1. Noise Suppression Devices AMOBEADS™

An amorphous noise suppression device is unique and completely different from conventional noise filters. Conventional noise prevention products focus on somehow minimizing the noise after it's been created, by typically trying to absorb the noise, and so their effectiveness in noise reduction is directly influenced by frequency of the circuit. Amorphous noise suppressing devices, on the other hand, focus on the source of the noise and work to prevent or minimize the noise before it has a chance to develop. The source of the electronic circuit noise is the rapid change of current or voltage, and the effectiveness of the amorphous cores in eliminating this noise is independent of frequency.

An amorphous noise suppression device is a product that takes full advantage of the unique magnetic characteristics of the cobalt based amorphous alloy. Toshiba Materials offers two noise suppression devices, "AMOBEADS™" and "SPIKE KILLER™". "AMOBEADS™" deliver excellent noise suppression characteristics of the cobalt based amorphous alloy. "AMOBEADS™" and "SPIKE KILLER™", which are larger in size than "AMOBEADS™", most often are wire wound and are effective in eliminating or minimizing higher noise levels.

Example for Noise Suppressing Effect (Chopper Converter)

With an excellent saturable characteristic, "AMOBEADS™" suppress the reverse recovery current of the diode and decrease the noise that is occurring. When the current for diode reverses and tries to go into the recovery condition, the "AMOBEADS™" displays a large inductance and oppose the generation of the recovery current. In this instance, a soft recovery is possible for core material with a smaller coercive force.

<table>
<thead>
<tr>
<th>AB4X2X6W</th>
<th>5.0±0.3</th>
<th>1.5</th>
<th>7.5</th>
<th>4.0</th>
<th>2.0</th>
<th>6.0</th>
<th>3.6</th>
<th>12.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB3X2X3W</td>
<td>4.0±0.3</td>
<td>1.5</td>
<td>6.0</td>
<td>3.0</td>
<td>2.0</td>
<td>3.0</td>
<td>0.9</td>
<td>3.0</td>
</tr>
<tr>
<td>AB2.8X4.5DY</td>
<td>4.0±0.2</td>
<td>5.7±0.3</td>
<td>0.9</td>
<td>3.0</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB5X4X3DY</td>
<td>5.95±0.2</td>
<td>4.2±0.3</td>
<td>0.45min</td>
<td>PBT Black</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB4X2X6DY</td>
<td>5.0±0.2</td>
<td>7.2±0.3</td>
<td>3.6min</td>
<td>PBT Black</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB3X2X3DY</td>
<td>4.0±0.2</td>
<td>4.2±0.3</td>
<td>0.9min</td>
<td>PBT Black</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB2.8X4.5DY</td>
<td>4.0±0.2</td>
<td>5.7±0.3</td>
<td>0.9min</td>
<td>PBT Black</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LB4X2X8U</td>
<td>20.0 max</td>
<td>4.0</td>
<td>3.0</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LB4X2X8F</td>
<td>16.0 max</td>
<td>4.2</td>
<td>3.0</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB4X2X6SM</td>
<td>6.0±0.3</td>
<td>8.0±0.3</td>
<td>5.0±0.3</td>
<td>(1.8×0.52)</td>
<td>3.6 min</td>
<td>12.0</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>AB3X2X3SM</td>
<td>5.0±0.3</td>
<td>5.0±0.3</td>
<td>4.0±0.3</td>
<td>(1.8×0.35)</td>
<td>0.9 min</td>
<td>3.0</td>
<td>2,000</td>
<td></td>
</tr>
</tbody>
</table>

Example for Noise Suppressing Effect (Chopper Converter)
1. Noise Suppression Devices

AMOBEADS™ are also available with a lead which results in devices, "AMOBEADS™" and "SPIKE KILLER™". AMOBEADS™ deliver excellent noise suppression characteristics of the cobalt based amorphous alloy. Toshiba Materials offers two noise suppression devices, An amorphous noise suppression device is a product that takes full advantage of the unique magnetic effectiveness of the amorphous cores in eliminating this noise is independent of frequency.

The source of the electronic circuit noise is the rapid change of current or voltage, and the work to prevent or minimize the noise before it has a chance to develop. Amorphous noise suppressing devices, on the other hand, focus in influenced by frequency of the circuit. Amorphous noise suppressing devices, on the other hand, focus created, by typically trying to absorb the noise, and so their effectiveness in noise reduction is directly on the source of the noise and work to prevent or minimize the noise before it has a chance to develop.

An amorphous noise suppression device is unique and completely different from conventional noise prevention products. Conventional noise prevention products focus on somehow minimizing the noise after it's been generated, by typically trying to absorb the noise, and so their effectiveness in noise reduction is directly influenced by frequency of the circuit.

Example for Noise Suppressing Effect (Chopper Converter)

When the current for diode reverses and tries to go into the recovery condition, the "AMOBEADS™" displays a large inductance and oppose the generation of the recovery current. In this instance, a soft recovery is possible for core material with a B-H Curve (typical)

-0.6

0.4

0.6

-0.2

0.2

0.4

-0.6

-1.0

-0.8

-0.6

-0.4

-0.2

0.0

-0.2

-0.4

-0.6

-0.8

-1.0


Without Countermeasure With AMOBEADSTM

<table>
<thead>
<tr>
<th>Type No.</th>
<th>O.D. [mm]</th>
<th>I. D. min [mm]</th>
<th>Core size [mm] x Thickness [mm]</th>
<th>Current [mA]</th>
<th>Total Flux [μWb]</th>
<th>AL value [μH]</th>
<th>Insulating Cover</th>
<th>Packing Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB3X2X3W</td>
<td>4.0</td>
<td>1.5</td>
<td>4.5</td>
<td>3.0</td>
<td>2.0</td>
<td>3.0</td>
<td>0.9</td>
<td>3.0</td>
</tr>
<tr>
<td>AB3X2X4.5W</td>
<td>4.0</td>
<td>1.5</td>
<td>6.0</td>
<td>3.0</td>
<td>2.0</td>
<td>4.5</td>
<td>1.3</td>
<td>5.0</td>
</tr>
<tr>
<td>AB4X2X4.5W</td>
<td>5.0</td>
<td>1.5</td>
<td>6.0</td>
<td>4.0</td>
<td>2.0</td>
<td>4.5</td>
<td>2.7</td>
<td>9.0</td>
</tr>
<tr>
<td>AB4X2X6W</td>
<td>5.0</td>
<td>1.5</td>
<td>7.5</td>
<td>4.0</td>
<td>2.0</td>
<td>8.0</td>
<td>3.6</td>
<td>12.0</td>
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<tr>
<td>AB4X2X8W</td>
<td>5.0</td>
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<td>4.0</td>
<td>2.0</td>
<td>8.0</td>
<td>4.8</td>
<td>16.0</td>
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</table>

![W series](Image 436x487 to 561x592)

### W series

**W series**

<table>
<thead>
<tr>
<th>Type No.</th>
<th>O.D. [mm]</th>
<th>I. D. min [mm]</th>
<th>Core size [mm] x Thickness [mm]</th>
<th>Current [mA]</th>
<th>Total Flux [μWb]</th>
<th>AL value [μH]</th>
<th>Insulating Cover</th>
<th>Packing Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB2.8X4.5DY</td>
<td>4.0±0.2</td>
<td>5.7±0.3</td>
<td>0.9min</td>
<td>PBT Black</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB3X2X3DY</td>
<td>4.0±0.2</td>
<td>4.2±0.3</td>
<td>0.9min</td>
<td>PBT Black</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB3X2X4.5DY</td>
<td>4.0±0.2</td>
<td>5.7±0.3</td>
<td>1.3min</td>
<td>PBT Gray</td>
<td>10,000</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AB4X2X6DY</td>
<td>5.0±0.2±0.3</td>
<td>7.2±0.3</td>
<td>3.6min</td>
<td>PBT Black</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB5X4X3DY</td>
<td>5.95±0.2</td>
<td>4.2±0.3</td>
<td>0.45min</td>
<td>PBT Black</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Inner diameter can pass through a 1.2X0.7mm lead.

### AMOBEADS™ with lead

**Bulk type**

<table>
<thead>
<tr>
<th>Type No.</th>
<th>O.D. [mm]</th>
<th>I. D. min [mm]</th>
<th>Core size [mm] x Thickness [mm]</th>
<th>Current [mA]</th>
<th>Total Flux [μWb]</th>
<th>AL value [μH]</th>
<th>Insulating Cover</th>
<th>Packing Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB4X2X8F</td>
<td>16.0max</td>
<td>4.2±0.5</td>
<td>14.0±1.0</td>
<td>(8.0)</td>
<td>4.8 min</td>
<td>16.0 min</td>
<td>PBT case Black</td>
<td>1,000</td>
</tr>
<tr>
<td>LB4X2X8U</td>
<td>20.0max</td>
<td>4.0±0.5</td>
<td>5.0±1.0</td>
<td>1.0</td>
<td>0.9min</td>
<td>3.0</td>
<td>PBT case Black</td>
<td>3,000</td>
</tr>
</tbody>
</table>

### Radial taping

<table>
<thead>
<tr>
<th>Type No.</th>
<th>P [mm]</th>
<th>Po [mm]</th>
<th>Do [mm]</th>
<th>a [mm]</th>
<th>d [mm]</th>
<th>Current [mA]</th>
<th>Total Flux [μWb]</th>
<th>AL value [μH]</th>
<th>Insulating Cover</th>
<th>Packing Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB2.8X4.5U</td>
<td>12.7</td>
<td>12.7</td>
<td>φ4.0</td>
<td>9.0max</td>
<td>φ0.8</td>
<td>(5)</td>
<td>0.9min</td>
<td>3,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SMD Type AMOBEADS™

<table>
<thead>
<tr>
<th>Type No.</th>
<th>O.D. [mm]</th>
<th>I. D. min [mm]</th>
<th>Core size [mm] x Thickness [mm]</th>
<th>Current [mA]</th>
<th>Total Flux [μWb]</th>
<th>AL value [μH]</th>
<th>Insulating Cover</th>
<th>Packing Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB3X2X3SM</td>
<td>5.0±0.3</td>
<td>5.0±0.3</td>
<td>4.0±0.3</td>
<td>(1.8±0.35)</td>
<td>0.9 min</td>
<td>3.0</td>
<td>LCP case Black</td>
<td>2,000</td>
</tr>
<tr>
<td>AB4X2X6SM</td>
<td>6.0±0.3</td>
<td>8.0±0.3</td>
<td>5.0±0.3</td>
<td>(1.8±0.52)</td>
<td>3.0 min</td>
<td>12.0</td>
<td>LCP case Black</td>
<td>1,000</td>
</tr>
</tbody>
</table>

- 1 Reference Value
- 2 Minimum Guarantee on Measuring Condition : 50kHz, 80A/m (sine wave), R.T.
- 3 Measuring Condition: 50kHz, 1V, 1 turn, R.T.
- 4 Typical Value, using a cross section of lead
- 5 Measuring Condition: 100kHz, 80A/m (sine wave), R.T. ±6 Tolerance ±0.2[mm]
- 7 Converted from Inductance Value L at 1kHz, 100mA (sine wave), R.T.

φc(μWb) = 0.282 x L1(μH)

AMOBEADS™ sample kits are available. Please ask sales department.

AMOBEADS™ and “SPIKE KILLER™” are Registered trademarks of TOSHIBA MATERIALS Co., Ltd.

AMOBEADS™ and “SPIKE KILLER™” are Resistered in U.S.A., France, Germany, U.K., Japan.

RoHS compliant products

Standard Specifications

RoHS compliant products

AB / LB Series
Examples of Applied Circuits and their Characteristics

Application of Amorphous Noise Suppression Devices

Chopper Converter

Control Circuit for Motor

Flyback Converter

Motor Driving Circuit

Forward Converter

Push-pull Converter

Characteristics (Typical value)

Coreloss Characteristic [AMOBEADS™]

Frequency Characteristics of Inductance

Flux(φ) Decline Ratio vs. Temperature
Effects of Noise Suppression by AMOBEADS™

Spike Voltage Suppression

Spike voltage can be reduced and ringing phenomena can also be prevented by AMOBEADS. Also Schottky barrier diode (SBD) can be protected from over voltage.

Frequency: 500kHz
Output Voltage - Current: -5V-20A

Diode Voltage
V₀ 10V/div

Diode Current
I₀ 5A/div

Output Noise Reduction

When the ferrite is replaced by AMOBEADS at the secondary output diode (FRD) of the forward converter circuit, the output noise can be tremendously reduced, not only the noise peak level but also the amplitude range.

Frequency: 150kHz
Output Voltage - Current: -15V-10A

Output Noise
Vₙ 20mv/div

Primary Surge Voltage

When the ferrite is replaced by AMOBEADS at the secondary output diode (SBD) of the forward converter circuit, the output noise and harmful influence to the primary stage can be reduced. These effects are based on the inclination of the actual BH curves between amorphous and ferrite materials.

Frequency: 250kHz
Output Voltage - Current: -5V-15A

Output Noise
Vₙ 50mv/div

Actual BH Curve

BH characteristics of Ferrite

BH characteristics of Amobeads