

Texas Instruments Lead (Pb)-Free Program. Committed to Achieving Lead-Free and RoHS Compatibility.

Texas Instruments (TI) is an industry leader in the movement to Lead (Pb)-Free. TI defines "Lead (Pb)-Free" or "Pb-Free" to mean semiconductor products that are compatible with the current RoHS requirements for all six substances, including the requirements that lead not exceed 0.1% by weight in homogeneous material. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

On January 27, 2003, the European Union passed the "Restriction on Use of Hazardous Substances in Electrical and Electronic Equipment," or "RoHS" legislation 2002/95/EC, which becomes effective July 1, 2006. TI recognizes that customers require early availability of Pb-Free products and TI has set an aggressive schedule for Pb-Free conversion in response to customer's needs, targeting to have the majority of TI products available Pb-Free by the end of 2004.

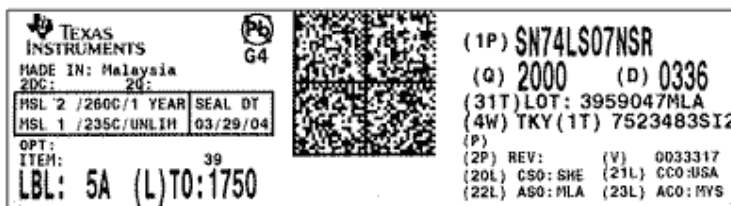
Lead-Free Conversion Overview

TI is well on its way to full RoHS compatibility. Small amounts of lead have been commonly used in integrated circuits for many years. During the late 1980s, TI began an initiative to convert its products to lead-free alternatives.

Today, TI's integrated circuits meet the proposed RoHS thresholds for cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs). Most of our integrated circuits also meet the proposed thresholds for lead, with the remaining devices on a near-term schedule for qualification and availability. This status is based on TI's current understanding of RoHS and TI's knowledge of the materials that go into its products.

Lead (Pb)-Free Logo

After June 1, 2004, TI will begin shipping Pb-Free capable integrated circuit (IC) components using packing labels that align with Joint Electronic Device Engineering Council (JEDEC) standards. TI began using a Pb-Free logo on packing labels in 2003 for devices that utilize both a Pb-Free finish and a material set rated for use in lead-free reflow processes. TI's new JEDEC-compliant label will continue to reflect these markings for applicable devices.



Example of TI's JEDEC-compliant packaging label with the Lead (Pb)-Free logo and MSL rating.

Devices marked with a Pb-Free logo are compatible with the proposed RoHS thresholds for all substances, including lead (Pb).

The table below reflects a substance list with corresponding information about TI's RoHS compatibility status.

RoHS Substance List and TI Status

Substance	Threshold	Status of TI's Integrated Circuits	Documents
Lead	0.1% per weight	Majority are compatible, check product content by device name	Joint EIA/EICTA/JGPSSI Industry Material Composition Declaration Guide European Commission proposed amendment to RoHS issued December 2003; 1000 ppm homogeneous material threshold.
Cadmium	75ppm* 100ppm*	Compatible	Joint EIA/EICTA/JGPSSI Industry Material Composition Declaration Guide: threshold = 75ppm* European Commission proposed amendment to RoHS issued December 2003; 100 ppm homogeneous material threshold.
Mercury	0.1% per weight	Compatible	Joint EIA/EICTA/JGPSSI Industry Material Composition Declaration Guide European Commission proposed amendment to RoHS issued December 2003; 1000 ppm homogeneous material threshold.
Hexavalent Chromium	0.1% per weight	Compatible	Joint EIA/EICTA/JGPSSI Industry Material Composition Declaration Guide European Commission proposed amendment to RoHS issued December 2003; 1000 ppm homogeneous material threshold.
Polybrominated biphenyls (PBB)	0.1% per weight	Compatible	Joint EIA/EICTA/JGPSSI Industry Material Composition Declaration Guide European Commission proposed amendment to RoHS issued December 2003; 1000 ppm homogeneous material threshold.
Polybrominated diphenyl ethers (PBDE)	0.1% per weight	Compatible	Joint EIA/EICTA/JGPSSI Industry Material Composition Declaration Guide European Commission proposed amendment to RoHS issued December 2003; 1000 ppm homogeneous material threshold.

* Current documents conflict on threshold allowable. TI is compatible with the lower threshold.

In addition to the RoHS substances, TI is addressing additional substances of concern through our "Green" mold compound initiative. TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material).

Today, Br and Sb are key components of the flame retardant systems in most IC molding compounds used by the Semiconductor industry, including TI. In response to environmental concerns, most mold compound suppliers began formulating mold compounds with alternative flame retardant systems several years ago.

TI does not supply IC component that uses a mold compound containing inorganic (red) phosphorous as an alternative flame retardant system. The company is currently working with strategic mold compound suppliers to develop Green mold compounds with industry accepted flame retardant systems. TI plans to introduce these new materials beginning in 2004.

Should you have further questions about this program, please contact your local TI Representative.

Eco-Info & Lead (Pb)-Free: Texas Instruments Lead (Pb)-Free/Green Package Roadmap

Package Type	Lead (Pb)-Free Finish + 260C			+ Green Mold Compound	
	Terminal Finish	PCN Date Range	Conversion Period	PCN Date Range	Conversion Period
MicroStar BGA (0.8mm pitch)	SnAgCu ¹	No PCN issued ^{2,4}	3Q 2000 - 2Q 2003 ²	1Q 2004 - 2Q 2004	3Q 2003 - 4Q 2004 ²
MicroStar BGA (< 0.8mm pitch)	SnAgCu ¹	No PCN issued ^{2,4}	3Q 2002 - 2Q 2003 ²	1Q 2004 - 2Q 2004	3Q 2003 - 4Q 2003 ²
MicroStar Jr	SnAgCu ¹	No PCN issued ^{2,4}	3Q 2002 - 2Q 2003 ²	No PCN issued ^{2,4}	2Q 2004 - 4Q 2004 ²
PBGA	SnAgCu	No PCN issued ^{2,4}	2Q 2004 - 4Q 2004 ²	TBD	TBD
SOIC / SOP / SSOP	NiPdAu	4Q 2002 - 2Q 2004 ³	1Q 2003 - 1Q 2005	1Q 2004 - 2Q 2004	2Q 2004 - 1Q 2005
TSSOP / TVSOP	NiPdAu	1Q 2004 - 2Q 2004	2Q 2004 - 1Q 2005	1Q 2004 - 2Q 2004	2Q 2004 - 1Q 2005
SC70 / SOT23	NiPdAu	2Q 2003 - 2Q 2004	3Q 2003 - 1Q 2005	2Q 2003 - 2Q 2004	3Q 2003 - 1Q 2005
SOT223 / TSOT	NiPdAu	1Q 2004	1Q 2004 - 1Q 2005	1Q 2004	1Q 2004 - 1Q 2005

PowerPAD	NiPdAu	4Q 2003 ⁴	2Q 2004 - 1Q 2005 ⁴	4Q 2003 ⁴	2Q 2004 - 1Q 2005 ⁴
SIP	Matte Sn	1Q 2004	2Q 2004	1Q 2004	2Q 2004
MSOP	NiPdAu	1Q 2004 - 2Q 2004	2Q 2004 - 4Q 2004	1Q 2004 - 2Q 2004	2Q 2004 - 4Q 2004
PLCC	Matte Sn	1Q 2004 - 4Q 2004	2Q 2004 - 4Q 2004	TBD	TBD
QFN	NiPdAu	1Q 2004 - 2Q 2004	2Q 2004 - 4Q 2004	1Q 2004 - 2Q 2004	2Q 2004 - 4Q 2004
QSOP	NiPdAu	1Q 2004	2Q 2004	1Q 2004	2Q 2004
TO-220	Matte Sn	1Q 2004	2Q 2004 - 4Q 2004	1Q 2004 - 4Q 2004	2Q 2004 - 4Q 2004
TQFP / LQFP	NiPdAu	2Q 2004 - 4Q 2004	2Q 2004 - 1Q 2005	2Q 2004 - 4Q 2004	2Q 2004 - 1Q 2005

Please note that not all TI devices in a particular package style will be converted to the Lead (Pb)-Free finish or green material set at the timing indicated. Please contact the TI EZ Surveys team (ezsurveys@list.ti.com) for Pb-Free/Green availability of specific devices. Conversions are being managed by assembly site. Multiple PCNs are being issued by site.

Specific Notes:

1. Specific alloys for Pb-Free solder balls used can be provided upon request.
2. Pb-Free ball packages will be setup with new parts numbers, different from the part numbers for existing SnPb ball options. Most devices will be setup with the Pb-Free part number upon customer request.
3. Initial PCN indicated peak reflow rating of 250C (per J-STD-020B) but most devices in this category have been upgraded to 260C peak reflow.
4. Conversion to new material sets will be driven by customer demand.