BII5040 Series Power Amplifier

DESCRIPTION

BII5040 series linear power amplifiers are ideal to drive 0.1 to 10MHz piezoelectric transducers for acoustic systems of underwater, air, and ultrasonics (solids).

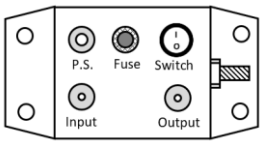
APPLICATIONS

Driving Ultrasonic Transducers: SONAR, NDT and HIFU	High Speed Underwater Wireless Communication
Underwater Sound Velocimeter, Sound Velocity Probe	Object Avoidance, Tracking, Distance Gage, Phantom Echo Generation
Short Range Navigation, Distance Gage, Altimeter	Driving Ultrasonic Air Transducers

ABSOLUTE MAXIMUM RATINGS

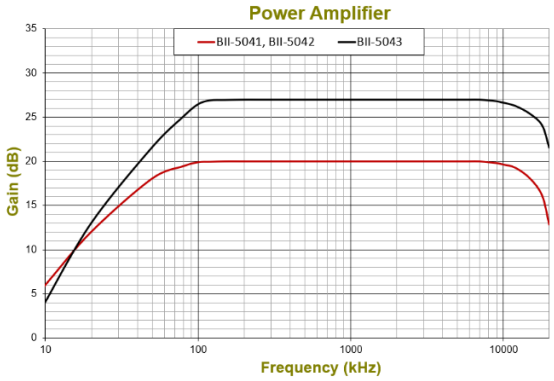
DC Supply Voltage:	+36 VDC
Input Voltage:	10 Vpp
Output Peak Current:	2 A
Shut-down Control Voltage:	-0.2 to +12 VDC

SPECIFICATIONS

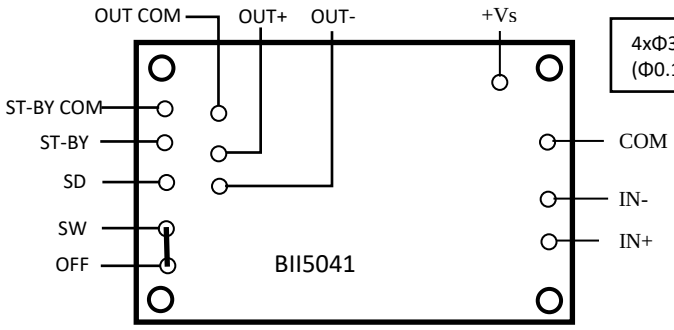
	BII5042	BII5041	BII5043	BII5044
Power Amplifier				
Source Level Capability:	182.7 + DI (dB re µPa*m) in Water. **DI**: Directivity Index, in dB.			
Signal Type:	Voltage Spikes, Sine Pulse/Burst, Chirp/FM Pulse, Spread Spectrum, FSK and PSK Signals, Continuous Signal CW, etc…	Pulsing Signals ONLY: Voltage Spikes, SINE Pulses, etc… Duty Cycle D * Pulse Width PW ≤ 100 (mS*%) 1% ≤ D ≤ 25%. For Example: If Duty Cycle D ≤ 1%, Pulse Width PW ≤ 100 mS. If Duty Cycle D = 10%, Pulse Width PW ≤ 10 mS. If Duty Cycle D = 25%, Pulse Width PW ≤ 4 mS. Duty Cycle D > 25% may overheat and damage the amplifier.		Voltage Spikes, Sine Pulse/Burst, Chirp/FM Pulse, Spread Spectrum, FSK and PSK Signals, Continuous Signal CW, etc…
Power Bandwidth (-3 dB):	100 kHz to 10 MHz			
Operating Frequency:	50 kHz to 10 MHz Warning: the device performance degrades if operating frequency less than Minimum Operating Frequency.			
RMS Power Capability:	14.5 W @ V_s = +24 VDC. 31.3 W @ V_s = +32 VDC			
Power Efficiency: **(at max. output current)**	Driving Tuned Transducers (Resistive load): 50% at +24 VDC. 56% at +32 VDC. Driving Untuned Transducers: Power Efficiency of driving tuned transducers*cosθ. θ: Impedance Phase of Untuned Transducers.			
Gain:	20 dB or x10	20 dB or x10	27dB or x22.4	27dB or x22.4
Shut-down Control:	On-board ON/OFF Switch: Manually or Digitally	Digital Output or Not Used	Not used	Not used
Shut-down Voltage:	TTL/CMOS Compatible: **Shut-down**: Logic Low or 0 to +0.4 VDC. **Active**: Logic High or +0.8 to +5 VDC.		Not Applicable	Not Applicable
Input Signal Type:	Single-ended			
Input Impedance:	200 Ω || 4pF			
Maximum Input Voltage:	Max. Output Voltage Vomax/Gain, in Vpp, or 5Vpp, whichever is less.			
Maximum Output Voltage:	V_{omax}=(Supply Voltage V_s – 7), in Vp.		112Vpp@+32VDC. 76.2Vpp@+24VDC.	
Max. Output Current:	2.0 A		0.9 A	
Minimum Load R_{min}:	10 Ω		50 Ω	
Output Type:	Differential		Single-ended	
Supply Voltage V_s:	+12 to +32 VDC		+12 to +32VDC.	
Suggested DC Supply	Marine Battery, Automobile Battery, or DC Power Supply with Grounded Output and Protection of Output Current Limit. Fully charged 12V Automobile or Marine Battery are from 12.6 to 14.4 VDC. Ensure that voltage of battery pack is less than maximum DC supply voltage.			
Quiescent Current:	Shut-down: 0.8 mA; Active: 53 mA.		53 mA	53 mA
Fuse:	N/A		2.5A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4".	
Cable:	0.15m or 6" wires	60 mm wires	1. DC Power Supply Cables: **DC-PP-24**. 2. Grounding Cable: **GWL18**.	
Connector:	Wire Leads	Wire Leads	Input BNC Jack, Output BNC Jack, and DC Power Jack.	
Grounding Terminal:	N/A	N/A	Grounding Stud #10-24.	
Physical Size:	Round PCB: ΦDxH = Φ101.6x50.8 mm	Rectangular PCB: LxWxH = 68.6x36.1x36.3mm	Metal Enclosure: LxWxH=147.2x67.2x67 mm	Metal Enclosure: LxWxH=180.5x110.3x75 mm
Mounting Holes:	4 x Φ4.87mm	4 x Φ3.2mm	4 x Φ5.5mm Mounting Holes. Accept M5 and #10 Screws.	
Weight in Air:	53 grams	13 grams	0.8 kg	1.2 kg
Operating Temperature:	-20 to 70°C or -4 to 158°F			
Storage Temperature:	-20 to 70°C or -4 to 158°F			

WARNING: The buyer should observe the National Electrical Code or other related codes of buyer's country to assemble and integrate this device into buyer's product or system, and follow the code to ground and insulate this device. It is buyer's sole responsibility to make sure the proper insulation and grounding for operating safety before putting the device into service.

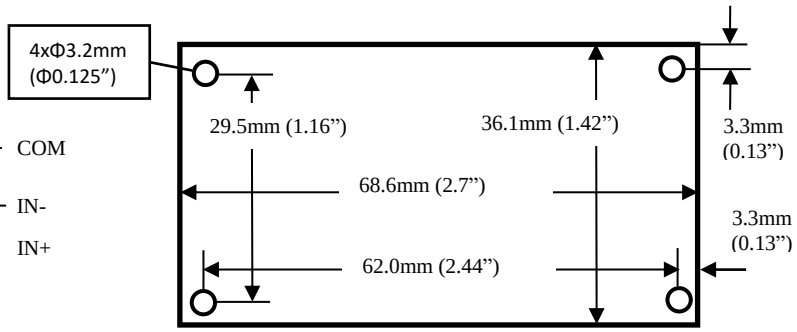
Frequency Response



BII5041 CONTROLS and TERMINALS:

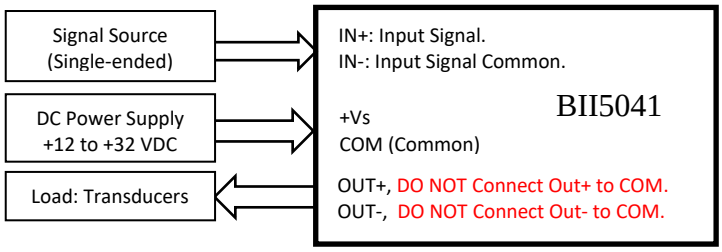


BII5041 Physical Size:



Wire Leads	Signal	Wires' Colour	Wire Leads	Signal	Wires' Colour
IN+	Input Signal	White	**ST-BY**	Shut Down Control	Default: PCB Via Pad, BII does not solder wire.
IN-	Input Signal common	Blue	**ST-BY COM**	Shut Down Control Common	Default: PCB Via Pad, BII does not solder wire.
COM	Power Supply Common	Black	**SD**	Shut-down pin	Default: PCB Via Pad, BII does not solder wire.
+Vs	Power Supply Voltage	Red	**SW**	Shut-down pin	Default: SW is wired to OFF
OUT-	Negative Output	Yellow	**OFF**	Shut-down OFF pin	Default: OFF is wired to SW
OUT+	Positive Output	Blue	**OUT COM**	Output Common	Default: PCB Via Pad, BII does not solder wire.
Default Factory-set: SW is wired to OFF, shut-down function is not available. To use shut-down function: 1. Cut off the wire between SW and OFF. 2. Solder a wire from SW to SD. 3. Solder wires to ST-BY and ST-BY COM respectively.					

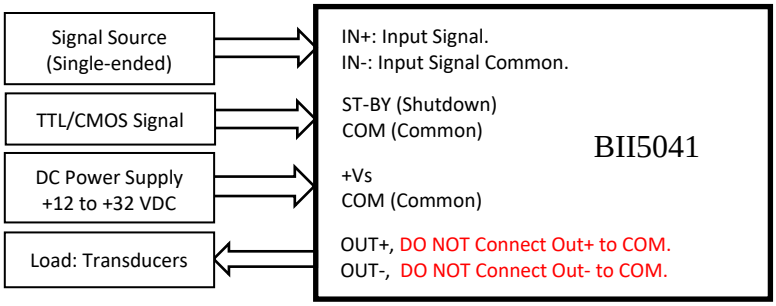
BII5041 SUGGESTED WIRING: Shut-down function is not used and SW is wired to OFF.



Warning: Outputs of the Power amplifier are differential, DO NOT Connect Out + or Out - to COM.

BII5041 SUGGESTED WIRING: Shut-down function is used.

To use shut-down function: Cut off the wire between SW and OFF; Solder a wire from SW to SD; Solder wires to ST-BY and ST-BY COM respectively.



Warning: Outputs of the Power amplifier are differential, DO NOT Connect Out + or Out - to COM.

BII5041 SHIPMENT: Assembled board, Qty.: 1

BII5042 ST-BY SWITCH (Shutdown SWITCH)

OFF Position:	Output Enabled.	**DIO Position:**	TTL/CMOS Logic High -> Output Enabled; TTL/CMOS Logic Low -> Output Disabled.

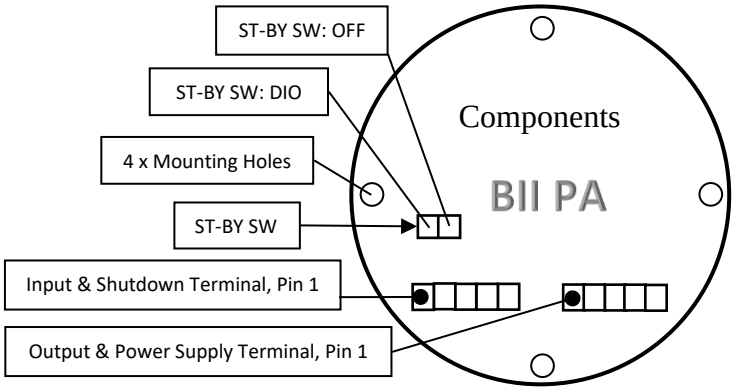
BII5042 TERMINALS and WIRINGS

Input and ST-by (Shutdown) Terminal

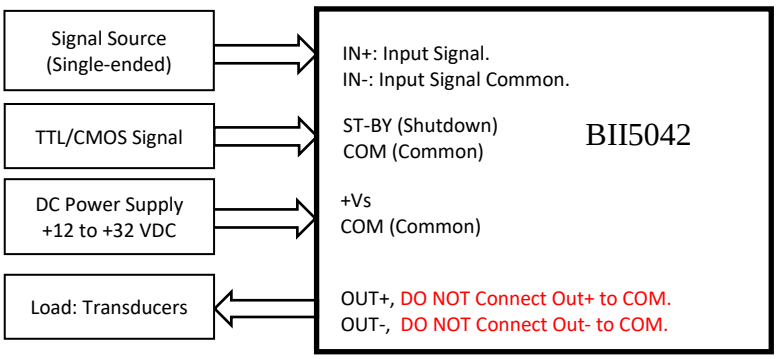
Pin 1: ST-BY (Shutdown)	White,	6" Wire
Pin 2: COM (Common)	Black,	6" Wire
Pin 3: IN+ (Input Signal)	Blue,	6" Wire
Pin 4: IN- (Input Common)	Yellow,	6" Wire
Pin 5: COM (Common)	Black,	6" Wire

Output and Power Supply Terminal

Pin 1: +Vs	Red,	6" Wire
Pin 2: +Vs	Red,	6" Wire
Pin 3: COM (Common)	Black,	6" Wire
Pin 4: OUT+	Blue,	6" Wire
Pin 5: OUT-	Yellow,	6" Wire

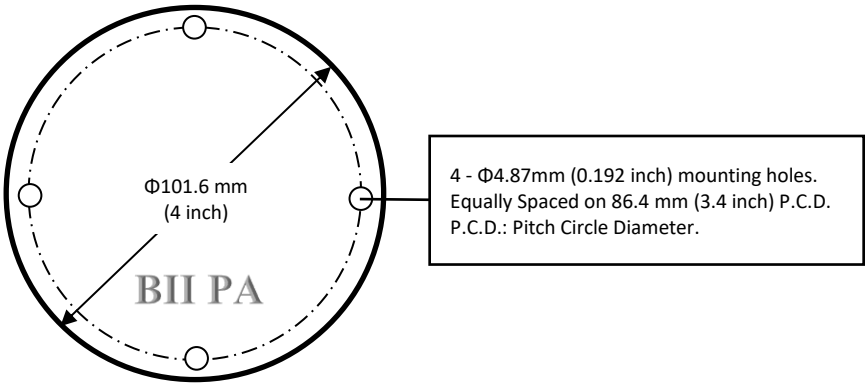


BII5042 SUGGESTED WIRING:



Warning: Outputs of the Power amplifier are differential, DO NOT Connect Out + or Out - to COM.

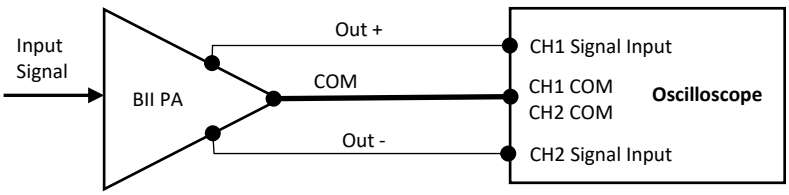
BII5042 Physical Size (unit mm): ΦDxH = Φ101.6x50.8mm



BII5042 SHIPMENT:

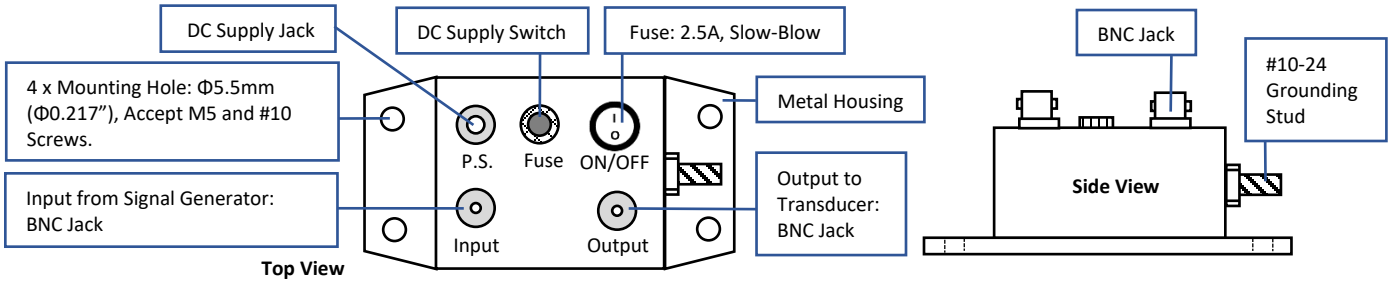
Assembled board, Qty.: 1	Input and ST-BY Plug with 6" wires, Qty.: 1.	Output and Power Supply plug with 6" wires, Qty.: 1.

Measure Differential Output of BII Power Amplifiers

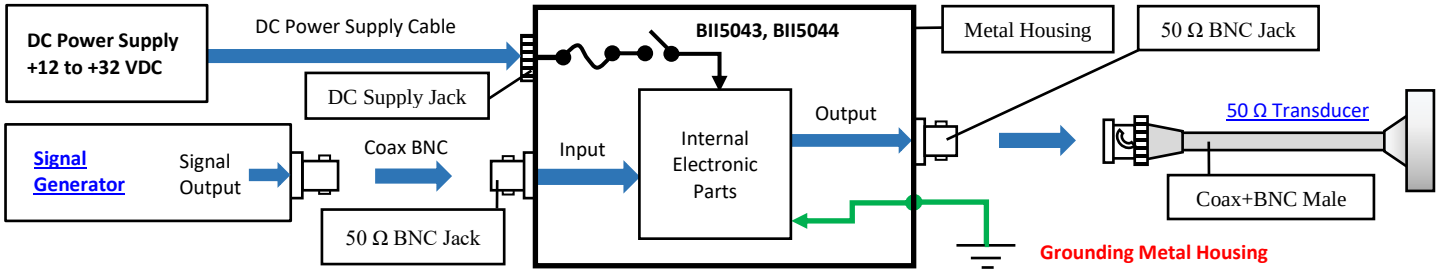


Warning: Outputs of the Power amplifier are differential, DO NOT Connect Out + or Out - to any COM.

BII5043 Metal Enclosure, Overall Size: LxWxH = 147.2x67.2x67mm. Mounting Hole Φ5.5mm (Φ0.217") accepts M5 or #10 screw. Screws are not supplied.
BII5044 Metal Enclosure, Overall Size: LxWxH = 180.5x110.3x75mm. Mounting Hole Φ5.5mm (Φ0.217") accepts M5 or #10 screw. Screws are not supplied.



System Block Diagram and Wiring: Driving 50Ω Transducer with BNC Male.

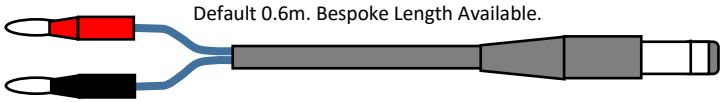


Signal Generator	BII5043, BII5044.		Transducer Cable and Connectors
BNC Jack	**Input: BNC Jack**	**Output: BNC Jack**	**Coax + In-line BNC Plug (Male)**
Signal: Center Socket	Signal: Center Socket	Signal: Center Socket	Signal: Center Pin
Common: Body.	Grounded Common: Body.	Grounded Common: Body.	Common: Body.
DC Power Supply Cable, Part Number: **DC-PP-24**: One 0.6 m DC supply cable with DC Power Plug and Banana Plugs. **Red Banana Plug**: +VDC, **Black Banana Plug**: Common.			
DC Supply Switch: Turn ON and Turn OFF DC Supply. **"I" -> ON; "O" -> OFF.**			
Fuse: 2.5A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4".			
Accessories: Included: One Grounding Cable, Part Number: **GWL18**.			
Grounding Metal Case for operating safety. **Grounding Stud:** #10-24 Screw 316SS. Nut and Washer are included. Support Single-Point Grounding with Multiple Devices. **Note: The body of Power Supply Jack is connected to metal case.**			
1. Install the device to a safe solid object to avoid sliding. An air free-flowing area and good thermal conducting object allow the device to cool down. 2. Never use the device in the event of slide happening, otherwise, loss of the device into water, property damage, and person injury may occur.			

Customer's Question: What if the connector of my transducer/projector is SMA or SMC Connector?
BII Answers: Buyer may order a BNC to SMA (or SMC) adaptor from local electronic distributors in buyer's country. BII may ship the adaptor as accessory of the device. Please discuss with BII for customizations.

DC Supply Cable Pair: Part Number DC-PP-24.

To Terminals of DC Supply:
a. One Red 4mm Banana Plug.
b. One Black 4mm Banana Plug.

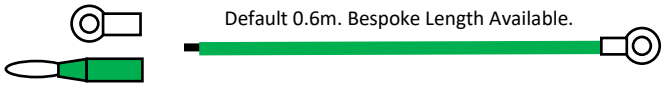


DC Power Plug.
To DC Power Jack of the Device.

Red Banana Plug: +VDC. **Black Banana Plug:** Common.
One 0.6m DC supply cable. One end of the cable is with DC Power Plug, another end is Red and Black Banana Plugs. Depending on output terminals of buyer's DC Supply, buyer may assemble other type of connectors to DC supply cable at buyer's cost.

Grounding Cable and Terminals

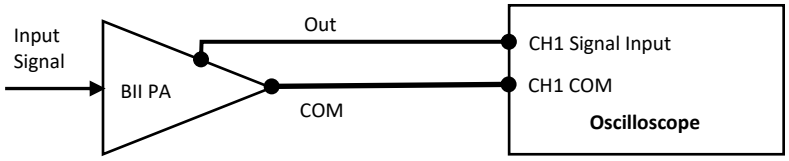
Terminal to buyer's Grounding Terminal:
a. Default: Wire Lead
b. One #10 Ring Terminal
c. One 4mm Banana Plug



#10 Ring Terminal
#10-24 nut and #10 washer included.

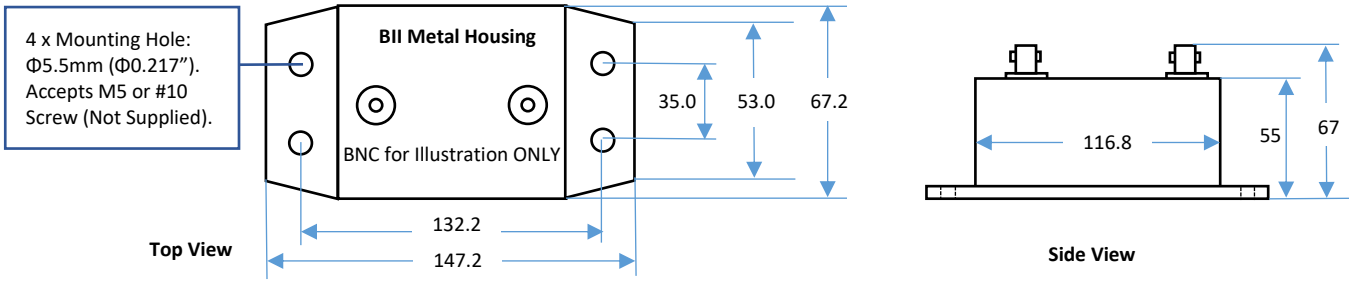
Grounding Cable, Part Number: GWL18, Support Single-Point Grounding with Multiple Devices.
One 0.6m AWG 18 Green Wire with #10 Ring Terminal and Wire Lead. One #10 Ring Terminal and one 4mm Banana Plug (Green) are included.
Depending on buyer's grounding terminal type, buyer assembles #10 Ring Terminal, 4mm Banana Plug, or other type of connectors to grounding cable at buyer's cost.

Measure Single Ended Output of BII Power Amplifiers



Warning:
1. Outputs of the power amplifier is high voltage, choose suitable oscilloscope probe with correct attenuation and voltage rating.
2. for operating safety, ensure proper grounding, and shut down power supply of the device before handing the cables, wirings and hookup, etc.

Metal Housings, Outline Dimensions (mm), Illustration only, the scale is not 1:1.



Metal Housings, Outline Dimensions (mm), Illustration only, the scale is not 1:1.