Notice for TAIYO YUDEN products

Please read this notice before using the TAIYO YUDEN products.

REMINDERS

Product Information in this Catalog

Product information in this catalog is as of October 2019. All of the contents specified herein and production status of the products listed in this catalog are subject to change without notice due to technical improvement of our products, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual product specification sheets.

Approval of Product Specifications

Please contact TAIYO YUDEN for further details of product specifications as the individual product specification sheets are available. When using our products, please be sure to approve our product specifications or make a written agreement on the product specification with TAIYO YUDEN in advance.

Pre-Evaluation in the Actual Equipment and Conditions

Please conduct validation and verification of our products in actual conditions of mounting and operating environment before using our products.

Limited Application

1. Equipment Intended for Use

The products listed in this catalog are intended for generalpurpose and standard use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and other equipment specified in this catalog or the individual product specification sheets.

TAIYO YUDEN has the line-up of the products intended for use in automotive electronic equipment, telecommunications infrastructure and industrial equipment, or medical devices classified as GHTF Classes A to C (Japan Classes I to III). Therefore, when using our products for these equipment, please check available applications specified in this catalog or the individual product specification sheets and use the corresponding products.

2. Equipment Requiring Inquiry

Please be sure to contact TAIYO YUDEN for further information before using the products listed in this catalog for the following equipment (excluding intended equipment as specified in this catalog or the individual product specification sheets) which may cause loss of human life, bodily injury, serious property damage and/or serious public impact due to a failure or defect of the products and/or malfunction attributed thereto.

- (1) Transportation equipment (automotive powertrain control system, train control system, and ship control system, etc.)
- (2) Traffic signal equipment
- (3) Disaster prevention equipment, crime prevention equipment
- (4) Medical devices classified as GHTF Class C (Japan Class III)
- (5) Highly public information network equipment, dataprocessing equipment (telephone exchange, and base station, etc.)
- (6) Any other equipment requiring high levels of quality and/or reliability equal to the equipment listed above

3. Equipment Prohibited for Use

Please do not incorporate our products into the following equipment requiring extremely high levels of safety and/or reliability.

- (1) Aerospace equipment (artificial satellite, rocket, etc.)
- (2) Aviation equipment *1
- (3) Medical devices classified as GHTF Class D (Japan Class IV), implantable medical devices *²

- (4) Power generation control equipment (nuclear power, hydroelectric power, thermal power plant control system, etc.)
- (5) Undersea equipment (submarine repeating equipment, underwater work equipment, etc.)
 (2) time
- (6) Military equipment
- (7) Any other equipment requiring extremely high levels of safety and/or reliability equal to the equipment listed above

*Notes:

- There is a possibility that our products can be used only for aviation equipment that does not directly affect the safe operation of aircraft (e.g., in-flight entertainment, cabin light, electric seat, cooking equipment) if such use meets requirements specified separately by TAIYO YUDEN. Please be sure to contact TAIYO YUDEN for further information before using our products for such aviation equipment.
- Implantable medical devices contain not only internal unit which is implanted in a body, but also external unit which is connected to the internal unit.

4. Limitation of Liability

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment that is not intended for use by TAIYO YUDEN, or any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

Safety Design

When using our products for high safety and/or reliability-required equipment or circuits, please fully perform safety and/or reliability evaluation. In addition, please install (i) systems equipped with a protection circuit and a protection device and/or (ii) systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault for a failsafe design to ensure safety.

Intellectual Property Rights

Information contained in this catalog is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.

Limited Warranty

Please note that the scope of warranty for our products is limited to the delivered our products themselves and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a failure or defect in our products. Notwithstanding the foregoing, if there is a written agreement (e.g., supply and purchase agreement, quality assurance agreement) signed by TAIYO YUDEN and your company, TAIYO YUDEN will warrant our products in accordance with such agreement.

TAIYO YUDEN's Official Sales Channel

The contents of this catalog are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter "TAIYO YUDEN's official sales channel"). Please note that the contents of this catalog are not applicable to our products purchased from any seller other than TAIYO YUDEN's official sales channel.

Caution for Export

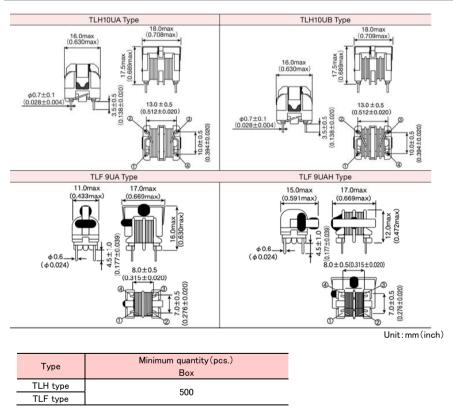
Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

LEADED COMMON MODE CHOKE COILS FOR AC LINES



	BER	*Operating Tem	np. : -25~+105°C (Including self-generated heat)
T L F	△ 9 U A △ 1 0 2 W 0 ② ③ ④ ④ ⑤	R 8 K 1 6 7	$\Delta =$ Blank space
①Series name		④Nominal Induc	ctance
Code	Series name	Code	Nominal Inductance [μ H]
TLF	Common mode choke	(example)	
TLH	Hybrid choke	102	1000
		103	10000
2 Dimensions of	f core		
Code	Dimensions of core[mm]	⑤Inductance to	blerance
∆9	9	Code	Inductance tolerance
10	10	Δ	Nominal Values or higher
		W	+100/-10%
3)Shape			
Code	Shape	6 Rated current	t
UAΔ	U core, vertical type	Code	Rated current[A]
UAH	U core, horizontal type	R54	0.54
UB∆	U core, vertically split wound	0R8	0.8
		%R=Decimal p	point
		⑦Internal code	
		Code	Internal code
		K1	Adhesive fixation

STANDARD EXTERNAL DIMENSIONS / MINIMUM QUANTITY



TLH10UA type (Hybrid choke)

Parts number	EHS	Common mode inductance [mH]	Inductance tolerance	Normal mode inductance [mH] (typ.)	DC Resistance [Ω](max.)	Rated current [A] (max.)	Rated voltage AC [V] (max.)
TLH10UA 901 2R0	RoHS	0.9	min.	0.067	0.089	2.0	250
TLH10UA 112 1R8	RoHS	1.1	min.	0.087	0.126	1.8	250
TLH10UA 152 1R6	RoHS	1.5	min.	0.126	0.171	1.6	250
TLH10UA 212 1R4	RoHS	2.1	min.	0.160	0.222	1.4	250
TLH10UA 282 1R2	RoHS	2.8	min.	0.215	0.272	1.2	250
TLH10UA 432 1R0	RoHS	4.3	min.	0.330	0.398	1.0	250
TLH10UA 622 0R8	RoHS	6.2	min.	0.430	0.578	0.8	250
TLH10UA 872 0R7	RoHS	8.7	min.	0.644	0.878	0.7	250
TLH10UA 992 0R6	RoHS	9.9	min.	0.836	1.138	0.6	250
TLH10UA 143 0R5	RoHS	14	min.	1.256	1.567	0.5	250

TLH10UB type(Hybrid choke)

Parts number	EHS	Common mode inductance [mH]	Inductance tolerance	Normal mode inductance [mH](typ.)	DC Resistance [Ω](max.)	Rated current [A] (max.)	Rated voltage AC [V] (max.)
TLH10UB 701 2R0	RoHS	0.7	min.	0.056	0.097	2.0	250
TLH10UB 112 1R7	RoHS	1.1	min.	0.068	0.133	1.7	250
TLH10UB 142 1R4	RoHS	1.4	min.	0.113	0.214	1.4	250
TLH10UB 232 1R2	RoHS	2.3	min.	0.150	0.274	1.2	250
TLH10UB 352 1R0	RoHS	3.5	min.	0.232	0.422	1.0	250
TLH10UB 442 0R8	RoHS	4.4	min.	0.328	0.624	0.8	250
TLH10UB 872 0R7	RoHS	8.7	min.	0.580	0.982	0.7	250
TLH10UB 972 0R6	RoHS	9.7	min.	0.735	1.314	0.6	250
TLH10UB 113 0R5	RoHS	11	min.	0.877	1.577	0.5	250

TLF 9UA type

Parts number	EHS	Common mode inductance [mH]	Inductance tolerance	DC Resistance [Ω](max.)	Rated current [A] (max.)	Rated voltage AC [V] (max.)
TLF 9UA 102W0R8K1	RoHS	1.0	+100/-10%	0.5	0.80	250
TLF 9UA 202WR54K1	RoHS	2.0	+100/-10%	1.0	0.54	250
TLF 9UA 302WR42K1	RoHS	3.0	+100/-10%	1.5	0.42	250
TLF 9UA 502WR32K1	RoHS	5.0	+100/-10%	2.5	0.32	250
TLF 9UA 802WR25K1	RoHS	8.0	+100/-10%	4.0	0.25	250
TLF 9UA 103WR23K1	RoHS	10	+100/-10%	4.5	0.23	250

TLF 9UAH type

Parts number	EHS	Common mode inductance [mH]	Inductance tolerance	DC Resistance [Ω](max.)	Rated current [A] (max.)	Rated voltage AC [V] (max.)
TLF 9UAH102W0R8K1	RoHS	1.0	+100/-10%	0.5	0.80	250
TLF 9UAH202WR54K1	RoHS	2.0	+100/-10%	1.0	0.54	250
TLF 9UAH302WR42K1	RoHS	3.0	+100/-10%	1.5	0.42	250
TLF 9UAH502WR32K1	RoHS	5.0	+100/-10%	2.5	0.32	250
TLF 9UAH802WR25K1	RoHS	8.0	+100/-10%	4.0	0.25	250
TLF 9UAH103WR23K1	RoHS	10	+100/-10%	4.5	0.23	250

LEADED COMMON MODE CHOKE COILS FOR DC AND SIGNAL LINES LEADED COMMON MODE CHOKE COILS FOR AC LINES

PACKAGING

 $\textcircled{1}{Minimum} \ {\rm Quantity}$

TLH/TLF Type

Tumo	Minimum Quantity[pcs]	
Туре	Box	
TLH10UA	1000	
TLH10UB	1000	
TLF9UA	500	
TLF9UB	500	



LEADED COMMON MODE CHOKE COILS FOR DC AND SIGNAL LINES, LEADED COMMON MODE CHOKE COILS FOR AC LINES

RELIABILITY DATA

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1. Operating Temperature Range			
Specified Value	TLH, TLF Type	$-25 \sim + 105^{\circ}C$	
Test Method and Remarks	Including temperature rise due to self-generated heat.		

2. Storage temperature range			
Specified Value	TLH, TLF Type	−40~+ 85°C	

3. Rated current				
Specified Value	TLH, TLF Type	Within the specified range		
Test Method and Remarks	TLH10U: The maximum value of AC current within the temperature rise of 60°CTLF9UA: The maximum value of AC current within the temperature rise of 45°CTLF9UB: The maximum value of DC current within the temperature rise of 45°C			

4. Inductance			
Specified Value	TLH, TLF Type		Within the specified tolerance
Test Method and Remarks	TLF9U : Measuring equipment Measuring frequency Measuring voltage TLH、TLF (except TLF9U) : Measuring equipment Measuring frequency Measuring voltage	: 1kHz : 1Vrms	84A or its equivalent 84A or its equivalent

5. DC resistance	5. DC resistance			
Specified Value	TLH, TLF Type		Within the specified tolerance	
Test Method and Remarks	Measuring equipment	: DC ohmmeter		

6. Terminal strength tensile force				
Specified Value	TLH, TLF Type		No abnormality	
	TLH10UA, TLH10UB, TLF	9U : Apply the state	ed tensile force gradually in the direction to draw terminal.	
	force [N]	duration [s]		
Test Method and	5	30 ± 5		
Remarks				
Remarks	TLF (except TLF9U): App	ly the stated tensile	force gradually in the direction to draw terminal.	
	force [N]	duration [s]		
	10	30 ± 5		

7. Insulation resista	nce between wires		
Specified Value	TLH, TLF Type		100M Ω min.
Test Method and Remarks	Applied voltage : 500VDC (TLH, TLF (: 250VDC (TLF9UB) Duration : 60sec.		(cept TLF9UB))

▶ 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/).



8. Insulation resistance between wire and core			
Specified Value	TLH, TLF Type		100M Ω min.(except TLH)
Test Method and Remarks	TLF : Applied voltage Duration	: 500VDC (TLF (except : 250VDC (TLF9UB) : 60 sec.	TLF9UB))

9. Withstanding : be	9. Withstanding : between wires			
Specified Value	TLH, TLF Type		No abnormality	
Test Method and Remarks	Applied voltage : 2000VAC (TLH, TLF : 500VDC (TLF9UB) Duration : 60sec		except TLF9UB))	

10. Withstanding : b	10. Withstanding : between wires and core			
Specified Value	TLH, TLF Type		No abnormality(except TLH)	
Test Method and Remarks	TLF : Applied voltage Duration	: 2000VAC (TLF (excep : 500VDC (TLF9UB) : 60sec.	t TLF9UB))	

11. Rated voltage			
Specified Value	TLH, TLF Type		Within the specified range
Test Method and Remarks	TLH, TLF (except TLF9UB) TLF9UB	: 250VAC : 50VDC	

12. Resistance to v	ibration		
Specified Value	TLH, TLF Type		TLF9U : Inductance change : Within $\pm 5\%$ TLH, TLF (except TLF9U) : Appearance is no abnormality and within the specified range
Test Method and Remarks	Frequency range: 10 to 55 to 10HzAmplitude: 1.5mm (shall notMounting method: soldering onto P		xceed acceleration 196m/s²) board condition after the removal from test chamber, followed by the

13. Solderability	-			
Specified Value	TLH, TLF Type		At least 90% of terminal electrode is covered by new solder.	
Test Method and	TLH, TLF : Solder temperature Duration Immersion depth	re : 235±0.5°C : 2±0.5sec. : Up to 1.5 to 2.0mm from PBC mounted level.		
Remarks	TLH, TLF : Solder temperature Duration Immersion depth	: 245±5℃ : 4±1sec. : Up to 1.0 to 1.5mr	n from PBC mounted level.	

14. Resistance to soldering heat

Specified Value	TLH, TLF Type	TLF9UA : Inductance change : Within $\pm 5\%$
Test Method and Remarks	TLH, TLF : Solder temperature Duration Immersion depth Recovery TLH, TLF :	n from PBC mounted level. covery under the standard condition after the removal from test chamber, followed by the .hin 2hrs.
- Condina	Solder temperature Duration Immersion depth Recovery	n from PBC mounted level. covery under the standard condition after the removal from test chamber, followed by the :hin 2hrs.

15. Thermal shock		
Specified Value	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 : According to JIS C60068-2-14. Conditions for 1 cycle -25℃~+85℃, keep each 30min Number of cycles : 10 Recovery : At least 1hr of recov measurement within 2	rery under the standard condition after the removal from test chamber, followed by the 2 hrs.

16. Damp heat	
Specified Value	TLH, TLF Type TLH, TLF (except TLF9UA) : Withstanding voltage : No abnormality Insulation resistance : No abnormality
Test Method and Remarks	TLH, TLF : Temperature : 60±2°C : 40±2°C (※except TLF9U) 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.

17. Loading under d	lamp heat	
Specified Value	TLH, TLF Type	Withstanding voltage : No abnormality Insulation resistance : No abnormality
Test Method and Remarks	TLH, TLF : Temperature Humidity Duration Applied voltage Recovery	: 60±2°C : 40±2°C (※except TLF9U) : 90~95%RH : 100 hrs : 500 hrs Apply rated current across windings (※except TLF9U) : Apply the following specified voltage between windings. TLF9UA 250VAC TLF9UB 50VDC : At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.

18. Low temperatur	e life test	
Specified Value	TLH, TLF Type	TLF9U : Inductance change : Within \pm 15% TLH, TLF (except TLF9U) : Withstanding voltage : No abnormality Insulation resistance : No abnormality
Test Method and Remarks	TLH, TLF : Temperature : $-25\pm2^{\circ}C$: $-40\pm2^{\circ}C$ ($\%$ TLF•TLH Duration : 500 hrs Recovery : At least 1hr of recovery	1) under the standard removal from test chamber followed by the measurement within 2 hrs.

19. High Temperature life test		
Specified Value	TLH, TLF Type	TLF9U : Inductance change : Within $\pm 15\%$ TLH, TLF (except TLF9U) : Withstanding voltage : No abnormality Insulation resistance : No abnormality
Test Method and Remarks	TLH, TL F : Temperature : 105±3°C (※ TLF•TLH) Duration : 500 hrs Recovery : At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.	

LEADED COMMON MODE CHOKE COILS FOR DC AND SIGNAL LINES, LEADED COMMON MODE CHOKE COILS FOR AC LINES

PRECAUTIONS

1. Circuit Design	
Precautions	 Operating environment 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	 Design 1. Please design insertion pitches as matching to that of leads of the component on PCBs.
Technical considerations	 Design 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	 Wave soldering Please refer to the specifications in the catalog for a wave soldering. Do not immerse the entire inductor in the flux during the soldering operation. Lead free soldering 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 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	 Lead free soldering 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. Recommended conditions for using a soldering iron 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	 Cleaning conditions 1. Please contact any of our offices for about a cleaning.

5. Handling	
Precautions	 Handling Keep the product away from all magnets and magnetic objects. Mechanical considerations Please do not give the product any excessive mechanical shocks. Please do not add any shock or power to a product in transportation. Packing 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	 Handling There is a case that a characteristic varies with magnetic influence. Mechanical considerations There is a case to be damaged by a mechanical shock. There is a case to be broken by a fall. Packing There is a case that a lead route turns at by a fall or an excessive shock.

> 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/).

6. Storage conditions	
Precautions	 Storage 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. Recommended conditions
Technical considerations	 Storage 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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