

For Automotive
Electronics

Passive Components

Selection Guide



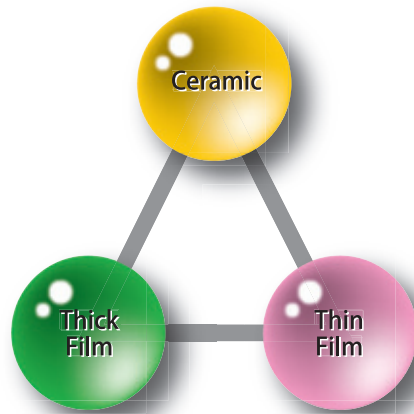
KOA

<http://www.koaglobal.com>

Wide range Passive components

KOA's wide product lineup offers you the passive components you want. Our flagship products are resistors, inductors and thermistors. We also offer you some useful components such as overcurrent protection fuses, over-voltage / ESD protection varistors and platinum thermal sensors for precise temperature detection.

Combined components and higher scale integration into hybrid ICs of these elements are also provided.



Supreme Technology

KOA has developed a ceramic technology which helps to enhance its current portfolio of thick and thin film technologies.

These new and unique products are based on the future-orientated technologies and will help to support your new product design.

While helping to save the development time with simulation, KOA's new products are innovated taking into consideration heat radiation design, as well as supporting applications under high temperatures. KOA's solutions are designed to offer support on circuit designs focusing on "speed", and are also in a position to offer new products based on your requested functionality and timing.

The results of these new developments are products with the highest reliability, even in the smallest size.

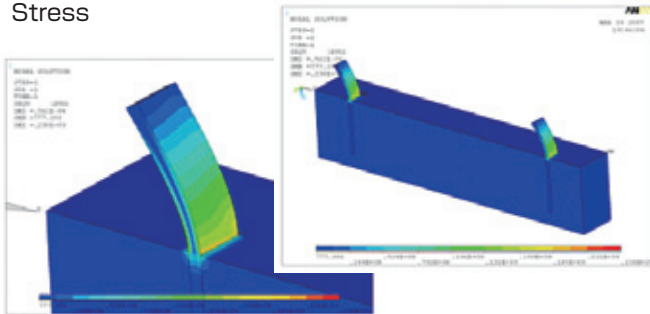
Considering the environment, we are supplying lead-free terminals and lead-free products compliant with the regulations such as RoHS, WEEE, ELV, REACH and halogen-free.

We are willing to receive your various requests: "Can you make such a product?"



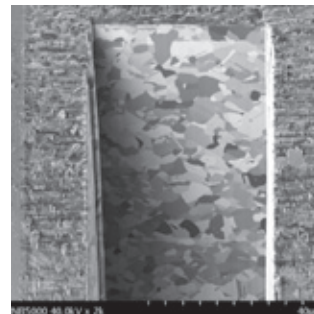
LTCC (Low Temperature Co-fired Ceramic) Substrate

Simulation Stress

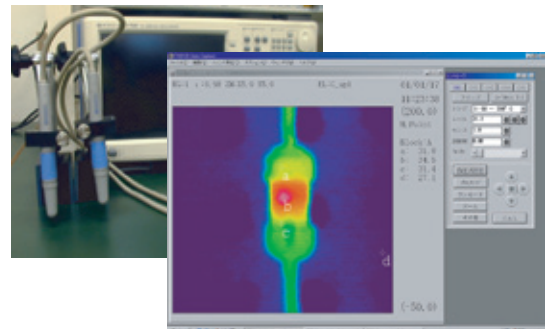


Analysis

FIB-SEM observation image

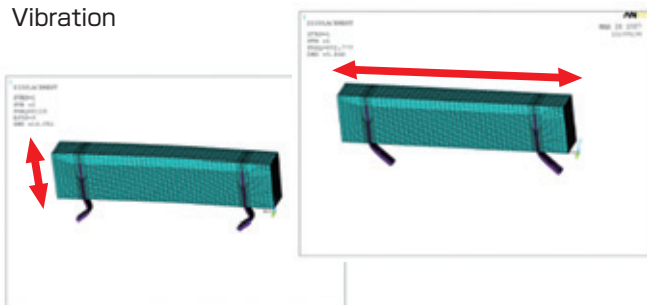


EO Sampling Oscilloscope



High Sensitivity Infrared
Radiation Thermometer

Vibration





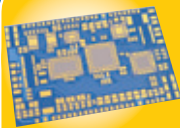
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For Autom



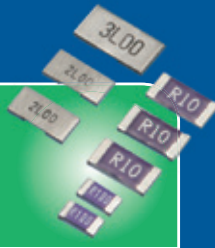
Current Sensing Resistors

TLR	Metal Plate Chip Resistors
Features	Metal plate type, 0.5m~20mΩ 0402~2512 inch size TLRZ : Jumper Type 0.2mΩ Max.~ TLRH : Low T.C.R. Type 6mΩ~270mΩ
Performance	Power rating : 0.5W~5W T.C.R. : ±50×10 ⁻⁶ /K~
PS	Chip Type Power Shunt Resistors
Features	Metal plate type 2 terminal : PSL2/2512 inch, PSJ2/3920 inch size 4 terminal : PSF4/1216 inch, PSG4/2725 inch size
Performance	Power rating : ~12W Resistance Range : PSL2/PSJ2:0.2mΩ~ PSF4/PSG4:0.5mΩ,1mΩ T.C.R. : ±50×10 ⁻⁶ /K~
SL	Current Detecting Chip Resistors
Features	Resin molded type, 3m~22MΩ TSL : Low Profile Type SLN : Low T.C.R. Type
Performance	Power rating : 0.75W~7W T.C.R. : ±50×10 ⁻⁶ /K~
HS	Power Shunt Resistors (Large Current)
Features	Metal plate type (Bus bar and Cable can be screwed on.) 4015~ millimeter size Correct electric current detection by a voltage pin is possible.
Performance	Current rating : ~600A Resistance Range : 0.1mΩ~ T.C.R. : ±50×10 ⁻⁶ /K~
WK73S	Wide Terminal Type Flat Chip Resistors
Features	Thick film wide termination type, 10m~9.76Ω 0612~1225 inch size WK73S_RT : Anti Sulfuration Type WU73 : Low T.C.R. Type (±100×10 ⁻⁶ /K), 10m~100mΩ
Performance	T.C.R. : ±100×10 ⁻⁶ /K~ Operating temp. range : -55°C~+155°C
UR73V, SR73	Low Resistance Flat Chip Resistors
Features	Thick film type, 10m~10Ω 0201~2512 inch size UR73V : Low T.C.R. Type (±75×10 ⁻⁶ /K~) SR73_RT : Anti Sulfuration Type
Performance	T.C.R. : ±75×10 ⁻⁶ /K~ Operating temp. range : -55°C~+155°C



LTCC Substrate

KLC	LTCC Multilayer Substrate
Features	Low dielectric-loss and low loss conductors. High temperature and humidity tolerant. KA・MCM : Custom Hybrid IC
Performance	Stack accuracy : 20μm max. Line & space : 60μm min. Substrate flatness : 30μm (/15mm) max.



Thick Film Resistors



RK73, WK73R	Flat Chip Resistors
Features	General purpose to precision. RK73_RT : Flat Chip Resistors (Anti Sulfuration) WK73R_RT : Wide Terminal (Anti Sulfuration)
Performance	Resistance tolerance : ±0.25%~±5% Operating temp. range : -55°C~+155°C
SG73	Anti Surge Flat Chip Resistors
Features	Excellent surge resistant characteristic. SG73S : Anti Surge (Precision) SG73P : Anti Pulse (Precision) SG73_RT : Surge Resistors (Anti Sulfuration)
Performance	Resistance tolerance : ±0.5%~±20% Operating temp. range : -55°C~+155°C

Engine Control Unit

Chip resistors : **RK73**
Anti sulfuration : **RK73_RT**
High power chip resistors : **WK73**
Anti sulfuration : **WK73R/S_RT**
Current detecting resistors :
SL, TLR, WK73S
Anti surge resistors : **SG73/S/P**
Anti sulfuration surge :
SG73_RT
Chip varistors : **NV73DL/DS**
Thermal sensors : **SDT73V, SDT101B, SDT310VASP**

Electric Power Steering

Precision chip resistors :
RN73H, KPC
Current detecting resistors :
TLR, PS, SL
Anti sulfuration surge :
SG73/S/P
Thermal sensors : **SDT73V, LT**

Air Flow Sensors

Platinum thermal sensors : **SDT101B, SDT310VASP**

Engine Ignition

Ceramic resistors : **CPCN**

Transmission Control

Current detecting resistors :
TLR, SL, WK73S
Thermal sensors : **SDT73V, SDT101B**

Air Conditioner Control System

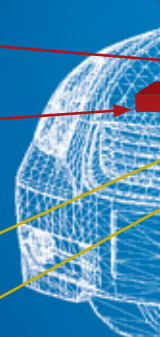
Current detecting : **TLR, SL**
Thermal sensors : **LT73V**
Varistors : **NV73DL/DS**

Electric Pump

Current detecting resistors :
TLR, SL

HID・Headlight Control

Anti surge resistors : **S**
Current detecting resistors :
SL, LR, BPR, WK73S
Anti sulfuration :
RK73_RT, SG73_RT, WK
Chip varistors : **NV73D**
LED current limiting : **L**
Choke coils : **LPC**
Thermal sensors : **LT73**



Network Resistors



CN	Chip Networks
Features	4 elements of SMD resistor arrays, Convex and concave termination available. CN1J4 : Concave Termination Type CN1E4K, CN1J4A, 1J4K : Convex Termination Type
Performance	Resistance tolerance : $\pm 1\% \sim \pm 5\%$ Operating temp. range : $-55^{\circ}\text{C} \sim +155^{\circ}\text{C}$

Power Resistors



BxR	Ceramic Case Resistors
Features	BGR : Wirewound Resistors (Glass Core) BWR : Wirewound Resistors (Ceramic Core) BSR : Metal Oxide Film Resistors (Ceramic Core)
Performance	Resistance range : $0.1 \sim 75\text{k}\Omega$ Power rating : $1\text{W} \sim 10\text{W}$ (70°C), $15\text{W} \sim 40\text{W}$ (25°C) Operating temp. range : $-40^{\circ}\text{C} \sim +155^{\circ}\text{C}$

CPCN	Ceramic Resistors/Noise suppressor
Features	Noise reduction of engine ignition circuit. $10.7 \times 3.5\text{mm} \sim 18.3 \times 7.2\text{mm}$
Performance	Resistance : 1k, 2k, 5k, 10k, 15k Ω Power rating : $0.5\text{W} \sim 2\text{W}$ Operating temp. range : $-40^{\circ}\text{C} \sim +200^{\circ}\text{C}$

MOS	Metal Oxide Resistors
Features	Flame retardant coating (Equivalent to UL94V-0) Power rating : $0.5\text{W} \sim 5\text{W}$ MOSX : Small Metal Film Resistors
Performance	Resistance range : $10 \sim 100\text{k}\Omega$ MOSX : $0.1 \sim 9.1\Omega$ Operating temp. range : $-55^{\circ}\text{C} \sim +200^{\circ}\text{C}$

Infotainment Car Navigation

Choke coils : LPC
High freq. inductors : KQ
Chip fuses : CCF, CCP, TF
Chip varistors : NV73DL/DS
Thermal sensors : LT73V

Hybrid System DC/DC Converter

Current detecting resistors : TLR, PS, SL, LR72
Precision chip resistors : RN73H, KPC
Anti sulfuration surge : SG73
Chip varistors : NV73DL/DS
Thermal sensors : LT73V

Hybrid System

Pre-charge resistor,
Discharge resistance
power resistors : BGR, BSR
Inverter for temperature compensation
Thermal sensors : LT73V, SDT73V

Battery Management System

Precision chip resistors : RN73H, KPC
Current detecting resistors : TLR, PS, SL
Cell balancing : WK73R, TF16VN

Exhaust Emissions Sensor Control Circuit

Precision chip resistors : RN73H, KPC
Current detecting : SL, WK73S

Tire-Pressure Monitoring System

High freq. inductors : KQ

ABS • Brake Control System

Current detecting : SL, SR73
Precision resistors : RN73H, KPC
Thermal sensors : SDT73V, SDT101B
Choke coils : LPC

Body Control Module

Current detecting : SR73, WK73S
Anti surge resistors : SG73
Chip varistors : NV73DL/DS

Smart Key System

Current detecting resistors : SL, TSL
High freq. inductors : KQ

Instrument Panel, Electronic Relay

Current detecting resistors : TLR, SL, TSL, SR73, WK73S

Power Seat Control

Current detecting : SL, TSL, BPR, SR73
Varistors : NV73DL/DS

Seatbelt Control

Current detecting resistors : TLR, SL
Choke coils : LPC

Motor Control for Power Window, Door and Mirror

Current detecting resistors : SL, TSL, SR73, WK73S
Anti surge resistors : SG73/P/S
Chip varistors : NV73DL/DS
Choke coils : LPC

73V

ontrol
G73/P
istors :

73_RT
DL/DS
MOS

8V

Products

Selection



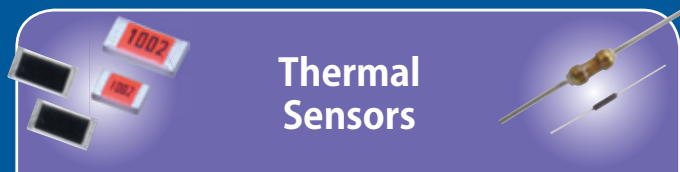
Thin Film Resistors

RN73H	Thin Film Flat Chip Resistors
Features	High precision Excellent in long term stability 0402~1210 inch size
Performance	Resistance tolerance: $\pm 0.05\%$ ~ T.C.R.: $\pm 5 \times 10^{-6}/K$ ~ Operating temp. range: $-55^{\circ}C \sim +155^{\circ}C$
KPC	Thin Film Resistor Networks
Features	Ultra high precision High reliability package SOT-23, QSOP, SOIC-N
Performance	Relative resistance tolerance: $\pm 0.05\%$ ~ Tracking T.C.R.: $\pm 5 \times 10^{-6}/K$ ~ Operating temp. range: $-55^{\circ}C \sim +125^{\circ}C$



Circuit Protectors

NV73DL/DS	Multilayer Metal Oxide Chip Varistors
Features	Surge voltage protectors. Suitable for the countermeasure against ESD and load dump surge 0603~1206, 2420 inch size
Performance	Varistor voltage: 12~82V Maximum peak current (8/20 μ s): 80~300A Operating temp. range: $-40^{\circ}C \sim +125^{\circ}C$
TF16VN	Chip Current Fuses
Features	SMD over current protectors. Rapid change of temp. $-55^{\circ}C/+125^{\circ}C$, 1000 cycles
Performance	Rated current: 0.80~3.15A Rated voltage: 32V Operating temp. range: $-55^{\circ}C \sim +125^{\circ}C$
TF10/16	Chip Current Fuses
Features	SMD over current protectors. Rapid change of temp. $-55^{\circ}C/+125^{\circ}C$, 10 cycles
Performance	Rated current: 0.2~5.0A Rated voltage: 24V, 32V Operating temp. range: $-55^{\circ}C \sim +125^{\circ}C$
CCF/CCP	Chip Current Fuses
Features	Surface mounting fuses with ceramic body. Rapid change of temp. $-55^{\circ}C/+125^{\circ}C$, 100 cycles 2410/1206, 1210 inch size
Performance	Rated current: 0.4~15A Rated voltage: DC 60~160V/24~76V Operating temp. range: $-55^{\circ}C \sim +125^{\circ}C/-40^{\circ}C \sim +125^{\circ}C$



Thermal Sensors

SDT310VASP	Small type Platinum Thin Film Thermal Sensors (Small Heater Element)
Features	Resistance value 20 Ω Usable as a heater of hot film flow sensor. Thermal time constant 3.2s
Performance	Resistance tolerance: $\pm 1\%$ Power rating: 0.5W Operating temp. range: $-55^{\circ}C \sim +600^{\circ}C$
SDT101B	Platinum Thin Film Thermal Sensors
Features	Resistance value: 10, 100, 500 Ω Usable as a heater of hot film flow sensor.
Performance	Resistance tolerance: $\pm 0.5\%$ ~ T.C.R.: $+3500 \times 10^{-6}/K$ ~ Operating temp. range: $-55^{\circ}C \sim +300^{\circ}C$
SDT73V	Platinum Thermal Chip Sensors
Features	SMD platinum thin film thermal sensors. T.C.R. is in accordance with JIS, IEC standards.
Performance	Resistance tolerance: $\pm 0.2\%$ ~ T.C.R.: $+3850 \pm 50 \times 10^{-6}/K$ ~ Operating temp. range: $-55^{\circ}C \sim +155^{\circ}C$
LT73V	Linear PTC Flat Chip Resistors
Features	SMD thin film thermal sensors.
Performance	Rated ambient temp. $+85^{\circ}C$ Resistance tolerance: $\pm 2\%$, $\pm 5\%$ T.C.R.: $+150 \sim +4500 \times 10^{-6}/K$ ~ Operating temp. range: $-55^{\circ}C \sim +155^{\circ}C$



Inductors

LPC	Power Chip Inductors
Features	High rated current, Low DC Resistance. LPC4235/4545/4045
Performance	Inductance range: 0.82 μ H~2.2mH Allowable DC current: 0.12A~3.66A Operating temp. range: $-40^{\circ}C \sim +125^{\circ}C$
KQ	Chip Inductors for High Frequency Circuits
Features	KQ: Air-Core Chip Inductors (High Q)
Performance	Inductance range: 1n~10 μ H Inductance tolerance: $\pm 2\%$ ~ Operating temp. range: $-40^{\circ}C \sim +125^{\circ}C$




Guide

- Below are our products recommended for automotive applications.
- Ask our business contact for other products applicable to automotive applications.

Category	Type	Product Name	Operating Temperature		AEC-Q200 Data	note
			Lower (°C)	Upper (°C)		
Thick Film Resistors	RK73	Flat Chip Resistors	-55	155	○※	※Exemption B/H : 1F
	RK73_RT	Flat Chip Resistors (Anti Sulfuration)			○	
	SG73/S/P	Surge Current Flat Chip Resistors			○	
	SG73/S/P_RT	Surge Resistors (Anti Sulfuration)			○	
	WK73R	Wide Terminal Type Flat Chip Resistors			○	
	WK73R/S_RT	Wide Terminal (Anti Sulfuration)			○	
	HV73V	Flat Chip Resistors (High Voltage)			○	
	CN	Chip Networks			○※	※CN1E4K, CN1J4/A/K
Current Detecting Resistors	SR73	Low Resistance Flat Chip Resistors	-55	150	○※	※Exemption 1H
	SR73_RT	Low Resistance Flat Chip Resistors (Anti Sulfuration)			○	
	UR73V	Low Resistance Flat Chip (Low T.C.R.)			○	
	WK73S/WU73	Wide Terminal Type Low Resistance		155	○	
	SL/TSL/SLN	Current Detecting Chip Resistors	-55※	180	○	※SLN5: -65 to 180°C
	TLR	Metal Plate Chip Resistors	-65	170※1	○※2	※1 1E: to 125°C, 2A: to 155°C ※2 Exemption 1E"
	TLRH	Metal Plate Chip Resistors		170※	○	※2A: -65 to 155°C
	PSB/E/I	Chip Type Power Shunt Resistors		155	○	
	PSJ2/L2/G4/F4	Chip Type Power Shunt Resistors		175	○	
	HS	Large Current shunt	-65	175	○	
Thin Film Resistors	RN73H	Thin Film Flat Chip Resistors	-55	155	○	
	KPC	Thin Film Resistor Networks		125※	—	155°C is Custom Check the use conditions
	RN41	Melf Type Thin Film Resistors		155	○※	※Only 2E5/3A5
Power Resistors	MOS (X)	Metal Oxide Film Resistors	-55	200	—	Check the use conditions
	HPC	Ceramic Resistors	-40		○	
	CPCN	Ceramic Resistors			—	Check the use conditions
	BWR	Wirewound Resistors (Ceramic Core)		—	Check the use conditions	
	BGR	Wirewound Resistors (Glass Core)		155	—	Check the use conditions
	BSR	Metal Oxide Film Resistors	—	—	Check the use conditions	
Thermal Sensors	SDT310VASP	Small type Platinum Thin Film Thermal Sensors (Small Heater Element)	-55	600	○	
	SDT101B	Platinum Thin Film Thermal Sensors	-55	300	○※	※Only 500Ω
	SDT73V	Platinum Thermal Chip Sensors	-40	155	○	
	LT73V	Linear PTC Flat Chip Resistors	-55	155	○	
Circuit Protectors	NV73DL/DS	Multilayer Metal Oxide Chip Varistors	-40	125	○	
	TF16VN	Chip Current Fuses (For Automotive)	-55		○	
	TF10/16	Chip Current Fuses	-55		—	Check the use conditions
	CCF	Chip Current Fuses	-55		—	Check the use conditions
	CCP	Chip Circuit Protectors			—	Check the use conditions
Inductors	LPC	Power Chip Inductors	-40	85	○※	※4045
	LPC4235 • 4545	Power Chip Inductors		125	○	
	KQ	Air-Core Chip Inductors		125	○	
LTCC	KLC	LTCC Multilayer Substrate	—	—	—	Check the use conditions

○: Applicable — : N/A

● Description of classification by use for automotive

Power train • Chassis control system 	Engine ECU • Transmission ECU • Battery management system and inverter control unit of hybrid vehicle • Electric power steering, ABS, Electric brake etc., operating temperature range of the installation environment is roughly	-40°C~+155°C
Body electrical system 	Electric pump, Electric mirror • Power seat • Air-bag ECU • Head lamp control • TPMS • Rader system etc., operating temperature range of the installation environment is roughly	-40°C~+105°C
Accessories 	Car-audiovideo • Navigation • ETC • Back sonar • Back monitoring camera etc., operating temperature range of the installation environment is roughly	-40°C~+85°C

- The categories are our own example and will not limit the use of the products nor guarantee the performance unconditionally.
- Should you wish to use the products introduced here contact our sales because this is only a guide to decide which product is to be used for automotive applications. Test and check the products mounted on the actual applications.

Quality - 1st

Increased clock speed and miniaturization in computers, AV and portable equipment demand miniaturization and high integration for their components. On the other hand, high reliability is required by infrastructures in network, automotive, medical and measurement equipment.

With the "Quality 1st" management policy, KOA has been making an effort to provide superior products which satisfy customers.

We have been registered for the quality management system ISO/TS16949, which takes advantage of former ISO9001 and QS9000, and the environment management system ISO14000. We also have been training all employees to provide advanced skills.

All of us always focus on "Quality" first.

Our new solutions, which are beyond simple sales activities, are suitable for your business model and will strengthen both companies with synergy.

**Required products
in the nick of time
as much as you want**

Services

KOA provides top level services and global support with a world wide production and sales organization. Our immediate reply will contribute to your design activity and productivity with our supply chain management support.

Our business area covers all electronic business fields. So our sales are less affected by business cycles. We have been making an effort to maintain a stable supply. We can provide you various solutions and products from standard to custom products according to your order system and distribution.

Moreover, various kinds of technical support are available such as product information on the website, answers and support for several questions and quick delivery for sample requests.

In addition to offering product information, our customer-conscious support has been highly regarded for the proposal of components and/or a simulation based on a circuit operation. We elaborate the support from the waveform analysis for anti-pulse and thermal design for PCB to EMC evaluation.

We are willing to hold customized seminars on your request from a basic educational program for circuit design beginners to a technical forum introducing latest technology and trends for professionals. Please consult with us.

We always welcome you sincerely.

Standards Registration

ISO 9001 Dec. 1994

ISO/TS16949 Oct. 2003

ISO 14001 Apr. 1998

ISO/IEC17025 Jul. 2007

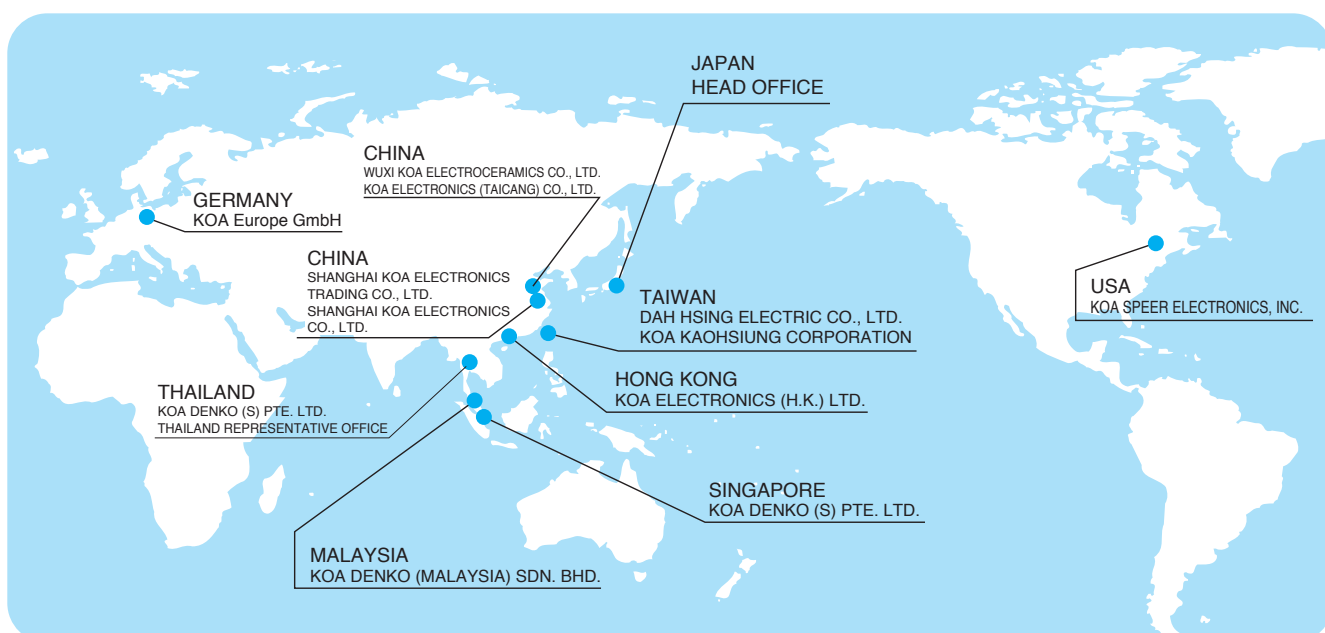
Production and Quality

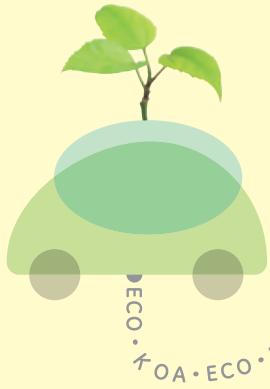
We have been training each employee to provide customers safe and high quality products which you can use with perfect reliability. All the employees and the manufacturing division are in a body with the confidence that each of us build quality. Therefore, we have been improving quality and reliability every year.

Using the highest level in-house analyzing equipment, we will immediately reply to analysis of failure and research for environmental hazardous contents.

KOA's unique KPS (Koa Profit System) activity, based on our just-in-time policy, has improved lead time, ratio of facility turnover, and above all, a short and well-regulated process with our Shop system. In addition to your satisfaction with our QCD support, our total SCM activity, which included information exchange and improved physical distribution will support your productivity.

Concerned with the environment, our manufacturing aims to reducing discharge of CO₂ and to achieve zero-emission. We have realized a clean process and green products by a reduction of environmental hazardous substance. Additionally, we have been promoting a company-wide green purchasing and green procurement plan.





www.koaglobal.com

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Japan	JAPAN	GLOBAL SALES CENTER	2-17-2 MIDORI-CHO, FUCHU-SHI, TOKYO 183-0006, JAPAN TEL [+81] 42-336-5755 FAX [+81] 42-336-5353
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	CHINA	上海可爾電子貿易有限公司 SHANGHAI KOA ELECTRONICS TRADING CO., LTD.	中国上海市漕河涇新興技術開發區桂平路581号 NO.581 GUIPING ROAD, CAO HE JING, SHANGHAI, 200233, CHINA TEL [+86] 21-64320101 FAX [+86] 21-64320083
	CHINA	上海興亞電子元件有限公司 SHANGHAI KOA ELECTRONICS CO., LTD.	中国上海市漕河涇新興技術開發區桂平路581号 NO.581 GUIPING ROAD, CAO HE JING, SHANGHAI, 200233, CHINA TEL [+86] 21-64850723 FAX [+86] 21-64852960
	CHINA	無錫興和電子陶瓷有限公司 WUXI KOA ELECTROCERAMICS CO., LTD.	中国江蘇省宜興市和橋鎮西鋤村向山路1号 HEQIAO, YIXING CITY, JIANGSU PROVINCE, 214215, CHINA TEL [+86] 510-87871645 FAX [+86] 510-87871626
	CHINA	興和電子(太倉)有限公司 KOA ELECTRONICS (TAICANG) CO., LTD.	中国江蘇省太倉市太倉經濟開發區洛陽東路77号 NO. 77 LUOYANG EAST ROAD, TAICANG ECONOMY DEVELOPMENT AREA, TAICANG, JIANGSU PROVINCE, 215400, CHINA TEL [+86] 512-53561111 FAX [+86] 512-53561600
	TAIWAN	大興電工股份有限公司 DAH HSING ELECTRIC CO., LTD.	中華民國台北市南京東路1段34號平安大樓11樓 11TH FLOOR PING-AN MANSION, NO.34 SEC.1, NAN-KING EAST ROAD, TAIPEI, TAIWAN TEL [+886] 2-2521-4166 FAX [+886] 2-2564-1859
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