

DATA SHEET

GENERAL PURPOSE CHIP RESISTORS

 $\begin{array}{c} RC_L \; series \\ \pm 0.1\%, \; \pm 0.5\%, \; \pm 1\%, \; \pm 5\% \\ \mbox{Sizes } 0075/0\, 100/020\, I/0402/0603/0805/ \\ 1206/12\, 10/12\, 18/20\, 10/25\, 12 \end{array}$

RoHS compliant & Halogen free



Product specification – May 15, 2020 V.II

YAGEO Phícomp

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Chip Resistor Surface Mount

SERIES 0075 to 2512

<u>SCOPE</u>

This specification describes RC series chip resistors with lead free terminations made by thick film process.

APPLICATIONS

• All general purpose application

FEATURES

- Halogen Free Epoxy
- RoHS compliant
 - Products with lead free terminations meet RoHS requirements
 - Pb-glass contained in electrodes, resistors element and glass are exempted by RoHS
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Saving of PCB space
- None forbidden-materials used in products/production

ORDERING INFORMATION - GLOBAL PART NUMBER

Global part numbers are identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

GLOBAL PART NUMBER

RC_L

RC XXXX X X X XX XXXX L

(2) (3) (4) (5) (6) (7)

(I) SIZE

0075/0100/0201/0402/0603/0805/1206/1210/1218/2010/2512

(2) TOLERANCE

(1)

- $B = \pm 0.1\%$
- $D = \pm 0.5\%$
- $F = \pm 1.0\%$
- $J = \pm 5.0\%$ (for jumper ordering, use code of J)

(3) PACKAGING TYPE

- R = Paper taping reel
- K = Embossed taping reel
- S = ESD safe reel (0075/0100 only)

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Based on spec.

(5) TAPING REEL & POWER

- 07= 7 inch dia. Reel
- 10=10 inch dia. Reel
- 13=13 inch dia. Reel
- 7W = 7 inch dia. Reel & 2 x standard power
- 7N = 7 inch dia. Reel, ESD safe reel (0075/0100 only)
- 3W = 13 inch dia. Reel & 2 x standard power

(6) RESISTANCE VALUE

There are $2 \sim 4$ digits indicated the resistance value.

Letter R/K/M is decimal point

Example:

 $97R6 = 97.6\Omega$

9K76 = 9760Ω

 $|M = |,000,000\Omega$

(7) DEFAULT CODE

Letter L is the system default code for ordering only.^(Note)

ORDERING EXAMPLE

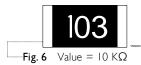
The ordering code for a RC0402 0.0625W chip resistor value $100K\Omega$ with

 $\pm 5\%$ tolerance, supplied in 7-inch tape reel of 10,000 units per reel is: RC0402JR-07100KL.

NOTE

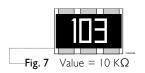
- 1. All our RSMD products meet RoHS compliant and Halogen Free. "LFP" of the internal 2D reel label mentions "Lead Free Process".
- 2. On customized label, "LFP" or specific symbol can be printed.

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MARKING						
RC0075 / RC	C0100 / RC0201 / RC0	402				
Fig. 1	presition	No Marking				
RC0603						
Fig. 2 240	240 $0 = 24 \times 10^{0} = 24$	1%, 0.5%,E24 o	exception va	alues 10/1	1/13/15/20/75 of E2	24 series
	$\frac{1}{3} = 806 \times 10^{0} = 806 \Omega$	%, 0.5%, E96 0/ / 3/ 5/24			ing method, includi	ng values
	03 ue = 10 KΩ	5%, E24 series First two digit		cant figure	e and 3rd digit for n	umber of zeros
RC0805 / RC	CI206 / RCI2I0 / RC2	010 / RC2512				
Fig. 5 Value	ΟΟ2 ue = 10 KΩ	1%, 0.5%, E24/ First three dig			re and 4th digit for	number of zeros



5%, E24 series : 3 digits First two digits for significant figure and 3rd digit for number of zeros

RC1218



1002 Fig. 8 Value = 10 KΩ

First two digits for significant figure and 3rd digit for number of zeros

Both E-24 and E-96 series: 4 digits, $\pm 1\% \& \pm 0.5\%$ First three digits for significant figure and 4th digit for number of zeros

For further marking information, please see special data sheet "Chip resistors marking".

E-24 series: 3 digits, ±5%

Chip Resistor Surface Mount

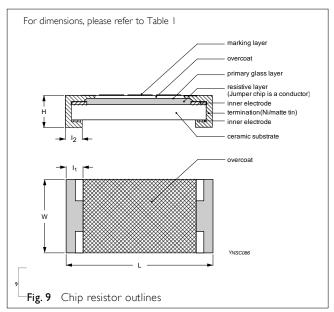
SERIES 0075 to 2512

CONSTRUCTION

The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added on each end to make the contacts to the thick film resistive element. The composition of the resistive element is a noble metal imbedded into a glass and covered by a second glass to prevent environmental influences. The resistor is laser trimmed to the rated resistance value. The resistor is covered with a protective epoxy coat, finally the two external terminations (matte tin on Ni-barrier) are added, as shown in Fig.9.

Outlines

RC_L



DIMENSION

Table I

TYPE	L (mm)	W (mm)	H (mm)	l⊤(mm)	l ₂ (mm)
RC0075	0.30±0.01	0.15±0.01	0.13±0.01	0.08±0.03	0.08±0.03
RC0100	0.40±0.02	0.20±0.02	0.13±0.02	0.10±0.03	0.10±0.03
RC0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
RC0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
RC0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
RC0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
RC1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
RC1210	3.10±0.10	2.60±0.15	0.55±0.10	0.45±0.15	0.50±0.20
RC1218	3.10±0.10	4.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
RC2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.20	0.50±0.20
RC2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.50±0.20

ELECTRICAL CHARACTERISTICS

								Table 2
JUMPER CRITERIA		RESISTANCE RANGE	DIELECTRIC WITHSTANDING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	MAXIMUM WORKING VOLTAGE	OPERATING TEMPERATURE RANGE	POWER	CHARAC- TERISTICS
Rated Current 0.5A Maximum Current 1.0A	I0Ω≦R <i00ω -200~+600ppm℃ I00Ω≦R≦IMΩ ±200ppm℃</i00ω 	5% (E24) I0Ω≦R≦IMΩ I% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	25V	25V	10V	-55℃ to 125℃	1/50 W	RC0075
Rated Current 0.5A Maximum Current 1.0A	IΩ≦R<10Ω -200~+600ppm°C I0Ω≤ R < 100Ω: ±300ppm/°C I00Ω≤ R ≤ I0MΩ: ±200ppm/°C I0MΩ< R ≤ 22MΩ: ±250ppm/°C	5% (E24) ΙΩ≦R≦22ΜΩ Ι% (E24/E96) ΙΩ≦R≦Ι0ΜΩ 0.5% (E24/E96) 33Ω≦R≦470KΩ Jumper<50mΩ	30V	30V	15V	-55℃ to 125℃	1/32 W	RC0100

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Table 2

CHARAC- TERISTICS	POWER	OPERATING TEMPERATURE RANGE	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	DIELECTRIC WITHSTANDING VOLTAGE	RESISTANCE RANGE	TEMPERATURE COEFFICIENT	JUMPER CRITERIA
RC0201	1/20 W	-55℃ to 125℃	25V	50V	50V	5% (E24) IΩ≦R≦I0MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.5% (E24/E96) IΩ≦R≦IMΩ 0.1% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	IΩ≦R≦I0Ω -100~+350ppm℃ I0Ω <r≦i0mω ±200ppm℃</r≦i0mω 	Rated Current 0.5A Maximum Current 1.0A
RC0402	1/16 W	-55℃ to 155℃	50V	1007	100V	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦10MΩ 0.5% (E24/E96) IΩ≦R≦1MΩ 0.1% (E24/E96) I0Ω≦R≦1MΩ Jumper<50mΩ	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±100ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	Rated Current I.0A Maximum Current 2.0A
	I/8W	-55℃ to 155℃	50V	100V	1007	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ	IΩ≦R≦IMΩ ±200ppm°C	
RC0603	1/10 W	-55℃ to 155℃	75V	150V	150V	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.5% (E24/E96) IΩ≦R≦IMΩ 0.1% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±100ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	Rated Current I.0A Maximum Current 2.0A
-	1/5 W	-55℃ to 155℃	75V	150V	150V	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ	IΩ≦R≦IMΩ ±200ppm°C	
RC0805	1/8 W	-55℃ to 155℃	150V	300∨	300∨	5% (E24) IΩ≦R≦I00MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.5% (E24/E96) IΩ≦R≦IMΩ 0.1% (E24/E96) I0Ω≦R≦IMΩ I0%, 20% (E24) 24MΩ≦R≦I00MΩ Jumper<50mΩ	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±100ppm°C I0MΩ<r≦22mω ±200ppm°C 24MΩ<r≦i00mω ±300ppm°C</r≦i00mω </r≦22mω </r≦i0mω 	Rated Current 2.0A Maximum Current 5.0A
	1/4 W	-55℃ to 155℃	I 50V	300V	300∨	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ	IΩ≦R≦IMΩ ±200ppm°C	

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FOOTPRINT AND SOLDERING PROFILES

For recommended footprint and soldering profiles, please refer to data sheet "Chip resistors mounting"

RC_L

Table 2

CHARAC- TERISTICS	POWER	OPERATING TEMPERATURE RANGE	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	DIELECTRIC WITHSTANDING VOLTAGE	RESISTANCE RANGE	TEMPERATURE COEFFICIENT	JUMPER CRITERIA
RC1206	1/4 W	-55℃ to 155℃	200V	400∨	500V	5% (E24) IΩ≦R≦I00MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.5% (E24/E96) IΩ≦R≦IMΩ 0.1% (E24/E96) I0Ω≦R≦IMΩ I0%, 20% (E24) 24MΩ≦R≦I00MΩ Jumper<50mΩ	IΩ≦R≦10Ω ±200ppm°C 10Ω <r≦10mω ±100ppm°C 10MΩ<r≦22mω ±200ppm°C 24MΩ≦R≦100MΩ ±300ppm°C</r≦22mω </r≦10mω 	Rated Current 2.0A Maximum Current 10.0A
	1/2 W	-55℃ to 155℃	200V	400∨	500V	5% (E24) ΙΩ≦R≦ΙΜΩ Ι% (E24/E96) ΙΩ≦R≦ΙΜΩ	IΩ≦R≦IMΩ ±200ppm℃	
RC1210	1/2 W	-55°C to 155°C	200V	500V	500V	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±I00ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	Rated Current 2.0A Maximum Current 10.0A
RC1218	I W	-55℃ to 155℃	200V	500V	500V	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	IΩ≦R≦I0Ω ±200ppm℃ I0Ω <r≦imω ±100ppm℃</r≦imω 	Rated Current 6.0A Maximum Current 10.0A
RC2010	3/4 W	-55°C to 155°C	200V	500V	500V	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±I00ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	Rated Current 2.0A Maximum Current 10.0A
RC2512	I W	-55℃ to 155℃	200V	500V	500V	5% (E24) ΙΩ≦R≦22MΩ Ι% (E24/E96) ΙΩ≦R≦Ι0MΩ 0.1%, 0.5% (E24/E96) Ι0Ω≦R≦ΙMΩ Jumper<50mΩ	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±100ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	Rated Current 2.0A Maximum Current 10.0A
	2 W	-55℃ to 155℃	200V	400∨	500V	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ	IΩ≦R≦IMΩ ±200ppm°C	

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PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	PAPER TAPINO	g reel (r)		esd safe reel (s) (4mm width, 1mm Pitch plastic Embossed)	EMBOSSED TAPING REEL
REEL DIMENSION	7" (178 mm)	10" (254mm)	13" (330 mm)	7" (178 mm)	7" (178 mm)
RC0075				20000	
RC0100	20000		80000	40000	
RC0201	10000	20000	50000		
RC0402	10000	20000	50000		
RC0603	5000	10000	20000		
RC0805	5000	10000	20000		
RC1206	5000	10000	20000		
RC1210	5000	10000	20000		
RC1218					4000
RC2010					4000
RC2512					4000

RC_L

NOTE

For tape and reel specification/dimensions, please refer to data sheet "Chip resistors packing".

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

RC0402 to RC2512 Range: -55°C to +155°C (Fig. 10-1) RC0075 to RC0201 Range: -55°C to +125°C (Fig. 10-2)

POWER RATING

Each type rated power at 70 °C: RC0075=1/50W RC0100=1/32W RC0201=1/20W RC0402=1/16W, 1/8W RC0603=1/10W, 1/5W RC0805=1/8W, 1/4W RC1206=1/4W, 1/2W RC1210=1/2W RC1218=1W RC2010=3/4W RC2512=1W, 2W

RATED VOLTAGE

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = \sqrt{(P \times R)}$$

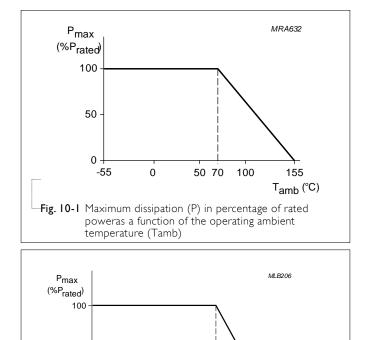
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or max. working voltage whichever is less Where

V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

 $R = Resistance value (\Omega)$



50 --55 0 50 70 100 125 T_{amb}(^oC) Fig. 10-2 Maximum dissipation (P) in percentage of rated poweras a function of the operating ambient temperature (Tamb)

Chip Resistor Surface Mount RC_L SERIES 0075 to 2512

TESTS AND REQUIREMENTS

Table 8 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of	MIL-STD-202 Method 304	At +25/–55°C and +25/+125°C	Refer to table 2
Resistance (T.C.R.)		Formula:	
		$T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$	
		Where t_1 =+25 ° C or specified room temperature	
		t_2 =–55 ° C or +125 ° C test temperature	
		R_1 =resistance at reference temperature in ohms R_2 =resistance at test temperature in ohms	
Life/ Endurance	MIL-STD-202 Method 108A IEC 60115-1 4.25.1	At 70±2°C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off, still air required	0075: \pm (5%+100mΩ) <100mΩ for jumper 01005: \pm (3% +50mΩ) <100mΩf or jumper Others: \pm (1% \pm 50mΩ) for P/D/E tol
			$\pm(1\%+50m\Omega)$ for B/D/F tol $\pm(3\%+50m\Omega)$ for J tol <100mR for jumper
High Temperature Exposure	MIL-STD-202 Method 108A IEC 60068-2-2	I,000 hours at maximum operating temperature depending on specification, unpowered.	0075: ± (5%+100mΩ) <100mΩ for jumper 01005: ±(1% +50mΩ) < 50mΩf or jumper
			Others: $\pm(1\%+50m\Omega)$ for B/D/F tol $\pm(2\%+50m\Omega)$ for J tol
			<50mR for jumper
Moisture Resistance	MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined at 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H, without steps	0075: ± (2%+100mΩ) <100mΩ for jumper 01005: ±(2% +50mΩ) < 100mΩf or jumper
		7a & 7b, unpowered Parts mounted on test-boards, without condensation on parts	Others: $\pm (0.5\%+50m\Omega)$ for B/ D/F tol $\pm (2\%+50m\Omega)$ for tol
			<100mR for jumper
Humidity	IEC 60115-1 4.24.2	Steady state for 1000 hours at 40°C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off	0075: ± (5%+100mΩ) no visible damage 01005: ±(3% +50mΩ) < 100mΩf or jumper
			Others: ±(1%+50mΩ) for B/D/F tol ±(2%+50mΩ) for J tol <100mR for jumper

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Thermal Shock	MIL-STD-202 Method 107G	-55/+125°C Note Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air - Air	0075/01005: ±(1% +50mΩ) < 50mΩf or jumper Others: ±(0.5%+50mΩ) for B/D/F tol ±(1%+50mΩ) for J tol < 50mR for jumper
Short Time Overload	IEC 60115-1 4.13	2.5 times RCWV or maximum overload voltage which is less for 5 seconds at room temperature	0075/01005: ±(2% +50mΩ) < 50mΩf or jumper Others: ±(1%+50mΩ) for B/D/F tol ±(2%+50mΩ) for J tol <50mR for jumper No visible damage
Board Flex/ Bending	IEC 60115-1 4.33	Device mounted or as described only I board bending required bending time: 60±5 seconds 0075/0100/0201/0402:5mm; 0603/0805:3mm; 1206 and above:2mm	0075/01005: ±(1% +50mΩ) < 50mΩf or jumper Others: ±(1%+50mΩ) for B/D/F/J tol <50mR for jumper No visible damage
Solderability - Wetting	J-STD-002 test B	Electrical Test not required Magnification 50X SMD conditions: Ist step: method B, aging 4 hours at 155°C dry heat 2nd step: leadfree solder bath at 245±3°C Dipping time: 3±0.5 seconds	W ell tinned (>95% covered) No visible damage
-Leaching	J-STD-002 test D	Leadfree solder ,260°C, 30 seconds immersion time	No visible damage
-Resistance to Soldering Heat	MIL-STD-202 Method 210F IEC 60115-1 4.18	Condition B, no pre-heat of samples Leadfree solder, 260°C ±5°C, 10 ±1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	$\begin{array}{c} 0075:\pm(3\%+50m\Omega)\\ <50m\Omega \mbox{ for jumper}\\ 01005:\pm(1\%+50m\Omega)\\ <50m\Omega \mbox{ for jumper}\\ Others:\\ \pm(0.5\%+50m\Omega) \mbox{ for B/D/F tol.}\\ \pm(1\%+50m\Omega) \mbox{ for J tol.}\\ <50mR \mbox{ for jumper}\\ No visible \mbox{ damage} \end{array}$

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Chip Resistor Surface Mount

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REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 11	May 15, 2020	-	- Extend RC0201, RC0402, RC0603, RC0805, RC1206 D tol resistance range to 10hm
Version 10	Dec. 12, 2018	-	- Updated 0075 dimensions
Version 9	Mar. 06, 2018	-	- Add 0.5%/1% marking rule for RC0603 ~ RC2512 based on marking datasheet
Version 8	July 10, 2017	-	- Add "3W" part number coding for 13" Reel & double power
Version 7	Mar. 7, 2017	-	- Add 10" packing
Version 6	Feb.15, 2017	-	- Extend RC0805 and RC1206 resistance range to 100Mohm
Version 5	Oct. 06, 2016	-	- Description: Update Dimension of I2 of RC2512 (2W)
Version 4	Jan. 22, 2016	-	- Update resistance range
Version 3	Dec. 24, 2015	-	- Updated test and requirements
Version 2	Jul. 23, 2015	-	- Updated test and requirements
Version I	Jan. 21, 2015	-	- ESD Safe Reel update
Version 0	Dec. 15, 2014	-	- First issue of this specification

RC_L

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CR-05FL7--150R CR-05FL7--698K CR-12FP4--324R CR-12JP4--680R CRCW04021K20FKEE CRCW06032K10FKEC CRCW06036K80FKEE M55342K03B499DRS6 M55342K06B6E19RWL 742C083750JTR MCR01MZPF1202 MCR01MZPF1601 MCR01MZPF1800 MCR01MZPF6201 MCR01MZPF9102 MCR01MZPJ121 MCR01MZPJ125 MCR01MZPJ751 MCR03EZHJ103 MCR03EZPFX2004 MCR03EZPJ270 MCR03EZPJ821 MCR10EZPF1102 MCR10EZPF2700 MCR18EZPJ330 RC1005F1152CS RC1005F1372CS RC1005F1912CS RC1005F3011CS RC1005F471CS RC1005F4751CS RC1005F5621CS RC1005F6041CS RC1005J106CS RC1005J121CS RC1005J122CS RC1005J154CS RC1005J180CS RC1005J181CS RC1005J202CS RC1005J391CS RC1005J512CS RC1005J560CS RC1005J683CS RC1005J823CS RC1608F1022CS RC1608F333CS RC1608F3651CS RC1608F5110CS RC1608J121CS