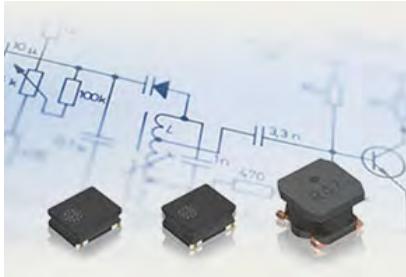


Inductors (Coils)



The VLS series power inductors are magnetic shield (resin) type wound inductors that have been developed taking full advantage of the material technology and manufacturing processes that TDK have accumulated so far. This type of inductors can largely be classified into three categories: VLS-HBX/HBU series, VLS-CX series, and VLS-EX/AF/EX-H series; and they show respective excellent features. This article introduces the structure, features, and application purposes of these products, and other information that helps you in an easy-to-understand way.

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Product summary

VLS-HBX/HBU series are the wire-wound type inductors that use metallic magnetic material as their cores. VLS-CX series and VLS-EX/AF/EX-H series are also wire-wound type inductors but they use ferrite material as their cores.

Each product in these series reduces magnetic flux leakage by covering the wire winding part with resin in which magnetic material is mixed.

Figure 1: Product summary

| Series | VLS-HBX series VLS-HBU series | VLS-CX series | VLS-EX series VLS-AF series VLS-EX-H series |
|-----------------|--|--|---|
| Product summary | <p>Magnetic shield type wound inductors that use metallic magnetic material</p> <p>These inductors use metallic magnetic material to achieve larger current and low Rdc. They have been developed pursuing simple product structure. The magnetic flux leakage is reduced by covering the wire winding by resin in which magnetic material is mixed. The manufacturing processes of these inductors are automated and the products are not touched by humans during being processed; which means that high quality and high productivity are realized at the same time.</p> | <p>Magnetic shield type wound inductors that use ferrite material</p> <p>By optimizing the core shape of the conventional products, these inductors have superior electrical characteristics than the conventional ones. They have been developed pursuing simple product structure. The magnetic flux leakage is reduced by covering the wire winding by resin in which magnetic material is mixed. The manufacturing processes of these inductors are automated and the products are not touched by humans during being processed; which means that high quality and high productivity are realized at the same time.</p> | <p>Magnetic shield type wound inductors that achieve larger current and lower resistance</p> <p>With ferrite magnetic material and optimum structural design, these power inductors achieve larger current and lower Rdc. The processes from the production of cores to finishing the coil take place in the same plant to make the lead time shorter. Also, stable manufacturing is enabled by automated production line.</p> |
| Features | <ul style="list-style-type: none"> • Larger current and low resistance are achieved by using metallic magnetic material. • The magnetic shield structure enables high-density mounting. • High quality and high productivity, and therefore stable supply is possible. • HBU series are designed for boost circuits such as back panels. | <ul style="list-style-type: none"> • By optimizing the core shape, larger current and lower resistance compared to conventional products are achieved. • High voltage specifications are achieved by using ferrite magnetic material. • The magnetic shield structure enables high-density mounting. • High quality and high productivity, and therefore stable supply is possible. | <ul style="list-style-type: none"> • Larger current and lower resistance compared to conventional products are achieved with optimum structural design. • The magnetic shield structure enables high-density mounting. • High quality and high productivity, and therefore stable supply is possible. • AF series is designed for sound quality improvement applications. • EX-H series is designed for automotive applications. |
| Applications | <ul style="list-style-type: none"> • Smart phones, tablet terminals • Other mobile devices | <ul style="list-style-type: none"> • Smart phones, tablet terminals • Other mobile devices | <ul style="list-style-type: none"> • TV, STB, gaming equipment • Other AV equipment • in-vehicle infotainment |

Product structures

The structures of the VLS series products can largely be classified into two types. VLS-HBX/HBU series and VLS-CX series employ terminal electrode structure to reduce size and thickness. VLS-EX/AF/EX-H series are the middle-sized products of 5 mm or 6 mm, which employ metal terminals.

Figure 2: Product structures

| Series | VLS-HBX series VLS-HBU series | VLS-CX series | VLS-EX series VLS-AF series VLS-EX-H series |
|--------------------|---|--|---|
| Product structures |  <p>DR core -Square DR core design is employed for better magnetic characteristics.</p> <p>External resin coating with magnetic powder mixed in -Magnetic material is mixed in external resin coating for better magnetic characteristics.</p> <p>Silver electrode + plating -The silver electrode structure is employed for lower profile and better magnetic characteristics.</p> <p>Thermo compression bonded connecting wire -Thermo compression bonded connecting wires are used for higher production efficiency. -High joint strength: Reflow resistance, shock resistance.</p> |  |  <p>DR core -Square DR core design is employed for better magnetic characteristics.</p> <p>External resin coating with magnetic powder mixed in -Magnetic material is mixed in external resin coating for better magnetic characteristics.</p> <p>Metal terminal + plating -Metal terminals are used for ensuring the flatness of the mounting surface.</p> <p>Laser welded connecting wire -Laser welded connecting wires are used for higher production efficiency. -High joint strength: Reflow resistance, shock resistance.</p> |

Product features

Figure 3 shows the features of each VLS series. VLS-HBU series achieves high withstand voltage by coating the metal core. VLS-EX-H series is designed for automotive applications with permissible operating temperature as high as 125°C.

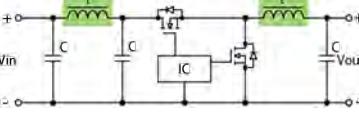
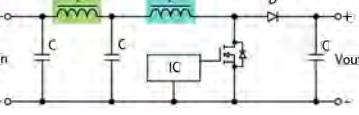
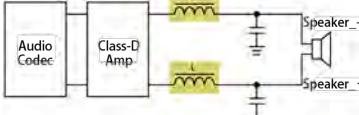
Figure 3: List of product features

| Series | VLS-HBX series | VLS-HBU series | VLS-CX series | VLS-EX series | VLS-AF series | VLS-EX-H series |
|------------------------------------|---|---|---|--|---|---|
| Appearance |  |  |  |  |  |  |
| Operating temperature range | -40 to 105°C (including self-temperature rise) | | -40 to 105°C (including self-temperature rise) | -40 to 105°C (including self-temperature rise) | | -40 to 125°C (including self-temperature rise) |
| Core | Metal | Metal + coating | Ferrite | Ferrite | | |
| External coating | External resin coating with metallic magnetic powder mixed in | | External resin coating with metallic magnetic powder mixed in | External resin coating with ferrite magnetic powder mixed in | | |
| Terminal electrode specifications | Silver electrode + plating | | Silver electrode + plating | Metal terminal + plating | | |
| Printing display / Printing method | Polarity / Laser | | Polarity / Laser | Polarity + L value / Laser | L value / Laser | Polarity + L value + Production code / Laser |
| Features | Standard specifications | High withstand voltage specifications with coated metal core | High withstand voltage specifications with ferrite core | Standard specifications | Sound quality improvement specifications |  Automotive application specifications |

Applications

Figure 4 shows which VLS series is optimum for which application circuit. VLS-HBU series is suitable for step-up type DC-DC converters and VLS-AF series is suitable for low-pass filter circuits for class-D amplifiers.

Figure 4: Applications and suitable products

| | DC-DC converter (Step-down type) | DC-DC converter (Step-up type) | Low-pass filter for class-D amplifiers |
|----------------|---|--|---|
| Applications |  |  |  |
| Product series | ■ VLS-HBX, VLS-CX, VLS-EX, VLS-EX-H ■ VLS-HBU ■ VLS-AF | | |

List of products

Figure 5 shows the list of products by series and by shape. You can view the detailed information of the product or purchase a sample by clicking the type name.

Figure 5: List of products

 Commercial grade  Automotive grade

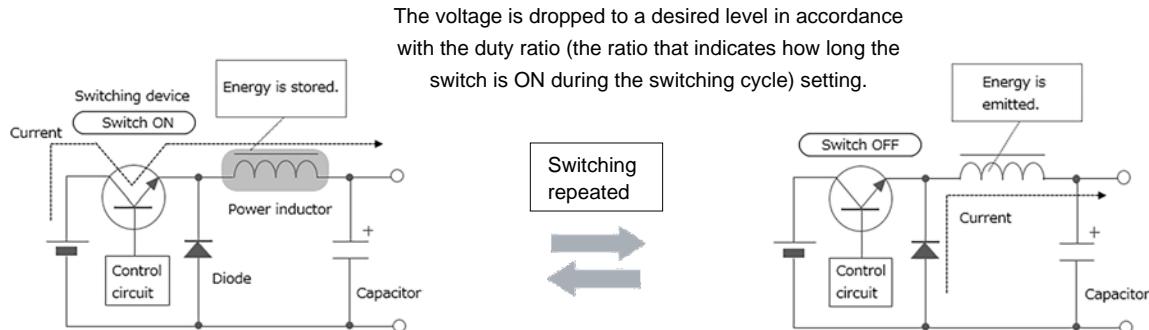
| Size (mm) | Height (mm) | VLS-HBX series | VLS-HBU series | VLS-CX series | VLS-EX series | VLS-AF series | VLS-EX-H series | |
|-----------|-------------|---|---|--|---|--|--|---|
| 2.0x1.6 | 1.0 Max. |  VLS201610HBX-1 | |  VLS201610CX-1 | | | | |
| | 1.2 Max. |  VLS201612HBX-1 | |  VLS201612CX-1 | | | | |
| 2.5x2.0 | 1.0 Max. |  VLS252010HBX-1 |  VLS252010HBU |  VLS252010CX-1 | | | | |
| | 1.2 Max. |  VLS252012HBX-1 |  VLS252012HBU |  VLS252012CX-1 | | | | |
| 3.0x3.0 | 1.2 Max. |  VLS3012HBX | |  VLS3012CX-1 | | | | |
| 4.0x4.0 | 1.2 Max. |  VLS4012HBX | | | | | | |
| 5.0x5.0 | 4.5 Max. | | | |  VLS5045EX | | | |
| 6.0x6.0 | 4.5 Max. | | | |  VLS6045EX |  D-Amp LPF |  VLS6045AF |  VLS6045EX-H Automotive(125°C) |

What are power inductors?

Power inductors are inductors used for power supply circuit such as DC-DC converters. They are also called power coils or power chocks. One of the inductors' characteristics is that they store energy by self-induction function. Chopper type DC-DC converters use inductors having such characteristics with switching devices for voltage conversion (see Figure 6).

Depending on the processing method, inductors can be classified into multilayer type, thin-film type, and wire-wound type. Since wire-wound type permits large current to flow, most of the power inductors are wire-wound type. Various wound-type power inductor products with ferrite or soft magnetic metal core are offered. Recently, the multilayer type and thin-film type, with which reduction of size and thickness can be achieved, are being improved to allow for larger current.

Figure 6: DC-DC converter (chopper type / step-down type) and inductor



Contact Information

Inquiries on products, sales, or technical matters

Related Links

[Inductor \(coil\) product information](#)



Various kinds of information on TDK Group's inductors (coils) are comprehensively provided on this page.

- [Lineup](#)
- [Inductors for high frequency applications Selection Guide](#)
- [Inductors for Power Circuits Selection Guide \(Commercial Grade\)](#)
- [Inductors for Power Circuits Selection Guide \(Automotive Grade\)](#)
- [Inductors for standard circuits/decoupling circuits Selection Guide](#)
- [Application Note "Selection Guide for Power Inductors in Consideration of Leakage Flux"](#)
- [Solution Guide "Solutions for silencing DC-DC converters - Measures Against Acoustic Noise in Power Inductors"](#)