

Introduction to

DC-DC Converter and LED Driver

2021-03-04



Inductor



Resistor



Powder



RF



ISO9001 ISO14001 IATF16949

Agenda (DC-DC Converter)

- ◆ A briefing of DC-DC Converter
- ◆ Advantages
- ◆ Target applications and DC-DC Converter Solutions
- ◆ Key spec. selection guide
- ◆ Naming rule for DC-DC Converter



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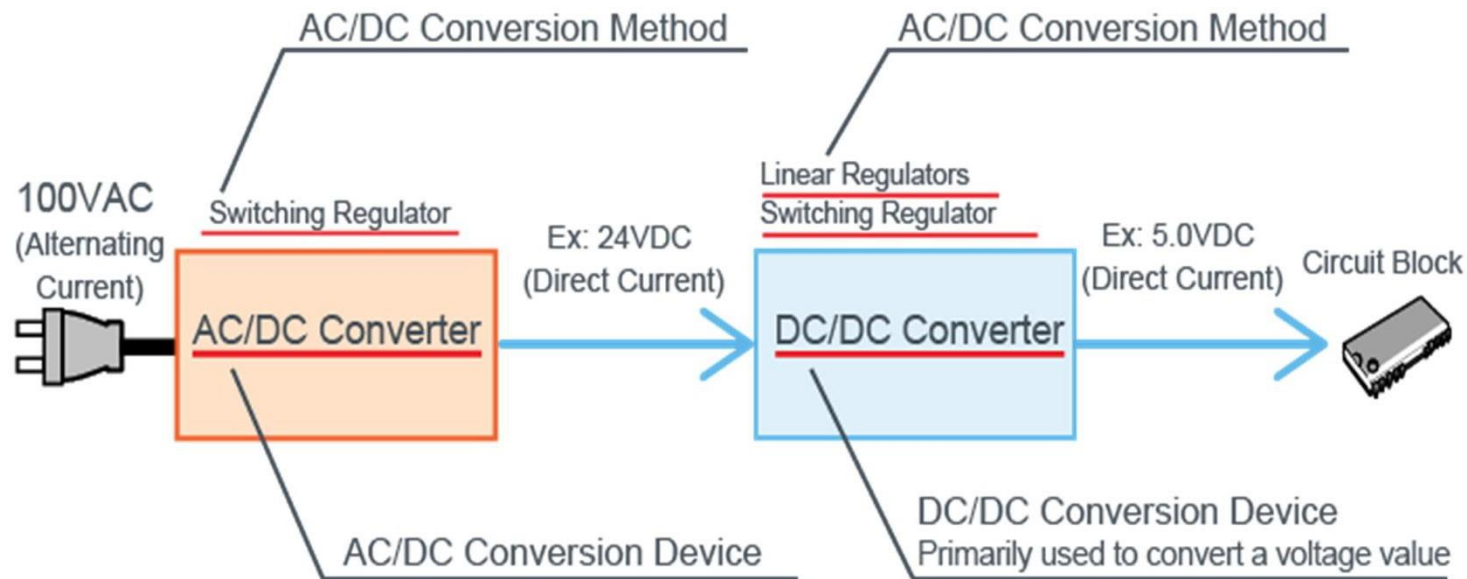


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What is DC/DC Converter ?

◆ DC/DC Converter

As its name implies, a DC-DC converter converts one DC voltage to another.



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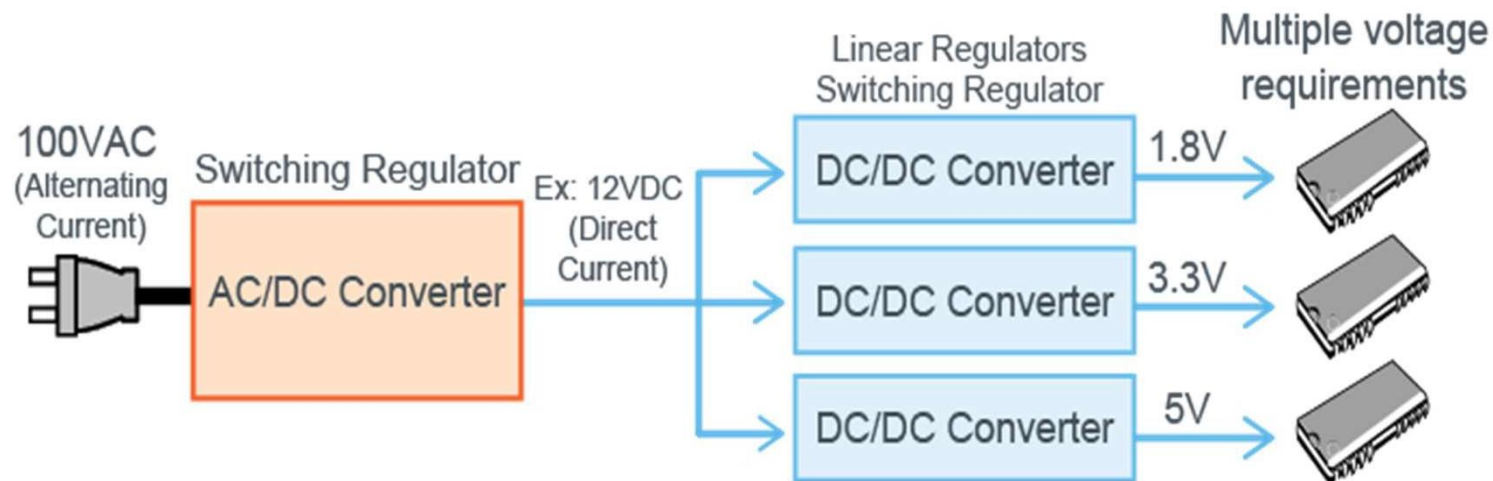
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Why do you use a DC/DC Converter ?

- ◆ The operating voltage of different electronic devices such as ICs can vary over a wide range, making it necessary to provide specific voltage for specific device.



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Typical types of DC-DC Converter

- ◆ Isolated
- ◆ Non-isolated

	Forward	Flyback
Transformer (isolation)	<u>one or more output voltage(0~75w)</u>	<u>one or more output voltage(0~50w)</u>
Transformerless (non-isolated)	Buck type: The output voltage is smaller than the input voltage and the polarity is the same.	Boost type: The output voltage is larger than the input voltage.



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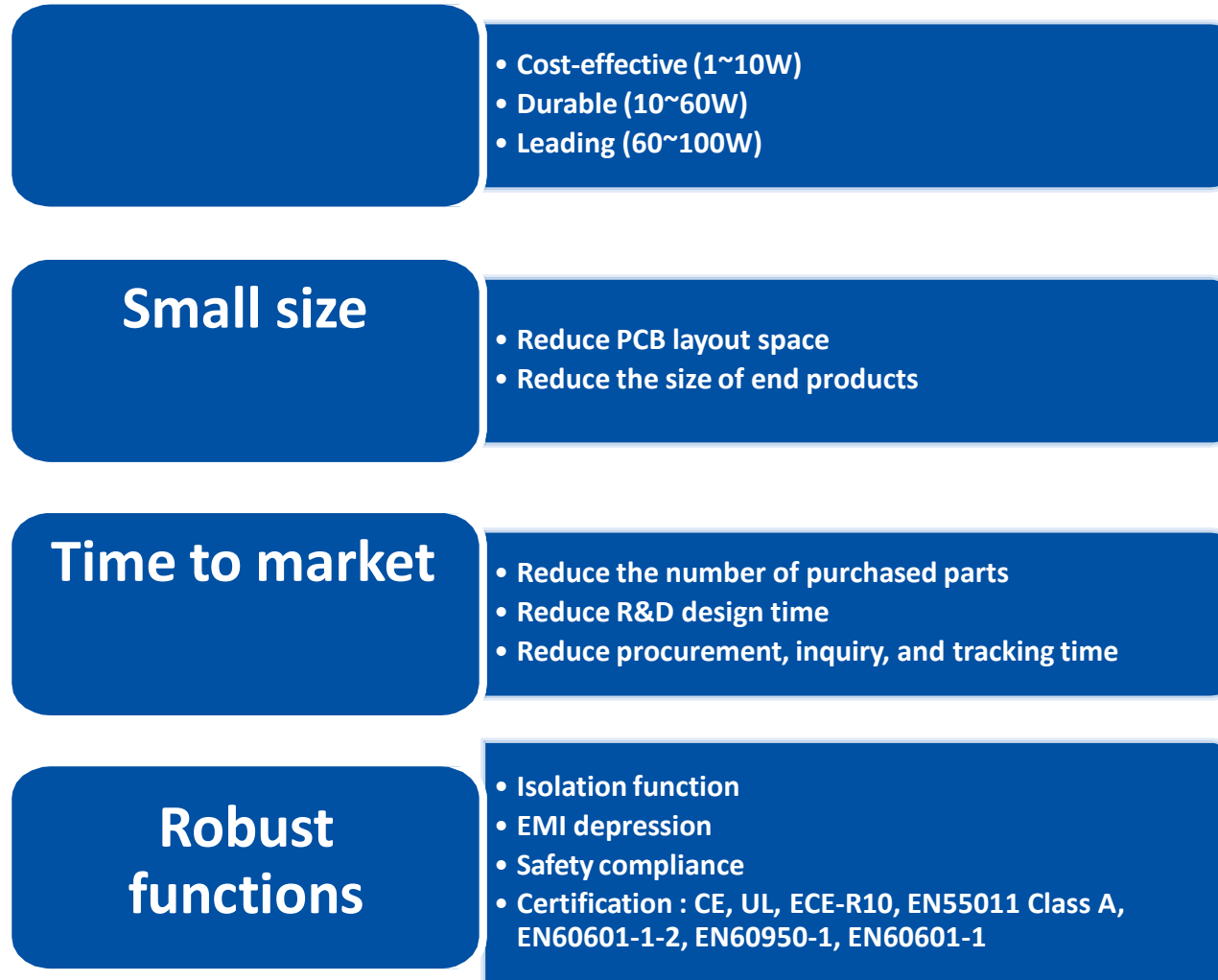


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Advantages



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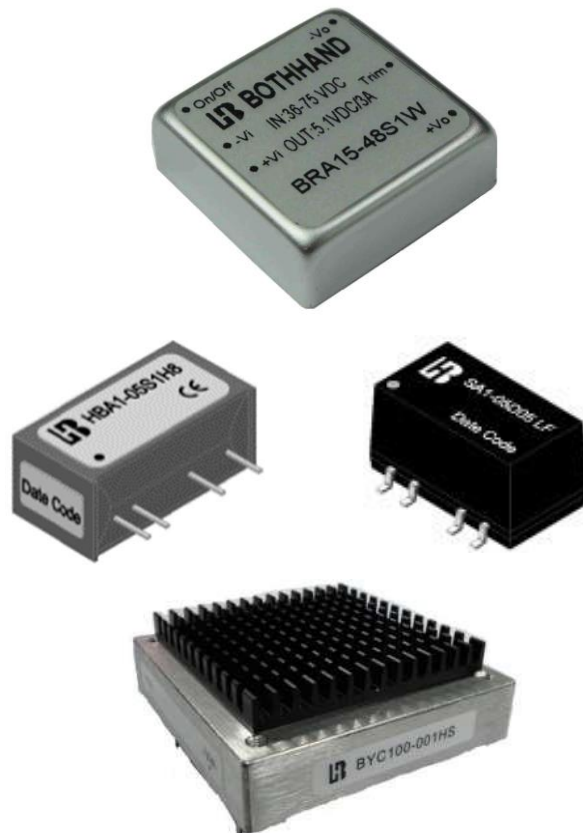
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Target form factors

Encapsulated
(SMD, DIP, SIP and etc.)



Brick (TBD)



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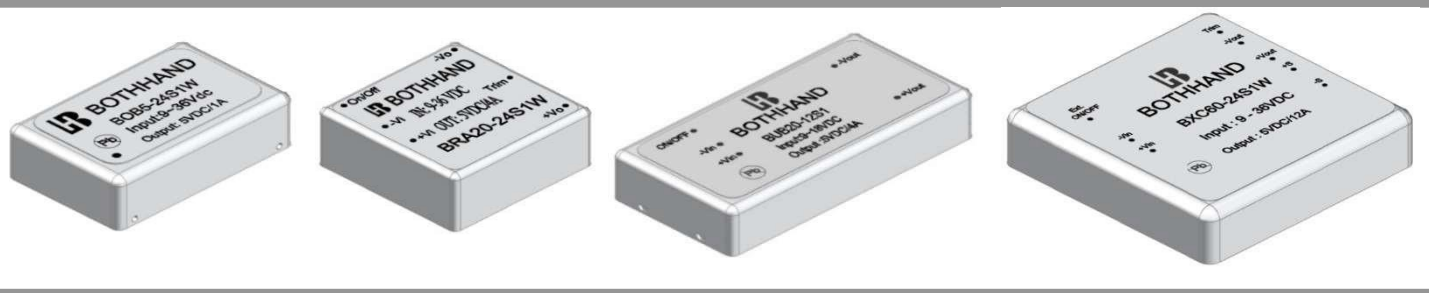
ISO9001 ISO14001 IATF16949

Typical Applications and offering brief

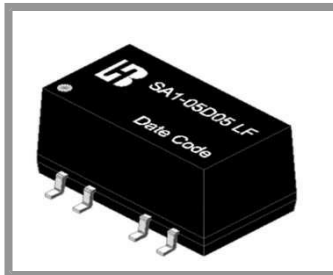
Typical Applications

Automation and industrial control equipment, HMI, PLC, I/O communication board, PV Inverter, Inverter, Industrial meter, Smart meter, Industrial network and communication equipment, Industrial PC, Surveillance, Power monitoring equipment, Medical equipment, Outdoor LED lighting, Power module for electric motorcycle, BMS and power module for electric vehicle, In-vehicle system, Rail transit system, etc.

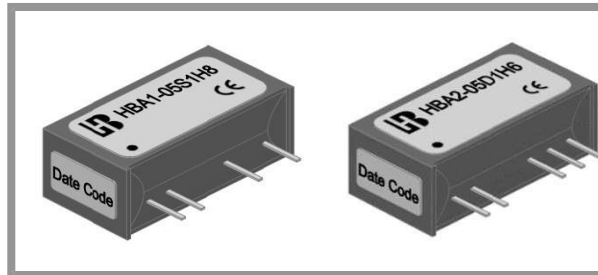
Wide range input (2:1, 4:1)



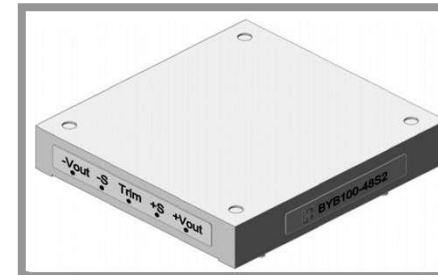
1 Watt SMD



1~2 Watts isolation Voltage: 8KVDC



100 Watts



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Available series

Output Power (W)	Package	Isolation	Non-isolation	Regulated	Non-regulated
1~3	SIP	V	V	V	
3~8	DIP	V	V	V	
6~10	1" X 1"	V	V	V	
5~30	1" X 2"	V	V	V	
25~40	1.6" X 2"	V	V	V	
40~60	2" X 2"	V	V	V	
100	2.4" X 2.3"	V	V	V	
1	SMD	V	V		V
1~2	SIP	V	V		V
1.5~24	DIP	V	V	V	



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Isolated offerings-1~2W

Chilisin (Series)	Isolated/ Non-isolated	Output power	Package	Input Voltage	Output Voltage	Isolation Voltage	Operating temperature	BOTHHAND (Series)
BTD2_011SA1Z	Isolated	1	SMD	5,12, 24	5, 12, 15	1K	Operating temperature range: -40°C to + 85°C	SA1
BTD2_013SA1Z	Isolated	1	SMD	5,12, 24	5, 12, 15	3K	Operating temperature range: -40°C to + 85°C	SA1
BTD2_012SD1Z	Isolated	1	SMD	4.5~5.5, 10.8~13.2, 21.6~26.4	3.3, 5, 9, 12, 15	1.5K	Operating temperature range: -40°C to + 105°C	SD1(P)
BTD2_012DQAZ	Isolated	1	SIP	2.97~3.63, 4.5~5.5, 10.8~13.2, 13.5~16.5, 21.6~26.4	3.3, 5, 12, 15	1.5K	Operating temperature range: -40°C to + 105°C	DQA1(P)
BTD1_012DHAY	Isolated	1	SIP	4.5~5.5, 10.8~13.2, 13.5~16.5, 21.6~26.4	5, 12, 15	1.5K	Operating temperature range: -40°C to + 85°C	DHA1
BTD1_013DHBY	Isolated	1	SIP	4.5~5.5, 10.8~13.2, 21.6~26.4	5, 12, 15	3K	Operating temperature range: -40°C to + 85°C	DHB1(H3)
BTD2_012DKAZ	Isolated	1	SIP	4.5~5.5, 10.8~13.2, 21.6~26.4	3.3, 5, 12, 15, 24, ± 5 , ± 9 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 105°C	DKA1(P)
BTD2_013DKBZ	Isolated	1	SIP	2.97~3.63, 4.5~5.5, 10.8~13.2, 21.6~26.4	3.3, 5, 12, 15, ± 5 , ± 9 , ± 12 , ± 15	3K	Operating temperature range: -40°C to + 105°C	DKB1(PH3)
BTD2_016HBAZ	Isolated	1	SIP	4.5~5.5, 10.8~13.2, 21.6~26.4	5, 12, 15, ± 5 , ± 12 , ± 15	6.4K	Operating temperature range: -40°C to + 85°C	HBA1(H6)
BTD2_022SR2Z	Isolated	2	SMD	4.5~5.5, 10.8~13.2, 21.6~26.4	5, 12, 15	1.5K	Operating temperature range: -40°C to + 105°C	SR2(P)
BTD2_022DHAY	Isolated	2	SIP	4.5~5.5, 10.8~13.2, 13.5~16.5, 21.6~26.4	5, 12	1.5K	Operating temperature range: -40°C to + 85°C	DHA2
BTD2_023DHBY	Isolated	2	SIP	4.5~5.5, 10.8~13.2, 13.5~16.5, 21.6~26.4	5, 12	3K	Operating temperature range: -40°C to + 85°C	DHB2(H3)
BTD2_022DKAZ	Isolated	2	SIP	4.5~5.5, 10.8~13.2, 21.6~26.4	5, 9, 12, 15, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 105°C	DKA2(P)
BTD2_023DKBZ	Isolated	2	SIP	4.5~5.5, 10.8~13.2, 21.6~26.4	5, 12, 15, ± 5 , ± 12 , ± 15	3K	Operating temperature range: -40°C to + 105°C	DKB2(H3)
BTD2_026HBAZ	Isolated	2	SIP	4.5~5.5, 10.8~13.2, 21.6~26.4	5, 12, 15, ± 5 , ± 12 , ± 15	6.4K	Operating temperature range: -40°C to + 85°C	HBA2(H6)



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Isolated offerings-3~8W

Chilisin (Series)	Isolated/ Non-isolated	Output power	Package	Input Voltage	Output Voltage	Isolation Voltage	Operating temperature	BOTHHAND (Series)
BTD1_032SDBW	Isolated	3	SMD	9~36, 18~75	3.3, 5, 12, 15, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	SDB3(W)
BTD1_033CEAX	Isolated	3	SIP	4.5~9, 9~18, 18~36, 36~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	3K	Operating temperature range: -40°C to + 85°C	CEA3(H3)
BTD1_032BOBX	Isolated	3	DIP	9~18, 18~36, 36~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BOB3
BTD1_032BOBW	Isolated	3	DIP	9~36, 18~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BOB3(W)
BTD1_052BOBX	Isolated	5	DIP	9~18, 18~36, 36~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BOB5
BTD1_052BOBW	Isolated	5	DIP	9~36, 18~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BOB5(W)
BTD1_056HAAX	Isolated	5	DIP	9~18, 18~36	3.3, 5, 12, $\pm 12, \pm 15$	6K	Operating temperature range: -40°C to + 85°C	HAA5(H6)
BTD1_052MUAX	Isolated	5	DIP	9~18, 18~36, 36~75	5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -55°C to + 95°C	MUA5
BTD1_062HOBW	Isolated	6	DIP	9~36, 18~75	5, 12	1.5K	Operating temperature range: -40°C to + 85°C	HOB6(W)
BTD1_062BRNX	Isolated	6	DIP	9~18, 18~36, 36~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BRN6
BTD1_062BRNW	Isolated	6	DIP	9~36, 18~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BRN6(W)
BTD1_062ERNW	Isolated	6	DIP	9~36, 18~75	5	1.5K	Operating temperature range: -40°C to + 85°C	ERN6(W)
BTD1_081SOBX	Isolated	8	SMD	9~18, 18~36, 36~75	3.3, 5, 12, 15, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	SOB8
BTD1_082BOBX	Isolated	8	DIP	9~18, 18~36, 36~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BOB8
BTD1_082BOBW	Isolated	8	DIP	9~36, 18~75	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	BOB8(W)
BTD1_082ROBW	Isolated	8	DIP	43~160	3.3, 5, 12, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	ROB8(W)
BTD1_082HOBX	Isolated	8	DIP	9~18, 18~36, 36~75	3.3, 5, 12, 15, $\pm 5, \pm 12, \pm 15$	1.5K	Operating temperature range: -40°C to + 85°C	HOB8



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Isolated offerings-10~100W

Chilisin (Series)	Isolated/ Non-isolated	Output power	Package	Input Voltage	Output Voltage	Isolation Voltage	Operating temperature	BOTHHAND (Series)
BTD1_0A2BRNX	Isolated	10	DIP	9~18, 18~36, 36~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BRN10
BTD1_0A2BRNW	Isolated	10	DIP	9~36, 18~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BRN10(W)
BTD1_0A2ERNW	Isolated	10	DIP	9~36, 18~75	5	1.5K	Operating temperature range: -40°C to + 85°C	ERN10(W)
BTD1_0A2HUBX	Isolated	10	DIP	9~18, 18~36, 36~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	HUB10
BTD1_0C2HUBX	Isolated	12	DIP	9~18, 18~36, 36~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	HUB12
BTD1_0C2BUBW	Isolated	12	DIP	9~36, 18~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BUB12(W)
BTD1_0F2BUAX	Isolated	15	DIP	9~18, 18~36, 36~75	3.3, 5, 1, 12, ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 71°C	BUA15(L)
BTD1_0F2BUBX	Isolated	15	DIP	9~18, 18~36, 36~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BUB15
BTD1_0F2BUBW	Isolated	15	DIP	9~36, 18~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BUB15(W)
BTD1_142BUBX	Isolated	20	DIP	9~18, 18~36, 36~75	3.3, 5, 12, ± 3.3 , ± 5 , ± 12	1.5K	Operating temperature range: -40°C to + 85°C	BUB20
BTD1_142BUBW	Isolated	20	DIP	9~36, 18~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BUB20(W)
BTD1_192BVAX	Isolated	25	DIP	9~18, 18~36, 36~75	3.3, 5, 12, 15, ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BVA25
BTD1_1E2BUCX	Isolated	30	DIP	9~18, 18~36, 36~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BUC30
BTD1_1E2BVAW	Isolated	30	DIP	9~36, 18~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BVA30(W)
BTD1_282BWAX	Isolated	40	DIP	9~18, 18~36, 36~75	3.3, 5, 12, ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BWA40(HS)
BTD1_282BWCW	Isolated	40	DIP	9~36, 18~75	3.3, 5, 12, ± 5 , ± 12 , ± 15	1.5K	Operating temperature range: -40°C to + 85°C	BWC40(WHS)
BTD1_3C2BXCW	Isolated	60	DIP	9~36, 18~75	3.3, 5, 12, 15	1.5K	Operating temperature range: -40°C to + 85°C	BXC60(W)
BTD1_3C2BWCX	Isolated	60	DIP	18~36, 36~75	3.3, 5, 12, 15	1.5K	Operating temperature range: -40°C to + 85°C	BWC60
BTD1_642BYBX	Isolated	100	DIP	36~75	12, 24, 28, 48	1.5K	Operating temperature range: -40°C to + 85°C	BYB100
BTD1_642BYCX	Isolated	100	DIP	38~58	12	1.5K	Operating temperature range: -40°C to + 85°C	BYC100



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Non-isolated offerings

Chilisin (Series)	Isolated/ Non-isolated	Output power	Package	Input Voltage	Output Voltage	Operating temperature	BOTHHAND (Series)
BTD0_02078EC	Non-isolated	1.65~7.5	DIP	4.75~30, 6.5~36, 15~36	3.3, 5, 12	Operating temperature range: -40°C to + 85°C	B78E
BTD0_02078HC	Non-isolated	1.65~12	DIP	9~72, 14~72, 20~72, 36~72	3.3, 5, 9, 12, 15, 24	Operating temperature range: -40°C to + 85°C	B78HB
BTD0_03078EC	Non-isolated	3.3~15	DIP	4.75~30, 6.5~36, 15~36, 18~36	3.3, 5, 12, 15	Operating temperature range: -40°C to + 85°C	B78E
	Non-isolated	3.3~15	DIP				B78E
	Non-isolated	3.3~15	DIP				B78E
	Non-isolated	3.3~15	DIP				B78E
BTD0_05078OC	Non-isolated	4.95~12	DIP	7~36, 15~36	3.3, 5, 12	Operating temperature range: -40°C to + 85°C	B78O
	Non-isolated	4.95~12	DIP				B78O
BTD0_07078CC	Non-isolated	6.6~10	DIP	4.75~30, 6.5~36	3.3, 5	Operating temperature range: -40°C to + 85°C	B78C



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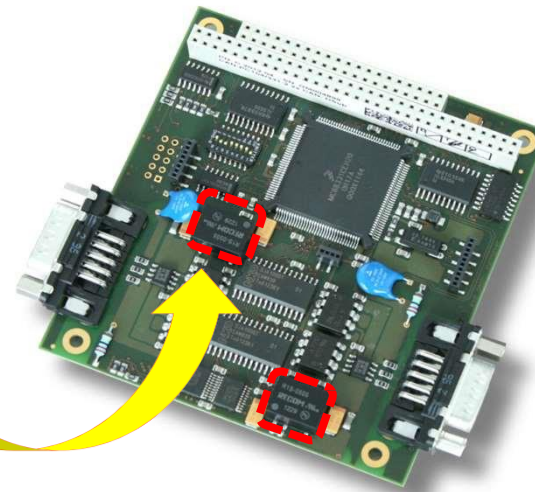
Target segments in EV applications

◆ Target segments

- Driving motor (IGBT Driver)
- CAN bus interface cards
- Converting requirements from 12/24 Vdc to other DC voltages for specific devices or ICs



DC-DC Converter



EV Motor



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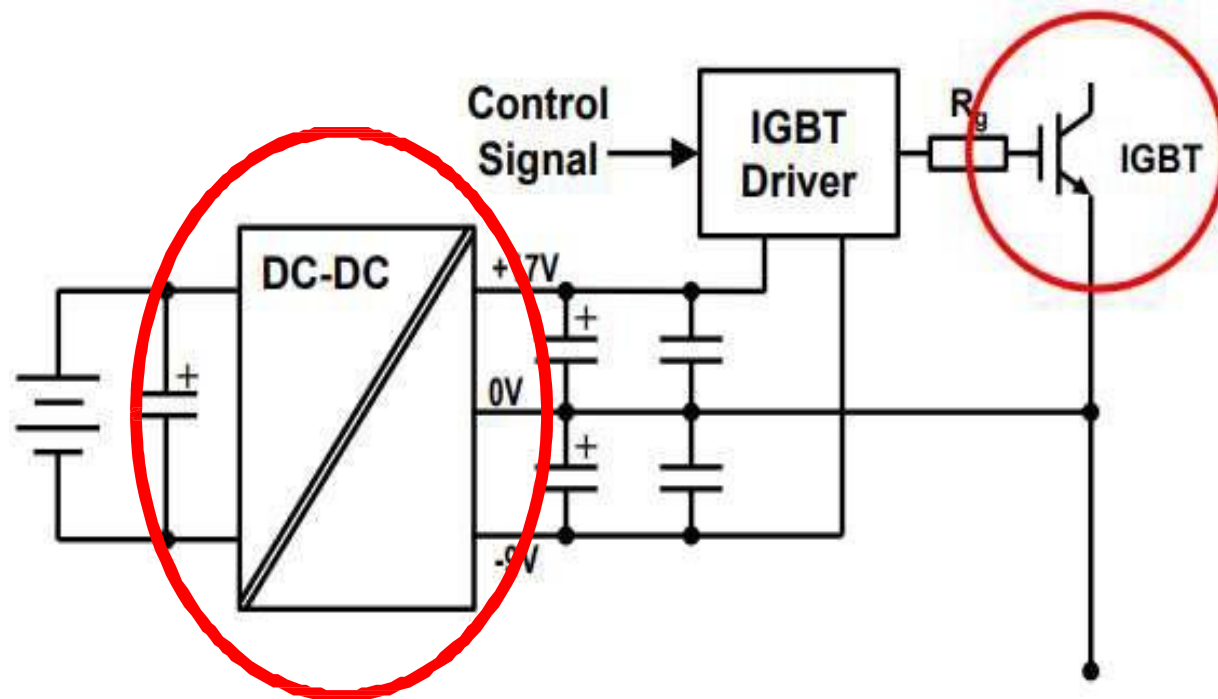
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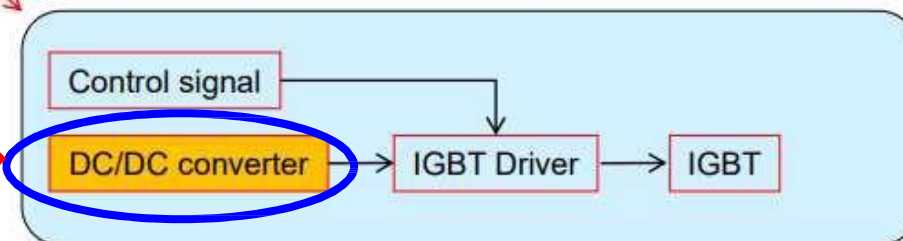
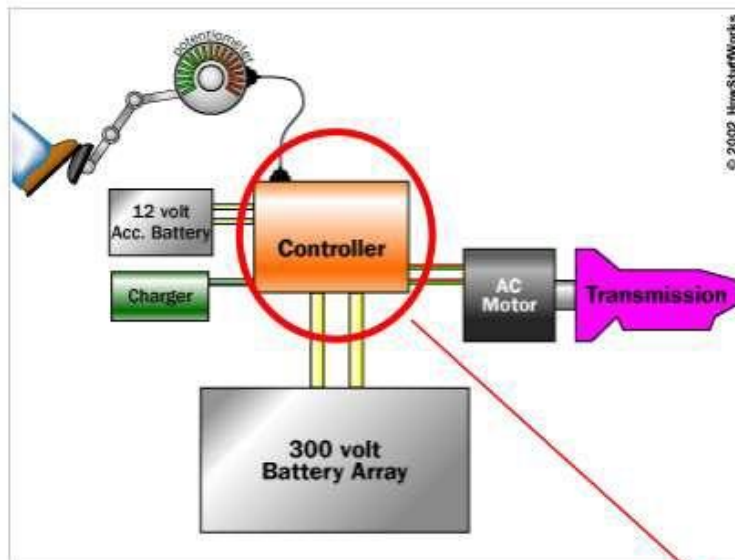
Typical IGBT application circuit

DC-DC Converter as IGBT driver



Data source: MGJ series DC-DC for IGBT applications, Murata Power Solutions

DC-DC Converter as HEV/EV IGBT Driver



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Proposed series for IGBT Driver

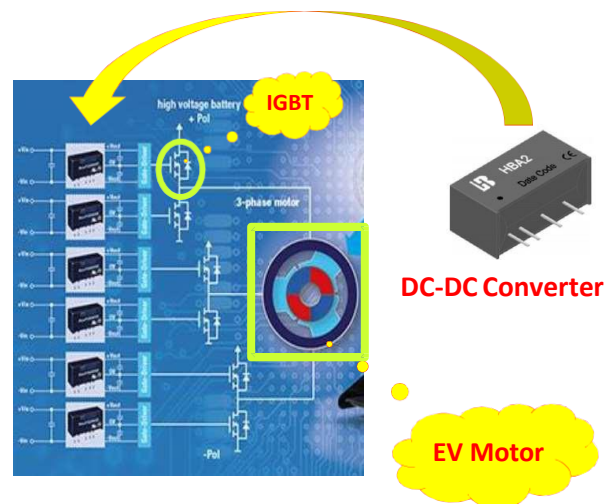
HBA2H6 Series

7 pin SiP Package, 2 Watt, Isolated, Unregulated

Features

- 7 pin SiP package
- Input / Output Isolation Voltage: 6.4kVDC
- High Efficiency
- Lead Free Design, RoHS Compliant
- Operating temperature: -40°C to +85°C
- Optional Reinforced Isolation 8kVDC
- EMI Standard / Approval: EN55011, Class A
- EMS Standard / Approval: EN60601-1-2
- Safety Standard / Approval: IEC / EN60950-1

IEC / EN60601-1



CLS	BH
BTD200021S16HBAZR1	HBA2-05S1H6
BTD200021S26HBAZR1	HBA2-05S2H6
BTD200021S36HBAZR1	HBA2-05S3H6
BTD200022S16HBAZR1	HBA2-12S1H6
BTD200022S26HBAZR1	HBA2-12S2H6
BTD200022S36HBAZR1	HBA2-12S3H6
BTD200023S16HBAZR1	HBA2-24S1H6
BTD200023S26HBAZR1	HBA2-24S2H6
BTD200023S36HBAZR1	HBA2-24S3H6
BTD200021D16HBAZR1	HBA2-05D1H6
BTD200021D26HBAZR1	HBA2-05D2H6
BTD200021D36HBAZR1	HBA2-05D3H6
BTD200022D16HBAZR1	HBA2-12D1H6
BTD200022D26HBAZR1	HBA2-12D2H6
BTD200022D36HBAZR1	HBA2-12D3H6
BTD200023D16HBAZR1	HBA2-24D1H6
BTD200023D26HBAZR1	HBA2-24D2H6
BTD200023D36HBAZR1	HBA2-24D3H6



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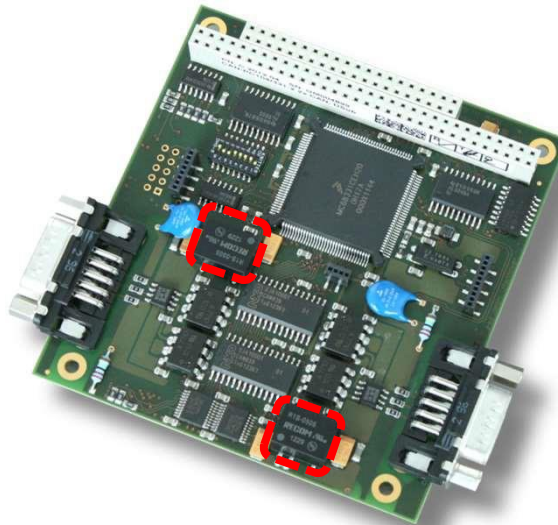
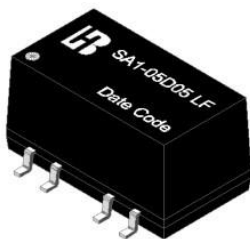
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Proposed series for CAN Interface Card

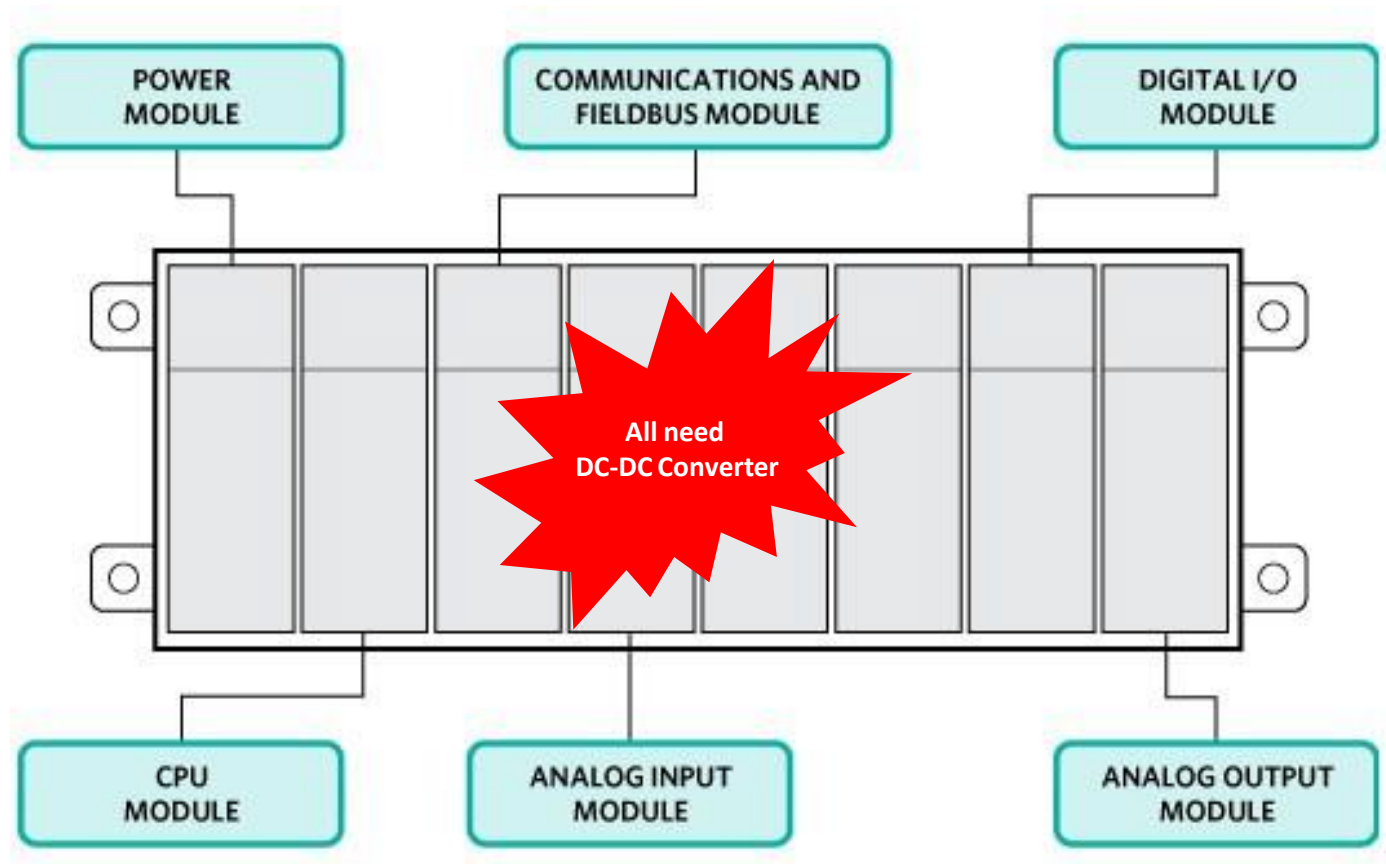
- ◆ 1~2 Watts
- ◆ SA1 Series
- ◆ Input: +/-10%
- ◆ Package: SMD type
- ◆ Dimension: 13.6*8.8*7.85 -Single
- ◆ Dimension: 15.2*8.8*7.85 -Dual
- ◆ Unregulated



CLS	BH
BTD200011S11SA1ZR1	SA1-0505 LF
BTD200011S21SA1ZR1	SA1-0512 LF
BTD200011S31SA1ZR1	SA1-0515 LF
BTD200012S11SA1ZR1	SA1-1205 LF
BTD200012S21SA1ZR1	SA1-1212 LF
BTD200012S31SA1ZR1	SA1-1215 LF
BTD200013S11SA1ZR1	SA1-2405 LF
BTD200013S21SA1ZR1	SA1-2412 LF
BTD200013S31SA1ZR1	SA1-2415 LF
BTD200011S13SA1ZR1	SA1-0505H LF
BTD200011S23SA1ZR1	SA1-0512H LF
BTD200011S33SA1ZR1	SA1-0515H LF
BTD200012S13SA1ZR1	SA1-1205H LF
BTD200012S23SA1ZR1	SA1-1212H LF
BTD200012S33SA1ZR1	SA1-1215H LF
BTD200013S13SA1ZR1	SA1-2405H LF
BTD200013S23SA1ZR1	SA1-2412H LF
BTD200013S33SA1ZR1	SA1-2415H LF



Typical function blocks of PLC



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ISO9001 ISO14001 IATF16949

Proposed series for Signaling PLC

BOB8W Series

- Input: 9~36V、36~75V
- Dimension: 31.75 × 20.32 × 10.16 mm
- Same size has 3~12Watts output.
- Regulated



CLS	BH	CLS	BH
BTD100082S02BOBXR1	BOB8-12S0	BTD100084D22BOBXR1	BOB8-48D2
BTD100082S12BOBXR1	BOB8-12S1	BTD100084D32BOBXR1	BOB8-48D3
BTD100082S22BOBXR1	BOB8-12S2	BTD101083S02BOBXR1	BOB8-24S0W
BTD100083S02BOBXR1	BOB8-24S0	BTD101083S12BOBXR1	BOB8-24S1W
BTD100083S12BOBXR1	BOB8-24S1	BTD101083S22BOBXR1	BOB8-24S2W
BTD100083S22BOBXR1	BOB8-24S2	BTD101084S02BOBXR1	BOB8-48S0W
BTD100084S02BOBXR1	BOB8-48S0	BTD101084S12BOBXR1	BOB8-48S1W
BTD100084S12BOBXR1	BOB8-48S1	BTD101084S22BOBXR1	BOB8-48S2W
BTD100084S22BOBXR1	BOB8-48S2	BTD101083D12BOBXR1	BOB8-24D1W
BTD100082D12BOBXR1	BOB8-12D1	BTD101083D22BOBXR1	BOB8-24D2W
BTD100082D22BOBXR1	BOB8-12D2	BTD101083D32BOBXR1	BOB8-24D3W
BTD100082D32BOBXR1	BOB8-12D3	BTD101084D12BOBXR1	BOB8-48D1W
BTD100083D12BOBXR1	BOB8-24D1	BTD101084D22BOBXR1	BOB8-48D2W
BTD100083D22BOBXR1	BOB8-24D2	BTD101084D32BOBXR1	BOB8-48D3W
BTD100083D32BOBXR1	BOB8-24D3		
BTD100084D12BOBXR1	BOB8-48D1		



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Proposed series for Smart Grid Meter

- ◆ 1~2Watt
- ◆ HBA1 Series
- ◆ Input: +/-10%
- ◆ Isolation: 6~8KVDC
- ◆ Dimension: 19.5 × 12.5 × 9.8 mm
- ◆ Unregulated



CLS	BH
BTD200011S16HBAZR1	HBA1-05S1H6
BTD200011S26HBAZR1	HBA1-05S2H6
BTD200011S36HBAZR1	HBA1-05S3H6
BTD200012S16HBAZR1	HBA1-12S1H6
BTD200012S26HBAZR1	HBA1-12S2H6
BTD200012S36HBAZR1	HBA1-12S3H6
BTD200013S16HBAZR1	HBA1-24S1H6
BTD200013S26HBAZR1	HBA1-24S2H6
BTD200013S36HBAZR1	HBA1-24S3H6
BTD200011D16HBAZR1	HBA1-05D1H6
BTD200011D26HBAZR1	HBA1-05D2H6
BTD200011D36HBAZR1	HBA1-05D3H6
BTD200012D16HBAZR1	HBA1-12D1H6
BTD200012D26HBAZR1	HBA1-12D2H6
BTD200012D36HBAZR1	HBA1-12D3H6
BTD200013D16HBAZR1	HBA1-24D1H6
BTD200013D26HBAZR1	HBA1-24D2H6
BTD200013D36HBAZR1	HBA1-24D3H6



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Proposed series for medical applications

HBA1H6 Series

7 pin SIP Package, 1 Watt, Isolated, Unregulated

Features

- 7 pin SIP package
- Input / Output Isolation Voltage: 6.4kVDC
- High Efficiency
- Lead Free Design, RoHS Compliant
- Operating temperature: -40°C to +85°C
- Optional Reinforced Isolation 8kVDC
- EMI Standard / Approval: EN55011, Class A
- EMS Standard / Approval: EN60601-1-2
- Safety Standard / Approval: IEC / EN60950-1
IEC / EN60601-1

Medical
related
certification



CLS	BH
BTD200011S16HBAZR1	HBA1-05S1H6
BTD200011S26HBAZR1	HBA1-05S2H6
BTD200011S36HBAZR1	HBA1-05S3H6
BTD200012S16HBAZR1	HBA1-12S1H6
BTD200012S26HBAZR1	HBA1-12S2H6
BTD200012S36HBAZR1	HBA1-12S3H6
BTD200013S16HBAZR1	HBA1-24S1H6
BTD200013S26HBAZR1	HBA1-24S2H6
BTD200013S36HBAZR1	HBA1-24S3H6
BTD200011D16HBAZR1	HBA1-05D1H6
BTD200011D26HBAZR1	HBA1-05D2H6
BTD200011D36HBAZR1	HBA1-05D3H6
BTD200012D16HBAZR1	HBA1-12D1H6
BTD200012D26HBAZR1	HBA1-12D2H6
BTD200012D36HBAZR1	HBA1-12D3H6
BTD200013D16HBAZR1	HBA1-24D1H6
BTD200013D26HBAZR1	HBA1-24D2H6
BTD200013D36HBAZR1	HBA1-24D3H6



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Resistor



Powder



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Selection guide-Output power

- ◆ Confirm the **output power** of demand!

1watt	2watt	3watt	6watt	8watt
10watt	12watt	15watt	20watt	25watt
30watt	40watt	60watt	100watt	

- ◆ Confirm input voltage (V)
- ◆ Confirm output voltage (V)
- ◆ Select size



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Selection guide-Input voltage

- ◆ Confirm the output power of demand!
- ◆ Confirm **input voltage (V)**

	Type 1	Type 2	Type 3	Type 4
+/- 10%	4.5~5~5. 5	10.8~12~13. 2	13.5~15~16. 5	21.6~24~26. 4
2:1	4.5~5~9	9~12~18	18~24~36	36~48~75
4:1 (W)	9~24~36	18~48~75		

- ◆ Confirm output voltage (V)
- ◆ Select size



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Selection guide-output voltage

- ◆ Confirm output power of demand!
- ◆ Confirm input voltage (V)
- ◆ Confirm **output voltage (V)**

	Type 1	Type 2	Type 3	Type 4	Type 5
Single output	3.3	5	12	15	24
Dual output	+/-5	+/-12	+/-15		

* Voltage regulation (3 watts or more) /
Unregulated (less than 3 watts)

- ◆ Select size



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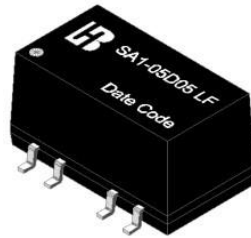


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Selection guide-size

◆ Select **size** (mm)

■ Wattage: 1~2 Watts



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Selection guide-size (cont.)

◆ Select **size** (mm)

- Wattage: 3 Watts



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Selection guide-size (cont.)



Select **size** (mm)

- Wattage: 5~15 Watts



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Selection guide-size (cont.)



Select **size** (mm)

- Wattage: 15~30 Watts



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Selection guide-size (cont.)



Select **size** (mm)

- Wattage: 30~100 Watts



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Special specification consideration



Low temperature : $-55^{\circ}\text{C} \sim 85^{\circ}\text{C}$

- Series name starts with "M"
- MRD5, MUA15, MYC60W



High isolation :

- Suffix begins with "H"
- "H3" mean isolation: 3KVDC, "H6" mean isolation: 6KVDC and etc.
 - ◆ 3KVDC: BOB3H3, BOB3WH3, BOB5H3, BOB5WH3, BOB8H3, HUB10H3, HUB12H3, BXE40WH3
 - ◆ 6KVDC: HBA1H6, HBA2H6, HAA5H6, HDB25/30H6
 - ◆ 8KVDC: HBA1H8, HBA2H8



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Special specification consideration (cont.)



Different Wattage

- Same Size
- Same pin assignment



1"x1"

- 6Watt : BRN6W
- 10Watt : BRN10W
- 15Watt : BRN15W
- 20Watt : BRN20W



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Naming rule for DC-DC Converter

1 2 3 4 5 6 7 8 9 10 11 12 13-15 16 17 18

X X X X XX XX X X X X XXX X XX

17-18) Version > 版本別 R1:第一版 R2:第二版

16) **Input Voltage Range** > 輸入電壓範圍
0: No W: 4:1 X: 2:1 Y: +/- 5% Z: +/- 10% C:客製

13.14.15) **Material** > 材料 外殼識別碼,以外殼尺寸及材質為依據,用英文字母及數字表示. 代碼查表4.

12.) **Voltage immunity** > 耐壓
0:No 1:1KV 2:1.5KV 3:3KV 6:6KV 8:8KV C:客製

11.) **Output Voltage** > 輸出電壓 代碼查表2

10.) **Output Number** > 輸出電壓組數
S:Single 單輸出 D: Dual 雙輸出 T: 三輸出 Y:非對稱輸出

9.) **Input Voltage** > 輸入電壓 代碼查表1

7.8.) **Power** > 輸出功率 用兩碼16進制表示,代碼查表3
01:1W 0C:12W...1E:30W....64:100W.

6.) Design 2 > 客製
5.) Design 1 > 客製 00: 依客戶設定自動帶入預設值為00

4.) **Type** > 類型 0: 非隔離型,穩壓 1: 隔離型, 穩壓
2: 隔離型, 非穩壓

3.) **Product** > 產品 D: DC-DC Converter

2.) **BU** > 群組 T: WPC(Power module類)

1.) **Grade** > 級別 A: 車規 B: 一般品



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表1:第9碼表示輸入電壓

輸入電壓代碼	輸入電壓(V)
0	3.3
1	5
2	12
3	24
4	48
5	72
6	110
C	客製

表2:第11碼表示輸出電壓

輸出電壓代碼	輸出電壓(V)	輸出電壓代碼	輸出電壓(V)
0	3.3	H	6.5
1	5	I	4.5
2	12	J	6
3	15	K	36
4	28	L	25
5	24	M	7
6	48	N	8
7	1.5	O	19
8	1.8		
9	2.5		
A	9		
B	7.2		
C	客製		
D	18		
E	15.5		
F	27		
G	7.5		

表3:第7.8碼表示輸出功率。
用16進制表示

輸出功率(W) 10進制	16進制表示
1	01
2	02
3	03
10	0A
12	0C
30	1E
100	64
255	FF



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表4: 第13與14碼表示尺寸與材質

第13與14碼	尺寸與材質	外觀圖片
HBA:	19.5*12.5*9.8 + Plastic	
BOB	32*20.3*10.2 + Metal	
BRN:	25.4*25.4*10.2 + Metal	
BUB:	50.8*25.4*10.2 + Metal	
BVA	50.8*40.6*10.2 + Metal	
BWA:	50.8*50.8*10.2 + Metal	
XXX	其他的附表對照	



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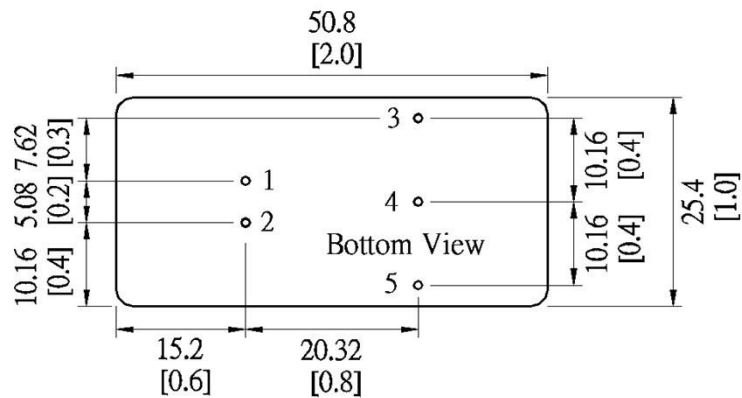
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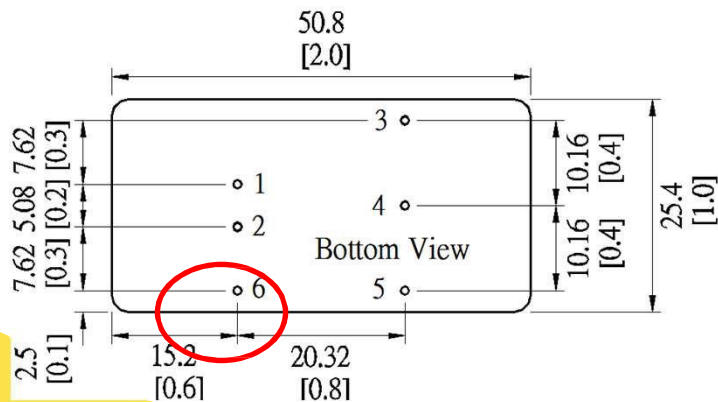
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註記:腳位元元識別字，用英文字母表示

BUA:U尺寸金屬外殼的**A**種腳位



BUB:U尺寸金屬外殼的**B**種腳位



Pin Assignment		
pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No pin	Common
5	-Vout	-Vout



Pin Assignment		
pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No pin	Common
5	-Vout	-Vout
6	Remote On/Off	Remote On/Off





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Agenda (LED Driver)

- ◆ Target applications
- ◆ Advantages
- ◆ Naming rule for LED Driver
- ◆ Offerings



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Target applications

BOTHHAND's LED Driver w/control can be applied to

Application:

- Residential & Commercial lighting
- Display/Signage
- Stage lighting
- Street & Area lighting
- Vehicle lighting



BOTHHAND's DC-DC constant current (CC)

buck-boost low profile LED drivers have been designed for cost-sensitive LED lighting applications. With their compact form factors, BOTHHAND's low profile LED drivers can be built into those traditional indoor, outdoor and vehicle lighting applications where space is critical and humidity-proof is necessary.

BOTHHAND's low power series meet the growing demand for compact drivers, while the medium power solutions meet the needs of the high brightness LED lighting market.



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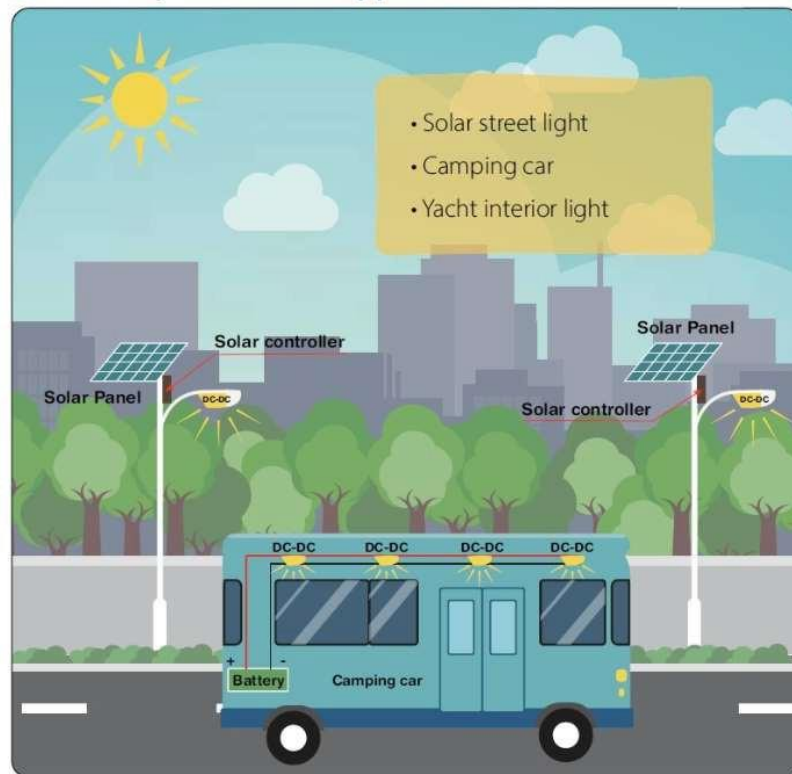


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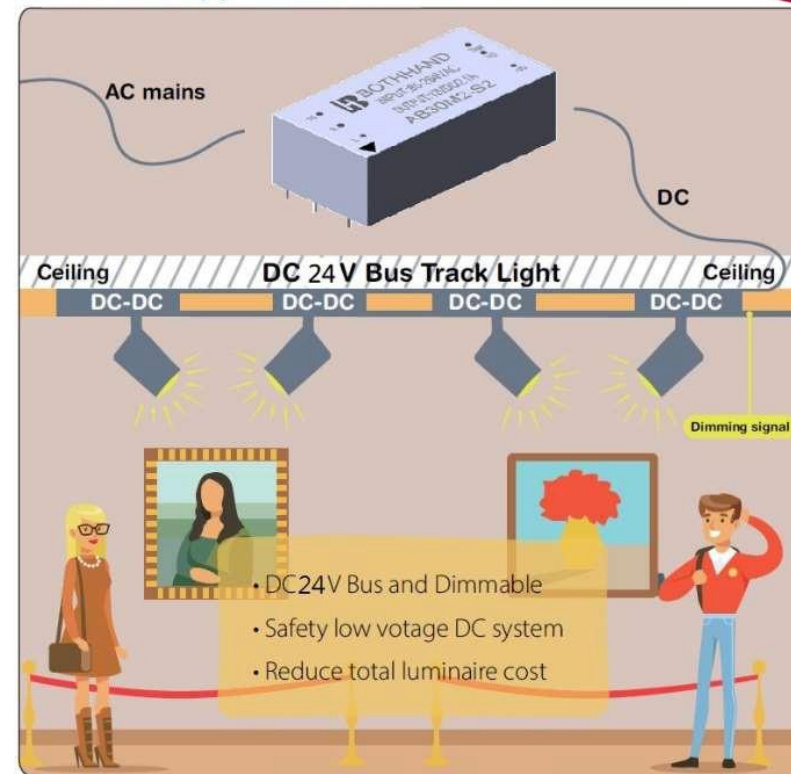
DC source applications

Patent pending

Battery DC Source application



DC Bus application



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- Resistor
- Powder
- RF

Advantages

Small size

- Reduce PCB layout space
- Reduce the size of end products

Time to market

- Reduce the number of purchased parts
- Reduce R&D design time
- Reduce procurement, inquiry, and tracking time

Robust functions

- Isolation function
- EMI depression
- Safety compliance



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Advantages of LED Driver w/control

- ◆ Wider operating input voltage: 9~36 Vdc
- ◆ Substitute of existing LED driver board (LED driver IC with discrete components): one module can drive 6~10 types of vehicle light/lamp
- ◆ Miniature module: pass test of the ISO-7637, save customer's development time and more possibility of co-layout
- ◆ Inventory management: can save up to 60~80% cost, raise turn over rate and decrease the risk of slow moving stock
- ◆ Certifications
 - EMC
 - ◆ CISPR25
 - ◆ ECE R10_Rev4
 - ◆ ISO 16750-2:2010(E)
 - ESD
 - ◆ ISO 10605



Vehicle
related
certification



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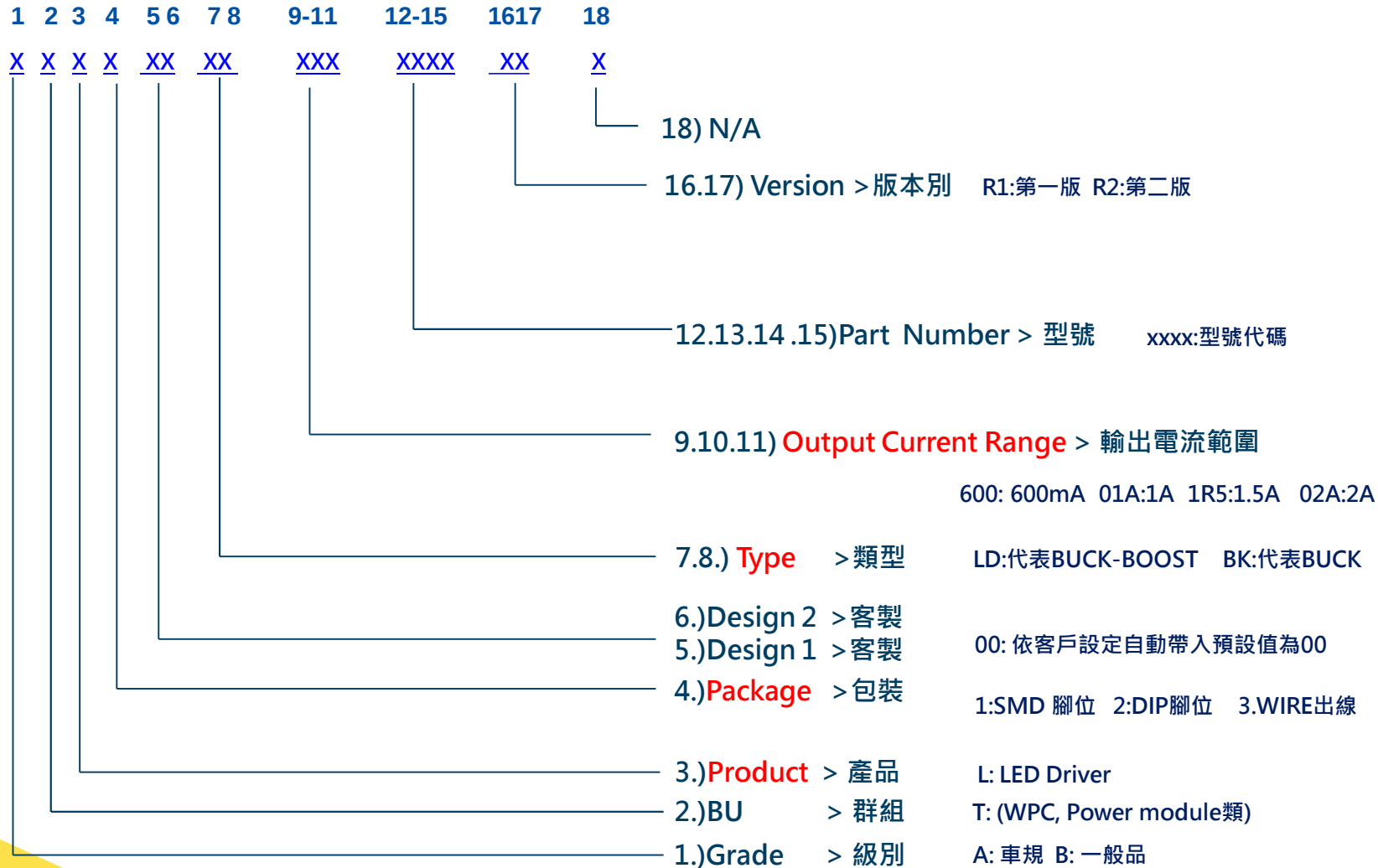


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Naming rule for LED Driver



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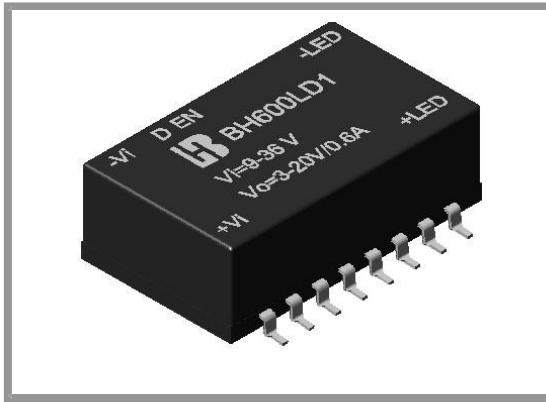
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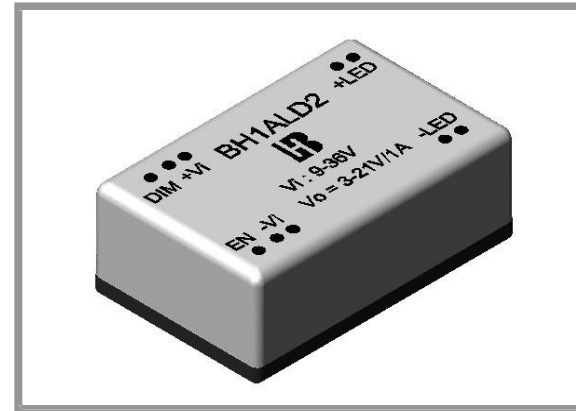
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Offering brief

3~12 WATTS SMD

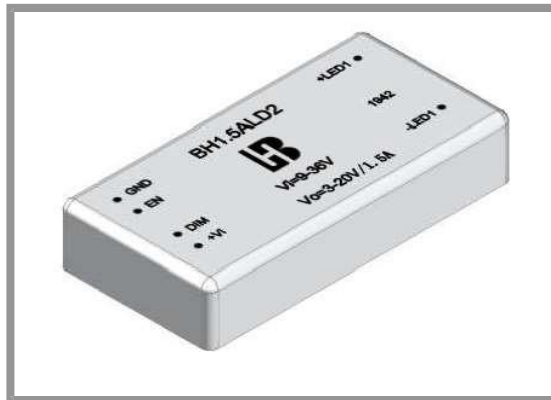


3~20W WATTS SMD & DIP

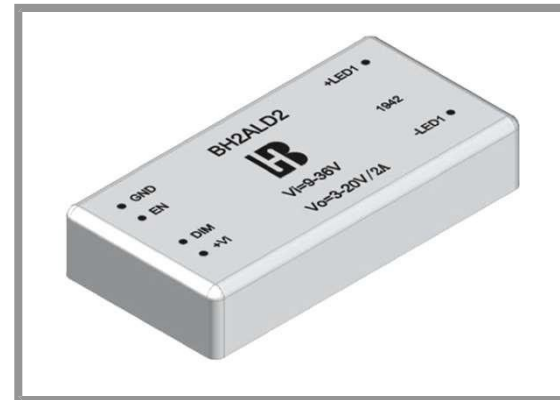


Patent
pending

4.5~30 WATTS DIP



6~40W WATTS DIP



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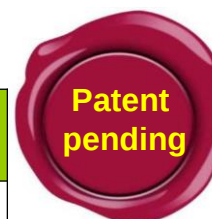
Powder



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Brief spec.

Model No.	Brief spec.	Outline
BH600LDX BTL100LD600BH00R10	SMD · 24.25*14.35*8.3mm (L*W*H) Input voltage:9~36VDC · Output voltage:3~21V · Output current:0~600mA	
BH1ALDX BTL100LD01ABH00R10	SMD、DIP · 31.8*20.3*12.2mm (L*W*H) Input voltage:9~36VDC · Output voltage:3~21V · Output current:0~1A	
BH1R5ALD2 BTL200LD1R5BH00R10	DIP · 50.8*25.4*10.4mm (L*W*H) Input voltage:9~36VDC · Output voltage:3~21V · Output current:1.5A	
BH2ALD2 BTL200LD02ABH00R10	DIP · 50.8*25.4*10.4mm (L*W*H) Input voltage:9~36VDC · Output voltage:3~21V · Output current:2A	



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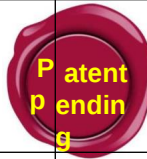


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Cross Reference

Topology

Brand	Model	BUCK	BOOST	BUCK-BOOST
BH	BH600LDX(BTL100LD600BH00R10) BH1ALDX(BTL100LD01ABH00R10) BH1R5ALD2(BTL200LD1R5BH00R10) BH2ALD2(BTL200LD02ABH00R10)	V		V
RECOM	RBD-12(/W) RCD24(/W)			V
MEANWELL	LDB-L Series LDD-L Series	V		V
MORNSUN	KC24RT KC24W	V		
Note: ◆ BUCK Topology: Input voltage > output voltage about 1.5~2.0V ◆ BOOST Topology: Input voltage < output voltage about 1.5~2.0V ◆ BUCK-BOOST Topology: The output voltage is not limited within the input voltage range within the specification				



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