



## FEATURES

- UL62368-1 recognised
- EN62368-1 certified
- IEC61558-1 recognition pending
- ANSI/AAMI ES60601-1, 1 MOPP/2 MOOP's recognition pending
- Wide input voltage range 85-264VAC/ 120-370VDC
- Operating temperature range -40°C to 85°C
- 4.25kVDC isolation 'Hi Pot Test'
- 3.3V, 5V, 12V & 24V single regulated outputs
- Over current protection
- Short circuit protection
- Meets EMC class B with no external components

## PRODUCT OVERVIEW

The BAC10 series delivers an output power of 10 watts from -40°C to 55°C, operating up to 85°C with derating, from AC or DC input voltages. The BAC10 series small footprint is EMC class B compliant without the need of any external components. The BAC10 series is suited to medical applications with 1 MOPP and 2 MOOP.

With high efficiency at low loads and low no load power consumption, the BAC10 supports standby mode operation for applications in industrial, medical, automation, IOT as well as household and home automation.



## SELECTION GUIDE

Order Code <sup>1</sup>	Output Power W	Output Voltage V	Output Current A	Ripple & Noise				Efficiency				Isolation Capacitance pF	MTTF <sup>2</sup>	
				115V		230V		115V		230V			MIL 217 kHrs	Telcordia
				Typ.	Max.	Typ.	Max.	Min.	Typ.	Min.	Typ.			
				mVp-p				%						
<b>BAC10S03DC</b>	6.6	3.3	2	40	80	50	80	70	73	70	73	170	337	5207
<b>BAC10S05DC</b>	10	5	2	50	80	50	80	75	77.5	75	79	170	276	2357
<b>BAC10S12DC</b>	10	12	0.83	50	120	65	120	77	80.5	78	82	170	304	2937
<b>BAC10S24DC</b>	10	24	0.42	60	200	85	200	79	83	80	83.5	170	344	4277

## INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	All input types	85	115/230	264	VAC
	All input types	120		370	VDC
Input frequency		47	50/60	63	Hz
Switching frequency			79		kHz
Input current	Nominal Vin = 115VAC	BAC10S03DC		150	mA
		BAC10S05DC		200	
		BAC10S12DC		190	
		BAC10S24DC		190	
	Nominal Vin = 230VAC	BAC10S03DC		100	
		BAC10S05DC		130	
		BAC10S12DC		120	
		BAC10S24DC		120	
Inrush current	Nominal Vin = 115VAC		11	A	
	Nominal Vin = 230VAC		25		
Input leakage current	250VAC		25	µA	
Stand by power	BAC10S03DC	115VAC		66	mW
		230VAC		74	
	BAC10S05DC	115VAC		97	
		230VAC		104	
	BAC10S12DC	115VAC		83	
		230VAC		91	
	BAC10S24DC	115VAC		202	
		230VAC		210	

## ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units	
Isolation test voltage	Production tested for 1 second	4250			VDC	
	Qualification tested for 1 minute	4250				
Resistance	Viso = 1000VDC	100			MΩ	
Safety approvals <sup>3</sup>	UL62368-1	Reinforced	Creepage and clearance 8.6mm		240	VAC
	EN62368-1				240	
	ANSI/AAMI ES60601-1			1 MOPP/ 2 MOOP		

1. 6 pin variant available - Orderable part numbers are BAC10SxxD6C, for further information refer to the application notes.

2. Calculated using MIL-HDBK-217F FN2 and Telcordia SR-332, parts stress method with nominal input voltage 115VAC at full load.

3. ANSI/AAMI ES60601-1 recognition is currently pending

All specifications typical at T<sub>a</sub>=25°C, nominal input voltage and rated output current unless otherwise specified.

OUTPUT CHARACTERISTICS							
Parameter	Conditions			Min.	Typ.	Max. Units	
Minimum load				10		%	
Initial voltage accuracy	All output types					±3 %	
Line regulation	Low line to high line	BAC10S03DC			±0.13	±0.5	%
		BAC10S24DC			±0.03	±0.5	
		All others			±0.04	±0.5	
Load Regulation	10% total load to 100% total load	115VAC	BAC10S03DC		±0.12	±1	%
			BAC10S05DC		±0.5	±1	
			BAC10S12DC		±0.02	±1	
			BAC10S24DC		±0.07	±1	
		230VAC	BAC10S03DC		±0.06	±1	
			BAC10S05DC		±0.4	±1	
			BAC10S12DC		±0.02	±1	
			BAC10S24DC		±0.08	±1	
Temperature coefficient						0.05 %/°C	
Transient Response	Peak deviation - 50-75% & 75-50% swing	115VAC	3.3V & 5V output types		±2	%Vout	
			12V & 24V output types		±1		
	Settling time (within 1% Vout Nom.)	230VAC	3.3V & 5V output types		±0.5	µs	
			12V & 24V output types		0		
Current limit inception	Hiccup	BAC10S03DC			110	%	
		BAC10S05DC			110		
		BAC10S12DC			115		
		BAC10S24DC			120		
Hold up time	115VAC				15	ms	
	230VAC				75		

TEMPERATURE CHARACTERISTICS						
Parameter	Conditions			Min.	Typ.	Max. Units
Operation	Please refer to derating graphs			-40		85
Storage	Convection cooling 0.2m/s			-40		85
Product temperature rise above ambient	BAC10S05DC				35	°C
	BAC10S12DC				30	
	All others				25	

ABSOLUTE MAXIMUM RATINGS	
Short-circuit protection <sup>1</sup>	Continuous, auto recovery
Input voltage	277VAC
Lead temperature 1.0mm from case for 7 +2/-0 seconds (to JEDEC JESD22-B106)	270 ±5°C
Shelf life (1 year)	Please refer to reconditioning application notes.
Wave solder	Wave Solder profile not to exceed the profile recommended in IEC 61760-1 Section 6.1.3. Please refer to <a href="#">application notes</a> for further information.

1. Please see application notes for more details.

## TECHNICAL NOTES

### ISOLATION VOLTAGE

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Murata Power Solutions BAC10 series of AC/DC converters are all 100% production tested at their stated isolation voltage. This is 4.25kVDC for 1 second.

A question commonly asked is, "What is the continuous voltage that can be applied across the part in normal operation?"

The BAC10 series is pending recognition by Underwriters Laboratory to 240VAC for Reinforced Insulation.

### REPEATED HIGH-VOLTAGE ISOLATION TESTING

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

## SAFETY APPROVAL

### ANSI/AAMI ES60601-1

The BAC10 series is pending recognition by Underwriters Laboratory (UL) to ANSI/AAMI ES60601-1 and provides 1 MOPP (Means Of Patient Protection) and 2 MOOP (Means Of Operator Protection) based upon a working voltage of 240VAC max., between Primary and Secondary. File number E202895 applies.

### EN62368-1

The BAC10 series has been certified by Demko (D) to EN62368 for reinforced insulation to a working voltage of 240VAC. File number D-07177 applies.

### UL62368

The BAC10 series has been recognised by Underwriters Laboratory (UL) to UL62368 for reinforced insulation to a working voltage of 240VAC. File number E151252 applies.

Creepage and clearance 8.6mm

Working altitude OVC II 5000m

### IEC61558-1

The BAC10 series is pending recognition to IEC61558-1.

## RoHS COMPLIANCE INFORMATION



This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds based on IEC 61760-1. Please refer to [application notes](#) for further information. The pin termination finish on this product series is Hot Dipped over Matte Tin with Nickel Preplate. The series is backward compatible with Sn/Pb soldering systems. For further information, please visit [www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)



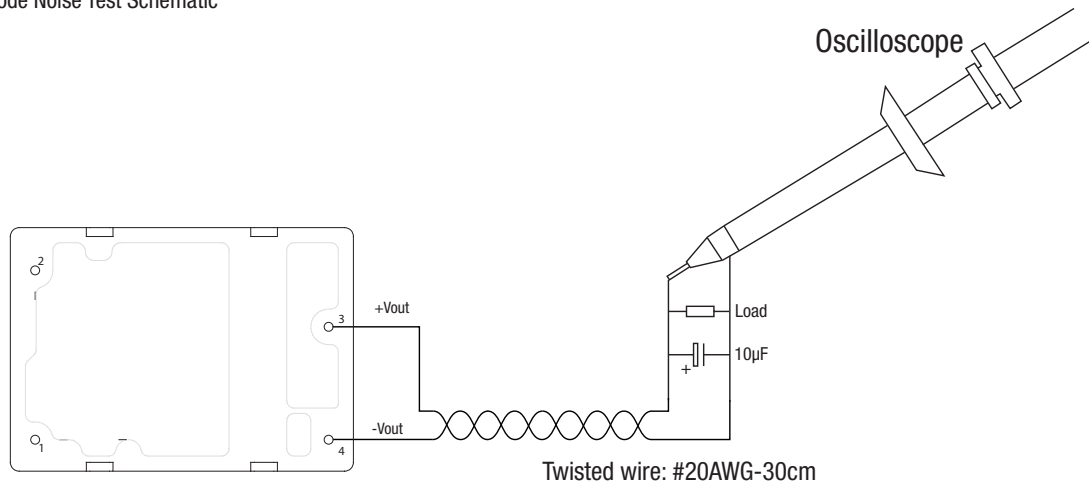
## CHARACTERISATION TEST METHODS

### Ripple & Noise Characterisation Method

Ripple and noise measurements are performed with the following test configuration.

C1 10 $\mu$ F electrolytic capacitor

### Differential Mode Noise Test Schematic



## APPLICATION NOTES

### Output Capacitance and start-up times

The BAC10 series does not require output capacitors to meet datasheet specification. To meet datasheet specification, output capacitance should not exceed:

Part No.	Maximum Load Capacitance (per output) $\mu$ F	Start-up times	
		115VAC	230VAC
		ms	
<b>BAC10S03DC</b>	1000	500	200
<b>BAC10S05DC</b>	1000	500	200
<b>BAC10S12DC</b>	440	500	200
<b>BAC10S24DC</b>	220	500	200

When operational in an application will operate down to -40°C. For start-up below nominal input voltage  $\leq$ 115VAC, at very low temperatures, please refer the temperature derating graphs.

### Minimum Load

The minimum load to meet full datasheet specification is 10% of the full rated load across the specified input voltage range.

### Reconditioning

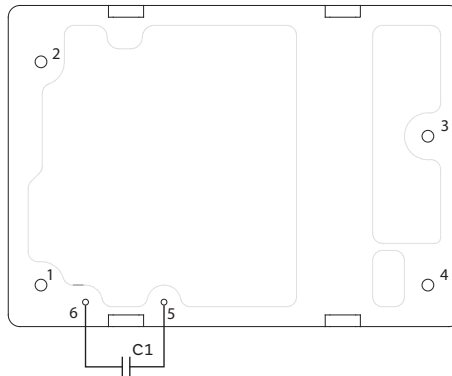
This series contains electrolytic capacitors, which require reconditioning if the product is stored non-powered for more than 2 years from the date of manufacture. To recondition the capacitors, an AC input voltage should be applied with output loading for 10 minutes. For further information please contact Murata.

## APPLICATION NOTES (Continued)

### BAC10 optional 6 pin variants

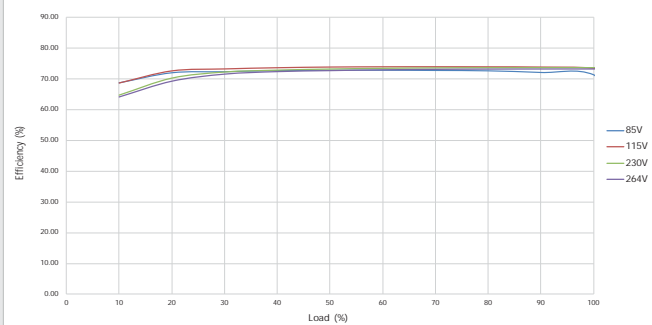
An external 27uF electrolytic may be fitted to enable start up at -40°C , with minimum input voltage into 100% load.

C1 27uF electrolytic capacitor

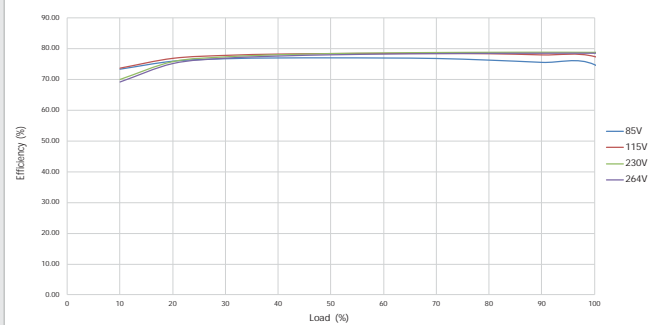


## EFFICIENCY VS LOAD

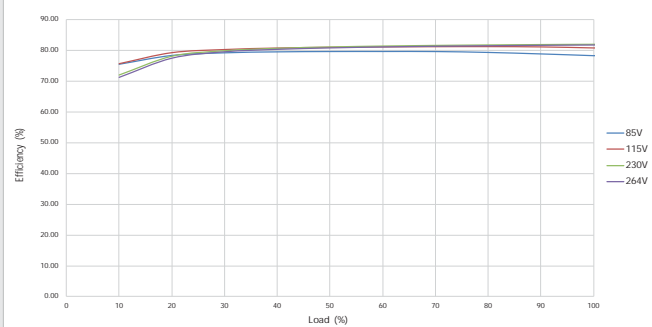
**BAC10S03DC**



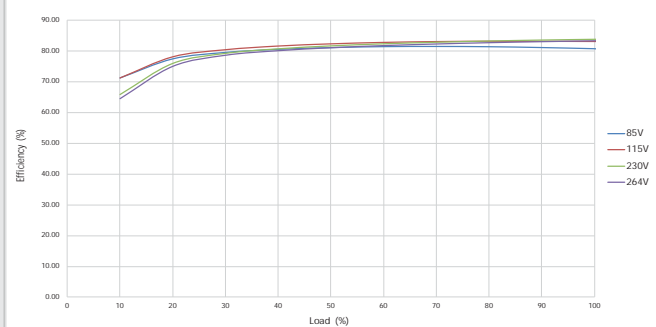
**BAC10S05DC**



**BAC10S12DC**

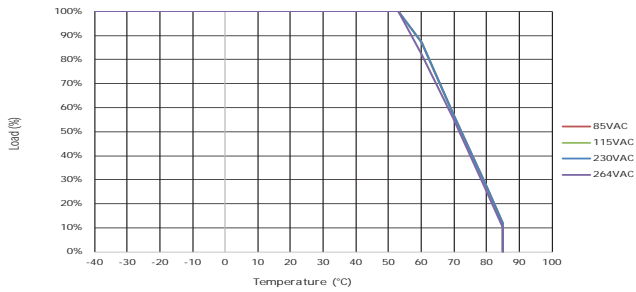


**BAC10S24DC**

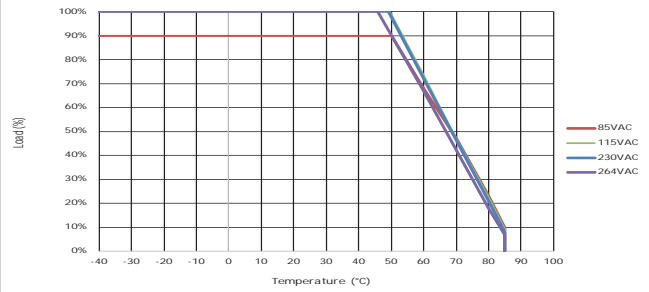


**TEMPERATURE DERATING - OPERATIONAL**

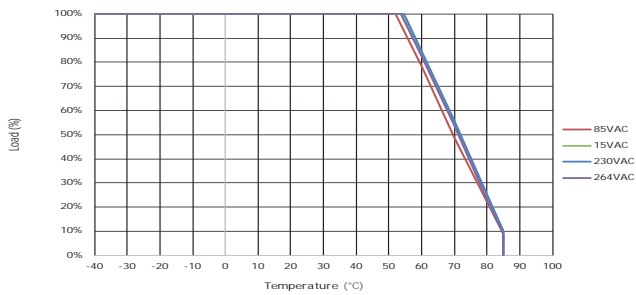
**BAC10S03DC**



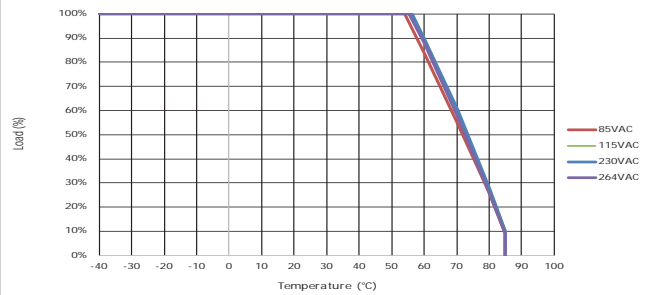
**BAC10S05DC**



**BAC10S12DC**

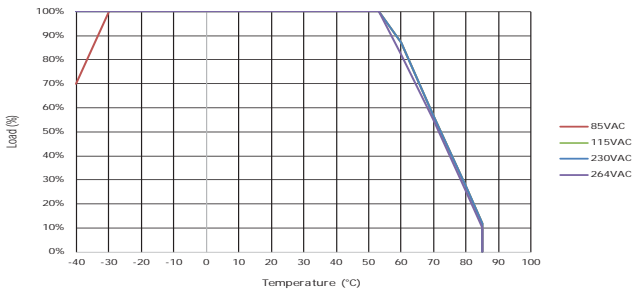


**BAC10S24DC**

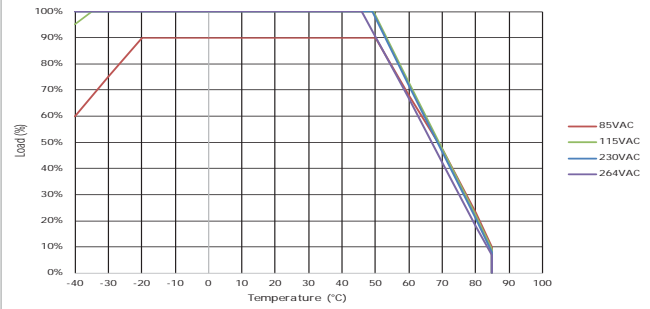


**TEMPERATURE DERATING - COLD START**

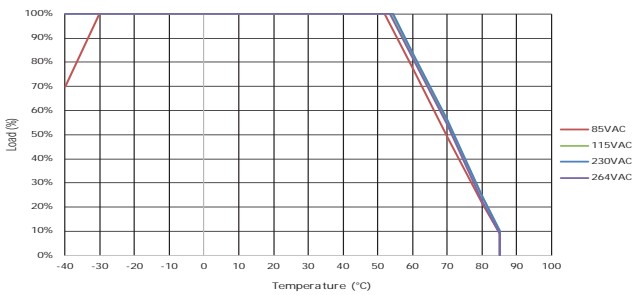
**BAC10S03DC**



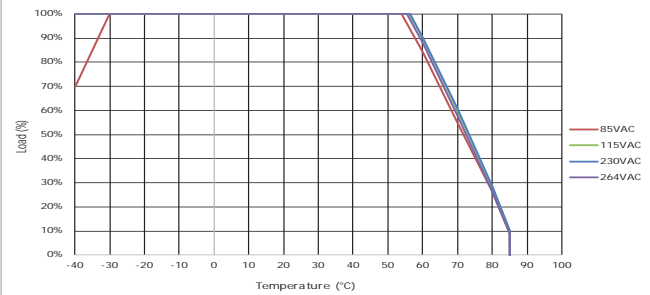
**BAC10S05DC**



**BAC10S12DC**



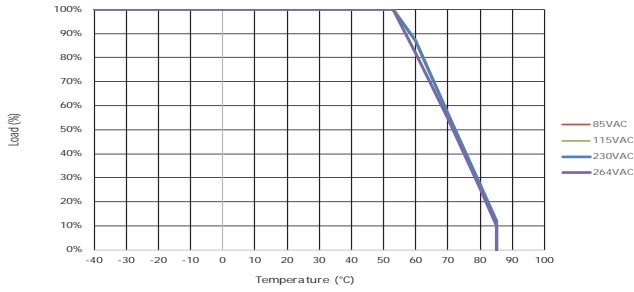
**BAC10S24DC**



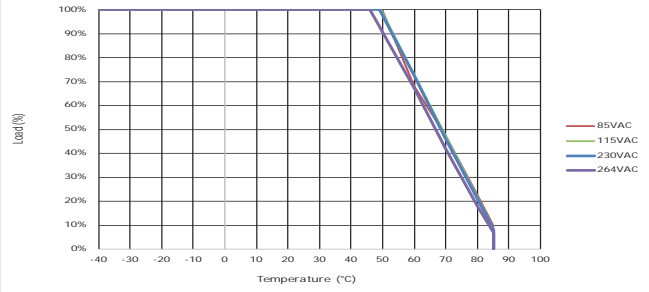


## TEMPERATURE DERATING - 6 PIN VARIANTS

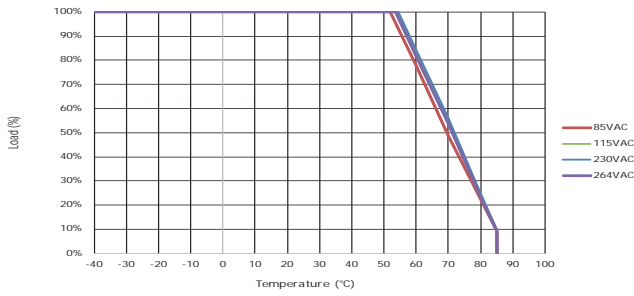
**BAC10S03D6C**



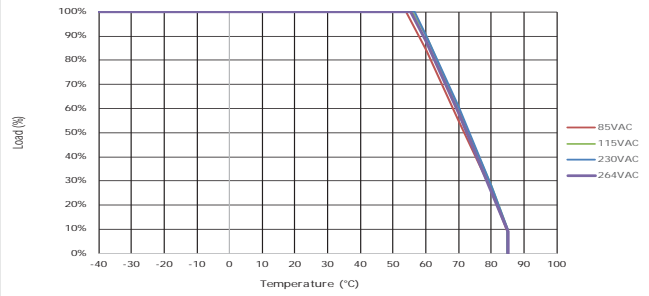
**BAC10S05D6C**



**BAC10S12D6C**

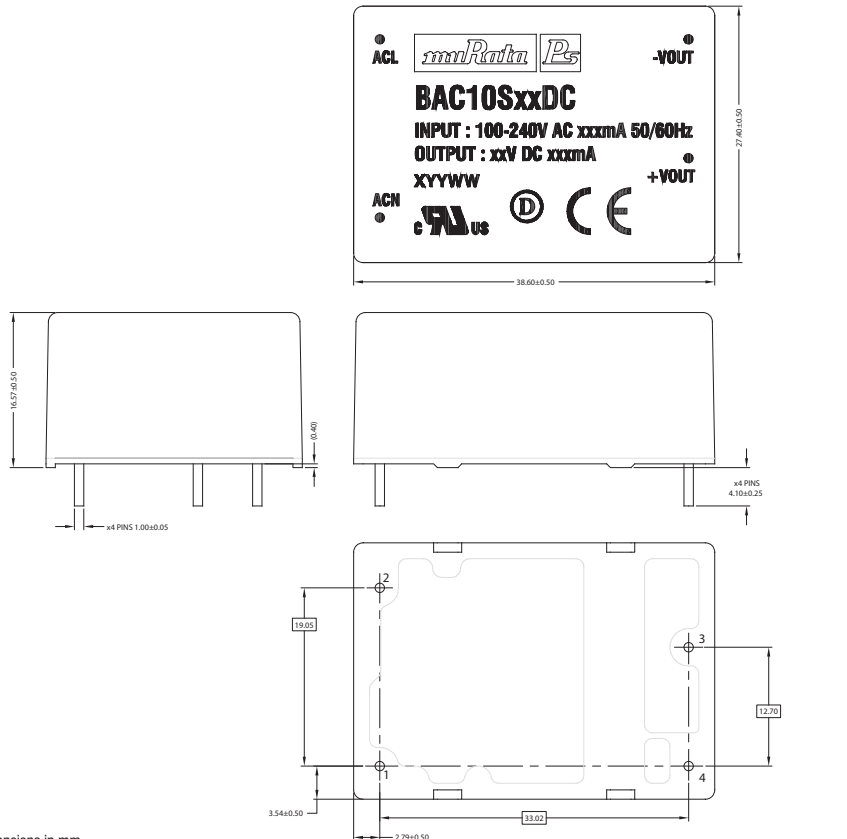


**BAC10S24D6C**



## PACKAGE SPECIFICATIONS

### MECHANICAL DIMENSIONS - STANDARD



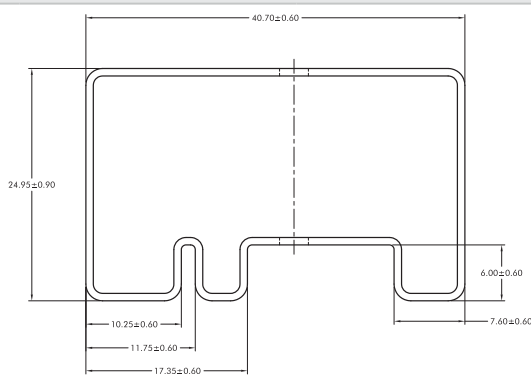
All dimensions in mm  
Unless otherwise specified all pins within  $\pm 0.30$  of true position.

Weight: 30g

### PIN CONNECTIONS

Pin	Function
1	AC(L)
2	AC(N)
3	+Vout
4	-Vout

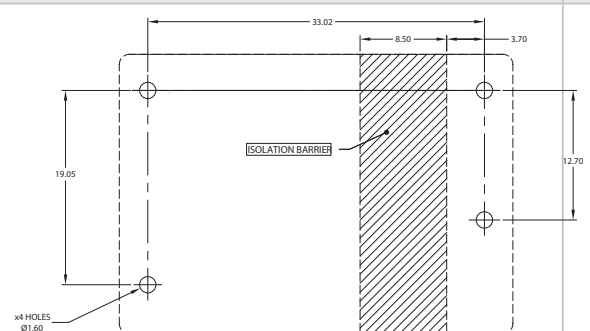
### TUBE OUTLINE DIMENSIONS



Unless otherwise specified all dimensions in mm.  
Tube Length : 530mm $\pm 2.0$

Tube Quantity : 18

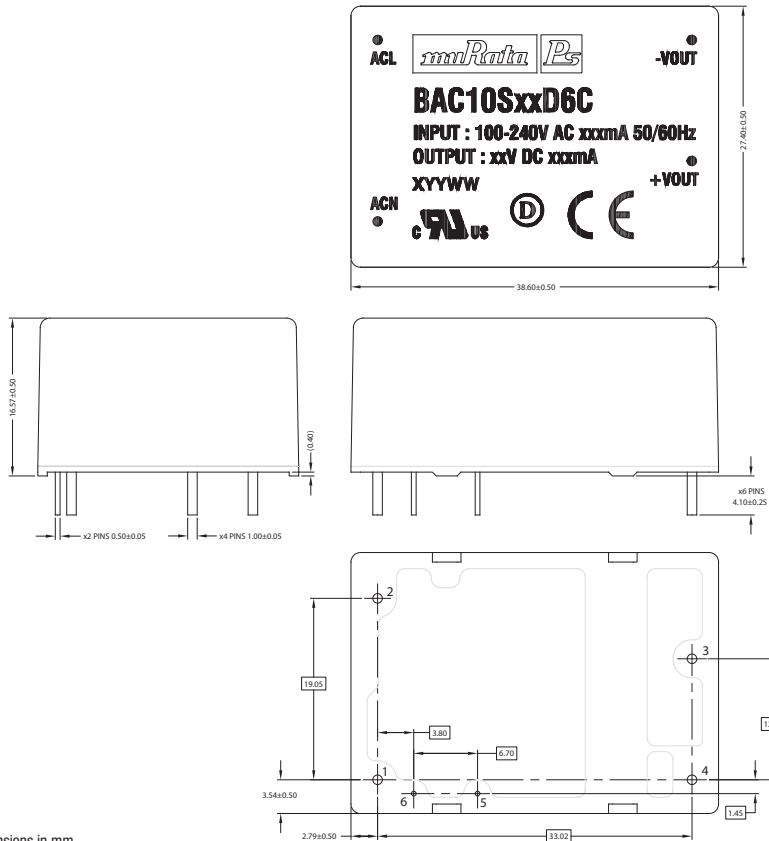
### RECOMMENDED FOOTPRINT DETAILS



The isolation barrier shown must not have any copper traces even on internal layers. This is to avoid compromising the creepage and clearance distance. PCB layouts must take into consideration the required clearance and creepage requirements to maintain the clearance and creepage of the isolation barrier.  
All dimensions in mm (inches).

**PACKAGE SPECIFICATIONS (Continued)**

**MECHANICAL DIMENSIONS - OPTIONAL 6 PIN**



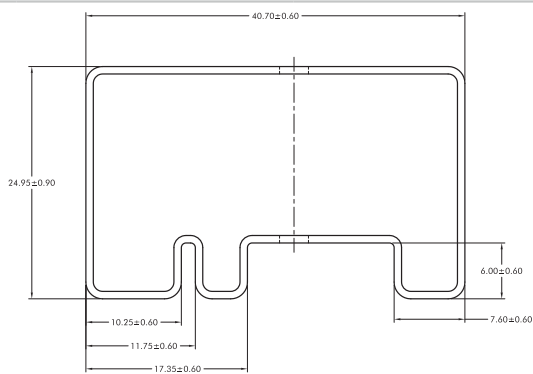
All dimensions in mm  
Unless otherwise specified all pins within ±0.30 of true position.

Weight: 30g

**PIN CONNECTIONS**

Pin	Function
1	AC(L)
2	AC(N)
3	+Vout
4	-Vout
5	-Cin
6	+Cin

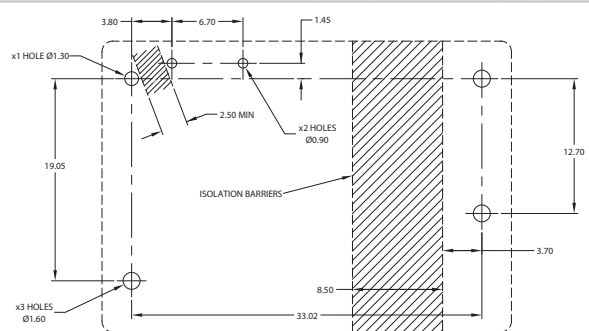
**TUBE OUTLINE DIMENSIONS**



Unless otherwise specified all dimensions in mm.  
Tube Length : 530mm±2.0

Tube Quantity : 18

**RECOMMENDED FOOTPRINT DETAILS**



The isolation barrier shown must not have any copper traces even on internal layers. This is to avoid compromising the creepage and clearance distance. PCB layouts must take into consideration the required clearance and creepage requirements to maintain the clearance and creepage of the isolation barrier.  
All dimensions in mm (Inches).

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- Power plant control equipment
- Medical equipment
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- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Data Processing equipment

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