

## Electronic Components for Automotive Applications



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**YAGEO**  
**Phicom**

**FERROXCUBE**  
A YAGEO COMPANY

# About Yageo



Founded in 1977, the Yageo Corporation has become a world-class provider of passive component services with capabilities on a global scale, including production and sales facilities in Asia, Europe and the Americas.

Yageo currently ranks as the world No.1 in chip-resistors, No. 3 in MLCCs and No. 4 in ferrite products, with a strong global presence: 21 sales offices in 15 countries, 9 production sites, 8 JIT logistic hubs, and 2 R&D centers worldwide. Ferroxcube and Vitrohm, who produce ferrites and leaded resistors, are also a part of the Yageo group.

We support our customers with extensive literature including datasheets, brochures and application notes, which are also available electronically on our website at: [www.yageo.com](http://www.yageo.com)

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# Introduction

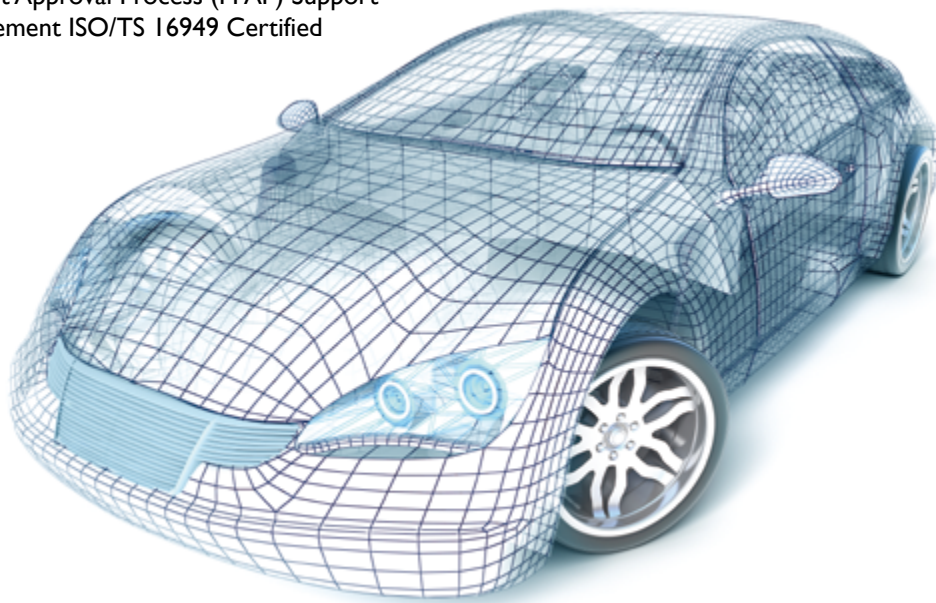
## Gear Up for Automotive Applications

As the leading service provider of global passive components, Yageo is pleased to bring you this brochure to offer you a full range of products to fulfill your automotive application requirements. The brochure includes thick film automotive-grade chip resistors, automotive-grade MLCCs, antennas and other related products.

Compared to other applications, the requirements of the automotive industry for application and specification components are stricter, especially for things such as high reliability, resistance to high temperature and high humidity. Yageo's AC Series for the automotive industry is designed to fulfill customer expectations and demonstrate Yageo's commitment to the industry.

## Requirements for Automotive Applications

- Narrow Specifications and Cpk Monitoring
- 100% AOI for Pattern Matching and Defect Detection
- AEC-Q200 Stress Test Qualified
- Production Part Approval Process (PPAP) Support
- Quality Management ISO/TS 16949 Certified



### Convenience (Infotainment & Comfort)

- Electronic Toll Collection (ETC)
- Vehicle Information and Communication System (VICS)
- Bluetooth Communication
- GPS/Navigation
- Audio/Video
- Air Conditioner Control System
- PAS (Parking Assist System)
- Automatic Cruise Control

### Environment (Emission Control)

- Electric Cars
- Hybrid
- Battery Management System (BMS)
- DC/DC Converter
- Electric Power Steering
- Fuel Control

### Safety & Security (Body Control & Power System)

- Engine Control Unit (ECU)
- Power Seat Control
- Body & Motor Control for Power Windows, Doors and Mirrors
- Keyless Entry System
- Lighting Control
- Tire Pressure Monitoring System (TPMS)
- ABS, Airbag System



# Applications

Automotive Applications Matrix										
Product Line	R-Chip								MLCC	Wireless Components
Size / Series	AC 0201~2512	AA 0201~2512	AT 0201~2512	SR 0402~2512	PT 0402~2512	RL 0402~2512	PA 2512	PE 0402~2512	AC 0402~1210	ANT / BPF / LPF / BLN / DPX
<b>Convenience (Infotainment &amp; Comfort)</b>										
Electronic Toll Collection (ETC)	V	V							V	
Vehicle Information and communication System (VICS)	V	V							V	2.4/5 GHz Chip Antenna
Bluetooth Communication	V								V	Bluetooth Chip Antenna
GPS/Navigation	V	V			V	V	V	V	V	GPS/Glonass Chip & Patch Antennas
Audio/Video	V		V	V					V	
Air Conditioner Control System	V		V						V	
PAS (Parking Assist System)	V								V	
Automatic Cruise Control	V								V	
<b>Environment (Emission Control)</b>										
Battery Management System (BMS)			V		V	V	V	V	V	
DC/DC Converter			V		V	V	V	V	V	
Electric Power Steering	V	V	V						V	
Fuel Control	V	V							V	
<b>Safety &amp; Security (Body Control &amp; Power System)</b>										
Engine Control Unit (ECU)	V	V	V	V	V	V	V	V	V	
Power Seat Control	V								V	
Body & Motor Control for Power Windows, Doors and Mirrors	V	V		V	V	V	V	V	V	
Keyless Entry System	V	V							V	Short range Chip antennas
Lighting Control	V			V					V	
Tire Pressure Monitoring System (TPMS)			V		V	V	V	V	V	Short range Chip antennas
ABS, Airbag System	V	V	V						V	

# Component Solutions

## HID Lighting

The main error amplifier and its external associated resistors and capacitors will determine where the peak of the power curve occurs as well as the shape of the frequency response of the ballast.

### Yageo solution for HID lighting control

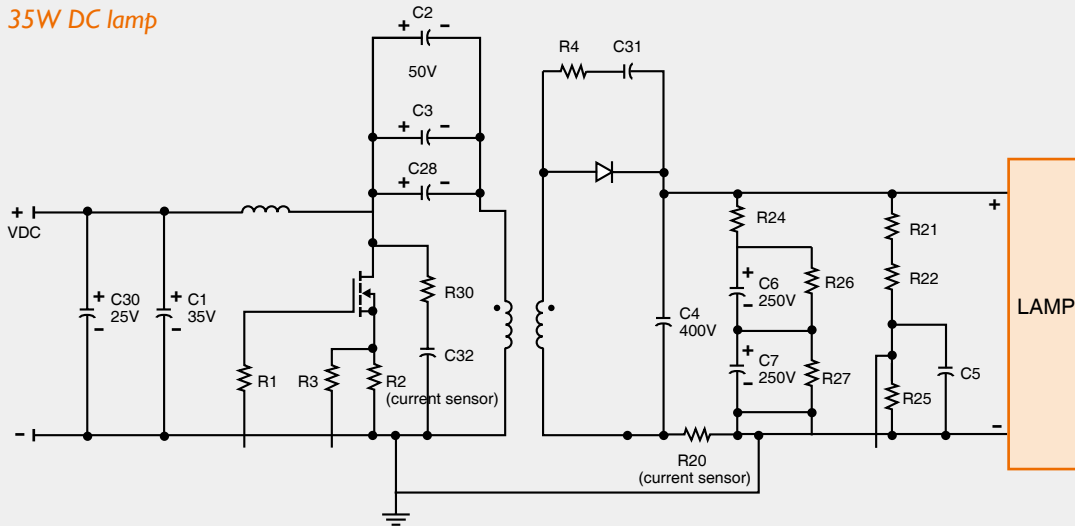
#### Resistors

AC series: AC0402~AC1206 (1Ω-1MΩ)  
 AA series: AA0402~AA2512 (1Ω to 10MΩ)  
 PT series: PT0402~PT2512 (100mΩ-910mΩ)  
 RL series: RL0603~RL2512 (10mΩ-910mΩ)

#### Capacitors

AC series: AC0402~AC1210 (10pF-2.2μF)

#### 35W DC lamp



## Interior Lighting Applications

Interior lighting applications include cluster or instrument backlighting, dome or map reading lights, courtesy lights at doors or in the trunk, and display backlighting.

### Power supply for interior lighting applications

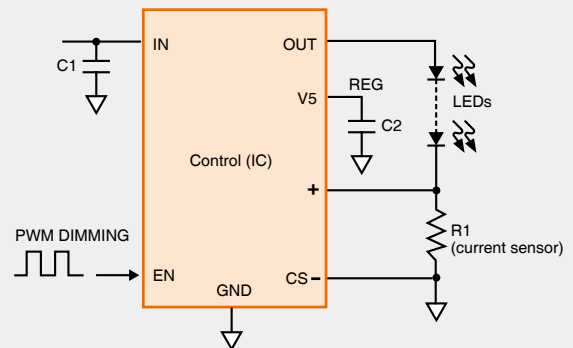
#### Yageo solution for interior lighting

#### Resistors

AA series: AA0402~AA2512 (1Ω to 10MΩ)  
 PA series: PA1206~PA2512 (1mΩ-100mΩ)  
 PE series: PE0603~PE2512 (1mΩ-100mΩ)

#### Capacitors

AC series: AC0402~AC1210 (10pF-2.2μF)



## Automotive Protected Circuit

The automotive electrical system makes up of large current electromotor, relay, solenoid, lighting and switch. So it is easy to engender the peak signal and noise.

### Yageo solution for automotive protected circuit

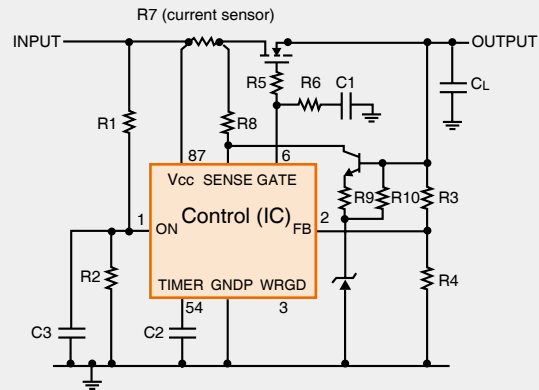
#### Resistors

AC series: AC0402~AC1206 (1Ω-1MΩ)  
 AA series: AA0402~AA2512 (1Ω to 10MΩ)  
 AT series: AT0402~AT1206 (10Ω to 1MΩ)  
 RL series: RL0603~RL2512 (10mΩ-910mΩ)

#### Capacitors

AC series: AC0402~AC1210 (10pF-2.2μF)

### Protected circuit



## Automotive Current Mode PWM Control Circuit

- In order to prevent output leakage current from activating the power switch, the output should be shunted to ground with a resistor.
- Timing and bypass capacitors should be connected to GND pin in a single point ground.

### Yageo solution for current mode control circuit

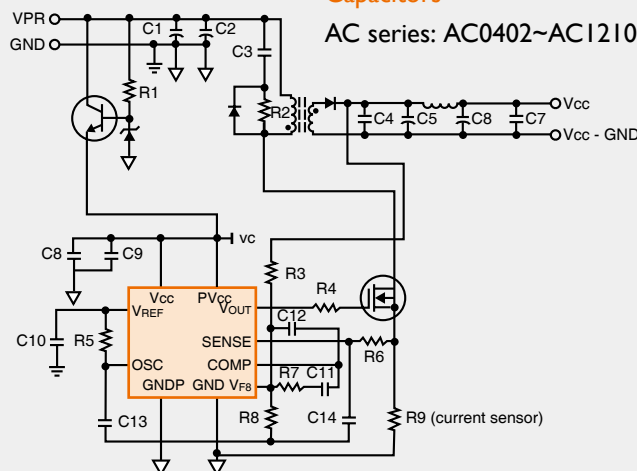
#### Resistors

AC series: AC0402~AC1206 (1Ω-1MΩ)  
 AA series: AA0402~AA2512 (1Ω to 10MΩ)  
 AT series: AT0402~AT1206 (10Ω to 1MΩ)  
 PT series: PT0402~PT2512 (100mΩ-910mΩ)  
 PE series: PE0603~PE2512 (1mΩ-100mΩ)

#### Capacitors

AC series: AC0402~AC1210 (10pF-2.2μF)

### PWM control circuit





# Recommended Products

## Automotive Grade Chip Resistors: AC Series



### Features

- EIA0201 to 2512 case sizes
- 100% AOI at screen printing
- Stable process control including narrow specifications and Cpk monitor
- 100% AOI after plating
- ESD withstands max. voltage of 2KV
- Humidity resistance of 1% (1,000 hours @ +85°C, 85% RH, applied 10% of operating power)
- Moisture sensitivity level: MSL I
- Soldering profiles according to J-STD-020D
- Halogen free epoxy
- RoHS compliant

## Automotive Anti-Sulfurated Chip Resistors: AA Series



### Features

- EIA0201 to 2512 case sizes
- Superior resistance against sulfur containing atmosphere (105°C 750hours)
- AEC-Q200-qualified
- Moisture sensitivity level: MSL I
- Soldering profiles according to J-STD-020D
- Halogen free epoxy
- RoHS compliant
- 100% AOI after plating

## Automotive Thin Film Chip Resistor: AT Series



### Features

- EIA0402 to 1206 case sizes
- Sulfur-resistant (ASTM B809-95 Standard)
- Higher pulse load performance, especially for higher ohmic values (> 33k ohm)
- AEC-Q200-qualified
- Moisture sensitivity level: MSL I
- Halogen free epoxy
- RoHS compliant
- 100% AOI after plating

## Thick Film Low Ohmic Chip Resistors: RL / PT Series



### Features

- Excellent performance at current sensing applications
- PT series: excellent T.C.R. and high rated power

### Applications

- Current sensing
- Over current protection

## Surge Chip Resistors: SR Series



### Features

- EIA0402 to 2512 case sizes
- Low assembly costs
- Excellent performance at pulse loading
- High reliability and stability

### Applications

- Circuits requiring high pulse
- Ideal for blocking surge voltage in power supplies

## Current Sensors - low T. C. R. Chip Resistors: PR / PA / PE Series



### Features

- Ultra-low resistance down to 0.0005  $\Omega$
- Original trimless design significantly improves current detection, making them ideal for large current fast switching circuits

- Resistive element composed of a special alloy, resulting in a superior resistance-temperature coefficient
- The unique chip structure minimizes thermal stress during temperature cycling, resulting in greater reliability

### Applications

- Ideal for a variety of applications, including current control circuits, over current protect circuits, and battery charge detection

## Automotive Grade MLCC: AC Series



### Features

- EIA 0402 to 1812 & array 0508 to 0612 case sizes
- DC voltage ratings of 6.3V to 630V
- Capacitance offerings ranging from 10pF up to 1  $\mu$ F
- High thermal stability

- High ripple current capability
- Negligible capacitance change with respect to temperature from -55°C to +125°C
- Non-polar device, minimizing installation concerns



# Recommended Products

## GPS/Glonass Antennas



### Features

- Support GPS & GLONASS system
- High radiation efficiency
- Pin-solder process
- Frequency: 1575/1602 MHz

### Applications

- Navigation device
- Telematics box
- Fleet management

## Cellular WWAN Antennas



### Features

- Compact Size
- High radiation efficiency
- Multi-band coverage
- Reflow process compatible

### Applications

- Global cellular network devices
- Telematics
- Cellular broadband access
- M2M module

## Short Range Antennas



### Features

- Compact size
- Omni-directional radiation
- Tape & reel automatic mounting
- Reflow process compatible

### Applications

- Smart meter
- Industrial remote control
- ISM band equipment

## 2.4 GHz Bluetooth/WiFi Antennas



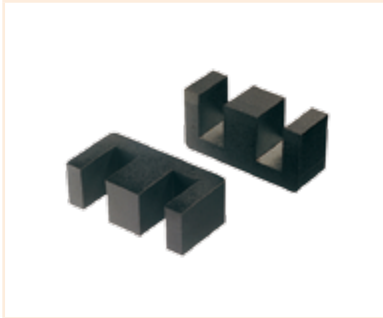
### Features

- Compact size
- Omni-directional radiation
- Tape & reel automatic mounting
- Reflow process compatible

### Applications

- 2.4 GHz WiFi device
- Bluetooth gadget
- ZigBee device
- ISM band equipment

## E Cores



### Features

- Materials: 3C90, 3C92, 3C94, 3C95, 3C96, 3C97, 3F35, 3F36
- Available in a wide variety of sizes

### Applications

- Power converters
- Small signal applications
- EMI suppression

## Toroids (Ring Cores)



### Features

- Flame retardant in accordance with UL94V-2
- Materials: 3E27, 3E5, 3E6, 3E10, 3E12, 4A11

### Applications

- EMC chokes for suppressing RF interference

## PQ Cores



### Features

- Materials: 3C90, 3C92, 3C94, 3C95, 3C96, 3C97, 3F35, 3F36
- Available in a wide variety of sizes

### Applications

- General purpose transformers
- Power conversion

## Custom Shapes



### Features

- Standard materials
- Standard manufacturing process
- Design in support to optimize cost and reliability

# Comparison for Automotive Grade vs Commercial Grade

## Chip Resistors Automotive Grade Series vs RC Series

Item	Automotive Grade Series	Commercial Grade
<b>Documentation</b>	PPAP with AEC-Q200 test report	Standard reliability test report
<b>Qualification Criteria</b>	AEC-Q200	IEC 60115-8
<b>Process Control</b>	a. 100% AOI at screen printing b. 100% AOI after plating c. Enlarge sampling size	Standard control
<b>Dedicated Production Machines</b>	Yes	No

## Chip Resistors Qualification Tests

Qualification Tests	Automotive Grade Series	Commercial Grade
<b>Temperature Cycling</b>	1,000 cycles (-55°C to +125°C) Measurement at 24±2 hours after test conclusion	25 cycles (-55°C to +125°C) Measurement at 24±2 hours after test conclusion
<b>Biased Humidity</b>	1,000 hours; +85°C/85% R.H.; 10% of operating power Measured at 24±2 hours after test conclusion	On request
<b>Operational Life</b>	1,000 hours at 125°C, applied de-rated (36%) continuous working voltage in condition of 1.5 hours on and 0.5 hour off	1,000 hours at 70°C, applied RCWV in condition of 1.5 hours on and 0.5 hours off
<b>Mechanical Shock</b>	MIL-STD-202G Standard Method 213 Condition C	On request
<b>Vibration</b>	5Gs for 20 minutes. 12 cycles each of 3 orientations Test from 10-2,000 Hz	On request
<b>Thermal Shock</b>	-55/+125 °C Number of cycles required is 300 Maximum transfer time is 20 seconds Dwell time is 15 minutes. Air – Air	-55/+125 °C Number of cycles required is 300 Maximum transfer time is 20 seconds Dwell time is 15 minutes. Air – Air
<b>ESD</b>	HBM 1KV/2KV	On request

Note: Detailed tests and requirements, please refer to specific data sheets of Yageo automotive chip resistor series.



## MLCC AC Series vs CC Series

Item	AC series	CC series
Documentation	PPAP with AEC-Q200 test report	Standard reliability test report
Qualification Criteria	AEC-Q200	IEC 60384
Process Control	100% AOI	Standard control
Dedicated Production Machine	Yes	No

## MLCC Qualification Tests

Qualification Tests	AC series	CC series
High Temperature Exposure	Unpowered; 1,000 hours at T = 150°C	N/A
Temperature Cycling	1,000 cycles (-55°C to +125°C) Measurement at 24±2 hours after test conclusion	5 cycles (-55°C to +125°C) Measurement at 24±2 hours after test conclusion
Thermal Shock	Rapid change of temperature test: NP0/X7R: -55 °C to +125 °C; 300 cycles 15 minutes at lower category temperature; 15 minutes at upper category temperature	N/A
Moisture Resistance	T = 24 hrs/per cycle; 10 continuous cycles unpowered	N/A
Biased Humidity	1,000 hours at 85°C/85% R.H., with U <sub>r</sub>	500 hours at 40°C/95% R.H., with U <sub>r</sub>
Mechanical Shock	Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen (18 shocks)	N/A
Vibration	5 g's for 20 minutes, 12 cycles each of 3 orientations	N/A
ESD	Level Confirmed	N/A
Solderability (Steam Aging)	Guaranteed	N/A
Board Flex	Class 1: 3 mm, Class 2: 2 mm	1 mm
Beam Load (Body Strength)	≤ 0805 Thickness > 0.5mm: 20N Thickness ≤ 0.5mm: 8N ≥ 1206 Thickness > 1.25 mm: 54N Thickness ≤ 1.25 mm: 15N	N/A

# Product Information - Chip Resistors

Electrical characteristics								unit: mm		
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance		T. C. R. ( ppm/°C)	Jumper criteria (unit:A)	
AA0201	1/20W	-55°C to 125°C	25V	50V	50V	E24 ±5% E24/E96 ±0.5%, ±1%	1 Ω to 10 MΩ Jumper < 0.05Ω	1Ω ≤ R ≤ 10Ω -100/350	I <sub>Rated</sub>	0.5
AA0402	1/16W	-55°C to 155°C	50V	100V	100V			10Ω < R ≤ 10MΩ ±200	I <sub>Max.</sub>	1.0
AA0603	1/10W		75V	150V	100V			I <sub>Rated</sub>	1.0	
AA0805	1/8W		150V	300V	300V			I <sub>Max.</sub>	2.0	
AA1206	1/4W		200V	400V	500V			I <sub>Rated</sub>	2.0	
AA1210	1/2W		200V	500V	500V			I <sub>Max.</sub>	10.0	
AA1218	1W		200V	500V	500V			I <sub>Rated</sub>	6.0	
AA2010	3/4W		200V	500V	500V			I <sub>Max.</sub>	10.0	
AA2512	1W		200V	500V	500V			I <sub>Rated</sub>	2.0	
								I <sub>Max.</sub>	10.0	
AC0201	1/20W	-55°C to 125°C	25V	50V	50V	E24 ±5% E24/E96 ±0.5%, ±1%	1Ω ≤ R ≤ 10MΩ Jumper < 0.05Ω	1Ω ≤ R ≤ 10Ω -100/350	I <sub>Rated</sub>	0.5
AC0402	1/16W	-55°C to 155°C	50V	100V	100V			10Ω < R ≤ 10MΩ ±200	I <sub>Max.</sub>	1.0
AC0603	1/10W		50V	100V	100V			I <sub>Rated</sub>	1.0	
AC0805	1/8W		150V	300V	300V			I <sub>Max.</sub>	2.0	
AC1206	1/4W		200V	400V	500V			I <sub>Rated</sub>	2.0	
AC1210	1/2W		200V	500V	500V			I <sub>Max.</sub>	10.0	
AC1218	1W		200V	500V	500V			I <sub>Rated</sub>	6.0	
AC2010	3/4W		200V	500V	500V			I <sub>Max.</sub>	10.0	
AC2512	1W		200V	500V	500V			I <sub>Rated</sub>	2.0	
								I <sub>Max.</sub>	10.0	
AT0402	1/16W	-55°C to 155°C	50V	100V	100V	E-24/E96 ±0.1%, ±0.25% ±0.5%, ±1%	10~100KΩ	±25 ±50	---	---
AT0603	1/10W		75V	150V	100V		10~300KΩ		---	---
AT0805	1/8W		150V	300V	300V		10~1MΩ		---	---
AT1206	1/4W		200V	400V	500V				---	---



Packing quantities					
Size code	Tape width	178mm / Ø7" reel		254mm / Ø10" reel	330mm / Ø13" reel
		Paper	Embossed	Paper	Paper
0201	8mm	10 000	---	---	50 000
0402	8mm	10 000	---	20 000	50 000
0603	8mm	5 000	---	10 000	20 000
0805	8mm	5 000	---	10 000	20 000
1206	8mm	5 000	---	10 000	20 000
1210	8mm	5 000	---	---	20 000
1218	12mm	---	4 000	---	---
2010	12mm	---	4 000	---	---
2512	12mm	---	4 000	---	---

### Explanation of ordering code

**AC 0603JR — 07 100K L**

**Series name (code 1-2)** —  
AC = Automotive grade chip resistors

**Size code (code 3-6)** —  
(inch / metric)  
0201 = 0.6 × 0.3      1210 = 3.2 × 2.6  
0402 = 1.0 × 0.5      1218 = 3.2 × 4.5  
0603 = 1.6 × 0.8      2010 = 5.0 × 2.5  
0805 = 2.0 × 1.25    2512 = 6.35 × 3.2  
1206 = 3.2 × 1.6

**Tolerance (code 7)** —  
D = ±0.5%  
F = ±1%  
J = ±5% (for jumper ordering)

**Packing style (code 8)** —  
R = Paper tape reel  
K = Embossed plastic tape reel

**Default code (code 17)** —  
L

**Resistance (code 12-16)** —  
0R = Jumper  
10R = 10Ω  
100R = 100Ω  
100K = 100KΩ

**Taping reel (code 10-11)** —  
07 = 7 inch Dia. reel  
10 = 10 inch Dia. reel  
13 = 13 inch Dia. reel

**T. C. R. (code 9)** —  
"—" = Based on spec.

# Product Information - MLCCs

Electrical Characteristics					
Type	TC	Operating Temp Range	Capacitance Range	Voltage Range	Tolerance
AC0402	NPO	-55°C to 125°C	0.47pF~220pF	50V	±5%
	X7R	-55°C to 125°C	100pF~100nF	10V~50V	±10%, ±20%
AC0603	NPO	-55°C to 125°C	0.47pF~680pF	50V~250V	±5%
	X7R	-55°C to 125°C	100pF~220nF	10V~100V	±10%, ±20%
AC0805	NPO	-55°C to 125°C	0.47pF~1nF	50V~630V	±5%
	X7R	-55°C to 125°C	150pF~1μF	10V~500V	±10%, ±20%
AC1206	NPO	-55°C to 125°C	0.47pF~2.7nF	50V~630V	±5%
	X7R	-55°C to 125°C	220pF~1μF	6.3V~630V	±10%, ±20%
AC1210	NPO	-55°C to 125°C	47pF~2.7nF	50V~500V	±5%
	X7R	-55°C to 125°C	2.2nF~1μF	6.3V~500V	±10%, ±20%
AC1812	X7R	-55°C to 125°C	2.2nF~1μF	50V~100V	±10%, ±20%
AC0508 (Array)	NPO	-55°C to 125°C	10pF~100pF	50V	±5%, ±10%
	X7R	-55°C to 125°C	1.0nF~10nF	16V~50V	±10%, ±20%
AC0612 (Array)	NPO	-55°C to 125°C	10pF~470pF	50V	±5%, ±10%
	X7R	-55°C to 125°C	220pF~47nF	16V~50V	±10%, ±20%

Thickness classes and packing quantities						
Size code	Thickness classification (mm)	Tape width	180mm / Ø7" reel		330mm / Ø13" reel	
			Paper	Blister	Paper	Blister
0402	0.5 ±0.05 / ±0.15 / ±0.20	8 mm	10 000	---	50 000	---
0603	0.8 ±0.1 / ±0.2		4 000	---	15 000	---
0805	0.6 ±0.1		4 000	---	20 000	---
	0.85		4 000	---	15 000	---
	1.25 ±0.2		---	3 000	---	10 000
1206	0.6 ±0.1		4 000	---	20 000	---
	0.85 ±0.1		4 000	---	15 000	---
	1.15 ±0.1		---	3 000	---	10 000
	1.25 ±0.2		---	3 000	---	10 000
	1.6 ±0.2		---	2 000	---	10 000
1210	0.85 ±0.1		---	4 000	---	10 000
	1.25 ±0.2		---	3 000	---	---
	1.6		---	2 000	---	---
1812	0.85		---	2 000	---	---
	1.15		---	1 000	---	---
	1.25		---	1 000	---	---
	1.6		---	1 000	---	---
0508 (Array)	0.6		4 000	---	---	---
	0.8		---	---	---	---
0612 (Array)	0.6		4 000	---	---	---
	0.8		---	---	---	---





Dimensions		Inch-based	Metric	L <sub>1</sub>	W	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max	L <sub>4</sub> min
		0402	1005M	1.0 ±0.05	0.5 ±0.05	0.15	0.30	0.40
		0603	1608M	1.6 ±0.10	0.8 ±0.10	0.20	0.60	0.40
		0805	2012M	2.0 ±0.20	1.25 ±0.20	0.25	0.75	0.55
		1206	3216M	3.2 ±0.30	1.6 ±0.20	0.25	0.75	1.40
		1210	3225M	3.2 ±0.30	2.5 ±0.20	0.25	0.75	1.40
		1812	3245M	4.5 ±0.40	3.2 ±0.30	0.25	0.75	2.20
		Inch-based	Metric	L	W	A	B	P
		0508 (Array)	1220M	2.0 ±0.15	1.25 ±0.15	0.28 ±0.10	0.2 ±0.10	0.5 ±0.10
		0612 (Array)	1632M	3.2 ±0.15	1.6 ±0.15	0.4 ±0.10	0.3 ±0.20	0.8 ±0.10

### Explanation of ordering code

**AC 0402 K R X7R 8 B B I 02**

**Series name (code 1-2)**  
AC = Automotive grade capacitors

**Size code (code 3-6)**  
0402  
0603  
0805  
1206  
1210  
1812  
0508(Array)  
0612(Array)

**Capacitance tolerance (code 7)**  
J = ±5%  
K = ±10%  
M = ±20%

**Packing style (code 8)**  
R = Paper / PE tape reel Ø7 inch  
P = Paper / PE tape reel Ø13 inch  
K = Embossed plastic tape reel Ø7 inch  
F = Embossed plastic tape reel Ø13 inch

**TC material (code 9-11)**  
NP0  
X7R

**Capacitance value (code 15-17)**  
102 = 1 000 pF  
(2 significant digits+number of zeros;  
the 3rd digit signifies the multiplying  
factor, and letter R is decimal point)  
0 = x 1  
1 = x 10<sup>1</sup>  
2 = x 10<sup>2</sup>  
3 = x 10<sup>3</sup>  
4 = x 10<sup>4</sup>  
5 = x 10<sup>5</sup>  
6 = x 10<sup>6</sup>  
7 = x 10<sup>7</sup>  
X X R = Special capacitance  
(X X: capacitance before decimal point)

**Process code (code 14)**  
N = NP0  
B = X7R

**Termination (code 13)**  
B = Ni-Barrier

**Rated voltage (code 12)**  
5 = 6.3 V      A = 200 V  
6 = 10 V        B = 500 V  
7 = 16 V        Y = 250 V  
8 = 25 V        Z = 630 V  
9 = 50 V  
0 = 100 V

# Product Information

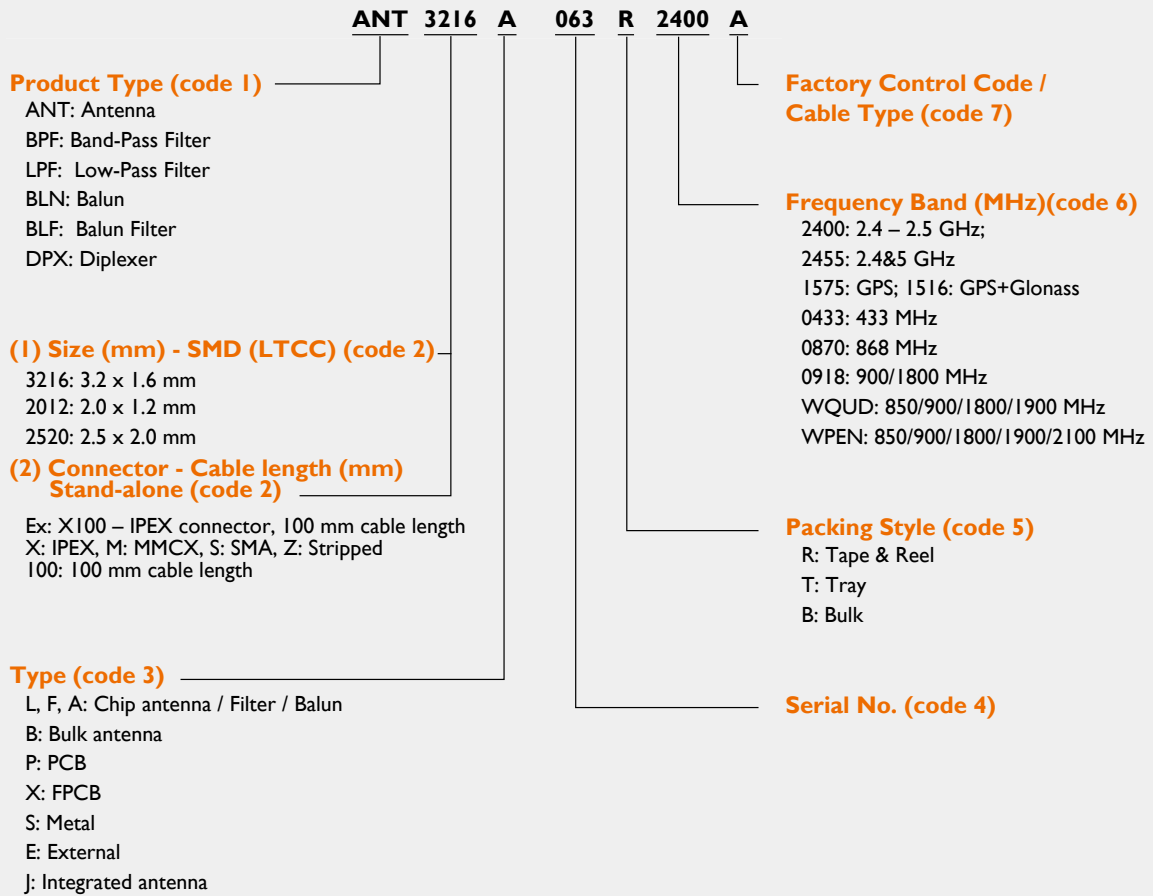
## - Wireless Components

Product Series	Part Number (new)	Part Number (old)	Frequency range (MHz)	Gain	Size (mm)	Assembly
Cellular WWAN	ANT2112A010B0918A	CAN4313284109181B	824~960/ 1710~1990	0~1 dBi	21*12*0.5	SMD
	ANT3505B000TWPENA	CAN4313449009181B	824~960 /1710~2170	2.9 dBi	35*5*6	SMD
	ANTX100P001BWPEN3	-	824~960/ 1710~2170	4.2 dBi	50*20*0.55	I-PEX dia 1.13, 100mm
2.4 GHz	ANT1204F001R2400A	CAN4311059012451K	2400~2500	6.66 dBi	12*4*2	SMD
	ANT3216LL00R2400A	CAN4311712002453K	2400~2500	5 dBi	3.2*1.6*1.3	SMD
	ANT3216A063R2400A	CAN4311212632453K	2400~2500	1.69 dBi	3.2*1.6*0.5	SMD
	ANT2012LL13R2400A	CAN4311714132454K	2400~2500	2.72 dBi	2.0*1.2*1	SMD
	ANTX200P001B24003	-	2400~2500	4.8 dBi	18.4*7.5*0.55	I-PEX dia 1.13, 200mm
GPS	ANT1515B00BT1575A	CAN43134230B1581B	1575	1.5 dBic	15*15*4	SMD
	ANT1818B00FT1575A	CAN43134240F1581B	1575	4 dBic	18*18*4	Pin Solder
	ANT2525B00BT1575A	CAN43134250B1581B	1575	5.5 dBic	25*25*4	SMD
GPS+Glonass	ANT1818B00BT1516A	CAN43134240B1561B	1575 / 1602	1.89 / 2.59 dBi	18*18*4	SMD
	ANT1818B00DT1516A	CAN43134240D1561B	1575 / 1602	2.65 / 2.79 dBi	18*18*4	Pin Solder
	ANT2525B00BT1516A	CAN43134250B1561B	1575 / 1602	3.44 / 4.10 dBi	25*25*4	SMD
	ANT2525B00DT1516A	CAN43134250D1561B	1575 / 1602	3.5 / 3.8 dBi	25*25*4	Pin Solder
Active GPS	ANT1212JB27B1575A	CAN4313322271581B	1575	25 dB	12*12*6.5	Connector
	ANT1818JB30B1575A	CAN4313324301581B	1575	25 dB	18*18*7.1	Connector
	ANT2525JB08B1575A	CAN4313325081581B	1575	16 dB	25*25*7.5	Connector
	ANT1606JB12B1575A	CAN4313346121581B	1575	20 dB	20*6*6.4	Connector
Active GPS+Glonass	ANT8010JLC1B1516A	CAN4313981C11561B	1575 / 1602	20/20 dB	22*6*1.9	Connector
ISM Bands	ANT1204LL05R0915A	CAN4311759050911K	915	3.32	12*4*1.6	SMD
	ANT1204LL08R0870A	CAN4311759080871K	870	0.5	12*4*1.6	SMD
	ANT7020LL05R0870A	CAN4311772050872K	870	N/A	7.0*2.0*0.7	SMD
	ANT1204LL20R0433A	CAN4311759200431K	433	0.83	12*4*1.2	SMD
	ANT1204LL20R0315A	CAN4311759200311K	315	N/A	12*4*1.2	SMD
	ANT2405F001R0169A	CAN4311050010162K	169	N/A	24*5*1.2	SMD
SDARS	ANT2020B00FT2300A	CAN43134200F2301B	2320~2345	N/A	20*20*4	Pin Solder
FM	ANT2405F001R0098A	CAN4311050010882K	88~108	N/A	24*5*1.6	SMD



## Explanation of ordering code

Ordering example : **ANT3216A063R2400A**



## YAGEO - A GLOBAL COMPANY

### HQ

Taipei, Taiwan  
Tel. +886 2 6629 9999  
Fax. +886 2 6628 8886  
Mail: sales\_tw@yageo.com

### China and ASIA

**Suzhou, China**  
Tel. +86 512 6825 5568  
Fax. +86 512 6825 5386  
Mail: sales\_sz@yageo.com

**Qingdao, China**  
Tel. +86 532 8797 0533  
Fax. +86 532 8797 0533  
Mail: sales\_sz@yageo.com

**Dongguan, China**  
Tel. +86 769 8772 0275  
Fax. +86 769 8791 0053  
Mail: sales\_dg@yageo.com

**Tokyo, Japan**  
Tel. +81 3 6809 3972  
Fax. +81 3 6809 3982  
Mail: sales\_yj@yageo.com

**Seongnam, Korea**  
Tel. +82 31 712 4797  
Fax. +82 31 712 5866  
Mail: sales\_yk@yageo.com

**Singapore**  
Tel. +65 6244 7800  
Fax. +65 6244 4943  
Mail: sales\_ysa@yageo.com

**Kuala Lumpur, Malaysia**  
Tel. +60 3 8063 8864  
Fax. +60 3 8063 7376  
Mail: sales\_ysa@yageo.com

**Penang, Malaysia**  
Tel. +60 4 3973049  
Fax. +60 4 3973050  
Mail: sales\_ysa@yageo.com

### EUROPE

**Munich, Germany**  
Tel. +49 8990 7784 380  
Fax. +49 8990 7784 379  
Mail: sales\_je@yageo.com

**Milan, Italy**  
Tel. +39 02 6129 1017  
Fax. +39 02 6601 7490  
Mail: sales\_je@yageo.com

**Roermond, Benelux**  
Tel. +31 475 385 555  
Fax. +31 475 385 589  
Mail: sales\_je@yageo.com

**Szombathely, Hungary**  
Tel. +36 94 517 702  
Fax. +36 94 517 701  
Mail: sales\_je@yageo.com

**Moscow, Russian Federation**  
Tel. +7 965 408 1811  
Fax. +7 498 610 0707  
Mail: sales\_je@yageo.com

### NORTH AMERICA

**San Jose, U.S.A.**  
Tel. +1 408 240 6200  
Fax. +1 408 240 6201  
Mail: sales\_ya@yageo.com

**Mexico**  
Tel. +52 33 31330631  
Fax. +1 408 240 6201  
Mail: sales\_ya@yageo.com

For a complete listing of all Yageo sales offices, distributors, and representatives, please visit "contact us" at [www.yageo.com](http://www.yageo.com)

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