

## FEATURES

- High common mode impedance at high frequency effects excellent noise suppression performance.
- Operating temperature-40~+125°C(Including self - temperature rise)
- High reliability -Reliability tests comply with AEC-Q200
- 100% Lead(Pb) & Halogen-Free and RoHS compliant.



## APPLICATIONS

- Common mode noise filtering for automotive Ethernet system

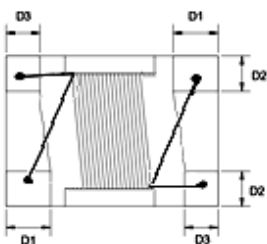
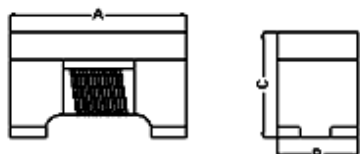
## Explanation of Part Number

### ACT 45L-201- 2P-T F

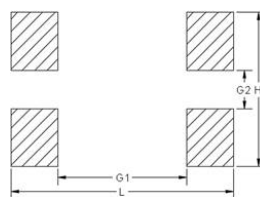
**1    2    3    4    5    6**

- ◆ 1:Product Series:Wire Wound Chip Common Mode Filters
- ◆ 2:Dimensions:
- ◆ 3:Inductance( $\mu$ H):201=200uH
- ◆ 4:Number of Lines:2P=2 lines
- ◆ 5:Packing(Tape & Reel)
- ◆ 6:F:Hazardous Substance Free Products

## Shapes and Dimensions [mm]

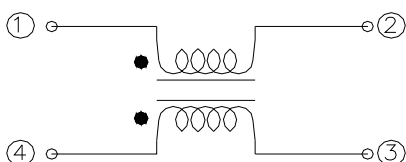


### Recommended PC Board Pattern



Series	A(mm)	B(mm)	C(mm)	D1(mm)	D2(mm)	D3(mm)	L(mm)	H(mm)	G1(mm)	G2(mm)
ACT45L	4.5±0.2	3.2±0.2	2.8±0.15	0.80±0.2	0.85±0.2	0.6±0.2	5.0	3.6	3.4	1.7

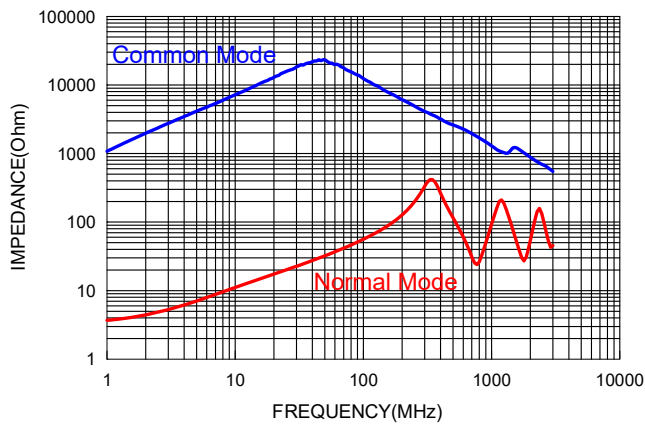
## Schematic Diagram



## Electrical Characteristics:

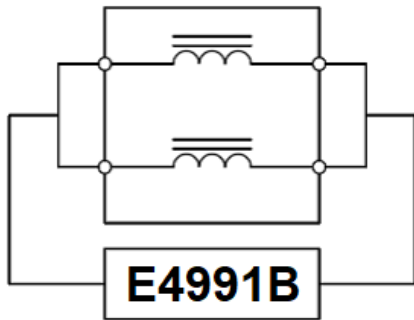
Part Number	Inductance ( $\mu\text{H}$ )+60/-20( $\mu\text{H}$ ) [100kHz/0.1V]	DC Resistance ( $\Omega$ ) max.	Rated Current (mA) max.	Rated Volt. (Vdc) max.	IR ( $\Omega$ ) min.
ACT45L-201- 2P-TF	200	4.5	100	50	10M

## Typical Electrical Characteristics:

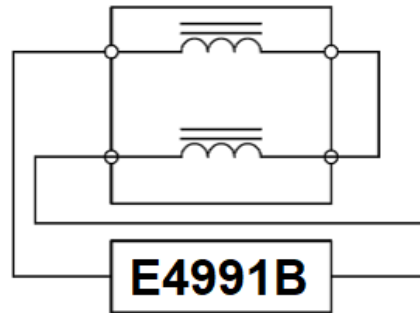


## MEASURING CIRCUITS 2LINE

### Common mode

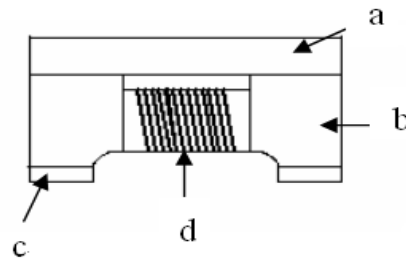


### Differential mode

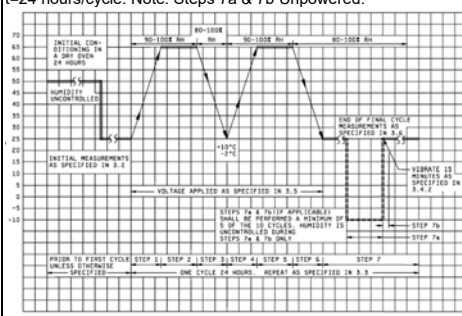


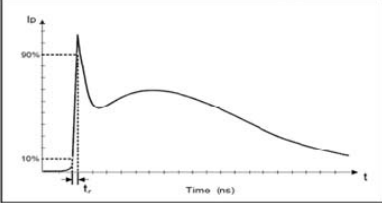
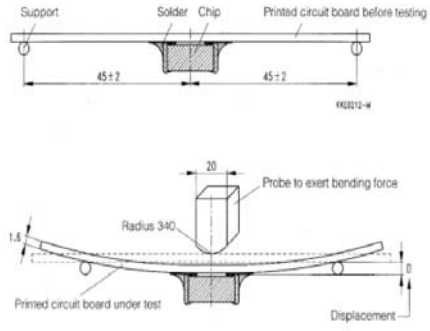
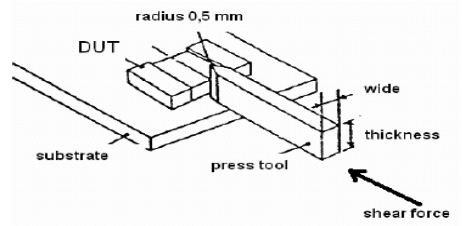
### Materials

No.	Description	Specification
a.	Upper Plate	Ferrite
b.	Core	Ferrite Core
c.	Termination	Ag/Ni/Sn
d.	Wire	Enameled Copper Wire



# Reliability Test

Item	Performance	Test Condition															
Operating temperature	-40~+125℃(Including self - temperature rise)																
Storage temperature	-40~+125℃(on board)																
<b>Electrical Performance Test</b>																	
Inductance	Refer to standard electrical characteristics list.	Keysight –E4980AL+ Keysight t -16334A															
DCR		Agilent-34420A Agilent-4338B															
I.R.		Chroma 19073															
Temperature Rise Test	Rated Current ΔT 40℃ Max	1.Applied the allowed DC current. 2.Temperature measured by digital surface thermometer															
<b>Reliability Test</b>																	
High Temperature Exposure(Storage) AEC-Q200	Appearance : No damage Impedance : within±15% of initial value Inductance : within±10% of initial value RDC : within ±15% of initial value and shall not exceed the specification value	Preconditioning: Run through IR reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles Temperature : 150±2℃ Duration : 1000hrs Min. Measured at room temperature after placing for 24±4 hrs															
Temperature Cycling AEC-Q200		Preconditioning: Run through IR reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles Condition for 1 cycle Step1 : -55±2℃ 30min Min. Step2 : 150±2℃ transition time 1min MAX. Step3 : 150±2℃ 30min Min. Step4 : Low temp. Transition time 1min MAX. Number of cycles : 1000 Measured at room temperature after placing for 24±4 hrs t=24 hours/cycle. Note: Steps 7a & 7b Unpowered.															
Moisture Resistance (AEC-Q200)																	
Biased Humidity (AEC-Q200)		Preconditioning: Run through IR reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles Humidity : 85±3% R.H, Temperature : 85℃±2℃ Duration: 1000hrs Min. Measured at room temperature after placing for24±4hrs															
High Temperature Operational Life (AEC-Q200)		Preconditioning: Run through IR reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles Temperature : 150±2℃ Duration : 1000hrs Min. with 100% rated current. Measured at room temperature after placing for24±4hrs															
External Visual	Appearance : No damage.	Inspect device construction, marking and workmanship. Electrical Test not required.															
Physical Dimension	According to the product specification size measurement	According to the product specification size measurement															
Resistance to Solvents	Appearance : No damage.	Add aqueous wash chemical - OKEM clean or equivalent.															
Mechanical Shock	Appearance : No damage. Impedance : within±15% of initial value Inductance : within±10% of initial value RDC : within ±15% of initial value and shall not exceed the specification value	<table border="1"> <thead> <tr> <th>Type</th> <th>Peak value (g's)</th> <th>Normal duration (D) (ms)</th> <th>Wave form</th> <th>Velocity change (Vi)ft/sec</th> </tr> </thead> <tbody> <tr> <td>SMD</td> <td>100</td> <td>6</td> <td>Half-sine</td> <td>12.3</td> </tr> <tr> <td>Lead</td> <td>100</td> <td>6</td> <td>Half-sine</td> <td>12.3</td> </tr> </tbody> </table> <p>3 shocks in each direction along 3 perpendicular axes. (18 shocks).</p>	Type	Peak value (g's)	Normal duration (D) (ms)	Wave form	Velocity change (Vi)ft/sec	SMD	100	6	Half-sine	12.3	Lead	100	6	Half-sine	12.3
Type	Peak value (g's)	Normal duration (D) (ms)	Wave form	Velocity change (Vi)ft/sec													
SMD	100	6	Half-sine	12.3													
Lead	100	6	Half-sine	12.3													

Item	Performance	Test Condition								
Vibration		IPC/JEDEC J-STD-020E Classification Reflow Profiles Oscillation Frequency:10Hz~2KHz~10Hz for 20 minute Equipment : Vibration checker Total Amplitude:5g Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations) .								
Resistance to Soldering Heat	Appearance : No damage. Impedance : within±15% of initial value Inductance : within±10% of initial value RDC : within ±15% of initial value and shall not exceed the specification value	Test condition : <table border="1"> <thead> <tr> <th>Temperature(°C)</th> <th>Time(s)</th> <th>Temperature ramp/immersion and emersion rate</th> <th>Number of heat cycles</th> </tr> </thead> <tbody> <tr> <td>260 ±5 (solder temp)</td> <td>10 ±1</td> <td>25mm/s ±6 mm/s</td> <td>1</td> </tr> </tbody> </table>	Temperature(°C)	Time(s)	Temperature ramp/immersion and emersion rate	Number of heat cycles	260 ±5 (solder temp)	10 ±1	25mm/s ±6 mm/s	1
Temperature(°C)	Time(s)	Temperature ramp/immersion and emersion rate	Number of heat cycles							
260 ±5 (solder temp)	10 ±1	25mm/s ±6 mm/s	1							
Thermal shock (AEC-Q200)		Preconditioning: Run through IR reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles Condition for 1 cycle Step1 : -55±2°C 15±1min Step2 : 150±2°C within 20Sec. Step3 : 150±2°C 15±1min Number of cycles : 300 Measured at room temperature after placing fo24±4hrs								
ESD	Appearance : No damage.	 <p>Direct Contact and Air Discharge PASSIVE COMPONENT HBM ESD Discharge Waveform to a Coaxial Target Test method: AEC-Q200-002 Test mode : Contact Discharge Discharge level : 4 KV (Level: 2 )</p>								
Solderability	More than 95% of the terminal electrode should be covered with solder .	a. Method B, 4 hrs @155°C dry heat @235°C±5°C Testing Time :5 +0/-0.5 seconds b. Method D category 3. (8hours ± 15 min)@ 260°C±5°C Testing Time :30 +0/-0.5 seconds								
Electrical Characterization	Refer Specification for Approval	Summary to show Min, Max, Mean and Standard deviation .								
Flammability	Electrical Test not required.	V-0 or V-1 are acceptable.								
Board Flex	Appearance : No damage	Preconditioning: Run through IR reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles Place the 100mm X 40mm board into a fixture similar to the one shown in below Figure with the component facing down. The apparatus shall consist of mechanical means to apply a force which will bend the board (D) x = 2 mm minimum. The duration of the applied forces shall be 60 (+ 5) sec. The force is to be applied only once to the board. 								
Terminal Strength(SMD)	Appearance : No damage	Preconditioning: Run through IR reflow for 3 times.( IPC/JEDEC J-STD-020E Classification Reflow Profiles With the component mounted on a PCB with the device to be tested, apply a 17.7 N (1.8 Kg) force to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to apply a shock to the component being tested. 								

## Soldering

Mildly activated rosin fluxes are preferred. Metal-lions terminations are suitable for re-flow soldering systems. If hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

### 1.1 IR Soldering Reflow:

Recommended temperature profiles for lead free re-flow soldering in Figure 1. Table 1.1&1.2 (J-STD-020E)

### 1.2 Soldering Iron:

Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended. (Figure 2.)

- Preheat circuit and products to 150°C
- Never contact the ceramic with the iron tip
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- 350°C tip temperature (max)
- 1.0mm tip diameter (max)
- Limit soldering time to 4~5sec.

Fig.1 IR Soldering Reflow

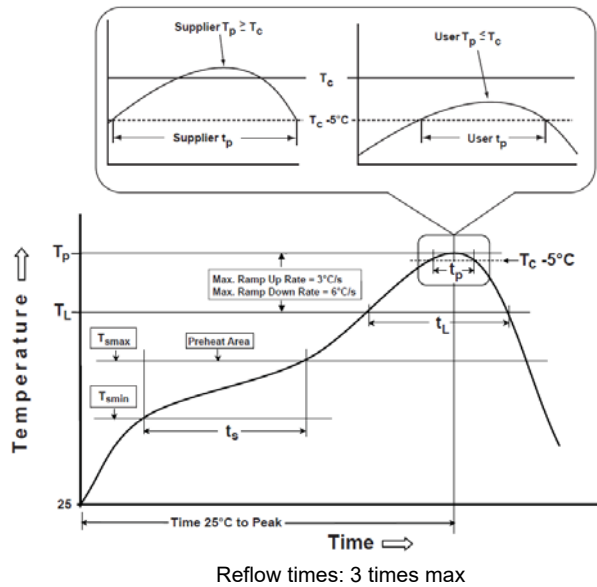


Fig.2 Iron soldering temperature profiles

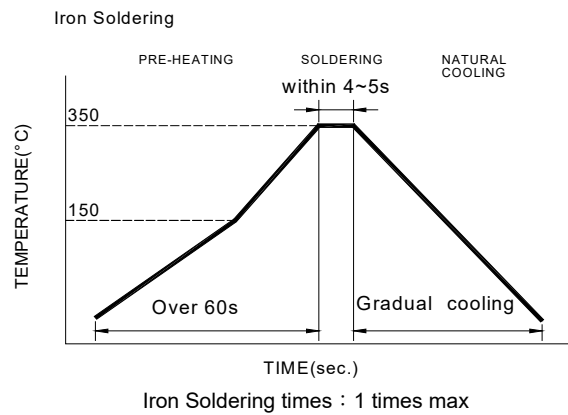


Table (1.1): Reflow Profiles

Profile Type:	Pb-Free Assembly
Preheat	
-Temperature Min( $T_{smin}$ )	150°C
-Temperature Max( $T_{smax}$ )	200°C
-Time( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ )	60-120seconds
Ramp-up rate( $T_L$ to $T_p$ )	3°C/second max.
Liquidus temperature( $T_L$ )	217°C
Time( $t_L$ ) maintained above $T_L$	60-150 seconds
Classification temperature( $T_c$ )	See Table (1.2)
Time( $t_p$ ) at $T_c - 5^\circ\text{C}$ ( $T_p$ should be equal to or less than $T_c$ .)	< 30 seconds
Ramp-down rate( $T_p$ to $T_L$ )	6°C /second max.
Time 25°C to peak temperature	8 minutes max.

**T<sub>p</sub>**: maximum peak package body temperature, **T<sub>c</sub>**: the classification temperature.

For user (customer) **T<sub>p</sub>** should be equal to or less than **T<sub>c</sub>**.

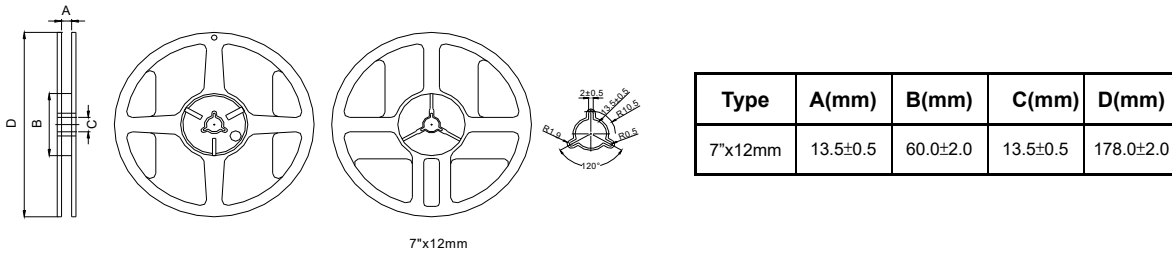
Table (1.2) Package Thickness/Volume and Classification Temperature ( $T_c$ )

	Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >2000
PB-Free Assembly	<1.6mm	260°C	260°C	260°C
	1.6-2.5mm	260°C	250°C	245°C
	≥2.5mm	250°C	245°C	245°C

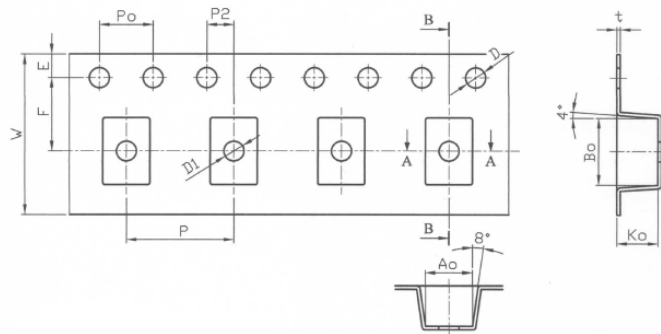
Reflow is referred to standard IPC/JEDEC J-STD-020E ◦

## Packaging Information

### Reel Dimension



### Tape Dimension / 12mm

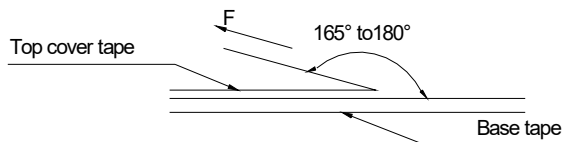


Series	P(mm)	Po(mm)	P2(mm)	Bo(mm)	Ao(mm)	Ko(mm)	D(mm)	E(mm)	F(mm)	W(mm)	t(mm)	D1(mm)
ACT45L	8.00±0.10	4.00±0.10	2.00±0.05	4.90±0.10	3.60±0.10	3.00±0.10	1.50+0.10/-0.00	1.75±0.10	5.50±0.05	12.00±0.10	0.26±0.05	1.50±0.10

### Packaging Quantity

Chip size	Chip/Reel	Inner Box	Middle Box	Carton
ACT45L	500	2000	10000	20000

### Tearing Off Force



The force for tearing off cover tape is 15 to 80 grams in the arrow direction under the following conditions.

Room Temp. (°C)	Room Humidity (%)	Room atm (hPa)	Tearing Speed mm/min
5~35	45~85	860~1060	300

### Application Notice

- Storage Conditions(component level)
  - To maintain the solderability of terminal electrodes:
    1. Metal-Lions products meet IPC/JEDEC J-STD-020E standard-MSL, level 1.
    2. Temperature and humidity conditions: Less than 40°C and 60% RH.
    3. Recommended products should be used within 12 months from the time of delivery.
    4. The packaging material should be kept where no chlorine or sulfur exists in the air.
- Transportation
  1. Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
  2. The use of tweezers or vacuum pick up is strongly recommended for individual components.
  3. Bulk handling should ensure that abrasion and mechanical shock are minimized.