

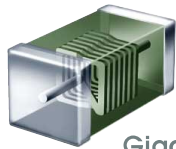
Multilayer Chip Inductors For High-frequency Circuits And Modules, MLK0603 series

Conforming to RoHS Directive

Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

The 0603 type - the smallest in the industry, and the most advanced in the MLK series, with numerous achievements in its use as a high Q element optimal for signal-processing circuits in the 1-2GHz band in mobile communication devices such as RF amplifiers, mixers, VCO, PLL synthesizers - is available in 19 varieties covering 1-33nH, responding to the cutting-edge design needs of small digital devices.

With further fine-tuned super-fine lamination technology, allowing no misalignment - even of micron-order, mass-production technology of condensed "Gigaspira™ Multilayer structure", of greater precision than ever, inside the super-small 0603 chip where the area of internal conductor pattern can be reduced to 1/3 of the 1005 type, has been established.

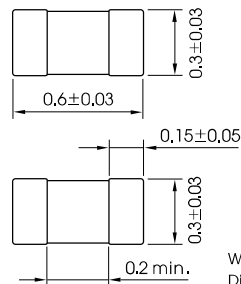


Gigaspira™ multilayer structure

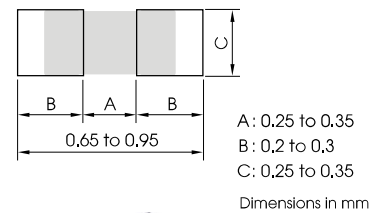
Original GHz-band-ready structure overcoming the limitations of the conventional structures.

Cutting-edge hyper specifications and outstanding circuit condensation effects are offered too - not to mention diverse modules for mobile telephones of the next generation; small device RF modules such as DVC, digital still cameras, and PDA devices; and CCD modules, as well as downsizing the design of Bluetooth modules integrated in those devices.

Shapes and dimensions



Recommended PC board pattern (Reflow process)



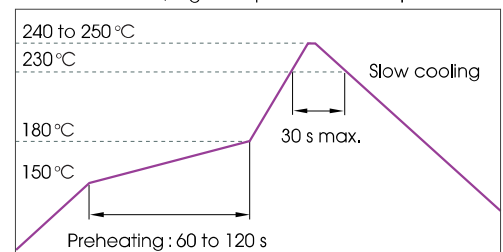
A: 0.25 to 0.35
B: 0.2 to 0.3
C: 0.25 to 0.35
Dimensions in mm

Weight: 0.2 mg
Dimensions in mm



Recommended soldering conditions

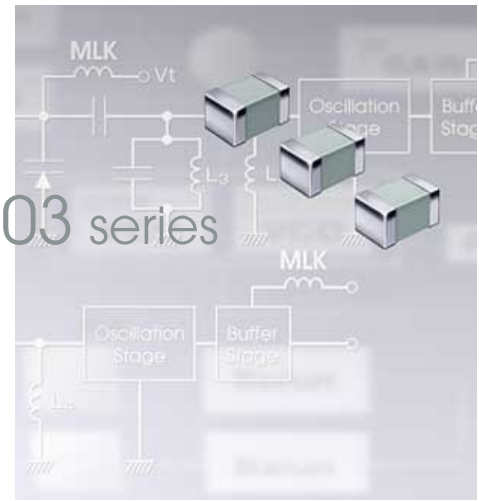
Lead-free solder/High-temperature reflow process



Basic characteristics

Typical data

MLK0603 series

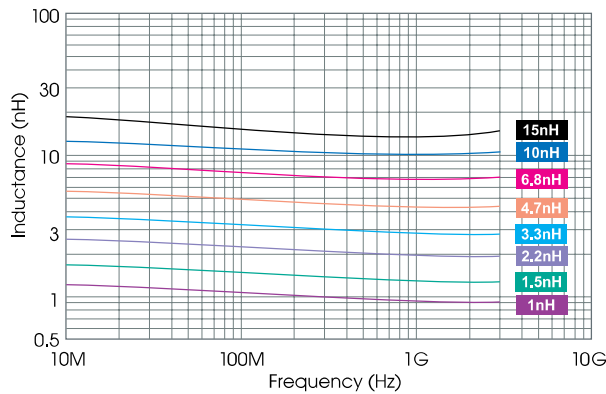


Temperature range

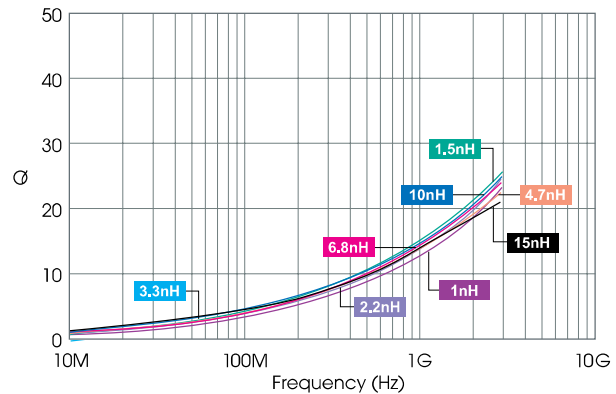
Operating	-55 to +125 °C
Storage*	-55 to +125 °C

*Individual product

Inductance vs. frequency characteristics



Q vs. frequency characteristics



Typical Electrical Characteristics

Part No.	Inductance (nH) at 100MHz	Q			Self-resonance frequency (GHz)	DC resistance (ohm)	Rated current (mA)
		at 100MHz	at 300MHz	at 1GHz			
MLK0603L1N0S	1.0±0.3nH	3 typ.	7 typ.	13 typ.	12 min. / 17.1 typ.	0.2 max. / 0.13 typ.	300 max.
MLK0603L1N2S	1.2±0.3nH	4 typ.	8 typ.	14 typ.	11 min. / 15.2 typ.	0.25 max. / 0.14 typ.	300 max.
MLK0603L1N5S	1.5±0.3nH	4 typ.	8 typ.	14 typ.	9.5 min. / 14.8 typ.	0.3 max. / 0.15 typ.	300 max.
MLK0603L1N8S	1.8±0.3nH	4 typ.	8 typ.	14 typ.	8.5 min. / 12.7 typ.	0.35 max. / 0.18 typ.	300 max.
MLK0603L2N2S	2.2±0.3nH	4 typ.	8 typ.	14 typ.	8 min. / 11.7 typ.	0.4 max. / 0.21 typ.	300 max.
MLK0603L2N7S	2.7±0.3nH	4 typ.	8 typ.	14 typ.	7.5 min. / 10.7 typ.	0.45 max. / 0.24 typ.	300 max.
MLK0603L3N3S	3.3±0.3nH	4 typ.	8 typ.	14 typ.	7 min. / 10.2 typ.	0.5 max. / 0.26 typ.	200 max.
MLK0603L3N9S	3.9±0.3nH	4 typ.	8 typ.	14 typ.	6.5 min. / 9.5 typ.	0.55 max. / 0.3 typ.	200 max.
MLK0603L4N7S	4.7±0.3nH	5 typ.	8 typ.	14 typ.	6 min. / 9 typ.	0.6 max. / 0.34 typ.	200 max.
MLK0603L5N6S	5.6±0.3nH	5 typ.	8 typ.	15 typ.	5.7 min. / 8.5 typ.	0.7 max. / 0.38 typ.	200 max.
MLK0603L6N8J	6.8±5%	5 typ.	9 typ.	15 typ.	5.5 min. / 7.9 typ.	0.8 max. / 0.49 typ.	200 max.
MLK0603L8N2J	8.2±5%	5 typ.	9 typ.	15 typ.	5 min. / 7.6 typ.	0.9 max. / 0.51 typ.	200 max.
MLK0603L10NJ	10±5%	5 typ.	9 typ.	15 typ.	4.7 min. / 7.3 typ.	1 max. / 0.59 typ.	200 max.
MLK0603L12NJ	12±5%	5 typ.	9 typ.	15 typ.	4.3 min. / 6.8 typ.	1.1 max. / 0.7 typ.	200 max.
MLK0603L15NJ	15±5%	5 typ.	8 typ.	14 typ.	4 min. / 6.1 typ.	1.2 max. / 0.86 typ.	200 max.
MLK0603L18NJ	18±5%	5 typ.	8 typ.	14 typ.	3.7 min. / 5.5 typ.	1.4 max. / 0.92 typ.	100 max.
MLK0603L22NJ	22±5%	5 typ.	8 typ.	14 typ.	3.5 min. / 5 typ.	1.6 max. / 0.98 typ.	100 max.
MLK0603L27NJ	27±5%	5 typ.	8 typ.	13 typ.	3.0 min. / 4.5 typ.	1.8 max. / 1.1 typ.	100 max.
MLK0603L33NJ	33±5%	5 typ.	8 typ.	13 typ.	2.8 min. / 4.2 typ.	2.0 max. / 1.3 typ.	100 max.

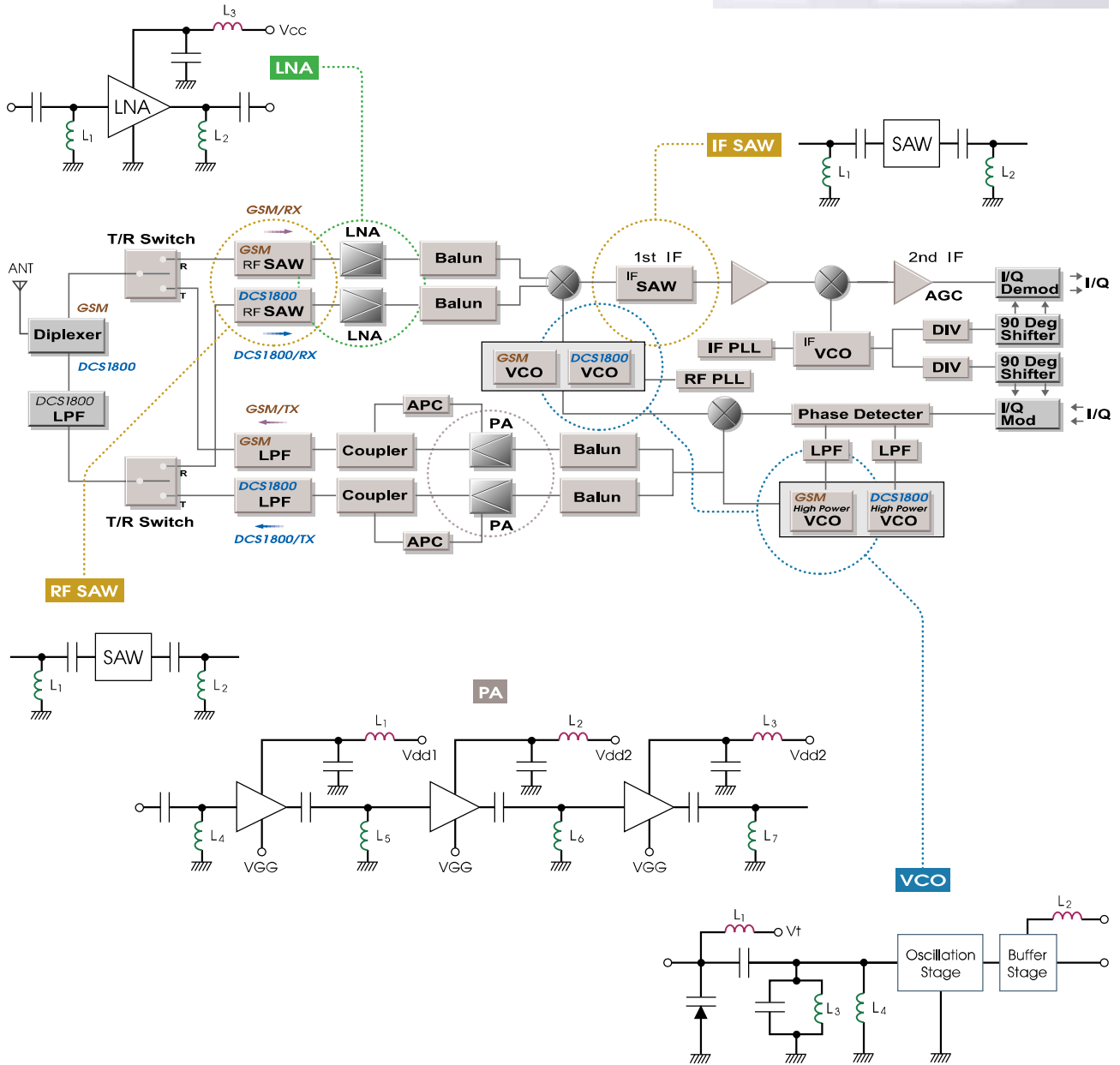
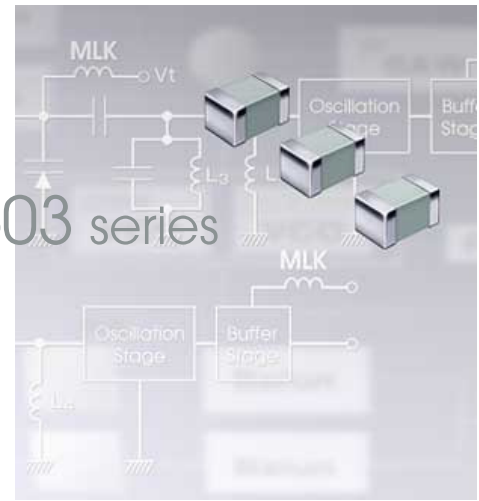
Measuring instruments

LQ: HP4291A+I6197A / SRF: HP8720C / Rdc: YOKOGAWA TYPE7561 / Idc: The value where the temperature of the inductor increases by 20°C

Example of mobile phone applications

GSM/DCS1800 Dual-band System

MLK0603 series



Gigaspira™ multilayer structure

Advantages of the MLK 0603 and 1005 series

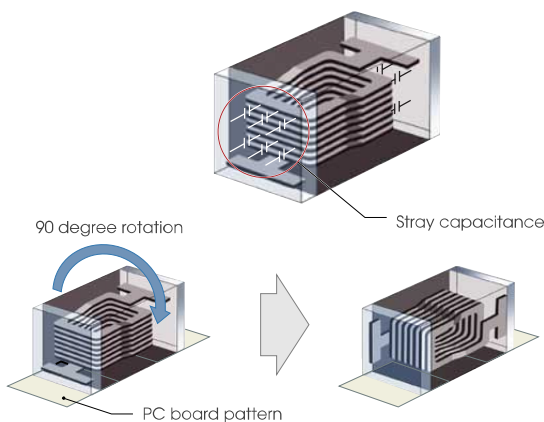
Unprecedented GHz-band high Q characteristics

1. Adoption of low-permissivity micro ceramic materials and low-resistance Ag internal conductors. 2. Development of new lamination structure - Gigaspira™ - offering minimization of the internal stray capacitance's effect (decreased self-resonant frequency; decreased Q in GHz band), which increases as elements are minimized and inductance is increased (highly integrated internal conductors). 3. By establishing advanced fine lamination technology with improved micron-level mass-production process control order, low-loss/high Q characteristics are provided in designing mobile devices with high-frequency circuits such as RF circuits, Blue-tooth modules, DVC, DSC, and PDA of diverse mobile devices.

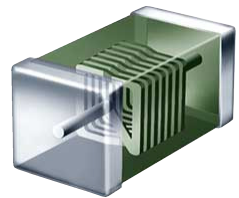
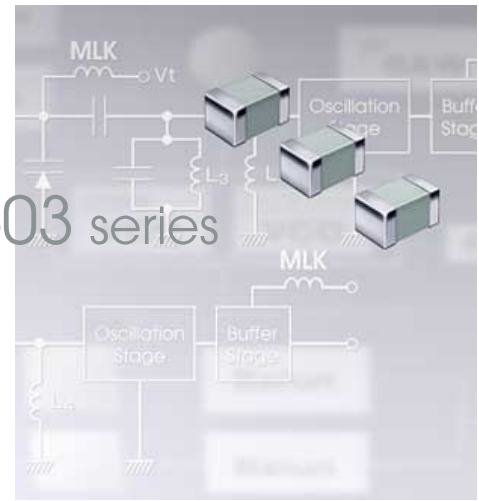
One additional advantage - fully compliant with bulk attachment

With altered lamination direction of internal conductors, and both ends of the conductors being placed in the center of an element's longitudinal direction, and the original design, where, via hole conductors used to connect them with the center of terminal electrodes, electrical symmetry that can maintain balance of its characteristic, whether it revolves in an a or b direction (see the diagram right), has been realized. For the first time, the bulk attachment is fully compliant as a high-frequency chip inductor.

In addition to the circuit condensation effect after minimization of the chips and the improvement in signal quality using high-Q, more effective benefits than those of conventional elements are promised such as stable design of circuit characteristic, stabilized quality, improved implementation cost, and so forth.

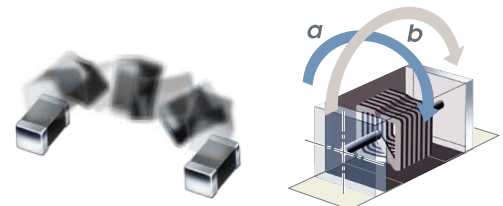


MLK0603 series



Gigaspira™ multilayer structure

The spiral conductors and terminal electrodes laminated in the center and the longitudinal direction of the element are connected through the via hole conductors formed on the central axis in the element's longitudinal direction. Original GHz-ready high Q laminated L chip structure where the stray capacitance between the internal conductors and terminal electrodes is minimized.



Element with the conventional structure

With the conventional structure, if minimization is performed while maintaining the L value, the distance between the internal conductors and terminal electrodes shortens and the stray capacitance increases, and, as a result, causes deterioration of self-resonant frequency.

Also, because the conventional structure altered the relative position of the internally-connected conductors and land patterns as the element revolved, the inductance value showed a minor fluctuation. However, when it's used for matching of GHz-band signal circuits, this small fluctuation can't be ignored and attachment by the directional identification marking was necessary.

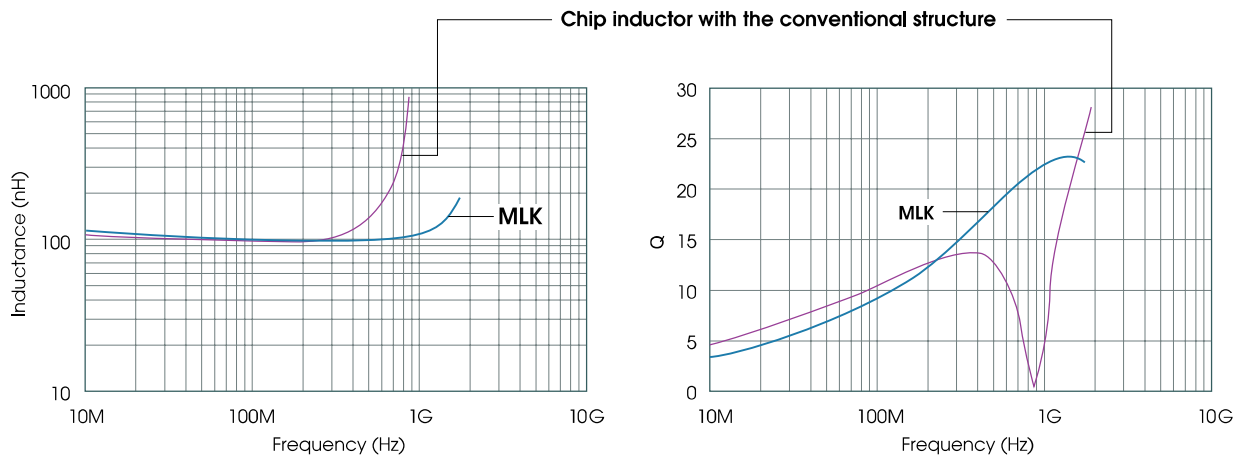
Comparison of frequency characteristics

Comparative example of the type 1005, 100nH products

An unprecedented-degree of self-resonant frequency of 2GHz(100nH products) - 19GHz (1nH products), surpassing the chip inductors of conventionally-laminated structure, is supported.

The optimal and the most powerful high Q characteristic (20-32 at 1GHz) for GHz-band signal circuits such as RF amplifiers, mixers, VCO, PLL synthesizers, and so forth, which determine the communication quality, has been achieved.

MLK0603 series



Multilayer Chip Inductors For High-frequency Circuits And Modules,

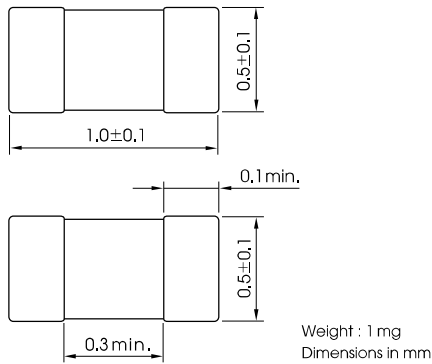


Conforming to RoHS Directive

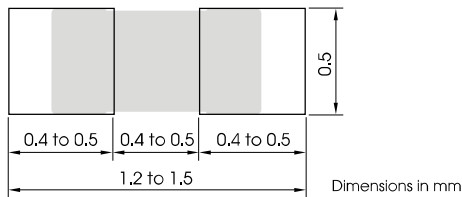
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MLK1005 series

Shapes and dimensions

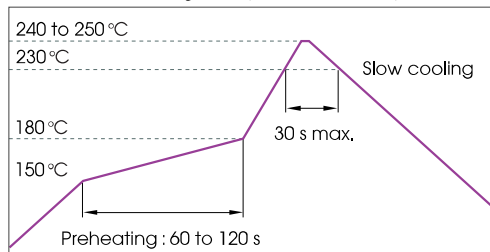


Recommended PC board pattern
(Reflow process)



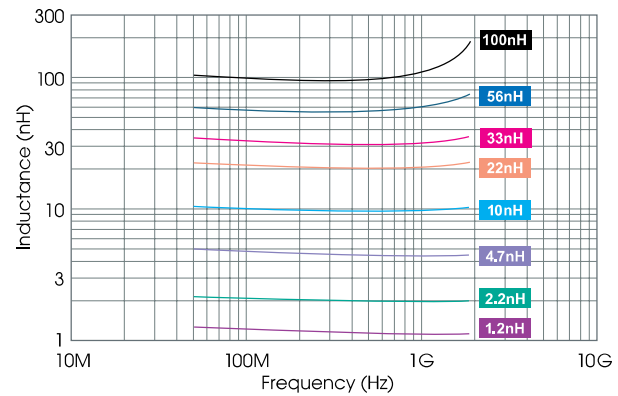
Recommended soldering conditions

Lead-free solder/High-temperature reflow process

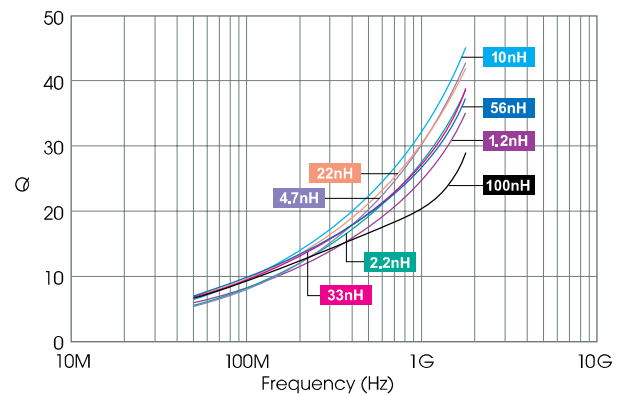


Frequency characteristics

Inductance vs. frequency characteristics



Q vs. frequency characteristics



MLK1005 series

Temperature range

Operating	-55 to +125 °C
Storage*	-55 to +125 °C

*Individual product

Typical Electrical Characteristics

Part No.	Inductance (nH) at 100MHz	Q			Self-resonance frequency (GHz)	DC resistance (ohm)	Rated current (mA)
		at 100MHz	at 300MHz	at 1GHz			
MLK1005S1N0S	1.0±0.3nH	7 typ.	12 typ.	24 typ.	12 min. / 19 typ.	0.1 max. / 0.05 typ.	300 max.
MLK1005S1N2S	1.2±0.3nH	7 typ.	13 typ.	26 typ.	11 min. / 16.2 typ.	0.15 max. / 0.07 typ.	300 max.
MLK1005S1N5S	1.5±0.3nH	8 typ.	15 typ.	28 typ.	9.5 min. / 13.6 typ.	0.16 max. / 0.08 typ.	300 max.
MLK1005S1N8S	1.8±0.3nH	8 typ.	15 typ.	29 typ.	8.5 min. / 10.5 typ.	0.2 max. / 0.11 typ.	300 max.
MLK1005S2N2S	2.2±0.3nH	8 typ.	15 typ.	29 typ.	8 min. / 10 typ.	0.21 max. / 0.11 typ.	300 max.
MLK1005S2N7S	2.7±0.3nH	8 typ.	15 typ.	30 typ.	7.5 min. / 9.2 typ.	0.23 max. / 0.16 typ.	300 max.
MLK1005S3N3S	3.3±0.3nH	9 typ.	16 typ.	32 typ.	7 min. / 8.5 typ.	0.25 max. / 0.16 typ.	300 max.
MLK1005S3N9S	3.9±0.3nH	9 typ.	16 typ.	30 typ.	6.5 min. / 8.2 typ.	0.28 max. / 0.16 typ.	300 max.
MLK1005S4N7S	4.7±0.3nH	9 typ.	16 typ.	31 typ.	6 min. / 7.3 typ.	0.32 max. / 0.19 typ.	300 max.
MLK1005S5N6D	5.6±0.5nH	9 typ.	16 typ.	31 typ.	5.7 min. / 7.2 typ.	0.35 max. / 0.21 typ.	300 max.
MLK1005S6N8D	6.8±0.5nH	9 typ.	16 typ.	31 typ.	5.5 min. / 6.8 typ.	0.38 max. / 0.28 typ.	300 max.
MLK1005S8N2D	8.2±0.5nH	9 typ.	16 typ.	31 typ.	5 min. / 6.5 typ.	0.42 max. / 0.31 typ.	300 max.
MLK1005S10NJ	10±5%	9 typ.	16 typ.	31 typ.	4.7 min. / 6.3 typ.	0.45 max. / 0.33 typ.	200 max.
MLK1005S12NJ	12±5%	9 typ.	16 typ.	32 typ.	4.3 min. / 6.2 typ.	0.5 max. / 0.41 typ.	200 max.
MLK1005S15NJ	15±5%	9 typ.	16 typ.	30 typ.	4 min. / 5.6 typ.	0.55 max. / 0.44 typ.	200 max.
MLK1005S18NJ	18±5%	9 typ.	16 typ.	30 typ.	3.7 min. / 5.3 typ.	0.65 max. / 0.53 typ.	200 max.
MLK1005S22NJ	22±5%	9 typ.	16 typ.	30 typ.	3.5 min. / 5.1 typ.	0.75 max. / 0.58 typ.	200 max.
MLK1005S27NJ	27±5%	9 typ.	16 typ.	28 typ.	3 min. / 4.7 typ.	0.95 max. / 0.75 typ.	200 max.
MLK1005S33NJ	33±5%	9 typ.	16 typ.	27 typ.	2.5 min. / 4.2 typ.	1.1 max. / 0.81 typ.	200 max.
MLK1005S39NJ	39±5%	9 typ.	16 typ.	27 typ.	2.0 min. / 3.4 typ.	1.2 max. / 0.67 typ.	100 max.
MLK1005S47NJ	47±5%	9 typ.	16 typ.	26 typ.	1.8 min. / 2.9 typ.	1.3 max. / 0.79 typ.	100 max.
MLK1005S56NJ	56±5%	9 typ.	16 typ.	25 typ.	1.5 min. / 2.8 typ.	1.4 max. / 0.97 typ.	100 max.
MLK1005S68NJ	68±5%	9 typ.	15 typ.	23 typ.	1.2 min. / 2.7 typ.	1.6 max. / 1.18 typ.	100 max.
MLK1005S82NJ	82±5%	9 typ.	14 typ.	20 typ.	1 min. / 2.1 typ.	1.8 max. / 1.24 typ.	50 max.
MLK1005SR10J	100±5%	9 typ.	14 typ.	20 typ.	0.8 min. / 2 typ.	2.2 max. / 1.5 typ.	50 max.

Measuring instruments

L,Q: HP4291A+16197A / SRF: HP8720C / Rdc: YOKOGAWA TYPE7561 / Idc: The value where the temperature of the inductor increases by 20°C