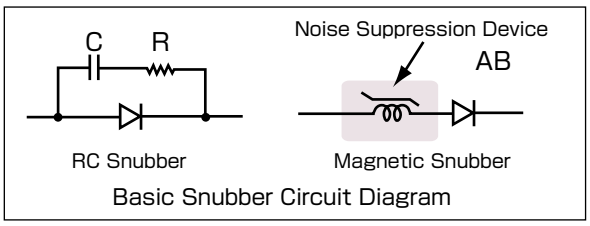
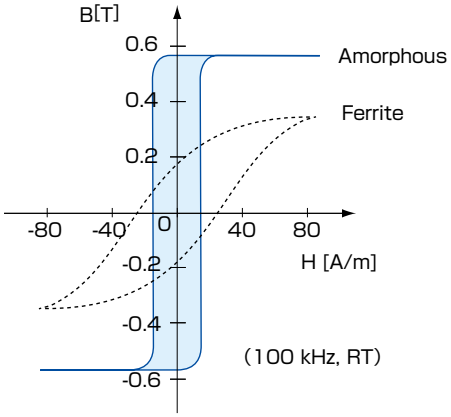
1. Noise Suppression Devices AMOBEADS™

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.

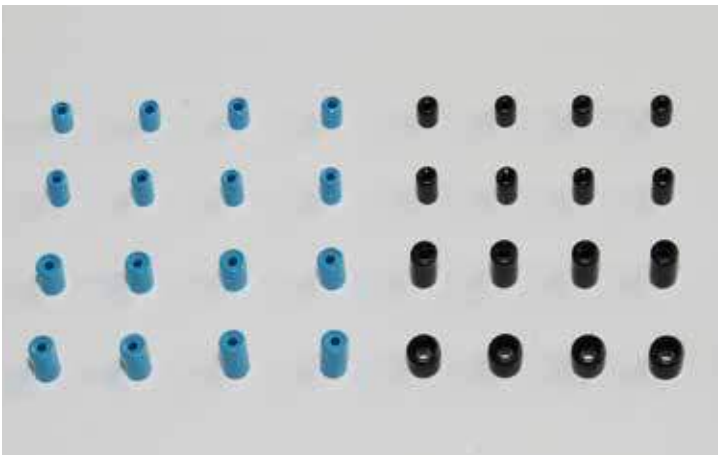
An amorphous noise suppression device is a product that takes full advantage of the unique magnetic characteristics of the cobalt based amorphous alloy. Toshiba Materials offers two noise suppression devices, "AMOBEADS™ " and "SPIKE KILLERS™ ". AMOBEADS™ " deliver excellent noise suppression results and are convenient to use by simply being slipped over the leads of the semiconductor device. "AMOBEADS™ " are also available with a lead thru and in a surface mount configuration. "SPIKE KILLERS™ ", which are larger in size than "AMOBEADS™ ", most often are wire wound and are effective in eliminating or minimizing higher noise levels.



Basic Snubber Circuit Diagram

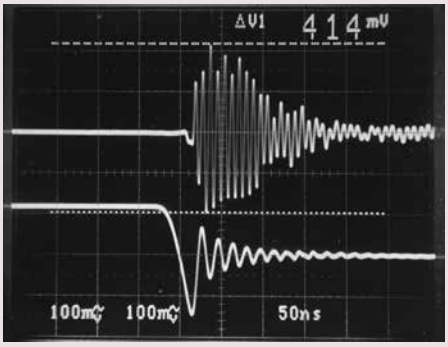


B-H Curve (typical)



Example for Noise Suppressing Effect (Chopper Converter)

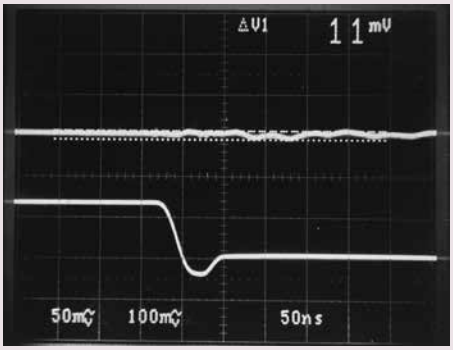
With an excellent saturable characteristic, "AMOBEADS™ " suppress the reverse recovery current of the diode and decrease the noise that is occurring. When the current for diode reverses and tries to go into the recovery condition, the "AMOBEADS™ " displays a large inductance and oppose the generation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



Without Countermeasure

Output Noise

Diode Current
1A/div



With AMOBEADS™
(AB4×2×8W)

Standard Specifications

AMOBEADS™

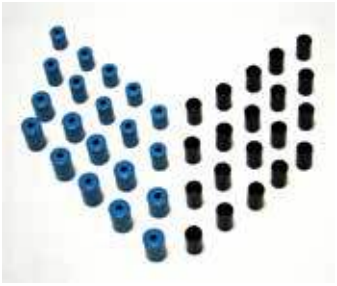
W series

Type No.	Finished Dimensions [mm]			Core Size [mm]*1			Total Flux*2	AL value*3	Insulating Cover	Packing Unit
	O.D. max	I. D. min	H.T. max	O.D.	I. D.	H.T.	ϕc[μWb] min	L[μH] min		
AB3X2X3W	4.0	1.5	4.5	3.0	2.0	3.0	0.9	3.0	PBT case Blue	2,000 [pcs/box]
AB3X2X4.5W	4.0	1.5	6.0	3.0	2.0	4.5	1.3	5.0		
AB4X2X4.5W	5.0	1.5	6.0	4.0	2.0	4.5	2.7	9.0		
AB4X2X6W	5.0	1.5	7.5	4.0	2.0	6.0	3.6	12.0		
AB4X2X8W	5.0	1.5	9.5	4.0	2.0	8.0	4.8	16.0		

DY series (low price) (Recommend for big demand, 10,000pcs/lot)

Type No.	Finished Dimensions [mm]		Total Flux*7	Insulating Cover	Packing Unit [pcs/bag]
	O.D.	H.T.	ϕc[μWb]		
AB2.8X4.5DY	4.0±0.2	5.7±0.3	0.9min	PBT Black	10,000
AB3X2X3DY	4.0±0.2	4.2±0.3	0.9min	PBT Black	10,000
AB3X2X4.5DY	4.0±0.2	5.7±0.3	1.3min	PBT Gray	10,000
AB4X2X6DY	5.0+0.2/-0.3	7.2±0.3	3.6min	PBT Black	5,000
AB5X4X3DY	5.95±0.2	4.2±0.3	0.45min	PBT Black	5,000

※Inner diameter can pass through a 1.2X0.7mm lead.
However, Inner diameter of AB5x4x3DY can pass through a 2.5x0.7 mm lead.

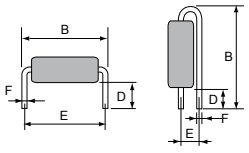


W series DY sereis

AMOBEADS™ with lead

Bulk type

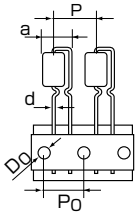
Type No.	Finished Dimensions [mm]				Current*4 [A]	Total flux*2 ϕc[μWb]	AL Value*3 L[μH]	Insulating Cover	Packing Unit
	B	D	E	F					
LB4X2X8F	16.0max	4.2±0.5	14.0±1.0	ϕ1.25±0.1	(8.0)	4.8 min	16.0 min	PBT case Black	1,000 [pcs/box]
LB4X2X8U	20.0max	4.0±0.5	5.0±1.0	ϕ1.25±0.1					



LB4X2X8F LB4X2X8U

Radial taping

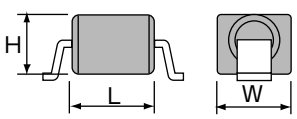
Type No.	P [mm]	Po [mm]	Do [mm]	a [mm]	d [mm]	Current*4 I [A]	Total Flux*7 ϕc[μWb]	Packing Unit
LB2.8X4.5U	12.7	12.7	ϕ4.0	9.0max	ϕ0.8	(5)	0.9min	3,000 [pcs/box]

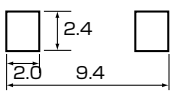


SMD Type AMOBEADS™

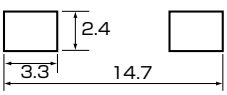
Type No.	Finished Dimensions [mm]			Lead width x thickness	Io*4 [A]	Total Flux*2 ϕc[μWb]	AL value*3 L[μH]	Insulating Cover	Packing Unit [pcs/reel]
	width	length	height						
AB3X2X3SM	5.0±0.3	5.0±0.3	4.0±0.3	(1.8×0.35)	(6.0)	0.9 min	3.0	LCP case Black	2,000
AB4X2X6SM	6.0±0.3	8.0±0.3	5.0±0.3	(1.8×0.52)	(9.0)	3.6 min	12.0		1,000

Recommended Land Pattern (mm)





AB3X2X3SM

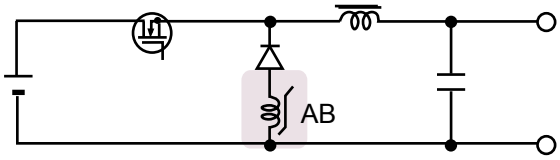


AB4X2X6SM

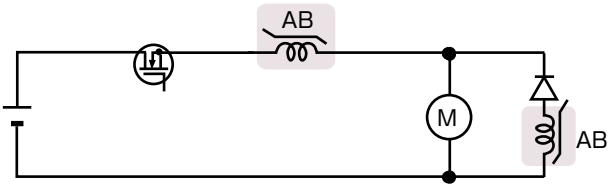
∗1 Reference Value ∗2 Minimum Guarantee on Measuring Condition : 50kHz、80A/m(sine wave), R.T.
∗3 Measuring Condition:50kHz, 1V, 1turn, R.T.
∗4 Typical Value, using a cross section of lead
∗5 Measuring Condition:100kHz, 80A/m(sine wave), R.T. ∗6 Tolerance ±0.2[mm]
∗7 Converted from Inductance Value L_1 at 1kHz、100mA(sine wave)、R.T.
ϕc(μWb)=0.282 x L_1(μH)

Examples of Applied Circuits and their Characteristics

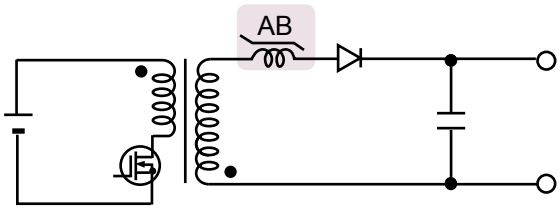
Application of Amorphous Noise Suppression Devices



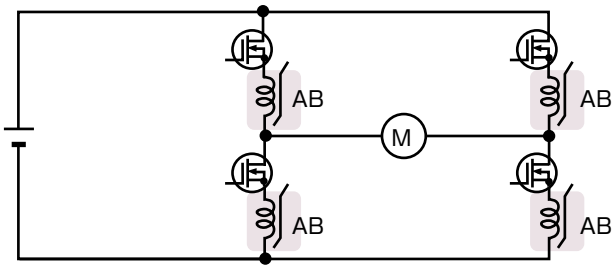
Chopper Converter



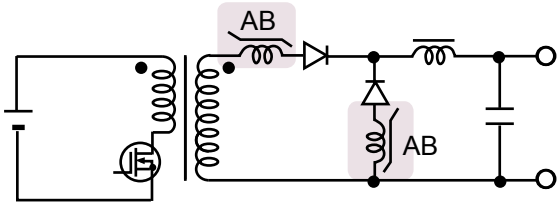
Control Circuit for Motor



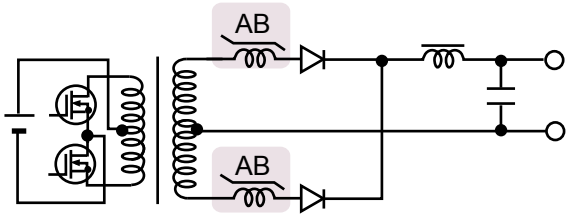
Flyback Converter



Motor Driving Circuit

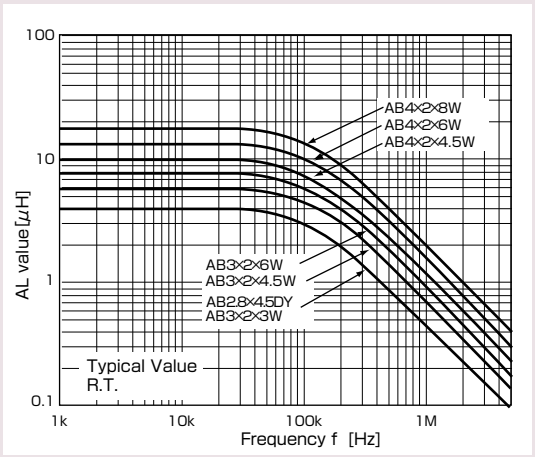


Forward Converter

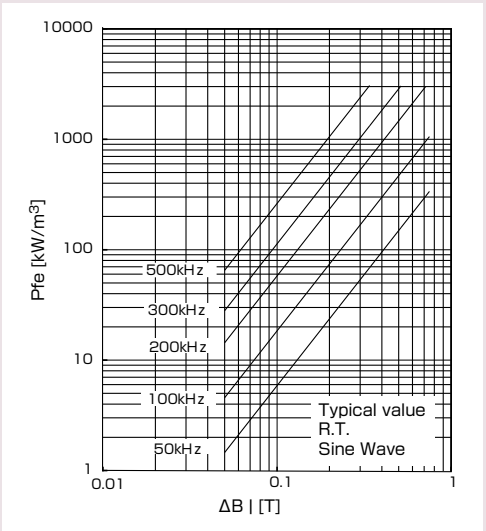


Push-pull Converter

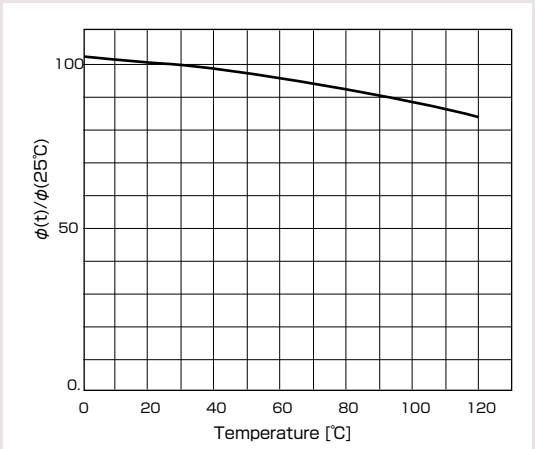
Characteristics (Typical value)



Frequency Characteristics of Inductance



Coreloss Characteristic [AMOBEADS™]



Flux(ϕ) Decline Ratio vs. Temperature

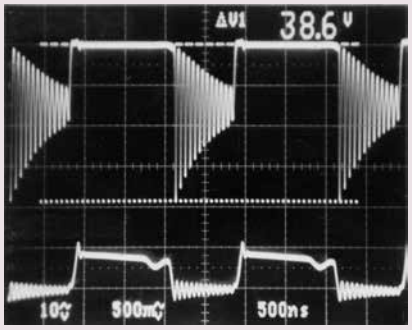
Effects of Noise Suppression by AMOBEADS™

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

Without Countermeasure



AMOBEADS™ "AB4×2×4.5W"

Diode Voltage
V_D
10V/div

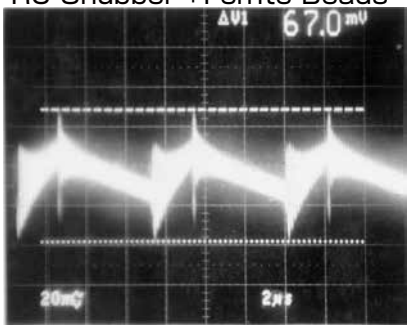
Diode Current
I_D
5A/div

Output Noise Reduction

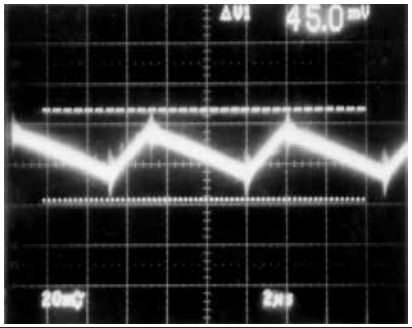
When the ferrite is replaced by AMOBEADS at the secondary output diode (FRD) of the forward converter circuit, the output noise can be tremendously reduced, not only the noise peak level but also the amplitude range.

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

RC Snubber +Ferrite Beads



AMOBEADS™ "AB4×2×4.5W"



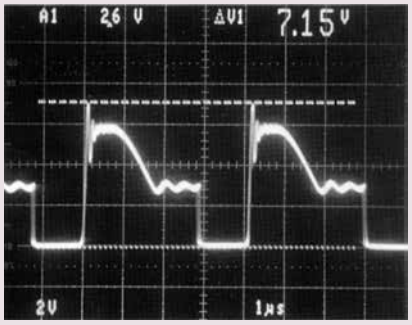
Output Noise
V_N
20mv/div

Primary Surge Voltage

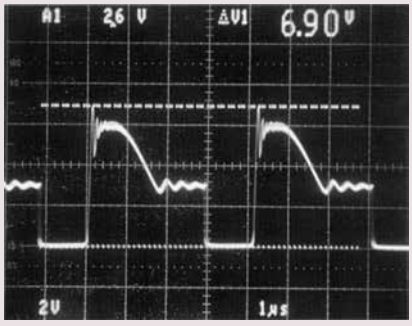
When the ferrite is replaced by AMOBEADS at the secondary output diode (SBD) of the forward converter circuit, the output noise and harmful influence to the primary stage can be reduced. These effects are based on the inclination of the actual BH curves between amorphous and ferrite materials.

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

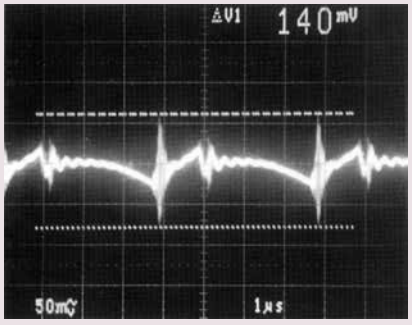
Ferrite Beads 4×2×4

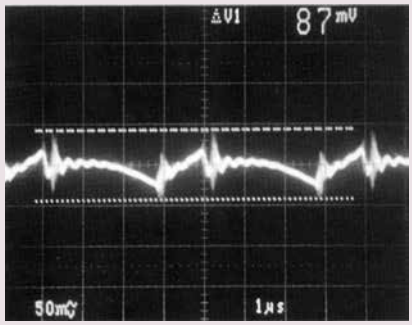


AMOBEADS™ "AB4×2×4.5W"



MOS-FET
Drain-Source
Voltage
V_{DS}
200V/div

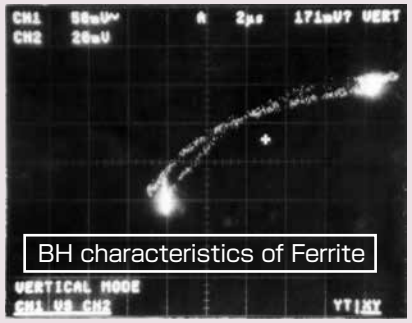




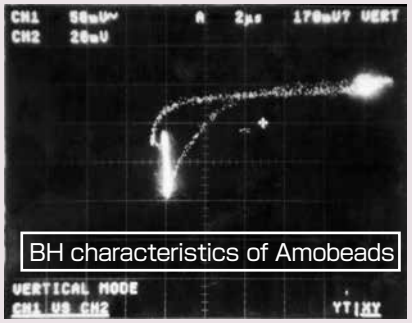
Output Noise
V_N
50mv/div

Output Noise

Actual BH Curve



B
H



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