

For Automotive Electronics

# Passive Components

Selection Guide



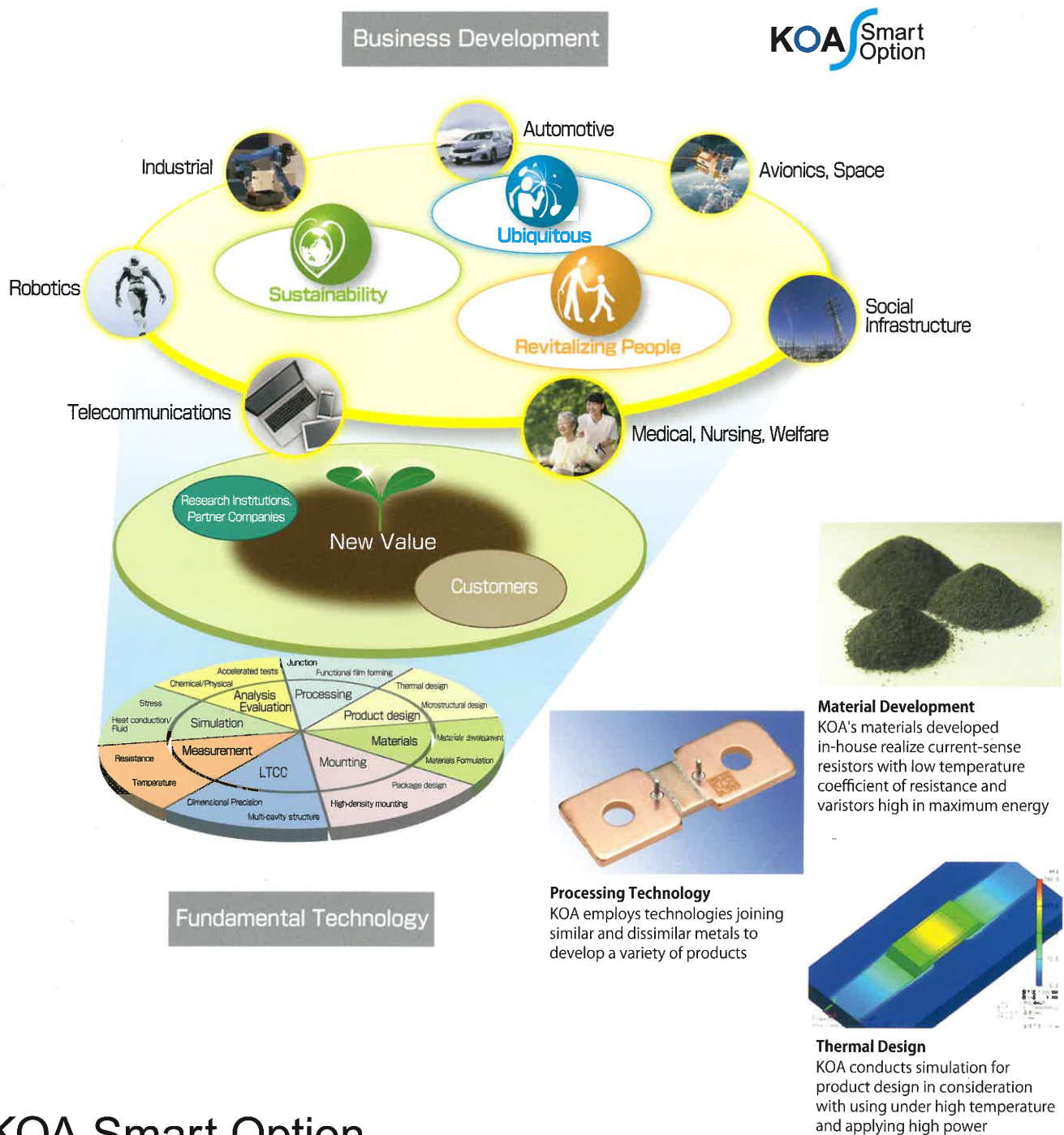
[www.koaglobal.com](http://www.koaglobal.com)

# For the future, create New Value together with customers

## Creation of New Value

KOA, for nearly 30 years, has been engaging in business improvement activities under the banner of the KPS (KOA Profit System) with the involvement of all employees. Currently, KOA is in the third phase of KPS to focus on building a business model of offering New Value to its customers by tapping into its product development capabilities made possible by its fundamental technologies to capitalize on innovations transpiring in the future.

KOA, since its foundation over 70 years ago, has accumulated a variety of fundamental technologies for Materials, Processing, Evaluation, etc., in the process of expanding its electronic components business with resistors being its mainstay products. Through deepening further and linking its fundamental technologies and by pursuing Open Innovation with research institutions working on cutting-edge projects and with partner companies, KOA is striving to create New Value together with its customers.



## KOA Smart Option

It is our wish that even in new markets that emerge from innovations, choosing KOA as a partner is the "smart option" for our customers.





www.koaglobal.com

# For Autom



## Thick Film Resistors

<b>RS73F/RK73F/RK73G</b>	<b>Precision</b>
Features	Excellent Resistance Tolerance and T.C.R. RS73 : Low T.C.R., High Reliability (Ultra Precision) RK73F : Low T.C.R. (Ultra Precision)
Performance	Resistance tolerance : $\pm 0.1\%$ ~ T.C.R. : $\pm 25 \times 10^{-6}/K$ Long term stability : 0.2%~
<b>HRK73</b>	<b>High Temperature</b>
Features	Suitable for conductive glue mounting 0603~1206 inch Size
Performance	Operating temp. range : $-55^{\circ}C \sim 200^{\circ}C$
<b>WK73R</b>	<b>Wide Terminal Type</b>
Features	High rated power and resistant to heat cycle 0204~1225 inch Size WG73 : Anti Surge (2010 inch size)
Performance	Power rating : 0.33W~3W
<b>SG73</b>	<b>Anti Surge • Anti Pulse</b>
Features	SG73S : Anti Surge (Precision) SG73P : Anti Pulse (Precision) SG73G : Low T.C.R. Type (Ultra Precision)
Performance	Resistance tolerance : $\pm 0.25\%$ ~ $\pm 20\%$ T.C.R. : $\pm 50 \times 10^{-6}/K$ ~
<b>HV73V</b>	<b>High Voltage</b>
Features	Excellent for higher Working Voltages 0603~1206 inch Size
Performance	Max. working voltage : $\sim 800V$ (1206 inch size)
<b>□-RT</b>	<b>Anti Sulfuration</b>
Features	Excellent anti-sulfuration characteristic Line up various types from general purpose to low resistance General, Precision, Anti Surge, Wide Terminal, High Voltage, Network, Low resistance
Performance	Resistance tolerance : $\pm 0.1\%$ ~ $\pm 20\%$



## Current Sensing Resistors

<b>HS</b>	<b>Large Current Type</b>
Features	Bus bar and Cable can be screwed on. 4015 millimeter~ size Correct electric current detection by a voltage pin is possible
Performance	Current rating : $\sim 600A$ Resistance Range : 0.1m~0.2m $\Omega$ T.C.R. : $\pm 50 \times 10^{-6}/K$ ~
<b>PS</b>	<b>Chip Type Power Shunt</b>
Features	Metal plate type 2 terminal : PSL2/2512 inch, PSJ2/3920 inch size 4 terminal : PSF4/1216 inch, PSG4/2725 inch size
Performance	Resistance Range : PSL2/PSJ2:0.2m $\Omega$ ~ PSF4/PSG4:0.5m $\Omega$ , 1m $\Omega$ Power rating : $\sim 12W$ T.C.R. : $\pm 50 \times 10^{-6}/K$ ~
<b>TLR</b>	<b>Metal Plate</b>
Features	0402~2512 inch size TLRZ : Jumper Type 0.2m $\Omega$ Max.~ TLRH : Low T.C.R., 6m~270m $\Omega$ (0805, 2512 inch size)
Performance	Resistance Range:0.5m~20m $\Omega$ Power rating : 0.25~5W T.C.R. : $\pm 50 \times 10^{-6}/K$ ~
<b>SL</b>	<b>Molded Type</b>
Features	SLN : Low T.C.R. Type
Performance	Resistance Range:3m~360m $\Omega$ Power rating : 0.75~7W T.C.R. : $\pm 50 \times 10^{-6}/K$ ~
<b>WU73/WK73S</b>	<b>Thick Film Wide Terminal Type</b>
Features	Thick film wide termination type, 10m~9.76 $\Omega$ Resistant to heat cycle WU73 : Low T.C.R. Type (0612 inch size)
Performance	Power Rating : 0.75~3W T.C.R. : $\pm 75 \times 10^{-6}/K$ ~
<b>UR73V/SR73</b>	<b>Thick Film</b>
Features	Thick film type, 10m~10 $\Omega$ 0201~2512 inch size UR73V : Low T.C.R. Type (0805, 1206 inch size)
Performance	Power Rating : 0.166~2W T.C.R. : $\pm 75 \times 10^{-6}/K$ ~



## Network Resistors

<b>CN</b>	<b>Chip Networks</b>
Features	4 elements of SMD resistor arrays, CN1J4 : Concave Termination Type CN1E4K, 1J4K : Convex Termination Type
Performance	Resistance tolerance : $\pm 1\%$ ~ $\pm 5\%$



## LTCC Substrate

<b>KLC</b>	<b>LTCC Multilayer Substrate</b>
Features	Excellent high frequency performance ceramics of low dielectric-loss Custom Hybrid IC is available
Performance	Dielectric constant : 7, C.T.E. : $5.5 \times 10^{-6}/K$ Conductor resistivity : Silver 2.5m $\Omega \cdot cm$ Line/Space : 60/60 $\mu m$ Min.



# otive Electronics KOA



## Thin Film Resistors



HVD	Thin Film Resistors Network For High Voltage Divider	RN73H	Thin Film Flat Chip Resistors
Features	High precision high voltage divider Relative precision of pair resistors is guaranteed High reliability, long term stability package	Features	High precision Excellent in long term stability 0402~1210 inch size
Performance	Max. working voltage : ~1000V Resistance range : ~11.5MΩ Operating temp. range : -55°C~+155°C	Performance	Resistance tolerance : ±0.05%~ T.C.R. : ±5×10 <sup>-6</sup> /K~ Operating temp. range : -55°C~+155°C
KPC	Thin Film Resistor Networks	LT73V	Linear PTC Flat Chip Resistors
Features	Ultra high precision High reliability, long term stability package SOT-23, QSOP 16/20/24, SOIC 08/14/16	Features	SMD thin film thermal sensors
Performance	Relative resistance tolerance : ±0.05%~ Tracking T.C.R. : ±5×10 <sup>-6</sup> /K~ Operating temp. range : -55°C~+125°C (155°C is custom)	Performance	Rated ambient temp. : 85°C Resistance tolerance : ±2%, ±5% T.C.R. : 150~4500×10 <sup>-6</sup> /K

### EV/PHEV Inverter

Current sensing : PS, TLR, SL  
High Temperature : HRK73  
Anti surge, Anti pulse : SG73/S/P/G  
High Voltage : HV73V  
Precision :  
RS73, RK73F, HVD, RN73H, KPC  
High Power : BGRV, BSRV  
Thermal sensors : LT73V

### EV/PHEV Battery Management System

Large current shunt : HS  
Current sensing : PS, TLR, SL  
High Voltage : HV73V  
High voltage divider : HVD  
Precision :  
RS73, RK73F, RN73H, KPC  
Cell balancing :  
SG73S/P/G, WK73R, TF16VN

### EV/PHEV DC/DC Converter

Current sensing :  
PS, TLR, SL  
Anti surge, Anti pulse :  
SG73/S/P/G  
Precision :  
RS73, RK73F, HVD,  
RN73H, KPC  
Chip varistors :  
NV73DL/DS  
Thermal sensors :  
LT73V

### EV/PHEV On board charger

Current sensing :  
PS, TLR, SL  
High Voltage : HV73V  
Pre-charge,  
Discharge : BGRV, BSRV  
Thermal sensors :  
LT73V, SDT73V

### Engine ECU

Current sensing :  
TLR, SL, WK73S, WU73, UR73V  
High power : WK73  
Anti surge, Anti pulse : SG73/S/P/G  
Anti sulfuration :  
WK73\_RT, SG73\_RT, SR73\_RT  
Chip varistors : NV73DL/DS

### ASC/ESC Brake Control System

Current sensing :  
PS, TLR, SL, WK73S, WU73, UR73V, SR73  
Precision : RN73H, KPC  
Thermal sensors : SDT73V, SDT101B  
Choke coils : LPC

### Air Flow Sensors

Platinum thermal sensors :  
SDT310VASP, SDT101B

### Engine Ignition

Ceramic resistors : CPCN

### Transmission Control

Current sensing :  
TLR, SL, WK73S, WU73, UR73V  
High Temperature :  
HRK73

### Anti sulfuration :

WK73\_RT, SG73\_RT, SR73\_RT

### Air Conditioner Control System Electric compressor

Current sensing : PS, TLR, SL  
Varistors : NV73DL/DS  
Thermal sensors : LT73V

### Electric Pump Oil Pump/Fuel Pump/Water Pump

Current sensing : PS, TLR, SL  
Anti surge, Anti pulse : SG73S/P/G

### LED/HID Headlight Control

Current sensing : SL, WK73S  
Anti surge, Anti pulse : SG73/S/P/G  
Anti sulfuration :  
WK73\_RT, SG73\_RT, SR73\_RT  
Current limiting : MOS  
Chip varistors : NV73DL/DS  
Choke coils : LPC  
Thermal sensors : LT73V

### AFS/Auto leveling

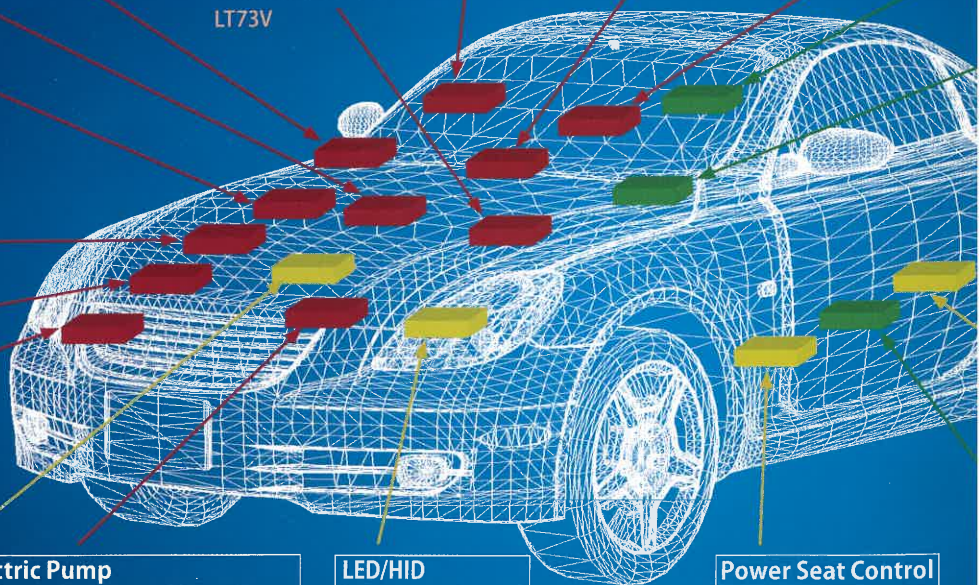
Current sensing : UR73V, SR73

### Power Seat Control

Current sensing :  
SL, UR73V, SR73  
Varistors : NV73DL/DS

### Seatbelt Control

Current sensing : TLR, SL  
Choke coils : LPC





# Products

# Selection

## Thermal Sensors

### SDT310VASP Small type Platinum Thin Film Thermal Sensors (Small Heater Element)

**Features**  
Resistance value 20Ω  
Usable as a heater of hot film flow sensor  
Thermal time constant 3.2s

**Performance**  
Resistance tolerance: ±1%  
Power rating: 0.5W  
Operating temp. range: -55°C~+600°C

### SDT101B/SDT73V Platinum Thin Film Thermal Sensors

**Features**  
SDT101B: Leded type (Resistance: 10, 100, 500Ω)  
Usable as a heater of hot film flow sensor  
SDT73V: SMD type (Resistance: 100, 500Ω)

**Performance**  
Resistance tolerance: ±0.2%~  
T.C.R.:  $3500 \times 10^{-6}/K$  (SDT101B),  $3850 \times 10^{-6}/K$  (SDT73V)  
Operating temp. range: -55°C~+300°C (SDT73V: ~155°C)

### Electric Power Steering

Current sensing:

PS, TLR, SL

Precision: RN73H, KPC

Anti surge, Anti pulse:

SG73/S/P/G

### ADAS

Camera, millimeter wave, LIDAR,  
HUD, Electric mirror

Current sensing:

WK73S, WU73, UR73V, SR73

Anti surge, Anti pulse: SG73/S/P/G

Chip varistors: NV73DL/DS

### Infotainment Car Navigation

Current sensing: UR73V

Chip fuses: TF16VN

Chip varistors: NV73DL/DS

Choke coils: LPC

High freq. inductors: KQ

Thermal sensors: LT73V

### Exhaust Emissions Sensor Control Circuit

Precision: RN73H, KPC

Current sensing: SL, WK73S

Thermal sensors: SDT310VASP

### Tire-Pressure Monitoring System

High freq. inductors: KQ

### Body Control Module

Current sensing:

WK73S, WU73, UR73V, SR73

Anti surge, Anti pulse: SG73/S/P/G

Chip varistors: NV73DL/DS

### Motor Control for Power Window, Door and Mirror

Current sensing:

TLR, SL, WK73S, WU73, UR73V, SR73

Anti surge, Anti pulse: SG73/P/S/G

Chip varistors: NV73DL/DS

Choke coils: LPC

### Smart Key System

Current sensing: SL

High freq. inductors: KQ

## Power Resistors

### B□RV Ceramic Case Resistors

**Features**  
Resistors with ceramic case  
BGRV: Wirewound Resistors (Glass Core)  
BSRV: Metal Oxide Film Resistors (Ceramic Core)

**Performance**  
Resistance range: 0.51~56kΩ  
Power rating: 15W~40W  
Operating temp. range: -40°C~+155°C

### CPCN Ceramic Resistors/Noise suppressor

**Features**  
Noise reduction of engine ignition circuit.  
10.7×3.5mm~18.3×7.2mm  
2NS: SUS304 Electrode cap

**Performance**  
Resistance: 1k, 2k, 5k, 10k, 15kΩ  
Power rating: 0.5W~2W  
Operating temp. range: -40°C~+200°C

## Inductors

### LPC Power Chip Inductors

**Features**  
High rated current, Low DC Resistance  
LPC4235/4545/4045

**Performance**  
Inductance range: 0.82μH~2.2mH  
Allowable DC current: 0.12A~3.66A

### KQ Chip Inductors for High Frequency Circuits

**Features**  
Air Core Chip Inductors(High Q)

**Performance**  
Inductance range: 1nH~10μH  
Inductance tolerance: ±2%~

## Circuit Protectors

### TF16VN Chip Current Fuses

**Features**  
SMD over current protectors  
Rapid change of temp. -55°C/+125°C, 1000 cycles

**Performance**  
Rated current: 0.40~3.15A  
Rated voltage: 32V

### NV73DL/DS Multilayer Metal Oxide Chip Varistors

**Features**  
Surge voltage protectors  
Suitable as countermeasure against ESD and load dump surge  
0603~1206, 2420 inch size

**Performance**  
Varistor voltage: 12~82V  
Maximum peak current (8/20μs): 80~300A




# 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)			○			
	RS73	High Reliability Flat Chip Resistors			○			
	RS73_RT	High Reliability Flat Chip Resistors (Anti Sulfuration)			○			
	SG73/S/P/G	Surge Current Flat Chip Resistors			○			
	SG73/S/P_RT	Surge Current Flat Chip Resistors (Anti Sulfuration)			○			
	WK73R/WG73	Wide Terminal Type Flat Chip Resistors/Anti Surge			○			
	WK73R/S_RT	Wide Terminal (Anti Sulfuration)			○			
	HV73V	High Voltage Flat Chip Resistors			○			
	CN	Chip Networks			○※	※CN1E4K, CN1J4/K		
	HRK73	High Temperature Flat Chip Resistors			200	○		
Current Detecting Resistors	SR73	Low Resistance Flat Chip Resistors	-55	155	○※	※Exemption 1H		
	SR73_RT	Low Resistance Flat Chip Resistors (Anti Sulfuration)			○			
	UR73V	Low Resistance Flat Chip (Low T.C.R.)			○			
	WU73/WK73S	Wide Terminal Type Low Resistance			○			
	SL/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"
	TLRZ	Metal Plate Chip Jumper			-55	155	○	
	TLRH	Metal Plate Chip Resistors				170※	○	※2A: -65 to 155°C
Thin Film Resistors	PSB/E/I	Chip Type Power Shunt Resistors	-65	155	○			
	PSJ2/L2/G4/F4	Chip Type Power Shunt Resistors			○			
	HS	Large Current shunt			○			
	RN73H	Thin Film Flat Chip Resistors			155	○		
	KPC	Thin Film Resistor Networks			125※	—	※155°C is Custom	
Power Resistors	HVD	Thin Film Resistors Network For High Voltage Divider	-55	155	○			
	RN41	Melf Type Thin Film Resistors			155	○※	※Only 2ES/3AS	
	BGRV	Wirewound Resistors (Glass Core)			155	○		
Thermal Sensors	BSRV	Metal Oxide Film Resistors	-40	200	○			
	CPCN/HPC	Ceramic Resistors			—	Check the use conditions		
	SDT310VASP	Small type Platinum Thin Film Thermal Sensors (Small Heater Element)			600	○		
	SDT101B	Platinum Thin Film Thermal Sensors			300	○※	※Only 500Ω	
Circuit Protectors	SDT73V	Platinum Thermal Chip Sensors	-55	155	○			
	LT73V	Linear PTC Flat Chip Resistors			○			
Inductors	NV73DL/DS	Multilayer Metal Oxide Chip Varistors	-40	125	○			
	TF16VN	Chip Current Fuses (For Automotive)	-55	125	○			
	LPC4235・4545	Power Chip Inductors	-40	125	○			
LPC4045	Power Chip Inductors	○						
KQ	Air-Core Chip Inductors	○						
LTCC	KLC	LTCC Multilayer Substrate	—	—	—	Check the use conditions		

○: Applicable — : N/A

## ● Description of classification by use for automotive

 <b>Power train・Chassis control system</b>	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
 <b>Body electrical system</b>	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
 <b>Accessories</b>	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

Auto market has been evolving with the keywords "environment", "safety" and "convenience". People shift to using electric vehicles with consideration for environment while electronic control is increasingly promoted.

Furthermore, safety control including ADAS(Advanced Driver Assistance System) are enriched and high precision sensing and control system are being developed toward automatic driving, electronic components are indispensable for all these applications that require high performance and reliability.

As miniaturization of portal devices, development of wearable devices and IoT business spreading, small size and high performance electronic devices are required.

High reliability to support safe society is indispensable for medical devices, measuring equipment and infrastructure facilities including telecommunication base station and data center. Under the management policy of Quality 1st and to meet the markcustomer requirements, we promote the activities to achieve Zero Defect Flow and high quality products. For Quality Management System, we have ISO 9001 registration, ISO/TS16949 registration for automotive market, environment management system ISO14001 and ISO/ IEC17025 registration for analysis laboratory of environmental hazardous materials.

# Service

KOA provides top level global support with a worldwide production and sales organization.

Our website is multilingual with latest product information in Japanese, English and Chinese.

We will help your product inquiries and requests for technical support. Please visit our website.

KOA Website: [www.koaglobal.com](http://www.koaglobal.com)

# Standards Registration

ISO 9001 Dec. 1994

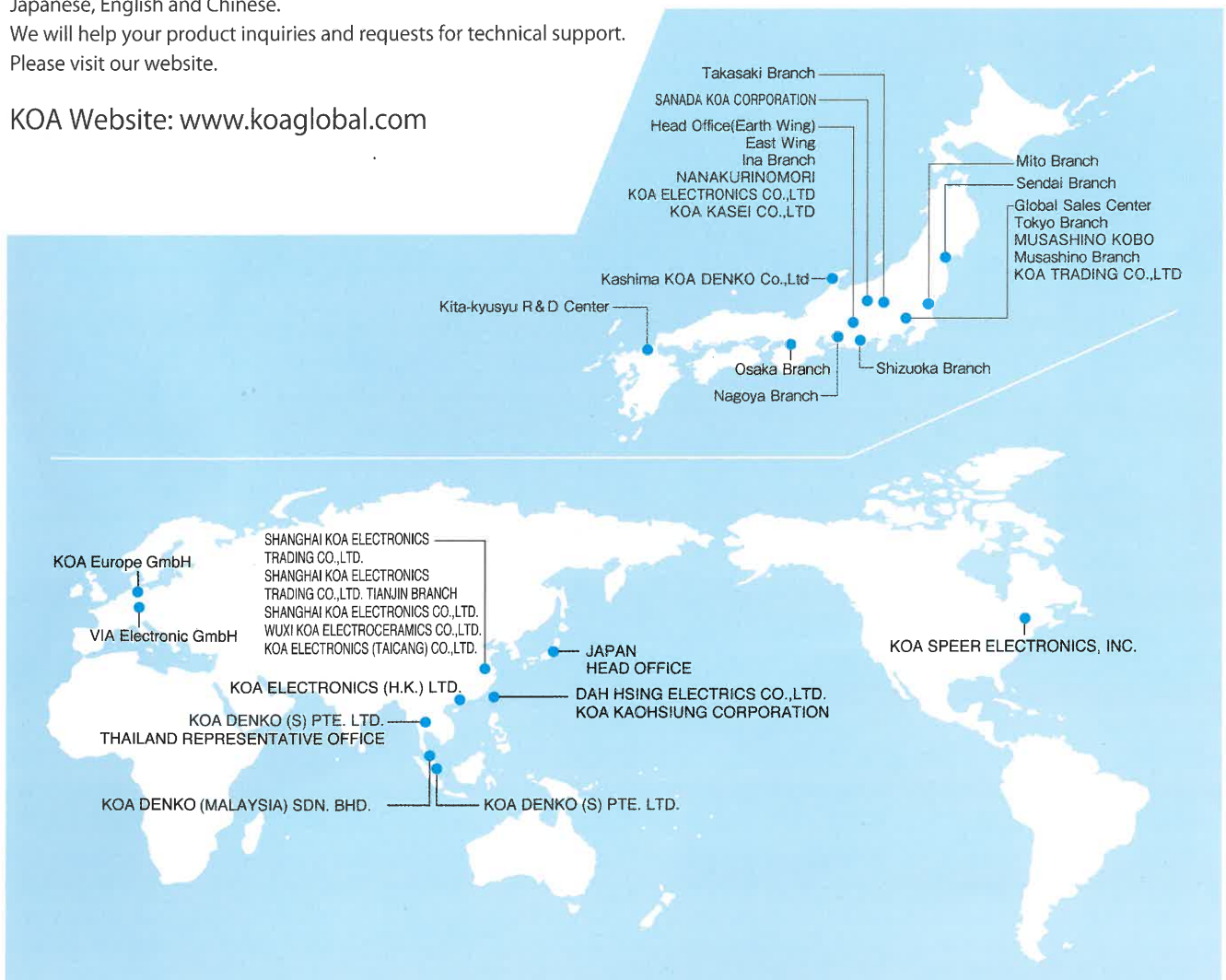
IATF16949 May. 2018

ISO 14001 Apr. 1998

ISO/IEC17025 Jul. 2007

# Production

KOA's production through solid supply chain supports production activities and flexibly responses to customers' requirements by KOA's unique production improvement activity, KPS activity, based on our just-in-time policy, only what is needed, when it is needed, and in the amount needed. We operate environment management system conformed to ISO14001, as the name of "Father Sun", to promote green procurement as well as to reduce environmental risks by zero emission, environmental accident protection and energy saving activities.





www.koaglobal.com



## KOA Overseas Sales Offices

Area	Country	Sales Offices	Address
Japan	<u>JAPAN</u>	GLOBAL SALES CENTER	2-17-2 MIDORI-CHO, FUCHU-SHI, TOKYO 183-0006, JAPAN TEL [+81] 42-336-5755 FAX [+81] 42-336-5353
North and South America	<u>USA</u>	KOA SPEER ELECTRONICS, INC.	199 BOLIVAR DRIVE, BRADFORD, PA. 16701, USA TEL [+1] 814-362-5536 FAX [+1] 814-362-8883
Europe	<u>GERMANY</u>	KOA Europe GmbH	KADDENBUSCH 6, D-25578 DÄGELING ITZEHOE, GERMANY TEL [+49] 4821-8989-0 FAX [+49] 4821-8989-89
Asia	<u>SINGAPORE</u>	KOA DENKO (S) PTE. LTD.	72 BENDEMEER ROAD, #06-28 LUZERNE, SINGAPORE 339941 TEL [+65] 63395151 FAX [+65] 63398556
	<u>THAILAND</u>	KOA DENKO (S) PTE. LTD. THAILAND REPRESENTATIVE OFFICE	38 Q.HOUSE CONVENT BLDG. 7TH FLOOR UNIT 7CD, CONVENT RD., SILOM, BANGRAK, BANGKOK 10500 THAILAND TEL [+66] 2632-0382 FAX [+66] 2632-0903
	<u>HONG KONG</u>	KOA ELECTRONICS (H.K.) LTD.	UNIT 2315, METROPOLIS TOWER, 10 METROPOLIS DRIVE, HUNG HOM, KOWLOON, HONG KONG TEL [+852] 2492-6918 FAX [+852] 2492-7398
	<u>CHINA</u>	上海可爾電子貿易有限公司 SHANGHAI KOA ELECTRONICS TRADING CO., LTD.	中国上海市漕河泾新興技術開發区桂平路581号 NO.581 GUIPING ROAD, CAO HE JING, SHANGHAI, 200233, CHINA TEL [+86] 21-64320101 FAX [+86] 21-64320083
	<u>CHINA</u>	上海可爾電子貿易有限公司天津分公司 SHANGHAI KOA ELECTRONICS TRADING CO., LTD. TIANJIN BRANCH	中国天津市和平区南京路219号天津中心8楼823室 Rm 823, No.216, Nanjing RD, Heping District Tianjin CHINA TEL [+86] 21-64320101 FAX [+86] 21-64320083
	<u>TAIWAN</u>	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
	<u>TAIWAN</u>	高雄興垂股份有限公司 KOA KAOHSIUNG CORPORATION	中華民國高雄市楠梓加工出口區開發路17之2號 17-2 KAI-FA ROAD, N.E.P.Z.KAOHSIUNG, 81170, TAIWAN TEL [+886] 7-363-4157 FAX [+886] 7-363-4543
	<u>JAPAN</u>	HEAD OFFICE	EARTH WING IN KOA PINE PARK 14016, OAZA, NAKA-MINOWA MINOWA-MACHI, KAMIINA-GUN, NAGANO, 399-4697, JAPAN TEL [+81] 265-70-7171