Notice for TAIYO YUDEN products

Please read this notice before using the TAIYO YUDEN products.

⚠ REMINDERS

- Product information in this catalog is as of October 2011. All of the contents specified herein are subject to change without notice due to technical improvements, etc. Therefore, please check for the latest information carefully before practical application or usage of the Products.

  Please note that Taiyo Yuden Co., Ltd. shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this catalog or individual specification.

- Please contact Taiyo Yuden Co., Ltd. for further details of product specifications as the individual specification is available.

- Please conduct validation and verification of products in actual condition of mounting and operating environment before commercial shipment of the equipment.

- All electronic components or functional modules listed in this catalog are developed, designed and intended for use in general electronics equipment.(for AV, office automation, household, office supply, information service, telecommunications, (such as mobile phone or PC) etc.). Before incorporating the components or devices into any equipment in the field such as transportation,(automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network (telephone exchange, base station) etc. which may have direct influence to harm or injure a human body, please contact Taiyo Yuden Co., Ltd. for more detail in advance.
  Do not incorporate the products into any equipment in fields such as aerospace, aviation, nuclear control, submarine system, military, etc. where higher safety and reliability are especially required.

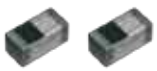
  In addition, even electronic components or functional modules that are used for the general electronic equipment, if the equipment or the electric circuit require high safety or reliability function or performances, a sufficient reliability evaluation check for safety shall be performed before commercial shipment and moreover, due consideration to install a protective circuit is strongly recommended at customer's design stage.

- The contents of this catalog are applicable to the products which are purchased from our sales offices or distributors (so called "TAIYO YUDEN's official sales channel").
  It is only applicable to the products purchased from any of TAIYO YUDEN's official sales channel.

- Please note that Taiyo Yuden Co., Ltd. shall have no responsibility for any controversies or disputes that may occur in connection with a third party's intellectual property rights and other related rights arising from your usage of products in this catalog. Taiyo Yuden Co., Ltd. grants no license for such rights.

- Caution for export
  Certain items in this catalog may require specific procedures for export according to "Foreign Exchange and Foreign Trade Control Law" of Japan, "U.S. Export Administration Regulations", and other applicable regulations. Should you have any question or inquiry on this matter, please contact our sales staff.

MULTILAYER CHIP INDUCTORS FOR HIGH FREQUENCY APPLICATIONS (HK SERIES)



WAVE* REFLOW

*Except for HK0402 HK0603, HK1005

FEATURES

- Multilayer inductor made of advanced ceramics with low-resistivity silver used as internal conductors provides excellent Q and SRF characteristics.
- Designed to address surface mount inductor needs for applications above 100MHz.
- Multilayer block structure ensures outstanding reliability, high productivity and product quality.
- The small case size lineup with 01005 inch size.

APPLICATIONS

- Portable telephones, PHS and W-LAN
- Miscellaneous high-frequency circuits
- EMI countermeasure in high-frequency circuits

ORDERING CODE

H K △ 0 6 0 3 1 0 N J — T

❶

❶Type	
HK	Multilayer chip inductors for high frequency

❷

❷External Dimensions (L×W) [mm]	
0402(01005)	0.4×0.2
0603(0201)	0.6×0.3
1005(0402)	1.0×0.5
1608(0603)	1.6×0.8
2125(0805)	2.0×1.2

❸

❸Nominal Inductance [nH]	
example	
3N9	3.9
10N	10
R10	100
R12	120

*R=decimal point
*N=0.0(nH type)

❹

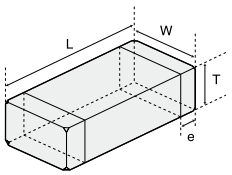
❹Inductance Tolerances	
H	±3%
J	±5%
C	±0.2nH
S	±0.3nH

❺

❺Packaging	
—T	Tape & Reel

EXTERNAL DIMENSIONS/STANDARD QUANTITY

●HK Type



Type	L	W	T	e	Standard Quantity [pcs] Paper Tape	Standard Quantity [pcs] Embossed Tape
HK0402 (01005)	0.4±0.02 (0.016±0.001)	0.2±0.02 (0.008±0.001)	0.2±0.02 (0.008±0.001)	0.1±0.03 (0.004±0.001)	20000	—
HK0603 (0201)	0.6±0.03 (0.024±0.001)	0.3±0.03 (0.012±0.001)	0.3±0.03 (0.012±0.001)	0.15±0.05 (0.006±0.002)	15000	—
HK1005 (0402)	1.0±0.05 (0.039±0.002)	0.5±0.05 (0.020±0.002)	0.5±0.05 (0.020±0.002)	0.25±0.10 (0.010±0.004)	10000	—
HK1608 (0603)	1.6±0.15 (0.063±0.006)	0.8±0.15 (0.031±0.006)	0.8±0.15 (0.031±0.006)	0.3±0.2 (0.012±0.008)	4000	—
HK2125 (0805)	$2.0^{+0.3}_{-0.1}$ ($0.079^{+0.012}_{-0.004}$)	1.25±0.2 (0.049±0.008)	0.85±0.2 (0.033±0.008)	0.5±0.3 (0.020±0.012)	—	4000
			$1.0^{+0.2}_{-0.3}$ ($0.039^{+0.008}_{-0.012}$)		—	3000

Unit : mm(inch)

AVAILABLE INDUCTANCE RANGE

Inductance [nH]	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2	10.0	12.0	15.0	18.0	22.0	27.0	33.0	39.0	47.0	56.0	68.0	82.0	100.0	120.0	150.0	180.0	220.0	270.0	330.0	390.0	470.0
HK0402 (Imax. [mA]) Operating temp.: −55～+125℃	1N0□ 380	1N2□ 370	1N5□ 330	1N8□ 310	2N2□ 290	2N7□ 270	3N3□ 240	3N9□ 230	4N7□ 220	5N6□ 200	6N8○ 180	8N2○ 170	10N○ 160	12N○ 160																					
HK0603 (Imax. [mA]) Operating temp.: −55～+125℃	1N0□ 470	1N2□ 450	1N5□ 430	1N8□ 390	2N2□ 360	2N7□ 340	3N3□ 320	3N9□ 300	4N7□ 280	5N6□ 260	6N8○ 250	8N2○ 230	10N○ 220	12N○ 190	15N○ 180	18N○ 170	22N○ 150	27N○ 120	33N○ 110	39N○ 100	47N○ 100	56N○ 80	68N○ 80	82N○ 70	R10○ 60									
HK1005 (Imax. [mA]) Operating temp.: −55～+125℃	1N0□	1N2□	1N5□	1N8□	2N2□	2N7□	3N3□	3N9□	4N7□	5N6□	6N8○	8N2○	10N○	12N○	15N○	18N○	22N○	27N○	33N○	39N○	47N○	56N○	68N○	82N○	R10○	R12○	R15○	R18○	R22○	R27○			
	← 300																		← 200				180	← 150	→	140	130	120	110				
Operating temp.: −55～+85℃	900	900	850	700	700	650	550	500	500	430	430	380	340	330	320	310	300	300	250	250	230	220	←			200				→			
HK1608 (Imax. [mA]) Operating temp.: −40～+85℃	1N0□	1N2□	1N5□	1N8□	2N2□	2N7□	3N3□	3N9□	4N7□	5N6□	6N8○	8N2○	10N○	12N○	15N○	18N○	22N○	27N○	33N○	39N○	47N○	56N○	68N○	82N○	R10○	R12○	R15○	R18○	R22○	R27○	R33○	R39○	R47○
	←															300															← 150		→
HK2125 (Imax. [mA]) Operating temp.: −40～+85℃			1N5S	1N8S	2N2S	2N7S	3N3S	3N9S	4N7S	5N6S	6N8J	8N2J	10NJ	12NJ	15NJ	18NJ	22NJ	27NJ	33NJ	39NJ	47NJ	56NJ	68NJ	82NJ	R10J	R12J	R15J	R18J	R22J	R27J	R33J	R39J	R47J
			←															300															→

※ □, ○mark indicates the Inductance tolerance code. The product with tolerance less than ±0.3nH(□), ±5% (○)is also available. Please contact your local sales office.

PART NUMBERS

HK0402

Ordering code		EHS (Environmental Hazardous Substances)	Inductance (nH)	Q min.	LQ Measuring frequency [MHz]	Q (Typical) Frequency [MHz]					Self-resonant frequency (MHz)		Resistance DC (Ω)	Rated current (mA) max.	Thickness (mm) (inch)
						100	300	500	800	1000	min.	Typ.	max.		
HK0402 1N0□		RoHS	1.0±0.3nH	3	100	4	7	9	12	14	10000	>13500	0.18	380	
HK0402 1N2□		RoHS	1.2±0.3nH	3	100	4	7	9	12	14	10000	>13500	0.19	370	
HK0402 1N5□		RoHS	1.5±0.3nH	3	100	4	7	9	11	12	10000	>13500	0.24	330	
HK0402 1N8□		RoHS	1.8±0.3nH	3	100	4	7	9	11	12	10000	13100	0.27	310	
HK0402 2N2□		RoHS	2.2±0.3nH	3	100	4	7	9	11	12	9800	11300	0.29	290	
HK0402 2N7□		RoHS	2.7±0.3nH	3	100	4	7	9	11	12	8800	10300	0.35	270	
HK0402 3N3□		RoHS	3.3±0.3nH	3	100	4	7	9	11	12	7300	8800	0.42	240	0.20±0.02 (0.008±0.001)
HK0402 3N9□		RoHS	3.9±0.3nH	3	100	4	7	9	11	12	6800	8300	0.46	230	
HK0402 4N7□		RoHS	4.7±0.3nH	3	100	4	6	8	10	11	6400	7900	0.52	220	
HK0402 5N6□		RoHS	5.6±0.3nH	3	100	4	6	8	10	11	5100	6600	0.63	200	
HK0402 6N8○		RoHS	6.8±5%	3	100	4	6	8	10	11	4400	5900	0.71	180	
HK0402 8N2○		RoHS	8.2±5%	3	100	4	6	8	10	11	4100	5600	0.81	170	
HK0402 10N○		RoHS	10±5%	3	100	4	6	8	10	11	3400	4900	0.93	160	
HK0402 12N○		RoHS	12±5%	3	100	4	6	8	10	11	2900	4400	0.99	160	

※ □, ○mark indicates the Inductance tolerance code.

HK0603

Ordering code		EHS (Environmental Hazardous Substances)	Inductance (nH)	Q min.	LQ Measuring frequency [MHz]	Q (Typical) Frequency [MHz]					Self-resonant frequency (MHz)		Resistance DC (Ω)		Rated current (mA) max.	Thickness (mm) (inch)
						100	300	500	800	1000	min.	Typ.	max.	Typ.		
HK 0603 1N0□		RoHS	1.0±0.3nH ※	4	100	6	12	17	22	27	10000	>13000	0.11	0.088	470	
HK 0603 1N2□		RoHS	1.2±0.3nH ※	4	100	6	12	16	21	25	10000	>13000	0.12	0.089	450	
HK 0603 1N5□		RoHS	1.5±0.3nH ※	4	100	6	12	15	20	23	10000	>13000	0.13	0.11	430	
HK 0603 1N8□		RoHS	1.8±0.3nH ※	4	100	6	12	15	20	23	10000	>13000	0.16	0.12	390	
HK 0603 2N0□		RoHS	2.0±0.3nH ※	4	100	6	12	15	20	22	10000	>13000	0.17	0.13	380	
HK 0603 2N2□		RoHS	2.2±0.3nH ※	4	100	6	12	15	20	22	8800	12500	0.19	0.14	360	
HK 0603 2N4□		RoHS	2.4±0.3nH ※	4	100	6	12	15	20	22	8300	11700	0.20	0.15	350	
HK 0603 2N7□		RoHS	2.7±0.3nH ※	5	100	7	12	15	20	22	7700	11000	0.21	0.16	340	
HK 0603 3N0□		RoHS	3.0±0.3nH ※	5	100	7	12	15	20	22	7200	11000	0.22	0.18	330	
HK 0603 3N3□		RoHS	3.3±0.3nH ※	5	100	7	12	15	20	22	6700	9600	0.23	0.19	320	
HK 0603 3N6□		RoHS	3.6±0.3nH ※	5	100	7	12	15	20	22	6400	9100	0.25	0.20	310	
HK 0603 3N9□		RoHS	3.9±0.3nH ※	5	100	7	12	15	20	22	6000	8600	0.27	0.20	300	
HK 0603 4N3□		RoHS	4.3±0.3nH ※	5	100	7	12	15	19	21	5700	8100	0.30	0.22	280	
HK 0603 4N7□		RoHS	4.7±0.3nH ※	5	100	7	12	15	19	21	5300	7600	0.30	0.24	280	
HK 0603 5N1□		RoHS	5.1±0.3nH ※	5	100	7	12	15	19	21	5000	7100	0.33	0.26	270	
HK 0603 5N6□		RoHS	5.6±0.3nH ※	5	100	7	12	15	19	21	4600	6600	0.36	0.27	260	
HK 0603 6N2□		RoHS	6.2±0.3nH ※	5	100	7	11	14	18	20	4200	6100	0.38	0.29	250	0.30±0.03 (0.012±0.001)
HK 0603 6N8○		RoHS	6.8±5% ※	5	100	7	11	14	18	20	3900	5600	0.39	0.30	250	
HK 0603 7N5○		RoHS	7.5±5% ※	5	100	7	11	14	18	19	3600	5300	0.41	0.34	240	
HK 0603 8N2○		RoHS	8.2±5% ※	5	100	7	11	14	18	19	3400	4900	0.45	0.34	230	
HK 0603 9N1○		RoHS	9.1±5% ※	5	100	7	11	14	17	18	3200	4600	0.48	0.40	220	
HK 0603 10N○		RoHS	10±5% ※	5	100	7	11	14	17	18	2900	4200	0.51	0.41	220	
HK 0603 12N○		RoHS	12±5% ※	5	100	7	11	14	17	18	2700	3800	0.68	0.45	190	
HK 0603 15N○		RoHS	15±5% ※	5	100	7	11	13	16	17	2300	3300	0.71	0.5	180	
HK 0603 18N○		RoHS	18±5% ※	5	100	7	11	13	16	17	2100	3000	0.81	0.57	170	
HK 0603 22N○		RoHS	22±5% ※	5	100	7	11	13	15	16	1800	2600	1	0.71	150	
HK 0603 27N○		RoHS	27±5% ※	4	100	6	10	12	14	15	1800	2600	1.35	1.11	120	
HK 0603 33N○		RoHS	33±5% ※	4	100	6	10	12	14	14	1700	2400	1.47	1.33	110	
HK 0603 39N○		RoHS	39±5% ※	4	100	6	10	12	13	12	1500	2100	1.72	1.51	100	
HK 0603 47N○		RoHS	47±5% ※	4	100	6	10	11	12	11	1300	1800	1.90	1.74	100	
HK 0603 56N○		RoHS	56±5% ※	4	100	6	10	11	11	10	1100	1600	2.27	1.85	80	
HK 0603 68N○		RoHS	68±5% ※	4	100	6	10	11	11	10	1100	1500	2.66	2.30	80	
HK 0603 82N○		RoHS	82±5% ※	4	100	6	10	11	10	8	1000	1400	3.37	2.60	70	
HK 0603 R10○		RoHS	100±5% ※	4	100	6	9	10	9	6	900	1200	3.74	3.00	60	

※ □, ○mark indicates the Inductance tolerance code. The product with tolerance less than ±0.3nH (□), ±5% (○) is also available. Please contact your local sales office.

* This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/) or CD catalogs.

PART NUMBERS

●HK1005

Ordering code		EHS (Environmental Hazardous Substances)	Inductance (nH)	Q min.	LQ Measuring frequency [MHz]	Q (Typical) Frequency [MHz]					Self-resonant frequency (MHz)		Resistance DC (Ω)		Rated current (mA) max.		Thickness (mm) (inch)
						100	300	500	800	1000	min.	Typ.	max.	Typ.	−55~+125℃	−55~+85℃	
HK 1005 1N0□		RoHS	1.0±0.3nH ※	8	100	11	25	34	43	52	10000	>13000	0.08	0.04	300	900	
HK 1005 1N2□		RoHS	1.2±0.3nH ※	8	100	11	25	35	44	52	10000	>13000	0.09	0.04	300	900	
HK 1005 1N5□		RoHS	1.5±0.3nH ※	8	100	11	24	33	44	48	6000	>13000	0.1	0.05	300	850	
HK 1005 1N8□		RoHS	1.8±0.3nH ※	8	100	11	23	30	36	42	6000	11000	0.12	0.06	300	700	
HK 1005 2N0□		RoHS	2.0±0.3nH ※	8	100	11	21	27	34	39	6000	10500	0.12	0.06	300	700	
HK 1005 2N2□		RoHS	2.2±0.3nH ※	8	100	10	18	25	31	36	6000	10000	0.13	0.07	300	700	
HK 1005 2N4□		RoHS	2.4±0.3nH ※	8	100	10	18	24	31	35	6000	9500	0.13	0.07	300	650	
HK 1005 2N7□		RoHS	2.7±0.3nH ※	8	100	10	18	24	31	34	6000	9000	0.13	0.08	300	650	
HK 1005 3N0□		RoHS	3.0±0.3nH ※	8	100	10	18	24	31	35	6000	8500	0.16	0.09	300	600	
HK 1005 3N3□		RoHS	3.3±0.3nH ※	8	100	10	18	24	31	35	6000	8000	0.16	0.1	300	550	
HK 1005 3N6□		RoHS	3.6±0.3nH ※	8	100	10	18	24	31	35	5000	7500	0.2	0.11	300	500	
HK 1005 3N9□		RoHS	3.9±0.3nH ※	8	100	10	18	24	31	35	4000	7000	0.21	0.12	300	500	
HK 1005 4N3□		RoHS	4.3±0.3nH ※	8	100	10	18	24	31	35	4000	6500	0.2	0.12	300	500	
HK 1005 4N7□		RoHS	4.7±0.3nH ※	8	100	10	18	24	31	34	4000	6000	0.21	0.12	300	500	
HK 1005 5N1□		RoHS	5.1±0.3nH ※	8	100	10	18	24	31	34	4000	5800	0.21	0.13	300	450	
HK 1005 5N6□		RoHS	5.6±0.3nH ※	8	100	10	18	24	30	35	4000	5700	0.23	0.15	300	430	
HK 1005 6N2□		RoHS	6.2±0.3nH ※	8	100	10	18	24	30	34	3900	5600	0.25	0.16	300	430	
HK 1005 6N8○		RoHS	6.8±5% ※	8	100	10	18	23	29	32	3900	5500	0.25	0.17	300	430	
HK 1005 7N5○		RoHS	7.5±5% ※	8	100	10	18	23	29	32	3700	5200	0.25	0.18	300	400	0.50±0.05 (0.020±0.002)
HK 1005 8N2○		RoHS	8.2±5% ※	8	100	10	18	23	29	31	3600	4900	0.28	0.21	300	380	
HK 1005 9N1○		RoHS	9.1±5% ※	8	100	10	18	23	29	31	3400	4500	0.3	0.22	300	360	
HK 1005 10N○		RoHS	10±5% ※	8	100	10	18	23	29	31	3200	4300	0.31	0.23	300	340	
HK 1005 12N○		RoHS	12±5% ※	8	100	11	18	23	29	31	2700	3900	0.4	0.28	300	330	
HK 1005 15N○		RoHS	15±5% ※	8	100	11	18	23	28	30	2300	3500	0.46	0.31	300	320	
HK 1005 18N○		RoHS	18±5% ※	8	100	11	18	23	28	30	2100	3100	0.55	0.35	300	310	
HK 1005 22N○		RoHS	22±5% ※	8	100	11	17	22	26	27	1900	2800	0.6	0.42	300	300	
HK 1005 27N○		RoHS	27±5% ※	8	100	11	17	21	25	26	1600	2300	0.7	0.47	300	300	
HK 1005 33N○		RoHS	33±5% ※	8	100	11	16	20	23	22	1300	1900	0.8	0.5	200	250	
HK 1005 39N○		RoHS	39±5% ※	8	100	11	16	20	23	21	1200	1700	0.9	0.52	200	250	
HK 1005 47N○		RoHS	47±5% ※	8	100	11	16	19	21	18	1000	1500	1	0.58	200	230	
HK 1005 56N○		RoHS	56±5% ※	8	100	11	16	18	18	16	750	1300	1	0.61	200	220	
HK 1005 68N○		RoHS	68±5% ※	8	100	11	15	17	18	11	750	1200	1.2	0.7	180	200	
HK 1005 82N○		RoHS	82±5% ※	8	100	10	14	16	15	6	600	1100	1.3	0.81	150	200	
HK 1005 R10○		RoHS	100±5% ※	8	100	10	14	14	12	—	600	1000	1.5	0.94	150	200	
HK 1005 R12○		RoHS	120±5% ※	8	100	10	12	10	—	—	600	800	1.6	1.1	150	200	
HK 1005 R15○		RoHS	150±5% ※	8	100	12	17	17	—	—	550	920	3.2	2.57	140	200	
HK 1005 R18○		RoHS	180±5% ※	8	100	12	16	—	—	—	500	810	3.7	2.97	130	200	
HK 1005 R22○		RoHS	220±5% ※	8	100	12	16	—	—	—	450	700	4.2	3.29	120	200	
HK 1005 R27○		RoHS	270±5% ※	8	100	12	14	—	—	—	400	600	4.8	3.92	110	200	

※ □, ○mark indicates the Inductance tolerance code. The product with tolerance less than ±0.3nH(□), ±5% (○) is also available. Please contact your local sales office.

●HK1608

Ordering code		EHS (Environmental Hazardous Substances)	Inductance (nH)	Q min.	LQ Measuring frequency [MHz]	Q (Typical) Frequency [MHz]					Self-resonant Frequency (MHz)		DC-Resistance (Ω)		Rated current (mA) max.	Thickness (mm) (inch)
						100	300	500	800	1000	min.	Typ.	max.	Typ.		
HK 1608 1N0□		RoHS	1.0±0.3nH ※	8	100	14	30	40	70	90	10000	>13000	0.05	0.015	300	
HK 1608 1N2□		RoHS	1.2±0.3nH ※	8	100	14	30	40	70	90	10000	>13000	0.05	0.015	300	
HK 1608 1N5□		RoHS	1.5±0.3nH ※	8	100	14	26	34	47	50	6000	>13000	0.10	0.03	300	
HK 1608 1N8□		RoHS	1.8±0.3nH ※	8	100	10	18	24	30	34	6000	>13000	0.10	0.06	300	
HK 1608 2N2□		RoHS	2.2±0.3nH ※	8	100	12	22	29	37	40	6000	12000	0.10	0.06	300	
HK 1608 2N7□		RoHS	2.7±0.3nH ※	10	100	13	24	32	41	45	6000	11000	0.10	0.06	300	
HK 1608 3N3□		RoHS	3.3±0.3nH ※	10	100	14	25	33	42	47	6000	9000	0.12	0.06	300	
HK 1608 3N9□		RoHS	3.9±0.3nH ※	10	100	13	25	33	42	46	6000	8000	0.14	0.07	300	
HK 1608 4N7□		RoHS	4.7±0.3nH ※	10	100	13	25	33	42	47	4000	6500	0.16	0.08	300	
HK 1608 5N6□		RoHS	5.6±0.3nH ※	10	100	14	25	33	42	46	4000	5800	0.18	0.09	300	
HK 1608 6N8○		RoHS	6.8±5% ※	10	100	14	25	33	43	47	4000	5600	0.22	0.11	300	
HK 1608 8N2○		RoHS	8.2±5% ※	10	100	14	26	34	44	48	3500	5200	0.24	0.13	300	
HK 1608 10N○		RoHS	10±5% ※	12	100	14	26	34	43	47	3400	4600	0.26	0.16	300	
HK 1608 12N○		RoHS	12±5% ※	12	100	14	27	35	45	49	2600	4000	0.28	0.17	300	
HK 1608 15N○		RoHS	15±5% ※	12	100	15	28	37	46	51	2300	3400	0.32	0.20	300	
HK 1608 18N○		RoHS	18±5% ※	12	100	15	27	36	44	48	2000	3000	0.35	0.21	300	
HK 1608 22N○		RoHS	22±5% ※	12	100	16	28	36	44	47	1600	2900	0.40	0.25	300	0.8±0.15 (0.031±0.006)
HK 1608 27N○		RoHS	27±5% ※	12	100	16	29	37	45	46	1400	2200	0.45	0.28	300	
HK 1608 33N○		RoHS	33±5% ※	12	100	17	31	40	46	47	1200	1800	0.55	0.35	300	
HK 1608 39N○		RoHS	39±5% ※	12	100	18	31	39	44	44	1100	1600	0.60	0.38	300	
HK 1608 47N○		RoHS	47±5% ※	12	100	17	28	34	35	34	900	1600	0.70	0.45	300	
HK 1608 56N○		RoHS	56±5% ※	12	100	17	28	34	34	31	900	1400	0.75	0.50	300	
HK 1608 68N○		RoHS	68±5% ※	12	100	18	29	34	30	22	700	1200	0.85	0.55	300	
HK 1608 82N○		RoHS	82±5% ※	12	100	18	28	33	27	—	600	1100	0.95	0.60	300	
HK 1608 R10○		RoHS	100±5% ※	12	100	18	27	28	16	—	600	1000	1.00	0.65	300	
HK 1608 R12○		RoHS	120±5% ※	8	50	16	24	23	—	—	500	800	1.20	0.68	300	
HK 1608 R15○		RoHS	150±5% ※	8	50	13	19	16	—	—	500	800	1.20	0.73	300	
HK 1608 R18○		RoHS	180±5% ※	8	50	13	18	12	—	—	400	700	1.30	0.85	300	
HK 1608 R22○		RoHS	220±5% ※	8	50	12	16	—	—	—	400	600	1.50	0.95	300	
HK 1608 R27○		RoHS	270±5% ※	8	50	14	15	—	—	—	400	550	1.9	1.34	150	
HK 1608 R33○		RoHS	330±5% ※	8	50	14	—	—	—	—	350	480	2.1	1.53	150	
HK 1608 R39○		RoHS	390±5% ※	8	50	13	—	—	—	—	350	410	2.3	1.72	150	
HK 1608 R47○		RoHS	470±5% ※	8	50	13	—	—	—	—	300	360	2.6	2.04	150	

※ □, ○mark indicates the Inductance tolerance code. The product with tolerance less than ±0.3nH(□), ±5% (○) is also available. Please contact your local sales office.

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PART NUMBERS

●HK2125

Ordering code		EHS (Environmental Hazardous Substances)	Inductance (nH)	Q min.	LQ Measuring frequency [MHz]	Q (Typical) Frequency [MHz]					Self-resonant Frequency (MHz)		DC-Resistance (Ω)		Rated current (mA) max.	Thickness (mm) (inch)
						100	300	500	800	1000	min.	Typ.	max.	Typ.		
HK 2125 1N5S		RoHS	1.5±0.3nH	10	100	21	39	57	61	68	4000	>6000	0.10	0.02	300	0.85±0.2 (0.033±0.008)
HK 2125 1N8S		RoHS	1.8±0.3nH	10	100	18	35	49	55	59	4000	>6000	0.10	0.02	300	
HK 2125 2N2S		RoHS	2.2±0.3nH	10	100	18	33	46	53	58	4000	>6000	0.10	0.03	300	
HK 2125 2N7S		RoHS	2.7±0.3nH	12	100	19	36	50	56	60	4000	>6000	0.10	0.03	300	
HK 2125 3N3S		RoHS	3.3±0.3nH	12	100	16	29	40	47	51	4000	>6000	0.13	0.04	300	
HK 2125 3N9S		RoHS	2.2±0.3nH	12	100	18	33	46	54	60	4000	>6000	0.15	0.05	300	
HK 2125 4N7S		RoHS	4.7±0.3nH	12	100	18	34	46	55	60	3500	>6000	0.20	0.05	300	
HK 2125 5N6S		RoHS	5.6±0.3nH	15	100	20	38	51	60	66	3200	5400	0.23	0.05	300	
HK 2125 6N8J		RoHS	6.8±5%	15	100	20	39	52	63	69	2800	4200	0.25	0.06	300	
HK 2125 8N2J		RoHS	8.2±5%	15	100	21	40	54	63	70	2400	3700	0.28	0.07	300	
HK 2125 10NJ		RoHS	10±5%	15	100	20	38	51	60	67	2100	3100	0.30	0.09	300	
HK 2125 12NJ		RoHS	12±5%	15	100	21	39	52	60	67	1900	3000	0.35	0.10	300	
HK 2125 15NJ		RoHS	15±5%	15	100	22	42	55	63	72	1600	2600	0.40	0.11	300	
HK 2125 18NJ		RoHS	18±5%	15	100	24	44	57	63	72	1500	2300	0.45	0.13	300	
HK 2125 22NJ		RoHS	22±5%	18	100	23	43	55	60	69	1400	2100	0.50	0.16	300	
HK 2125 27NJ		RoHS	27±5%	18	100	23	42	53	58	68	1300	1800	0.55	0.17	300	
HK 2125 33NJ		RoHS	33±5%	18	100	24	43	54	55	60	1200	1700	0.60	0.19	300	
HK 2125 39NJ		RoHS	39±5%	18	100	23	41	50	47	47	1000	1400	0.65	0.25	300	
HK 2125 47NJ		RoHS	47±5%	18	100	23	41	49	43	41	900	1200	0.70	0.26	300	$1.00^{+0.2}_{-0.3}$ ($0.039^{+0.008}_{-0.012}$)
HK 2125 56NJ		RoHS	56±5%	18	100	23	42	48	39	38	800	1100	0.75	0.28	300	
HK 2125 68NJ		RoHS	68±5%	18	100	25	42	45	30	—	700	900	0.80	0.33	300	
HK 2125 82NJ		RoHS	82±5%	18	100	24	41	41	—	—	600	800	0.90	0.37	300	
HK 2125 R10J		RoHS	100±5%	18	100	23	37	37	—	—	600	800	0.90	0.40	300	
HK 2125 R12J		RoHS	120±5%	13	50	22	33	29	—	—	500	700	0.95	0.43	300	
HK 2125 R15J		RoHS	150±5%	13	50	22	34	26	—	—	500	700	1.00	0.46	300	
HK 2125 R18J		RoHS	180±5%	13	50	23	34	20	—	—	400	600	1.10	0.50	300	
HK 2125 R22J		RoHS	220±5%	12	50	20	23	—	—	—	350	550	1.20	0.75	300	
HK 2125 R27J		RoHS	270±5%	12	50	20	29	—	—	—	300	480	1.30	0.85	300	
HK 2125 R33J		RoHS	330±5%	12	50	22	15	—	—	—	250	400	1.40	0.90	300	
HK 2125 R39J		RoHS	390±5%	10	50	17	12	—	—	—	250	400	1.30	0.85	300	
HK 2125 R47J		RoHS	470±5%	10	50	17	—	—	—	—	200	350	1.50	0.95	300	

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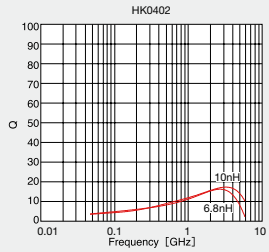
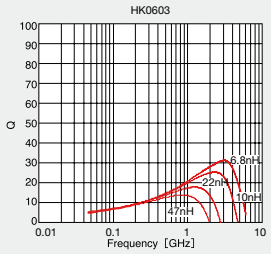
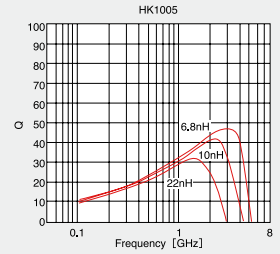
ELECTRICAL CHARACTERISTICS

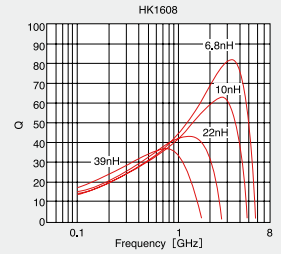
Q-Characteristics

Measured by 8719C









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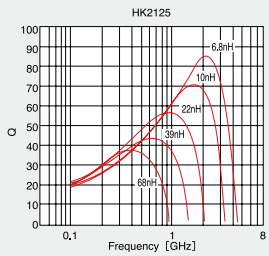
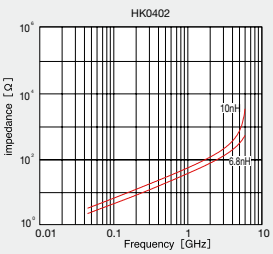
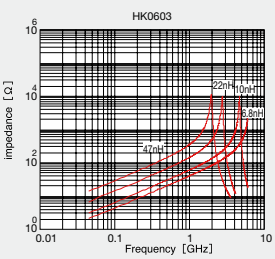
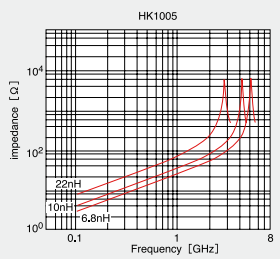


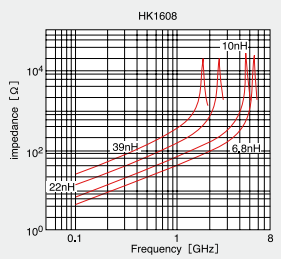
Impedance-vs-Frequency characteristics

Measured by 8719C









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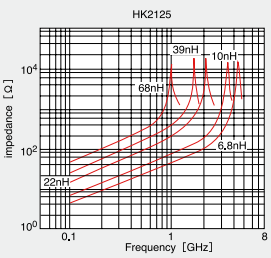

Inductance-vs-Frequency characteristics

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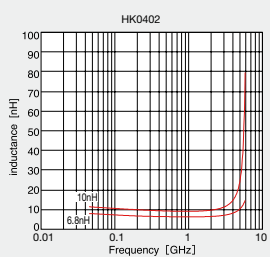

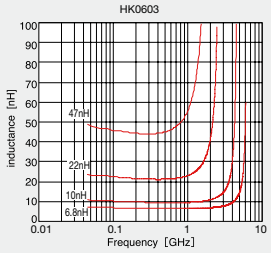

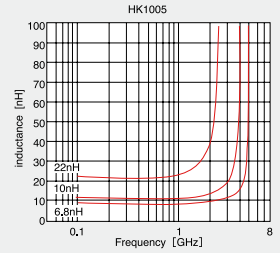

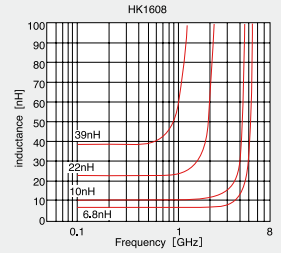

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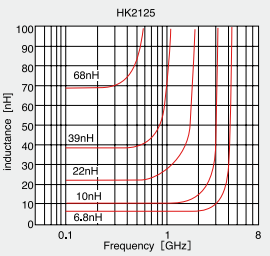

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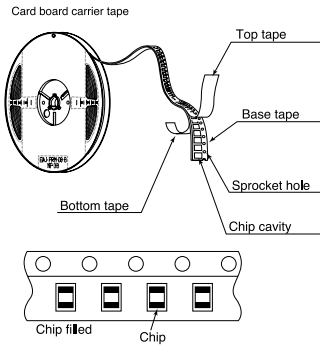
PACKAGING

①Minimum Quantity

● Tape & Reel Packaging

Type	Thickness [mm] (inch)	Standard Quantity [pcs]	
		Paper Tape	Embossed Tape
CK1608(0603)	0.8 (0.031)	4000	—
CK2125(0805)	0.85 (0.033)	4000	—
	1.25 (0.049)	—	2000
CKS2125(0805)	0.85 (0.033)	4000	—
	1.25 (0.049)	—	2000
CKP2012(0805)	0.9 (0.035)	—	3000
CKP2016(0806)	0.9 (0.035)	—	3000
CKP2520(1008)	0.7 (0.028)	—	3000
	0.9 (0.035)	—	3000
	1.1 (0.043)	—	2000
NM2012(0805)	0.9 (0.035)	—	3000
NM2520(1008)	1.1 (0.043)	—	2000
LK1005(0402)	0.5 (0.020)	10000	—
LK1608(0603)	0.8 (0.031)	4000	—
LK2125(0805)	0.85 (0.033)	4000	—
	1.25 (0.049)	—	2000
HK0402(01005)	0.2 (0.008)	20000	—
HK0603(0201)	0.3 (0.012)	15000	—
HK1005(0402)	0.5 (0.020)	10000	—
HK1608(0603)	0.8 (0.031)	4000	—
HK2125(0805)	0.85 (0.033)	—	4000
	1.0 (0.039)	—	3000
HKQ0603S(0201)	0.3 (0.012)	15000	—
HKQ0603U(0201)	0.3 (0.012)	15000	—
AQ105(0402)	0.5 (0.020)	10000	—
BK0402(01005)	0.2 (0.008)	20000	—
BK0603(0201)	0.3 (0.012)	15000	—
BK1005(0402)	0.5 (0.020)	10000	—
BKH1005(0402)	0.5 (0.020)	10000	—
BK1608(0603)	0.8 (0.031)	4000	—
BK2125(0805)	0.85 (0.033)	4000	—
	1.25 (0.049)	—	2000
BK2010(0804)	0.45 (0.018)	4000	—
BK3216(1206)	0.8 (0.031)	—	4000
BKP0603(0201)	0.3 (0.012)	15000	—
BKP1005(0402)	0.5 (0.020)	10000	—
BKP1608(0603)	0.8 (0.031)	4000	—
BKP2125(0805)	0.85 (0.033)	4000	—

②Taping material



CK	1608
CK	2125
CKS	2125
LK	1005
LK	1608
LK	2125
HK	0402
HK	0603
HK	1005
HK	1608
HKQ	0603
AQ	105
BK	0402
BK	0603
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BK	2010
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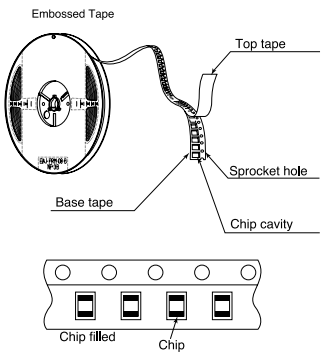
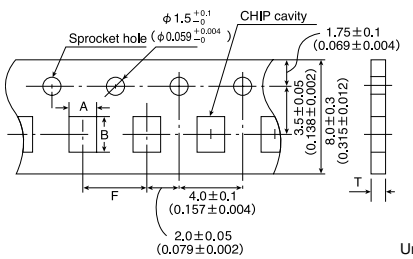
BKH	1005



CK	2125
CKS	2125
CKP	2012
CKP	2016
CKP	2520
NM	2012
NM	2520
LK	2125
HK	2125
BK	2125
BK	3216

③Taping Dimensions

● Paper tape (0.315 inches wide)



Unit : mm (inch)

Type	Thickness (mm) (inch)	Chip cavity		Insertion Pitch	Tape Thickness
		A	B	F	T
CK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
CK2125(0805)	0.85 (0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
CKS2125(0805)	0.85 (0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
LK1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
LK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
LK2125(0805)	0.85 (0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
HK0402(01005)	0.2 (0.008)	0.25±0.04 (0.010±0.002)	0.45±0.04 (0.018±0.002)	2.0±0.05 (0.079±0.002)	0.36max (0.014max)
HK0603(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
HK1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
HK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
HKQ0603S(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
HKQ0603U(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
AQ105(0402)	0.5 (0.020)	0.75±0.1 (0.030±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)

To next page

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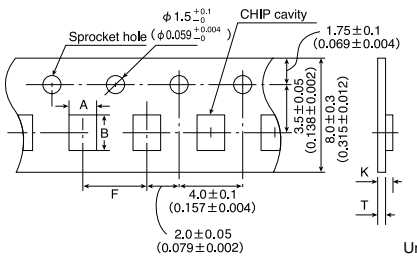
PACKAGING

Type	Thickness (mm) (inch)	Chip cavity		Insertion Pitch	Tape Thickness
		A	B	F	T
BK0402(01005)	0.2 (0.008)	0.25±0.04 (0.010±0.002)	0.45±0.04 (0.018±0.002)	2.0±0.05 (0.079±0.002)	0.36max (0.014max)
BK0603(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
BK1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
BK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BK2125(0805)	0.85 (0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BK2010(0804)	0.45 (0.018)	1.2±0.1 (0.047±0.004)	2.17±0.1 (0.085±0.004)	4.0±0.1 (0.157±0.004)	0.8max (0.031max)
BKP0603(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
BKP1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
BKP1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BKP2125(0805)	0.85 (0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BKH1005(0805)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)

Unit : mm (inch)

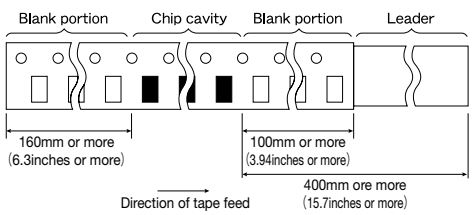
●Embossed Tape (0.315 inches wide)



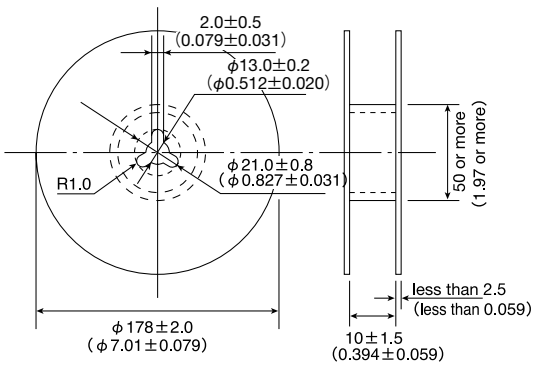
Unit : mm (inch)

Type	Thickness (mm) (inch)	Chip cavity		Insertion Pitch	Tape Thickness	
		A	B	F	K	T
CK2125(0805)	1.25 (0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
CKS2125(0805)	1.25 (0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
CKP2012(0805)	0.9 (0.035)	1.55±0.2 (0.061±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.3 (0.051)	0.3 (0.012)
CKP2016(0806)	0.9 (0.035)	1.8±0.1 (0.071±0.004)	2.2±0.1 (0.087±0.004)	4.0±0.1 (0.157±0.004)	1.3 (0.051)	0.25 (0.01)
CKP2520(1008)	0.7 (0.028)	2.3±0.1 (0.091±0.004)	2.8±0.1 (0.110±0.004)	4.0±0.1 (0.157±0.004)	1.4 (0.055)	0.3 (0.012)
	0.9 (0.035)				1.4 (0.055)	
	1.1 (0.043)				1.7 (0.067)	
NM2012(0805)	0.9 (0.035)	1.55±0.2 (0.061±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.3 (0.051)	0.3 (0.012)
NM2520(1008)	1.1 (0.043)	2.3±0.1 (0.091±0.004)	2.8±0.1 (0.110±0.004)	4.0±0.1 (0.157±0.004)	1.7 (0.067)	0.3 (0.012)
LK2125(0805)	1.25 (0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
HK2125(0805)	0.85 (0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.5 (0.059)	0.3 (0.012)
	1.0 (0.039)				2.0 (0.079)	
BK2125(0805)	1.25 (0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
BK3216(1206)	0.8 (0.031)	1.9±0.1 (0.075±0.004)	3.5±0.1 (0.138±0.004)	4.0±0.1 (0.157±0.004)	1.4 (0.055)	0.3 (0.012)

④LEADER AND BLANK PORTION

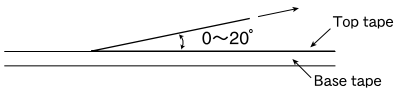


⑤Reel Size



⑥Top tape strength

The top tape requires a peel-off force of 0.1～0.7N in the direction of the arrow as illustrated below.



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RELIABILITY DATA

Multilayer chip inductors and beads

1. Operating Temperature Range		
BK0402		−55～+125℃
BK0603		
BK1005		
BKH1005		
BK1608		
BK2125		
ARRAY	BK2010	
	BK3216	
BKP0603		−55～+85℃
BKP1005		
BKP1608		
BKP2125		
CK1608		−40～+85℃
CK2125		
CKS2125		
CKP2012		
CKP2016		
CKP2520		
NM2012		
NM2520		
LK1005		
LK1608		
LK2125		
HK0402		−55～+125℃
HK0603		
HK1005		
HK1608		−40～+85℃
HK2125		
HKQ0603S		−55～+125℃
HKQ0603U		
AQ105		

2. Storage Temperature Range		
BK0402		−55～+125℃
BK0603		
BK1005		
BKH1005		
BK1608		
BK2125		
ARRAY	BK2010	
	BK3216	
BKP0603		−55～+85℃
BKP1005		
BKP1608		
BKP2125		
CK1608		−40～+85℃
CK2125		
CKS2125		
CKP2012		
CKP2016		
CKP2520		
NM2012		
NM2520		
LK1005		
LK1608		
LK2125		
HK0402		−55～+125℃
HK0603		
HK1005		
HK1608		−40～+85℃
HK2125		
HKQ0603S		−55～+125℃
HKQ0603U		
AQ105		

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RELIABILITY DATA

Multilayer chip inductors and beads

3. Rated Current		
BK0402		240～540mA DC
BK0603		100～500mA DC
BK1005		120～1000mA DC
BKH1005		200mA DC
BK1608		150～1500mA DC
BK2125		200～1200mA DC
ARRAY	BK2010	100mA DC
	BK3216	100～200mA DC
BKP0603		1.0A DC
BKP1005		800～2000mA DC
BKP1608		1.0～3.0A DC
BKP2125		1.5～4.0A DC
CK1608		50～60mA DC
CK2125		60～500mA DC
CKS2125		110～280mA DC
CKP2012		0.7～1.2A DC
CKP2016		0.9～1.6A DC
CKP2520		1.1～1.8A DC
NM2012		0.8～1.5A DC
NM2520		0.9～1.1A DC
LK1005		20～25mA DC
LK1608		1～150mA DC
LK2125		5～300mA DC
HK0402		160～380mA DC
HK0603		60～470mA DC
HK1005		110～300mA DC
HK1608		150～300mA DC
HK2125		300mA DC
HKQ0603S		130～600mA DC
HKQ0603U		130～600mA DC
AQ105		280～710mA DC

Definition of rated current:
- In the CK, CKS and BK Series, the rated current is the value of current at which the temperature of the element is increased within 20℃.
- In the BK Series P type and CK Series P type, NM Series the rated current is the value of current at which the temperature of the element is increased within 40℃.
- In the LK,HK,HKQ,and AQ Series, the rated current is either the DC value at which the internal L value is decreased within 5% with the application of DC bias, or the value of current at which the temperature of the element is increased within 20℃.

4. Impedance		
BK0402		10～120Ω ±25%
BK0603		10～600Ω ±25%
BK1005		10～1800Ω ±25%
BKH1005		1500～1800Ω ±25%
BK1608		22～2500Ω ±25%
BK2125		15～2500Ω ±25%
ARRAY	BK2010	5～1000Ω ±25%
	BK3216	68～1000Ω ±25%
BKP0603		22～33Ω ±25%
BKP1005		10～220Ω ±25%
BKP1608		33～470Ω ±25%
BKP2125		33～330Ω ±25%
CK1608		—
CK2125		
CKS2125		
CKP2012		
CKP2016		
CKP2520		
NM2012		
NM2520		
LK1005		
LK1608		
LK2125		
HK0402		
HK0603		
HK1005		
HK1608		
HK2125		
HKQ0603S		
HKQ0603U		
AQ105		

【Test Methods and Remarks】
BK0402 Series
Measuring frequency : 100±1MHz
Measuring equipment : E4991A(or its equivalent)
Measuring jig : 16196D(or its equivalent)
BK0603 Series, BKP0603 Series
Measuring frequency : 100±1MHz
Measuring equipment : 4291A(or its equivalent)
Measuring jig : 16193A(or its equivalent)
BK1005 Series, BKP1005 Series, BKH1005 Series
Measuring frequency : 100±1MHz
Measuring equipment : 4291A(or its equivalent)
Measuring jig : 16192A(or its equivalent), 16193A(or its equivalent)
BK1608・2125 Series, BKP1608・2125 Series
Measuring frequency : 100±1MHz
Measuring equipment : 4291A(or its equivalent), 4195A(or its equivalent)
Measuring jig : 16092A(or its equivalent) or 16192A(or its equivalent)/HW
BK2010・3216 Series
Measuring frequency : 100±1MHz
Measuring equipment : 4291A(or its equivalent), 4195A(or its equivalent)
Measuring jig : 16192A(or its equivalent)

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RELIABILITY DATA

Multilayer chip inductors and beads

5. Inductance	
BK0402	—
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	4.7～10.0μH：±20%
CK2125	0.1～10.0μH：±20%
CKS2125	1.0～10.0μH：±20%
CKP2012	0.47～4.7μH：±20%
CKP2016	0.47～4.7μH：±20%
CKP2520	0.47～4.7μH：±20%
NM2012	0.82～1.0μH：±20%
NM2520	1.0～2.2μH：±20%
LK1005	0.12～2.2μH：±10%　Q 0.12～2.2μH：±30%
LK1608	0.047～33.0μH：±20%　0.10～12.0μH：±10%　Q 0.12～2.2μH：±30%
LK2125	0.047～33.0μH：±20%　0.10～12.0μH：±10%　Q 0.12～2.2μH：±30%
HK0402	1.0～6.2nH：±0.3nH　6.8～12nH：±5%
HK0603	1.0～6.2nH：±0.3nH　6.8～100nH：±5%
HK1005	1.0～6.2nH：±0.3nH　6.8～270nH：±5%
HK1608	1.0～5.6nH：±0.3nH　6.8～470nH：±5%
HK2125	1.5～5.6nH：±0.3nH　6.8～470nH：±5%
HKQ0603S	0.6～6.2nH：±0.3nH　6.8～22nH：±5%
HKQ0603U	0.6～6.2nH：±0.3nH　6.8～22nH：±5%
AQ105	1.0～6.2nH：±0.3nH　6.8～15nH：±5%

【Test Methods and Remarks】
CK Series：
Measuring frequency：2 to 4MHz（CK1608）
Measuring frequency：2 to 25MHz（CK2125）
Measuring frequency：2 to 10MHz（CKS2125）
LK Series：
Measuring frequency：10 to 25MHz（LK1005）
Measuring frequency：1 to 50MHz（LK1608）
Measuring frequency：0.4 to 50MHz（LK2125）
CKP Series, NM Series：
Measuring frequency：1MHz(CKP2012, CKP2016, CKP2520, NM2012・NM2520)
Measuring equipment, jig：・4194A+16085B+16092A(or its equivalent)
・4195A+41951+16092A(or its equivalent)
・4294A+16192A(or its equivalent)
・4291A+16193A(or its equivalent)/LK1005
・4285A+42841A+42842C+42851−61100(CKP2012・CKP2016・CKP2520・NM2012・NM2520)
Measuring current：・1mA rms(0.047 to 4.7μH)　・0.1mA rms(5.6 to 33μH)
HK、HKQ、AQ Series：
Measuring frequency：100MHz(HK0402・HK0603・HK1005・AQ105)
Measuring frequency：50/100MHz(HK1608・HK2125)
Measuring frequency：500MHz(HKQ0603S・HKQ0603U)
Measuring equipment, jig：・4291A+16197A(or its equivalent)/HK0603・AQ105
・4291A+16193A(or its equivalent)/HK1005
・E4991A+16197A(or its equivalent)/HKQ0603S・HKQ0603U
・4291A+16092+in-house made jig(or its equivalent)/HK1608・HK2125
・E4991A+16196D(or its equivalent)/HK0402

RELIABILITY DATA

Multilayer chip inductors and beads

6. Q		
BK0402		—
BK0603		
BK1005		
BKH1005		
BK1608		
BK2125		
ARRAY	BK2010	
	BK3216	
BKP0603		
BKP1005		
BKP1608		
BKP2125		
CK1608		20 min.
CK2125		15～20 min.
CKS2125		—
CKP2012		
CKP2016		
CKP2520		
NM2012		
NM2520		
LK1005		10～20 min.
LK1608		10～35 min.
LK2125		15～50 min.
HK0402		3 min.
HK0603		4～5 min.
HK1005		8 min.
HK1608		8～12 min.
HK2125		10～18 min.
HKQ0603S		10～13 min.
HKQ0603U		10～13 min.
AQ105		8 min.

【Test Methods and Remarks】
CK Series：
Measuring frequency：2 to 4MHz（CK1608）
Measuring frequency：2 to 25MHz（CK2125）
LK Series：
Measuring frequency：10 to 25MHz（LK1005）
Measuring frequency：1 to 50MHz（LK1608）
Measuring frequency：0.4 to 50MHz（LK2125）
Measuring equipment, jig：・4194A+16085B+16092A（or its equivalent）
・4195A+41951+16092A（or its equivalent）
・4294A+16192A（or its equivalent）
・4291A+16193A（or its equivalent）/LK1005
Measuring current：・1mA rms（0.047 to 4.7μH）　・0.1mA rms（5.6 to 33μH）

HK、HKQ、AQ Series：
Measuring frequency：100MHz（HK0603・HK1005・AQ105）
Measuring frequency：50/100MHz（HK1608・HK2125）
Measuring frequency：500MHz（HKQ0603S・HKQ0603U）
Measuring equipment, jig：・4291A+16197A（or its equivalent）/HK0603・AQ105
・4291A+16193A（or its equivalent）/HK1005
・E4991A+16197A（or its equivalent）/HKQ0603S・HKQ0603U
・4291A+16092A+ in-house made jig（or its equivalent）/HK1608・HK2125
・E4991A+16196D（or its equivalent）HK0402

7. DC Resistance		
BK0402		0.10～0.53Ω max.
BK0603		0.065～1.50Ω max.
BK1005		0.03～0.80Ω max.
BKH1005		1.50～2.00Ω max.
BK1608		0.05～1.10Ω max.
BK2125		0.05～0.75Ω max.
ARRAY	BK2010	0.10～0.90Ω max.
	BK3216	0.15～0.80Ω max.
BKP0603		0.065～0.070Ω max.
BKP1005		0.030～0.20Ω max.
BKP1608		0.025～0.18Ω max.
BKP2125		0.020～0.075Ω max.
CK1608		0.45～0.85Ω（±30%）
CK2125		0.16～0.65Ω max.
CKS2125		0.09～0.40Ω typ.
		0.12～0.52Ω max.
CKP2012		0.10～0.28Ω max.
CKP2016		0.08～0.20Ω max.
CKP2520		0.05～0.16Ω max.
NM2012		0.10～0.19Ω max.
NM2520		0.13～0.22Ω max.
LK1005		0.41～1.16Ω max.
LK1608		0.2～2.2Ω max.
LK2125		0.1～1.1Ω max.
HK0402		0.18～0.99Ω max.
HK0603		0.11～3.74Ω max.
HK1005		0.08～4.8Ω max.
HK1608		0.05～2.6Ω max.
HK2125		0.10～1.5Ω max.
HKQ0603S		0.06～1.29Ω max.
HKQ0603U		0.06～1.29Ω max.
AQ105		0.07～0.45Ω max.

【Test Methods and Remarks】
Measuring equipment：VOAC-7412（made by Iwasaki Tsushinki）　VOAC-7512（made by Iwasaki Tsushinki）

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RELIABILITY DATA

Multilayer chip inductors and beads

8. Self Resonance Frequency (SRF)	
BK0402	—
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	17～25MHz min.
CK2125	24～235MHz min.
CKS2125	—
CKP2012	
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	40～180MHz min.
LK1608	9～260MHz min.
LK2125	13～320MHz min.
HK0402	29000～10000MHz min.
HK0603	900～10000MHz min.
HK1005	400～10000MHz min.
HK1608	300～10000MHz min.
HK2125	200～4000MHz min.
HKQ0603S	1900～10000MHz min.
HKQ0603U	1900～10000MHz min.
AQ105	2300～10000MHz min.

【Test Methods and Remarks】
LK Series :
Measuring equipment : 4195A (or its equivalent)
Measuring jig : 41951+16092A (or its equivalent)
HK、HKQ、AQ Series :
Measuring equipment : 8719C (or its equivalent) ・8753D (or its equivalent) /HK2125

9. Temperature Characteristic	
BK0402	—
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	
CK2125	
CKS2125	
CKP2012	
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	
LK1608	
LK2125	
HK0402	Inductance change : Within ±10%
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
HK、HKQ、AQ Series : Temperature range : −30 to +85℃
Reference temperature : +20℃

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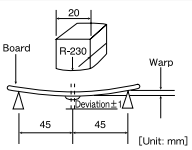
RELIABILITY DATA

Multilayer chip inductors and beads

10. Resistance to Flexure of Substrate	
BK0402	No mechanical damage.
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY	BK2010
	BK3216
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	
CK2125	
CKS2125	
CKP2012	
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	
LK1608	
LK2125	
HK0402	
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
Warp : 2mm (BK Series without 0402size, BKP, BKH, CK, CKS, CKP, NM, LK, HK, HKQ, AQ Series)
: 1mm (BK0402, HK0402 Series)
Testing board : glass epoxy-resin substrate
Thickness : 0.8mm



11. Solderability	
BK0402	At least 75% of terminal electrode is covered by new solder.
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY	BK2010
	BK3216
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	At least 75% of terminal electrode is covered by new solder.
CK2125	
CKS2125	
CKP2012	
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	
LK1608	
LK2125	
HK0402	
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
Solder temperature : 230±5℃
Duration : 4±1 sec.

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RELIABILITY DATA

Multilayer chip inductors and beads

12. Resistance to Soldering	
BK0402	Appearance : No significant abnormality. Impedance change : Within ±30%
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	No mechanical damage. Remaining terminal electrode : 70% min. Inductance change R10～4R7 : Within ±10% 6R8～100 : Within ±15% CKS2125 : Within ±20% CKP2012、CKP2016、CKP2520、NM2012、NM2520 : Within ±30%
CK2125	
CKS2125	
CKP2012	
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	No mechanical damage. Remaining terminal electrode : 70% min. Inductance change : Within ±15%
LK1608	No mechanical damage. Remaining terminal electrode : 70% min. Inductance change 47N～4R7 : Within ±10% 5R6～330 : Within ±15%
LK2125	
HK0402	No mechanical damage. Remaining terminal electrode : 70% min. Inductance change : Within ±5%
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
Solder temperature : 260±5℃
Duration : 10±0.5 sec.
Preheating temperature : 150 to 180℃
Preheating time : 3 min.
Flux : Immersion into methanol solution with colophony for 3 to 5 sec.
Recovery : 2 to 3 hrs of recovery under the standard condition after the test.(See Note 1)

13. Thermal Shock	
BK0402	Appearance : No significant abnormality. Impedance change : Within ±30%
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	No mechanical damage. Inductance change : Within ±20% Q change : Within ±30% Inductance change : Within ±20% (CKS2125)
CK2125	
CKS2125	
CKP2012	No mechanical damage. Inductance change : Within ±30%
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	No mechanical damage. Inductance change : Within ±10% Q change : Within ±30%
LK1608	
LK2125	
HK0402	No mechanical damage. Inductance change : Within ±10% Q change : Within ±20%
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
Conditions for 1 cycle
Step 1 : Minimum operating temperature $^{+0}_{-3}$℃ 30±3 min.
Step 2 : Room temperature 2 to 3 min.
Step 3 : Maximum operating temperature $^{+3}_{-0}$℃ 30±3 min.
Step 4 : Room temperature 2 to 3 min.
Number of cycles : 5
Recovery : 2 to 3 hrs of recovery under the standard condition after the test.(See Note 1)

(Note 1) When there are questions concerning mesurement result ; measurement shall be made after 48±2 hrs of recovery under the standard condition.

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Multilayer chip inductors and beads

14. Damp Heat (Steady state)	
BK0402	Appearance : No significant abnormality. Impedance change : Within ±30%
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	No mechanical damage. Inductance change : Within ±20% Q change : Within ±30%
CK2125	
CKS2125	Inductance change : Within ±20%
CKP2012	No mechanical damage. Inductance change : Within ±30%
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	No mechanical damage. Inductance change : Within ±10% Q change : Within ±30%
LK1608	
LK2125	No mechanical damage. Inductance change : Within ±20% Q change : Within ±30%
HK0402	No mechanical damage. Inductance change : Within ±10% Q change : Within ±20%
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
BK, BKP, BKH Series :
Temperature : 40±2℃
Humidity : 90 to 95%RH
Duration : 500^{+24}_{-0} hrs
Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.(See Note 1)

LK、CK、CKS、CKP、NM、HK、HKQ、AQ Series :
Temperature : 40±2℃ (LK、CK、CKS、CKP、NM Series)
: 60±2℃ (HK、HKQ、AQ Series)
Humidity : 90 to 95%RH
Duration : 500±12 hrs
Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.(See Note 1)

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RELIABILITY DATA

Multilayer chip inductors and beads

15. Loading under Damp Heat	
BK0402	Appearance : No significant abnormality. Impedance change : Within ±30%
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	No mechanical damage. Inductance change : Within ±20%　Q change : Within ±30%
CK2125	
CKS2125	No mechanical damage.　Inductance change : Within ±20%
CKP2012	No mechanical damage.　Inductance change : Within ±30%
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	No mechanical damage.　Inductance change : Within ±10%　Q change : Within ±30%
LK1608	No mechanical damage. Inductance change : 0.047 to 12.0μH : Within ±10%　15.0 to 33.0μH : Within ±15%　Q change : Within ±30%
LK2125	No mechanical damage.　Inductance change : Within ±20%　Q change : Within ±30%
HK0402	No mechanical damage. Inductance change : Within ±10%　Q change : Within ±20%
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
BK, BKP, BKH Series :
Temperature : 40±2℃
Humidity : 90 to 95%RH
Applied current : Rated current
Duration : 500^{+24}_{0} hrs
Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.(See Note 1)

LK、CK、CKS、CKP、NM、HK、HKQ、AQ Series :
Temperature : 40±2℃ (LK、CK、CKS、CKP、NM Series)
: 60±2℃ (HK、HKQ、AQ Series)
Humidity : 90 to 95%RH
Applied current : Rated current
Duration : 500±12 hrs
Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.(See Note 1)

Note on standard condition: "standard condition" referred to herein is defined as follows:
5 to 35℃ of temperature, 45 to 85% relative humidity, and 86 to 106kPa of air pressure.
When there are questions concerning measurement results:
In order to provide correlation data, the test shall be conducted under condition of 20±2℃ of temperature, 60 to 70% relative humidity, and 86 to 106kPa of air pressure.
Unless otherwise specified, all the tests are conducted under the "standard condition."

(Note 1) Measurement shall be made after 48±2 hrs of recovery under the standard condition.

RELIABILITY DATA

Multilayer chip inductors and beads

16. Loading at High Temperature	
BK0402	Appearance : No significant abnormality Impedance change : Within ±30%
BK0603	
BK1005	
BKH1005	
BK1608	
BK2125	
ARRAY BK2010	
ARRAY BK3216	
BKP0603	
BKP1005	
BKP1608	
BKP2125	
CK1608	No mechanical damage. Inductance change : Within ±20%　Q change : Within ±30%
CK2125	
CKS2125	No mechanical damage.　Inductance change : Within ±20%
CKP2012	No mechanical damage.　Inductance change : Within ±30%
CKP2016	
CKP2520	
NM2012	
NM2520	
LK1005	No mechanical damage.　Inductance change : Within ±10%　Q change : Within ±30%
LK1608	No mechanical damage. Inductance change : 0.047 to 12.0μH : Within ±10%　15.0 to 33.0μH : Within ±15%　Q change : Within ±30%
LK2125	No mechanical damage.　Inductance change : Within ±20%　Q change : Within ±30%
HK0402	No mechanical damage. Inductance change : Within ±10%　Q change : Within ±20%
HK0603	
HK1005	
HK1608	
HK2125	
HKQ0603S	
HKQ0603U	
AQ105	

【Test Methods and Remarks】
BK, BKH Series :
Temperature : 125±3℃
Applied current : Rated current
Duration : 500^{+24}_{0} hrs
Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.(See Note 1)

LK、CK、CKS、CKP、NM、HK、HKQ、AQ、BKP Series :
Temperature : 85±2℃ (LK、CK、CKS、CKP、NM、BKP Series)
: 85±2℃ (HK1608, 2125)
: 85±2℃ (HK1005, AQ105 operating temperature range −55 to +85℃)
: 125±2℃ (HK0402, HK0603, HK1005, HKQ0603S, HKQ0603U, AQ105 operating temperature range −55 to +125℃)
Applied current : Rated current
Duration : 500±12 hrs
Recovery : 2 to 3 hrs of recovery under the standard condition after the test.(See Note 1)

Note on standard condition: "standard condition" referred to herein is defined as follows:
5 to 35℃ of temperature, 45 to 85% relative humidity, and 86 to 106kPa of air pressure.
When there are questions concerning measurement results:
In order to provide correlation data, the test shall be conducted under condition of 20±2℃ of temperature, 60 to 70% relative humidity, and 86 to 106kPa of air pressure. Unless otherwise specified, all the tests are conducted under the "standard condition."

(Note 1) Measurement shall be made after 48±2 hrs of recovery under the standard condition.

PRECAUTIONS

Precautions on the use of Multilayer chip Inductors, Multilayer chip inductors for high frequency, Multilayer chip bead Inductors

1. Circuit Design

Precautions

◆Verification of operating environment, electrical rating and performance

1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any inductors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications.

◆Operating Current (Verification of Rated current)

1. The operating current for inductors must always be lower than their rated values.
2. Do not apply current in excess of the rated value because the inductance may be reduced due to the magnetic saturation effect.

2. PCB Design

Precautions

◆Pattern configurations (Design of Land-patterns)

1. When inductors are mounted on a PCB, the size of land patterns and the amount of solder used (size of fillet) can directly affect inductor performance. Therefore, the following items must be carefully considered in the design of solder land patterns:
   (1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.
   (2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by solder-resist.
   (3) The larger size of land patterns and amount of solder, the smaller Q value after mounting on PCB. It makes higher the Q value to design land patterns smaller than terminal electrode of chips.

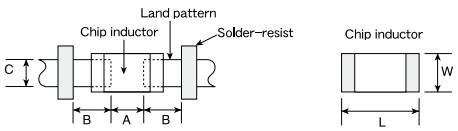
◆Pattern configurations (Inductor layout on panelized [breakaway] PC boards)

1. After inductors have been mounted on the boards, chips can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering the reflow soldered boards etc.) For this reason, planning pattern configurations and the position of SMD inductors should be carefully performed to minimize stress.

Technical consider-ations

◆Pattern configurations (Design of Land-patterns)

1. The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amounts (larger fillets which extend above the component end terminations). Examples of improper pattern designs are also shown.
   (1) Recommended land dimensions for a typical chip inductor land patterns for PCBs



Recommended land dimensions for wave-soldering

Type		1608	2125	3216
Size	L	1.6	2.0	3.2
	W	0.8	1.25	1.6
A		0.8～1.0	1.0～1.4	1.8～2.5
B		0.5～0.8	0.8～1.5	0.8～1.7
C		0.6～0.8	0.9～1.2	1.2～1.6

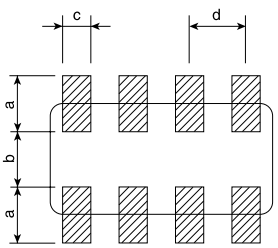
(Unit : mm)

Recommended land dimensions for reflow-soldering

Type		0402	0603	1005	105	1608	2012	2125	2016	3216	2520
Size	L	0.4	0.6	1.0	1.0	1.6	2.0	2.0	2.0	3.2	2.5
	W	0.2	0.3	0.5	0.6	0.8	1.25	1.25	1.6	1.6	2.0
A		0.15～0.25	0.20～0.30	0.45～0.55	0.50～0.55	0.8～1.0	0.8～1.2	0.8～1.2	0.8～1.2	1.8～2.5	1.0～1.4
B		0.10～0.20	0.20～0.30	0.40～0.50	0.30～0.40	0.6～0.8	0.8～1.2	0.8～1.2	0.8～1.2	0.6～1.5	0.6～1.0
C		0.15～0.30	0.25～0.40	0.45～0.55	0.60～0.70	0.6～0.8	0.9～1.6	0.9～1.6	1.2～2.0	1.2～2.0	1.8～2.2

(Unit : mm)

Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land-patterns.

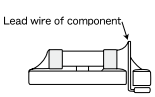
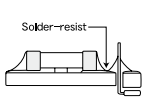
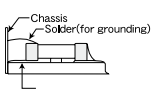
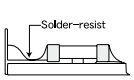
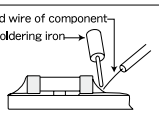
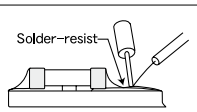
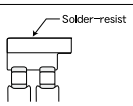


Recommended land dimension for Reflow-soldering

Type		3216	2010
Size	L	3.2	2.0
	W	1.6	1.0
a		0.7～0.9	0.5～0.6
b		0.8～1.0	0.5～0.6
c		0.4～0.5	0.2～0.3
d		0.8	0.5

(Unit : mm)

(2) Examples of good and bad solder application

Item	Not recommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand-soldering of leaded components near mounted components		
Horizontal component placement		

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PRECAUTIONS

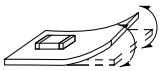
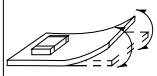
Precautions on the use of Multilayer chip Inductors, Multilayer chip inductors for high frequency, Multilayer chip bead Inductors

2. PCB Design

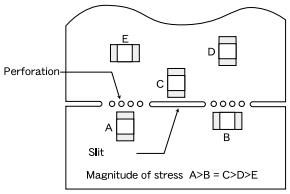
Technical consider-ations

◆Pattern configurations (Inductor layout on panelized [breakaway] PC boards)

1-1. The following are examples of good and bad inductor layout; SMD inductors should be located to minimize any possible mechanical stresses from board warp or deflection.

Item	Not recommended	Recommended
Deflection of the board		 Position the component at a right angle to the direction of the mechanical stresses that are anticipated.

1-2. To layout the inductors for the breakaway PC board, it should be noted that the amount of mechanical stresses given will vary depending on inductor layout. An example below should be counted for better design.



1-3. When breaking PC boards along their perforations, the amount of mechanical stress on the inductors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, any ideal SMD inductor layout must also consider the PCB splitting procedure.

3. Considerations for automatic placement

Precautions

◆Adjustment of mounting machine

1. Excessive impact load should not be imposed on the inductors when mounting onto the PC boards.
2. The maintenance and inspection of the mounter should be conducted periodically.

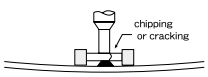
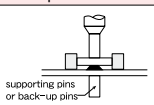
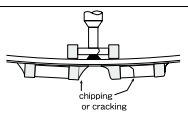
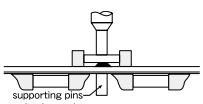
◆Selection of Adhesives

1. Mounting inductors with adhesives in preliminary assembly, before the soldering stage, may lead to degraded inductor characteristics unless the following factors are appropriately checked; the size of land patterns, type of adhesive, amount applied, hardening temperature and hardening period. Therefore, it is imperative to consult the manufacturer of the adhesives on proper usage and amounts of adhesive to use.

Technical consider-ations

◆Adjustment of mounting machine

1. If the lower limit of the pick-up nozzle is low, too much force may be imposed on the inductors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle:
   (1) The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board.
   (2) The pick-up pressure should be adjusted between 1 and 3N static loads.
   (3) To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins or back-up pins should be used under the PC board. The following diagrams show some typical examples of good pick-up nozzle placement:

Item	Improper method	Proper method
Single-sided mounting		
Double-sided mounting		

2. As the alignment pin wears out, adjustment of the nozzle height can cause chipping or cracking of the inductors because of mechanical impact on the inductors. To avoid this, the monitoring of the width between the alignment pin in the stopped position, and maintenance, inspection and replacement of the pin should be conducted periodically.

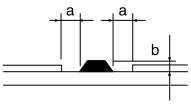
Technical consider-ations

◆Selection of Adhesives

1. Some adhesives may cause reduced insulation resistance. The difference between the shrinkage percentage of the adhesive and that of the inductors may result in stresses on the inductors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely affect component placement, so the following precautions should be noted in the application of adhesives.
   (1) Required adhesive characteristics
      a. The adhesive should be strong enough to hold parts on the board during the mounting & solder process.
      b. The adhesive should have sufficient strength at high temperatures.
      c. The adhesive should have good coating and thickness consistency.
      d. The adhesive should be used during its prescribed shelf life.
      e. The adhesive should harden rapidly.
      f. The adhesive must not be contaminated.
      g. The adhesive should have excellent insulation characteristics.
      h. The adhesive should not be toxic and have no emission of toxic gasses.
   (2) When using adhesives to mount inductors on a PCB, inappropriate amounts of adhesive on the board may adversely affect component placement. Too little adhesive may cause the inductors to fall off the board during the solder process. Too much adhesive may cause defective soldering due excessive flow of adhesive on to the land or solder pad.

[Recommended conditions]

Amount of adhesives



After inductors are bonded

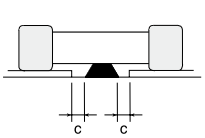


Figure	0805 case sizes as examples
a	0.3mm min
b	100～120μm
c	Area with no adhesive

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Precautions on the use of Multilayer chip Inductors, Multilayer chip inductors for high frequency, Multilayer chip bead Inductors

4. Soldering

Precautions

◆Selection of Flux

1. Since flux may have a significant effect on the performance of inductors, it is necessary to verify the following conditions prior to use;
   (1) Flux used should be with less than or equal to 0.1 wt% (Chlorine conversion method) of halogenated content. Flux having a strong acidity content should not be applied.
   (2) When soldering inductors on the board, the amount of flux applied should be controlled at the optimum level.
   (3) When using water-soluble flux, special care should be taken to properly clean the boards.

◆Soldering

1. Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions, **and please contact us about peak temperature when you use lead-free paste.**

Technical considerations

◆Selection of Flux

1-1. When too much halogenated substance (Chlorine, etc.) content is used to activate the flux, or highly acidic flux is used, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the Inductor.

1-2. Flux is used to increase solderability in flow soldering, but if too much is applied, a large amount of flux gas may be emitted and may detrimentally affect solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system.

1-3. Since the residue of water-soluble flux is easily dissolved by water content in the air, the residue on the surface of Inductor in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux.

◆Soldering

1-1. Preheating when soldering

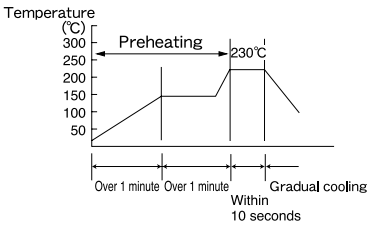
Heating: Chip inductor components should be preheated to within 100 to 130℃ of the soldering. Cooling: The temperature difference between the components and cleaning process should not be greater than 100℃.

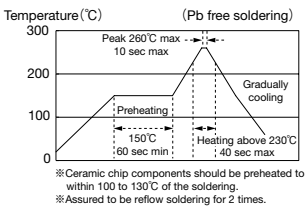
Chip inductors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling. Therefore, the soldering process must be conducted with a great care so as to prevent malfunction of the components due to excessive thermal shock.

Recommended conditions for soldering

[Reflow soldering]

Temperature profile

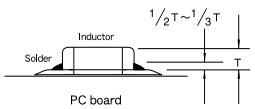




※Ceramic chip components should be preheated to within 100 to 130℃ of the soldering.
※Assured to be reflow soldering for 2 times.

Caution

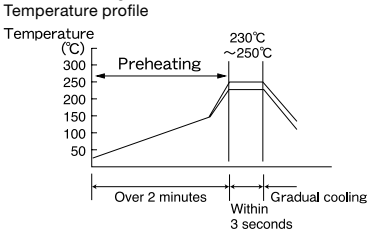
1. The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3 of the thickness of the inductor, as shown below:

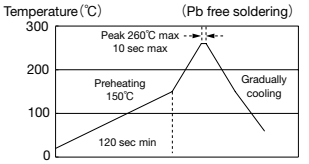


2. Because excessive dwell times can detrimentally affect solderability, soldering duration should be kept as close to recommended times as possible.

[Wave soldering]

Temperature profile





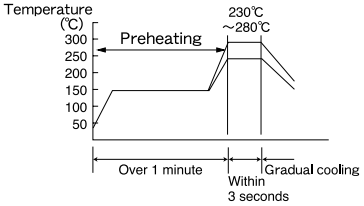
※Ceramic chip components should be preheated to within 100 to 130℃ of the soldering.
※Assured to be wave soldering for 1 time.
※Except for reflow soldering type.

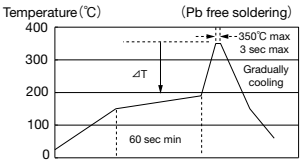
Caution

1. Make sure the inductors are preheated sufficiently.
2. The temperature difference between the inductor and melted solder should not be greater than 100 to 130℃.
3. Cooling after soldering should be as gradual as possible.
4. Wave soldering must not be applied to the inductors designated as for reflow soldering only.

[Hand soldering]

Temperature profile





(※ΔT190℃ (3216Type max), ΔT≦130℃ (3225 Type ming)
※It is recommended to use 20W soldering iron and the tip is 1φ or less.
※The soldering iron should not directly touch the components.
※Assured to be soldering iron for 1 time.

Note: The above profiles are the maximum allowable soldering condition, therefore these profiles are not always recommended.

Caution

1. Use a 20W soldering iron with a maximum tip diameter of 1.0 mm.
2. The soldering iron should not directly touch the inductor.

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PRECAUTIONS

Precautions on the use of Multilayer chip Inductors, Multilayer chip inductors for high frequency, Multilayer chip bead Inductors

5. Cleaning	
Precautions	◆Cleaning conditions 1. When cleaning the PC board after the Inductors are all mounted, select the appropriate cleaning solution according to the type of flux used and purpose of the cleaning (e.g. to remove soldering flux or other materials from the production process.) 2. Cleaning conditions should be determined after verifying, through a test run, that the cleaning process does not affect the inductor's characteristics.
Technical consider-ations	◆Cleaning conditions 1. The use of inappropriate solutions can cause foreign substances such as flux residue to adhere to the inductor, resulting in a degradation of the inductor's electrical properties (especially insulation resistance). 2. Inappropriate cleaning conditions (insufficient or excessive cleaning) may detrimentally affect the performance of the inductors. (1) Excessive cleaning a. In the case of ultrasonic cleaning, too much power output can cause excessive vibration of the PC board which may lead to the cracking of the inductor or the soldered portion, or decrease the terminal electrodes' strength. Thus the following conditions should be carefully checked; Ultrasonic output Below 20W/ℓ Ultrasonic frequency Below 40kHz Ultrasonic washing period 5 min. or less

6. Post cleaning processes	
Precautions	◆Application of resin coatings, moldings, etc. to the PCB and components. 1. With some type of resins a decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the inductor's performance. 2. When a resin's hardening temperature is higher than the inductor's operating temperature, the stresses generated by the excess heat may lead to inductor damage or destruction. 3. Stress caused by a resin's temperature generated expansion and contraction may damage inductors. The use of such resins, molding materials etc. is not recommended.

7. Handling	
Precautions	◆Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting inductors and other components, care is required so as not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆General handling precautions 1. Always wear static control bands to protect against ESD. 2. Keep the inductors away from all magnets and magnetic objects. 3. Use non-magnetic tweezers when handling inductors. 4. Any devices used with the inductors (soldering irons, measuring instruments) should be properly grounded. 5. Keep bare hands and metal products (i.e., metal desk) away from chip electrodes or conductive areas that lead to chip electrodes. 6. Keep inductors away from items that generate magnetic fields such as speakers or coils. ◆Mechanical considerations 1. Be careful not to subject the inductors to excessive mechanical shocks. (1) If inductors are dropped on the floor or a hard surface they should not be used. (2) When handling the mounted boards, be careful that the mounted components do not come in contact with or bump against other boards or components.

8. Storage conditions	
Precautions	◆Storage 1. To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. Recommended conditions Ambient temperature Below 40℃ Humidity Below 70% RH The ambient temperature must be kept below 30℃. Even under ideal storage conditions inductor electrode solderability decreases as time passes, so inductors should be used within 6 months from the time of delivery. *The packaging material should be kept where no chlorine or sulfur exists in the air.
Technical consider-ations	◆Storage 1. If the parts are stocked in a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place. For this reason, components should be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the inductors.

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