

MURATA PRODUCTS
Lead Elimination Activities



Innovator in Electronics

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Murata's Lead Elimination and Reduction Activities

Lead, one of the environmentally hazardous chemical substances, has been used in a variety of equipment. Murata has long promoted reduction and elimination measures.

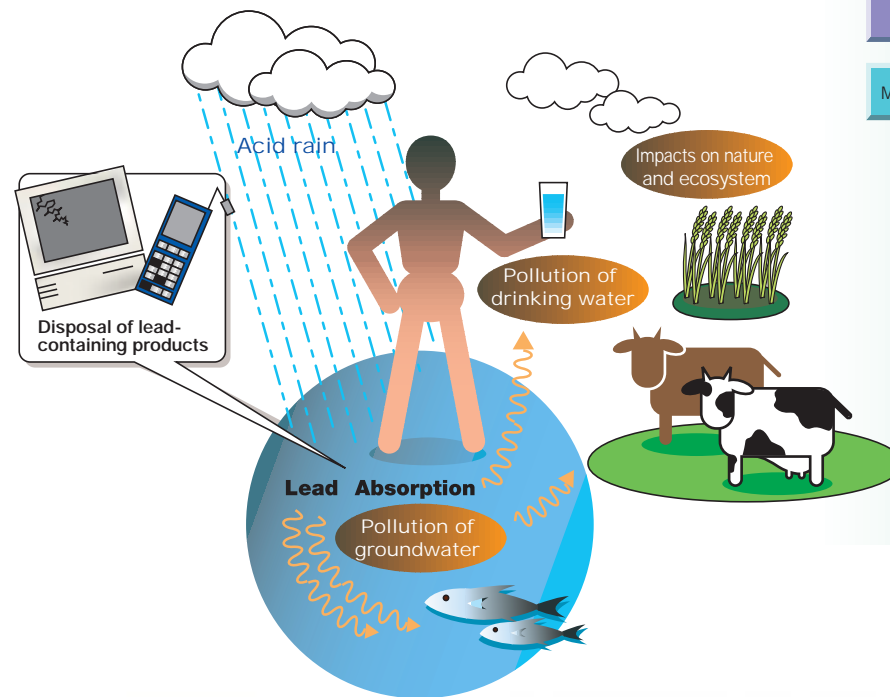
We have made significant progress, eliminating it from terminal plating and surfaces as well as many internal connections. The amount in our ceramic materials is also reducing. We now supply an extensive range of lead-reduced and lead-free products to the world's markets.

Impact of lead on the environment

Lead (Pb) has long been a useful metal for glass and plastic additives, battery electrodes, solder and so on. However, if automobile components and electronic equipment containing lead are disposed of without proper treatment, it may cause water pollution because lead is easily dissolved by acid rain. It is known that this substance has an adverse impact on the global environment and the human body. Given this background, environmental regulations, typically the ELV Directive^(#1) and the WEEE & RoHS Directive Drafts^(#2) discussed in the EU, define restrictions on the form and the amount of use of lead and other environmentally hazardous chemical substances. (With the WEEE & RoHS Directive Drafts, restrictions on such substances are under consideration.) Furthermore, automobile and electronic equipment manufacturers are strongly requested to use lead-free solder in the PCB assembly process, and to eliminate lead from electronic components used for electronic equipment.

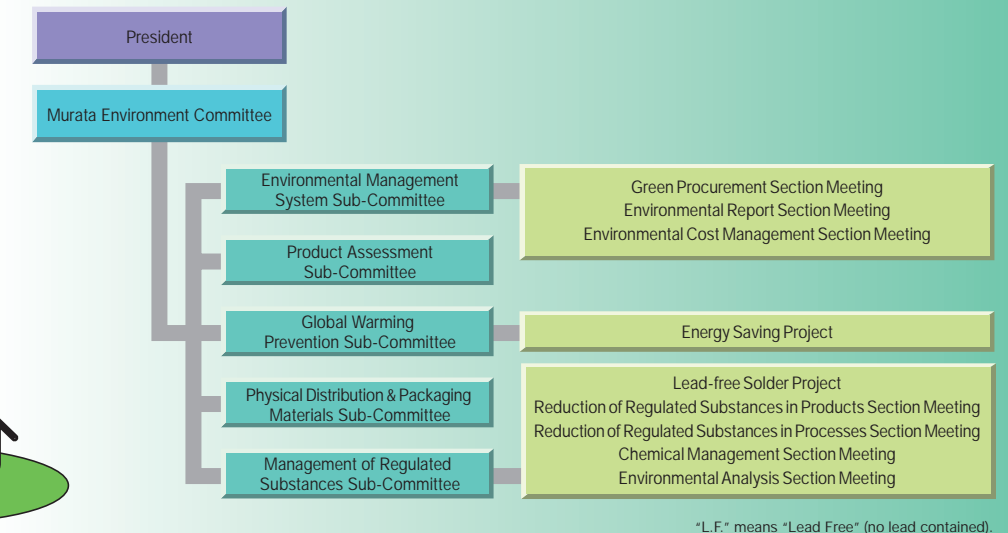
^{#1} ELV (End of life vehicle) Directive
This Directive is intended to oblige automobile manufacturers to collect and recycle the automobiles that have reached the end of their service life, and prohibit the use of lead, mercury, cadmium and hexavalent chromium in automobiles registered from July 1, 2003 onward.

^{#2} WEEE (Waste Electrical and Electronic Equipment) Directive Draft
RoHS (the restriction of the certain hazardous substances in electrical and electronic equipment) Directive Draft
These Directive Drafts are intended to order collection, disposal and recycling of electronic equipment, and adoption of substitutes for environmentally hazardous substances, i.e. lead, mercury, cadmium, hexavalent chromium, and specific brominated flame retardants.



Murata's lead-elimination/reduction promotion system

Murata established the Environmental Committee to discuss and examine the environmental activities and subjects of the whole group. As a subordinate organization of the Environmental Committee, Murata established sub-committees and section meetings to conduct specialized research and planning activities. Since 1995, Murata has promoted various activities for lead elimination/reduction from its products and adoption of substitutes for lead, through the "L.F. Solder Project" under the restricted substance control committee.



"L.F." means "Lead Free" (no lead contained).

Murata's Environmental Preservation Activities

In 1995, Murata established its Environmental Charter, which spells out the basic environmental policy and action plan for the whole group. Murata is making a daily effort to put this commitment into practice.

■ Concept (Excerpt from "Corporate Environmental Policy" of Murata Environmental Charter)

With the desire to contribute to a truly rich human society, we develop materials and products, devise and maintain production activities, and supply products worldwide. However, we cannot deny that our production activities as well as our products themselves are unintentionally affecting the global environment. We fully acknowledge this impact on the global environment and are taking action to reduce our environmental impacts as one of the important initiatives being put into practice as part of our Murata Philosophy and establishment vision. We will unite the efforts of our management organization, repeatedly work toward reducing our environmental impacts, and through management efficiency determine the points at which business and environmental interests converge.

■ Providing Environmentally Conscious Products

("Corporate Objectives and Targets for Fiscal 2002")
of Murata Environmental Charter

● Environmentally Conscious Design

- Promoting environmentally conscious design through product assessments, with a plan to implement this policy throughout the company by the end of fiscal 2003

● Management and reduction of environmentally hazardous chemical substances in products

- Making positive efforts to adopt substitutes for environmentally hazardous chemical substances and alternative technologies
- Supplying products containing substitutes for the lead in the metal plating on electrodes and lead wires as well as for the solder used for internal parts to the greatest extent possible

● Saving packaging materials and distribution energies

- Promotion of shift from taping to bulk case packaging for chip components

● Green procurement

- Making positive efforts to procure environmentally friendly materials
- Planning to expand the green procurement policy to all our offices outside Japan by the end of fiscal 2003

Lead Elimination Projects, and Examples of Actual Measures

Murata classifies lead-containing product parts into three categories for the systematic conduct of lead-elimination/reduction activities.

Lead elimination from terminals

(Terminal specifications and supply period of each product are listed on p. 6 through p. 15.)

Lead elimination from terminal plating, and from solder on terminal surfaces

Lead elimination from all products will be completed by the end of December 2003.

Actions

- Adoption of Sn, Sn-Cu, Au, Ag, Ag-Pd and Cu as substitutes (in surface-mounting components)
- Adoption of Sn-Cu, Sn-Ag-Cu and Ag as substitutes (in lead components)

Lead elimination from terminal plating for chip monolithic ceramic capacitors of size 1005 (1.0 x 0.5 mm)

Actions Completed

Surface mounting performance for Sn-Ag-Cu solder
Because the solder fillet formed on Sn plating is equivalent to that on Sn-Pb plating, it has been proved that the Sn-plated terminal is reliable.

Lead-free product (Sn plating) Conventional product (Sn-Pb plating)

Solderability
It has been proved that the Sn-plated terminal's solderability is equivalent to that of the Sn-Pb plated terminal.

Time for onset of wetting (sec)

■ Sn plating ▲ Sn-Pb plating PCT 105°C, 1.2 atm, 4 hours

Initial After PCT Initial After PCT

Sn-Ag-Cu solder Sn-Pb solder

Composition of solder for surface mounting

Lead elimination from internal materials of products

(Examples of the products that have completed lead elimination from all parts are listed on p. 15.)

Reduction of lead used for solder in products, for glass in electrode materials, and in stabilizers for polyvinyl chloride etc., and adoption of substitutes.

Promoting lead reduction and substitution by the end of December 2003

Actions

- Eliminating lead from solder in products (adoption of Sn-Ag and Sn-Cu solder)
- Adoption of lead-free glass as substitute
- Adoption of lead-free stabilizer as substitute

Lead elimination from solder for internal connections in disc ceramic capacitors

Actions Completed

Product structure (internal)
Typically, Sn-Ag or Sn-Cu solder is used for connection of the internal electrode and lead terminals.

Lead-free Sn solder (for connection of internal parts)
Internal electrode
Lead wire (Sn-Cu plating)

Reliability of lead-free soldered products
When the solder for connection of internal parts is replaced with lead-free solder, it has been proved that the capacitance of the product using the lead-free solder is equivalent to that of the conventional product using lead-containing solder.

Humidity loading test Life test

40°C, 95%RH, Rated voltage, After 500 hours 125°C, Rated voltage, After 100 hours

Capacitance change (%)

Sn-Cu Sn-Ag Sn-Pb Sn-Cu Sn-Ag Sn-Pb

Composition of solder for internal connections

Reduction in amount of lead contained in ceramics, and adoption of substitutes

Research on substitution of lead* contained in ceramics, some glass materials and free cutting alloys.
Reducing the amount of lead through manufacturing process improvement and product design improvement (miniaturization and surface mounting)

Conducting research and constantly examining the possibility of substitution

Actions

- Product miniaturization/surface mounting
- Development of high-property materials

* The lead contained in these parts is technically difficult to replace with other materials. Therefore, the present ELV Directive and RoHS Directive Draft exempt it from the ban.

Miniaturization of piezoelectric ceramic components

Actions Completed

Miniaturized piezoelectric components
Through product miniaturization, the amount of lead used in a product can be reduced.

Surface-mounting component [Ceramic resonator (CERALOCK®)]

CSTCS_MX CSTCG_V
4.7 x 4.1 x 2.0mm 2.0 x 1.3 x 0.95mm
Lead compound content reduction ratio: 99%

Lead component [Ceramic resonator (CERALOCK®)]
















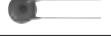



CST_MXW CSTLS_X
8 x 10 x 5mm 7 x 7 x 4mm
Lead compound content reduction ratio: 60%

● Actions to cope with the shift to lead-free solder Murata is promoting development, production and supply of products applicable to lead-free solder (typically, Sn-Ag-Cu solder).










List of products with lead-free terminals

The following are specifications and the supply period of the products that have completed lead elimination from their terminal plating, and from solder on terminal surfaces.












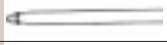






1 Capacitors

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Monolithic Ceramic Capacitors								
Soldering Electrode	GRP03/GRP15		Reflow	Sn-Pb	Sn	Available	In progress	Changed
Tin Plated Layer	GRM18/GRM21/GRM31		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Tin Plated Layer	GRM32/GRM43/GRM55		Reflow	Sn	Sn	Available	In progress	Unchanged
Smoothing	GJ2		Reflow	Sn-Pb	Sn	*1	*1	Changed
Low Dissipation	GJ615		Reflow	Sn-Pb	Sn	Available	In progress	Changed
High Frequency and High Power	ERF1D			Flow/Reflow	Sn	Sn	Available	In progress
High Frequency and High Power	ERF22	Reflow		Sn	Sn	Available	In progress	Unchanged
High Frequency and High Power	ERH1X/ERH3X		Reflow	Ag	Ag	Available	In progress	Unchanged
High Frequency	ERA11/ERA21		Flow/Reflow	Sn-Pb	Sn	*1	*1	Changed
High Frequency	ERA32		Reflow	Sn-Pb	Sn	*1	*1	Changed
High Frequency	ERD		Reflow	Ag	Ag	Available	In progress	Unchanged
High Frequency for Flow/Reflow Soldering	GQM		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Monolithic Microchip	GMA		Wire Bonding	Au	Au	Available	In progress	Unchanged
Automotive Soldering Electrode	GCP15		Reflow	Sn-Pb	Sn	Available	In progress	Changed
Automotive Soldering Electrode	GCM18/GCM21/GCM31		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Automotive Soldering Electrode	GCM32/GCM43/GCM55		Reflow	Sn	Sn	Available	In progress	Unchanged
Capacitor Array	GNM			Reflow	Sn	Sn	Available	In progress
Low ESL	LLL		Reflow	Sn	Sn	Available	In progress	Unchanged
● Monolithic Ceramic Capacitors for Medium-voltage								
Low Dissipation/ High-capacitance for General-use	GRM21/GRM31		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Low Dissipation/ High-capacitance for General-use	GRM32/GRM42/GRM43/GRM55		Reflow	Sn	Sn	Available	In progress	Unchanged
Only for Information Devices/ Tip & Ring	GR431		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Only for Information Devices/ Tip & Ring	GR432/GR442/GR443/GR455		Reflow	Sn	Sn	Available	In progress	Unchanged
● Monolithic Ceramic Capacitors Safety Standard Recognized	GA2/GA3		Reflow	Sn	Sn	Available	In progress	Unchanged
● Monolithic Ceramic Capacitors (lead type)	RPE		Flow	Sn-Pb	Sn-Cu	Available	In progress	Changed
● Ceramic Capacitors (12-500V)	DD		Flow	Sn-Pb	*1	*1	*1	*1
● High-voltage Ceramic Capacitors (250V-6.3kV)	DE		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
● Safety Standard Recognized Ceramic Capacitors	DE		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
● High-voltage Ceramic Capacitors (10-40kV)	DHR		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
	DHS		Screw Stop	Ni	Ni	Available	In progress	Unchanged
● High-frequency Power Ceramic Capacitors	DC5_C1B/DC5_C3B		Soldering Iron	Ag	Ag	Available	In progress	Unchanged
	DC5_C4B/DC5_C6B/DC5_C8B		Screw Stop	Ag	Ag	Available	In progress	Unchanged
	DCT/DCA			Screw Stop	Ni	Ni	Available	In progress

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 For specific information on part number change, contact the local Murata sales office or authorized distributor.
 The product appearance picture indicates only one type of the relevant series. The appearance may vary depending on the part number.











Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Ceramic Trimmer Capacitors								
Chip	TZR1		Reflow	(-)Au, (+)Sn	(-)Au, (+)Sn	Available	In progress	Unchanged
Chip	TZY2		Reflow	(-)Sn, (+)Sn	(-)Sn, (+)Sn	Available	In progress	Unchanged
Chip	TZV2		Reflow	(-)Au, (+)Sn	(-)Au, (+)Sn	Available	In progress	Unchanged
Chip	TZC3		Reflow	(-)Ag, (+)Ag	(-)Ag, (+)Ag	Available	In progress	Unchanged
Chip	TZB4		Reflow	Sn-Pb	Sn	Available	In progress	Unchanged
Leaded	TZ03		Flow/ Soldering Iron	Sn	Sn	Available	In progress	Unchanged
Leaded Taping	TZ03_T		Flow/ Soldering Iron	Sn-Pb	Sn-Cu	Available	In progress	Unchanged
● C Networks								
Low-profile	CGSD		Flow	Sn-Pb	Sn-Cu	Jun. 2003	Dec. 2003	Unchanged
	B□□C		Flow	Sn-Pb	Sn-Cu	Jun. 2003	Dec. 2003	Unchanged

2 Resistors / Thermistors
















Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● PTC Thermistors (POSISTOR®)								
for Heater	PTWS		Soldering Iron Ni	Ni	Ni	Available	In progress	Unchanged
for Heater	PTWT		Mechanical Connection	SUS	SUS	Available	In progress	Unchanged
for Overcurrent Protection Chip	PRG18		Reflow	Sn-Pb	Sn	Available	In progress	Changed
for Overcurrent Protection Leaded	PTGL		Flow	Sn-Pb	Sn-Cu	Available	In progress	Unchanged
for Overheat Sensing Chip	PRF18/PRF21		Reflow	Sn-Pb	Sn	Available	In progress	Changed
for Overheat Sensing Leaded	PTFL/PTFM		Flow	Sn-Pb	Sn-Cu	Available	In progress	Unchanged
for Degaussing Circuits Leaded	PTDL		Flow	Sn-Pb	Sn-Cu	Available	Aug. 2003	Unchanged
for Degaussing Circuits Case	PTDA/PTDC/PTDD		Flow	Sn	Sn	Available	In progress	Unchanged
for Motor Starters	PTH7M/PTH8M		Connectors	Cu-Ni	Cu-Ni	Available	In progress	Unchanged
● NTC Thermistors								
for Temperature Compensation	NCP18/NCP21		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
for Temperature Compensation	NCP03/NCP15		Reflow	Sn	Sn	Available	In progress	Unchanged
for Temperature Sensor	NTSA/NTSD		Flow	Sn-Pb	Sn-Cu	Available	In progress	Unchanged
for Inrush Current Suppression	NTPA		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
● High Voltage Resistors								
	MHR_PA		Flow	Sn-Pb	Sn	Available	Apr. 2003	Unchanged
	MHR_SA		Flow	Sn-Pb	Sn	Jun. 2003	Dec. 2003	Unchanged
● R Networks								
	RG		Flow	Sn-Pb	Sn	Jun. 2003	Dec. 2003	Unchanged
● Trimmer Potentiometers								
SMD Open 2mm Size	PVZ2		Reflow	Au	Au	Available	In progress	Unchanged
SMD Open 3mm Size	PVZ3		Reflow	Au	Au	Available	In progress	Unchanged

*1 For details, please contact Murata.



List of products with lead-free terminals

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
SMD Open 3mm Size	PVS3		Reflow	Sn-Pb	Sn	Available	In progress	Unchanged
SMD Open 3mm Size	PVA3		Flow/Reflow	(#2)Au, (#1,3)Sn-Pb	(#2)Au, (#1,3)Sn	Available	In progress	Unchanged
SMD Sealed 2mm Size	PVF2		Reflow	Au	Au	Available	In progress	Unchanged
SMD Sealed 3mm Size	PVG3		Reflow	Sn	Sn	Available	In progress	Unchanged
SMD Sealed 4mm Size	PVM4		Flow/Reflow	(#2)Au, (#1,3)Sn-Pb	(#2)Au, (#1,3)Sn	Available	In progress	Unchanged
SMD Sealed Multi-turns	PVG5		Reflow	Sn-Pb	Sn	Available	In progress	Unchanged
Leaded Sealed Single-turn	PVC6		Flow/Soldering Iron	Sn	Sn	Available	In progress	Unchanged
Leaded Sealed Single-turn	PV32/PV34		Flow/Soldering Iron	Sn-Pb	Sn-Cu	Available	In progress	Unchanged
Leaded Sealed Multi-turns	PV23/PV12/PV22/ PV36/PV37		Flow/Soldering Iron	Sn-Pb	Sn-Cu	Available	In progress	Unchanged
SMD Dust-proof 12mm Size	PVS1		Reflow	Au	Au	Available	In progress	Unchanged


















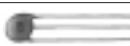


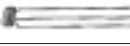




3 Coil / Delay Lines

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Chip Coils								
for High Frequency Horizontal Winding	LQW15A/LQW18A		Reflow	Sn	Sn	Available	In progress	Unchanged
for High Frequency Horizontal Winding	LQW2BH/LQW31H		Flow/Reflow	Sn-Pb	Sn-Cu	Available	In progress	Changed
for High Frequency Winding Ferrite	LQH31H		Flow/Reflow	Sn-Pb	Sn-Cu	Available	In progress	Changed
for High Frequency Monolithic	LQG15H		Reflow	Sn-Pb	Sn	Available	In progress	Changed
for High Frequency Monolithic	LQG18H		Reflow	Sn	Sn	Available	In progress	Unchanged
for High Frequency Film	LQP03T/LQP15T		Reflow	Sn	Sn	Available	In progress	Unchanged
for High Frequency Film	LQP15M/LQP18M		Reflow	Sn-Pb	Sn	Available	In progress	Changed
for General Use Winding	LQH31M/32M/ 43M(N)		Flow/Reflow	Sn-Pb	Sn-Cu	Available	In progress	Changed
for General Use Monolithic	LQM18N/LQM21N		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
for Choke Winding	LQH31C/LQH32C/ LQH43C		Flow/Reflow	Sn-Pb	Sn-Cu	Available	In progress	Changed
for Choke Monolithic	LQM21D/LQM21F/ LQM31F		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
for Choke Large Current	LQH55D		Reflow	Sn-Pb	Sn-Cu	Available	In progress	Changed
for Choke Large Current	LQH66S		Reflow	Sn-Pb	Sn-Cu	Available	In progress	Changed
● Chip Multilayer Delay Lines								
	LDH31/LDH32		Reflow	Sn	Sn	Available	In progress	Unchanged
	LDH43/LDH54/ LDH65/LDHA2		Reflow	Au	Au	Available	In progress	Unchanged






4 Noise Suppression Products / EMI Suppression Filters (EMIFIL®)

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Chip EMIFIL®								
Chip Ferrite Beads	BLM03		Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Ferrite Beads	BLM15		Reflow	Sn	Sn	Available	In progress	Unchanged

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Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
Chip Ferrite Beads	BLM18/BLM21/BLM31/BLM41		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Ferrite Beads Arrays	BLA2A		Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Ferrite Beads Arrays	BLA31		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Capacitor	NFM18/NFM21		Reflow	Sn	Sn	Available	In progress	Unchanged
Capacitor	NFM3D/NFM41		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Capacitor Array	NFA31		Reflow	Sn	Sn	Available	In progress	Unchanged
LC Combined	NFE31		Reflow	Sn,Ag	Sn,Ag	Available	In progress	Unchanged
LC Combined	NFE61		Flow/Reflow	Sn,Ag	Sn,Ag	Available	In progress	Unchanged
LC Combined	NFL18/NFL21		Reflow	Sn	Sn	Available	In progress	Unchanged
LC Combined	NFW31		Flow/Reflow	Sn-Pb	Sn-Cu	Available	Oct. 2003	Unchanged
RC Combined	NFR21G		Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Common Mode Choke Coils	DLM2HG		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Common Mode Choke Coils	DLP31D		Flow/Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Common Mode Choke Coils	DLP31S		Flow/Reflow	Ag	Ag	Available	In progress	Unchanged
Chip Common Mode Choke Coils	DLW21/DLW31		Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Common Mode Choke Coils	DLW5A/DLW5B		Reflow	Sn-Pb	Sn-Cu	Apr. 2003	Oct. 2003	Unchanged
● Lead Type EMIFIL®								
Inductor	BL01/BL02/BL03		Flow	Sn-Pb	Sn-Cu	Available	Jun. 2003	Unchanged
Capacitor	DS		Flow	Sn-Pb	Sn-Cu	Available	Jun. 2003	Unchanged
LC Combined	BNX		Flow	Sn-Pb	Sn-Ag-Cu	Apr. 2003	Oct. 2003	Unchanged
Common Mode Choke Coils	PLT09H		Flow	Sn-Pb	Sn	Apr. 2003	Oct. 2003	Unchanged
● EMIFIL® with Varistor Function	VFR3V/VFS6V/VFS9V		Flow	Sn-Pb	Sn-Cu	Available	Jun. 2003	Unchanged
● AC Line Filters	PLA/PLH/PLY		Flow	Sn-Pb	Sn-Cu	Oct. 2003	Oct. 2003	Unchanged
● RC/C Modules	ARCL/CNTL		Flow	Sn-Pb	*1	*1	*1	*1
● Microwaves Absorbers	EA		Tape Bonding	-	-	Available	In progress	Unchanged
● Ferrite Cores for EMI Suppression FS			-	-	-	Available	In progress	Unchanged

5 Resonators


















Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Ceramic Resonators (CERALOCK®)								
SMD MHz (Built-in Capacitance)	CSTCC_G		Reflow	Au	Au	Available	In progress	Unchanged
SMD MHz (Built-in Capacitance)	CSTCR_G		Reflow	Au	Au	Available	In progress	Unchanged
SMD MHz (Built-in Capacitance)	CSTCE_G		Reflow	Au	Au	Available	In progress	Unchanged
SMD MHz (Built-in Capacitance)	CSTCE_V		Reflow	Au	Au	Available	In progress	Unchanged
SMD MHz (Built-in Capacitance)	CSTCV_X_Q		Reflow	Au	Au	Available	In progress	Unchanged

*1 For details, please contact Murata.



List of products with lead-free terminals

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
SMD MHz (Built-in Capacitance)	CSTCG_V		Reflow	Au	Au	Available	In progress	Unchanged
SMD MHz (Built-in Capacitance)	CSTCW_X		Reflow	Sn	Sn	Available	In progress	Unchanged
SMD MHz	CSACV_X_Q		Reflow	Au	Au	Available	In progress	Unchanged
SMD MHz	CSACW_X		Reflow	Sn	Sn	Available	In progress	Unchanged
Leaded MHz (Built-in Capacitance)	CSTLS_G		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
Leaded MHz (Built-in Capacitance)	CSTLS_X		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
Leaded MHz	CSALS_X		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
SMD kHz	CSBFB		Reflow	Ag	Ag	Available	In progress	Unchanged
Leaded kHz	CSBLA		Flow	Ag	Ag	Available	In progress	Unchanged
● SAW Resonators	SARC		Reflow	Au	Au	Available	In progress	Unchanged
● BGS Resonators	MKRG A		Flow	Ag	Ag	Available	In progress	Unchanged
	MKRKA		Reflow	Au	Au	Available	In progress	Unchanged





















6 Piezoelectric Sound Components

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Piezoelectric Speakers (CERAMITONE®)	VSB		Soldering Iron	Sn-Pb	Sn-Ag-Cu	Available	Mar. 2003	Changed
● Piezoelectric Diaphragms	7BB/7MB/7NB/7SB		-	-	-	Available	In progress	Unchanged
Leaded	7BB_A		Soldering Iron	Sn-Pb	Sn-Ag-Cu	Available	Mar. 2003	Changed
● Piezoelectric Buzzers								
Pin	PKB24SPC/ PKB30SPC		Flow	Sn-Pb	Sn	Available	Mar. 2003	Changed
Leaded	PKB24SW		Soldering Iron	Sn-Pb	*1	*1	*1	*1
● Piezoelectric Sounders								
SMD	PKLCS		Reflow	Au	Au	Available	In progress	Unchanged
External-Drive Pin	PKM13EPY		Flow	Sn-Pb	Sn	Available	Mar. 2003	Changed
External-Drive Pin for 4kHz	PKM17EPP-4001		Flow	Sn-Pb	*1	*1	*1	*1
External-Drive Pin for 2kHz	PKM17EPP-2002		Flow	Sn	Sn	Available	In progress	Unchanged
External-Drive Pin	PKM17EPT		Flow	Sn	Sn	Available	In progress	Unchanged
External-Drive Pin	PKM22EPP		Flow	Sn-Pb	Sn	Available	Mar. 2003	Changed
External-Drive Pin	PKM22EP		Flow	Sn	Sn	Available	In progress	Unchanged
External-Drive Pin	PKM22EPT		Flow	Sn-Pb	Sn	Available	Mar. 2003	Changed
External-Drive Leaded	PKM17EW-2001		Soldering Iron	Sn-Pb	*1	*1	*1	*1
Self-Drive Pin	PKM30SPT		Flow	Sn-Pb	*1	*1	*1	*1
Self-Drive Pin	PKM24SP		Flow	Sn	Sn	Available	In progress	Unchanged
● Piezoelectric Ringers (PIEZORINGER®)								
External - Drive Leaded	PKM34EW		Soldering Iron	Sn-Pb	*1	*1	*1	*1



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 For specific information on part number change, contact the local Murata sales office or authorized distributor.
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Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
External - Drive Pin	PKM33EP		Flow	Sn-Pb	*1	*1	*1	*1
● Piezoelectric Receiver SMD (CERAMIPHONE®)	PKLCD		Reflow	Au	Au	Available	In progress	Unchanged

7 Filters for Communication Equipment

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Antennas/Duplexers								
Dielectric Duplexers (GIGAFIL®)	DFYK/DFYG		Reflow	Cu	Cu	Available	In progress	Unchanged
Dielectric Duplexers (GIGAFIL®)	DFYH		Reflow	Au	Au	Available	In progress	Unchanged
Dielectric Duplexers (GIGAFIL®)	DFYH (Partially)*2		Reflow	Sn-Pb	Au	Available	Jun. 2003	Unchanged
● for RF/Local								
Dielectric Band Pass Filters (GIGAFIL®)	DFCB		Reflow	Cu	Cu	Available	In progress	Unchanged
Dielectric Band Pass Filters (GIGAFIL®)	DFCH		Reflow	Au	Au	Available	In progress	Unchanged
Dielectric Band Pass Filters (GIGAFIL®)	DFCH (Partially)*2		Reflow	Sn-Pb	Au	Available	Jun. 2003	Unchanged
Chip Multilayer LC Filters	LFB/LFL/LFH		Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Multilayer Diplexers	LFD21/LFD31		Reflow	Sn	Sn	Available	In progress	Unchanged
Chip Multilayer LC Trap	LFE		Reflow	Sn	Sn	Available	In progress	Unchanged
● for IF								
SMD Ceramic Filters (CERAFIL®) kHz	SFPCA		Reflow	Ag	Ag	Available	In progress	Unchanged
SMD Ceramic Filters (CERAFIL®) kHz	CFUCG/CFUCF		Reflow	Ag	Ag	Available	In progress	Unchanged
SMD Ceramic Filters (CERAFIL®) kHz	CFXCA		Reflow	Au	Au	Available	In progress	Unchanged
SMD Ceramic Filters (CERAFIL®) kHz	CFXCD		Reflow	Au	Au	Available	In progress	Unchanged
SMD Ceramic Filters (CERAFIL®) kHz	CFWCA		Reflow	Ag	Ag	Available	In progress	Unchanged
SMD Ceramic Filters (CERAFIL®) MHz	SFECS		Reflow	Ag	Ag	Available	In progress	Unchanged
Leaded Ceramic Filters (CERAFIL®) kHz	CFULA/CFULB		Flow	Ag	Ag	Available	In progress	Unchanged
Leaded Ceramic Filters (CERAFIL®) kHz	CFWLA/CFWLB		Flow	Ag	Ag	Available	In progress	Unchanged
SMD Ceramic Discriminators MHz	CDBC B		Reflow	Ag	Ag	Available	In progress	Unchanged
SMD Ceramic Discriminators kHz	CDSCA		Reflow	Au	Au	Available	In progress	Unchanged
Leaded Ceramic Discriminators kHz	CDBLA/CDBLB		Flow	Ag	Ag	Available	In progress	Unchanged
Chip LC Filters	LFB		Reflow	Sn	Sn	Available	In progress	Unchanged
BGS Filters	MKFK		Reflow	Au	Au	Available	In progress	Unchanged

8 Microwave Components




















Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Isolators	CE04/05/07		Reflow	Ag	Ag	Available	In progress	Unchanged
● Chip Multilayer Hybrid Baluns	LDB		Reflow	Sn	Sn	Available	In progress	Unchanged

*1 For details, please contact Murata.





*2 The information may vary depending on part number. For specific information on each part number, please contact Murata.

Continued on the following page. 




List of products with lead-free terminals

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Chip Multilayer Hybrid Couplers	LDC/LDD		Reflow	Sn	Sn	Available	In progress	Unchanged
● Chip Multilayer Antennas	LDA		Reflow	Au	Au	Available	In progress	Unchanged
● Chip Dielectric Antennas	ANC		Reflow	Ag	Ag	Available	In progress	Unchanged
● Dielectric Resonators (RESOMICS®)								
TE Mode Resonators	DRD/DRT		-	-	-	Available	In progress	Unchanged
TE Mode Resonators Support	DRZ		-	-	-	Available	In progress	Unchanged
Substrate	DRP		-	-	-	Available	In progress	Unchanged
TEM Mode Resonators Silver	DRR_S		Reflow	Sn-Pb	Ag	Mar. 2003	Jun. 2003	Unchanged
TEM Mode Resonators Copper	DRR_C		Reflow	Ag	Ag	Available	In progress	Unchanged
● High-frequency Monolithic Ceramic Capacitors	CLB		Wire Bonding	Au	Au	Available	In progress	Unchanged
● Coaxial Connectors								
with Switches SWD	MM8430		Reflow	Au,Ag	Au,Ag	Available	In progress	Unchanged
FSC	MM7329		Reflow	Au	Au	Available	In progress	Unchanged
GSC	MM9329		Reflow	Au,Ag	Au,Ag	Available	In progress	Unchanged
BFA	MM3325/MM3326		Flow	Au,Ag	Au,Ag	Available	In progress	Unchanged
FSC Cable	MXFG76FG/MXFG76XX/ MXFK81FK/MXFK81XX		-	-	-	Available	In progress	Unchanged
FSC Cable	MXFG76XX_A/ MXFK81XX_A		Soldering Iron	Sn-Pb	Sn-Ag-Cu	Available	Dec. 2003	*1
GSC Cable	MXTK_TK/ MXTK_XX		-	-	-	Available	In progress	Unchanged
GSC Cable	MXTK_XX_A		Soldering Iron	Sn-Pb	Sn-Ag-Cu	Available	Dec. 2003	*1
BFA Cable	MXYH_YH/ MXYH_XX		-	-	-	Available	In progress	Unchanged
BFA Cable	MXYH_XX_A		Soldering Iron	Sn-Pb	Sn-Ag-Cu	Available	Dec. 2003	*1























9 Microwave Modules

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● RF Diode Switches	LMSW		Reflow	Au,Sn-Pb	Au,Sn-Ag-Cu	Available	Dec. 2003	Unchanged
SWITCHPLEXER®	LMSP		Reflow	Au,Sn-Pb	Au,Sn-Ag-Cu	Available	Dec. 2003	Unchanged
● VCOs	MQ		Reflow	Cu-Ni-Au (typ.) (surface) Sn-Sb (typ.) (soldering plate)	Available	In progress	Unchanged	
● PLL Modules	HFQ		Reflow	Cu-Ni-Au (typ.) (surface) Sn-Sb (typ.) (soldering plate)	Available	In progress	Unchanged	





10 Filters for Audio Visual Equipment

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Ceramic Filters for AM								
Leaded	SFULA/SFZLA		Flow	Ag	Ag	Available	In progress	Unchanged
Leaded	SFPLA/CFULA/ CFWLA		Flow	Ag	Ag	Available	In progress	Unchanged
Leaded	PFSLA/PFWLA		Flow	Sn-Pb	*1	*1	*1	*1

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 For specific information on part number change, contact the local Murata sales office or authorized distributor.
 The product appearance picture indicates only one type of the relevant series. The appearance may vary depending on the part number.

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
SMD	PFWCC		Reflow	Au	Au	Available	In progress	Unchanged
SMD	SFPCA		Reflow	Ag	Ag	Available	In progress	Unchanged
● Ceramic Filters for AM Search Stop BFULA			Flow	Ag	Ag	Available	In progress	Unchanged
● Ceramic Filters for FM								
SMD	SFECS		Reflow	Ag	Ag	Available	In progress	Unchanged
SMD	SFEKV		Reflow	Ag	Ag	Available	In progress	Unchanged
Leaded	SFELA/SFELB/SFKLA/SFVLA		Flow	Sn-Pb	Sn-Cu	Mar. 2003	Oct. 2003	Changed
Leaded	SFTLA		Flow	Sn-Pb	*1	*1	*1	*1
● Ceramic Discriminators for FM								
SMD	CDACV		Reflow	Ag	Ag	Available	In progress	Unchanged
SMD	CDSCA		Reflow	Au	Au	Available	In progress	Unchanged
Leaded	CDALA		Flow	Sn-Pb	*1	*1	*1	*1
● Ceramic Filters for TV/VCR								
SMD	SFSKA		Reflow	Au	Au	Available	In progress	Unchanged
Leaded	SFSRA		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
Leaded (Chroma Signal)	SFSRH		Flow	Sn-Pb	*1	*1	*1	*1
Leaded (Low-profile)	SFSRL		Flow	Sn-Pb	*1	*1	*1	*1
Leaded (High-selectivity)	SFTRD		Flow	Sn-Pb	*1	*1	*1	*1
● Ceramic Discriminators for TV/VCR CDSRH/CDSRL			Flow	Sn-Pb	*1	*1	*1	*1
● Ceramic Traps for TV/VCR								
SMD	TPSKA/TPWKA		Reflow	Au	Au	Available	In progress	Unchanged
Leaded	TPSRA		Flow	Sn-Cu	Sn-Cu	Available	In progress	Unchanged
● BGS Traps MKTG			Flow	Ag	Ag	Available	In progress	Unchanged
● SAW Filters								
SMD	SAWK		Reflow	Au	Au	Available	In progress	Unchanged
Leaded	SAFG/SAWG		Flow	Sn-Pb	Sn	Apr. 2003 *3	Aug. 2003 *3	Changed
● BGS Filters MKFGA			Reflow	Au	Au	Available	In progress	Unchanged

11 Products for Video Equipment



Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Tuners								
for TV/VCR	TU700		Flow	Sn-Pb(Frame), Sn-Pb(Terminal)	Sn-Zn(Frame), Sn(Terminal)	Apr. 2003	Oct. 2003	Unchanged
for CATV	CAPTU1000		Flow	Sn-Pb(Frame), Sn-Pb(Terminal)	Sn-Zn(Frame), Sn(Terminal)	Apr. 2003	Oct. 2003	Unchanged
● Flyback Transformers MSU			Flow	Sn-Pb	Sn, Sn-Cu-Ni	Available	Mar. 2003	Unchanged
Primary Control System Modules MSP			Flow	Sn-Pb	Sn-Cu-Ni	Available	Mar. 2003	Unchanged

*1 For details, please contact Murata.




*3 The information may vary depending on part number. For details, please contact Murata.

Continued on the following page. 



List of products with lead-free terminals

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● High-voltage CR Blocks	MSC		Soldering Iron	Sn-Pb	Sn	Available	Mar. 2003	Unchanged
● Focus Adjusting Resistors	MHF		Soldering Iron	Sn-Pb	Sn	Available	In progress	Unchanged











12 Power Supplies

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Switching Power Supplies	MPA/MPN/MPS/MPW		Connectors	*4	*4	Available*4	In progress *4	Unchanged
● High-voltage Power Supplies	MPH/MPL		Connectors	*4	*4	Available*4	In progress *4	Unchanged
Piezoelectric Inverters	HFV/MPV		Connectors	*4	*4	Available*4	In progress *4	Unchanged
● DC/DC Converters	HFP		*4	*4	*4	Available*4	In progress *4	Unchanged

13 Functional Modules / Hybrid ICs







Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Hybrid ICs (HIC®/HLS®)								
Cut-off Module	H8D		Flow	Sn-Cu-Ni	Sn-Cu-Ni	Available	In progress	Unchanged
High Frequency Active Filter	AFE/AFM/AFL		Reflow	Pb-Sn-Sb	Sn-Ag-Cu	Apr. 2003	Oct. 2003	Unchanged

14 Sensors

Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
● Pyroelectric Infrared Sensors	IRA		Soldering Iron	Au	Au	Available	In progress	Unchanged
● Pyroelectric Infrared Sensor Modules	IMD-B10		Soldering Iron	Ni	Ni	Available	In progress	Unchanged
● Ultrasonic Sensors								
Water Proof (Connector)	MA40E8/MA40E9/MA40M		Connectors	Sn	Sn	Available	In progress	Unchanged
Water Proof (Leaded)	MA40E7		Soldering Iron	Sn-Pb	Sn	May. 2003	*1	Unchanged
Open Structure	MA40B/MA40S		Soldering Iron	Sn-Pb	Sn	May. 2003	*1	Unchanged
High Frequency	MA200A1/MA400A1/MA80A1		Soldering Iron	Sn-Pb	Sn	May. 2003	*1	Unchanged
● Shock Sensors								
SMD	PKGS		Reflow	Sn	Sn	Available	In progress	Unchanged
Leaded	PKS		Soldering Iron	Sn-Pb	Sn-Ag-Cu	Available	*1	Unchanged
● Piezoelectric Gyroscopes (GYROSTAR®)	ENC-03J		Soldering Iron	Sn-Pb	Sn-Cu	*1	*1	Unchanged
	ENC-03M		Reflow	Au	Au	Available	In progress	Unchanged
	ENV-05F-03		Flow	Sn-Pb	*1	*1	*1	Unchanged
● Non-contact Potentiometers	LP		Soldering Iron	Au	Au	Available	In progress	Unchanged
● Rotary Sensors	FR05CM12AL		Soldering Iron	Sn-Pb	Sn	Apr. 2003	*1	Unchanged
	FR05CM21AR		Soldering Iron	Sn-Pb	Sn	Apr. 2003	*1	Unchanged
	FR05CM65AF		Soldering Iron	Sn-Pb	Sn	Apr. 2003	*1	Unchanged



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Product	Series	Appearance	Mounting Methods	Conventional Composition	Lead-free composition	Sample	Mass Production	Part Number Change
	FR12AM32AC		Connectors	Ni	Ni	Available	In progress	Unchanged
● Magnetic Pattern Recognition Sensors	BS05C		Soldering Iron	Sn-Pb	Sn	Apr. 2003	*1	Unchanged
	BS05M		Soldering Iron	Sn-Pb	Sn	Apr. 2003	*1	Unchanged
	BS05N		Soldering Iron	Sn-Pb	Sn	Apr. 2003	*1	Unchanged
	BS05W		Soldering Iron	Sn-Pb	Sn	Apr. 2003	*1	Unchanged
● Electric Potential Sensors	PKE		Connectors	Sn-Pb	*1	*1	*1	Unchanged

*1 For details, please contact Murata.

Lead elimination from internal materials of products (examples of the products that have completed lead elimination from all parts)

As a result of our efforts in lead reduction and substitution for lead used in the solder for internal parts connection and other parts of products, some products completed lead elimination from all parts. The following are examples of Murata's completely lead-free products:

Chip Monolithic Ceramic Capacitors
Safety Standard Recognized



Trimmer Potentiometers PVZ2 series, etc.



Chip Coils LQG18HN series, etc.



Multilayer Devices LFB31_S series, etc.



The above products are only examples. In addition to the above, some other products have completed lead elimination from all parts. For details, please contact Murata.
For specific information on Murata's lead-eliminating activities, including composition of each part and production/supply schedule for each product, please contact the local Murata sales office or authorized distributor.

⚠ Note:**1. Export Control**

⟨For customers outside Japan⟩

Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

⟨For customers in Japan⟩

For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage to a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

- | | |
|-----------------------------|---|
| ① Aircraft equipment | ② Aerospace equipment |
| ③ Undersea equipment | ④ Power plant equipment |
| ⑤ Medical equipment | ⑥ Transportation equipment (vehicles, trains, ships, etc.) |
| ⑦ Traffic signal equipment | ⑧ Disaster prevention / crime prevention equipment |
| ⑨ Data-processing equipment | ⑩ Application of similar complexity and/or reliability requirements to the applications listed in the above |

3. Product specifications in this catalog are as of February 2003. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering. Especially, please read rating and ⚠ CAUTION (for storage, operating, rating, soldering, mounting and handling) in them to prevent smoking and/or burning, etc.

5. You are able to read a detailed specification in the website of Search Engine (<http://search.murata.co.jp/>) or catalog library (<http://www.murata.com/catalog/>) before to require our product specification or to transact the approval sheet for product specification.

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7. No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.

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