyl tin sulfamate	6517-25-5	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> SnSO <sub>3</sub> NH <sub>2</sub>	
Bis (tributyl tin) maleate	14275-57-1	C <sub>28</sub> H <sub>56</sub> O <sub>4</sub> Sn <sub>2</sub>	
Tributyl tin chloride	1461-22-9	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> SnCl	
Mixture of tributyl tin Cyclopentanecarboxylate and its alaoqs (Tributyl tin naphthenate)	85409-17-2		
Mixture of tributyl tin 1, 2, 3, 4, 4a, 4b, 5, 6, 10, 10a-decahydro-7 -isopropyl-1, 4a-dimethyl-1 phenanthrenecarboxylate and its analogs (Tributyl tin rosin salts)	26239-64-5	C <sub>32</sub> H <sub>56</sub> O <sub>2</sub> Sn	
Copolymer of alkyl acrylate, methyl Methacrylate and tributyl tin methacrylate (alkyl; C = 8)			



**5a - All types of asbestos**

<b>Name</b>	<b>CAS No.</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Asbestos	1332-21-4; 132207-32-0; 132207-33-1		
Crocidolite	12001-28-4	$\text{Na}_2\text{Fe}_5(\text{Si}_8\text{O}_{22})(\text{OH})_2$	Insulators, fillers, etc
Chrysotile	12001-29-5	$\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$	Insulators, fillers, etc
Amosite	12172-73-5	$(\text{Mg}, \text{Fe})_7\text{Si}_8\text{O}_{22}(\text{OH})_2$	Insulators, fillers, etc
Anthophyllite	17068-78-9	$(\text{Mg}, \text{Fe})_7\text{Si}_8\text{O}_{22}(\text{OH})_2$	Insulators, fillers, etc
Tremolite	14567-73-8	$\text{Ca}_2\text{Mg}_5\text{Si}_8\text{O}_{22}(\text{OH})_2$	Insulators, fillers, etc
Actinolite	13768-60-8	$\text{Ca}_2(\text{Mg}, \text{Fe})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$	Insulators, fillers, etc

**6a – Azo compounds****List of the amines that must not be produced when Azo compounds are decomposed Amines**

*Amines definition: any of a class of compounds derived from ammonia by replacement of one or more hydrogen atoms with organic group. Limit: 30 ppm (German law)*

<b>Name</b>	<b>CAS No</b>
4-Aminodiphenyl	92-67-1
Benzidine	92-87-5
4-chloro-o-toluidine	95-69-2
2-naphthylamine	91-59-8
o-aminoazotoluene	97-56-3
2-amino-4-nitrotoluene	99-55-8
p-chloroaniline	106-47-8
2,4-diaminoanisole	615-05-4
4, 4'-diaminodiphenylmethane	101-77-9
3, 3'-dichlorobenzidine	91-94-1
3, 3'-dimethoxybenzidine	119-90-4
3, 3'-dimethylbenzidine	119-93-7



<b>Name</b>	<b>CAS No</b>
3, 3'-dimethyl-4,4'-diaminodiphenylmethane	838-88-0
p-cresidine	120-71-8
4, 4'-methylene-bis-(2-chloroanilene)	101-14-4
4, 4'-oxideaniline	101-80-4
4, 4'-thiodianiline	139-65-1
o-toluidine	95-53-4
2, 4-toluylenediamine	95-80-7
2, 4, 5-trimethylamine	137-17-7
o-anisidine	90-04-0
4-aminoazobenzene	60-09-3

*Note: Amines can be found in textile, leather, dyes, antioxidants, lubricants, rubbers, plastics*

### **7a - Formaldehyde**

<b>Name</b>	<b>CAS No</b>	<b>Chemical formula</b>	<b>Main purposes</b>
Formaldehyde; formalin; formic aldehyde; formol	50-00-0	HCHO HCHO	Preservatives, monomer (e.g. phenol resin and melamine resin)

### **8a – Chlorofluorocarbons (CFC + Halons)**

<b>Name</b>	<b>CAS No</b>
Halons – Hydrobromofluorocarbons (as group)	various
Halon 1211 – Bromochlorodifluoromethane	353-59-3
Halon 1301 – Bromotrifluoromethane	75-63-8
Halon 2402- Dibromotetrafluoroethane	124-73-2
Dibromodifluoromethane (Hydrobromofluorocarbon)	1868-53-7
Methyl Bromide	74-83-9
2, 3-Dibromopropyl phosphate	126-43-2
1, 2-Dibromoethane	106-93-4
Chlorofluorocarbons (CFCs) as a Group	various





<b>Name</b>	<b>CAS No</b>
1, 1, 1, 2-Trichloro-2,2-difluoroethane	76-11-9
1, 1, 1-Trichloro-2,2,2-trifluoroethane	26523-64-8
1, 1, 1-Trifluorotrichloroethane	354-58-5
1, 1-Dichloro-1,2,2,2-tetrafluoroethane	374-07-2
1, 1-Dichloro-1,2,3,3,3-pentafluoropropane	111512-56-2
Dichlorotetrafluoroethane	1320-37-2
R11 Trichlorofluoromethane	75-69-4
R111 Pentachlorofluoromethane	354-56-3
R112 Tetrachlorodifluoroethane	76-12-0
R113 Trichlorotrifluoroethane	76-13-1
R114 Dichlorotetrafluoroethane	76-14-2
R115 Chloropentafluoroethane	76-15-3
R12 Dichlorodifluoromethane	75-71-8
R13 Chlorotrifluoromethane	75-72-9
R211 Heptachlorofluoropropane	422-78-6
R212 Hexachlorodifluoropropane	76546-99-3
R213 Pentachlorotrifluoropropane	2354-06-5
R214 Tetrachlorotetrafluoropropane	2268-46-4
R215 Trichloropentafluoropropane	4259-43-2
R216 Dichlorohexfluoropropane	661-97-2
R127 Monochloroheptafluoropropane	422-86-6
All other CFC's not listed above	

### **8b – Hydrochlorofluorocarbons (HCFC)**

<b>Name</b>	<b>CAS No</b>
HCFC-21 Dichlorofluoromethane	75-43
HCFC-22 Chlorodifluoromethane	75-45-6
HCFC-31 Chlorofluoromethane	593-70-4
HCFC-121 1,1,2,2-Tetrachloro-1-fluoroethane	354-14-3
HCFC- 121a 1,1,1,2-Tetrachloro-2-Fluoroethane	354-11-0
HCFC-122 1,2, 2-Trichloro-1,1-difluoroethane	354-21-2
HCFC-122a 1,2,2-Trichloro-1,2-difluoroethane	354-15-4
HCFC-123 2,2-Dichloro-1,1,1-trifluoroethane	306-83-2
HCFC-124 2-Chloro-1,1,1,2-tetrafluoroethane	2837-89-0
HCFC-124a 1-Chloro-1,1,2,2-tetrafluoroethane	354-25-6
HCFC-131 1,1,2-Trichloro-2-fluoroethane	359-28-4
HCFC-131a 1, 1, 2-Trichloro-1-fluoroethane	811-95-0





<b>Name</b>	<b>CAS No</b>
HCFC-131b 1, 1, 1-Trichloro-2-fluoroethane	2366-36-1
HCFC-132 1,2-Dichloro-1,2-difluoroethane	431-06-1
HCFC-132a 1,1-Dichloro-2,2-difluoroethane	471-43-2
HCFC-132b 1,2-Dichloro-1,1-difluoroethane	1649-08-7
HCFC-133 1-Chloro-1, 2,2-trifluoroethane	431-07-2
HCFC-133a 2-Chloro-1,1,1-trifluoroethane	75-88-7
HCFC-133b 1-Chloro-1,1,2-trifluoroethane	421-04-5
HCFC-141 1,2-Dichloro-1-fluoroethane	430-57-9
HCFC-141a 1,1-Dichloro-2-fluoroethane	430-53-5
HCFC-141b 1,1-Dichloro-1-fluoroethane	1717-00-6
HCFC-142 2-Chloro-1,1-difluoroethane	338-65-8
HCFC-142a 1-Chloro-1,2-difluoroethane	338-64-7
HCFC-142b 1-Chloro-1,1-difluoroethane	75-68-3
HCFC-151 Chlorofluoroethane	110587-14-9
HCFC-221 Hexachlorofluoropropane	29470-94-8
HCFC-222 Pentachlorodifluoropropane	116867-32-4
HCFC-223 Tetrachlorotrifluoropropane	29470-95-9
HCFC-224 Trichlorotetrafluoropropane	127564-91-4
HCFC-225 Dichloropentafluoropropane	127564-92-5
HCFC-226 Chlorohexafluoropropane	28987-04-4
HCFC-231 Pentachlorofluoropropane	134190-48-0
HCFC-232 Tetrachlorodifluoropropane	127564-82-3
HCFC-233 Trichlorotrifluoropropane	61623-04-9
HCFC-234 Dichlorotetrafluoropropane	127564-83-4
HCFC-235 Chloropentafluoropropane	108662-83-5
HCFC-241 Tetrachlorofluoropropane	134190-49-1
HCFC-242 Trichlorodifluoropropane	127564-90-3
HCFC-243 Dichlorotrifluoropropane	116890-51-8
HCFC-251 Trichlorofluoropropane	134190-51-5
HCFC-252 Dichlorodifluoropropane	134190-52-6
HCFC-253 Chlorotrifluoropropane	26588-23-8
HCFC-261 Dichlorofluoropropane	127404-11-9
HCFC-262 Chlorodifluoropropane	134190-53-7
HCFC-271 Chlorofluoropropane	134190-54-8
Chlorotetrafluoropropane	134190-50-4
All other HCFC's not listed above	



**9a – Residual monomers**

<b>Name</b>	<b>CAS No</b>	<b>Main purposes</b>
1,3-Butadiene monomer	106-99-0	as residual monomer
Butyl Acrylate	141-32-2	as adhesives
Acrylamide monomer	79-06-1	as residual monomer
Acrylonitrile monomer	107-13-1	as residual monomer
Epichlorhydrin monomer (chloroxypropane)	106-89-8, 25014-15-5, 25988-97-0	as residual monomer
Styrene monomer	100-42-5	as solvent, residual monomer
Styrene Oxide	96-09-3	as softener, residual monomer
Vinyl Chloride monomer (polyvinyl chloride not included)	75-01-4	as residual monomer, propellent in aerosol
Vinylidene chloride (1,1-Dichloroethylene) Monomer	75-35-4	as residual monomer

**10a – Benzene**

<b>Name</b>	<b>CAS No</b>	<b>Main purposes</b>
Benzene	71-43-2	Solvents, Lacquers, varnish, etc



## **DETAIL OF SUBSTANCES NOT USED BY STMicroelectronics**

### **DECLARATION EXAMPLES**

#### **1 - ODS ELIMINATION**

STMicroelectronics can make Customers ensured that all its own products are manufactured without the use of any ODS Class I.

In fact, in line with our Corporate Strategy for zero ODP (Ozone Depleting Potential) we have eliminated these Ozone Depleting Substances from our processes (in contact with products) since July 1993. ODS Class I are neither present in our processes nor in our final products.

In addition, ODS Class I have also been replaced, as refrigerant fluids, from our Air Conditioning Systems (chillers) since end 1997. Therefore, ST is facility/process/product ODS's Class I free.

Class II ODS were used in 1993 as Class I replacement. From January 1st 2002 we eliminated also ODS Class II in contact with products. We are in this way in compliance with the European Regulation 2037/2000 art. 5 which requires the prohibition of all ODS Class II used as solvents. STMicroelectronics uses ODS Class II, as fluid refrigerants in closed systems, only.

#### **2 - NON-USE OF INORGANIC PHOSPHOROUS COMPOUNDS AS FLAME RETARDANT**

STMicroelectronics is perfectly aware of device failures could occur using component encapsulation containing inorganic phosphorous compounds as flame retardant.

The flame retardant present to-day in epoxy resins used by STMicroelectronics is TetraBromoBisphenol-A. TBBA is a reactive brominated flame retardant. It is incorporated in the epoxy polymer after curing so that there is no TBBA free in the finished plastic products. To get the TBBA working well, Antimony Trioxide (Sb<sub>2</sub>O<sub>3</sub>) as synergist is added. All the STMicroelectronics plastic products currently on the market contain TBBA and Sb<sub>2</sub>O<sub>3</sub> as flame retardant to be able to meet the UL94 V-0 requirements.

No STMicroelectronics plastic products are containing inorganic phosphorous compounds as epoxy resin flame retardant.

STMicroelectronics is also working hard to move to "green packaging". It means that, in the next future, in addition to Lead (Pb) also halogenated flame retardants like TBBA and Sb<sub>2</sub>O<sub>3</sub> will be eliminated. We have already got non-halogenated moulding compound assessed and used at production level.

#### **3 - COMPLIANCE WITH Restriction of Hazardous Substances (RoHS) DIRECTIVE**

On 13th of February 2003, Directive 2002/95/EC of the European Parliament and of the Council of 27th January 2003 on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment entered into force.





Art.4 para 1 of this Directive requires that from 1 July 2006 new electrical and electronic equipment put on the market do not contain Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent Chromium (CrVI), Polybrominatedbiphenils (PBB) and Polybrominated diphenyl ethers (PBDE).

Some exemptions are included when no viable and reliable alternative materials exist such as for Lead (Pb) in high temperature solder used for silicon chips bonding in power electronic components.

Ecopack is the ST trade name used for RoHS compliant devices.

STMicroelectronics can ensure Customers that its own manufactured products do not contain Hg, Cd, CrVI, PBB and PBDE. So, the only substance going to be restricted by RoHS and present in STMicroelectronics products is Lead (Pb).

However, we would like to get our Customers aware that STMicroelectronics Corporate Lead-Free Roadmap forecasts the replacement of Lead (Pb) for most of our products during year 2004.

In addition, we would like to inform them that we already have got some family packages Lead-free available. With what above illustrated, we can make Customers ensured that all STMicroelectronics products are Hg, Cd, CrVI, PBB, PBDE free and therefore in compliance with RoHS Directive. Concerning Lead (Pb) we can say we are for some family packages RoHS compliant and for most of other ones we will become during 2004. See Certificate of Compliance to RoHS Directive requirements on page 29.

#### **4 – COMPLIANCE WITH EUROPEAN DIRECTIVE 2000/53EC ON END OF LIFE VEHICLES**

Be aware that STMicroelectronics products are in compliance with Art. 4.2(a) of European Directive 2000/53 on End-of Life Vehicle requirements. ST products do not contain mercury, cadmium and hexavalent chromium. Even if these heavy metals, as per our knowledge, are not intentionally added to our manufacturing processes (both Front-End and Back-End) we took in the past years, further warrants including them as banned substances in our Corporate Spec. 0115767.

So, Hg, Cd and CrVI are substances banned by ST Environmental Policy, as well.

According to Annex II of Directive 2000/53 (amended by Commission decision on 27 June 2002), Lead (Pb), that is the fourth element banned by 2000/53/EC Directive is, as "Solder in electronic circuit boards and other electric applications" part of materials exempted from Art 4.2(b) Annex II. Therefore, we state that STMicroelectronics products are fully in compliance with Art.4.2(a) of 2000/53 Directive requirements. However, it is also correct to inform Customers that ST Corporate Lead-free Program forecasts the elimination of Lead during 2004.

Some Lead-free products/lines are already converted, most of others will be available by end 2004.



## Certificate of Compliance

TO: Please, add Customer address

This is to certify that Lead-free components manufactured by STMicroelectronics Company and supplied to "Customer name" are in compliance with Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive)

Authorized signatory for STMicroelectronics:

Dr Carlo Cognetti  
(Corporate Package Development Director – Group VP)

Date: October 17, 2003

Dr Giuliano Boccaletti  
(Corporate Environment Director)

Date: October 20, 2003





## SUBSTANCES CURRENTLY PRESENT IN STMicroelectronics PRODUCTS

Name	CAS No	Main purposes
Copper (Cu)	7449-50-8	Packages leadframe composit.
Iron (Fe)	7439-89-6	Package leadframe composit.
Nickel (Ni)	7440-02-0	Plating of some package parts and leadframe composition
Gold (Au)	7440-57-5	Wires and die attach material (hard solder)
Silver (Ag)	7440-22-4	Plating of some package parts and glue die attach material composition
Aluminium (Al)	7429-90-5	Wires
Tin (Sn)	7440-31-5	Leadfinishing and die attach (soft solder) material composition in alloy with other substances
Lead (Pb)	7439-92-1	Leadfinishing and die attach (soft solder) material composition in alloy with other substances
Molding compound (Epoxy resin-EP)	29690-82-2	Encapsulation material for the silicon chip and its conductive connections.
Antimony Trioxide (Sb <sub>2</sub> O <sub>3</sub> ) (*)	1309-64-4	Flame retardant synergist in epoxy resins
TetraBromoBisphenol-A (TBBA) (*)	79-94-7	Flame retardant in epoxy resins
Silicon (chip) (Si)	7440-21-3	Active single crystal silicon containing minimums amounts (tens of ppb) of elements such as arsenic, phosphorous and boron



<b>Name</b>	<b>CAS No</b>	<b>Main purposes</b>
Ceramic (Al <sub>2</sub> O <sub>3</sub> )	1344-28-1	Ceramic package encapsulation material (base and cap) for the silicon chip and its conductive connections
Beryllium oxide (BeO)	1304-56-9	RF Transistors heat spreader. Used in ceramic compact form (no inhalable dust)

(\*) Flame retardant notes:

The major brominated/halogenated flame retardant in use to-day in the electronic field is TetraBromo-Bisphenol-A (TBBA), CAS number 79-94-7.

TBBA is a reactive brominated flame retardant. It is incorporated in the epoxy polymer after curing so that there is no TBBA free in the finished plastic products. It is associated with Antimony Trioxide (Sb<sub>2</sub>O<sub>3</sub>) CAS Number 1309-64-4 and they are both added by our epoxy resins Suppliers during epoxy formulation.

Sb<sub>2</sub>O<sub>3</sub> increases the flame retardant effectiveness of plastic compounds. Without Sb<sub>2</sub>O<sub>3</sub> synergist, around twice as much halogen compound (TBBA) would be needed to confirm level of flame retardancy required by international standard (UL 94 V-0).

There are no, presently, known banning or restriction legislation on the use of TBBA CAS No 79-94-7 and Sb<sub>2</sub>O<sub>3</sub> CAS Number 1309-64-4 as flame retardant anywhere in the world.

We can also state that an alternative to brominated/halogenated flame retardant is existing. A new halogen free polymer is currently on the market, which needs no additional flame retardant. The flame retardancy is given through its high inorganic filler content. It is a self-extinguish epoxy molding compound.

A ST line with halogen free epoxy resin has already been qualified and several products are provided to Customers. Other halogen free alternatives are under evaluation.

ST is really working hard on this "green packaging" field (no Lead, no TBBA, no Sb<sub>2</sub>O<sub>3</sub>).

Our concern is to supply to our Customers halogen free products with similar performance properties to those with TBBA/Sb<sub>2</sub>O<sub>3</sub> contained to comply with international standard requirements.



## PACKAGE FAMILY MATERIAL DECLARATIONS

Definitions to better understand the content of following tables:

1. RoHS: Acronym for European Directive 2002/95/EC of the European Parliament and of the Council on the **R**estriction of the use of certain **H**azardous **S**ubstances in electrical and electronic equipment.
2. RoHS compliant: components/devices which meet the requirements of Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of certain hazardous substances in electrical and electronic equipment (effective date will be July 1<sup>st</sup> 2006). A RoHS compliant product may not necessarily be totally Lead-free
3. Lead-free: European Directive 2002/95/EC allows for exemption of Lead content in certain internal product applications. Lead-free, for the purposes of this booklet content, means that external leads/balls/bumps only have a Lead (Pb) level equal or less than 0.1% by weight (1000 ppm). Therefore Lead-free components/devices are still using for internal connections and glass sealing, materials with Lead (Pb) level above 0.1% by weight (more than 1000 ppm) as per Directive 2002/95/EC exemptions.
4. Totally Lead-free: components/devices in which the Lead (Pb) level in any of the raw materials and in the finished product itself, is equal or less than 0.1% by weight (1000 ppm)

### **In brief:**

To-date (September 2004) the STMicroelectronics conversion to Lead-free devices is ongoing. ST forecasts to complete the conversion of its manufacturing capacity by June 30, 2005. In compliance with RoHS requirements, Pb element is removed from packaging materials, namely: solder coating of leadframe packages, solder balls of Ball Grid Arrays (BGA) packages and bumps of Flip Chip interconnection. Once the conversion is ultimated and concentration of Pb in above mentioned materials and in the component as a whole is less than 1000 ppm, a device will be both Totally Lead-free and RoHS compliant.

It must be noticed that for technologies using high Lead solder die attach and high Lead glass for sealing, Lead-free alternatives are not readily available; they have been exempted by the RoHS Directive.

Therefore, a product still using Lead for soft solder die attach and glass sealing in concentration levels exceeding 1000 ppm is considered Lead-free and RoHS compliant but not, obviously, a Totally Lead-free product.

### **Product Material Sheet Data:**

The new materials (Tin 100%, NiPdAu, etc), for Lead replacement, proposed by this 3<sup>rd</sup> edition, have been assumed to maintain the same percentages (%) as Lead. As soon as STMicroelectronics will ultimate the Lead conversion, new analysis of product materials content will be performed and percentages (%) evaluation of new elements, replacing Lead, will be more accurate.



**PLASTIC AXIAL DIODES****PACKAGE WEIGHT LIST**

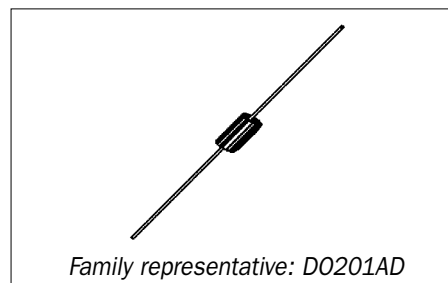
<b>Package</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
R6	8.85x8.85	1000	2328	(AG)
DO-15	3.34x6.34	6000	400	
DO-27	5x9.5	1900	1010	
DO-35	3.77x1.76	6000	150	
DO-201	5.05x9	3000	877	
DO-201AD	5.3x9.5	600	1120	
DO-41	2.35x4.7	3000	340	
F126	3x6.3	6000	385	
CB417	3.7x8.8	5000	630	
CB429	5.1x9.8	1900	870	

**SHIPPING MATERIALS****a) Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel (end lead strips)	Paper	Recyclable, biodegradable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Ammo pack**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tape	Kraft paper	Recyclable, biodegradable
Plastic tape	Polypropylene with acrylate	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**PLASTIC AXIAL DIODES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS Number	Element name (average by weight-%)	RoHS/Lead Status
Lead	Cu alloy	69.6	Cu	7440-50-8	99.9	
			Ag	7440-22-4	0.1	
Encapsulation	Epoxy resin	29.3	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.14	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft solder	0.06	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Leadfinishing	Tin	0.9	Sn	7440-31-5	100	

Totally Lead-free  
and  
RoHS compliant

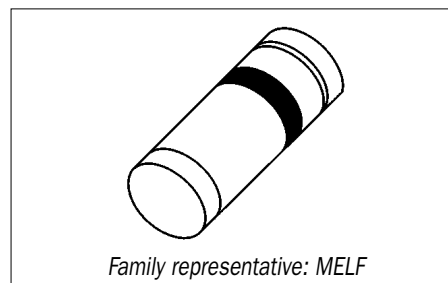
**SURFACE MOUNT DIODE IN MELF PACKAGES****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
MELF	1.6x3.6	2500	130	(CB466)
MINIMELF	2.6x5.2	2500	40	(CB465)

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

## SURFACE MOUNT DIODE IN MELF PACKAGES



### PRODUCT MATERIAL SHEET

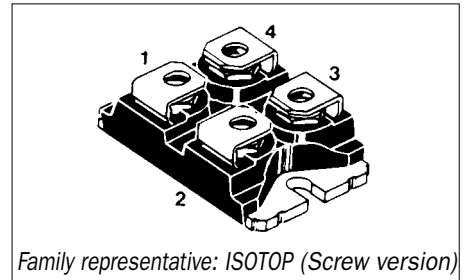
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Frame	Cu alloy	64.15	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Glass	34	PbO	1317-36-8	60.5	
			SiO <sub>2</sub>	60676-86-0	12.8	
			Others	various	26.7	
Chip	Doped Silicon	0.15	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Paint/Pigment	Dye	0.7	Epoxy (paint)	29690-82-2	100	
Leadfinishing	Tin/Lead	1	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	1	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

**POWER SCHOTTKY AND RECTIFIER DIODE****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
ISOTOP	25.5x31.7x7.0	10	27400	SCREW VERSION

**SHIPPING MATERIALS**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	Paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**POWER SCHOTTKY AND RECTIFIER DIODE**

**PRODUCT MATERIAL SHEET**

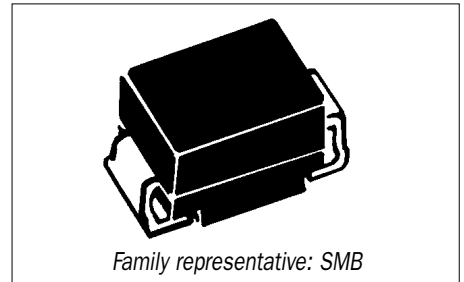
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Insulator	Ceramic	4.96	Al2O3	1344-28-1	100	
Leads	Cu alloy	10.72	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
			P	7723-14-0	0.1	
Heat spreader	Cu alloy	48.03	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
			P	7723-14-0	0.1	
Nuts	Iron	12.68	Fe	7439-89-6	100	
	Encapsulation	Epoxy resin	SiO2	60676-86-0	70	
Epoxy			29690-82-2	27		
Sb2O3			1309-64-4	2		
Br (TBBA)			79-94-7	1		
Chip	Doped Silicon	0.48	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft Solder	0.23	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Leads, heatspreader and nuts finishing	Nickel	0.12	Ni	7440-02-0	100	
						Lead-free and RoHS compliant

**TRISIL, TRANSIL AND SCHOTTKY DIODES IN PLASTIC PACKAGES****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
SMA	2.6x5.1x2.2	5000	70	(D0214AC)
SMB	3.7x4.4x2.2	2500	98	(SOD 6)
SMC	6.87x5.9x2.17	2500	250	(SOD 15)
ST MITE	1.9x1.9x1	12000	1.6	

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**TRISIL, TRANSIL AND SCHOTTKY DIODES IN PLASTIC PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	58.57	Cu	7440-50-8	97.45	
			Fe	7439-89-6	2.4	
			Zn	7440-66-6	0.12	
			P	7723-14-0	0.03	
Encapsulation	Epoxy resin	32.86	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	5.71	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft solder	1.14	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Clip	Cu alloy	1.14	Cu	7440-50-8	99.9	
			P	7723-14-0	0.1	
Leadfinishing	Tin/Lead	0.58	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.58	Sn	7440-31-5	100	Lead-free available and RoHS compliant

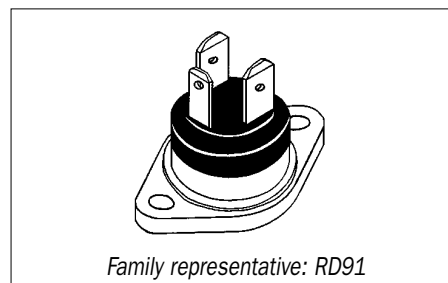


**THYRISTORS****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
RD-91	22.0x14.0	25	19800	(CB332)

**SHIPPING MATERIALS****a) Cardboard box**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Bags	Polyethylene	Recyclable, RESY PE-LD 04
Labels	paper	Recyclable, biodegradable

**THYRISTORS**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Header	Cu alloy	60.50	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.5	
Encapsulation	Epoxy resin	26.60	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Leads	Cu alloy	12.54	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.5	
Chip	Doped Silicon	0.11	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft Solder	0.05	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Header and Leads finishing	Nickel	0.20	Ni	7440-02-0	100	
						Totally Lead-free and RoHS compliant

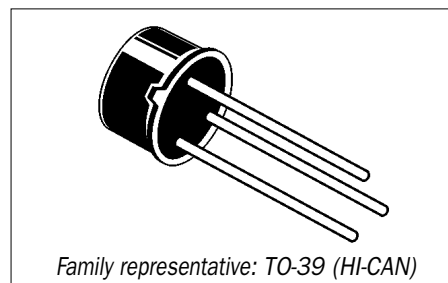
**SMALL SIGNAL TRANSISTORS IN METAL CAN PACKAGES****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
T0 5	8.5x6.6	500	964	
T0 18	4.9x5.3	1000	305	
T0 39	8.5x6.6	100	980	M.C. Power
T0 72	4.9x5.3	250	325	

**SHIPPING MATERIALS****a) Cardboard box**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Bags	Polyethylene	Recyclable, RESY PE-LD 04
Labels	paper	Recyclable, biodegradable

## SMALL SIGNAL TRANSISTORS IN METAL CAN PACKAGES



### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Header, cap and leads	Alloy 42	97.08	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Sealing	Glass	2.05	PbO	1317-36-8	60.5	
			SiO <sub>2</sub>	60676-86-0	12.8	
			Others	Various	26.7	
Chip	Doped Silicon	0.24	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Soft solder	0.01	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Aluminium	0.02	Al	7429-90-5	100	
Package and leads finishing	Tin	0.60	Sn	7440-31-5	100	

Totally Lead-free  
and  
RoHS compliant

**POWER PRODUCTS IN T03 PACKAGES****PACKAGE WEIGHT LIST**

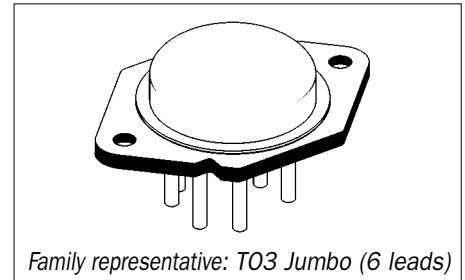
<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
T0-3	19.5x8.6	100	12380	2 LEADS 1.5 mm
T0-3	19.5x8.6	225	13700	4 LEADS, 1.5 mm
T0-3	19.5x8.6	225	13700	5 LEADS
T0-3 JUMBO	23.5x8.6	150	22800	6 LEADS
T0-3 JUMBO	23.5x8.6	150	22800	7 LEADS PIN 5 CONNECTED

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**POWER PRODUCTS IN TO3 PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Header	Iron	85.52	Fe	7439-89-6	100	
Lead	Alloy 42	1.13	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Sealing glass	Silicate	0.87	PbO	1317-36-8	60	
			SiO <sub>2</sub>	60676-86-0	12.5	
			Others	Various	27.5	
Cup	Iron	11.71	Fe	7439-89-6	100	
Chip	Doped silicon	0.25	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Soft solder	0.16	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Aluminum	0.01	Al	7429-90-5	100	
Header, leads and cup pre-finishing	Nickel	0.15	Ni	7440-02-0	100	
Leadfinishing	Tin/Lead	0.20	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.20	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**SMALL SIGNAL TRANSISTORS IN TO 92 PACKAGE****PACKAGE WEIGHT LIST**

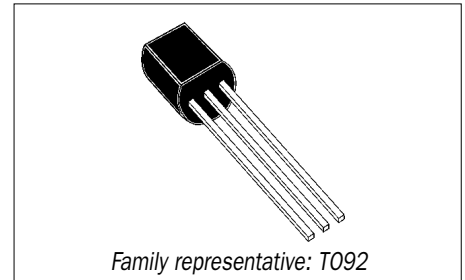
<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
T0 92	4.8x5.3	2500	250	
T0 92	4.8x5.3	2500	250	HI SINCERITY
T0 92	4.8x5.3	2500	250	S.SIG PLASTIC LEADS IN ROW
T0 92	4.8x5.3	2500	250	T
T0 92	4.8x5.3	2500	250	TOPGLASS

**SHIPPING MATERIALS****a) Cardboard box**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Bags	Polyethylene	Recyclable, RESY PE-LD 04
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Ammo pack**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tape	Kraft paper	Recyclable, biodegradable
Plastic tape	Polypropylene with acrylate	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SMALL SIGNAL TRANSISTORS IN TO 92 PACKAGE**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	44.2	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
Encapsulation	Epoxy resin	54.4	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.24	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft solder	0.12	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.16	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.88	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.88	Sn	7440-31-5	100	Lead-free available and RoHS compliant

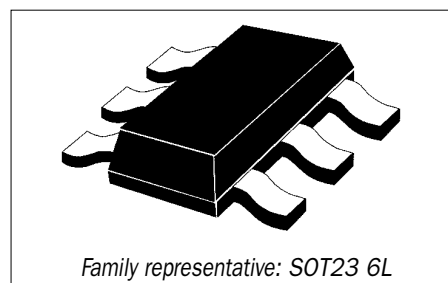


**SMALL OUTLINE TRANSISTORS AND DIODES LOW POWER****PACKAGE WEIGHT LIST**

Package	Body size (mm)	Bulk Qty	Weight (mg)	Remark
SOT 23	1.4x3x1	3000	10	3 LEADS
SOT 23	1.4x3x1	3000	17	6 LEADS PMOS STRIP
SOT 23	1.4x3x1	3000	17	6 LEADS
SOT 23	1.4x3x1	3000	16	5 LEADS TRANSIL ARRAY
SOT 23	1.4x3x1	3000	16	5 LEADS
SOT 23	1.4x3x1	3000	18	8 LEADS
SOT 23	1.4x3x1	3000	11	ANODE COMMUNE 2 dice
SOT 23	1.4x3x1	3000	7	CATHODE COMMUNE
SOT 23	1.4x3x1	3000	11	CATHODE COMMUNE 2 dice
SOT 23	1.4x3x1	3000	11	DIODES SERIE 2 dice
SOT 23	1.4x3x1	3000	7	SIMPLE DIODE
SOT 89	2.8x4.6x1.5	2500	52	
SOT 143	1.5x2.9x1	3000	10	
SOT 143	1.5x2.9x1	3000	11	BI PUCE
SOT 223	3.8x7.65x2.3	1000	110	
SOT 223	3.8x7.65x2.3	1000	110	PLANAR AND TOPGLASS
SOT 323	1x2x2	3000	4	3 LEADS
SOT 323	1x2x2	3000	6	5 LEADS (SC 70)
SOT 323	1x2x2	3000	7	6 LEADS
SOT 323	1x2x2	3000	9	8 LEADS
SOT 323	1x2x2	3000	4	ANODE COMMUNE 3 LEADS
SOT 323	1x2x2	3000	4	CATHODE COMMUNE 3LDS
SOT 323	1x2x2	3000	4	SERIE 3L
SOT 323	1x2x2	3000	7	6 LEADS 3 dice
SOT 343	1x2x0.9	3000	5	4 LEADS
SOT 523	0.8x0.75x1.6	3000	3	3 LEADS
SOT 665	1.1x1.6x0.6	3000	3	
SOT 666	1.1x1.6x0.6	3000	3	
SOD 123	2.4x1.6x0.98	3000	9	2 LEADS
SOD 323	1x2x1	3000	3	
SOD 523	0.8x0.75x1.6	3000	2	2 LEADS

**SHIPPING MATERIALS****a) Tape&Reel**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SMALL OUTLINE TRANSISTORS AND DIODES LOW POWER**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	31.1	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	65.2	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	2.6	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Glue (*)	0.34	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Aluminium	0.26	Al	7429-90-5	100	
Leadfinishing	Tin/Lead	0.5	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.5	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

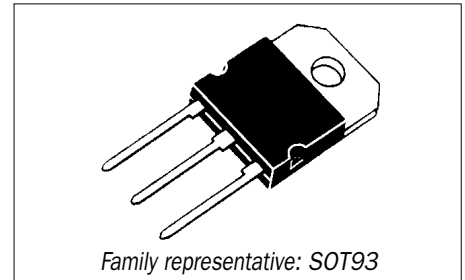
(\*) SOT/SOD Low Power packages can have both glue, as above reported, and gold (Au/Si eutectic). Only glue is, instead, used for SOT 666. SOT 666 is already Pb-free and RoHS compliant

**SMALL OUTLINE TRANSISTORS AND DIODES HIGH POWER****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
SOT 93 (TO-218)	15.5x12.9x4.6	300	4700	3 LEADS CUT TAB
SOT 93 (TO-218)	15.5x12.9x4.6	300	4700	3 LEADS FULL TAB
SOT 93 (TO-218)	15.5x12.9x4.6	300	4720	5 LEADS CUT TAB
SOT 93 (TO-218)	15.5x12.9x4.6	300	4720	5 LEADS FULL TAB
SOT 93 (TO-218)	15.5x12.9x4.6	300	4740	7 LEADS CUT TAB
SOT 93 (TO-218)	15.5x12.9x4.6	300	4740	7 LEADS FULL TAB
SOD 93	15.5x12.9x4.6	300	4650	
SOD 93	15.5x12.9x4.6	300	4650	ELECTROLITIC TINNING
TOP3	15.5x12.9x4.6	600	4550	NO ISOL.
DOP3	15.5x12.9x4.6	600	4500	

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SMALL OUTLINE TRANSISTORS AND DIODES HIGH POWER**

**PRODUCT MATERIAL SHEET**

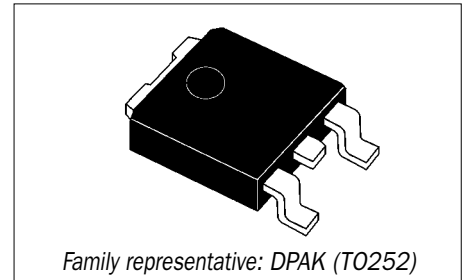
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Heatspreader	Cu alloy	71.68	Cu	7440-50-8	99.8	
			Co	7440-48-4	0.2	
Leadframe	Cu alloy	6.5	Cu	7440-50-8	99.8	
			Co	7440-48-4	0.2	
Encapsulation	Epoxy resin	20.3	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.7	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft Solder	0.42	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Aluminium	0.01	Al	7429-90-5	100	
Leadfinishing	Tin/Lead	0.39	Sn	7440-31-5	60	
			Pb	7439-92-1	40	
Leadfinishing	Tin	0.39	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**SURFACE MOUNT DEVICES (SMD) MEDIUM POWER TRANSISTORS****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
DPAK (TO 252)	6.6x6.2x2.2	2500	290	
D2PAK (TO 263)	10.3x9.6x4.5	1000	1380	AG SPOT, AU BOND. WIRE
D2PAK (TO 263)	10.3x9.6x4.5	1000	1380	AL BONDING WIRE
D2PAK (TO 263)	10.3x9.6x4.5	1000	1380	AL WIRE BOND (bended)
D2PAK (TO 263)	10.3x9.6x4.5	1000	1380	CLIP
D2PAK (TO 263)	10.3x9.6x4.5	1000	1380	DOUBLE TRACK
D2PAK/A	10.3x9.6x4.5	1000	1520	
PPAK	6.6x6.2x2.3	2500	320	5 LEADS
P2PAK	10.3x9.2x4.5	1000	1350	
P2PAK	10.3x9.2x4.5	1000	1350	4 LEADS
P2PAK/A	10.2x9.2x4.5	1000	1350	
SPAK	9.4x8,1x1,9	1000	425	3 LEADS
SPAK	9.4x8,1x1,9	1000	430	5 LEADS
SPAK	9.4x8,1x1,9	1000	435	7 LEADS

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SURFACE MOUNT DEVICES (SMD) MEDIUM POWER TRANSISTORS**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Heatspreader	Cu alloy, Ni plated + spot Ag	50.6	Cu	7440-50-8	98.4	
			Fe	7439-89-6	0.1	
			Ni	7440-02-0	0.8	
			Ag	7440-22-4	0.7	
Leadframe	Cu alloy	5.5	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	40	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	2.6	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft Solder	0.5	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Aluminium	0.34	Al	7429-90-5	100	
Leadfinishing	Tin/Lead	0.46	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.46	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**THROUGH HOLE PACKAGES MEDIUM POWER TRANSISTORS****PACKAGE WEIGHT LIST**

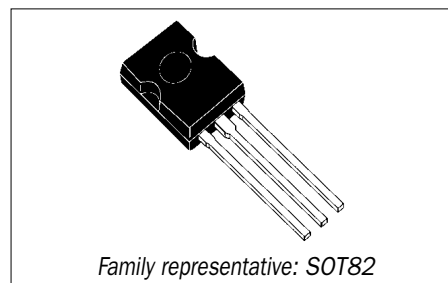
<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
IPAK (TO 251)	6.6x6.2x2.2	2500	310	
IPAK (TO 251)	6.6x6.2x2.2	2500	310	AU BONDING WIRES
I2PAK (TO 262)	10.3x9.6x4.5	250	1500	
I2PAK (TO 262)	10.3x9.6x4.5	250	1500	DT
SOT 32 (TO 226)	10.6x7.6x2.5	500	640	
SOT 82	10.6x7.6x2.5	500	720	
SOT 82	10.6x7.6x2.5	500	720	WITHOUT TINNING
TO 202-1	10x7.3x4.5	150	1400	
TO 202-V3	10x7.3x4.5	250	780	

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tube**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**THROUGH HOLE PACKAGES MEDIUM POWER TRANSISTORS**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Heatspreader	Cu alloy, Ni plated + spot Ag	32	Cu	7440-50-8	98.4	
			Fe	7439-89-6	0.1	
			Ni	7440-02-0	0.8	
			Ag	7440-22-4	0.7	
Leadframe	Cu alloy	25.9	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	39.2	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	1.46	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft Solder	0.41	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Aluminium	0.20	Al	7429-90-5	100	
Leadfinishing	Tin/Lead	0.83	Sn	7440-31-5	60	
			Pb	7439-92-1	40	
Leadfinishing	Tin	0.83	Sn	7440-31-5	100	Lead-free available and RoHS compliant

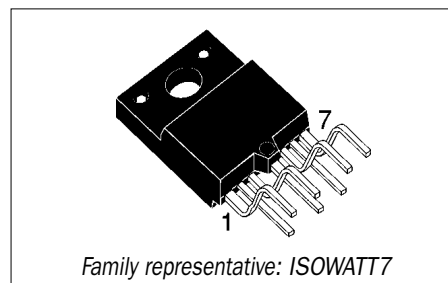


**MEDIUM/HIGH POWER TRANSISTOR/THYRISTOR ISOLATED PACKAGES****PACKAGE WEIGHT LIST**

Package	Body size (mm)	Bulk Qty	Weight (mg)	Remark
ISOWATT220AC	16.4x10.4x4.6	500	2000	
ISOWATT220	16.4x10.4x4.6	500	2040	
ISOWATT220FP	16.4x10.4x4.6	500	2040	TO-220FP
ISOWATT220FH	16.4x10.4x4.6	500	2040	TO-220FH
TO-247	21.8x15.9x5.3	600	4430	
ISOWATT218	21.2x16.2x5.6	300	5200	
ISOWATT218FX	24.5x15.7x5.7	300	5600	
ISOWATT5	21.2x16.2x5.6	300	5300	
ISOWATT7	21.2x16.2x5.6	300	5370	ISOWATT 221
MAX220	16.1x10.2x4.5	600	2290	
MAX220I	16.1x10.2x4.5	600	2350	
MAX247	20x15.6x5	600	4900	
DOP 3	15.5x12.9x4.6	300	4280	
TOP 3	15.5x12.9x4.6	300	4460	
SOT 93	15.5x12.9x4.6	300	4700	
SOT 93	15.5x12.9x4.6	300	4700	5 LEADS
SOT 93	15.5x12.9x4.6	300	4800	7 LEADS

**SHIPPING MATERIALS****a) Tube**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**MEDIUM/HIGH POWER TRANSISTOR/THYRISTOR ISOLATED PACKAGES**

**PRODUCT MATERIAL SHEET**

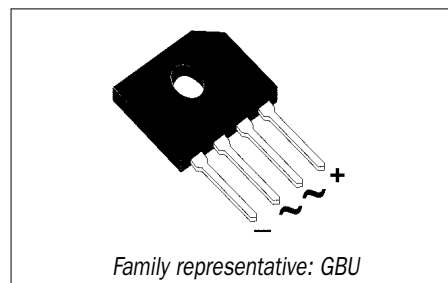
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	5.93	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
			P	7723-14-0	0.1	
Heat spreader	Cu alloy	45.3	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
			P	7723-14-0	0.1	
Encapsulation	Epoxy resin	48.1	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.15	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft Solder	0.05	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.02	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.45	Sn	7440-31-5	60	
			Pb	7439-92-1	40	
Leadfinishing	Tin	0.45	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

**GBU PACKAGES****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk (tube) Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
GBU PACKAGE	22.3x18.8x3.5	1000	3910	

**SHIPPING MATERIALS****a) tubes**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**GBU PACKAGES**

**PRODUCT MATERIAL SHEET**

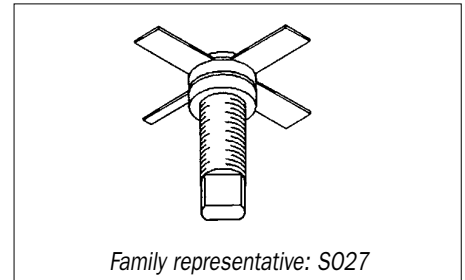
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	42.68	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.5	
Encapsulation	Epoxy resin	52.98	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.56	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater	Soft solder	0.45	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Clip (internal connect)	Cu alloy	2.5	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.5	
Leadfinishing	Tin/Lead	0.83	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.83	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**R.F. HERMETIC PACKAGES WITH STUD****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Base Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
S016	5.9x4.7	40	1460	
S027	5.9x4.7	40	1500	

**SHIPPING MATERIALS****a) Tray**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**R.F. HERMETIC PACKAGES WITH STUD**

**PRODUCT MATERIAL SHEET**

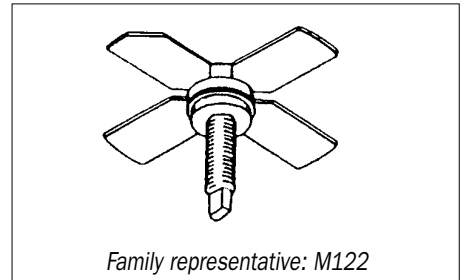
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Stud	Cu alloy	83.4	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Heat spreader	Ceramic gold plated	4.8	BeO	1304-56-9	99.7	
			Au	7440-57-5	0.3	
Lid	Cu alloy	4.06	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Leads	Alloy 42	7.6	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped Silicon	0.03	Si	7440-21-3	99.4	
			Au	7440-57-5	0.6	
Die bonding mater	Hard solder	0.01	Au	7440-57-5	94	
			Si	7440-21-3	6	
Wires	Gold	0.01	Au	7440-57-5	100	
Leads, lid and stud finishing	Gold	0.09	Au	7440-57-5	100	
						Totally Lead-free and RoHS compliant

**R.F. CERAMIC PACKAGES WITH STUD****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Base Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
M122	7.2x5.6	40	1900	
M130	12.8x7.4	40	5300	
M135	9.6x7.5	40	3800	
M164	12.8x7.6	40	8600	

**SHIPPING MATERIALS****a) Tray**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**R.F. CERAMIC PACKAGES WITH STUD**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Stud	Cu alloy	71.93	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Heat spreader	Ceramic gold plated	6.3	BeO	1304-56-9	99.7	
			Au	7440-57-5	0.3	
Lid	Ceramic	7.3	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	100	
Leads	Alloy 42	14	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped Silicon	0.29	Si	7440-21-3	99.4	
			Au	7440-57-5	0.6	
Die bonding mater	Hard solder	0.10	Au	7440-57-5	94	
			Si	7440-21-3	6	
Wires	Gold	0.01	Au	7440-57-5	100	
Leads and stud finishing	Gold	0.07	Au	7440-57-5	100	
						Totally Lead-free and RoHS compliant

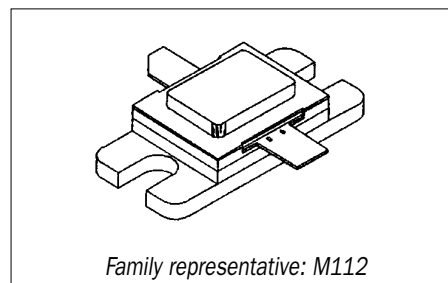


**R.F. HERMETIC FLANGED PACKAGES****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Base Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
M105	6.5x6.5x2.7	25	3100	
M112	12.9x10.3x4.2	25	6000	
M119	11x10.4x4.2	25	5600	
M151	6x2.6	25	2700	
M198	15.5x10.4x4.2	25	6800	
M207	15.4x10.3x3.4	25	7000	
S010/S011	6.5x2.0	25	1700	
S038	12.7x10.3x4.2	25	3700	
S042	10.3x9.8x4.2	25	3600	
S064	8.1x7.9x3.2	25	3400	

**SHIPPING MATERIALS****a) Tray**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**R.F. HERMETIC FLANGED PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Flange	Cu alloy	76.4	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Heat spreader	Ceramic gold plated	10	BeO	1304-56-9	99.6	
			Au	7440-57-5	0.4	
Lid	Cu alloy	5.3	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Leadframe	Alloy 42	6.5	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped Silicon	0.27	Si	7440-21-3	99.4	
			Au	7440-57-5	0.6	
Die bonding mater	Hard solder	0.12	Au	7440-57-5	94	
			Si	7440-21-3	6	
Wires	Gold	1.36	Au	7440-57-5	100	
Flange, lid and leadframe Finishing	Gold	0.05	Au	7440-57-5	100	

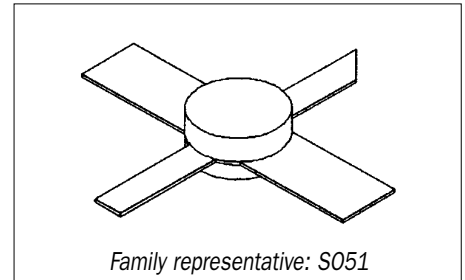
Totally Lead-free  
and  
RoHS compliant

**R.F. STUDLESS CERAMIC PACKAGES****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Base Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
M115	7.2x3.3	10	500	
M123	7.2x3.3	10	500	
S051	5.1x3.3	10	500	
S053	5.1x3.3	10	500	

**SHIPPING MATERIALS****a) Tray**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**R.F. STUDLESS CERAMIC PACKAGES**

**PRODUCT MATERIAL SHEET**

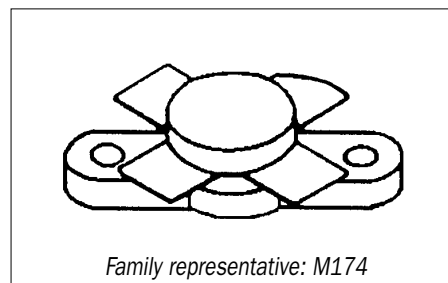
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Heat spreader	Ceramic gold plated	37.6	BeO	1304-56-9	99.7	
			Au	7440-57-5	0.3	
Lid	Ceramic	25.8	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	100	
Leads	Alloy 42	35.4	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped Silicon	0.56	Si	7440-21-3	99.4	
			Au	7440-57-5	0.6	
Die bonding mater	Hard solder	0.22	Au	7440-57-5	94	
			Si	7440-21-3	6	
Wires	Gold	0.08	Au	7440-57-5	100	
Leads and stud finishing	Gold	0.34	Au	7440-57-5	100	
						Totally Lead-free and RoHS compliant

**R.F. CERAMIC FLANGED PACKAGES****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Base Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
M103	8.3x6.5x3.2	25	5900	
M111	12.9x4.4	25	5200	
M113	9.8x4.4	25	4000	
M142	9.3x6.0x3.3	25	3700	
M156	8.3x6.5x3.2	25	2800	
M165	(2x12.8) x11x3.7	15	19500	
M168	10.3x9.1x3.8	25	11200	
M169	10.9x10.3x4.2	25	6900	
M170	8.7x6.4x3.2	25	2900	
M173	13.6x11.8x3.3	25	8200	
M174	12.8x4.3	25	5200	
M175	(2x13.6) x11.6x3.7	15	18800	
M177	16.3x4.1	25	7800	
M208	22.1x10.3x3.4	25	10000	
S058	6.3x1.7	25	3000	
S068	6.3x1.7	25	3000	

**SHIPPING MATERIALS****a) Tray**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**R.F. CERAMIC FLANGED PACKAGES**

**PRODUCT MATERIAL SHEET**

Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	Variation forecast by End 2003	RoHS/Lead Status
		69.28	Cu Fe	7440-50-8 7439-89-6	99.9 0.1	
Heat spreader	Ceramic gold plated					
		13.7	BeO Au	1304-56-9 7440-57-5	99.6 0.4	
Lid	Ceramic					
		11.6	Al2O3	1344-28-1	100	
Leadframe	Alloy 42 gold plated					
		5	Fe Ni Au	7439-89-6 7440-02-0 7440-57-5	57.4 41.6 1.0	
Chip	Doped Silicon					
		0.08	Si Au	7440-21-3 7440-57-5	99.4 0.6	
Die bonding mater	Hard solder					
		0.03	Au Si	7440-57-5 7440-21-3	94 6	
Wires	Gold	0.01	Au	7440-57-5	100	
Flange finishing	Nickel	0.30	Ni	7440-02-0	100	

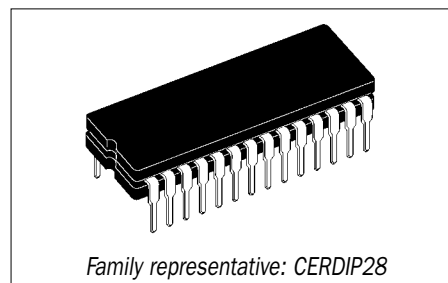
Totally Lead-free  
and  
RoHS compliant

**CERAMIC DUAL IN LINE PACKAGES****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
CERDIP 8	9.8x7.0x4.2	2000	1080	.300 F/S
CERDIP 22	24.8x7.0x4.2	1000	2800	.380 F/S
CERDIP 24	32.2x14.7x4.2	750	4812	.300 F/S
CERDIP 24	32.2x14.7x4.2	750	4812	.525 F/S
CERDIP 28	38x14.7x4.2	390	8120	.300 F/S
CERDIP 28	38x14.7x4.2	390	8120	.587 F/S
CERDIP 32	44x14.7x4.2	360	9140	.587 F/S
CERDIP 40	50.8x14.7x4.2	270	11380	.526 F/S

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**CERAMIC DUAL IN LINE PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Base	Alumina	34.28	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Cup	Alumina	33.22	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Leadframe	Alloy 42	13.18	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Sealing glass	Silicates	18.48	PbO	1317-36-8	53	
			SiO <sub>2</sub>	60676-86-0	8.5	
			Others	Various	38.5	
Chip	Doped silicon	0.44	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Silver glass	0.06	Ag	7440-22-4	80	
			Pb	7439-92-1	5	
			Others	Various	15	
Wires	Aluminium	0.04	Al	7429-90-5	100	
Leadfinishing	Tin	0.30	Sn	7440-31-5	100	

Lead-free  
and  
RoHS compliant

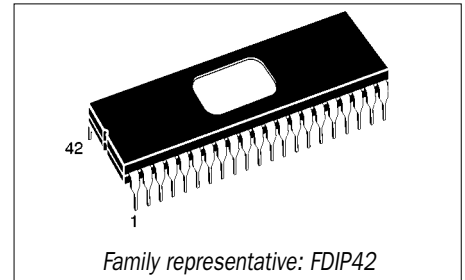


**FRIT-SEAL CERAMIC PACKAGE WITH BULLS-EYE (LENS)****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
FDIP 20	24.8x7.0x4.2	1000	2800	.320 F/S LENS 170
FDIP 24	32x14.7x4.2	750	4810	.615 F/S LENS 280
FDIP 28	38x14.7x4.2	390	7970	.526 F/S LENS 280
FDIP 28	38x14.7x4.2	390	7970	.526 F/S LENS 300
FDIP 28	38x14.7x4.2	390	7970	.526 F/S LENS 350
FDIP 32	44x14.7x4.2	360	9170	.280 F/S LENS MSI
FDIP 32	44x14.7x4.2	360	9170	.587 F/S LENS 335x492
FDIP 32	44x14.7x4.2	360	9170	.587 F/S LENS 380
FDIP 32	44x14.7x4.2	360	9170	LENS 260x420
FDIP 40	50.8x14.7x4.2	270	11380	.587 F/S LENS 370x430
FDIP 40	50.8x14.7x4.2	270	11380	.587 F/S LENS 380
FDIP 40	50.8x14.7x4.2	270	11380	.300 LEAD MSI WITH LENS
FDIP 40	50.8x14.7x4.2	270	11380	MSI LENS 320
FDIP 42	55x14.7x4.2	270	13160	F/S LSI LENS 370x450
FDIP 42	55x14.7x4.2	270	13160	LSI LENS 630x315

**SHIPPING MATERIALS**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**FRIT-SEAL CERAMIC PACKAGE WITH BULLS-EYE (LENS)**

**PRODUCT MATERIAL SHEET**

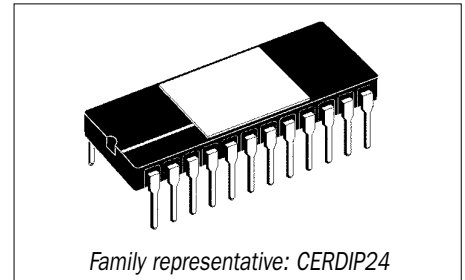
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Base	Alumina	47.32	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Cup	Alumina	25.6	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Lens	Quartz	0.015	SiO <sub>2</sub>	60676-86-0	100	
Leadframe	Alloy 42	12.2	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Sealing glass	Silicates	14.1	PbO	1317-36-8	53	
			SiO <sub>2</sub>	60676-86-0	8.5	
			Others	Various	38.5	
Chip	Doped silicon	0.42	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Silver glass	0.035	Ag	7440-22-4	80	
			Pb	7439-92-1	5	
			Others	Various	15	
Wires	Aluminium	0.03	Al	7429-90-5	100	
Leadfinishing	Tin	0.28	Sn	7440-31-5	100	
						Lead-free and RoHS compliant

**SIDE BRAZED CERAMIC DUAL IN LINE PACKAGES****PACKAGE WEIGHT LIST**

Package/Pin	Body size (mm)	Bulk Qty	Weight (mg)	Remark
CERDIP 08	7.8x13.2	2000	1020	.300 S/B
CERDIP 14	7.8x20.3	1000	1400	.300 S/B
CERDIP 16	7.8x20.3	1000	1410	.300 S/B WITH LENS
CERDIP 16	7.8x20.3	1000	1410	.320 S/B
CERDIP 18	7.8x22.8	1000	1480	.320 S/B
CERDIP 20	7.8x25.4	1000	1520	.310 S/B GOLD LIDDED
CERDIP 22	7.8x27.9	850	1580	.410 S/B
CERDIP 24	15.49x30.48	750	4080	.300 S/B SHRINK
CERDIP 24	15.49x30.48	750	4080	.610 S/B
CERDIP 28	15.49x35.56	700	4640	.610 S/B
CERDIP 30	15.49x38.10	480	4970	.400 S/B SHRINK
CERDIP 32	15.49x40.64	480	5730	.400 S/B SHRINK
CERDIP 32	15.49x40.64	480	5730	.400 SHRINK S/B LENS
CERDIP 40	15.49x50.8	270	7440	.610 S/B GOLD LIDDED
CERDIP 40	15.49x50.8	270	7440	.610 S/B LENS 350/300
CERDIP 42	15.49x52.2	390	7140	.600 S/B SHRINK LENS
CERDIP 42	15.49x52.2	390	7140	.610 S/B SHRINK
CERDIP 48	15.49x60.9	240	8170	.610 S/B

**SHIPPING MATERIALS**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SIDE BRAZED CERAMIC DUAL IN LINE PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Base	Alumina	86.23	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Lid	Alloy42	0.4	Fe	7439-89-6	57.6	
			Ni	7440-02-0	41.6	
Leadframe	Alloy 42	12.5	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped silicon	0.35	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Silver glass	0.18	Ag	7440-22-4	80	
			Pb	7439-92-1	5	
			Others	Various	15	
Wires	Gold	0.10	Au	7440-57-5	100	
Lid and Leadfinishing	Gold	0.24	Au	7440-57-5	100	

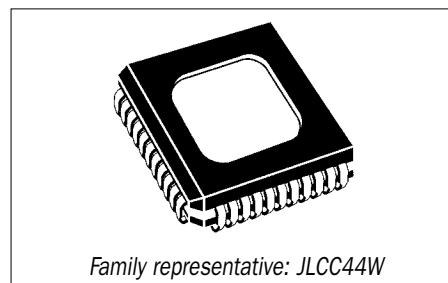
Totally Lead-free  
and  
RoHS compliant

**J LEADED CHIP CARRIER****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
JLCC 24	8.2x8.2x2.9	1600	1160	
JLCC 44	14.9x14.9x2.9	750	2130	
JLCC 52	17.7x17.7x2.9	500	2520	
JLCC 68	24.6x24.6x2.9	400	5380	
JLCC 84	29.4x29.4x2.9	320	7400	

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**J LEADED CHIP CARRIER**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Base	Alumina	67.50	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Lid and Leadframe	Alloy 42	31.75	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped silicon	0.62	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Silver glass	0.04	Ag	7440-22-4	80	
			Pb	7439-92-1	5	
			Others	Various	15	
Wires	Aluminium	0.08	Al	7429-90-5	100	
Lid and Leadfinishing	Gold plating	0.01	Au	7440-57-5	100	
						Totally Lead-free and RoHS compliant

**CERAMIC LEAD CHIP CARRIER****PACKAGE WEIGHT LIST**

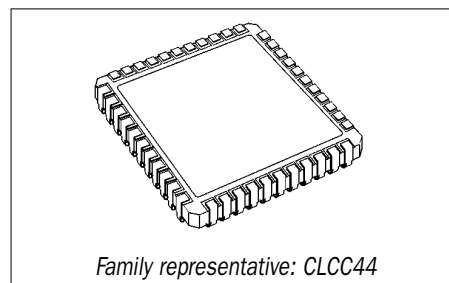
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
CLCC 28	12x12x2.3	756	1050	
CLCC 32	13.5x13.5x2.3	840	1200	
CLCC 36	14.5x14.5x2.3	840	1350	.420 + GLASS LID
CLCC 44	16.5x16.5x2.3	600	1990	
CLCC 44	16.5x16.5x2.3	600	1990	PIN 1 CONNECTED TO SEAL
CLCC 44	16.5x16.5x2.3	600	1990	
CLCC 48	18.5x18.5x2.3	680	2200	.560 + GLASS LID
CLCC 68	24.5x24.5x2.7	160	5380	
CLCC 68	24.5x24.5x2.7	160	5380	WITH LENS
CLCC 84	29.6x29.6x2.7	136	7620	.920 + GLASS LID
CLCC 84	29.6x29.6x2.7	136	7620	WITH LENS

**SHIPPING MATERIALS**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

<b>Inner Box</b>	<b>Cardboard, carbon coated</b>	<b>Recyclable, biodegradable</b>
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**CERAMIC LEAD CHIP CARRIER**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Base	Alumina	67.50	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Lid and Leadframe	Alloy 42	31.75	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped silicon	0.62	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Silver glass	0.04	Ag	7440-22-4	80	
			Pb	7439-92-1	5	
			Others	Various	15	
Wires	Aluminium	0.08	Al	7429-90-5	100	
Lid and Leadfinishing	Gold plating	0.01	Au	7440-57-5	100	

Totally Lead-free  
and  
RoHS compliant



**CERAMIC QUAD FLAT PACKAGE****PACKAGE WEIGHT LIST**

Package/Pin	Body size (mm)	Bulk Qty	Weight (mg)	Remark
CQFP 44	10x10x3.7	576	1420	
CQFP 44	14x14x3.7	336	1880	GULL WING
CQFP 52	14x14x3.7	336	1880	
CQFP 64	10x10x3.7	576	1650	
CQFP 64	14x14x3.7	336	1880	WITH LENS
CQFP 64	14x20x3.7	396	2580	
CQFP 68	14x20x3.7	396	2580	
CQFP 80	14x14x3.7	336	1780	
CQFP 80	14x20x3.7	396	1780	
CQFP 80	14x20x3.7	396	1780	GULL WING
CQFP 80	14x20x3.7	396	1780	WITH LENS
CQFP 84	14x20x3.7	396	1780	GLASS
CQFP 100	14x14x3.7	336	1750	14x14
CQFP 100	14x20x3.7	396	2560	GULL WING CAVITY DW
CQFP 100	14x20x3.7	396	2560	GULL WING CAVITY UP
CQFP 100	14x20x3.7	396	2560	GULL WING WITH LENS
CQFP 120	28x28x3.7	240	8020	GULL WING
CQFP 128	28x28x3.7	240	8070	GULL WING
CQFP 132	28x28x3.7	240	8070	F/S
CQFP 144	28x28x3.7	240	7880	19.2x19.2
CQFP 144	28x28x3.7	240	8240	GULL WING
CQFP 160	28x28x3.7	240	5200	GULL WING
CQFP 176	28x28x3.7	240	5240	13x13 OD24x24 PLAU
CQFP 208	28x28x3.7	240	7480	

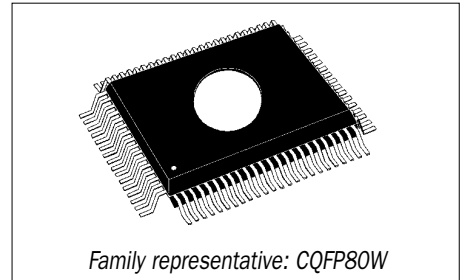
**SHIPPING MATERIALS****a) Tape&Reel**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

## CERAMIC QUAD FLAT PACKAGE



### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Base	Alumina	62.91	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Lid (*)	Alumina	5.28	Al <sub>2</sub> O <sub>3</sub>	1344-28-1	90	
			SiO <sub>2</sub>	60676-86-0	10	
Leadframe	Alloy 42	30.5	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped silicon	0.38	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Silver glass	0.27	Ag	7440-22-4	80	
			Pb	7439-92-1	5	
			Others	Various	15	
Wires	Gold	0.18	Au	7440-57-5	100	
Leadfinishing	Gold	0.48	Au	7440-57-5	100	
						Totally Lead-free and RoHS compliant

(\*) Same percentage for Lids having lens included

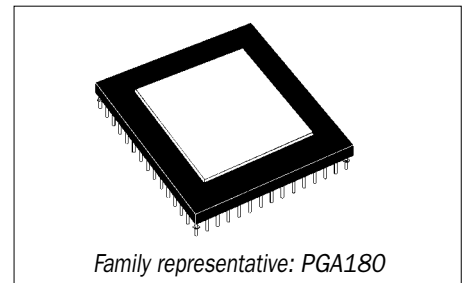
**CERAMIC PIN GRID ARRAY****PACKAGE WEIGHT LIST**

Package/Pin	Body size (mm)	Bulk Qty	Weight (mg)	Remark
CPGA 64	28x28x2.6	360	5200	
CPGA 68	28x28x2.6	360	5200	
CPGA 68	28x28x2.6	360	5200	
CPGA 68	28x28x2.6	360	5200	WITH CER CAP
CPGA 84	28x28x2.6	200	6000	
CPGA 84	28x28x2.6	200	6000	UP 10x10
CPGA 84	28x28x2.6	200	6000	WITH CER. CAP
CPGA 88	28x28x2.6	200	6000	
CPGA 100	33.5x33.5x2.6	200	6700	
CPGA 101	33.5x33.5x2.6	200	6700	
CPGA 120	33.5x33.5x2.6	200	10140	UP
CPGA 120	33.5x33.5x2.6	200	10140	CER. CAP/LENS
CPGA 120	33.5x33.5x2.6	200	10140	DW .35x.35
CPGA 121	33.5x33.5x2.6	200	10140	PINS UP WITHOUT LENS
CPGA 132	33.5x33.5x2.6	200	12000	DW
CPGA 135	33.5x33.5x2.6	200	12000	UP
CPGA 144	40x40x2.8	200	16160	CER. CAP
CPGA 144	40x40x2.8	200	16160	UP
CPGA 155	40x40x2.8	200	16160	
CPGA 168	40x40x2.8	200	16160	CAVITY DOWN
CPGA 180	40x40x3.4	200	17570	
CPGA 180	40x40x2.8	200	18000	DW
CPGA 208	40x40x2.8	200	18500	
CPGA 208	40x40x2.8	200	18500	DW
CPGA 208	40x40x2.8	200	18500	UP
CPGA 224	40x40x3.8	180	25070	PINS DOWN
CPGA 224	40x40x2.8	180	25070	PINS UP
CPGA 257	50.7x50.7x3.8	160	33300	UP
CPGA 296	50.7x50.7x3.8	160	38300	CAVITY DOWN
CPGA 319	50.7x50.7x3.8	160	41300	DOWN 21/21

**SHIPPING MATERIALS**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**CERAMIC PIN GRID ARRAY**



**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Base	Alumina	80.5	Al2O3	1344-28-1	90	
			SiO2	60676-86-0	10	
Lid	Alumina	7.26	Al2O3	1344-28-1	90	
			SiO2	60676-86-0	10	
Leadframe	Alloy 42	11.25	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Chip	Doped silicon	0.47	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material	Silver glass	0.22	Ag	7440-22-4	80	
			Pb	7439-92-1	5	
			Others	Various	15	
Wires	Aluminum	0.12	Al	7429-90-5	100	
Lid and Leadfinishing	Gold plating	0.18	Au	7440-57-5	100	
						Totally Lead-free and RoHS compliant

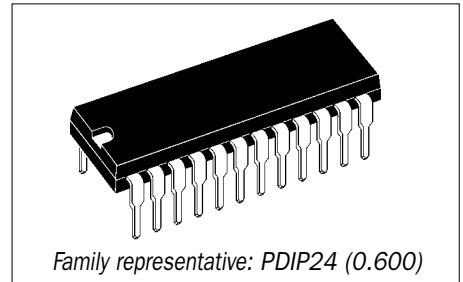
**DUAL IN LINE PLASTIC PACKAGES Frame = 0.25****PACKAGE WEIGHT LIST**

Package/Pin/mils width		Body size (mm)	Bulk Qty	Weight (mg)	Remark
P-DIP 8	300	10.9x6.6x3.3	2000	480	
P-DIP 14	300	20x6.3x3.3	1000	1000	
P-DIP 16	300	20x6.3x3.3	1000	1025	
P-DIP 18	300	23.2x6.3x3.3	800	1100	
P-DIP 20	300	25.4x6.3x3.3	720	1360	
P-DIP 22	300	28.1x8.2x3.8	720	2038	
P-DIP 22	300	28.1x8.2x3.8	720	2038	ALLOY 42
P-DIP 24	300	35.5x8.2x3.8	360	2590	
P-DIP 24	300	35.5x8.2x3.8	360	2590	SLIM
P-DIP 24	600	32.2x14.1x3.8	360	3700	
P-DIP 24	600	32.2x14.1x3.8	360	3700	ALLOY 42
P-DIP 28	300	37x8.2x3.8	312	4200	
P-DIP 28	600	37.3x14.1x3.8	312	4200	ALLOY 42
P-DIP 28	600	37.3x14.1x3.8	312	4200	
P-DIP 32	600	42.0x14.1x3.8	264	4700	
P-DIP 40	600	52x14.1x3.8	216	6000	
P-DIP 40	600	52x14.1x3.8	216	6000	ALLOY 42
P-DIP 42	600	54.6x14.1x3.8	390	6300	
P-DIP 48	600	62.7x14.1x3.8	240	7700	

ALLOY 42 = Fe 58% Ni 42%

**SHIPPING MATERIALS****a) Tube**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**DUAL IN LINE PLASTIC PACKAGES Frame = 0.25**

**PRODUCT MATERIAL SHEET**

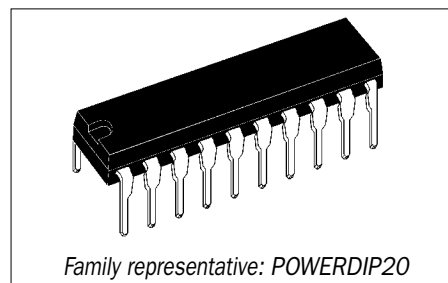
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy+ Ag plating	28.1	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.3	
			P	7723-14-0	0.1	
			Ag	7440-22-4	0.1	
Encapsulation	Epoxy resin	70	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	1	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.05	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.15	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.7	Sn	7440-31-5	60	
			Pb	7439-92-1	40	
Leadfinishing	Tin	0.7	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

**POWER DUAL IN LINE PLASTIC PACKAGES****PACKAGE WEIGHT LIST**

<b>Package/Pin/mils width</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
PowerDIP8 300	9.8x7.1x4.1	2000	600	Al Wires
PowerDIP8 300	9.8x7.1x4.1	2000	600	Au Wires
PowerDIP16 300	20.0x7.1x4.6	1000	1000	
PowerDIP18 300	24.8x7.1x4.6	1000	1350	
PowerDip20 300	24.8x7.1x4.6	1000	1380	

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**POWER DUAL IN LINE PLASTIC PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy+ Ag plating	46.7	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.3	
			P	7723-14-0	0.1	
			Ag	7440-22-4	0.1	
Encapsulation	Epoxy resin	51	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	1	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.32	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.25	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.73	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.73	Sn	7440-31-5	100	Lead-free available and RoHS compliant



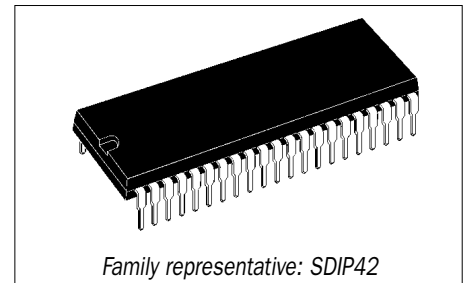
**S-DIP (SHRINK DUAL IN LINE PLASTIC PACKAGES)****PACKAGE WEIGHT LIST**

Package/Pin/mils width	Body size (mm)	Bulk Qty	Weight (mg)	Remark
S-DIP24 300	22.9x4.0x3.8	1000	1200	
S-DIP30 400	27.9x8.6x3.8	750	2200	
S-DIP32 400	29.0x8.9x3.8	750	2350	
S-DIP42 600	38.6x14x4.6	390	3870	
S-DIP52 600	47.5x14x4.6	270	5550	
S-DIP56 600	52.0x14x4.6	270	6025	
S-DIP64 750	58.2x17.0x4.6	120	9150	

**SHIPPING MATERIALS****a) Tube**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

## S-DIP (SHRINK DUAL IN LINE PLASTIC PACKAGES)



### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy+ Ag plating	25.24	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.3	
			P	7723-14-0	0.1	
			Ag	7440-22-4	0.1	
Encapsulation		72.8	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.63	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.18	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.20	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.95	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.95	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

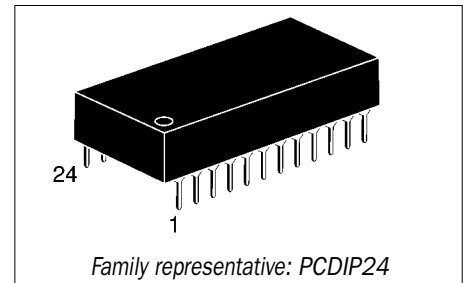
**P-DIP ZEROPOWER/TIMEKEEPER****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
PDIP24	32.3x18.8x8.4	280	9700	
PDIP28	39.4x17.8x8.4	240	10600	

*(\*) In addition to the functions provided by ZEROPOWER RAMs, these devices also include a high precision real-time calendar/clock function which can be calibrated directly from system software.*

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**P-DIP ZEROPOWER/TIMEKEEPER**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu Alloy	9.19	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Cap		18	Thermoplastic	Glass reinforced	100	
Encapsulation and Filler	Epoxy resin	53.32	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Battery	Lithium cell	17.22	Stainless steel	–	80	
			Carbon monofluoride	51311-17-2	10	
			Propylene Carbonate	108-32-7	4	
			Lithium	7439-93-2	3	
			Polypropylene	9003-07-0	3	
Clock	Quartz crystal	1.59	SiO <sub>2</sub>	60676-86-0	100	
Chip	Doped Silicon	0.36	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.01	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.05	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.26	Sn	7440-31-5	63	
			Pb	7439-92-1	37	
Leadfinishing	Tin	0.26	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

**SMALL OUTLINE PLASTIC PACKAGES****PACKAGE WEIGHT LIST**

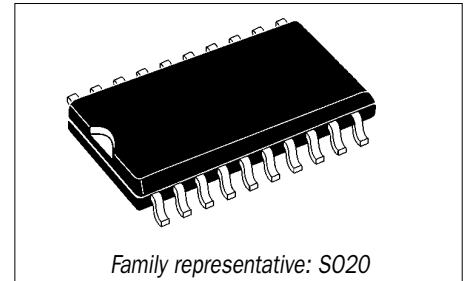
Package/Pin/mils width		Body size (mm)	Bulk (tube) Qty	Tape & Reel Qty	Weight (mg)	Remark
SO 8	150	4.9x3.9x1.6	2000	2500	80	
SO 8	208	4.9x5.1x1.6	1800	1500	125	WIDE
SO 14	150	8.6x3.9x1.6	1000	1000	130	
SO 16	150	9.9x3.9x1.6	1000	1000	150	
SO 16	300	10.3x7.5x2.3	1000	1000	400	
SO 18	300	11.5x7.5x2.3	800	1000	450	
SO 20	300	12.8x7.5x2.3	800	1000	500	
SO 24	300	15.4x7.5x2.3	800	1000	550	
SO 28	300	17.6x7.5x2.3	700	1000	640	
SO 34	300	18.06x7.5x2.3	700	1000	780	SHRINK 7.5 mm
SO 44	525	28.3x13.3x2.3	180	500	910	

**SHIPPING MATERIALS****a) Tube**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Bag	Polyethylene	Recyclable, RESY PE-LD 04
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SMALL OUTLINE PLASTIC PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	28.6	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
			P	7723-14-0	0.1	
Encapsulation	Epoxy resin	66.2	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	3.6	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.8	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.32	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.48	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.48	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	NiPdAu	0.48	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

Note - preplated frames (PPF):

- a. No Ag spot on island pad with NiPdAu Leadframe.
- b. Ag spot on island pad with 100% Tin plating Leadframe.

**SHRINK SMALL OUTLINE PACKAGES****PACKAGE WEIGHT LIST**

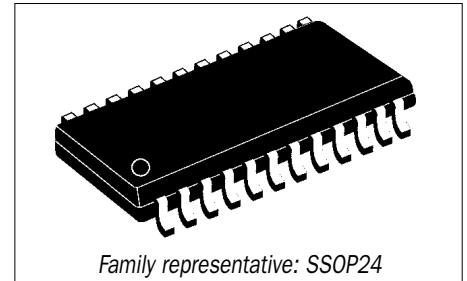
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Tape &amp; reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
SSOP 14	5.3x6.0x1.75	1500	120	5.3 WIDE
SSOP 16	5.3x6.3x1.75	1500	125	5.3 WIDE
SSOP 20	5.3x7.2x1.75	1350	200	5.3 WIDE
SSOP 24	5.3x8.2x1.75	1350	210	5.3 WIDE
SSOP 28	5.3x10.2x1.75	1350	240	5.3 WIDE
SSOP 36	7.5x15x1.75	1000	270	7.5 WIDE
SSOP 64	10.16x26x1.75	800	340	10.16 WIDE

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tube**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SHRINK SMALL OUTLINE PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	28.6	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
			P	7723-14-0	0.1	
Encapsulation	Epoxy resin	66.2	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	3.6	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.8	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.32	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.48	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.48	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	NiPdAu	0.48	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

Note - preplated frames (PPF):

- a. No Ag spot on island pad with NiPdAu Leadframe.
- b. Ag spot on island pad with 100% Tin plating Leadframe.



**POWER SO PACKAGES****PACKAGE WEIGHT LIST**

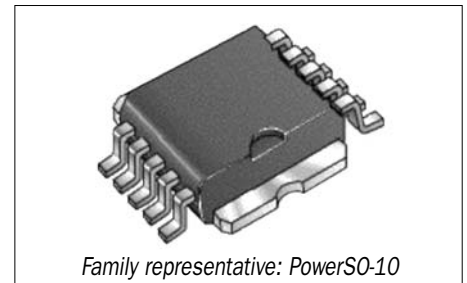
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Bulk (tube) Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
POWER SO 10	9.2x7.2x3.5	1000	310	1140	
POWER SO 10 R.F.	9.2x7.2x3.5	1000	310	1140	GULL WING
POWER SO 10 R.F.	9.2x7.2x3.5	1000	310	1140	STRAIGHT
POWER SO 16	9.2x7.2x3.5	600	310	1580	

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**POWER SO PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	5.36	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Heat spreader	Cu alloy	53.74	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	38.64	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	1.26	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.45	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.20	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.35	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.35	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**POWER SO PACKAGES****PACKAGE WEIGHT LIST**

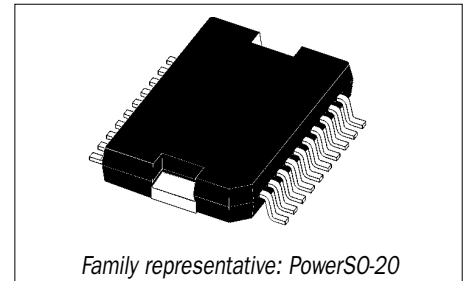
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Bulk (tube) Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
POWER SO 20S	16x11.1x3.3	600	310	1900	
POWER SO 20	16x11.1x3.3	600	310	1900	SLUG DOWN
POWER SO 20	16x11.1x3.3	600	310	1900	SLUG UP
POWER SO26	16x11.1x3.3	600	310	1910	SLUG UP
POWER SO28	16x11.1x3.3	600	310	1910	SLUG UP
POWER SO 36	16x11,1x3.3	600	310	1925	
POWER SO 36	16x11,1x3.3	600	310	1925	SLUG UP
POWER SO 36	16x11,1x3.3	600	310	1925	Multichip SLUG UP
POWER SO 36	16x11,1x3.3	600	310	1925	Multichip

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**POWER SO PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	8.3	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Heat spreader	Cu alloy	52	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	38.4	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.70	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.20	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.03	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.37	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.37	Sn	7440-31-5	100	Lead-free available and RoHS compliant

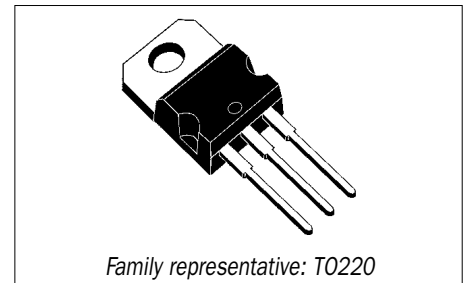
**TO 220 PACKAGE****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
TO 220	10.4x9.2x4.8	1000	1900	CB415 TRIACS
TO 220	10.4x9.2x4.8	1000	1900	20p MONO FULL NICKEL
TO220AB	10.4x9.2x4.8	1000	1900	3 LEADS TIN PLATING
TO 220 AB	10.4x9.2x4.8	1000	1900	NON ISOLATED
TO220AC	10.4x9.2x4.8	1000	1900	2 LEADS TIN PLATING
TO 220 BIC.	10.4x9.2x4.8	1000	1900	VERSAWATT
TO 220	10.4x9.2x4.8	1000	1900	FULL COPPER
TO 220	10.4x9.2x4.8	1000	1900	MONO ANTISTRESS
TO 220	10.4x9.2x4.8	1000	1900	MONO Ag SPOT ANTISTRE.
TO 220	10.4x9.2x4.8	1000	1900	MONO Ag SPOT V. REG.
TO 220	10.4x9.2x4.8	1000	1900	MONOC.
TO 220	10.4x9.2x4.8	1000	1900	Ni CLIP
TO 220	10.4x9.2x4.8	1000	1900	Ni CLIP NEW
TO 220	10.4x9.2x4.8	1000	1900	Ni-T

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05



**TO 220 PACKAGE**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	12.66	Cu	7440-50-8	99.75	
			Fe	7439-89-6	0.1	
			Ni	7440-02-0	0.15	
Heat spreader	Cu alloy	65.26	Cu	7440-50-8	99.75	
			Fe	7439-89-6	0.1	
			Ni	7440-02-0	0.15	
Encapsulation	Epoxy resin	21.3	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.25	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.08	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.03	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.42	Sn	7440-31-5	63	
			Pb	7439-92-1	37	
Leadfinishing	Tin	0.42	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

**MULTIWATT****PACKAGE WEIGHT LIST**

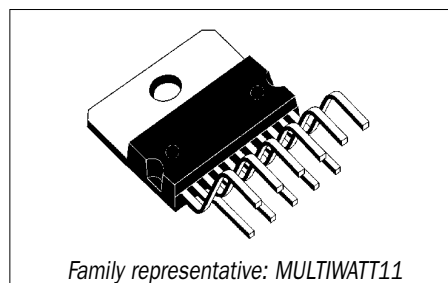
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
MULTIWATT 8	20.2x10.7x5.0	500	5500	FLOATING IN LINE
MULTIWATT 8	20.2x10.7x5.0	500	5500	ON LINE
MULTIWATT 11	20.2x10.7x5.0	500	5550	IN LINE
MULTIWATT 11	20.2x10.7x5.0	500	5550	SPLIT VERTICAL
MULTIWATT 15	20.2x10.7x5.0	500	5700	IN LINE
MULTIWATT 15	20.2x10.7x5.0	500	5700	SHORT LEADS
MULTIWATT 15	20.2x10.7x5.0	500	5700	SPLIT VERTICAL

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**MULTIWATT**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy + Ag	14	Cu	7440-50-8	99.6	
			Fe	7439-89-6	0.1	
			Ag	7440-22-4	0.3	
Heat spreader	Cu alloy + Ag	65	Cu	7440-50-8	99.6	
			Fe	7439-89-6	0.1	
			Ag	7440-22-4	0.3	
Encapsulation	Epoxy resin	20.2	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.25	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.08	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires (*)	Gold/Copper	0.03	Au	7440-57-5	100	
			Cu	7440-50-8	100	
Leadfinishing	Tin/Lead	0.44	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.44	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

(\*) Wires can be alternatively Copper or Gold



**PENTAWATT, HEPTAWATT****PACKAGE WEIGHT LIST**

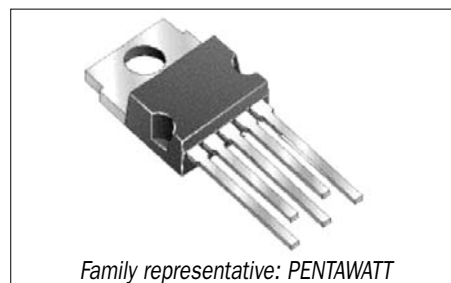
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
PENTAWATT	10.4x9.2x4.8	1000	1980	
PENTAWATT	10.4x9.2x4.8	1000	1980	HIGH VOL. IN LINE
PENTAWATT	10.4x9.2x4.8	1000	1980	HV2
HEPTAWATT	10.4X9.2X4.8	1000	2000	LEADS SPLIT VERTICAL
HEPTAWATT	10.4X9.2X4.8	350	2000	LEADS SMD
HEPTAWATT	10.4X9.2X4.8	1000	2000	LEADS SPLIT HORIZONTAL

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin / stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**PENTAWATT, HEPTAWATT**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	12.66	Cu Fe	7440-50-8 7439-89-6	99.9 0.1	
Heat spreader	Cu alloy	65.26	Cu Fe	7440-50-8 7439-89-6	99.9 0.1	
Encapsulation	Epoxy resin	21.3	SiO <sub>2</sub> Epoxy Sb <sub>2</sub> O <sub>3</sub> Br (TBBA)	60676-86-0 29690-82-2 1309-64-4 79-94-7	70 27 2 1	
Chip	Doped Silicon	0.25	Si Al	7440-21-3 7429-90-5	99.4 0.6	
Die bonding mater.	Soft Solder (·)	0.08	Pb Sn Ag	7439-92-1 7440-31-5 7440-22-4	93.5 5 1.5	
Wires	Gold (*)	0.03	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.42	Sn Pb	7440-31-5 7439-92-1	85 15	
Leadfinishing	Tin	0.42	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant

(·) For Heptawatt: Pb 97.5 Sn 1 Ag 1.5

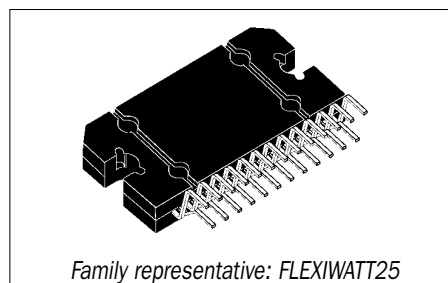
(\*) For Heptawatt: Cu

**FLEXIWATT****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
FLEXIWATT # 2 15	29x15.5x5.0	544	4900	FULL MOLD 2
FLEXIWATT 15	29x15.5x5.0	544	4900	SLIC
FLEXIWATT 21	29x15.5x5.0	544	6800	ZIP FORMING
FLEXIWATT 21	29x15.5x5.0	544	6800	FM2 FULL MOLD 2
FLEXIWATT 25	29x15.5x5.0	340	7300	Hrztl Bending FULL MOLD 2
FLEXIWATT 25	29x15.5x5.0	340	7300	FULL MOLD # 2
FLEXIWATT 27	29x15.5x5.0	340	7800	Hrztl Bending FULL MOLD 2
FLEXIWATT 27	29x15.5x5.0	340	7800	FM2 FULL MOLD 2

**SHIPPING MATERIALS****a) Tubes**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**FLEXIWATT**

**PRODUCT MATERIAL SHEET**

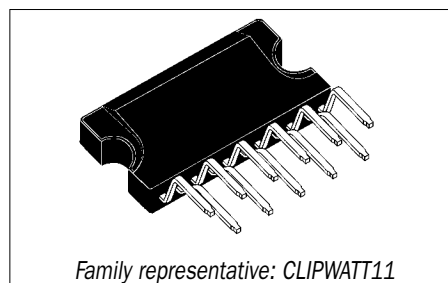
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	12.35	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Heat spreader	Cu alloy	54.16	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	32.40	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.48	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.15	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.11	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.35	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.35	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**CLIPWATT PACKAGES****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
Clipwatt 8	20x11x3.1	750	1700	
Clipwatt 11	20x11x3.1	750	1720	
Clipwatt 15	20x11x3.1	750	1800	
Clipwatt 19	20x11x3.1	750	2300	

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**CLIPWATT PACKAGES**

**PRODUCT MATERIAL SHEET**

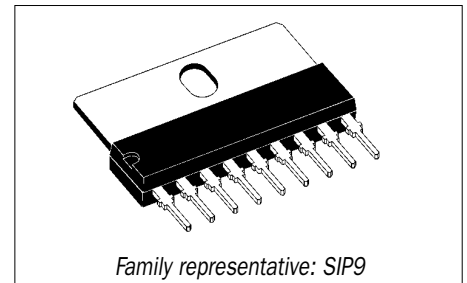
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	31.98	Cu	7440-50-8	99.8	
			Co	7440-48-4	0.2	
Heat spreader	Cu alloy	18.78	Cu	7440-50-8	99.8	
			Co	7440-48-4	0.2	
Encapsulation	Epoxy resin	47.21	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.78	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.25	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.05	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.95	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.95	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**SINGLE IN LINE PLASTIC PACKAGES****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
SIL 2	10.2x7.1x3.3	2000	485	
SIL 3	10.2x7.1x3.3	2000	500	
SIL 4	10.2x7.1x3.3	2000	520	
SIP 9	24.8x7.1x6.2	800	1870	
SIP 10	24.8x7.1x6.2	800	2020	

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**SINGLE IN LINE PLASTIC PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	17.92	Cu	7440-50-8	99.8	
			Co	7440-48-4	0.2	
Heat spreader	Cu alloy	41.39	Cu	7440-50-8	99.8	
			Co	7440-48-4	0.2	
Encapsulation	Epoxy resin	38.66	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.42	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft Solder	0.18	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.08	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	1.35	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	1.35	Sn	7440-31-5	100	Lead-free available and RoHS compliant



**PLASTIC LEADED CHIP CARRIER****PACKAGE WEIGHT LIST**

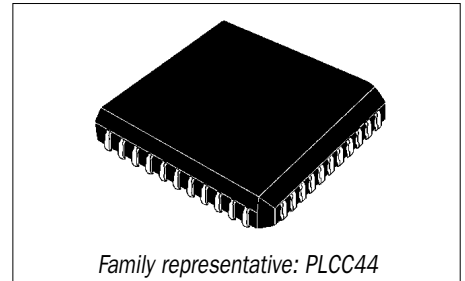
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk (tube) Qty</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
PLCC 20	8.9x8.9x3.8	2000	1000	700	
PLCC 28	11.5x11.5x3.8	1600	500	1170	
PLCC 32	14.1x11.6x2.8	750	750	1070	RECTANGULAR
PLCC 32	14.1x14.1x3.8	750	750	1700	
PLCC 44	16.6x16.6x3.8	725	500	2300	
PLCC 52	19.1x19.1x3.8	500	500	3200	
PLCC 68	24.2x24.2x3.8	400	250	4600	
PLCC 84	29.3x29.3x3.8	256	250	6600	

**SHIPPING MATERIALS****a) Tube**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Bag	Polyethylene	Recyclable, RESY PE-LD 04
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**PLASTIC LEADED CHIP CARRIER**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	32.1	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.4	
			P	7723-14-0	0.1	
Encapsulation	Epoxy resin	66.1	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	0.9	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.28	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.1	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.52	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.52	Sn	7440-31-5	100	Memories: Totally Lead-free and RoHS compliant Other products: by end Q304

**THIN QUAD FLAT PACKAGES****PACKAGE WEIGHT LIST**

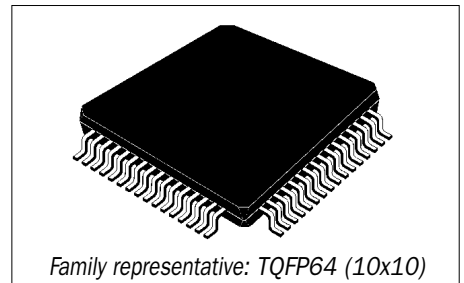
Package/Pin	Body size (mm)	Bulk Qty	Weight (mg)	Remark
TQFP 32	5x5x1.0	2160	70	
TQFP 32	5x5x1.0	2160	70	Exp Pad Down
TQFP 32	7x7x1.0	1500	140	
TQFP 32	7x7x1.0	1500	140	Exp Pad Down
TQFP 44	10x10x1.0	960	260	Exp Pad Down
TQFP 44	10x10x1.0	960	260	
TQFP 48	7x7x1.0	1500	140	
TQFP 64	10x10x1.0	960	260	Exp Pad Down
TQFP 80	14x14x1.0	960	420	
TQFP 100	14x14x1.0	540	520	
TQFP 100	14x14x1.0	540	520	Exp Pad Down
TQFP 128	14x14x1.0	540	520	
TQFP 128	14x14x1.0	540	520	Exp Pad Down
TQFP 144	20x20x1.0	360	1120	Exp Pad Down
TQFP 176	20x20x1.0	360	1120	
TQFP 176	20x20x1.0	360	1120	Exp Pad Down

**SHIPPING MATERIALS****a) Tape&Reel**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**THIN QUAD FLAT PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	29.8	Cu	7440-50-8	98.5	
			Zn	7440-66-6	1.0	
			Fe	7439-89-6	0.5	
Encapsulation	Epoxy resin	59.1	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	4.1	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	1.2	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	3.2	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	2.6	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	2.6	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	NiPdAu	2.6	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

**LOW QUAD FLAT PACKAGES****PACKAGE WEIGHT LIST**

Package/Pin	Body size (mm)	Bulk Qty	Weight (mg)	Remark
LQFP 32	5x5x1.4	2160	92	
LQFP 32	7x7x1.4	1500	180	Exp Pad Down
LQFP 32	7x7x1.4	1500	180	
LQFP 44	10x10x1.4	960	350	
LQFP 44	10x10x1.4	960	350	Exp Pad Down
LQFP 44	14x14x1.4	540	650	
LQFP 48	7x7x1.4	1500	180	
LQFP 52	10x10x1.4	960	350	
LQFP 64	10x10x1.4	960	350	Exp Pad Down
LQFP 64	10x10x1.4	960	350	
LQFP 64	14x14x1.4	540	645	
LQFP 80	14x14x1.4	540	650	
LQFP 80	14x14x1.4	540	650	Exp Pad Down
LQFP 100	14x14x1.4	540	650	
LQFP 100	14x20x1.4	432	970	
LQFP 100	14x14x1.4	540	650	Exp Pad Down
LQFP 100	14x14x1.4	540	925	Slug Up
LQFP 128	14x14x1.4	540	520	
LQFP 128	14x20x1.4	432	970	Exp Pad Down
LQFP 128	14x20x1.4	432	970	
LQFP 144	20x20x1.4	360	1315	
LQFP 144	20x20x1.4	360	1315	Exp Pad Down
LQFP 176	24x24x1.4	400	1650	
LQFP 208	28x28x1.4	300	2240	
LQFP 208	28x28x1.4	300	2240	Exp Pad Down
LQFP 216	24x24x1.4	400	1650	

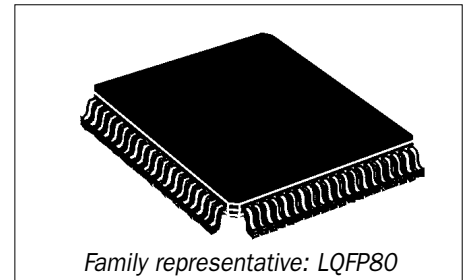
**SHIPPING MATERIALS****a) Tape&Reel**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

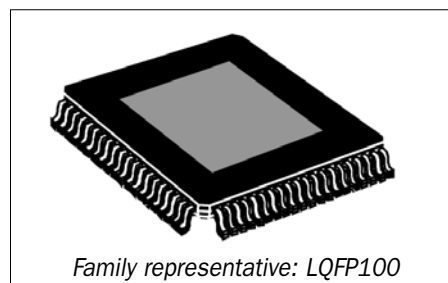
**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05



**LOW QUAD FLAT PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	29.8	Cu	7440-50-8	98.5	
			Zn	7440-66-6	1.0	
			Fe	7439-89-6	0.5	
Encapsulation	Epoxy resin	59.1	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	4.1	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	1.2	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	3.2	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	2.6	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	2.6	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	NiPdAu	2.6	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

**LOW QUAD FLAT PACKAGE 100 SLUG UP**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	5.94	Cu	7440-50-8	98.5	
			Zn	7440-66-6	1.0	
			Fe	7439-89-6	0.5	
Slug	Cu alloy	42.16	Cu	7440-50-8	98.5	
			Zn	7440-66-6	1.0	
			Fe	7439-89-6	0.5	
Encapsulation	Epoxy resin	40.6	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	4.1	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	1.2	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	3.2	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	2.8	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	2.8	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	NiPdAu	2.8	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

**PLASTIC QUAD FLAT PACKAGE****PACKAGE WEIGHT LIST**

Package/Pin	Body size (mm)	Bulk (Tray) Qty	Tape & Reel Qty	Weight (mg)	Remark
PQFP 32	7x7x1.5	960		180	
PQFP 44	10x10x2.0	576	750	470	
PQFP 44	14x14x2.7	504	500	1000	
PQFP 52	10x10x2.0	576	750	470	
PQFP 52	14x14x2.7	504	500	1000	
PQFP 64	10x10x2.0	576	750	470	
PQFP 64	14x14x2.0	504	500	1300	
PQFP 64	14x14x2.7	504	500	1130	
PQFP 80	14x14x2.0	504	500	1300	
PQFP 80	14x20x2.7	396	500	1600	
PQFP 100	14x14x2.0	504	500	1300	
PQFP 100	14x20x2.7	396	500	1600	
PQFP 100	14x20x2.7	396	500	1600	SLUG DOWN
PQFP 100	14x20x2.7	396	500	1600	SLUG UP
PQFP 120	28x28x3.4	240	200	5400	SLUG
PQFP 120	28x28x3.4	240	200	5400	
PQFP 120	28x28x3.4	240	200	5400	SPREADER
PQFP 128	14x20x2.7	396	500	1600	
PQFP 128	28x28x3.4	240	200	5400	INVERT.LF
PQFP 128	28x28x3.4	240	200	5400	SPREADER
PQFP 128	28x28x3.4	240	200	5400	SLUG DOWN
PQFP 128	28x28x3.4	240	200	5400	SLUG
PQFP 128	28x28x3.4	240	200	5400	
PQFP 144	28x28x3.4	240	200	5420	SLUG DOWN
PQFP 144	28x28x3.4	240	200	5420	SPREADER
PQFP 144	28x28x3.4	240	200	5420	SLUG
PQFP 144	28x28x3.4	240	200	5420	
PQFP 144	28x28x3.4	240	200	5420	SLUG UP
PQFP 160	28x28x3.4	240	200	5550	DIE DOWN
PQFP 160	28x28x3.4	240	200	5550	SLUG DOWN
PQFP 160	28x28x3.4	240	200	5550	
PQFP 160	28x28x3.4	240	200	5550	SPREADER
PQFP 160	28x28x3.4	240	200	5550	SLUG
PQFP 160	28x28x3.4	240	200	5550	SLUG UP
PQFP 208	28x28x3.4	240	200	5900	
PQFP 208	28x28x3.4	240	200	5900	SPREADER DOWN
PQFP 208	28x28x3.4	240	200	5900	DIE DOWN
PQFP 208	28x28x3.4	240	200	5900	SLUG DOWN
PQFP 208	28x28x3.4	240	200	5900	SLUG UP
PQFP 240	32x32x3.4	196	169	6200	
PQFP 256	32x32x3.4	240	200	6220	



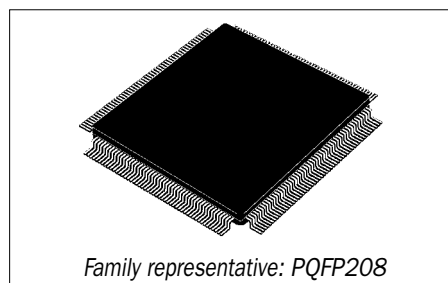


**PLASTIC QUAD FLAT PACKAGE****SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**PLASTIC QUAD FLAT PACKAGE**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	15.1	Cu	7440-50-8	98.5	
			Zn	7440-66-6	1.0	
			Fe	7439-89-6	0.5	
Encapsulation	Epoxy resin	82.5	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	1.1	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.32	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.42	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.56	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.56	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	NiPdAu	0.56	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

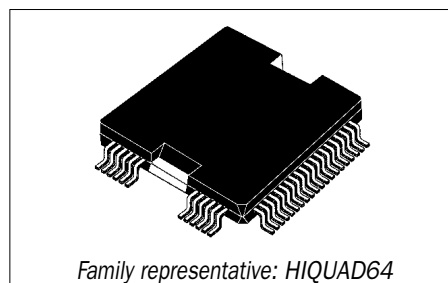
**HIGH QUAD PACKAGES****PACKAGE WEIGHT LIST**

<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
HI-QUAD 64	14x14	500	2140	POWER
HI-QUAD 92	14x92	200	3390	POWER

**SHIPPING MATERIALS****a) Tray**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

## HIGH QUAD PACKAGES



Family representative: HIQUAD64

### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	Compliance to RoHS
Leadframe	Cu alloy	5.1	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Heat spreader	Cu alloy	59.8	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	32.6	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped silicon	1.3	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Soft solder	0.5	Pb	7439-92-1	93.5	
			Sn	7440-31-5	5	
			Ag	7440-22-4	1.5	
Wires	Gold	0.25	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.45	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.45	Sn	7440-31-5	100	Lead-free available and RoHS compliant

**THIN SMALL OUTLINE PACKAGES****PACKAGE WEIGHT LIST**

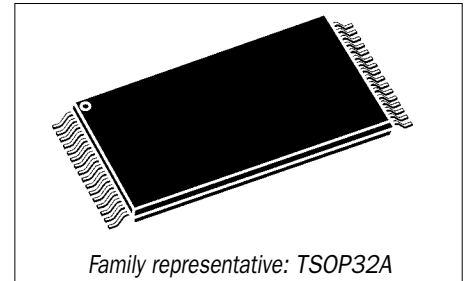
<b>Package/Pin</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
TSOP-1 28	8x13.4	2000	215	
TSOP-1 28	8x13.4	2000	215	Reverse
TSOP-1 32	8x20	1500	325	
TSOP-1 32	8x14	1500	325	Die-up
TSOP-1 40	10x14	1500	280	
TSOP-1 40	10x20	1500	400	
TSOP-1 48	12x20	1500	510	
TSOP-1 56	14x20	1200	590	

**SHIPPING MATERIALS****a) Tray**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**THIN SMALL OUTLINE PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	22.74	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	71.01	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	4.05	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.54	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.31	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	1.35	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	1.35	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	Tin/Bismuth	1.35	Sn	7440-31-5	97	Totally Lead-free available and RoHS compliant
			Bi	7440-69-9	3 (*)	

(\*) For some memorie products only.

**THIN SMALL OUTLINE PACKAGES - Frame Alloy 42****PACKAGE WEIGHT LIST**

Package/Pin	Body size (mm)	Tape & Reel Qty	Weight (mg)	Remark
TSOP-1 28	8x13.4	2000	215	
TSOP-1 32	8x20	1500	325	
TSOP-1 32	8x20	1500	325	Reverse
TSOP-1 40	10x20	1500	460	
TSOP-1 40	10x14	1500	280	
TSOP-1 44	10x18	1500	445	
TSOP-1 48	12x20	1500	510	Reverse
TSOP-1 48	12x20	1500	510	Reverse Mol.
TSOP-1 56	14x20	1200	590	

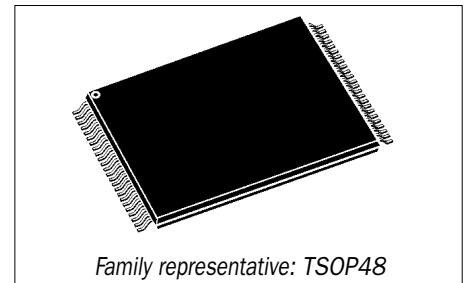
*TSOP48 and TSOP32 are epoxy resin brominated flame retardant free available.*

**SHIPPING MATERIALS****a) Tray**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**THIN SMALL OUTLINE PACKAGES - Frame Alloy 42**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Alloy 42	22.74	Fe	7439-89-6	58	
			Ni	7440-02-0	42	
Encapsulation	Epoxy resin	71.01	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	4.05	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.54	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.31	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	1.35	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	1.35	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	Tin/Bismuth	1.35	Sn	7440-31-5	97	Totally Lead-free available and RoHS compliant
			Bi	7440-69-9	3 (*)	

(\*) For some memorie products only.



**THIN SMALL SMALL OUTLINE PACKAGES****PACKAGE WEIGHT LIST**

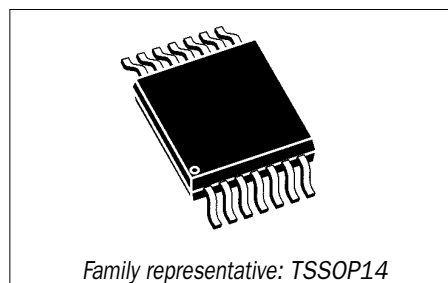
Package/Pin	Body size (mm)	Tape & reel Qty	Weight (mg)	Remark
TSSOP 8	3.0x2.9x1.2	4000	28	BODY 3.0 pitch 0.65 slim
TSSOP 8	4.4x2.9x1.2	4000	34	BODY 4.4 pitch 0.65
TSSOP 14	4.4x5.0x1.2	2500	54	BODY 4.4 pitch 0.65
TSSOP 16	4.4x5.0x1.2	2500	65	BODY 4.4 pitch 0.65
TSSOP 20	4.4x6.5x1.2	2500	72	BODY 4.4 pitch 0.65
TSSOP 24	4.4x7.8x1.2	2500	78	BODY 4.4 pitch 0.65
TSSOP 28	4.4x9.7x1.2	2500	84	BODY 4.4 pitch 0.65
TSSOP 28	6.1x9.7x1.2	2500	90	BODY 6.1 pitch 0.5
TSSOP 30	4.4x9.7x1.2	2500	88	BODY 4.4 pitch 0.5
TSSOP 38	4.4x9.7x1.2	2500	94	BODY 4.4 pitch 0.5
TSSOP 48	6.1x12.5x1.2	2000	102	BODY 6.1 pitch 0.5

**SHIPPING MATERIALS****a) Tube**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tube	Polyvinylchloride	Recyclable, RESY PVC 03
End pin/stopper	Polyvinylchloride	Recyclable, RESY PVC 03
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tape&Reel**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**THIN SMALL SMALL OUTLINE PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Leadframe	Cu alloy	32.5	Cu	7440-50-8	99.9	
			Fe	7439-89-6	0.1	
Encapsulation	Epoxy resin	60.7	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	3.9	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	1.2	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.9	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.8	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	NiPdAu	0.8	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

**LOW PROFILE BALL GRID ARRAY PACKAGES**

Thickness = 1.7 mm max, exceptions below reported

**PACKAGE WEIGHT LIST**

Package/Balls	Body size (mm)	Bulk Qty	Weight (mg)	Remark
LBGA 36	9x9	1560	191	
LBGA 48	10x12x1.35	1134	280	
LBGA 64	10x13x1.25	1104	281	
LBGA 64	9x9x1.5	1560	222	
LBGA 80	10x12	1134	325	
LBGA 132	15x15	720	604	
LBGA 144	13x13	960	466	
LBGA 156	15x15	720	611	
LBGA 160	15x15	720	612	
LBGA 168	23x23x1.96	360	1840	
LBGA 192	17x17x1.66	576	782	
LBGA 192	23x23	360	1387	
LBGA 196	15x15	720	622	
LBGA 208	17x17	576	787	
LBGA 256	17x17	576	801	
LBGA 288	23x23	360	1415	
LBGA 288	19x19	504	991	
LBGA 192+4	17x17	576	784	
LBGA 192+16	17x17	576	760	

**SHIPPING MATERIALS****a) Tray**

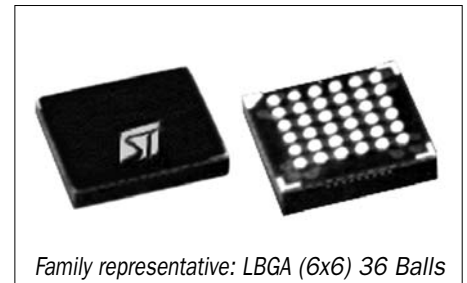
Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05



## LOW PROFILE BALL GRID ARRAY PACKAGES



### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Substrate	Glass epoxy	35.25	Bismaleimide Triazine	—	69	
			(Br) TBBA	79-94-7	1	
			Cu	7440-50-8	20	
			Resist	—	9	
			Ni	7440-02-0	0.8	
			Au	7440-57-5	0.2	
Encapsulation	Epoxy resin	42.65	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	5.90	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	2.05	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.95	Au	7440-57-5	100	
Balls	Tin/Lead	13.2	Sn	7440-31-5	63	
			Pb	7439-92-1	37	
Balls	SnAgCu	13.2	Sn	7440-31-5	95.5	Totally Lead-free available and RoHS compliant
			Ag	7440-22-4	4	
			Cu	7440-50-8	0.5	

The distribution of the Material Mass % can slightly change due to the different number of balls present also on the same size packages. Density of Lead/Tin ball composition Pb 37 Sn 63 is 8.2 mg/mm<sup>3</sup>. Density of SnAgCu ball composition 95.5/4/0.5 is 7.5 mg/mm<sup>3</sup>.

**THIN FINE PITCH BALL GRID ARRAY PACKAGES**

Thickness = 1.2 mm max

**PACKAGE WEIGHT LIST**

Package/Balls	Body size (mm)	Tape & Reel Qty	Weight (mg)	Remark
TFBGA 16	3x3	2500	21	
TFBGA 24	4x4	2500	36	
TFBGA 36	6x6	2500	76	
TFBGA 45	6.39x6.37	2500	88	
TFBGA 46	6.39x6.37	2500	88	
TFBGA 47	6.39x10.5	2500	137	
TFBGA 47	6.39x6.37	2500	89	
TFBGA 48	7x8MM 0.75 pitch	2500	117	
TFBGA 48	5x5	2500	59	
TFBGA 48	6.39x10.5	2500	138	
TFBGA 48	6.5x10	2500	133	
TFBGA 48	6x11	2500	135	
TFBGA 48	6x7	2500	91	
TFBGA 48	6x8 0.75 pitch	2500	102	
TFBGA 48	6x8 0.80 pitch	2500	102	
TFBGA 48	6x9	2500	113	
TFBGA 48	7x12	2500	168	
TFBGA 48	7x7	2500	104	
TFBGA 48	7x8	2500	117	
TFBGA 48	8x10	2500	161	
TFBGA 48	8x9	2500	146	
TFBGA 54	5.5x8.0	2500	100	
TFBGA 56	6x6	2400	82	
TFBGA 56	6.5x10	2500	135	
TFBGA 56	7.7x9	2500	143	
TFBGA 56	8x8	2500	148	
TFBGA 63	7x11	2500	160	
TFBGA 64	10x13	2500	258	
TFBGA 64	5x5	2500	64	
TFBGA 64	8x8	2500	136	

**THIN FINE PITCH BALL GRID ARRAY PACKAGES**

<b>Package/Balls</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
TFBGA 67	12x8	1500	196	
TFBGA 80	10x13	2500	262	
TFBGA 80	8x8	2500	140	
TFBGA 81	8x8	2500	141	
TFBGA 84	7x7	2500	114	
TFBGA 84	6x6	2400	90	
TFBGA 88	6x6	2400	91	
TFBGA 89	6x6	2400	91	
TFBGA 92	7x7	2500	116	
TFBGA 100	10x10x1.4	1500	253	
TFBGA 100	7x7	2500	118	
TFBGA 108	7x7	2500	121	
TFBGA 108	8x8	2500	148	
TFBGA 120	8x8	2500	152	
TFBGA 121	10x10	1500	218	
TFBGA 121 Stacked	10x10x1.26	1500	237	
TFBGA 132	8x8	2500	155	
TFBGA 168	12x12	1800	313	
TFBGA 180	10x10	1500	235	
TFBGA 196	15x15	1200	470	
TFBGA 196	8x8	2500	173	
TFBGA 208	15x15	1200	474	
TFBGA 224	12x12	1800	329	
TFBGA 228	12x12	1800	330	
TFBGA 233	15x15	1200	481	
TFBGA 240	15x15	1200	483	
TFBGA 244	10x10	1500	253	
TFBGA 288	12x12	1800	347	
TFBGA 336	13x13	1200	407	
TFBGA 108+36	7x7	2500	131	
TFBGA 132+36	8x8	2500	166	



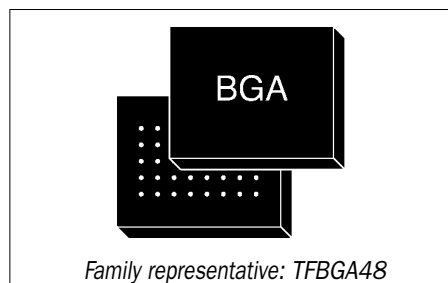
**THIN FINE PITCH BALL GRID ARRAY PACKAGES****SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

## THIN FINE PITCH BALL GRID ARRAY PACKAGES



### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Substrate	glass epoxy	35.25	Bismaleimide Triazine	—	69	
			(Br) TBBA	79-94-7	1	
			Cu	7440-50-8	20	
			Resist	—	9	
			Ni	7440-02-0	0.8	
			Au	7440-57-5	0.2	
Encapsulation	Epoxy resin	42.65	SiO2	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb2O3	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	5.90	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	2.05	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.95	Au	7440-57-5	100	
Balls	Tin/Lead	13.2	Sn	7440-31-5	63	
			Pb	7439-92-1	37	
Balls	SnAgCu	13.2	Sn	7440-31-5	95.5	Totally Lead-free available and RoHS compliant
			Ag	7440-22-4	4	
			Cu	7440-50-8	0.5	

The distribution of the Material Mass % can slightly change due to the different number of balls present also on the same size packages. Density of Lead/Tin ball composition Pb 37 Sn 63 is 8.2 mg/mm<sup>3</sup>. Density of SnAgCu ball composition 95.5/4/0.5 is 7.5 mg/mm<sup>3</sup>.



**LOW PROFILE FINE PITCH BALL GRID ARRAY PACKAGES**

Thickness = 1.7 mm max, exceptions below reported. Pitch 0.5 to 0.8 mm

**PACKAGE WEIGHT LIST**

<b>Package/Balls</b>	<b>Body size (mm)</b>	<b>Bulk (Tray) Qty</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
LFBGA 24	4x4	3840	2400	57	
LFBGA 36	6x6	2574	2400	123	
LFBGA 40	7x8MM pitch 0.5	2496	2500	187	
LFBGA 56	7x12x1.4	1104	2500	280	
LFBGA 64	10x8x1.4	1104	2500	270	
LFBGA 64	8x8	2088	2500	205	
LFBGA 66	12x8x1.4	1134	1500	321	
LFBGA 67	12x8x1.4	1134	1500	321	
LFBGA 72	12x8x1.4	1134	1500	322	
LFBGA 80	8x8	2088	2500	224	
LFBGA 88	8x10x1.4	1104	2500	277	
LFBGA 96	8x14x1.4	1104	1500	380	
LFBGA 96	13.5x5.5x1.6	960	1500	294	
LFBGA 100	10x10	1104	1500	343	
LFBGA 120	10x10	1104	1500	349	
LFBGA 121	15x15	960	1200	743	
LFBGA 132	12x12	1134	1800	491	
LFBGA 144	10x10	1104	1500	355	
LFBGA 144	11x11	1104	1200	422	
LFBGA 144	12x12	1134	1800	494	
LFBGA 160	12x12	1134	1800	499	
LFBGA 168	12x12x1.4	1134	1800	501	
LFBGA 180	12x12	1134	1800	504	
LFBGA 196	12x12	1134	1800	509	
LFBGA 217	15x15x1.5	960	1200	821	
LFBGA 240	15x15	960	1200	777	
LFBGA 289	15x15	960	1200	791	
LFBGA 64+16	9x9	1560	1750	277	
LFBGA 72+25	10x10	1104	1500	342	
LFBGA 90+20+20	12x16	960	1000	263	
LFBGA 120+24	8x12	1134	1500	343	
LFBGA 152+16	12x12	1134	1800	501	
LFBGA 312+25	17x17	504	1000	1006	

**LOW PROFILE FINE PITCH BALL GRID ARRAY PACKAGES****SHIPPING MATERIALS****a) Tape&Reel**

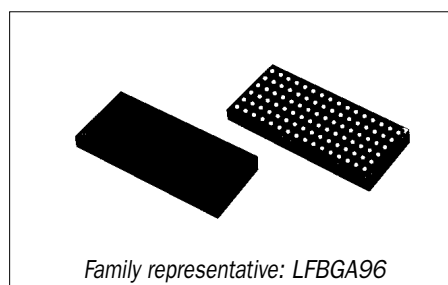
<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05



## LOW PROFILE FINE PITCH BALL GRID ARRAY PACKAGES



### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Substrate	Glass epoxy	35.25	Bismaleimide Triazine	—	69	
			(Br) TBBA	79-94-7	1	
			Cu	7440-50-8	20	
			Resist	—	9	
			Ni	7440-02-0	0.8	
			Au	7440-57-5	0.2	
Encapsulation	Epoxy resin	42.65	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	5.90	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	2.05	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.95	Au	7440-57-5	100	
Balls	Tin/Lead	13.2	Sn	7440-31-5	63	
			Pb	7439-92-1	37	
Balls	SnAgCu	13.2	Sn	7440-31-5	95.5	Totally Lead-free available and RoHS compliant
			Ag	7440-22-4	4	
			Cu	7440-50-8	0.5	

The distribution of the Material Mass % can slightly change due to the different number of balls present also on the same size packages. Density of Lead/Tin ball composition Pb 37 Sn 63 is 8.2 mg/mm<sup>3</sup>. Density of SnAgCu ball composition 95.5/4/0.5 is 7.5 mg/mm<sup>3</sup>.

**PLASTIC BALL GRID ARRAY PACKAGES**

Thickness = higher than 1.7 mm

**PACKAGE WEIGHT LIST**

Package/Balls	Body size (mm)	Tape & Reel Qty	Bulk (Tray) Qty	Weight (mg)	Remark
PBGA 144	13x13x1.75	1200	960	466	
PBGA 156	15x15x1.56	1200	504	611	
PBGA 177	23x23x1.96	350	360	1598	
PBGA 192	23x23x2.13	350	360	1906	
PBGA 208	17x17x1.96	1000	504	980	
PBGA 217	23x23x1.96	350	360	1637	
PBGA 220	17x17x1.96	1000	504	991	
PBGA 225	27x27x2.36	500	400	2589	
PBGA 233	23x23x1.96	350	360	1652	
PBGA 256	27x27x2.36	500	400	2620	
PBGA 276	27x27x2.36	500	400	2638	
PBGA 352	35x35x2.36	200	240	4800	
PBGA 364	27x27x2.36	500	400	2723	
PBGA 388	27x27x2.36	500	400	2723	
PBGA 396	35x35x2.36	200	240	4800	
PBGA 400	27x27x2.36	500	400	2757	
PBGA 416	27x27x2.36	500	400	2757	
PBGA 420	35x35x2.36	200	240	4800	
PBGA 484	23x23x2.06	350	360	1780	
PBGA 500	40x40x2.36	200	210	5690	
PBGA 596	40x40x2.36	200	210	5782	
PBGA 672	35x35x2.36	200	240	4928	
PBGA 729	35x35x2.36	200	240	4957	
PBGA 168+ 25	15x15x1.75	1200	504	630	
PBGA 256+ 16	27x27x2.36	500	400	2634	
PBGA 276+ 16	27x27x2.36	500	400	2654	
PBGA 284+ 16	27x27x2.36	500	400	2661	
PBGA 300+ 16	27x27x2.36	500	400	2677	
PBGA 300+ 36	27x27x2.36	500	400	2696	
PBGA 336+ 36	27x27x2.36	500	400	2731	
PBGA 352+ 36	35x35x2.36	200	240	4783	
PBGA 420+ +36	35x35x2.36	200	240	4817	
PBGA 532+36	35x35x2.36	200	240	4873	
PBGA 580+100	35x35x2.36	200	240	4931	
PBGA 708+84	35x35x2.36	200	240	4988	

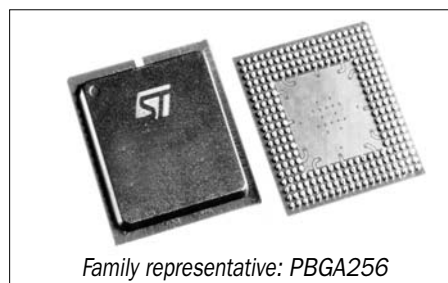
**PLASTIC BALL GRID ARRAY PACKAGES****SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**b) Tray**

Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Tray	Carbon fibre MPSU	Recyclable
Strap	Polypropylene	Recyclable, RESY PP 05
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

## PLASTIC BALL GRID ARRAY PACKAGES



### PRODUCT MATERIAL SHEET

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Substrate	Glass epoxy	29	Bismaleimide Triazine	—	69	
			(Br) TBBA	79-94-7	1	
			Cu	7440-50-8	20	
			Resist	—	9	
			Ni	7440-02-0	0.8	
			Au	7440-57-5	0.2	
Encapsulation	Epoxy resin	51.53	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Chip	Doped Silicon	2.68	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	0.80	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.99	Au	7440-57-5	100	
Balls	Tin/Lead	15	Sn	7440-31-5	63	
			Pb	7439-92-1	37	
Balls	SnAgCu	15	Sn	7440-31-5	95.5	Totally Lead-free available and RoHS compliant
			Ag	7440-22-4	4	
			Cu	7440-50-8	0.5	

The distribution of the Material Mass % can slightly change due to the different number of balls present also on the same size packages. Density of Lead/Tin ball composition Pb 37 Sn 63 is 8.2 mg/mm<sup>3</sup>. Density of SnAgCu ball composition 95.5/4/0.5 is 7.5 mg/mm<sup>3</sup>.

**VERY-THIN-PROFILE FINE PITCH BALL GRID ARRAY PACKAGES**

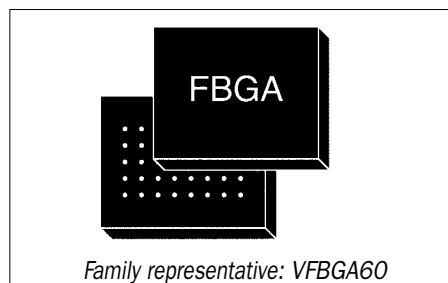
Thickness = 1. mm max

**PACKAGE WEIGHT LIST**

<b>Package/Balls</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
VFBGA 44	7.7x9.0	2500	108	
VFBGA 44	8.0x9.0	2500	112	
VFBGA 46	6.39x6.37	2500	66	
VFBGA 47	6.39x6.37	2500	66	
VFBGA 47	6.39x10.5	2500	105	
VFBGA 48	10.5x6.7	2500	106	
VFBGA 56	7.7x9.0	2500	109	
VFBGA 60	12.5x12	1800	229	

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**VERY-THIN-PROFILE FINE PITCH BALL GRID ARRAY PACKAGES**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Substrate	Glass epoxy	42.45	Bismaleimide Triazine (Br) TBBA	— 79-94-7	69 1	
			Cu	7440-50-8	20	
			Resist	—	9	
			Ni	7440-02-0	0.8	
			Au	7440-57-5	0.2	
			Encapsulation	Epoxy resin	37.50	
		Epoxy	29690-82-2	27		
		Sb2O3	1309-64-4	2		
		Br (TBBA)	79-94-7	1		
Chip	Doped Silicon	3.95	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	1.80	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.90	Au	7440-57-5	100	
Balls	Tin/Lead	13.40	Sn	7440-31-5	63	
			Pb	7439-92-1	37	
Balls	SnAgCu	13.40	Sn	7440-31-5	95.5	Totally Lead-free available and RoHS compliant
			Ag	7440-22-4	4	
			Cu	7440-50-8	0.5	

The distribution of the Material Mass % can slightly change due to the different number of balls present also on the same size packages. Density of Lead/Tin ball composition Pb 37 Sn 63 is 8.2 mg/mm<sup>3</sup>. Density of SnAgCu ball composition 95.5/4/0.5 is 7.5 mg/mm<sup>3</sup>.



**VERY THIN FINE PITCH QUAD FLAT PACKAGE NO LEAD**

Very thin = 1.00 max

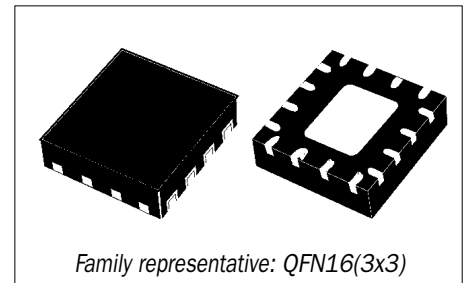
**PACKAGE WEIGHT LIST**

Package	Body size (mm)	Bulk Qty	Weight (mg)	Remark
VFQFPN 14	14x8	1500	312	14x8
VFQFPN 14	16x8	1500	357	16x8
VFQFPN 14	5x5	3000	69	5x5
VFQFPN 16	3x3	3000	25	pitch 0.50
VFQFPN 16	4x4	4000	44	pitch 0.65
VFQFPN 20	4x4	4000	44	pitch 0.50
VFQFPN 24	4x4	4000	40.443	4x4
VFQFPN 24	4x4	4000	44	pin 1 orientation
VFQFPN 28	5x5	3000	69	pitch 0.50
VFQFPN	2x2	4000	11	3l
VFQFPN	2x2x0.9	4000	11	8 leads
VFQFPN 32	5x5	3000	69	pitch 0.5
VFQFPN 36	6x6	3000	97	pitch 0.50
VFQFPN	3x3x0.9	3000	25	16 leads
VFQFPN	3x3x1.08	3000	25	pitch 0.50
VFQFPN	3x3x1.0 8	3000	25	pitch 0.50
VFQFPN 44	7x7	2500	136	pitch 0,5
VFQFPN 5	2x1	4000	5	2x1
VFQFPN 52	8x8	2500	188	pitch 0.50
VFQFPN	5x5x0.9	3000	69	5l small pad
VFQFPN 6	2x2	3000	11	
VFQFPN 6	2x2	3000	11	col
VFQFPN 68	10x10	1500	280	pitch 0.50
VFQFPN	7x7x1.0 48	2500	136	pitch 0.5
VFQFPN 8	2x3	3000	16	pitch 0.5
VFQFPN 8	3x3	3000	25	col
VFQFPN 8	6x5	3000	83	pitch 1.27
VFQFPN	4x3	4000	33	Dual 12l
VFQFPN	14.5x5	2000	69	Power flat
VFQFPN	3x3x0.9	3000	25	Power flat
VFQFPN	6x5	3000	83	Power flat
VFQFPN2	10x10x1.0 68	1500	280	pitch 0.50
VFQFPN2	4x4x1.0 20	3000	44	pitch 0.50
VFQFPN2	6x6x1.0 36	3000	97	pitch 0.50

**SHIPPING MATERIALS****a) Tape&Reel**

Composition Part	Material Name	Main features
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05



**VERY THIN FINE PITCH QUAD FLAT PACKAGE NO LEAD**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Encapsulation	Epoxy resin (*)	37.68	SiO <sub>2</sub>	60676-86-0	70	
			Epoxy	29690-82-2	27	
			Sb <sub>2</sub> O <sub>3</sub>	1309-64-4	2	
			Br (TBBA)	79-94-7	1	
Frame	Cu alloy	52.81	Cu	7440-50-8	97.5	
			Fe	7439-89-6	2.35	
			P	7723-14-0	0.03	
			Zn	7440-66-6	0.12	
Frame plating	Silver	1.08	Ag	7440-22-4	100	
Chip	Doped Silicon	5.30	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding mater.	Glue	1.68	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.96	Au	7440-57-5	100	
Leadfinishing	Tin/Lead	0.49	Sn	7440-31-5	85	
			Pb	7439-92-1	15	
Leadfinishing	Tin	0.49	Sn	7440-31-5	100	Totally Lead-free available and RoHS compliant
Leadfinishing	NiPdAu	0.49	Ni	7440-02-0	92.88	Totally Lead-free available and RoHS compliant
			Pd	7440-05-3	5.74	
			Au	7440-57-5	1.38	

(\*) VFQFPN can be encapsulated with green epoxy resin (no TBBA / Sb<sub>2</sub>O<sub>3</sub>).

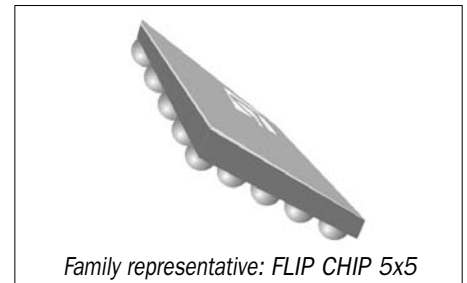
In this case epoxy resin composition will around move to SiO<sub>2</sub> = 90% Epoxy = 10%

**FLIP-CHIP CSP****PACKAGE WEIGHT LIST**

<b>Package/Bumps</b>	<b>Body size (mm)</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
Flip-chip 5	1.3x1.3x0.65	5000	3.31	
Flip-chip 6	1.6x1.1x0.65	5000	3.55	
Flip-chip 8	1.3x2.0x0.65	5000	5.16	
Flip-chip 8	1.6x1.6x0.65	5000	5.09	
Flip-chip 10	1.65x2.0x0.65	5000	6.52	
Flip-chip 11	1.6x2.1x0.65	5000	6.74	
Flip-chip 16	2.2x2.2x0.65	5000	9.73	
Flip-chip 20	2.6x2.1x0.65	5000	8.75	
Flip-chip 24	2.6x2.6x0.65	5000	13.8	
Flip-chip 25	2.67x2.67x0.65	5000	14.53	

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Carrier tape	Polystyrene carbon loaded or polycarbonate	Recyclable, RESY PS 06
Cover tape	Unsaturated polyester resin (UP)	Recyclable
Labels	paper	Recyclable, biodegradable
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**FLIP-CHIP CSP**

**PRODUCT MATERIAL SHEET**

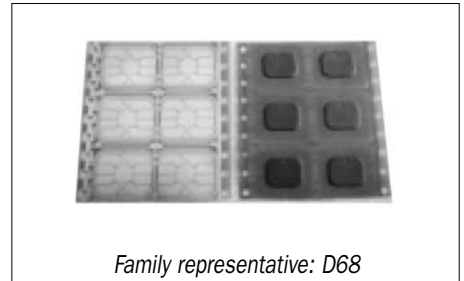
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Silicon	Doped silicon	73.87	Si	7440-21-3	73.87	
Isolation layer and passivation	Silicon oxide	0.36	SiO <sub>2</sub>	60676-86-0	0.36	
Metallization	Aluminium	0.27	Al	7429-90-5	24.35	
	Titanium		Ti	7440-32-8	10.45	
	Nickel		Ni	7440-02-0	20.90	
	Copper		Cu	7440-50-8	31.72	
	Gold		Au	7440-57-5	12.58	
Bumps	Tin	25.50	Sn	7440-31-5	95.5	
	Silver		Ag	7440-22-4	4	
	Copper		Cu	7440-50-8	0.5	
						Totally Lead-free available and RoHS compliant

**MICROMODULE (POTTING OR MOLDING PROCESS)****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (g)</b>	<b>Remark</b>
MICROMODULE Std35	Diam 7.3 x 0.6	N/A	10000	29	Standard 35mm
MICROMODULE D10	Diam 7 x 0.6	N/A	10000	29	Super35 – 8 contacts
MICROMODULE D15	Diam 7 x 0.6	N/A	15000	15	Super35 - 6 contacts
MICROMODULE D5	7 x 8.1 x 0.6	N/A	10000	30	Super35 - Dual 8 contacts
MICROMODULE D68	7.3 x 8.4 x 0.6	N/A	10000	29	Super35
MICROMODULE D7	7 x 8.1 x 0.6	N/A	10000	30	Super35 - Dual 6 contacts
MICROMODULE D8	8.6 x 8.4 x 0.6	N/A	10000	30	Super35
MICROMODULE C7	8.5 x 7.6 x 0.4	N/A	10000	28	Super35 - Contactless

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Interleaf	Unsaturated polyester resin (UP)	Recyclable
Labels	Paper	Recyclable, biodegradable
Bag	Polyethylene	Recyclable, RESY PE-LD 04
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**MICROMODULE (POTTING OR MOLDING PROCESS)**

**PRODUCT MATERIAL SHEET**

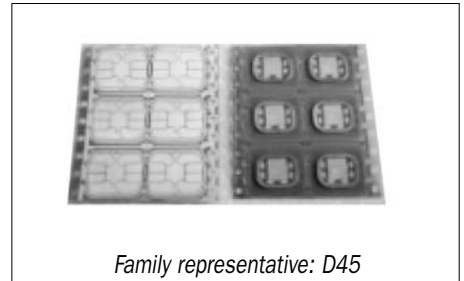
Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Substrate	Tape	85.73	Epoxy Glass tape	25068-38-6 28064-14-4	94.5	
			Adhesive	25036-25-3	1	
			Copper	7440-50-8	2.5	
			Nickel	7440-02-0	1	
			Gold	7440-57-5	1	
Encapsulation	Epoxy resin	9.6	SiO2	675-54-3	70	
			Epoxy	108-32-7	30	
Chip	Doped Silicon	4.12	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material.	Glue	0.52	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.03	Au	7440-57-5	100	
						Totally Lead-free and RoHS compliant

**MICROMODULE WITH METAL RING****PACKAGE WEIGHT LIST**

<b>Package</b>	<b>Body size (mm)</b>	<b>Bulk Qty</b>	<b>Tape &amp; Reel Qty</b>	<b>Weight (mg)</b>	<b>Remark</b>
MICROMODULE D35	7 x 7 x 0.6	N/A	10000	34	Super35
MICROMODULE D45	8.4 x 9.8 x 0.6	N/A	10000	38	Super35

**SHIPPING MATERIALS****a) Tape&Reel**

<b>Composition Part</b>	<b>Material Name</b>	<b>Main features</b>
Inner Box	Cardboard, carbon coated	Recyclable, biodegradable
Reel	Polystyrene	Recyclable, RESY PS 06
Interleaf	Unsaturated polyester resin (UP)	Recyclable
Labels	Paper	Recyclable, biodegradable
Bag	Polyethylene	Recyclable, RESY PE-LD 04
Seal	Polypropylene with acrylate	Recyclable, RESY PP 05

**MICROMODULE WITH METAL RING**

**PRODUCT MATERIAL SHEET**

Composition part	Material name	Material mass (%)	Element name composition	CAS No	Element name (average by weight-%)	RoHS/Lead Status
Substrate	Tape	73.54	Epoxy Glass tape	25068-38-6 28064-14-4	94.5	
			Adhesive	25036-25-3	1	
			Copper	7440-50-8	2.5	
			Nickel	7440-02-0	1	
			Gold	7440-57-5	1	
Encapsulation	Epoxy resin	4.71	SiO <sub>2</sub>	675-54-3	70	
			Epoxy	108-32-7	30	
Chip	Doped Silicon	2.41	Si	7440-21-3	99.4	
			Al	7429-90-5	0.6	
Die bonding material.	Glue	0.35	Ag	7440-22-4	75	
			Epoxy resin	29690-82-2	25	
Wires	Gold	0.03	Au	7440-57-5	100	
Ring	Ring	18.77	Brass (CuSn6)		100	
Ring attach material	Glue	0.19	Epoxy	225-716-2 249-204-3	100	

Totally Lead-free  
and  
RoHS compliant