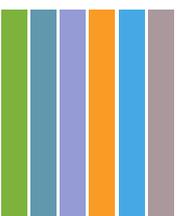




Alternative Energy

Application Selection Guide



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: 23 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



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Alternative Energy



Introduction

The fast growing global hunger for electricity cannot be met in the future by traditional sources of energy such as coal, oil, and gas, while atomic energy is regarded with reluctance due to its inherent risks and the unsolved problem of nuclear waste.

More energy conservation is one solution, but renewable resources like wind, solar, biomass, thermal, hydro-power, and tidal and wave energy have the potential to solve this global challenge in a fundamental and sustainable manner.

Alternative energy will also change our approach to energy generation. Aside from centralized power plants for the base load and country-wide, high energy transmission lines, small and dedicated units connected to local grids with smart metering systems will soon color the electricity map.

As these applications work in harsh environments plagued with thermal and mechanical stress, vibration, and high humidity, often in remote locations where maintenance is difficult, a very important feature of electronic circuits and components is long-term reliability.

Yageo offers a comprehensive range of passive components which fulfill the above requirements for the various functions in current and future designs.

High voltage (HV Series) capacitors up to 3kV are perfect in power invertors for wind and solar systems.

MLCCs with soft terminations (CS Series) are designed to prevent damage and cracks in the ceramic body under mechanical, thermal, and vibratory stresses.

Surge resistors (SR Series) can protect sensitive semiconductors against voltage spikes or short pulses from lightning strikes.

Precision thin film (RT Series) resistors provide long term stability

at low TCR and very narrow tolerances, which enables exact measurement of consumed energy in smart meter designs.

In circumstances where high humidity and air pollution add further challenges to the application of the thin film resistors, our rugged AT Series can withstand a temperature of 85°C at 85% relative humidity and is insensitive to degradation by sulfur dioxide, offering the ultimate solution.

Chips with double and triple power open the possibility of using a smaller case size, saving board space without sacrificing dissipation.

Incorporating Yageo's wireless solutions in smart meters allows communication of energy usage information between the consumer and utility companies via the Internet and integrates the device in a home computer network.

Wireless devices built into micro-inverters enable individual and remote optimization of each inverter and thus boost the efficiency of the entire solar power system.

Leaded resistors are widely used in this segment where, next to reliability and safety, power performance is very important. Smart meters contain metal film (MFR series) resistors with low tolerances and low TCR's for accurate energy measurement. Power inverter devices applied in solar equipment and windmills include high voltage (HHV Series), power wirewound (KNP/PNP) and precision metal film (MFP Series) resistors to ensure proper operation.

Very high power (AHA/AHP/AHB Series) leaded resistors are an excellent solution to clean inverter output from undesirable harmonic distortion which pollutes the grid.

All Yageo passive components are RoHS and REACH compliant.



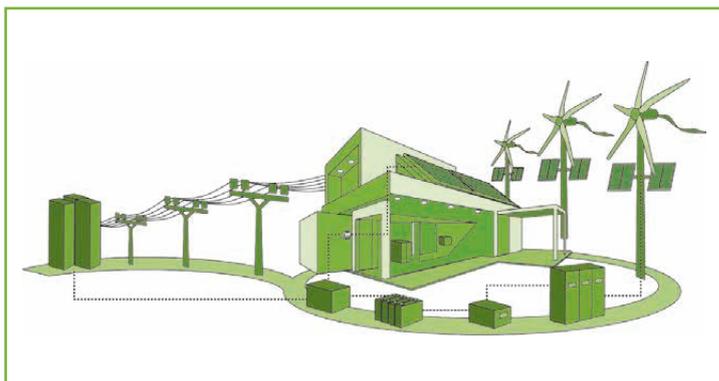
Electrical Grids



Smart Meters

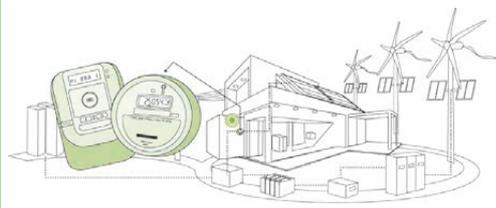


Intelligent Homes



Remote Power Management





Alternative Energy

Electrical Grids

Smart Meters

- Chip Resistors

RT Series

Thin film high precision high stability chip resistor



Feature

- High precision & stability
- Low TCR
- Low electrical noise
- Advanced sputtering technology

- Chip Resistors

PT Series

Thick film low ohmic, low TCR chip resistor



Feature

- Good current sensing performance
- High power rating for large current detection
- Accurate power control
- Highly reliable electrode construction
- AEC-Q200 compliant
- Low TCR

- Chip Resistors

RC high power Series

Thick film general purpose chip resistor, double power



Feature

- Highly reliable electrode construction
- Compatible for all soldering processes
- Highly stable in auto-placement surface mounting applications
- Barrier layer end termination

- Chip Resistors

RT(5ppm) Series

Ultra high precision 5ppm thin film chip resistor



Feature

- High precision & stability
- Super low TCR
- Low electrical noise
- Advanced sputtering technology

- MLCC

CC-HC Series

High Capacitance



Feature

- High capacitance
- Very Low ESR and ESL
- Low self heating
- High reliability with no polarity
- RoHS-compliant & halogen-free

- MLCC

CC-HCV Series

High CV



Feature

- High capacitance and high voltage
- Higher energy density
- High reliability with no polarity
- RoHS-compliant & halogen-free

- MLCC

CC-HV Series

High Voltage



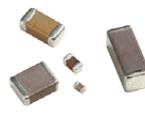
Feature

- Operates at high voltage
- Wide case size available
- High reliability with no polarity
- RoHS-compliant & halogen-free

- MLCC

CC-Class I and Class II (≥0201) Series

General purpose



Feature

- Suitable for all general purpose
- Low ESR and self-heating
- Stable capacitance and low impedance over wide frequency range
- High reliability with no polarity
- RoHS-compliant & halogen-free

- Wireless

Short-range/ Sub-GHz Antenna

Chip Antenna



Feature

- Compact size, small clearance
- SMD type antenna
- Operating temperature -40°C-105°C
- RoHS-compliant & halogen-free

- Wireless

WLAN/BT/ISM Antenna

Chip Antenna



Feature

- Compact size, small clearance
- SMD type antenna
- Operating temperature: -40°C-105°C
- RoHS-compliant & halogen-free

- Through Hole

MFR Series

Metal film resistors



Feature

- Wide resistance range
- High reliability
- High quality
- AEC-Q200 compliant
- Fully lead-free compliance with no RoHS exemptions (7C-1)

- Through Hole

MFO Series

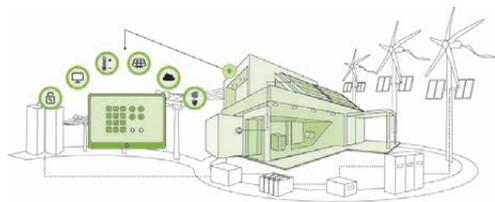
Metal film resistors, high power, professional



Feature

- High power & reduced size
- Wide resistance range
- High reliability
- High quality
- AEC-Q200 compliant
- Fully lead-free compliance with no RoHS exemptions (7C-1)

Intelligent Homes



• Chip Resistors

RT Series

Thin film high precision high stability chip resistor



Feature

- High precision & stability
- Low TCR
- Low electrical noise
- Advanced sputtering technology

• Chip Resistors

PT Series

Thick film low ohmic, low TCR chip resistor



Feature

- Good current sensing performance
- High power rating for large current detection
- Accurate power control
- Highly reliable electrode construction
- AEC-Q200 compliant
- Low TCR

• Chip Resistors

PE Series

Automotive grade metal current sensor, low TCR chip resistor



Feature

- Excellent current sensing performance
- High power rating for large current detection
- Accurate power control
- Reduce power consumption
- Low thermal EMF
- AEC-Q200 compliant
- Low TCR

• Chip Resistors

RT(5ppm) Series

Ultra high precision 5ppm thin film chip resistor



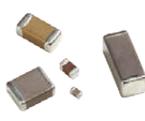
Feature

- High precision & stability
- Super low TCR
- Low electrical noise
- Advanced sputtering technology

• MLCC

CC-Class I and Class II (≥0201) Series

General purpose



Feature

- Suitable for all general purpose
- Low ESR and self-heating
- Stable capacitance and low impedance over wide frequency range
- High reliability with no polarity
- RoHS-complaint & halogen-free

• MLCC

CC-HCV Series

High CV



Feature

- High capacitance and high voltage
- Higher energy density
- High reliability with no polarity
- RoHS-compliant & halogen-free

• MLCC

CC-HV Series

High Voltage



Feature

- Operates at high voltage
- Wide case size available
- High reliability with no polarity
- RoHS-compliant & halogen-free

• MLCC

CC-Class I and Class II (≥0201) Series

General purpose



Feature

- Suitable for all general purpose
- Low ESR
- High reliability with no polarity
- RoHS-complaint & halogen-free

• MLCC

CQ Series

High Frequency



Feature

- HiQ and low ESR in VHF, UHF and microwave frequency bands
- BME process with copper inner electrodes
- Tight tolerance (min. ±0.05pF)
- High reliability with no polarity

• Wireless

WLAN/BT/ISM Antenna

Chip Antenna



Feature

- Compact size, small clearance
- SMD type antenna
- Operating temperature: -40°C-105°C
- RoHS-compliant & halogen-free

• Wireless

WLAN/BT/ISM Antenna

PCB Antenna



Feature

- Easy installation
- Flexible cable length and connector type
- Operating temperature: -40°C-85°C
- RoHS-compliant & halogen-free

• Wireless

Short-range/ Sub-GHz Antenna

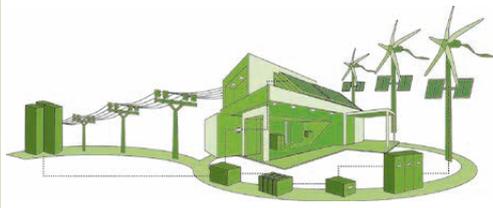
Chip Antenna



Feature

- Compact size, small clearance
- SMD type antenna
- Operating temperature -40°C-105°C
- RoHS-compliant & halogen-free





Alternative Energy

Electrical Grids

Remote Power Management

- Chip Resistors

RE Series

Thick film precision grade chip resistor



Feature

- Tight tolerance
- Low TCR
- Highly reliable electrode construction
- Compatible with all soldering processes

- Chip Resistors

PA Series

Automotive grade metal current sensor, low TCR chip resistor



Feature

- Excellent current sensing performance
- High power rating for large current detection
- Accurate power control
- Reduce power consumption
- Low thermal EMF
- AEC-Q200 compliant
- Low TCR

- Chip Resistors

PE Series

Automotive grade metal current sensor, low TCR chip resistor



Feature

- Excellent current sensing performance
- High power rating for large current detection
- Accurate power control
- Reduce power consumption
- Low thermal EMF
- AEC-Q200 compliant
- Low TCR

- Chip Resistors

RV Series

High voltage chip resistor



Feature

- High working voltage
- Reliable electrode construction
- High stability & reliability
- Highly stable in auto-placement surface mounting

- MLCC

CC-HC Series

High Capacitance



Feature

- High capacitance
- Very Low ESR and ESL
- Low self heating
- High reliability with no polarity
- RoHS-compliant & halogen-free

- MLCC

CC-HCV Series

High CV



Feature

- High capacitance and high voltage
- Higher energy density
- High reliability with no polarity
- RoHS-compliant & halogen-free

- MLCC

CC-HV Series

High Voltage



Feature

- Operates at high voltage
- Wide case size available
- High reliability with no polarity
- RoHS-compliant & halogen-free

- MLCC

CS Series

Soft termination



Feature

- Good Resistance to Bending
- Good Resistance to Mechanical Vibration
- Good Resistance to Thermal Shock

- MLCC

IC Series

Industrial grade



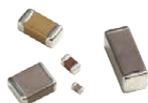
Feature

- Good for Harsh Outdoor environment application
- High Thermal Stability
- High Reliability

- MLCC

CC-Class I and Class II (≥0201) Series

General purpose



Feature

- Suitable for all general purpose
- Low ESR and self-heating
- Stable capacitance and low impedance over wide frequency range
- High reliability with no polarity
- RoHS-complaint & halogen-free



Check Products Datasheets
On Our Website

www.yageo.com



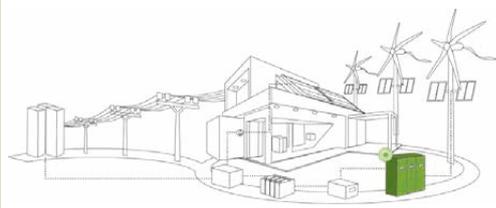


Solar & Wind Energy



Inverters





Inverters



• Chip Resistors
AF Series
 Sulfur resistance chip resistor



Feature

- Superior resistance against sulfur-containing environments
- Highly reliable electrode construction
- FOS test method: ASTM B809-95 105°C, 750 hours

• Chip Resistors
RT Series
 Thin film high precision high stability chip resistor



Feature

- High precision & stability
- Low TCR
- Low electrical noise
- Advanced sputtering technology

• Chip Resistors
PT Series
 Thick film low ohmic, low TCR chip resistor



Feature

- Good current sensing performance
- High power rating for large current detection
- Accurate power control
- Highly reliable electrode construction
- AEC-Q200 compliant
- Low TCR

• Chip Resistors
SR Series
 Surge Chip resistor



Feature

- Excellent pulse loading performance
- High stability & reliability
- Narrow tolerance to 0.5%
- Excellent ESD withstand performance
- AEC-Q200 compliant

• MLCC
CC-HC Series
 High Capacitance



Feature

- High capacitance
- Very Low ESR and ESL
- Low self heating
- High reliability with no polarity
- RoHS-compliant & halogen-free

• MLCC
CC-HCV Series
 High CV



Feature

- High capacitance and high voltage
- Higher energy density
- High reliability with no polarity
- RoHS-compliant & halogen-free

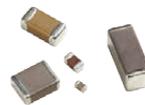
• MLCC
CC-HV Series
 High Voltage



Feature

- Operates at high voltage
- Wide case size available
- High reliability with no polarity
- RoHS-compliant & halogen-free

• MLCC
CC-Class I and Class II (≥0201) Series
 General purpose



Feature

- Suitable for all general purpose
- Low ESR
- High reliability with no polarity
- RoHS-compliant & halogen-free

• Through Hole
MFP Series
 Metal film resistors, precision



Feature

- High precision & stability
- Narrow tolerance
- Low TCR
- Low electrical noise
- AEC-Q200 compliant
- Fully lead-free compliance with no RoHS exemptions (7C-1)

• Through Hole
HHV Series
 Metal glazed film resistor, high-voltage & high ohmic



Feature

- UL1676 and VDE 0860 certified
- High working voltage up to 7KV
- Max. over load voltage up to 14KV
- Max. resistance up to 68Mohm
- Flameproof silicone-coated
- RoHS exemptions(7C-1)

• Through Hole
KNP Series
 Wirewound resistors, flameproof



Feature

- High reliability
- Flameproof silicone coated
- Excellent surge performance
- Fully lead-free compliance with no RoHS exemptions (7C-1)

• Through Hole
PNP Series
 Wirewound resistors, high power, flameproof, ultra miniature



Feature

- High reliability
- High power, ultra-miniature
- Flameproof silicone coated
- Excellent surge performance
- Fully lead-free compliance with no RoHS exemptions (7C-1)

Chip Resistors

Ordering information - Global part number

Global part number - Single resistor ⁽²⁾

Ordering example: RC0402JR-0710RL

RC 0402 J R - 07 10R L

Series name (code 1-2)

- RC = Thick film general
- RE = Thick film precision
- AC = Thick film automotive grade
- AA = Thick film anti-FOS automotive grade
- AF = Thick film anti-FOS
- SR = Thick film anti-surge
- RV = Thick film high voltage
- TR = Thick film trimmable
- AR = Thick film NiAu termination
- RT = Thin film high precision
- AT = Thin film high precision automotive grade
- RL/PT = Thick film low ohmic
- PA/PE/PS/PU = Metal current sensor
- UE = ESD suppressor⁽³⁾
- VRS = Multilayer chip varistor⁽³⁾

Size code (code 3-6)

- (inch / metric)
- 0075 = 0.3x 0.15
 - 0100 = 0.4 x 0.2
 - 0201 = 0.6 x 0.3
 - 0402 = 1.0 x 0.5
 - 0603 = 1.6 x 0.8
 - 0612 = 1.6 x 3.2
 - 0805 = 2.0 x 1.25
 - 0815 = 2.15 x 3.75
 - 0830 = 2.0 x 7.5
 - 1206 = 3.2 x 1.6
 - 1210 = 3.2 x 2.6
 - 1218 = 3.2 x 4.5
 - 2010 = 5.0 x 2.5
 - 2512 = 6.35 x 3.2

Tolerance (code 7)

- L = ±0.01%
- W = ±0.05%
- B = ±0.1%
- C = ±0.25%
- D = ±0.5%
- F = ±1%
- G = ±2%
- J = ±5% (for Thick Film Jumper ordering)
- K = ±10% (for TR = 0/-10%)
- M = ±20% (for TR = 0/-20%)
- N = ±30% (for TR = 0/-30%)
- “—” for RL/PT Jumper ordering

Default code⁽¹⁾ (code 17)

Resistance (code 12-16)

- 0R = Jumper
- 0U5 = 0.0005Ω
- 0R1 = 0.1Ω
- 1R = 1Ω
- 10R = 10Ω
- 100R = 100Ω
- 1K = 1 000Ω
- 1M = 1 000 000Ω
- 100M = 100 000 000Ω

Taping reel (code 10-11)

- 07 = 7 inch Dia. reel
- 13 = 13 inch Dia. reel
- 7N = 7 inch,ESD safe reel
- 7W = 7 in Dia. reel
2 x standard quantity
- 7T = 3 x standard power
- 47 = 4 x standard power
- 57 = 5 x standard power

T. C. R. (code 9)

- A = ±5 ppm/°C
- B = ±10 ppm/°C
- C = ±15 ppm/°C
- D = ±25 ppm/°C
- E = ±50 ppm/°C
- M = ±75 ppm/°C
- F = ±100 ppm/°C
- L = ±150 ppm/°C
- G = ±200 ppm/°C
- I = ±300 ppm/°C
- J = ±350 ppm/°C
- K = ±400 ppm/°C
- Q = ± 700 ppm/°C
- “—” = Based on spec (for thick film)

Packing style (code 8)

- R = Paper tape reel
- K = Embossed plastic tape reel
- S = ESD safe reel

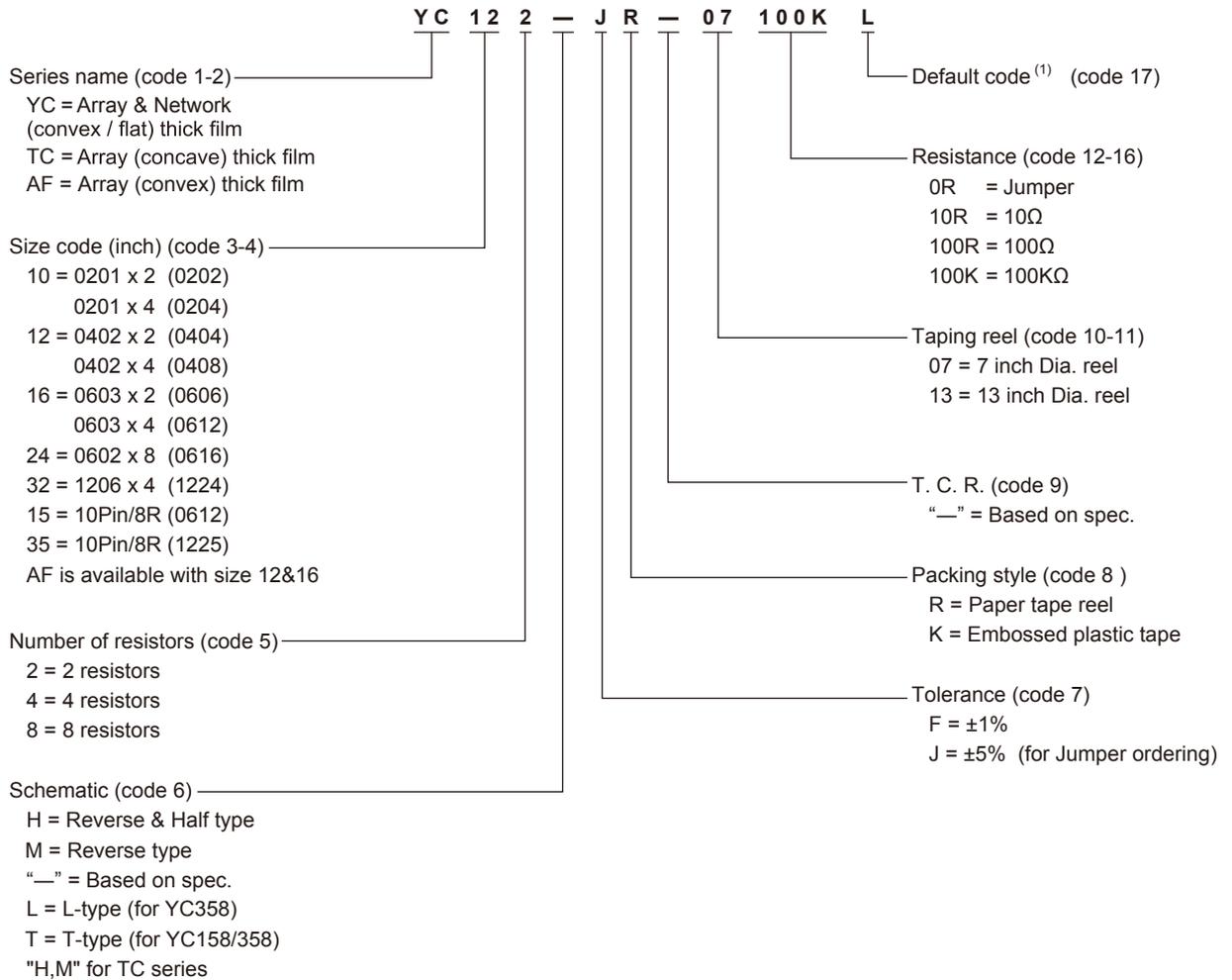
Note: 1. System default code for ordering only. Please refer to series datasheets for different default codes
 2. Global Part Number is the preferred clear text code for ordering Yageo and Phycomp branded products.
 3. Please refer to UE/VRS series datacheets for coding details.

Chip Resistors

Ordering information - Global part number - Arrays

Global part number - Arrays

Ordering example: YC122-JR-07100KL



Note: 1. System default code for ordering only. Please refer to series datasheets for different default codes

MLCC

Ordering information - Global part number

Global part number

Ordering example: CC0201KRX7R8BB102

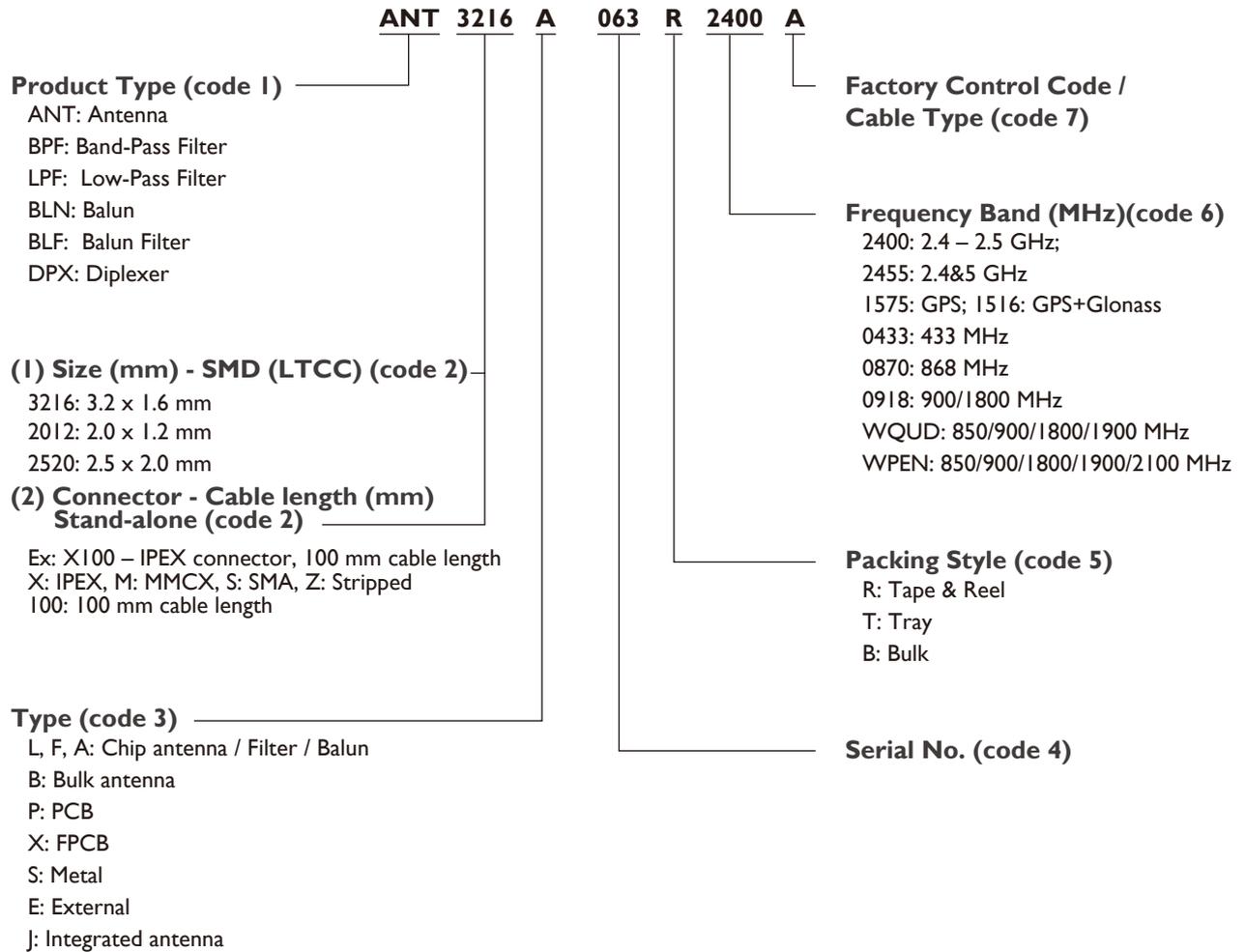
Series name (code 1-2)	Size code (code 3-6)	Capacitance tolerance (code 7)	Packing style (code 8)	TC material (code 9-11)	Process code (code 14)	Termination (code 13)	Rated voltage (code 12)	Capacitance value (code 15-17)
CA = 4 x Capacitors array CC = Multilayer chip capacitors CL = Low inductance capacitors CQ = High frequency capacitors SC = Safety certification capacitors AC = Automotive grade capacitors CS = Soft termination capacitors	0100 0201 0402 0603 0805 1206 1210 1808 1812 2220 0306 0508 0612	A = ±0.05 pF (CQ series only) B = ±0.1 pF C = ±0.25 pF D = ±0.5 pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20% Z = -20% to +80%	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 C = Bulk case	NPO X5R X7R Y5V	N = NPO B = Class 2 product	B = Ni-Barrier	5 = 6.3 V 6 = 10 V 7 = 16 V 8 = 25 V G = 35 V 9 = 50 V 0 = 100 V A = 200 V Y = 250 V B = 500 V Z = 630 V C = 1 kV D = 2 kV E = 3 kV T = X2 / Y3 for TUV / UL W = X1 / Y2 for TUV / UL U = X1 for UL (X7R, 1812)	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 ¹ 2 = x 10 ² 3 = x 10 ³ 4 = x 10 ⁴ 5 = x 10 ⁵ 6 = x 10 ⁶ 7 = x 10 ⁷ X X R = Special capacitance (X X: capacitance before decimal point)

Wireless

Ordering information - Global part number

Explanation of ordering code - New

Ordering example : **ANT3216A063R2400A**



Through Hole

Ordering information - Global part number

MFR	-I2	F	T	F	52-	I00R
Code 1 - 3 Series Name See Index	Code 4 - 6 Power Rating -05 = \varnothing d0.5mm -06 = \varnothing d0.6mm -07 = \varnothing d0.7mm -08 = \varnothing d0.8mm -10 = \varnothing d1.0mm -14 = \varnothing d1.4mm -12 = 1/6W -25 = 1/4W 25S = 1/4WS -50 = 1/2W 50S = 1/2WS 100 = 1W 1WS = 1WS 200 = 2W 2WS = 2WS 204 = 0.4W 207 = 0.6W 300 = 3W 3WS = 3WS 3WM = 3WM 400 = 4W 500 = 5W 5WS = 5WS 5SS = 5WSS 700 = 7W 7WS = 7WS 10A = 10W 20A = 20W 30A = 30W 40A = 40W 50A = 50W 10S = 10WS 15A = 15W 25A = 25W 10B = 100W 25B = 250W	Code 7 Tolerance P = \pm 0.02 % A = \pm 0.05 % B = \pm 0.1 % C = \pm 0.25% D = \pm 0.5 % F = \pm 1 % G = \pm 2 % J = \pm 5 % K = \pm 10 % - = Base on Spec.	Code 8 Packing Style T = Tape/Box R = Tape/Reel B = Bulk	Code 9 Temperature Coefficient of Resistance - = Base on Spec. A = \pm 5 ppm/ $^{\circ}$ C B = \pm 10 ppm/ $^{\circ}$ C C = \pm 15 ppm/ $^{\circ}$ C S = \pm 20ppm/ $^{\circ}$ C D = \pm 25 ppm/ $^{\circ}$ C E = \pm 50 ppm/ $^{\circ}$ C F = \pm 100 ppm/ $^{\circ}$ C G = \pm 200 ppm/ $^{\circ}$ C H = \pm 250 ppm/ $^{\circ}$ C I = \pm 300 ppm/ $^{\circ}$ C J = \pm 350 ppm/ $^{\circ}$ C	Code 10 - 12 Forming Type 26- = 26mm 52- = 52.4mm 73- = 73mm 81- = 81mm 91- = 91mm F = F Type FK = FK Type FKK = FKK Type FFK = F-form Kink M = M-Type Forming M-form W/flat MT = MT Type Forming MR = MR Type AV = AVIsert PN = PANAsert	Code 13 - 17 Resistance Value 0R1 = 0.1 I00R = 100 10K = 10,000 10M = 10,000,000

EXCEPTION:

• Cement series:

<Code 8>: Special packing style code

B: Bulk with wirewound or metal oxide sub-assembly for resistance value

W: Bulk with ceramic based wirewound sub-assembly for resistance value

M: Bulk with metal oxide sub-assembly for resistance value

F: Bulk with Fiberglass based wirewound sub-assembly for resistance value

<Code 10-12>: Without forming code

Example: **SQP500JB-I0R**

• JPW series:

<Code 13-17>: without resistance value code

Example: **JPW-06-T-52-**

YAGEO - A GLOBAL COMPANY

HQ

Taipei, Taiwan
Tel. +886 2 6629 9999
Fax. +886 2 6628 8886

China and ASIA

Suzhou, China
Tel. +86 512 6825 5568
Fax. +86 512 6825 5386

Shanghai, China
Tel. +86 21 64858697

Dongguan, China
Tel. +86 769 8772 0275
Fax. +86 769 8791 0053

Tokyo, Japan
Tel. +81 3 6809 3972
Fax. +81 3 6809 3982

Seongnam, Korea
Tel. +82 31 712 4797
Fax. +82 31 712 5866

Singapore
Tel. +65 6244 7800
Fax. +65 6244 4943

Kuala Lumpur, Malaysia
Tel. +60 3 8063 8864
Fax. +60 3 8063 7376

Penang, Malaysia
Tel. +60 4 3973049
Fax. +60 4 3973050

EUROPE

Munich, Germany
Tel. +49 8990 7784 380
Fax. +49 8990 7784 379

Milan, Italy
Tel. +39 02 6129 1017
Fax. +39 02 6601 7490

Roermond, Benelux
Tel. +31 475 385 555
Fax. +31 475 385 589

Szombathely, Hungary
Tel. +36 94 517 702
Fax. +36 94 517 701

Moscow, Russian Federation
Tel. +7 965 408 18 11
Fax. +7 498 610 07 07

NORTH AMERICA

San Jose, U.S.A.
Tel. +1 408 240 6200
Fax. +1 408 240 6201

Mexico
Tel. +52 33 31330631
Fax. +1 408 240 6201

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