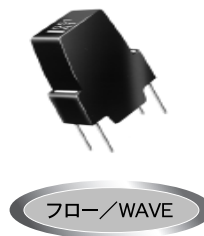
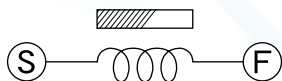


# リニアリティコイル LINEARITY COIL

OPERATING TEMP.	-25~+105℃ (製品自己発熱含む) (Including self-generated heat)
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回路記号例  
Example circuit symbol



## 特長 FEATURES

- 1.豊富な商品群(11, 13, 16, タイプ)
- 2.磁歪振動低減対応(PA)
- 3.自動挿入対応(PA)

1. Available in several sizes and types to provide various DC bias inductance characteristics.
2. Special material minimizes expansion and contraction of ferrite core.
3. PA types are available in packaging for automatic insertion.

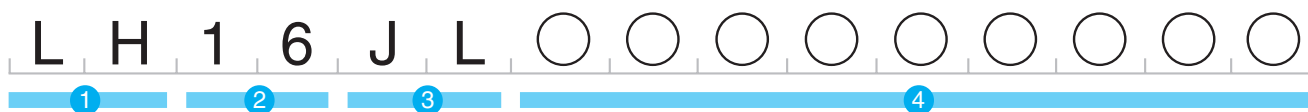
## 用途 APPLICATIONS

カラーテレビ及びコンピューター用モニター等の各種モニター類の水平偏向回路の補正

Used in compensating circuits for TV sets, monitors etc. to correct horizontal distortion.

## 形名表記法 ORDERING CODE

1	形式	2	コア外形寸法 (mm)	3	構造	4	当社管理記号
LH	リニアリティコイル	11	9.0~10.9	JL	塗装品		
		13	11.0~12.9	PA	四角形ケース		
		16	15.0~15.9				
		18	16.0~17.9				
		20	18.0~20.0				



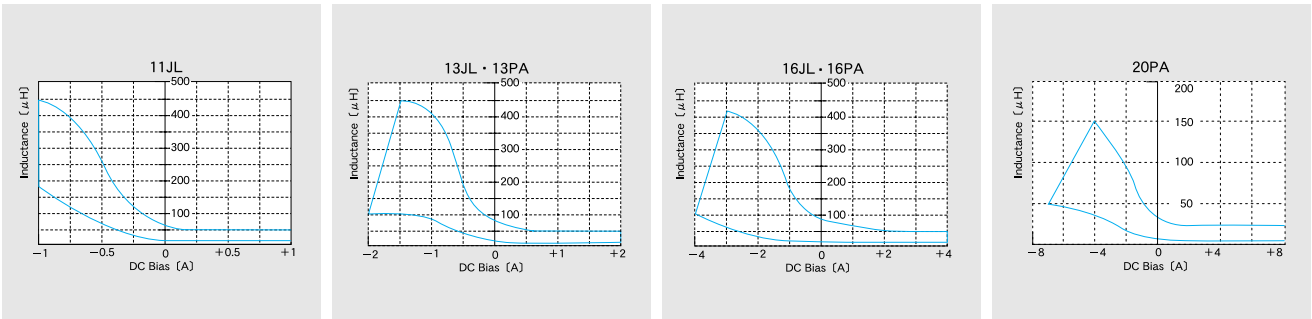
1	Type	2	Core dimensions(mm)	3	Structure	4	Internal code
LH	Linearity coil	11	9.0~10.9	JL	Coated		
		13	11.0~12.9	PA	Square case		
		16	15.0~15.9				
		18	16.0~17.9				
		20	18.0~20.0				

# 外形寸法 EXTERNAL DIMENSIONS

Fig	JL			PA		
	LH11	LH13	LH16	LH13	LH16	LH20
D	16max (0.630max)	16max (0.630max)	20max (0.787max)	20max (0.787max)	24max (0.945max)	30max (1.18max)
H	26max (1.02max)	28max (1.10max)	31max (1.22max)	24max (0.945max)	28max (1.10max)	42max (1.65max)
C	5±1 (0.197±0.039)	5±1 (0.197±0.039)	5±1 (0.197±0.039)	5±1 (0.197±0.039)	5±1 (0.197±0.039)	5±1 (0.197±0.039)
F	7.5±1 (0.295±0.039)	7.5±1 (0.295±0.039)	10±1 (0.394±0.039)	15±1 (0.591±0.039)	20±1 (0.787±0.039)	24.2±1 (0.953±0.039)
d	0.8 (0.031)	0.8 (0.031)	1.0 (0.039)	0.8 (0.031)	1.0 (0.039)	1.0 (0.039)
P1	—	—	—	10±0.5 (0.394±0.020)	10±0.5 (0.394±0.020)	10±0.5 (0.394±0.020)
P2	—	—	—	10±0.5 (0.394±0.020)	7.5±0.5 (0.295±0.020)	10±0.5 (0.394±0.020)

Unit : mm (inch)

# 特性図 ELECTRICAL CHARACTERISTICS



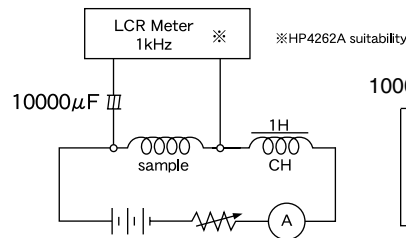
・ご用意の際は下記項目をご指定ください。

- ① 直流重畳特性
- ② 許容電流
- ③ 使用周波数

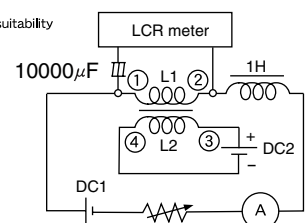
・ Please specify the following when ordering

- ① DC bias characteristics
- ② Allowable current
- ③ Operating frequency

測定回路 Measuring Circuit  
PBタイプを除く



PBタイプのみ



セレクションガイド  
Selection Guide

アイテム一覧  
Part Numbers

特性図  
Electrical Characteristics

梱包  
Packaging

信頼性  
Reliability Data

使用上の注意  
Precautions



etc

※営業窓口にご相談ください。Please contact our Sales Department.

最小受注単位数 Minimum Quantity

Type	箱づめ Box
LH11JL	600
LH13JL	500
LH16JL	400
LH13PA	400
LH16PA	280
LH20PA	200

Item	Specified Value					Test method and remarks										
	CM—RA/ BU—RA Type	CM—RB Type	TLF9U TLF14CB	TLF25RA	Linearity coil											
1.Operating Temperature Range	-25~+105°C		-25~+115°C	-25~+105°C		Including temperature rise due to self-generated heat.										
2.Storage temperature range	-40~+85°C															
3.Rated current	Within the specified range					CM : The maximum DC value having temperature increase within specified temperature, as detailed in individual specification.  TLF9UA, 14CB, 25RA : The maximum AC value having temperature increase within 45°C by the application of AC current.  TLF9UB : The maximum DC value having temperature increase within 45°C by the application of DC current.										
4.Inductance	Within the specified tolerance					CM・Linearity coil : Measuring equipmet : 4262A (HP) or its equivalent Measuring frequency : 1kHz  TLF9U, 14CB, 25RA : Measuring equipment : Impedance analyzer (HP4192A) or its equivalent Measuring frequency : 1kHz Measuring voltage : 0.35vosc (TLF14CB : 1.0V)										
5.DC resisitance	Within the specified tolerance					CM, TLF : Measuring equipment : DC ohmmeter										
6.Temperature characteristi					±30%	Linearity coil : Change of maximum inductance deviation in step 1 to 5 <table border="1"> <tr> <td>Temperature at step 1</td> <td>20°C</td> </tr> <tr> <td>Temperature at step 2</td> <td>-25°C</td> </tr> <tr> <td>Temperature at step 3</td> <td>20°C (standard temperature)</td> </tr> <tr> <td>Temperature at step 4</td> <td>+85°C</td> </tr> <tr> <td>Temperature at step 5</td> <td>20°C</td> </tr> </table>	Temperature at step 1	20°C	Temperature at step 2	-25°C	Temperature at step 3	20°C (standard temperature)	Temperature at step 4	+85°C	Temperature at step 5	20°C
Temperature at step 1	20°C															
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Temperature at step 3	20°C (standard temperature)															
Temperature at step 4	+85°C															
Temperature at step 5	20°C															
7.Withstanding voltage between layers					Appearance : Noabnormality Inductance change : Within±20%	Linearity coil : Aply with peak voltage of 500V to both terminals in the coil for 1min.										

Item	Specified Value					Test method and remarks																						
	CM—RA/ BU—RA Type	CM—RB Type	TLF9U TLF14CB	TLF25RA	Linearity coil																							
8. Terminal strength : tensile force	No abnormality					<p>No abnormality such as cutoff or looseness of lead.</p> <p>CM : Fix the component in the direction to draw terminal and gradually apply tensile force as detailed in individual specifications.</p> <p>TLF9U : Apply the stated tensile force gradually in the direction to draw terminal.</p> <table border="1"> <thead> <tr> <th>Nominal wire diameter tensile <math>\phi d</math> (mm)</th> <th>force (N)</th> <th>duration (S)</th> </tr> </thead> <tbody> <tr> <td><math>\phi 0.6</math></td> <td>5</td> <td>30±5</td> </tr> </tbody> </table> <p>TLF14CB : Apply the stated tensile force gradually in the direction to draw terminal.</p> <table border="1"> <thead> <tr> <th>Nominal wire diameter tensile <math>\phi d</math> (mm)</th> <th>force (N)</th> <th>duration (S)</th> </tr> </thead> <tbody> <tr> <td><math>\phi 0.8</math></td> <td>20</td> <td>30±5</td> </tr> </tbody> </table> <p>TLF25RA : Apply the tensile force of 10N in the direction to draw terminal for 5 seconds.</p> <p>Linearity coil : Apply the stated tensile force gradually in the direction to draw terminal.</p> <table border="1"> <thead> <tr> <th>Nominal wire diameter tensile <math>\phi d</math> (mm)</th> <th>force (N)</th> <th>duration (S)</th> </tr> </thead> <tbody> <tr> <td><math>0.3 &lt; \phi d \leq 0.5</math></td> <td>5</td> <td rowspan="3">30±5</td> </tr> <tr> <td><math>0.5 &lt; \phi d \leq 0.8</math></td> <td>10</td> </tr> <tr> <td><math>0.8 &lt; \phi d \leq 1.2</math></td> <td>25</td> </tr> </tbody> </table>	Nominal wire diameter tensile $\phi d$ (mm)	force (N)	duration (S)	$\phi 0.6$	5	30±5	Nominal wire diameter tensile $\phi d$ (mm)	force (N)	duration (S)	$\phi 0.8$	20	30±5	Nominal wire diameter tensile $\phi d$ (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
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9. Temperature rise	Refer to individual specification		45°C max.		Product Surface temperature : Within 50°C	TLF : Resistance substitution method Applied current : Rated current Duration : 1 hr																						
10. Terminal strength : bending					No abnormality such as cut lead, or looseness.	<p>Linearity coil : Applied current : Rated current Duration : 1 hr</p> <p>Linearity coil : Suspend a mass at the end the terminal, incline the body through angle of 90° and return it into 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</p> <table border="1"> <thead> <tr> <th>Nominal wire diameter (mm)</th> <th>Bending force (N)</th> <th>Mass reference weight (kg)</th> </tr> </thead> <tbody> <tr> <td><math>0.3 &lt; \phi d \leq 0.5</math></td> <td>2.5</td> <td>0.25</td> </tr> <tr> <td><math>0.5 &lt; \phi d \leq 0.8</math></td> <td>5</td> <td>0.5</td> </tr> <tr> <td><math>0.8 &lt; \phi d \leq 1.2</math></td> <td>10</td> <td>1.0</td> </tr> </tbody> </table>	Nominal wire diameter (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										
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11. Insulation resistance : between the terminals and body					100M $\Omega$ min.	Linearity coil : Metal globule method : Applied voltage : 500VDC : Duration : 60 sec.																						
12. Insulation resistance : between wires	100M $\Omega$ min.					CM • TLF : Applied voltage : Rated voltage (CM—RA/BU—RA, CM—RB) : 500VDC (TLF9UA, 14CB, 25RA) : 250VDC (TLF 9 UB) Duration : 60sec.																						
13. Insulation resistance : between wire and core			100M $\Omega$ min.			TLF : Applied voltage : 500VDC (TLF9UA, 14CB) : 250VDC (TLF 9 UB) Duration : 60 sec.																						

Item	Specified Value					Test method and remarks
	CM—RA/ BU—RA Type	CM—RB Type	TLF9U TLF14CB	TLF25RA	Linearity coil	
14. Withstanding : between wires	No abnormality					CM · TLF : Applied voltage : 250VDC (CM—RA/BU—RA, CM—RB) : 2000VAC (TLF9UA, 14CB, 25RA) : 500VDC (TLF 9 UB) Duration : 60min.
15. Withstanding : between wires and core			No abnormality			TLF : Applied voltage : 2000VAC (TLF9UA, 14CB) : 500VDC (TLF9UB) Duration : 60min.
16. Withstanding : between the terminals and body					No abnormality	Linearity coil : According to JIS (C) 5102.7.1.3 Metal globule method Applied voltage : 500VDC Duration : 60 sec.
17. Rated voltage	Within the specified range					TLF9UA, 14CB, 25RA : 250VAC TLF9UB : 50VDC
18. Resisistance to vibration		Appearance : No abnormality Inductance change : Within ±15%	Inductance change : Within ±5%		Appearance : No abnormality Inductance change : Within ±20%	CM, TLF : According to JIS C0040 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 <sup>2</sup> /s) Mounting method : soldering onto PC board Recovery : 2 to 24 hrs of recovery under the standard condition after the test. (CM—RA, CM—RB) : At least 1hr of recovery under the standard condition after the removal from test chamber, followed by the measurement within 2hrs. (TLF9U, 14CB)  Linearity coil : According to JIS C0040 Vibration type : A Directions : 2 hrs each in X, Y and Z directions Total : 6hrs Frequency range : 10 to 55 to 10Hz (1 min.) Amplitude : 1.5mm (shall not exceed acceleration 196m <sup>2</sup> /s) Mounting method : soldering onto PC board
19. Solderability	At least 75% of terminal electrode is covered by new solder.		Solder shall be uniformly adhered onto immersed surfaces.		At least 75% of terminal electrode is covered by new solder.	CM : Solder temperature : 235±5°C Duration : 2±0.5sec. Immersion depth : According to detailed specification.  TLF : Solder temperature : 230±5°C Duration : 2±0.5sec. Immersion depth : Up to 1.0 to 1.5mm from PBC mounted level.  Linearity coil : Solder temperature : 230±5°C Duration : 2±0.5sec. Immersion depth : Up to 2.0~2.5mm from terminal root.

Item	Specified Value					Test method and remarks																														
	CM—RA/ BU—RA Type	CM—RB Type	TLF9U TLF14CB	TLF25RA	Linearity coil																															
20. Resisatance to soldering heat	Appearance : No abnormality Impedance change : Refer to individual specification		Inductance change : Within±5%		Appearance : No abnormality Inductance change : Within±20% Terminals shall be satisfy the necessary strength.	<p>CM :</p> <p>Solder temperature : 260±5°C Duration : 5±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.</p> <p>TLF :</p> <p>Solder temperature : 260±5°C Duration : 5±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.</p> <p>Linearity coil :</p> <p>Solder temperature : 270±5°C Duration : 3±0.5sec. Immersion depth : Up to 2.0~2.5mm from terminal root. Recovery : 1 to 2 hrs of recovery under the standard condition after the test.</p>																														
21. Thermal shock	Appearance : No abnormality Inductance change : Refer to individual specification		Inductance change : Within±15%		Appearance : No abnormality Inductance change : Within ±20%	<p>CM, TLF :</p> <p>Accoding to JIS C0025</p> <p>Conditions for 1 cycle</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Duration (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-25±3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room Temperature</td> <td>Within 3</td> </tr> <tr> <td>3</td> <td>+85±2</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room Temperature</td> <td>Within 3</td> </tr> </tbody> </table> <p>Number of cycles : 10</p> <p>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) : At least 1hr of recovery under the standard condition after the removal from test chamber, followed by the measurement within 2 hrs. (TLF9U、14CB、25RA)</p> <p>Linearity coil :</p> <p>Accoding to JIS C0025</p> <p>Conditions for 1 cycle</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Duration (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-25<sup>+0</sup><sub>-3</sub></td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room Temperature</td> <td>Within 3</td> </tr> <tr> <td>3</td> <td>+85<sup>+2</sup><sub>-0</sub></td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room Temperature</td> <td>Within 3</td> </tr> </tbody> </table> <p>Number of cycles : 10</p> <p>Recovery : 1 to 2hrs of recovery under the standard condition after the removal from test chamber.</p>	Step	Temperature (°C)	Duration (min)	1	-25±3	30±3	2	Room Temperature	Within 3	3	+85±2	30±3	4	Room Temperature	Within 3	Step	Temperature (°C)	Duration (min)	1	-25 <sup>+0</sup> <sub>-3</sub>	30±3	2	Room Temperature	Within 3	3	+85 <sup>+2</sup> <sub>-0</sub>	30±3	4	Room Temperature	Within 3
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Item	Specified Value					Test method and remarks				
	CM—RA/ BU—RA Type	CM—RB Type	TLF9U TLF14CB	TLF25RA	Linearity coil					
22.Damp heat			Inductance change : Within±15%			TLF : Temperature : 60±2°C 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.				
23.Loading under damp heat	Appearance : No abnormality Inductance change : Refer to individual specification		Withstanding voltage : No abnormality Insulation resistance : No abnormality		Appearance : No abnormality Inductance change : Within±20%	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. : 1 to 2hrs of recovery under the standard condition after the removal from test chamber.  TLF : Temperature : 60±2°C Humidity : 90~95%RH Duration : 100 hrs Applied voltage : Apply the following specified voltage between windings. <table border="1" style="margin-left: 20px;"> <tr> <td>TLF9UA、14CB、25RA</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.  Linearity coil : Temperature : 40±2°C Humidity : 90~95%RH Duration : 500±12 hrs Applied current : Rated current Recovery : 1 to 2hrs of recovery under the standard condition after the removal from test chamber.	TLF9UA、14CB、25RA	250VAC	TLF9UB	50VDC
TLF9UA、14CB、25RA	250VAC									
TLF9UB	50VDC									
24.Loading at high temperature			Withstanding voltage : No abnormality Insulation resistance : No abnormality			TLF : Temperature : 85±2°C Duration : 100 hrs Applied voltage : Apply the following specified voltage between windings. <table border="1" style="margin-left: 20px;"> <tr> <td>TLF9UA、14CB、25RA</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、14CB、25RA	250VAC	TLF9UB	50VDC
TLF9UA、14CB、25RA	250VAC									
TLF9UB	50VDC									



Item	Specified Value					Test method and remarks
	CM—RA/ BU—RA Type	CM—RB Type	TLF9U TLF14CB	TLF25RA	Linearity coil	
25.Low temperature life test	Appearance : No abnormality Inductance change : Refer to individual specification		Inductance change : Within±15%		Appearance : No abnormality Inductance change : Within±20%	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)  TLF : Temperature : -25±2°C Duration : 500 hrs Recovery : At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.  Linearity coil : Temperature : -40±3°C Duration : 1000±24 hrs Recovery : 1 to 2hrs of recovery under the standard condition after the removal from test chamber.
26.High Temperature life test	Appearance : No abnormality Inductance change : Refer to individual specification		Inductance change : Within±15%		Appearance : No abnormality Inductance change : Within±20%	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)  TLF : Temperature : 85±2°C Duration : 500 hrs Recovery : At least 1hr of recovery under the standard removal from test chamber followed by the measurement within 2 hrs.  Linearity coil : Temperature : 85±2°C Duration : 1000±24 hrs Recovery : 1 to 2hrs of recovery under the standard condition after the removal from test chamber.