

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 2010. 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.

WOUND TORROIDS AND BEADS



WAVE

FEATURES

- Use of high loss ferrite materials for excellent high frequency noise absorption.
- High impedance for normal mode applications.
- 05 RD type available in taping for automatic insertion.
- 06 BT type is designed for high current applications (3A).

APPLICATIONS

- Absorption of high frequency noise from digital equipment data lines.

OPERATING TEMP.

- $-25^{\circ}\text{C} \sim 105^{\circ}\text{C}$ (Including self-generated heat)

ORDERING CODE

[FL-R / RD Type]

F L 0 5 R D 2 0 0 A T ○

1 Type	2 Dimensions of core	3 Shape	4 Nominal inductance (μH)	5 Inductance tolerance	6 Packaging	7 Internal code
FL Wound torroids and beads	05 4.8mm	R△ Ring core, with single wire lead RD Ring core, with case, pin type △=Blank space	example 1R0 1.0 200 20.0 ※R=decimal point	A Higher than normal value E Special tolerance	△ Bulk T Tape & Reel Z Ammo - Special code △=Blank space	△ Standard product 07 Product classification code △=Blank space

[FL-BT Type]

F L 0 6 B T △ 0 4 ○

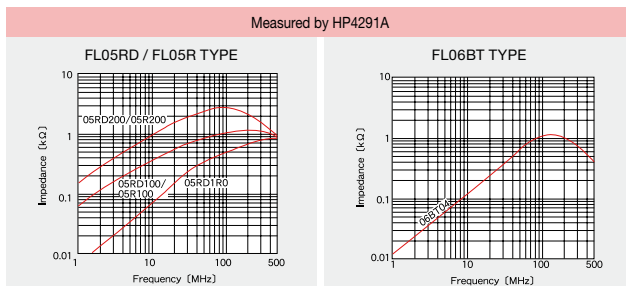
1 Type	2 Dimensions of core (diameter)	3 Shape	4 Product classification code	5 Internal code
FL Wound torroids and beads	06 6.0mm	BT Cylinder, porous core	△04 △=Blank space	△ Standard product △=Blank space

EXTERNAL DIMENSIONS/MINIMUM QUANTITY

Type		[05RD]	[05R]	[06BT04]
Fig.				
Minimum Quantity (pcs.)	Bulk	400	500	250
	Tape & Reel	2000	-	-
	Ammo	1500	-	-

Unit : mm (inch)

IMPEDANCE-FREQUENCY CHARACTERISTICS



Please contact TAIYO YUDEN for further information in regard to other characteristics.

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■ PART NUMBERS

Ordering code		EHS (Environmental Hazardous Substances)	Inductance [μ H]	Impedance [Ω] (typical)	DC Resistance [Ω] (max)	Rated current [A] (max)
FL05RD 1R0E□		RoHS	1.0 ^{+1.0} _{-0.5}	800 (at 400MHz)	0.08	0.5
FL05R 100A		RoHS	10 min.	900 (at 200MHz)	0.05	1.5
FL05RD 100A□		RoHS				
FL05R 200A-07		RoHS	20 min.	2000 (at 100MHz)	0.08	
FL05RD 200A□		RoHS				
FL06BT 04		RoHS	—	1000 (at 150MHz)	0.05	3.0

□Please specify the packaging code (T : Tape & reel, Z : ammo, Blank space : bulk)

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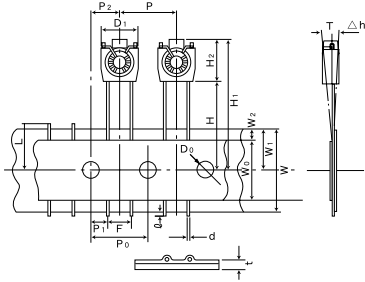
PACKAGING

① Minimum Quantity

Type	Minimum Quantity (pcs.)		
	Bulk	Tape & Reel	Ammo
FL05R	500	—	—
FL05RD	400	2000	1500
FL06BT	250	—	—

② Taping dimensions

● FL05RD

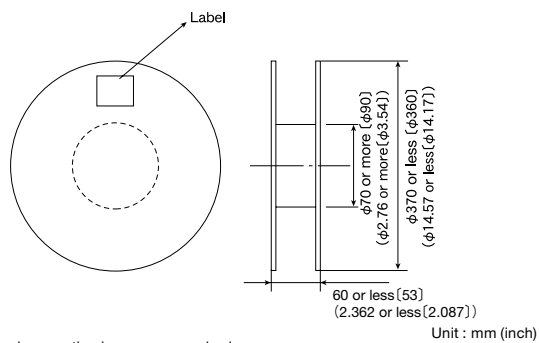


Type	Symbol	Dimension
FL05RD	D ₁	9.0 max. (0.354 max.)
	H ₂	9.0 max. (0.354 max.)
	T	3.7 max. (0.146 max.)
	H ₁	31.0 max. (1.22 max.)
	H	18.0±1.0 (0.709±0.039)
	P	12.7±1.0 (0.500±0.039)
	P ₀	12.7±0.3 (0.500±0.012) ※1
	P ₁	3.85±0.8 (0.152±0.031)
	P ₂	6.35±1.3 (0.250±0.051)
	W ₁	9.0 ^{+0.75} _{-0.5} (0.354 ^{+0.030} _{-0.020})
	F	5.0 ^{+0.6} _{-0.2} (0.197 ^{+0.024} _{-0.008})
	d	φ0.6 (φ0.024)
	△h	0±2.0 (0±0.079)
	W	18.0 ^{+1.0} _{-0.5} (0.709 ^{+0.024} _{-0.008})
	W ₀	12.5 min. (0.492 min.)
	W ₂	3.0 min. (0.118 min.) ※2
	ℓ	0 max. (0 max.)
D ₀	4.0±0.3 (0.157±0.012)	
L	11.0 max. (0.433 max.)	
t	0.7±0.2 (0.028±0.008)	

※1 Accumulated error for 20 pitches shall be within ±2mm. Unit : mm (inch)
 ※2 Pasting tape shall not exceed paste board.

③ Reel size

● FL05RD



Dimensions in parenthesis are measured value.

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RELIABILITY DATA

1. Operating temperature Range

LA Type	
CAL45 Type	-25~+105°C
LHL□□□	
FBA/FBR	-25~+85°C
FL05□ Type	
FL06BT Type	-25~+105°C

[Test Method and Remarks]

LA·CA·FL : Including self-generated heat
LHL□□□ : Including self-generated heat

2. Storage temperature Range

LA Type	
CAL45 Type	
LHL□□□	
FBA/FBR	-40~+85°C
FL05□ Type	
FL06BT Type	

3. Rated current

LA Type	
CAL45 Type	
LHL□□□	
FBA/FBR	Within the specified tolerance
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA, CA : The maximum DC value having inductance within 10% and temperature increase within 40°C (LA:20°C) by the application of DC bias.
LHL□□□ : The maximum DC value having inductance decrease within 10% (LHLC08, LHLC10 : within 30%) and temperature increase within the following specified temperature by the application of DC bias.

Reference temperature : 25°C (LHL08, LHL10, LHL13)
: 30°C (LHL16, LHLP□□)
: 40°C (LHLC08, LHLC10)

FB : No disconnection or appearance abnormality by continuous current application for 30 min. Change after the application shall be within ±20% of the initial value.

This is not guaranteed for electrical characteristics during current application.

FL : The maximum DC value having temperature rise within specified value.

4. Impedance

LA Type	
CAL45 Type	
LHL□□□	
FBA/FBR	Within the specified tolerance
FL05□ Type	
FL06BT Type	Refer to individual specification

[Test Method and Remarks]

FB : Measuring equipment : Impedance analyzer (HP4191A) or its equivalent

Measuring frequency : Specified frequency

FL06BT : Measuring equipment : 4291A (HP) or its equivalent

Measuring frequency : Specified frequency

5. Inductance

LA Type	
CAL45 Type	Within the specified tolerance
LHL□□□	
FBA/FBR	
FL05□ Type	Within the specified tolerance
FL06BT Type	

[Test Method and Remarks]

LA, CA : Measuring equipment : LCR meter (HP4285A + HP42851A or its equivalent)
Measuring frequency : Specified frequency

LHL□□□ : Measuring equipment : LCR meter (HP4285A+HP42851A or its equivalent)
LCR meter (HP4263A) or its equivalent (at 1KHz)

FL05R□ : Measuring equipment : HP4262A or its equivalent
Measuring frequency : 1kHz

6. Q

LA Type	Within the specified tolerance
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA : Measuring equipment : LCR meter (HP4285A + HP42851A or its equivalent)

Measuring frequency : Specified frequency

LHL□□□ (except LHLP) : Measuring equipment : LCR meter (HP4285A+HP42851A or its equivalent)
LCR meter (HP4263A) or its equivalent (at 1kHz)

Measuring frequency : Specified frequency

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RELIABILITY DATA

7. DC Resisistance

LA Type	Within the specified tolerance
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA, CA : Measuring equipment : low ohmmeter (A&D AD5812 or its equivalent)
 LHL□□□·FB·FL : Measuring equipment : DC ohmmeter

8. Self resonance frequency

LA Type	Within the specified tolerance
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA : Measuring equipment : Network analyzer (Anritsu MS620J or its equivalent)
 LHL□□□ (except LHLP) : Measuring equipment : (HP4191A, 4192A) its equivalent

9. Temperature characteristic

LA Type	△L/L : Within ±5%
CAL45 Type	
LHL□□□	△L/L : Within ±7% (except LHLP16 : Within ±20%)
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA : Change of maximum inductance deviation in step 1 to 5

Step	Temperature (°C)
1	20
2	-25 (Minimum operating temperature)
3	20 (Standard temperature)
4	+85 (Maximum operating temperature)
5	20

LHL□□□ : Change of maximum inductance deviation in step 1 to 5
 Temperature at step 1 : 20°C
 Temperature at step 2 : Minimum operating temperature
 Temperature at step 3 : 20°C (Standard temperature)
 Temperature at step 4 : Maximum operating temperature
 Temperature at step 5 : 20°C

10. Tensile strength test

LA Type	No abnormality such as cut lead, or looseness.
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA : Apply the stated tensile force progressively in the direction to draw terminal.

force (N)	duration (s)
25	5

CA : Apply the stated tensile force progressively in the direction to draw terminal.

force (N)	duration (s)
10	10

LHL□□□ : Apply the stated tensile force progressively in the direction to draw terminal.

Nominal wire diameter tensile ϕd (mm)	force (N)	duration (s)
$0.3 < \phi d \leq 0.5$	5	30±5
$0.5 < \phi d \leq 0.8$	10	
$0.8 < \phi d \leq 1.2$	25	

FBA/FBR : The body of a component shall be fixed and a tensile force of 20 ± 1 N shall be applied to the lead wire in the axial direction of the component during 10 ± 1 seconds.
 FL05R□ : Fix the body of a component in the direction to draw terminal, and gradually apply the tensile force of 4.9N.

11. Over current

LA Type	No emission of smoke no firing.
CAL45 Type	
LHL□□□	There shall be no scorch or short of wire. LHLC08, LHLC10 : There shall be no firing.
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LHL□□□/LA·CAL45 Type : Measuring current : Rated current×2
 Duration : 5 min.
 Number of measuring : one time

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RELIABILITY DATA

12. Terminal strength : bending

LA Type	No abnormality such as cut lead, or looseness.
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA, CA : Suspend a weight of specified mass at the end of the terminals and incline the body through the angle of 90 degrees and return it to the initial position. This operation is done over a period of 2-3 sec. Then second bend in the opposite direction shall be made.

Number of bends : Two times.

Nominal wire diameter tensile ϕd (mm)	Bending force (N)	Mass reference weight (kg)
$0.3 < \phi d \leq 0.5$	2.5	0.25
$0.5 < \phi d \leq 0.8$	5	0.50

LH·FB : Suspend a weight of specified mass at the end of the terminals and incline the body through the angle of 90 degrees and return it to the initial position. This operation is done over a period of 2-3 sec. Then second bend in the opposite direction shall be made.

Number of bends : Two times.

Nominal wire diameter tensile ϕd (mm)	Bending force (N)	Mass reference weight (kg)
$0.3 < \phi d \leq 0.5$	2.5	0.25
$0.5 < \phi d \leq 0.8$	5	0.5
$0.8 < \phi d \leq 1.2$	10	1.0

13. Insulation resistance : between the terminals and body

LA Type	100M Ω min.
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LHL□□□ : Applied voltage : 500 VDC
Duration : 60 sec.

14. Insulation resistance : between terminals and core

LA Type	1M Ω min. (Other than materail code MA)
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

FBA·FBR : Applied voltage : 100 VDC
Duration : 60±5 sec.

15. Withstanding : between the terminals and body

LA Type	No abnormality such as insulation damage
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LHL□□□ : According to JIS C5102. 7. 1. 3 (C)
Metal global method
Applied voltage : 500 VDC
Duration : 60 sec.

16. DC bias characteristic

LA Type	$\Delta L/L$: Within -10%
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA, CA : Measure inductance with appliation of rated current using LCR meter to compare it with the initial value.

17. Body strength

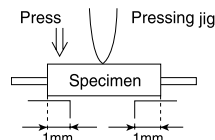
LA Type	No abnormality as damage.
CAL45 Type	
LHL□□□	No abnormality such as cracks on body.
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA : Applied force : 30N
Duration : 10 sec.
Speed : Shall attain to specified force in 2 sec.

CAL45 : Applied force : 50N
Duration : 10 sec.
Speed : Shall attain to specified force in 2 sec.

FBA : Applied force : 50±3N
Duration : 30±1 sec.



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RELIABILITY DATA

18. Resistance to vibration	
LA Type	$\Delta L/L$: Within $\pm 5\%$ Q : 30min
CAL45 Type	$\Delta L/L$: Within $\pm 5\%$
LHL□□□	Appearance : No abnormality $\Delta L/L$: Within $\pm 5\%$ Q change : Within $\pm 30\%$ (LHLP : only $\Delta L/L$)
FBA/FBR	Appearance : No abnormality Impedance change : Within $\pm 20\%$
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA, CA : Directions : 2 hrs each in X, Y and Z directions total : 6hrs.
 Frequency range : 10 to 55 to 10Hz (1min.)
 Amplitude : 1.5mm
 Mounting method : Soldering onto printed board.
 Recovery : At least 1hr of recovery under the standard condition after the test, followed by the measurement within 2hrs.

LHL□□□·FB : Directions : 2 hrs each in X, Y and Z directions total : 6hrs.
 Frequency range : 10 to 55 to 10Hz (1min.)
 Amplitude : 1.5mm (But don't exceed acceleration $196m/s^2$ (two power))
 Mounting method : Soldering onto printed board.

19. Resistance to shock	
LA Type	No significant abnormality in appearance
CAL45 Type	
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	

[Test Method and Remarks]

LA, CA : Drop test
 Impact material : concrete or vinyl tile
 Height : 1m
 Total number of drops : 10 times

20. Solderability	
LA Type	At least 75% of terminal electrode is covered by new solder.
CAL45 Type	
LHL□□□	At least 75% of terminal electrode is covered by new solder.
FBA/FBR	At least 90% of terminal electrode is covered by new solder.
FL05□ Type	
FL06BT Type	At least 75% of terminal electrode is covered by new solder.

[Test Method and Remarks]

LA, CA : Solder temperature : $230 \pm 5^\circ C$
 Duration : 2 ± 0.5 sec.

LHL□□□ : Solder temperature : $235 \pm 5^\circ C$
 Duration : 2 ± 0.5 sec.
 Immersion depth : Up to 1.5mm from bottom of case.

FB : Solder temperature : $230 \pm 5^\circ C$
 Duration : 3 ± 1 sec.
 Immersion depth : Up to 1.5mm from terminal root.

FL05R□ : Solder temperature : $230 \pm 5^\circ C$
 Duration : 2 ± 0.5 sec.
 Immersion depth : Up to 2 to 2.5mm from terminal root.

FL06BT : Solder temperature : $230 \pm 5^\circ C$
 Duration : 3 ± 1 sec.
 Immersion depth : Up to 0.5 to 1.0mm from terminal root.

21. Resistance to soldering heat	
LA Type	No significant abnormality in appearance
CAL45 Type	$\Delta L/L$: Within $\pm 5\%$
LHL□□□	No significant abnormality in appearance Inductance change : Within $\pm 5\%$ Q change : Within $\pm 30\%$ (LHLP : only $\Delta L/L$)
FBA/FBR	No significant abnormality in appearance Impedance change : Within $\pm 20\%$
FL05□ Type	Refer to individual specification
FL06BT Type	No significant abnormality in appearance Impedance change : Within $\pm 20\%$

[Test Method and Remarks]

LA, CA : Solder temperature : (CA) $270 \pm 5^\circ C$, (LA) $260 \pm 5^\circ C$
 Duration : 5 ± 0.5 sec. One time
 Immersed conditions : Inserted into substrate with $t=1.6$ mm
 Recovery : At least 1hr of recovery under the standard condition after the test, followed by the measurement within 2hrs.

LHL□□□ : Solder bath method : Solder temperature : $260 \pm 5^\circ C$
 Duration : 10 ± 1 sec.
 Up to 1.5mm from the bottom of case.

Manual soldering : Solder temperature : $350 \pm 10^\circ C$ (At the tip of soldering iron)
 Duration : 5 ± 1 sec.
 Up to 1.5mm from the bottom of case.

Caution : No excessive pressing shall be applied to terminals.
 Recovery : 4 to 24hrs of recovery under the standard condition after the test.

FB : Solder bath method : Condition 1 : Solder temperature : $260 \pm 5^\circ C$
 Duration : 10 ± 1 sec.
 Immersion depth : Up to 1.5mm from the terminal root.
 Condition 2 : Solder temperature : $350 \pm 5^\circ C$
 Duration : 3 ± 1 sec.
 Immersion depth : Up to 1.5mm from the terminal root.
 Recovery : 3hrs of recovery under the standard condition after the test.

FL : Solder condition : $260 \pm 5^\circ C$ 10 ± 1 sec.
 Immersion depth : Up to 0.5 to 1.0mm from the terminal root.
 Recovery : 3hrs of recovery under the standard condition after the test.

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RELIABILITY DATA

22. Resisistance to solvent

LA Type	Please avoid the ultrasonic cleaning of this product.	
CAL45 Type		
LHL□□□		
FBA/FBR	No significant abnormality in appearance	Impedance change : Within ±20%
FL05□ Type		
FL06BT Type		

[Test Method and Remarks]

FB : Solvent temperature : 20~25°C
 Duration : 30±5 sec.
 Solvent type : Acetone, trichloroethylene
 Recovery : 3hrs of recovery under the standard condition after the test.

23. Thermal shock

LA Type	△L/L : Within ±10% Q : 30min		
CAL45 Type	△L/L : Within ±10%		
LHL□□□	Appearance : No abnormality	Inductance change : Within ±10%	Q change : Within ±30% (LHLP : only △L/L)
FBA/FBR	Appearance : No abnormality	Impedance change : Within ±20%	
FL05□ Type	Refer to individual specification		
FL06BT Type	Appearance : No abnormality	Impedance change : Within ±20%	

[Test Method and Remarks]

LA, CA : Conditions for 1cycle

Step	Temperature (°C)	Duration (min.)
1	-25 ⁺⁰ ₋₃	30±3
2	Room temperature	Within 3
3	+85 ⁺² ₋₀	30±3
4	Room temperature	Within 3

Number of cycles : 5 cycles
 Recovery : At least 1hr of recovery under the standard condition after the removal from test chamber, followed by the measurement within 2hrs.

LHL□□□·FB : According to JIS C0025

Conditions for 1 cycle

Step	Temperature (°C)	Duration (min.)
1	Minimum operating temperature ⁺⁰ ₋₃	30±3
2	Room temperature	Within 3
3	Minimum operating temperature ⁺² ₋₀	30±3
4	Room temperature	Within 3

Number of cycles : 10 cycles (LHL□□□)
 : 5 cycles (FBA, FBR)
 Recovery : 4 to 24hrs of recovery under the standard condition after the removal from the test chamber. (LHL□□□)
 : 3hrs of recovery under the standard condition after the removal from the test chamber. (FBA, FBR)

FL : According to JIS C0025

Conditions for 1 cycle

Step	Temperature (°C)	Duration (min.)
1	-25 ⁺⁰ ₋₃	30±3
2	Room temperature	Within 3
3	+85 ⁺² ₋₀	30±3
4	Room temperature	Within 3

Number of cycles : 10 cycles
 Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.

24. Damp heat

LA Type	△L/L : Within ±10% Q : 30min	
CAL45 Type	△L/L : Within ±10%	
LHL□□□		
FBA/FBR	Appearance : No abnormality	Impedance change : Within ±20%
FL05□ Type		
FL06BT Type		

[Test Method and Remarks]

LA, CA : Temperature : 40±2°C
 Humidity : 90~95%RH
 Duration : 1000 hrs
 Recovery : At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs.

FB : Temperature : 60±2°C

Humidity : 90~95%RH
 Duration : 1000 hrs
 Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.

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RELIABILITY DATA

25. Loading under damp heat	
LA Type	$\Delta L/L$: Within $\pm 10\%$ Q : 30min
CAL45 Type	$\Delta L/L$: Within $\pm 10\%$
LHL□□□	Appearance : No abnormality Inductance change : Within $\pm 10\%$ Q change : Within $\pm 30\%$ (LHLP : only $\Delta L/L$)
FBA/FBR	
FL05□ Type	Refer to individual specification
FL06BT Type	Appearance : No abnormality Impedance change : Within $\pm 20\%$
[Test Method and Remarks]	
LA, CA	Temperature : $40 \pm 2^\circ\text{C}$ Humidity : $90 \sim 95\% \text{RH}$ Duration : 1000 hrs Applied current : Rated current Recovery : At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs.
LHL□□□	Temperature : $40 \pm 2^\circ\text{C}$ Humidity : $90 \sim 95\% \text{RH}$ Duration : 1000 ± 24 hrs Applied current : Rated current Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.
FL	Temperature : $60 \pm 3^\circ\text{C}$ Humidity : $90 \sim 95\% \text{RH}$ Duration : 500 (+12, -0) hrs Applied current : Rated current Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.
26. Loading at high temperature	
LA Type	$\Delta L/L$: Within $\pm 10\%$ Q : 30min
CAL45 Type	$\Delta L/L$: Within $\pm 10\%$
LHL□□□	
FBA/FBR	
FL05□ Type	
FL06BT Type	
[Test Method and Remarks]	
LA, CA	Temperature : $85 \pm 2^\circ\text{C}$ Duration : 1000 hrs Applied current : Rated current Recovery : At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs.
27. Low temperature life test	
LA Type	$\Delta L/L$: Within $\pm 10\%$ Q : 30min
CAL45 Type	$\Delta L/L$: Within $\pm 10\%$
LHL□□□	Appearance : No abnormality Inductance change : Within $\pm 10\%$ Q change : Within $\pm 30\%$ (LHLP : only $\Delta L/L$)
FBA/FBR	
FL05□ Type	Refer to individual specification
FL06BT Type	Appearance : No abnormality Impedance change : Within $\pm 20\%$
[Test Method and Remarks]	
LA, CA	Temperature : $-25 \pm 2^\circ\text{C}$ Duration : 1000 hrs Recovery : At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs.
LHL□□□	Temperature : $-40 \pm 3^\circ\text{C}$ Duration : 1000 ± 24 hrs Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.
FL	Temperature : $-40 \pm 3^\circ\text{C}$ Duration : 500 (+12, -0) hrs Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.
28. High temperature life test	
LA Type	
CAL45 Type	
LHL□□□	Appearance : No abnormality Inductance change : Within $\pm 10\%$ Q change : Within $\pm 30\%$ (LHLP : only $\Delta L/L$)
FBA/FBR	
FL05□ Type	Refer to individual specification
FL06BT Type	Appearance : No abnormality Impedance change : Within $\pm 20\%$
[Test Method and Remarks]	
LHL□□□	Temperature : $105 \pm 3^\circ\text{C}$ Duration : 1000 ± 24 hrs Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.
FL	Temperature : $85 \pm 3^\circ\text{C}$ Duration : 500 (+12, -0) hrs Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test chamber.

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PRECAUTIONS

CAL Type, LH Type, FB Type, FL Type, LA Type

1. Circuit Design	
Precautions	<ul style="list-style-type: none"> ◆ Operating environment <ol style="list-style-type: none"> 1. The products described in this specification are intended for use in general electronic equipment (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.
2. PCB Design	
Precautions	<ul style="list-style-type: none"> ◆ Design <ol style="list-style-type: none"> 1. Please design insertion pitches as matching to that of leads of the component on PCBs.
Technical considerations	<ul style="list-style-type: none"> ◆ Design <ol style="list-style-type: none"> 1. When inductors are mounted onto a PC board, hole dimensions on the board should match the lead pitch of the component, if not, it will cause breakage of the terminals or cracking of terminal roots covered with resin as excess stress travels through the terminal legs.
3. Considerations for automatic placement	
Precautions	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. Excessive impact load should not be imposed on the products when mounting onto the PC boards. 2. Mounting and soldering conditions should be checked beforehand.
Technical considerations	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.
4. Soldering	
Precautions	<ul style="list-style-type: none"> ◆ Wave soldering <ol style="list-style-type: none"> 1. Please refer to the specifications in the catalog for a wave soldering. 2. Do not immerse the entire inductor in the flux during the soldering operation. ◆ Lead free soldering <ol style="list-style-type: none"> 1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently. <p>Recommended conditions for using a soldering iron:</p> <ul style="list-style-type: none"> • Put the soldering iron on the land-pattern. • Soldering iron's temperature - Below 350°C • Duration - 3 seconds or less • The soldering iron should not directly touch the inductor. ◆ Reflow soldering <ol style="list-style-type: none"> 1. As for reflow soldering, please contact our sales staff.
Technical considerations	<ul style="list-style-type: none"> ◆ Lead free soldering <ol style="list-style-type: none"> 1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products.
5. Cleaning	
Precautions	<ul style="list-style-type: none"> ◆ Cleaning conditions <ol style="list-style-type: none"> 1. CAL type, LH type, LA Type Please do not do cleaning by a supersonic wave.
Technical considerations	<ul style="list-style-type: none"> ◆ Cleaning conditions <ol style="list-style-type: none"> 1. CAL type, LH type, LA Type If washing by supersonic waves, supersonic waves may deform products.
6. Handling	
Precautions	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. Keep the inductors away from all magnets and magnetic objects. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. Please do not give the inductors any excessive mechanical shocks. 2. LH type If inductors are dropped onto the floor or a hard surface they should not be used. ◆ Packing <ol style="list-style-type: none"> 1. Please do not give the inductors any excessive mechanical shocks. In loading, please pay attention to handling indication mentioned in a packing box (a loading direction / number of maximum loading / fragile item).
Technical considerations	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with magnetic influence. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. There is a case to be damaged by a mechanical shock. 2. LH type There is a case to be broken by a fall. ◆ Packing <ol style="list-style-type: none"> 1. There is a case that a lead wire could be deformed by a fall or an excessive shock.
7. Storage conditions	
Precautions	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <p>Recommended conditions</p> <ul style="list-style-type: none"> • Ambient temperature 0~40°C • Humidity Below 70% RH <p>The ambient temperature must be kept below 30°C. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, inductors should be used within one year from the time of delivery. In case of storage over 6 months, solderability shall be checked before actual usage.</p>
Technical considerations	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. Under 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.

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REFLOW

FEATURES

- CM01 Series is Wire-wound Structured Type Common Mode Choke Coil which provides highly effective noise suppression characteristics without distorting the wave pattern of High-speed Differential Signal interface.
- Developed 1210 case-size by utilizing our wire-wound technologies. This small and wire-wound structured product has little transmission loss and keeps high common impedance up to GHz range.
- CM01S600 : Suitable characteristics for super high speed differential signal such as USB3.0 and so on. Cutoff frequency is 10GHz.
- CM01H900 : Suitable characteristics for high speed differential signal such as HDMI, DVI, Displayport and so on. Cut-off frequency is 8GHz.
- CM01U900 : Suitable characteristics for differential signal such as USB2.0, LVDS, LAN and so on. Cut-off frequency is 3GHz. High rated current of this product makes it possible to replace 2012 size product for this product.
- CM01U161 : Suitable characteristics for differential signal such as USB2.0, LVDS, LAN and so on. Cut-off frequency is 3GHz. High common impedance of this product works effectively on noise suppression.

APPLICATIONS

- Radiated noise suppression in the High-speed Differential Signal interfaces [HDMI, Serial-ATA, IEEE1394, LVDS, and USB2.0] of LCD-TV, Blu-ray players, and PCs.
- Countermeasure for degradation of receiver sensitivity caused by high frequency noise from high-speed differential signal of Cellular phones, Data Cards and Smartphones.
- Common mode noise suppression raised from the power line and audio signal in a small device.

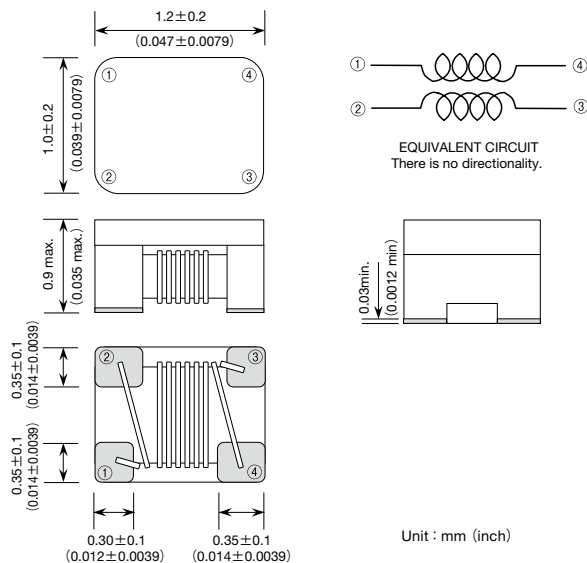
ORDERING CODE



1 Type		2 External Dimensions (L×W)		3 Product classification code		4 Impedance			5 Packaging	
CM	Common mode choke coil	01	1.2×1.0mm	S	USB3.0 correspondence	600	60Ω	typical at 100MHz	T	Taping
				H	HDMI/Displayport correspondence	900	90Ω	typical at 100MHz		
				U	USB2.0/LAN correspondence	161	160Ω	typical at 100MHz		

EXTERNAL DIMENSIONS/MINIMUM QUANTITY

CM01TYPE



Type	Minimum Quantity (pcs.)
	Embossed tape
CM01 [2 Lines] type	3000

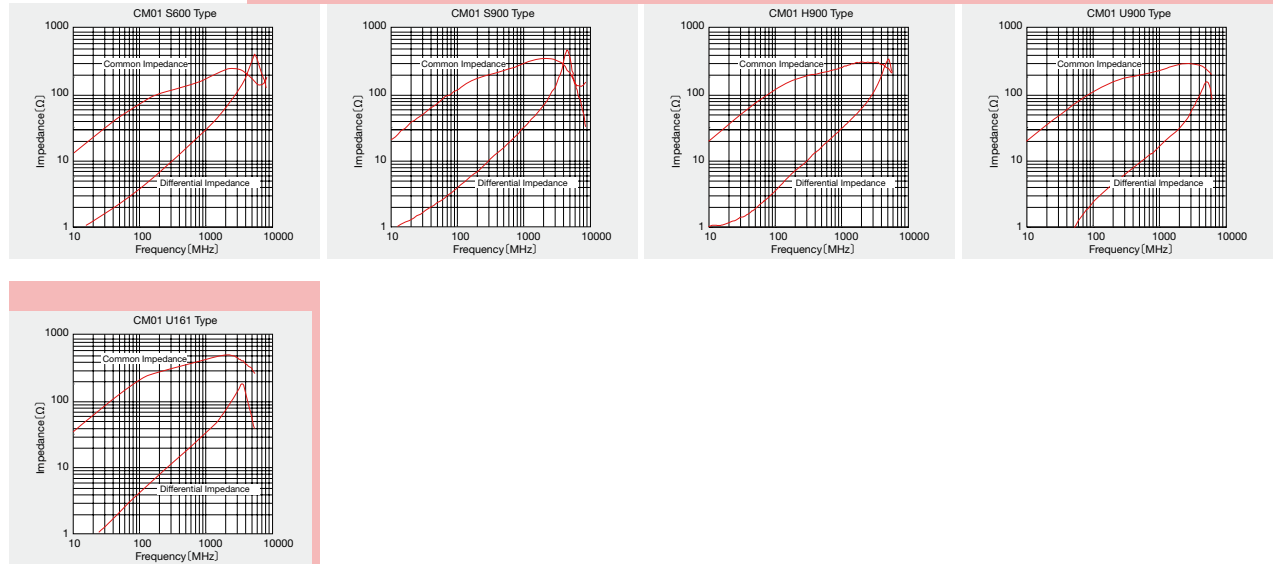
PART NUMBERS

CM01 TYPE

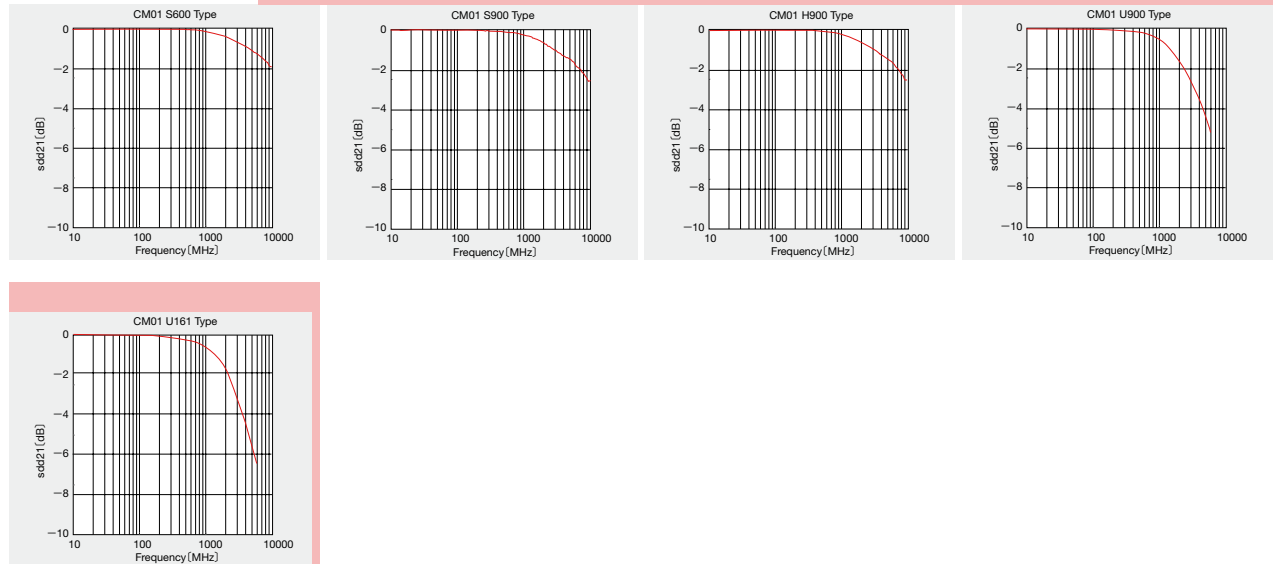
Ordering	EHS	No. of Lines	Common Impedance [Ω] (at 100MHz)	DC resistance [Ω]	Rated current [mA]	Rated voltage [V] (D.C.)	Insulation resistance [MΩ]	Cut off frequency [GHz]	Characteristic impedance [Ω]
CM01S600T	RoHs	2	60typ. 43min.	0.4max.	300max.	20max.	100min.	10.0typ.	90typ.
CM01S900T	RoHS	2	90typ. 65min.	0.5max.	280max.	20max.	100min.	8.0typ.	90typ.
CM01H900T	RoHS	2	90typ. 65min.	0.5max.	280max.	20max.	100min.	8.0typ.	100typ.
CM01U900T	RoHs	2	90typ. 65min.	0.3max.	400max.	20max.	100min.	3.0typ.	—
CM01U161T	RoHs	2	160typ. 120min.	0.6max.	260max.	20max.	100min.	3.0typ.	—

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Impedance characteristics



Transmission characteristic



FERRITE PRODUCTS

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COMMON MODE CHOKE COILS (FOR DC AND SIGNAL LINES) SMD TYPE



REFLOW

FEATURES

- Available in embossed tape and reel.
- Highly coupled coil construction ideal for common mode noise attenuation.

OPERATING TEMP.

- -25°C~105°C (Including self-generated heat)

APPLICATIONS

- Immunity against undesirable external line radiation fields and broadcast waves generated by multifunction telephone sets, PBXs, and facsimile machines.
- Preventive measure against DC line noise in electronic equipment.
- Suppresses radiated emissions from secondary power supplies and signal lines on AC adapters, battery chargers, and digital equipment.
- Excellent for reducing radiated noise in DVC (digital video cameras) and DSC (digital still cameras)
- Offers high speed differential mode noise attenuation in USB and IEEE1394 connectors in personal computers, printers, scanners and other computer peripherals.

ORDERING CODE

C	M	0	4	R	C	△	0	1	△	T	○
1	2	3	4	5	6						
1 Type		2 Dimensions of Core (mm)		3 Shape		4 Product classification code		5 Packaging		6 Internal code	
CM	Common mode choke coils	04	3.5	RC	Surface mount type	△01~△10	△T	Taped products	△	Standard Products	
BU		05	5.0	MC							
						△=Blank space		△=Blank space		△=Blank space	

EXTERNAL DIMENSIONS/MINIMUM QUANTITY

<p>BU05MC (2 Lines) type</p> <p>Minimum Quantity (pcs.) Embossed tape 2500</p>	<p>BU05MC (3 Lines) type</p> <p>Minimum Quantity (pcs.) Embossed tape 2500</p>	<p>CM04RC (2 Lines) type</p> <p>Minimum Quantity (pcs.) Embossed tape 1500</p>
<p>CM04RC 02T</p> <p>Minimum Quantity (pcs.) Embossed tape 1000</p>	<p>CM04RC 08T</p> <p>Minimum Quantity (pcs.) Embossed tape 2500</p>	<p>CM04RC (4 Lines) type</p> <p>Minimum Quantity (pcs.) Embossed tape 1000</p>

The values without tolerance are for reference only.

Unit : mm (inch)

PART NUMBERS

CM04RC Type

Ordering code	EHS (Environmental Hazardous Substances)	No. of Lines	Impedance [Ω] (typical)	DC resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (D.C.)	Insulation resistance [MΩ] (min.)
CM04RC01T	RoHS	2	800 (at 100MHz)	0.06	1.5	50	100
CM04RC04T	RoHS		900 (at 20MHz)	0.1	1.3		
CM04RC07T	RoHS		500 (at 160MHz)	0.06	2.5		
CM04RC09T	RoHS		270 (at 200MHz)	0.03	3.0		
CM04RC10T	RoHS		100 (at 200MHz)	0.02	4.0		
CM04RC02T	RoHS	3	1000 (at 100MHz)	0.18	0.5	50	100
CM04RC08T	RoHS		1000 (at 200MHz)	0.2	0.5		
CM04RC05T	RoHS	4	800 (at 100MHz)	0.2	0.5		

BU05MC Type

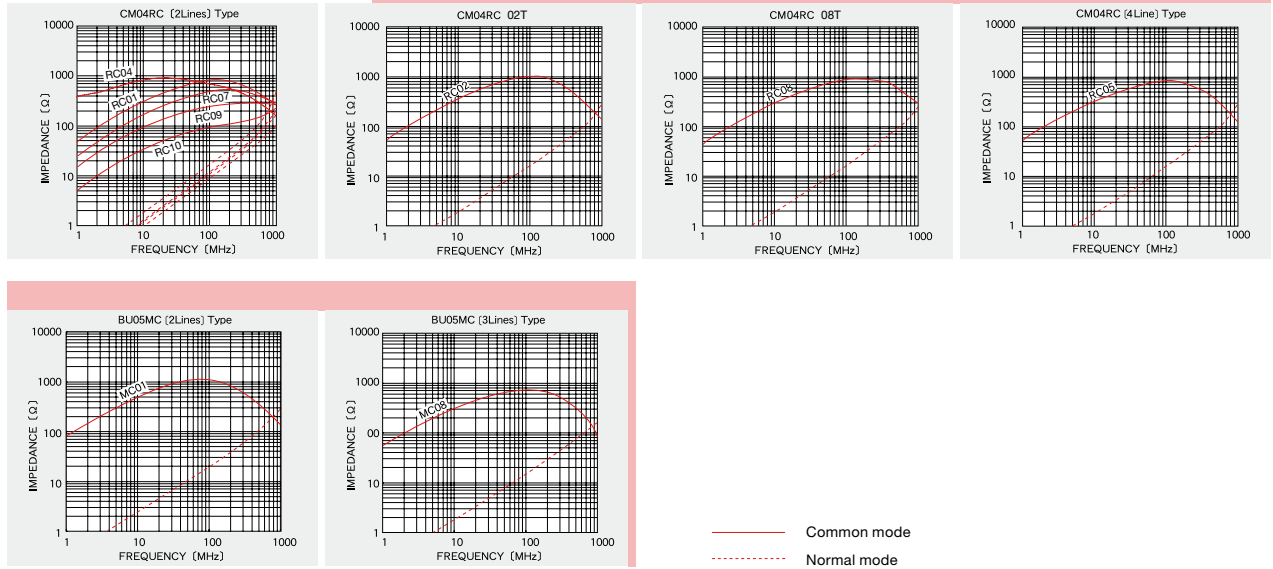
Ordering code	EHS (Environmental Hazardous Substances)	No. of Lines	Impedance [Ω] (typical)	DC resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (D.C.)	Insulation resistance [MΩ] (min.)
BU05MC01T	RoHS	2	1000 (at 60MHz)	0.12	1	50	100
BU05MC08T	RoHS	3	700 (at 60MHz)	0.11	0.5		

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ELECTRICAL CHARACTERISTICS

Impedance -vs- Frequency characteristics

(Measured by HP4291A)



FERRITE PRODUCTS

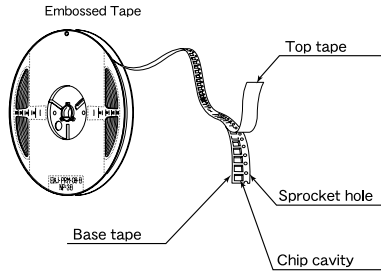
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PACKAGING

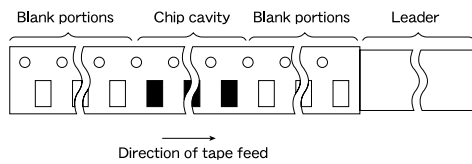
① Minimum Quantity

Type	Minimum Quantity (pcs.) Embossed tape
CM01 [2 Lines] type	3000
CM04RC [2 Lines] type	1500
CM04RC 02T	1000
CM04RC 08T	2500
CM04RC [4 Lines] type	1000
BU05MC [2 Lines] type	2500
BU05MC [3 Lines] type	2500

② Tape Material



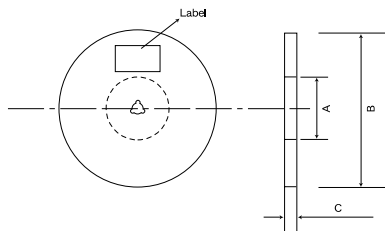
③ Leader and Blank Portion



Type	Leader	Blank portions (Leader side)	Blank portions (Chip cavity side)
CM01	200~400 (7.87~15.75)	160~200 (6.30~7.87)	160 (6.30) or more
CM04RC	150 (5.89)	80 (3.14)	80 (3.14)
BU05MC	150 (5.89)	80 (3.14)	80 (3.14)

Unit : mm (inch)

④ Reel size

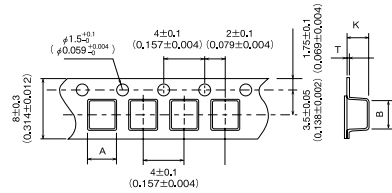


Type	A	B	C
CM01	$\phi 60+1/-0$ ($\phi 2.36+0.039/-0$)	$\phi 180+0/-3$ ($\phi 7.09+0/-0.118$)	10.0 ± 1.5 (0.394 ± 0.059)
CM04RC	$\phi 100\pm 1$ ($\phi 3.94\pm 0.039$)	$\phi 330\pm 2$ ($\phi 12.99\pm 0.079$)	18 ± 1.5 (0.709 ± 0.059)
BU05MC	$\phi 80\pm 1$ ($\phi 3.15\pm 0.039$)	$\phi 330\pm 2$ ($\phi 12.99\pm 0.079$)	13.5 ± 1 (0.53 ± 0.039)

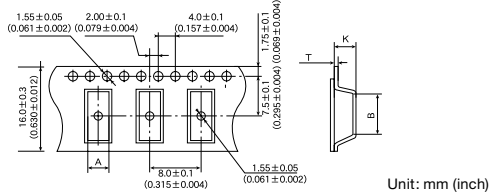
Unit : mm (inch)

⑤ Taping dimensions

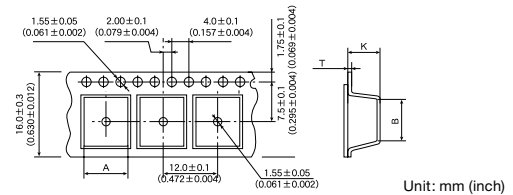
● Embossed tape (CM01 type)



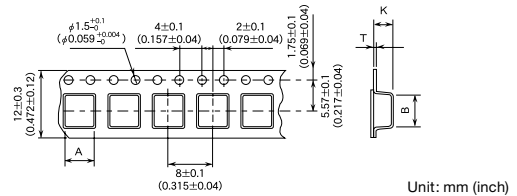
● Embossed tape (CM04RC type) 8mm pitch (0.31 inches pitch)



● Embossed tape (CM04RC type) 12mm pitch (0.472 inches pitch)



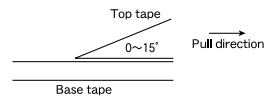
● Embossed tape (BU05MC type)



Type	Lines	Insertion pitch	Chip cavity		tape thickness	
			A	B	K	T
CM01	2	4.0±0.1	1.16±0.1	1.41±0.1	0.98±0.1	0.3max.
	2	8.0±0.1	5.7±0.1	9.65±0.1	5.2max	0.4±0.05
CM04RC	3(02T)	12.0±0.1	9.8±0.1	7.7±0.1	5.0max	0.38±0.05
	3(08T)	8.0±0.1	5.7±0.1	9.8±0.1	3.1max	0.4±0.05
BU05MC	4	12.0±0.1	10.3±0.1	10.3±0.1	5.0max	0.3±0.05
	2	8.0±0.1	5.35±1.5	5.7±0.2	3.2±0.1	0.4±0.05
3						

Unit : mm (inch)

⑥ Top Tape Strength



● CM01

The top tape requires a peel-off force of 0.1 to 1.0N in the direction of the arrow as illustrated above.

● CM04RC, BU05MC

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

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COMMON MODE CHOKE COILS (FOR DC AND SIGNAL LINES) LEADED TYPE



WAVE

FEATURES

- Highly reliable, compact and lightweight
- Easily inserted into the PCB

APPLICATIONS

- TLF Type : Countermeasure for noise in the low-frequency (AM) broad-casting band. Shields against radiated emissions in the broadcasting frequency for multi-functional telephone sets, PBXs, faxes, etc.
- CM/BU Type : Countermeasure for noise in the high-frequency (MHz) band

OPERATING TEMP.

TLF Type	-25°C~+105°C
CM Type	-25°C~+105°C

(Including self-generated heat)

ORDERING CODE

[TLF Type]

T L F \triangle 9 U B H 3 0 2 W K 1

1 Type	2 Dimensions of core	3 Shape	4 Nominal inductance (μ H)	5 Inductance tolerance (%)	6 Internal code
TLF Line filter	\triangle 9 9mm \triangle =Blank space	UB \triangle U core, vertically split wound UBH U core, horizontally split wound \triangle =Blank space	example 302 3000 203 20000	W +100 -10	K1 Adhesive fixation

[CM-BU Type]

C M 0 5 R A \triangle 0 6 \bigcirc

1 Type	2 Core dimensions (mm)	3 Shape	4 Product classification code	5 Internal code
CM Common mode choke coil BU Common mode choke coil	05 4.8 08 8.0 12 12.0	RA Double-wire lead RB Pin type with base	\triangle 01~ \triangle 20 \triangle =Blank space	\triangle Standard product \triangle =Blank space

EXTERNAL DIMENSIONS/MINIMUM QUANTITY

TLF9UB Type	TLF9UB H Type	CM \square RA Type / BU08RA Type																														
<p>Minimum Quantity (pcs.) Box 500</p>	<p>Minimum Quantity (pcs.) Box 500</p>	<table border="1"> <tr> <th>Type</th> <th colspan="2">Minimum Quantity (pcs.)</th> </tr> <tr> <td></td> <th>Box</th> <th>Bulk</th> </tr> <tr> <td>CM05RA06</td> <td>—</td> <td>500</td> </tr> <tr> <td>CM08RA \square</td> <td>—</td> <td>250</td> </tr> <tr> <td>CM12RA02</td> <td>—</td> <td>100</td> </tr> <tr> <td>BU08RA \square</td> <td>—</td> <td>200</td> </tr> </table> <table border="1"> <tr> <th>Type</th> <th>W (max.)</th> <th>T (max.)</th> </tr> <tr> <td>CM05</td> <td>6.5 (0.256)</td> <td>3.0 (0.118)</td> </tr> <tr> <td>CM08, BU08</td> <td>11.0 (0.433)</td> <td>6.0, 7.0 (0.024, 0.276)</td> </tr> <tr> <td>CM12</td> <td>15.5 (0.610)</td> <td>7.0 (0.276)</td> </tr> </table>	Type	Minimum Quantity (pcs.)			Box	Bulk	CM05RA06	—	500	CM08RA \square	—	250	CM12RA02	—	100	BU08RA \square	—	200	Type	W (max.)	T (max.)	CM05	6.5 (0.256)	3.0 (0.118)	CM08, BU08	11.0 (0.433)	6.0, 7.0 (0.024, 0.276)	CM12	15.5 (0.610)	7.0 (0.276)
Type	Minimum Quantity (pcs.)																															
	Box	Bulk																														
CM05RA06	—	500																														
CM08RA \square	—	250																														
CM12RA02	—	100																														
BU08RA \square	—	200																														
Type	W (max.)	T (max.)																														
CM05	6.5 (0.256)	3.0 (0.118)																														
CM08, BU08	11.0 (0.433)	6.0, 7.0 (0.024, 0.276)																														
CM12	15.5 (0.610)	7.0 (0.276)																														
CM05RB (2Lines Type)	CM08RB (2Lines Type)	CM08RB (4Lines Type)																														
<p>Minimum Quantity (pcs.) Box 1000</p>	<p>Minimum Quantity (pcs.) Box 500</p>	<p>Minimum Quantity (pcs.) Box 500</p>																														

Unit : mm (inch)

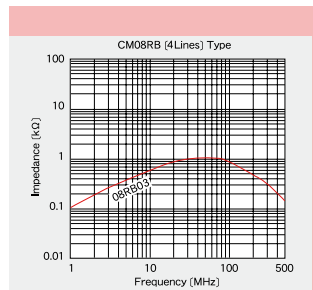
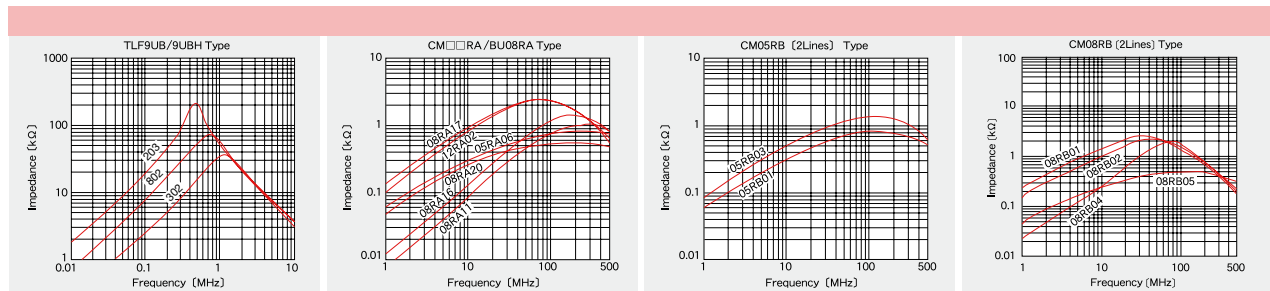
* This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>)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

PART NUMBERS

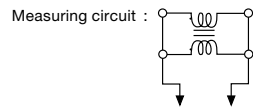
Ordering code		EHS (Environmental Hazardous Substances)	No. of lines	Inductance [μ H] [$\pm 100\%$]	DC resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] D.C.	Insulation resistance [M Ω] (min.)	Impedance [K Ω] (Reference values)
TLF9UBH 302WK1		RoHS	2	3000	1.5	0.4	50	100	≥ 20 (at 1MHz)
TLF9UB 302WK1		RoHS							
TLF9UBH 802WK1		RoHS		8000	3.0	0.3			≥ 40 (at 700kHz)
TLF9UB 802WK1		RoHS							
TLF9UBH 203WK1		RoHS							
TLF9UB 203WK1		RoHS	20000	6.5	0.18	≥ 150 (at 500kHz)			

Ordering code		EHS (Environmental Hazardous Substances)	No. of lines	Inductance [μ H] [at 1kHz]	Impedance [Ω] (typical)	DC resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] D.C.	Insulation resistance [M Ω] (min.)
CM05RA	06	RoHS	2	0.7 min.	700 (at 200MHz)	0.050	1.5	50	100
BU08RA	11	RoHS		0.7~1.3	1000 (at 250MHz)	0.013	4.0		
	16	RoHS		1.19~2.21	1200 (at 200MHz)	0.011	3.0		
CM08RA	17	RoHS		15.0 min.	2000 (at 80MHz)	0.040	2.4		
	20	RoHS		6.0 min.	500 (at 200MHz)	0.020	5.5		
CM12RA	02	RoHS		10.0 min.	2000 (at 80MHz)	0.040	3.0		
CM05RB	01	RoHS		7.0 min.	700 (at 70MHz)	0.050	2.0		
	03	RoHS		15.0 min.	1400 (at 100MHz)	0.060	1.5		
CM08RB	01	RoHS		40.0 min.	2500 (at 30MHz)	0.040	2.0		
	02	RoHS		15.0 min.	2000 (at 50MHz)	0.040	2.4		
	04	RoHS	110.0 min.	2000 (at 70MHz)	0.040	3.0			
	05	RoHS	6.0 min.	450 (at 100MHz)	0.020	4.0			
	03	RoHS	4	15.0 min.	1000 (at 50MHz)	0.050	2.0		

ELECTRICAL CHARACTERISTICS



Measuring conditions
 Equipment : HP4291A, HP4294A Vosc : 0.5V (CM/BU type)(TLF type)



To impedance analyzer

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COMMON MODE CHOKE COILS (FOR AC LINES) LEADED TYPE



WAVE

FEATURES

- TLH10UAH TYPE : Thin configuration (Hybrid choke, Height 10mmMAX)
- TLH10UA(B) TYPE : Ordinary configuration (Hybrid choke)
- TLF10UAH TYPE : Thin configuration (Height 10mmMAX)
- TLF9UA(H) K1 TYPE : Small-sized configuration
- TLF14CB(H) K1 TYPE : Ordinary configuration
- TLF24HB(H) K1 TYPE : Large current capacity for power supply line use

APPLICATIONS

- As a preventive measure against noise terminal voltage or power supply noise in TV's SW power supplies, NC machines, computer systems, peripheral units, measuring instruments, and controllers.

OPERATING TEMP.

-25°C ~ +105°C (Including self-generated heat)

ORDERING CODE

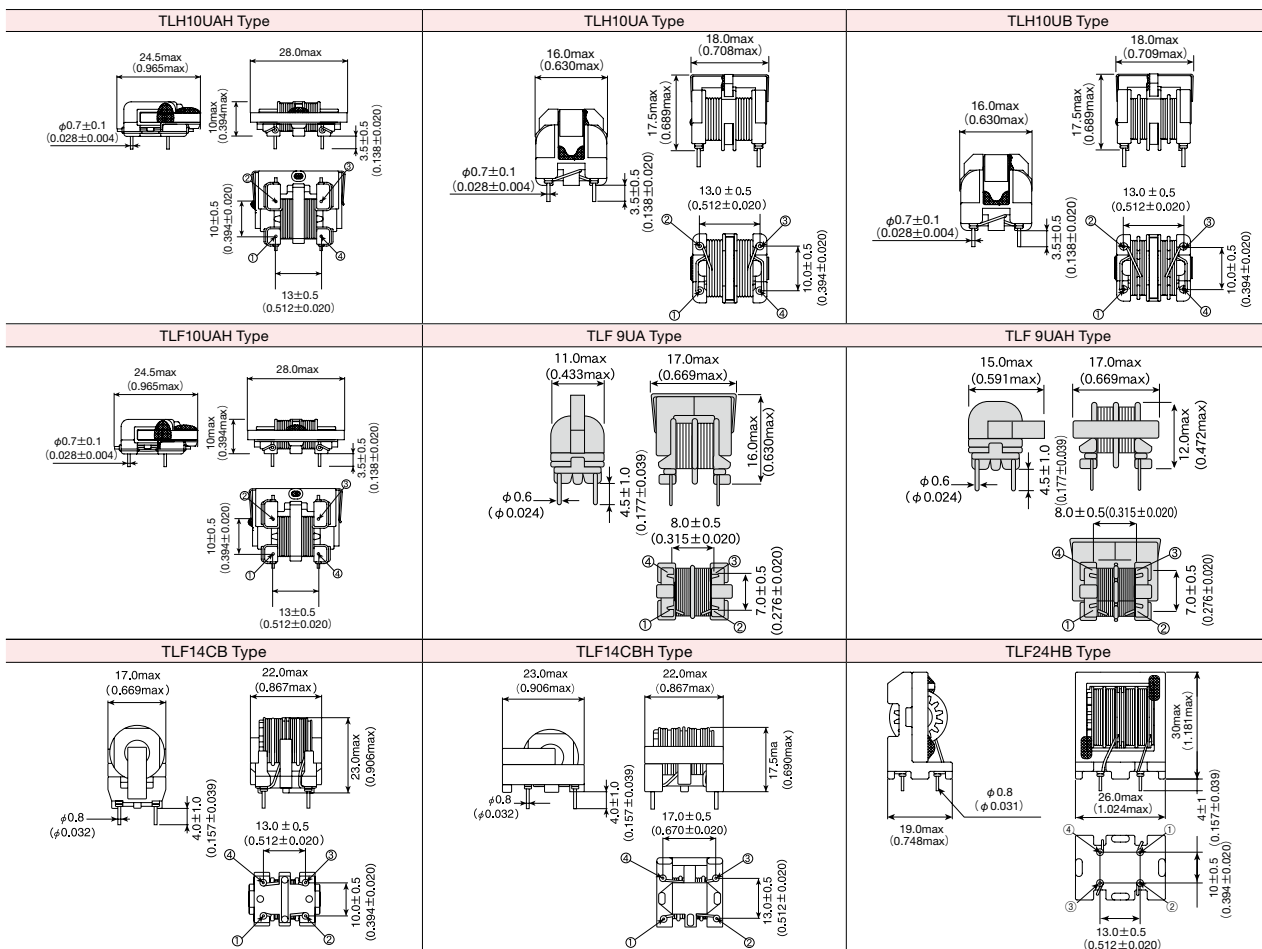
T L F 1 4 C B △ 1 0 3 △ 0 R 7 K 1

1 Type		3 Shape		4 Nominal Inductance (μH)		5 Inductance tolerance (%)		6 Rated current (A)		7 Internal code	
TLF	Common mode choke	UA△	U core, vertical type	102	1000	△	Nominal Values or higher	R54	0.54	K1	Adhesive fixation
TLH	Hybrid choke	UAH	U core, horizontal type	103	10000	W	+100/-10	0R8	0.8		
		UB△	U core, vertically split wound			△=Blank space		※R=decimal point			
		CB△	Square type core vertically split wound								
		CBH	Square type core horizontally split wound								
		HB△	Double-square type core vertically split wound								
		HBH	Double-square type core horizontally split wound								

△=Blank space

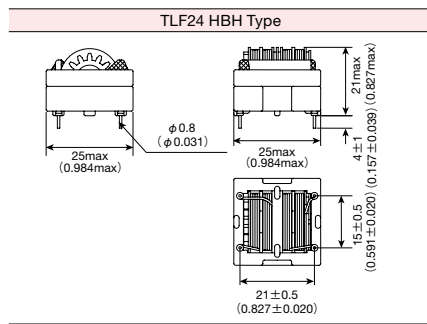
2 Core dimensions (mm)	
△9	9
10	10
14	14
24	24

EXTERNAL DIMENSIONS/MINIMUM QUANTITY



Unit : mm (inch)

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Unit : mm (inch)

Type	Minimum Quantity (pcs.) Box
TLH Type	500
TLF Type	

PART NUMBERS

TLH10UAH Type (Hybrid choke)

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	Normal Mode Inductance [mH] (Typ.)	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLH10UAH872 0R7	RoHS	8.7	min.	0.70	1.00	0.7	AC250	0.1~10
TLH10UAH992 0R6	RoHS	9.9		0.85	1.35	0.6		
TLH10UAH123 0R5	RoHS	12.0		1.06	1.60	0.5		

TLH10UA Type (Hybrid choke)

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	Normal Mode Inductance [mH] (Typ.)	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLH10UA 901 2R0	RoHS	0.9	min.	0.067	0.089	2.0	AC250	0.1~10
TLH10UA 112 1R8	RoHS	1.1		0.087	0.126	1.8		
TLH10UA 152 1R6	RoHS	1.5		0.126	0.171	1.6		
TLH10UA 212 1R4	RoHS	2.1		0.175	0.222	1.4		
TLH10UA 282 1R2	RoHS	2.8		0.215	0.272	1.2		
TLH10UA 432 1R0	RoHS	4.3		0.330	0.398	1.0		
TLH10UA 622 0R8	RoHS	6.2		0.430	0.578	0.8		
TLH10UA 872 0R7	RoHS	8.7		0.644	0.878	0.7		
TLH10UA 992 0R6	RoHS	9.9		0.836	1.138	0.6		
TLH10UA 143 0R5	RoHS	14.0		1.256	1.567	0.5		

TLH10UB Type (Hybrid choke)

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	Normal Mode Inductance [mH] (Typ.)	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLH10UB 701 2R0	RoHS	0.7	min.	0.056	0.097	2.0	AC250	0.1~10
TLH10UB 112 1R7	RoHS	1.1		0.068	0.133	1.7		
TLH10UB 142 1R4	RoHS	1.4		0.113	0.214	1.4		
TLH10UB 232 1R2	RoHS	2.3		0.160	0.274	1.2		
TLH10UB 352 1R0	RoHS	3.5		0.232	0.422	1.0		
TLH10UB 442 0R8	RoHS	4.4		0.328	0.576	0.8		
TLH10UB 872 0R7	RoHS	8.7		0.580	0.982	0.7		
TLH10UB 972 0R6	RoHS	9.7		0.735	1.314	0.6		
TLH10UB 113 0R5	RoHS	11.0		0.877	1.577	0.5		

TLF10UAH Type

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLF10UAH872 0R7	RoHS	8.7	min.	1.00	0.7	AC250	0.1~10
TLF10UAH992 0R6	RoHS	9.9		1.35	0.6		
TLF10UAH123 0R5	RoHS	12.0		1.60	0.5		

TLF 9UA Type

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLF 9UA 102W0R8K1	RoHS	1.0	+100%/-10%	0.5	0.80	AC250	0.1~10
TLF 9UA 202WR54K1	RoHS	2.0		1.0	0.54		
TLF 9UA 302WR42K1	RoHS	3.0		1.5	0.42		
TLF 9UA 502WR32K1	RoHS	5.0		2.5	0.32		
TLF 9UA 802WR25K1	RoHS	8.0		4.0	0.25		
TLF 9UA 103WR23K1	RoHS	10.0		4.5	0.23		

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PART NUMBERS

● TLF 9UAH Type

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLF 9UAH102W0R8K1	RoHS	1.0	+100%/−10%	0.5	0.80	AC250	0.1~10
TLF 9UAH202WR54K1	RoHS	2.0		1.0	0.54		
TLF 9UAH302WR42K1	RoHS	3.0		1.5	0.42		
TLF 9UAH502WR32K1	RoHS	5.0		2.5	0.32		
TLF 9UAH802WR25K1	RoHS	8.0		4.0	0.25		
TLF 9UAH103WR23K1	RoHS	10.0		4.5	0.23		

● TLF14CB Type

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLF14CB 102 1R5K1	RoHS	1.0	min.	0.10	1.5	AC250	0.1~10
TLF14CB 222 1R2K1	RoHS	2.2		0.18	1.2		
TLF14CB 332 1R0K1	RoHS	3.3		0.32	1.0		
TLF14CB 472 1R0K1	RoHS	4.7		0.38	1.0		
TLF14CB 562 0R8K1	RoHS	5.6		0.42	0.8		
TLF14CB 682 0R8K1	RoHS	6.8		0.60	0.8		
TLF14CB 103 0R7K1	RoHS	10.0		0.85	0.7		
TLF14CB 223 0R4K1	RoHS	22.0		1.7	0.4		
TLF14CB 333 0R3K1	RoHS	33.0		2.7	0.3		
TLF14CB 473 0R2K1	RoHS	47.0		3.6	0.2		
TLF14CB 563 0R2K1	RoHS	56.0		5.0	0.2		
TLF14CB 683 0R2K1	RoHS	68.0		6.5	0.2		

● TLF14CBH Type

Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLF14CBH102 1R5K1	RoHS	1.0	min.	0.10	1.5	AC250	0.1~10
TLF14CBH222 1R2K1	RoHS	2.2		0.18	1.2		
TLF14CBH332 1R0K1	RoHS	3.3		0.32	1.0		
TLF14CBH472 1R0K1	RoHS	4.7		0.38	1.0		
TLF14CBH562 0R8K1	RoHS	5.6		0.42	0.8		
TLF14CBH682 0R8K1	RoHS	6.8		0.60	0.8		
TLF14CBH103 0R7K1	RoHS	10.0		0.85	0.7		
TLF14CBH223 0R4K1	RoHS	22.0		1.7	0.4		
TLF14CBH333 0R3K1	RoHS	33.0		2.7	0.3		
TLF14CBH473 0R2K1	RoHS	47.0		3.6	0.2		
TLF14CBH563 0R2K1	RoHS	56.0		5.0	0.2		
TLF14CBH683 0R2K1	RoHS	68.0		6.5	0.2		

● TLF24HB Type

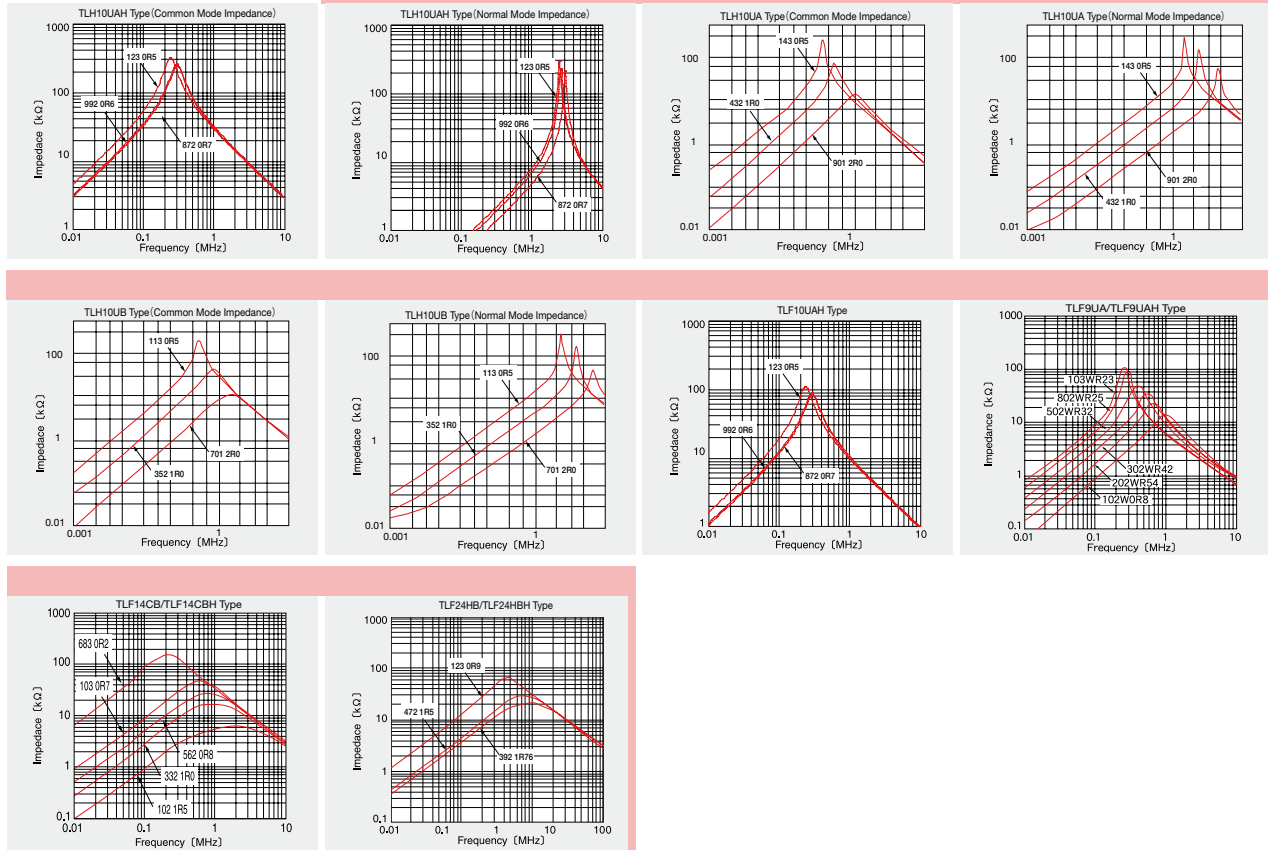
Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLF24HB 122 3R0K1	RoHS	1.2	min.	0.045	3.0	AC250	0.1~10
TLF24HB 222 2R2K1	RoHS	2.2		0.080	2.2		
TLF24HB 272 2R0K1	RoHS	2.7		0.090	2.0		
TLF24HB 332 1R8K1	RoHS	3.3		0.120	1.8		
TLF24HB 392 1R5K1	RoHS	3.9		0.130	1.5		
TLF24HB 562 1R4K1	RoHS	5.6		0.187	1.4		
TLF24HB 682 1R2K1	RoHS	6.8		0.254	1.2		
TLF24HB 822 1R0K1	RoHS	8.2		0.275	1.0		
TLF24HB 103 1R0K1	RoHS	10.0		0.345	1.0		
TLF24HB 123 0R9K1	RoHS	12.0		0.350	0.9		
TLF24HB 183 0R8K1	RoHS	18.0		0.550	0.8		
TLF24HB 273 0R6K1	RoHS	27.0		0.880	0.6		
TLF24HB 333 0R5K1	RoHS	33.0		1.150	0.5		

● TLF24HBH Type

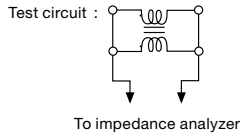
Ordering code	EHS	Common Mode Inductance [mH]	Inductance Tolerance	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Rated voltage [V] (max.)	Applicable frequency [MHz] Reference
TLF24HBH122 3R0K1	RoHS	1.2	min.	0.045	3.0	AC250	0.1~10
TLF24HBH222 2R2K1	RoHS	2.2		0.080	2.2		
TLF24HBH272 2R0K1	RoHS	2.7		0.090	2.0		
TLF24HBH332 1R8K1	RoHS	3.3		0.120	1.8		
TLF24HBH392 1R5K1	RoHS	3.9		0.130	1.5		
TLF24HBH562 1R4K1	RoHS	5.6		0.187	1.4		
TLF24HBH682 1R2K1	RoHS	6.8		0.254	1.2		
TLF24HBH822 1R0K1	RoHS	8.2		0.275	1.0		
TLF24HBH103 1R0K1	RoHS	10.0		0.345	1.0		
TLF24HBH123 0R9K1	RoHS	12.0		0.350	0.9		
TLF24HBH183 0R8K1	RoHS	18.0		0.550	0.8		
TLF24HBH273 0R6K1	RoHS	27.0		0.880	0.6		
TLF24HBH333 0R5K1	RoHS	33.0		1.150	0.5		

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Impedance-Frequency characteristic



Test conditions
Equipment : HP-4294A



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PACKAGING

Minimum Quantity

● CM/BU Type

Type	Minimum Quantity (pcs.)	
	Box	Bulk
CM05RA06	—	500
CM05RB□□	1000	—
CM08RA□□	—	250
CM08RB□□	500	—
CM12RA02	—	100
BU08RA□□	—	200

● TL Type

Type	Minimum Quantity (pcs.) Box
TLH10UAH	500
TLH10UA	
TLH10UB	
TLF10UAH	
TLF9UA□	
TLF9UB□	
TLF14CB□	
TLF24HB□	

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BALUN TRANSFORMERS



MB: WAVE MC: REFLOW

FEATURES

- High stability due to pair wire windings
- MC type: pins are molded into the base to create a singular structure
- This item can be custom designed to meet customer requirements

APPLICATIONS

- Impedance transformers
- Distribution transformers

OPERATING TEMP.

- -25°C~105°C (Including self-generated heat)

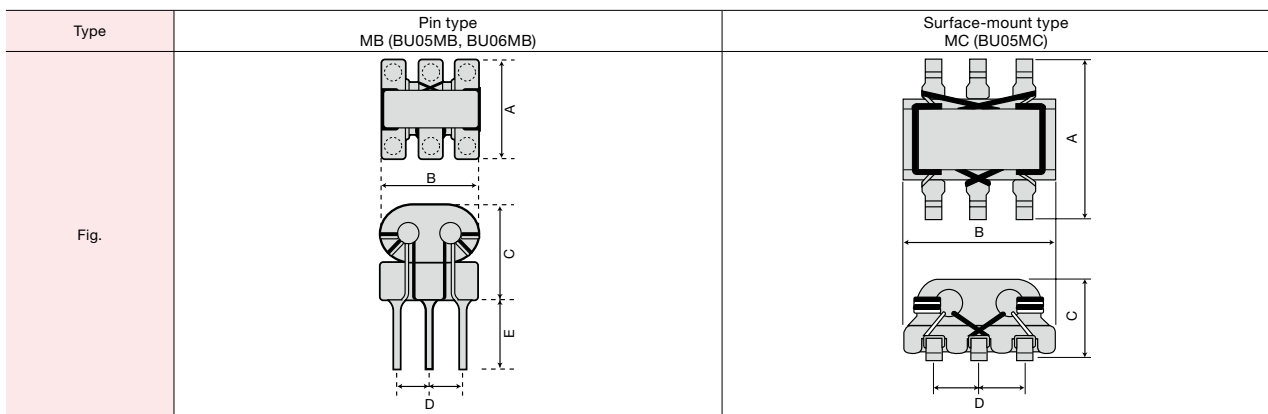
ORDERING CODE

B U 0 5 M B △ 0 1 △ △ ○

1 Type	2 Length of component [mm]	3 Shape	5 Packaging	6 Internal code
BU Balun transformer	05 5.0, 5.3 06 6.0	MB pin type MC Surface-mount type	△T Tape & Reel △△ Bulk (Only pin type) △=Blank space	△ Standard product △=Blank space

4 Product classification code
example △01
△=Blank space

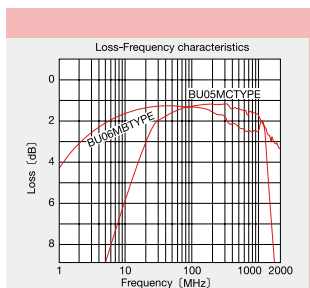
EXTERNAL DIMENSIONS/MINIMUM QUANTITY



Type	A	B	C	D	E	Minimum Quantity (pcs.)		Recommended Land Patterns [BU05MC]
						Box	Taping	
BU05MB	5.5 max. (0.217 max.)	5.5 max. (0.217 max.)	6.0 max. (0.236 max.)	1.75±0.2 (0.069±0.008)	3.5 (0.138)	200	—	
BU06MB	8 max. (0.315 max.)	8 max. (0.315 max.)	8 max. (0.315 max.)	2.25±0.2 pitch (0.089±0.008)	3.5~5.0 (0.138±0.197)	150	—	
BU05MC	5.3±0.5 (0.209±0.020)	5.0±0.3 (0.197±0.012)	2.7±0.2 (0.106±0.008)	1.5±0.2 pitch (0.059±0.008)	—	—	2500	

Unit : mm (inch)

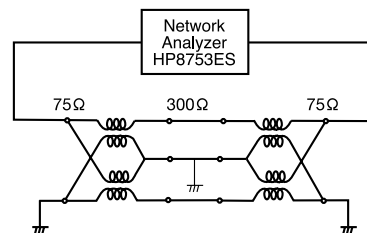
ELECTRICAL CHARACTERISTICS



The following chart shows typical ranges for operating characteristics.

Please specify the following when ordering.

- ① loss
- ② standing wave ratio (VSWR)
- ③ operating frequency
- ④ specified test circuit



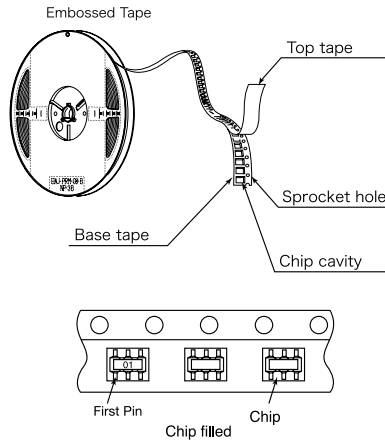
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PACKAGING

① Minimum Quantity

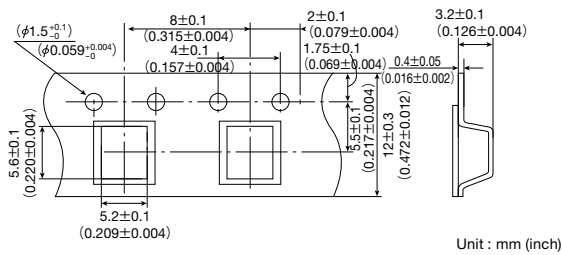
Type	Minimum Quantity (pcs.)	
	Box	Taping
BU05MC	—	2500
BU05MB	200	—
BU06MB	150	—

② Tape material

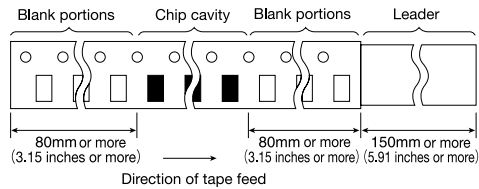


③ Taping dimensions

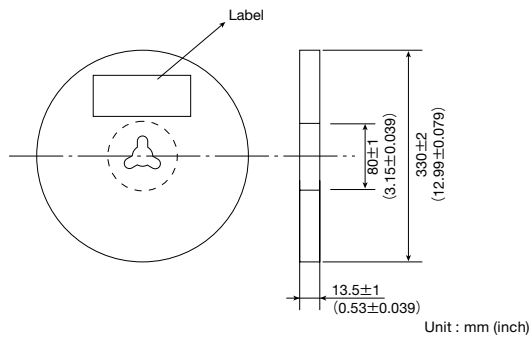
- Embossed tape 12mm wide (0.472 inches wide)



④ Leader and Blank portion

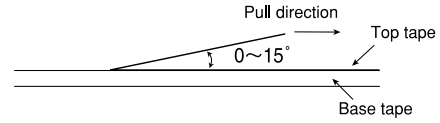


⑤ Reel size



⑥ Top Tape Strength

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



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RELIABILITY DATA

1. Operating Temperature Range

CM01	-40°C~+105°C
CM04RC	
BU05MC	-25°C~+105°C

[Test Method and Remarks]
Including self-generated heat

2. Storage Temperature Range

CM01	
CM04RC	-40°C~+85°C
BU05MC	

[Test Method and Remarks]
-5 to +40°C in taped packaging

3. Rated current

CM01	
CM04RC	Within the specified tolerance.
BU05MC	

[Test Method and Remarks]
The maximum value of DC current within a specified rise of temperature individually.

4. Impedance

CM01	
CM04RC	Within the specified tolerance.
BU05MC	

[Test Method and Remarks]
Measuring equipment : HP 4291A or its equivalent
Measuring frequency : Specified frequency

5. DC Resisittance

CM01	
CM04RC	Within the specified tolerance.
BU05MC	

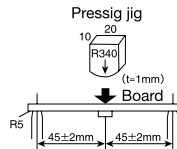
[Test Method and Remarks]
SMD transformer · Common mode choke coil :
Measuring equipment : DC ohm meter

6. Resistance to flexure of substrate

CM01	Within the specified tolerance.
CM04RC	
BU05MC	Refer to the individual specification.

[Test Method and Remarks]
According to JIS C 0051

	CM01	CM04RC · BU05MC
Warp	2mm	3mm
Pressing speed	0.5mm/sec.	
Duration	5±1sec.	



7. Dielectric resistance : between wires

CM01	
CM04RC	100MΩ min.
BU05MC	

[Test Method and Remarks]
Applied voltage : Rated voltage
Duration : 60 sec.

8. Rated voltage

CM01	
CM04RC	Within the specification.
BU05MC	

9. Withstanding voltage : between wires

CM01	
CM04RC	No abnormality.
BU05MC	

[Test Method and Remarks]
Applied voltage : Regulation voltage, DC250V(CM04RC), DC125V(BU05MC)
Duration : 60 sec.

10. Resistance to vibration

CM01	No abnormality observed in appearance
CM04RC	
BU05MC	Refer to the individual specification.

[Test Method and Remarks]
According to JIS C 0040
Directions : 2 hrs each in X, Y, and Z directions. Total : 6 hrs
Frequency range : 10 to 55 to 10 Hz (1 min.)
Amplitude : 1.5mm (Shall not exceed acceleration 196m/s²)
Mounting method : soldering onto printed board
Recovery : At least 2 hrs of recovery under the standard condition after the test, followed by the measurement within 48 hrs.

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RELIABILITY DATA

11. Solderability			
CM01	At least 90% of terminal electrode is covered by new solder.		
CM04RC			
BU05MC	At least 75% of terminal electrode is covered by new solder.		
[Test Method and Remarks]			
	CM01	CM04RC · BU05MC	
Solder temperature	245±5°C	235±5°C	
Duration	3±1sec.	2±0.5sec.	
Immersion depth	—	Up to 0.5mm from terminal root	

12. Resistance to solder Heat			
CM01	Within the specified tolerance.		
CM04RC			
BU05MC	Refer to the individual specification.		
[Test Method and Remarks]			
	CM01	CM04RC · BU05MC	
Reflow soldering	Preheating	: 150 to 180°C 1 to 2min	
	Peak	: 255±5°C 5sec. 230±5°C 30~40sec.	
	Number of reflow	: Within 2 times	
Manual soldering		—	
		Solder temperature : 350±5°C Duration : 3±1sec. Recovery : 1 to 2hrs of recovery under the standard condition after the test.	

13. Thermal shock			
CM01	Within the specified tolerance.		
CM04RC			
BU05MC	Refer to the individual specification.		
[Test Method and Remarks]			
Accoding to JIS C 0025			
Conditions of 1 cycle			
Step	Temperature (°C)		Time (min)
	CM01	CM04RC · BU05MC	CM01
1	-40±3°C	-25±3°C	30±3
2	Room Temp.	Room Temp.	3
3	85±2°C	85±3°C	30±3
4	Room Temp.	Room Temp.	3
Number of cycle : CM01 : 100 cycle CM04RC · BU05MC : 10 cycle			
Recovery : Recovery under the standard condition after removal from test chamber.			
CM01 : Should be measured within 2 to 48hours.			
CM04RC · BU05MC : Leave within 1 to 2 hours.			

14. Loading under damp heat			
CM01	Within the specified tolerance.		
CM04RC			
BU05MC	Refer to the individual specification.		
[Test Method and Remarks]			
	CM01	CM04RC · BU05MC	
Temperature	60±2°C	40±3°C	
Humidity	90~95%RH		
Applied current	Rated current		
Duration	1000±24hrs		
Recovery : Recovery under the standard condition after removal from test chamber.			
CM01 : Should be measured within 2 to 48hours.			
CM04RC · BU05MC : Leave within 1 to 2 hours.			

15. High temperature life test			
CM01	—		
CM04RC			
BU05MC	Refer to the individual specification.		
[Test Method and Remarks]			
	CM04RC · BU05MC		
Temperature	85±3°C		
Duration	1000±24hrs		
Recovery : Recovery under the standard condition after removal from test chamber.			
CM01 : Should be measured within 2 to 48hours.			
CM04RC · BU05MC : Leave within 1 to 2 hours.			

16. Low Temperature life Test			
CM01	Within the specified tolerance.		
CM04RC			
BU05MC	Refer to the individual specification.		
[Test Method and Remarks]			
	CM01	CM04RC · BU05MC	
Temperature	-40±2°C	-40±3°C	
Applied current	1000±24hrs		
Recovery : Recovery under the standard condition after removal from test chamber.			
CM01 : Should be measured within 2 to 48hours.			
CM04RC · BU05MC : Leave within 1 to 2 hours.			

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RELIABILITY DATA

17. Loading at high temperature life test

CM01	Within the specified tolerance.
CM04RC	
BU05MC	-

[Test Method and Remarks]

	CM01
Temperature	105±2°C
Applied current	Rated current
Duration	1000±24hrs

Recovery : Recovery under the standard condition after removal from test chamber.

CM01 : Should be measured within 2 to 48hours.

CM04RC・BU05MC : Leave within 1 to 2 hours.

Note on standard condition :

"standard condition" referred to herein is defined as follows:

5 to 35°C 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°C of temperature, 45 to 85% relative humidity and 86 to 106kPa of air pressure.

Unless otherwise specified, all the tests are conducted under the "standard condition."

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PRECAUTIONS

CM04RC, BU05MC, CM01

1. Circuit Design	
Precautions	<ul style="list-style-type: none"> ◆ Operating environment <ol style="list-style-type: none"> 1. The products described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.
2. PCB Design	
Precautions	<ul style="list-style-type: none"> ◆ Land pattern design <ol style="list-style-type: none"> 1. Please contact any of our offices for a land pattern, and refer to a recommended land pattern of specifications.
Technical considerations	<ul style="list-style-type: none"> ◆ Land pattern design Surface Mounting <ul style="list-style-type: none"> · Mounting and soldering conditions should be checked beforehand. · Applicable soldering process to these products is reflow soldering only. · Recommended Land Patterns <p style="text-align: right;">Unit: mm</p>
3. Considerations for automatic placement	
Precautions	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. Excessive impact load should not be imposed on the products when mounting onto the PC boards. 2. Mounting and soldering conditions should be checked beforehand.
Technical considerations	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.
4. Soldering	
Precautions	<ul style="list-style-type: none"> ◆ Reflow soldering <ol style="list-style-type: none"> 1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified. 2. This product can be used reflow soldering only. 3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering. ◆ Lead free soldering <ol style="list-style-type: none"> 1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently. ◆ Recommended conditions for using a soldering iron <ul style="list-style-type: none"> [CM04RC, BU05MC] <ul style="list-style-type: none"> · Put the soldering iron on the land-pattern. · Soldering iron's temperature - Below 350°C · Duration - 3 seconds or less · The soldering iron should not directly touch the inductor. [CM01] <ul style="list-style-type: none"> · Please do not conduct an adjustment with a soldering iron because the wire would be broken due to its thinness.
Technical considerations	<ul style="list-style-type: none"> ◆ Reflow soldering <ol style="list-style-type: none"> 1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products.
5. Cleaning	
Precautions	<ul style="list-style-type: none"> ◆ Cleaning conditions <ol style="list-style-type: none"> 1. Please contact any of our offices for a cleaning.
6. Handling	
Precautions	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. Keep the product away from all magnets and magnetic objects. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. When splitting the PC board after mounting product, care should be taken 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. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. Please do not give the product any excessive mechanical shocks. 2. Please do not add any shock and power to a product in transportation. ◆ Pick-up pressure <ol style="list-style-type: none"> 1. Please do not push to add any pressure to a winding part. Please do not give any shock and push onto an exposed part of ferrite cores. ◆ Packing <ol style="list-style-type: none"> 1. Please avoid accumulation of a packing box as much as possible.
Technical considerations	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with magnetic influence. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. There is a case to be damaged by a mechanical shock. 2. There is a case to be broken by the handling in transportation. ◆ Pick-up pressure <ol style="list-style-type: none"> 1. An excessive shock or stress may cause a damage to the product or a deterioration of a characteristic. ◆ Packing <ol style="list-style-type: none"> 1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.
7. Storage conditions	
Precautions	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> · Recommended conditions <ul style="list-style-type: none"> Ambient temperature : 0~40°C, Humidity : Below 70% RH <p>The ambient temperature must be kept below 30°C. Even under ideal storage conditions, the solderability of electrodes may decrease gradually. For this reason, the products should be used within one year from the time of delivery. In case of storage over 6 months, solderability shall be checked before actual usage.</p>
Technical considerations	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. Under 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.

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RELIABILITY DATA

1. Operating Temperature Range

CM-RA/BU-RA Type	-25~+105°C
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

Including temperature rise due to self-generated heat.

2. Storage temperature range

CM-RA/BU-RA Type	-40~+85°C
CM-RB Type	
TLH, TLF Type	

3. Rated current

CM-RA/BU-RA Type	Within the specified range
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

CM: The maximum value of DC current within a specified rise of temperature individually.
 TLH10U, TLF10UAH: The maximum value of AC current within the temperature rise of 60°C
 TLF9UA, 14CB: The maximum value of AC current within the temperature rise of 45°C
 TLF9UB: The maximum value of DC current within the temperature rise of 45°C

4. Inductance

CM-RA/BU-RA Type	Within the specified tolerance
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

CM:

Measuring equipment : 4263A (HP) or its equivalent
 Measuring frequency : 1kHz

TLF9U :

Measuring equipment : Impedance analyzer (HP4192A) or its equivalent
 Measuring frequency : 1kHz
 Measuring voltage : 0.35Vosc

TLH, TLF (except TLF9U) :

Measuring equipment : LCR meter 4284A or its equivalent
 Measuring frequency : 1kHz
 Measuring voltage : 1.0V

5. DC resistance

CM-RA/BU-RA Type	Within the specified tolerance
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

CM, TLH, TLF : Measuring equipment : DC ohmmeter

6. Terminal strength tensile force

CM-RA/BU-RA Type	No abnormality
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

CM : Fix the component in the direction to draw terminal and gradually apply tensile force as detailed in individual specifications.

TLF9U : Apply the stated tensile force gradually in the direction to draw terminal.

TLH, TLF (except TLF9U): Apply the stated tensile force gradually in the direction to draw terminal.

Nominal wire diameter tensile φ d [mm]	force [N]	duration [s]
φ 0.6	5	30±5

Nominal wire diameter tensile φ d [mm]	force [N]	duration [s]
φ 0.8	10	30±5

7. Insulation resistance between wires

CM-RA/BU-RA Type	100MΩ min.
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

CM, TLH, TLF : Applied voltage : Rated voltage (CM-RA/BU-RA, CM-RB)
 : 500VDC (TLH, TLF (except TLF9UB))
 : 250VDC (TLF9UB)
 Duration : 60sec.

8. Insulation resistance between wire and core

CM-RA/BU-RA Type	100MΩ min.
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

TLH, TLF : Applied voltage : 500VDC (TLH, TLF (except TLF9UB))
 : 250VDC (TLF9UB)
 Duration : 60 sec.

9. Withstanding : between wires

CM-RA/BU-RA Type	No abnormality
CM-RB Type	
TLH, TLF Type	

[Test method and remarks]

CM, TLH, TLF : Applied voltage : 250VDC (CM-RA/BU-RA, CM-RB)
 : 2000VAC (TLH, TLF (except TLF9UB))
 : 500VDC (TLF9UB)
 Duration : 60sec.

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RELIABILITY DATA

10. Withstanding : between wires and core		
CM-RA/BU-RA Type		
CM-RB Type		
TLH, TLF Type	No abnormality	
[Test method and remarks]		
TLH, TLF	: Applied voltage : 2000VAC (TLH, TLF (except TLF9UB)) : 500VDC (TLF9UB)	
Duration	: 60sec.	
11. Rated voltage		
CM-RA/BU-RA Type		
CM-RB Type	Within the specified range	
TLH, TLF Type		
[Test method and remarks]		
TLH, TLF (except TLF9UB)	: 250VAC	
TLF9UB	: 50VDC	
12. Resistance to vibration		
CM-RA/BU-RA Type		
CM-RB Type	Appearance : No abnormality	Inductance change : Within $\pm 15\%$
TLH, TLF Type	TLF9U : Inductance change : Within $\pm 5\%$	TLH, TLF (except TLF9U) : Within the specified range
[Test method and remarks]		
CM, TLH, TLF	: According to JIS C 0040	
Direction	: 2hrs each in X, Y and Z direction Total : 6hrs	
Frequency range	: 10 to 55 to 10Hz (1 min.)	
Amplitude	: 1.5mm (shall not exceed acceleration 196m/s ²)	
Mounting method	: soldering onto PC board	
Recovery	: 2 to 24 hrs of recovery under the standard condition after the test. (CM-RB) : At least 1hr of recovery under the standard condition after the removal from test chamber, followed by the measurement within 2hrs. (TLH, TLF)	
13. Solderability		
CM-RA/BU-RA Type	At least 75% of terminal electrode is covered by new solder.	
CM-RB Type		
TLH, TLF Type	Solder shall be uniformly adhered onto immersed surfaces.	
[Test method and remarks]		
CM	: Solder temperature : 235 \pm 5 $^{\circ}$ C Duration : 2 \pm 0.5sec. Immersion depth : According to detailed specification.	
TLH, TLF	: Solder temperature : 245 \pm 5 $^{\circ}$ C Duration : 4 \pm 1sec. Immersion depth : Up to 1.0 to 1.5mm from PBC mounted level.	
14. Resistance to soldering heat		
CM-RA/BU-RA Type	Appearance : No abnormality Inductance change : Refer to individual specification	
CM-RB Type		
TLH, TLF Type	TLF9UA : Inductance change : Within $\pm 5\%$	TLF14CB : Within the specified range
[Test method and remarks]		
CM	: Solder temperature : 260 \pm 5 $^{\circ}$ C Duration : 5 \pm 0.5sec. Immersion depth : Up to 2~2.5mm from terminal root. Recovery : 1 to 2 hrs of recovery under the standard condition after the test.	
TLH, TLF	: Solder temperature : 260 \pm 5 $^{\circ}$ C Duration : 10 \pm 1sec. Immersion depth : Up to 1.0 to 1.5mm from PBC mounted level. Recovery : At least 1hr of recovery under the standard condition after the removal from test chamber, followed by the measurement within 2hrs.	
15. Thermal shock		
CM-RA/BU-RA Type	Appearance : No abnormality Inductance change : Refer to individual specification	
CM-RB Type		
TLH, TLF Type	TLF9UA : Inductance change : Within $\pm 15\%$	TLH, TLF (except TLF9UA) : Withstanding voltage : No abnormality Insulation resistance : No abnormality
[Test method and remarks]		
CM, TLH, TLF	: According to JIS C 0025	
Conditions for 1 cycle		
Step	Temperature ($^{\circ}$ C)	Duration (min)
1	-25 \pm 3	30 \pm 3
2	Room Temperature	Within 3
3	+85 \pm 2	30 \pm 3
4	Room Temperature	Within 3
Number of cycles	: 10	
Recovery	: At least 1hr of recovery under the standard condition after the removal from test chamber, followed by the measurement within 2 hrs.	
16. Damp heat		
CM-RA/BU-RA Type		
CM-RB Type		
TLH, TLF Type	TLF9UA : Inductance change : Within $\pm 15\%$	TLH, TLF (except TLF9UA) : Withstanding voltage : No abnormality Insulation resistance : No abnormality
[Test method and remarks]		
TLH, TLF	: Temperature : 60 \pm 2 $^{\circ}$ C 40 \pm 2 $^{\circ}$ C (※TLF14CB)	
Humidity	: 90~95%RH	
Duration	: 500 hrs	
Recovery	: At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.	

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RELIABILITY DATA

17. Loading under damp heat					
CM-RA/BU-RA Type	Appearance : No abnormality Inductance change : Refer to individual specification				
CM-RB Type					
TLH, TLF Type	Withstanding voltage : No abnormality Insulation resistance : No abnormality				
[Test method and remarks]					
CM	: Temperature : 40±2°C : Humidity : 90~95%RH : Duration : 500 (+12, -0) hrs : Applied current : Rated current : Recovery : 1 to 2hrs of recovery under the standard condition after the removal from test chamber.				
TLH, TLF	: Temperature : 60±2°C : 40±2°C (※TLF14CB) : Humidity : 90~95%RH : Duration : 100 hrs : 500 hrs Apply rated current across windings (※TLF14CB) : Applied voltage : Apply the following specified voltage between windings. <table border="1" style="margin-left: 20px;"> <tr> <td>TLF9UA</td> <td>250VAC</td> </tr> <tr> <td>TLF9UB</td> <td>50VDC</td> </tr> </table> : Recovery : At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.	TLF9UA	250VAC	TLF9UB	50VDC
TLF9UA	250VAC				
TLF9UB	50VDC				
18. Low temperature life test					
CM-RA/BU-RA Type	Appearance : No abnormality Inductance change : Refer to individual specification				
CM-RB Type					
TLH, TLF Type	TLF9U : Inductance change : Within ±15% TLH, TLF (except TLF9U) : Withstanding voltage : No abnormality Insulation resistance : No abnormality				
[Test method and remarks]					
CM	: Temperature : -40±3°C : Duration : 500 (+12, -0) hrs : Recovery : 1 to 2hrs of recovery under the standard condition after the removal from test chamber. (CM-RA) : 1 to 2hrs of recovery under the standard condition after the removal from test chamber. (CM-RB)				
TLH, TLF	: Temperature : -25±2°C : -40±2°C (※TLF14CB) : Duration : 500 hrs : Recovery : At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.				
19. High Temperature life test					
CM-RA/BU-RA Type	Appearance : No abnormality Inductance change : Refer to individual specification				
CM-RB Type					
TLH, TLF Type	TLF9U : Inductance change : Within ±15% TLH, TLF (except TLF9U) : Withstanding voltage : No abnormality Insulation resistance : No abnormality				
[Test method and remarks]					
CM	: Temperature : 85±2°C : Duration : 500 (+12, -0) hrs : Recovery : 1 to 2hrs of recovery under the standard condition after the removal from test chamber. (CM-RA) : 1 to 2hrs of recovery under the standard condition after the removal from test chamber. (CM-RB)				
TLH, TLF	: Temperature : 85±2°C : 105±3°C (※TLF14CB) : Duration : 500 hrs : Recovery : At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.				

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PRECAUTIONS

CM-RA Type, CM-RB Type, TLH, TLF Type

1. Circuit Design	
Precautions	<ul style="list-style-type: none">◆ Operating environment1. The products described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.
2. PCB Design	
Precautions	<ul style="list-style-type: none">◆ Design1. Please design insertion pitches as matching to that of leads of the component on PCBs.
Technical considerations	<ul style="list-style-type: none">◆ Design1. When Inductors are mounted onto a PC board, hole dimensions on the board should match the lead pitch of the component, if not, it will cause breakage of the terminals or cracking of terminal roots covered with resin as excess stress travels through the terminal legs.
3. Soldering	
Precautions	<ul style="list-style-type: none">◆ Wave soldering1. Please refer to the specifications in the catalog for a wave soldering.2. Do not immerse the entire inductor in the flux during the soldering operation.◆ Lead free soldering1. When using products with lead free soldering, we request to use them after confirming of adhesion, temperature of resistance to soldering heat, etc. sufficiently.◆ Recommended conditions for using a soldering iron<ul style="list-style-type: none">• Put the soldering iron on the land-pattern.• Soldering iron's temperature - Below 350°C• Duration - 3 seconds or less• The soldering iron should not directly touch the product.
Technical considerations	<ul style="list-style-type: none">◆ Lead free soldering1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products.
4. Cleaning	
Precautions	<ul style="list-style-type: none">◆ Cleaning conditions1. TLF typePlease contact any of our offices for about a cleaning.
5. Handling	
Precautions	<ul style="list-style-type: none">◆ Handling1. Keep the product away from all magnets and magnetic objects.◆ Mechanical considerations1. Please do not give the product any excessive mechanical shocks.2. TLF typePlease do not add any shock or power to a product in transportation.◆ Packing1. Please do not give the product any excessive mechanical shocks.In loading, please pay attention to handling indication mentioned in a packing box (a loading direction / number of maximum loading / fragile item).
Technical considerations	<ul style="list-style-type: none">◆ Handling1. There is a case that a characteristic varies with magnetic influence.◆ Mechanical considerations1. There is a case to be damaged by a mechanical shock.2. TLF typeThere is a case to be broken by a fall.◆ Packing1. There is a case that a lead route turns at by a fall or an excessive shock.
6. Storage conditions	
Precautions	<ul style="list-style-type: none">◆ Storage1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled.<ul style="list-style-type: none">• Recommended conditionsAmbient temperature : 0~40°CHumidity : Below 70% RHThe ambient temperature must be kept below 30°C. Even under ideal storage conditions, the solderability of electrodes decreases gradually, so the products should be mounted within one year from the time of delivery.In case of storage over 6 months, solderability shall be checked before actual usage.
Technical considerations	<ul style="list-style-type: none">◆ Storage1. Under 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.

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