

electrocube RoHS & Pb-Free STATUS

October 3, 2005 // May 12, 2006

From: Electrocube, Inc.

To: Our Valued Customers

Subject: RoHS / Lead-Free Status Update

Electrocube (including Seacor) "standard" series of Capacitors and RC Networks, are typically axial and radial wire-lead terminated components, having cylindrical or ovalized tape-wrapped and epoxy end-filled, or epoxy-filled rectangular plastic box package styles. Hermetic capacitor product, Series 524 have cylindrical metal cased component bodies and axial lead-wires. Electrocube "standard" series RC Network RG1780 – RG1784 are radial wire-lead terminated components having epoxy-filled plastic box package styles. Electrocube "standard" series RC Network RG2675 – RG2678 are radial wire-lead terminated components having epoxy-dipped package styles. These products are typically applicable to plated-through-hole installation on circuit boards, and are solder terminated manually, or by wave-solder machine process, or are manually solder terminated into wired assemblies.

Electrocube "standard" series of Capacitors and RC Networks, having more specialized packaging are as follows:

Capacitor product series 247, 248, 926, 970 and 971 are epoxy-filled rectangular plastic box style components, having flat tab style termination features in various configurations with through-holes for clearance of threaded hardware, or using industry standard spade style quick-connect terminations. These products are typically mechanically secured and terminated using threaded hardware or a mating wire termination (not soldered).

RC Network products are typically epoxy-filled rectangular plastic box style components, having multiple insulated stranded wire leads. These products are typically mechanically secured and manually solder or crimp terminated into wired assemblies.

RC Network product series RG2408/2409/2411 utilize specialized industry standard modular enclosures for large-scale industrial control applications. These products are mechanically secured and terminated (not soldered)

It is Electrocube's intention to supply our standard products in a configuration that meets the significant material content / environmental compliance requirements of our customers to the greatest extent able, and we support ecologically and morally responsible reduction in the use of hazardous substances.

The EU RoHS Directive 2002/95/EC, will impose restrictions on the content of specific brominated flame retardants, and "heavy metals" Mercury, Cadmium, Hexavalent Chromium and Lead to be considered acceptable in electrical and electronics products placed on the market in Europe effective July 1, 2006. Other "green" initiatives, are alternatively mandating development of "Pb-Free" (lead-free) products.

RoHS compliance includes requirements for lead-free content, however "industry" has separated the two requirements, with somewhat different definitions. For the purpose of this communication "RoHS compliant" shall be implied mean to "lead-free" as these have been dual / parallel goals, to be coincidentally achieved.

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Electrocube is pleased to announce achievement of RoHS and Lead-Free Compliance, effective for products manufactured as date code 0540 (YYWW) and subsequent, and applicable to the “standard” series of Electrocube (including Seacor) Capacitors and RC Networks (listed below), and conditionally applicable (with noted exceptions) to Electrocube “custom” build-to-specification products.

Applicable Standard / Catalog Series Products (all package styles):

230/231/232 Series Metallized Polyester Film Capacitors
247/248 Series Metallized Polyester Film Capacitors
250/251/252 Series Polyester Film & Foil Capacitors
650/652/653 Series Metallized Polycarbonate Film Capacitors
730 Series Combination Film Capacitors
931/932/935 Series Metallized Polypropylene Film Capacitors
945 Series Metallized Polypropylene Film Capacitors
950/951/952 Series Polypropylene Film & Foil Capacitors
970/971 Series Metallized Polypropylene Film Capacitors
RG1676 Series RC Networks
RG1780/1781/1782/1783/1784 Series RC Networks
RG1983/1986/1988/2030/2031 Series RC Networks
RG2377/2406 Series RC Networks
RG2561/2562/2563/2564 Series RC Networks
RG2571/2572/2573/2574 Series RC Networks
Seacor Film Capacitors (various dielectrics & styles)

The following standard product series are currently RoHS Compliant, but shall not be considered Lead-Free.

524 Series Hermetic Polyester / Kraft Film & Foil Capacitors

The following standard product series ARE NOT currently RoHS Compliant and Pb-Free, but may be provided as such, as required by specific customer requirement, and as negotiated at time of quotation and order placement

520 Series Polyester / Kraft Film & Foil Capacitors
926 Series Metallized Polypropylene Film Capacitors

The following standard product series ARE NOT currently RoHS Compliant, but are scheduled to achieve compliant status on or before 07/01/06, by date code 0626. The following standard product series may or may not be considered / certified as Lead-Free (Pb-Free status TBD / pending investigation).

RG2408/2409/2411 Series RC Networks

Electrocube Inc., provides the following commentary, indicating our understanding of the requirements imposed by EU RoHS Directive 2002/95/EC and associated EU Commission Decisions / Amendments and D-G Environment Guidance documents, and further explaining our current RoHS compliant status, company position regarding numerous RoHS and lead-free implementation issues, and addressing specific issues commonly elevated by our customers.

REQUIREMENT OVERVIEW AND ISSUES –

The EU RoHS Directive 2002/95/EC of 27 January 2003, will impose restrictions on the content of Polybrominated Biphenyl (PBB) and Polybrominated Diphenyl Ether (PBDE) flame retardants, and “heavy metals” Mercury (Hg), Cadmium (Cd), Hexavalent Chromium (Cr⁺⁶) and Lead (Pb) to be considered acceptable in electrical and electronics products placed on the market in Europe effective July 1, 2006.

EU Commission has formally adopted / accepted Commission Decision 2005/618/EC of 18 August 2005, Amending Directive 2002/95/EC, and indicating that a maximum concentration value (MCV) of 0.10% (1000 PPM) for PBB, PBDE, Hg, Cr⁺⁶, and Pb, and 0.01% (100 PPM) for Cd, by weight in homogenous materials shall be tolerated.

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The EU / RoHS Technical Adaptation Committee (TAC) proposed a Draft Guidance Document of 07/2004, indicating that “homogenous material” means a material that cannot be mechanically disjointed into different materials. The term “homogenous” is understood as “of uniform composition throughout”. Examples of homogenous materials are individual types of: plastics, ceramics, glass, metals, alloys, paper board, resins, and coatings. The term “mechanically disjointed” means that materials can be, in principle, separated by mechanical actions such as for example: unscrewing, cutting, crushing, grinding and abrasive processes. These definitions have been released by the EU D-G Environment within a guidance document “FAQ on RoHS and WEEE” dated May, 2005.

The requirements of the RoHS legislation and guidance documents apply the MCVs down into the component part level. Each individual element of a component part, which can be mechanically disjointed (by a wide range of mechanical processes), must be considered for content compliance individually. The calculated / tested amount of a restricted substance would be compared against the mass of the specific homogenous separable material in which it occurs, to determine PPM and content compliance (i.e. Pb/lead content will be measured in any solder used or plated finish present / PBDE content will be measured in individual plastic materials).

The Annex to the RoHS Directive indicates numbers of specific usages, and general classes of end-item material, component, and product applications which are exempted from the requirements of the RoHS Directive, in which use of the otherwise restricted substances may be acceptably permitted.

The exemptions / permitted uses and maximum content, potentially applicable to raw materials and components utilized by Electrocube, would be for lead as an alloying element in steel (0.35% or 3500 PPM), and copper (4.00% or 40000 PPM), or lead (with no specific limitation) in ceramic and glass elements of various electronics components such as specific styles of capacitors and insulators. Exemption for use of PBDE flame retardant DecaBDE has received formal acceptance as Commission Decision 2005/717/EC of 13 October 2005, Amending the Annex to Directive 2002/95/EC.

In addition to the Commission Decisions already noted, numbers of specific substances and uses previously listed by the Annex to the RoHS Directive for consideration / evaluation for acceptable future use, have received formal acceptance as Commission Decision 2005/747/EC of 21 October 2005, Amending the Annex to Directive 2002/95/EC. These specific exemptions do not directly affect acceptability of Electrocube products. Numbers of the exemptions accepted and proposed are application sensitive, and may or may not apply to Electrocube products, based upon classification of our customer’s end-item product.

Numbers of specific substances and applications are under consideration / evaluation by the RoHS TAC, for potential future permitted use / exemption. RoHS requirements may remain subject to change to the effective date of the legislation. Industry groups continue to advance requests for additional amendments, exemptions, definitions and guidance through various petitions, commentary, Stakeholder Consultations, and Draft Documents.

There is currently no legislation prescribing the method / means by which RoHS compliance is to be demonstrated. A producer may provide a “self-declaration”, which may be justified by such as obtaining supplier assurances of compliant material and component content, or by “material declarations” developed by industry. There is currently no legislation that requires or defines what a material declaration shall include.

Numbers of industry organizations have proposed standards for material content declaration, a prominent example being Joint Industry Guide JIG-101 and associated IPC Guidance and Forms Documents, all of which remain to be finalized after a period of industry comment. The scope of these disclosure standards go well beyond RoHS substance content, including many additional substances, up to 100% content disclosure, and including the product’s processing specifications. “RoHS Compliance” has evolved into a broad issue of “Environmental Compliance / Material Content Declaration / Disclosure”

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Industry has demanded a separate “Pb-Free” (lead-free) content and process compatibility designation. Industry considers that the Pb-Free designation should not be used for RoHS compliant product containing Pb in excess of 0.1% by way of specific content exemptions allowed by the EU RoHS legislation. Industry considers that products shall receive multiple compliance / status designations, indicating RoHS compliance, lead-free condition (if applicable), lead-free category of terminal finish and lead-free process temperature compatibility. Per industry standards JEDEC JESD97, and IPC-1066, the accepted definition of the term “Pb-free” (lead-free) is: Electrical and electronic assemblies and components in which the lead (Pb) level in any of the raw materials and the end product is less than or equal to 0.1% by weight and also meets any Pb-free requirements / definitions adopted by the RoHS Directive 2002/95/EC.

Industry concerns over “Tin-Whiskering” of alternative Tin (Sn) plated finishes, is driving numerous customer requirements for use of specific multi-plated finishes, implementation of specific plating process control, and plating/product testing. Tin-Whiskering of tin-plated finishes constitutes a serious reliability concern. The true root cause of tin-whiskering, and effective mitigation / elimination (other than by the historic use of tin-lead plating, and/or “solder tinning”) has been the subject of extensive research over the years, remains poorly understood, and is currently the subject of much industry and scientific debate. The specific extraordinary (and expensive) finish and process controls imposed may likely be only minimally effective in reducing the likelihood of that finish producing tin-whiskers.

COMPLIANCE CERTIFICATION (RATIONALE & SCOPE) -

Electrocube has determined to self-certify products as RoHS compliant, based upon assurances obtained from our suppliers certifying that the materials and components provided by them are RoHS compliant, from which it follows that compliant materials, components and processing produce a compliant finished product.

Electrocube currently considers our end-product to be compliant or non-compliant based upon verification of certified compliant content of individual material and component elements of that product, rather than by performance of destructive testing / lab analysis of materials, component parts, finished components or assemblies to confirm specific content of RoHS restricted substances.

Electrocube has received numerous requests from our customers for specific additional information regarding material content / disclosure and component processing, which have been widely inconsistent in terms of content, scope and format. Customers have requested simple compliance certifications to 100% disclosure of material content based upon laboratory analysis, including inapplicable processing parameters.

Due to resource challenges, and lack of a uniform and appropriate industry standard, Electrocube cannot respond to the widely variable requests for compliance information. Electrocube currently provides RoHS compliance information in-general, and as applicable to specific product series, via our web-site (www.electrocube.com). Please refer to the ATTACHMENT 1 - NEDA WORKSHEET, for a standardized response, generally applicable across Electrocube’s standard product series. Electrocube will not provide a detailed listing of specific part numbers with associated RoHS compliance data. Electrocube will provide simple material declarations / statements / certifications of RoHS compliance for a product series in general, and for specific products on request. Electrocube will not provide comprehensive material disclosures / declarations.

Electrocube is not currently prepared to provide material disclosure in accordance with such “industry standards” as the Joint Industry Guide JIG-101 and associated IPC Guidance and Forms Documents. Electrocube does intend to pursue confirmation of JIG-101 content status on a schedule to be determined.

Electrocube’s current level of product certification capability might be considered to be consistent with IPC-1752 Class 1 and 2 (reference JIG-101), indicating product compliance in accordance with RoHS Directive 2002/95/EC and Amendments only, without part number change, since date code of 0540 (YYWW), providing specific compliance responses in a simple “yes/no” format, and providing some processing data.

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Electrocube intends to evaluate use of JIG-101 and/or alternative industry standards, which may be promoted and become recognized as beneficial and universally acceptable means of considering and reporting material content of our products. Electrocube will not, at this time, consider providing this level of comprehensive material content disclosure, or undertake the product analysis and testing required, to so accurately determine the specific and total product content in PPM across our product range.

CONTENT COMPLIANCE CERTIFICATION STATEMENTS -

Please refer to the separate COMPLIANCE CERTIFICATION STATEMENT applicable to the specific standard product series.

CONTENT COMPLIANCE DETAIL –

Electrocube has not, and does not currently intentionally utilize any of the RoHS restricted flame retardants or heavy metals as discrete substances or compounds additive to our products during processing performed in product manufacture at Electrocube.

Electrocube has historically supplied a mix of RoHS compliant and non-compliant products to our Distributors and OEM customers. Some specific Electrocube product has been inconsistently RoHS compliant, due to acceptable variations in material sourcing and manufacturing processing lot by lot.

Electrocube has utilized various tin/lead solder alloys to make internal electrical connections, and to seal hermetic metal-cased products.

Electrocube has obtained revised lead-free soldering materials and equipment, and accomplished process revisions implementing the use of various lead-free solder alloys as replacements for the tin/lead alloys previously used.

Electrocube has used variable alloys of tin-lead plating as our primary solderable finish for (round) termination lead-wires, and for features / details of fabricated and purchased component parts. Specific product series have utilized various components and conductors (round & flat-ribbon) having tin-lead plated finishes internal to product construction. External component lead-wires have in the past been provided with non-specific tin-only plated finish, for periods of time and for various reasons within the allowance of our catalog specifications.

Electrocube has accomplished revised procurements and receipt of lead wire and components, supporting conversion of existing tin-lead plated finishes to available options of tin plating. Electrocube currently provides non-specific Tin (Sn) only plated finishes on (round-wire) component leads and hook-up wires internal and external to construction of standard products. This termination finish is designated as category “e3” per JEDEC Standard JESD97.

Flat-ribbon conductors, having tin-lead plated finish, continue to be necessarily utilized in construction of specific standard product series, pending depletion of existing material inventories, and economic procurement of replacement conductor materials having Tin (Sn) only plated finish. Specific Electrocube product Series 520 and 926 have historically, and continue to, contain Lead(Pb) as an element of tin-lead plated finish of flat ribbon conductor materials used internal to product construction, in excess of requirements, in an amount >0.1%, and may not be currently certified to be RoHS Compliant and Pb-Free.

Electrocube has utilized tin-lead alloy winding foils in construction of a limited number of specific capacitor series and values. The applicable capacitor series and values have been re-specified to utilize acceptable alternative aluminum (rather than tin-lead) winding foils.

Limited intentional use and procurement of components and materials having restricted lead content continues, such as tin-lead plated finishes, and tin-lead solder alloys, to support manufacture of custom products.

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A Specific Electrocube product series necessarily contains lead as an alloying element of a fabricated steel component. "End-seal" components, utilized in the construction of hermetic capacitor Series 524, are machined from common "screw-machine" steel alloys, which contain Pb in an amount $>0.1\%$, but $\leq 0.35\%$, which is acceptable within the $\leq 0.35\%$ allowance of specific Exemption Point 6, per the Annex of the RoHS Directive. This product series cannot be considered / certified to be Pb-Free.

A specific Electrocube product series necessarily contains lead in a glass / ceramic element of an electronic component. "End-seal" components utilized in construction of hermetic capacitor Series 524 utilize a glass / ceramic insulating element, which contains Pb in an amount which may be $>0.1\%$, but which is acceptable within the unrestricted allowance of specific Exemption Points 5 & 7, per the Annex of the RoHS Directive. This product series cannot be considered / certified to be Pb-Free.

TBD Specific Electrocube product series may necessarily contain lead as an alloying element of fabricated steel and copper alloy components. Various hardware and termination components of the specialized industrial control enclosures used in construction of product Series RG2408, RG2409 and RG2411 may contain Pb in an amount $>0.1\%$, but acceptable within the allowance of specific Exemption Point 6 per the Annex of the RoHS Directive. This product series may or may not be considered / certifiable to be Pb-Free. Additionally, the plastic enclosures and associated hardware and termination components have been historically provided having RoHS non-compliant content of Cadmium and Hexavalent Chromium in the plastic resin and plated finishes. The source for these enclosures is committed to supplying fully compliant product by July 1, 2006. These product series will transition to certified RoHS Compliant status (and to certified Pb-Free compliance as able) by 07/01/06.

Some Electrocube product series have contained PBDE flame retardant. Specific insulating tape and tubing materials, used for external wrapped encasement and for internal insulation of components, have contained amounts of PBDE (specifically DecaBDE) in excess of directive limits. As a PBDE, DecaBDE content was originally not acceptable, but is currently considered acceptable by specific Commission Decision, and Amendment to the Annex of the RoHS Directive, as specific Exemption Point 9a (reference prior commentary).

Electrocube has implemented procurement, and is currently using a revised PBDE-free (and DecaBDE-free) insulating / over-wrap tape. Limited intentional use of tape materials having acceptable DecaBDE content continues, until such time as we have depleted our inventories and replaced them with more universally acceptable fully-PBDE-free / RoHS compliant alternative materials.

Limited intentional use and procurement of insulation tubing having RoHS acceptable DecaBDE flame retardant content continues, pending availability, specification, depletion of inventories and procurement of more universally acceptable fully-PBDE-free / RoHS compliant alternative material.

Compliance with the material content restrictions of EU RoHS Directive 2002/95/EC, and EU Commission Decisions / Amendments, and EU D-G Environment Guidance documents is mandated by Electrocube to our suppliers by purchase order provision. Electrocube will continue in efforts to identify acceptable RoHS compliant alternative materials, and implement revised procurements as may be necessary into the future.

Electrocube (including Seacor) "standard" series of Capacitors and RC Networks (as listed, and less exceptions noted) supplied to our Distributors and OEM Customers as of date code 0540 (YYWW) and subsequent, shall be considered RoHS Compliant and Pb-Free, unless specifically acceptable and contracted otherwise. RoHS Compliant and Pb-Free product is specifically identified as such. The Electrocube part numbers for the RoHS Compliant and Pb-Free products are identical to that of the pre-existing non-compliant product configurations. Please refer to the COMPLIANCE IDENTIFICATION and PROCUREMENT CONSIDERATIONS sections.

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OTHER PRODUCT ISSUES -

Electrocube has determined that functional electrical performance and reliability characteristics of the applicable standard product series are not negatively affected by implementation of RoHS compliant product designs. Electrocube has accomplished appropriate testing to sufficiently verify / confirm that the performance and reliability of revised product configurations are equivalent to that of product previously / historically provided. Details of testing / verification performed may or may not be published, or otherwise made available upon customer request.

Electrocube standard / catalog part numbers have not been revised to reflect RoHS compliant status, as those compliant designs are the “new standard” product. It is Electrocube’s intention to supply catalog standard product in a configuration that meets the significant environmental / content requirements of our customers on an ongoing basis, without the need for continuous part number change as content requirements may change.

Certification of compliance with RoHS content requirements does not imply certification that Electrocube product is compatible with lead-free machine (oven-reflow or wave-flow) soldering processes. Electrocube’s products, in pre-existing lead-containing, and in current lead-free configurations might be considered to be temperature sensitive in machine or manual soldering processes based upon pre-existing limitations of basic plastic materials from which they are constructed, and not on the basis of a change to lead-free content. Electrocube products may be considered to be less compatible with the increased processing temperatures required by lead-free machine soldering processes. Please refer to the PROCESS COMPLIANCE / COMPATIBILITY section.

As required by, or as acceptable to our customers, Electrocube will continue to support requirements for non lead-free products (as historically provided, but otherwise RoHS compliant) as customer directed exceptional variations of standard products, and as fully “custom” build-to-specification products having unique part numbers. Non lead-free construction may be limited to the use of tin-lead solder for specific critical solder terminations and plated finishes, to the extent that materials and components remain available to support customer specifications. Please refer to COMPLIANCE IDENTIFICATION / VERIFICATION, and PROCUREMENT CONSIDERATIONS sections.

PRODUCT COMPLIANCE IDENTIFICATION

RoHS compliant and non-compliant products are specifically identified, and separately processed in controlled manufacturing, and are specifically identified and separately packaged and stored in controlled inventory. As RoHS compliant procurement and processing has been phased-in, and as fully compliant production lots have been realized, Electrocube is able to specify the manufacturing date code, including and beyond which a specific product or product series may be certified to be RoHS compliant and lead-free.

Electrocube standard products are not directly marked to specifically reflect / confirm RoHS Compliant, and/or Pb-Free status. The lowest level of product packaging is marked with date code information, by which compliance status may be primarily determined. Date code information may or may not be directly marked on product, based upon the physical size and configuration of the product, available marking capability and cost.

Additionally, the lowest level product packaging, as well as shipping documentation (shipper, invoice, C of C), includes positive identification of RoHS Compliant and Pb-Free status product status, by way of compliance labeling or text. Based upon input from industry and standards such as JEDEC JESD97, specific legend text and symbology for product identification / labeling, have been determined to indicate RoHS Compliant and Pb-Free condition, and are in-use.

Industry requirements for special classification, identification and packaging of products with regard for maximum safe processing temperature and duration, and moisture sensitivity, are specifically applicable to surface mounted components exposed to higher temperature oven-reflow soldering processes, and are not applicable to typical Electrocube standard products to be manually or machine (wave) solder terminated.

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CUSTOM PRODUCTS -

Electrocube will not unilaterally revise custom products and implement the requirements of the RoHS Directive, without prior customer direction or approval, where doing so would violate prior customer agreements, or the requirements of prior product acceptance / qualification, particularly in regard to the lead-free requirements of the RoHS Directive, which are considered to have a potential product reliability impact.

In regard to custom products, it is Electrocube's intention to comply with the requirements of the RoHS Directive relative to content of flame retardants and heavy metals to the maximum extent possible, with exceptions taken for intentional lead content in the form of tin-lead plated finishes and tin-lead solder alloys, and to implement conversion to fully compliant lead-free configurations at customer request, and as otherwise acceptable. Electrocube will perform appropriate testing as directed by our customer to sufficiently verify / confirm that the performance and reliability of any revised custom product configuration is equivalent to that of product previously / historically provided.

PROCESS COMPLIANCE / COMPATIBILITY -

Industry standards / requirements such as IPC/JEDEC J-STD-020 & J-STD-033, and EIA/JEDEC JEP113, for special classification, identification and packaging in regards to moisture sensitivity, are specifically applicable to surface mounted components exposed to higher temperature oven-reflow soldering processes, and not applicable to typical (listed) Electrocube standard products, to be manually or machine (wave-flow) solder terminated, to be manually and mechanically installed and terminated, or to be manually solder or crimp terminated into wired assemblies.

In regard to elevated temperature capability and solderability, the pre-existing lead-containing and tin-lead plated, and current lead-free and tin plated configurations of the applicable listed Electrocube standard products should be considered backward COMPATIBLE with manual and machine (wave) soldering processes (controlled within the noted guidelines) utilizing conventional tin-lead solder alloys Sn63Pb37 or Sn60/Pb40, however these products should be considered temperature sensitive based upon the variables of dielectric material, value, tolerance, physical size, package style, lead length, and specifics of preheat technology, and maximum exposure of temperature and duration. Acceptable soldering processes must favor the minimum effective exposure of temperature and duration or risk component damage.

Topside preheating temperature is a specifically critical and potentially damaging factor relative to the limitations of specific capacitor dielectric film materials. Successful processing without part damage requires consideration of the noted variables, appropriate process control, and prudent decision directing secondary manually soldered component installation in circumstances where the mix of components and circuit board thermal mass require extended heating at increased temperatures.

Machine controlled (wave) soldering processes should preheat at a rate of 2-4 deg. C / second, and yield a circuit board top surface temperature of 100-120 deg. C maximum, and a bottom surface temperature within approximately 120 to 100 Deg. C of the solder temperature, at the exit of the preheat stage. The combination of top and bottom side preheating shall not result in component body temperatures exceeding the limitations of the applicable dielectric materials (105 deg. C for polypropylene, and 125 deg. C for polyester and polycarbonate). The circuit board shall ramp to a soldering stage over 183 deg. C for 10 to 20 seconds (measured at component leads and plated through hole lead termination points), including a maximum peak (solder) temperature and duration of 245 deg. C for 5 seconds, or 250 deg. C for 3 seconds.

Manual soldering processes should utilize temperature controlled soldering iron systems, having temperature of 600 to 700 deg. F (316 to 371 deg. C) and a heating duration of 2 to 5 seconds.

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In regard to elevated temperature capability, the pre-existing lead-containing and tin-lead plated, and current lead-free and tin plated configurations of the applicable listed Electrocube standard products should be considered NOT COMPATIBLE with Pb-Free machine (oven-reflow) solder profile per industry standard IPC/JEDEC J-STD-020, and NOT COMPATIBLE with a typical lead-free wave-flow solder process based upon temperature limitations of dielectric material. The necessarily increased temperatures and durations of all stages of the Pb-Free oven-reflow or wave-flow solder process will significantly exceed the temperature capability the plastic dielectric materials from which these products are constructed resulting in defective components.

In regard to elevated temperature capability and solderability, the pre-existing lead-containing and tin-lead plated, and current lead-free and tin plated configurations of the applicable listed Electrocube standard products should be considered forward COMPATIBLE with lead-free manual soldering processes (controlled within the noted guidelines).

Electrocube's recommendation would be to utilize lead-free solder alloys such as Sn96.5Ag3.0Cu0.5 or Sn95.5Ag3.8Cu0.7. These alloys provide a desirable combination of acceptable physical characteristics, and minimally increased liquidus temperature of 217-221 deg. C (in comparison with alternative lead-free solders). Published industry research would indicate that components having tin-lead plated termination finish will not adversely affect reliability of solder connections made with these lead-free solder alloys.

The potentially damaging effects of necessarily increased soldering temperatures and durations may be mitigated by use of optimized soldering tools and technique to complete solder terminations using the minimum effective temperature and duration.

Manual soldering processes should utilize technologically sophisticated / capable temperature controlled soldering iron systems (such as Metcal™) having temperature of 600 to 700 deg. (316 to 371 deg. C) and a heating duration of 2 to 5 seconds.

The listed Electrocube standard products, in pre-existing lead-containing, and in current lead-free configurations might be considered to be temperature sensitive in manufacturing processes based upon pre-existing limitations of basic plastic materials from which they are constructed, and not on the basis of a change to lead-free content.

Temperature and duration parameters for soldering processes should be considered not applicable to specific styles of the listed Electrocube standard products, to be manually and mechanically installed and terminated, or to be manually solder or crimp terminated into wired assemblies. In manufacturing processes, temperature exposure shall not result in component body temperatures exceeding the limitations of the applicable dielectric materials (105 deg. C for polypropylene, and 125 deg. C for polyester and polycarbonate).

Forward and backward solder process compatibility, of the pre-existing lead-containing and tin-lead plated, and current lead-free and tin plated configurations of the listed Electrocube standard products, should be considered not applicable to specific styles of the listed Electrocube standard products, to be manually and mechanically installed and terminated, or to be manually solder or crimp terminated into wired assemblies.

PRODUCT PROCUREMENT CONSIDERATIONS -

Customers will need to be specific regarding requirement for RoHS compliance at the time of order placement, during the period in which both product variations are available from Electrocube inventory.

Pricing may or may-not increase for RoHS compliant product on a case-by-case basis. Electrocube anticipates the pricing of products will continue to be reviewed based upon numbers of cost factors as ordered, and may require adjustment based upon increased cost of RoHS compliant materials and processing, as well as other cost factors.

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Inventories of basically compliant materials and components have been established. Electrocube does not anticipate the conversion to RoHS compliant content will result in an increase in typical lead-times.

The product revisions required by the RoHS Directive and lead-free initiative, have not resulted in any revision to the stock rotation policies of existing Electrocube Distributor Agreements.

ULTIMATE COMPLIANCE / CONTENT CERTIFICATION -

Full and unequivocal certification that the listed Electrocube standard product series (and custom products to the extent acceptable), will meet the flame retardant and heavy metal restrictions of EU RoHS Directive 2002/95/EC and EU Commission Decisions / Amendments and EU D-G Guidance documents, and any outstanding EU TAC Draft documents is pending finalization of RoHS requirements. Various existing and likely additional industry petitions, commentary, Stakeholder Consultations, Draft Commission Decisions and Guidance Documents, proposing amendment of RoHS legislation and Annexes to accommodate additional or revised exemptions, clarifications, definitions, etc., all require disposition by formal rejection, revision, or acceptance / adoption. It appears that this on-going process may likely continue up to (and potentially delay) the July 2006 effective date of the RoHS legislation.

Having achieved a baseline of RoHS compliance, Electrocube continues to monitor and react to changing RoHS compliance requirements and the needs of industry, and we will continue to aggressively pursue material discovery, process / product development and procurement efforts as requirements change.

IN CLOSING -

As our valued customer, Electrocube has appreciated your patience as we have we accomplished our RoHS compliant (and lead-free) product and process development efforts. Please do not hesitate to contact the Electrocube Sales / Customer Service Department by phone at 626-301-0122, by FAX at 626-357-8099, or by e-mail at esales@electrocube.com, if you need any further assistance with regard to the RoHS status of Electrocube products, relative to continued, reduced, specific, and/or eliminated utilization of the identified chemicals or materials.

Sincerely,
Electrocube, Inc.

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ATTACHMENT 1 - NEDA WORKSHEET – GENERAL PRODUCT TRANSITION INFORMATION

Utilizing the NEDA Lead-Free/RoHS Product Information Worksheet, Electrocube provides the following commentary (referencing Worksheet Instruction Steps) as a means of conveying general product transition information and schedule. This information duplicates information available elsewhere in this document.

Supplier: [Electrocube, Inc.](#)

Email: esales.electrocube.com

Phone: [626-301-0122](tel:626-301-0122)

Pb-Free/RoHS Contact: [Customer Service](#)

Pb-Free Website: www.electrocube.com

Date: [05/12/06](#)

Step 1 All existing “standard” part numbers. Product certification as “Pb-Free” is understood to require that Lead(Pb) content be equal or less than 0.1% (or 1000 ppm) by weight in homogenous material / discrete raw materials, and in total weight of end-product (component part). Product certification as “RoHS Compliant” is understood to require that PBB, PBDE, Hg, Cr+6, and Pb content be equal or less than 0.1% (or 1000 ppm), and content of Cd be equal or less than 0.01% (or 100 ppm) by weight in homogenous material, however, numerous exemption per RoHS Directive Annex and Amendments may be applied against this requirement. *All “standard”series of Electrocube (including Seacor) Capacitors and RC Networks, and (in-general) Electrocube “custom” build-to-specification products manufactured prior to and including date code 0539 (YYWW), shall not be considered Pb-Free or RoHS Compliant. Significant series of Electrocube standard products have typically included Lead (Pb) in excess of requirements, as a constituent of tin-lead solder utilized for first level interconnections internal to some components, and as a constituent of tin-lead plating previously used as the primary finish for (round wire) component leads. Specific product series have utilized various components and conductors having non-compliant tin-lead plated finishes internal to product construction. Specific and limited capacitor product series and values have utilized Tin alloy winding foils containing lead in-excess of requirements. Specific component Series 524 necessarily contains lead in excess of requirements, in steel alloy, and in glass / ceramic elements of component parts, but may be certified to be RoHS Compliant by specific RoHS Exemption. Specific component Series RG2408, RG2409 and RG2411 may necessarily contain lead in excess of requirements, in steel, and in copper (brass, bronze) alloys from which various termination details and hardware are fabricated, and may or may not be certified to be Pb-Free, but may be certified to be RoHS Compliant by specific RoHS Exemption. Series RG2408, RG2409 and RG2411 have contained Cadmium (Cd) and Hexavalent Chromium (Cr+6) in excess of requirements in enclosure plastic resin and finish of termination hardware items. Some Electrocube product series have contained DecaBDE flame retardant as a constituent of a specific insulating tape and heat shrink tubing, used as product over-wrap and as internal insulation, in excess of RoHS requirements as a PBDE, but which is considered acceptable and RoHS compliant content by specific RoHS Annex Exemption.*

Step 2 No / blank. *The existing Electrocube part numbers for the Pb-containing (and RoHS non-compliant) product have not been discontinued / terminated.*

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- Step 3** Same as Step 1. *The Electrocube part numbers for the Pb-free (and RoHS Compliant) products are identical to that of the pre-existing Pb-containing products. Electrocube has converted all “standard” product series (with noted explanations and exceptions) to Pb-Free (and RoHS Compliant) configurations. Some components have in-fact been lead-free, or inconsistently lead-free due to acceptable variations in material sourcing and manufacturing processing lot by lot. Specific component Series 520 and 926 necessarily contain lead in-excess of Pb-Free requirements, as a component of tin-lead plated finish of flat ribbon conductor materials used internal to product construction, and may not currently be certified to be Pb-Free (or RoHS Compliant), but may be provided as such, as required by specific customer requirement, and as negotiated at time of quotation and order placement. Specific component Series 524 necessarily contains lead in excess of Pb-Free requirements, in steel alloy, and in glass / ceramic elements of component parts, and will not be certified to be Pb-Free, but may be considered to be RoHS compliant. Specific component Series RG2408, RG2409 and RG2411 may necessarily contain lead in excess of Pb-Free requirements, in steel, and in copper (brass, bronze) alloys from which various termination details and hardware are fabricated, and may or may not be certified to be Pb-Free, but will be otherwise converted / certified to be Pb-Free and RoHS Compliant by 07/01/06 (date code 0626). Electrocube intends to convert “custom” build-to-specification products to Pb-free (and RoHS compliant) configurations at customer request, and as otherwise acceptable.*
- Step 4** No. *The identical part number is used for Pb-containing (and RoHS non-compliant), and for the Pb-free (and RoHS compliant) products.*
- Step 5** 0539. *The scheduled transition date for achievement of Pb-free status for standard product series was week of September 26, 2005, or date code 0539 (YYWW). The scheduled transition date for achievement of Pb-free status for Electrocube “custom” products is to be determined, based upon customer requirements on a case-by-case basis.*
- Step 6** 0540. *The actual transition date for achievement of Pb-free status for standard product series was October 3, 2005, or date code 0540 (YYWW). Transition for a number of specific standard product series is delayed to on or before July 01, 2006 (by date code 0626). The actual transition date for achievement of Pb-free status for Electrocube a number of specific “standard products, and for “custom” products, is to be determined / negotiated, based upon customer requirements on a case-by-case basis.*
- Step 7** “Pb-Free” symbol & text. *Specific labeling for packaging to indicate Pb-free condition of products has been determined and implemented, using input from industry and JEDEC JESD97 to define appropriate symbology and text. The listed Electrocube / Seacor products are not directly marked to indicate RoHS Compliant or Pb-Free status. The lowest level of product packaging is marked with date code information by which compliance status may be primarily determined. Date code information may or may not be directly marked on product, based upon physical size and configuration of the product, available marking capability and cost. Additionally, the lowest level of product packaging, as well as shipping documentation (shipper / invoice & C of C) include specific marking or labeling to indicate product status by way of appropriate Pb-Free and RoHS Compliant symbology and text.*
- Step 8** Yes. *Specific marking of shipping documentation (packing list/invoice and C of C) by statement and/or symbology to indicate Pb-free condition of products has been determined and implemented, using input from industry and JEDEC JESD97 to define appropriate symbology and text.*
- Step 9** “e3”. *Electrocube has implemented transition from tin-lead (Sn-Pb) plated / finished component lead wires, to tin (Sn) plated leads wires, which are Category “e3” per JEDEC JESD97.*

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Step 10 Not Applicable. Industry standards / requirements such as IPC/JEDEC J-STD-020 & J-STD-033, and EIA/JEDEC JEP113, for special classification, identification and packaging in regards to moisture sensitivity, are specifically applicable to surface mounted components exposed to higher temperature oven-reflow soldering processes, and are not applicable to typical Electrocube standard products. Electrocube standard products are predominantly axial or radial wire lead terminated components, intended to be manually or machine (wave-flow) terminated to plated-thru-hole circuit boards, or to be manually solder terminated into wired assemblies. Numerous product series are intended to be mechanically or manually crimp terminated into electrical assemblies.

Step 11 Yes. The Pb-free part number / product is compliant with EU RoHS Directive 2002/95/EC. Electrocube has converted all "standard" product series (with noted explanations and exceptions) to RoHS compliant configurations. Some components have in-fact been RoHS Compliant, or inconsistently RoHS Compliant due to acceptable variations in material sourcing and manufacturing processing lot by lot. Specific component Series 520 and 926 necessarily contain lead in-excess of RoHS Compliant and Pb-Free requirements, as a component of tin-lead plated finish of flat ribbon conductor materials used internal to product construction, and may not currently be certified to be RoHS Compliant or Pb-Free, but may be provided as such, as required by specific customer requirement, and as negotiated at time of quotation and order placement. Specific component Series 524 necessarily contains lead in excess of Pb-Free requirements, in steel alloy, and in glass / ceramic elements of component parts, and will not be certified to be Pb-Free, but may be certified to be RoHS Compliant by specific RoHS Exemption. Specific component Series RG2408, RG2409 and RG2411 may necessarily contain lead in excess of Pb-Free requirements, in steel, and in copper (brass, bronze) alloys from which various termination details and hardware are fabricated, and may or may not be certified to be Pb-Free, but may be certified to be RoHS Compliant by specific RoHS Exemption, Series RG2408, RG2409 and RG2411 have contained Cadmium (Cd) and Hexavalent Chromium (Cr⁺⁶) in excess of requirements in enclosure plastic resin and finish of termination hardware items, and will be otherwise converted / certified to be RoHS Compliant by 07/01/06 (date code 0626). Some Electrocube product series have contained DecaBDE flame retardant as a constituent of a specific insulating tape and heat shrink tubing, used as product over-wrap and as internal insulation, in excess of RoHS requirements as a PBDE, but which is considered acceptable and RoHS compliant content by specific RoHS Annex Exemption. Electrocube intends to convert "custom" build-to-specification products to RoHS partial compliancy, with exceptions taken for intentional lead content in the form of tin-lead plated finishes and tin-lead solder alloys, thereafter to implement conversion to fully RoHS compliant (and lead-free) configurations at customer request, and as otherwise acceptable.

Step 12 No. Electrocube will not provide internet links or web-site features directly linking specific part numbers to information regarding RoHS compliance status / certifications or RoHS specific material content disclosure. RoHS compliant product will be primarily confirmed by date code which will be directly marked on the product or on the lowest level of product packaging, and which will also be conveyed by shipping documentation, and by symbology and legend text which will be marked or labeled on the lowest level of product packaging, and on shipping documentation. General RoHS compliance information applicable to specific Electrocube product series will be primarily provided via the Electrocube web-site (www.electrocube.com). Format and content of this information is variable. Compliance data and certifications applicable to specific product series or specific part numbers will be provided on request.

Step 13 0539. The scheduled transition date for achievement of RoHS compliant status for standard product series was September 26, 2005, or date code 0539 (YYWW). The scheduled transition date for achievement of RoHS compliant status for Electrocube "custom" products is to be determined, based upon customer requirements on a case-by-case basis.

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Step 14 0540. *The actual transition date for achievement of RoHS compliant status for standard product series was October 3, 2005, or date code 0540 (YYWW). Transition for a number of specific standard product series is delayed to on or before July 01, 2006 (or by date code 0626). The actual transition date for achievement of RoHS compliant status for Electrocube a number of specific “standard”, and for “custom” products is to be determined / negotiated, based upon customer requirements on a case-by-case basis.*

Step 15 “RoHS Compliant” symbol & text. *Specific labeling for packaging to indicate RoHS compliance of products has been determined and implemented. In the absence of any generally accepted industry standard, Electrocube has defined simple compliance symbology and text statement.*
Refer to Step 7.

Step 16 Not Applicable. *Max Reflow Temperature is specifically applicable to surface mounted components exposed to oven-reflow soldering processes, and not applicable to typical Electrocube standard products. Electrocube standard products are predominantly axial or radial wire lead terminated components, intended to be manually or machine (wave-flow) terminated to plated-thru-hole circuit boards, or to be manually solder terminated into wired assemblies. Numerous product series are intended to be mechanically or manually crimp terminated into electrical assemblies. In machine controlled (wave) soldering processes, the combination of top and bottom side preheating, and exposure over soldering stage, and temperature exposure during any other manufacturing processes, shall not result in component body temperatures exceeding the limitations of the applicable dielectric materials (105 deg. C for polypropylene, and 125 deg. C for polyester and polycarbonate). In a conventional wave-solder process the maximum peak (solder) temperature and duration might be characterized as 245 deg. C for 5 seconds, or 250 deg. C for 3 seconds (measured on component leads at plated-thru-hole termination points).*

Step 17 Not Applicable. *See Step 16. Max Dwell Time at the Max Reflow Temperature is specifically applicable to surface mounted components exposed to oven-reflow soldering processes, and not applicable to typical Electrocube standard products.*

Step 18 No. *Electrocube will not provide a Part Qualification Link for products transitioning to Pb-Free and RoHS Compliance. Electrocube has determined that there is no change in functional (electrical) performance or reliability characteristics by implementation of RoHS compliant designs. In regard to standard product series, Electrocube has performed appropriate testing to sufficiently verify / confirm that the performance and reliability of revised product configurations are equivalent to that of product previously / historically provided. Details of testing / verification performed may or may not be published, or otherwise available upon customer request. In regard to custom products, Electrocube will perform appropriate testing as directed by our customer to sufficiently verify / confirm that the performance and reliability of any revised product configuration is equivalent to that of product previously / historically provided.*

Step 19 Yes. *Applicable product styles in Pb-Free and RoHS Compliant configurations remain “backward compatible” with traditional / legacy Sn/Pb soldering processes*

Step 20 No. *Electrocube will not provide internet links or web-site features directly linking specific part numbers to a Chemical Content Data Sheet in such industry recognized formats as EIA JIG, IMDS or AIAG ELV. Electrocube will not provide comprehensive material disclosures / declarations. Electrocube will provide simple material declarations / statements / certifications of RoHS compliance for product series in general (primarily via our web-site at www.electrocube.com, see Step 12), and for specific products on request.*

Step 21 Blank. *No additional information to provide.*

Step 22 05/12/06.