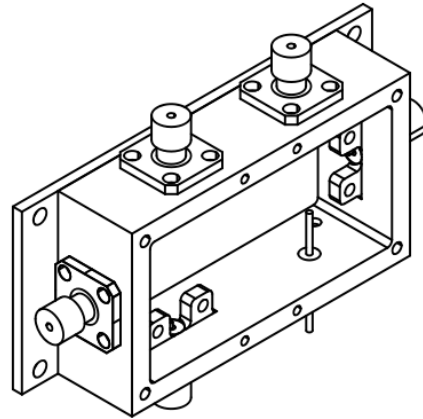
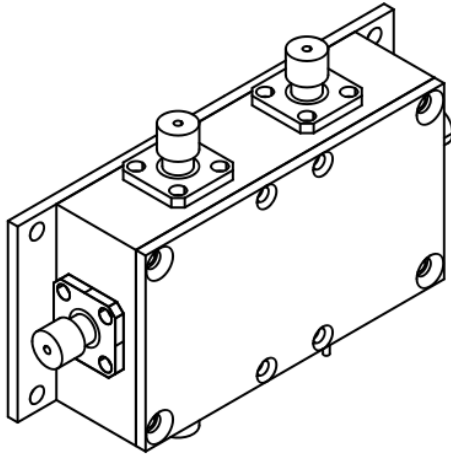


RF-ENCL-MINI-EXT-FX-XX-01 / RF Enclosure MINI-EXT-FX



Features

- Solid aluminum case, nickel plated
- Modular design
- 5 SMA ports
- Blind cover plates for unused ports
- Turret solder terminal
- Feedthrough capacitor
- Excellent RF shielding
- For RF and microwave applications

Applications

- RF prototyping
- RF PCB test fixture
- RF test equipment
- Small-series production

General description

The RF-ENCL-MINI is a milled aluminum enclosure designed for RF and microwave applications. It consists of a body that can mount a PCB and up to five SMA connectors. It comes with a turret terminal for connecting ground and a feedthrough capacitor to power a PCB.

The frame is attached to bottom and top cover plates with screws. This makes the inside of the enclosure easily accessible.

Due to the open, accessible design, the enclosure is also very well suited to be a test bed for new RF and microwave PCB designs.

The enclosure supports PCBs with a thickness between 0 and 1.6 mm (63 mil).

Specifications

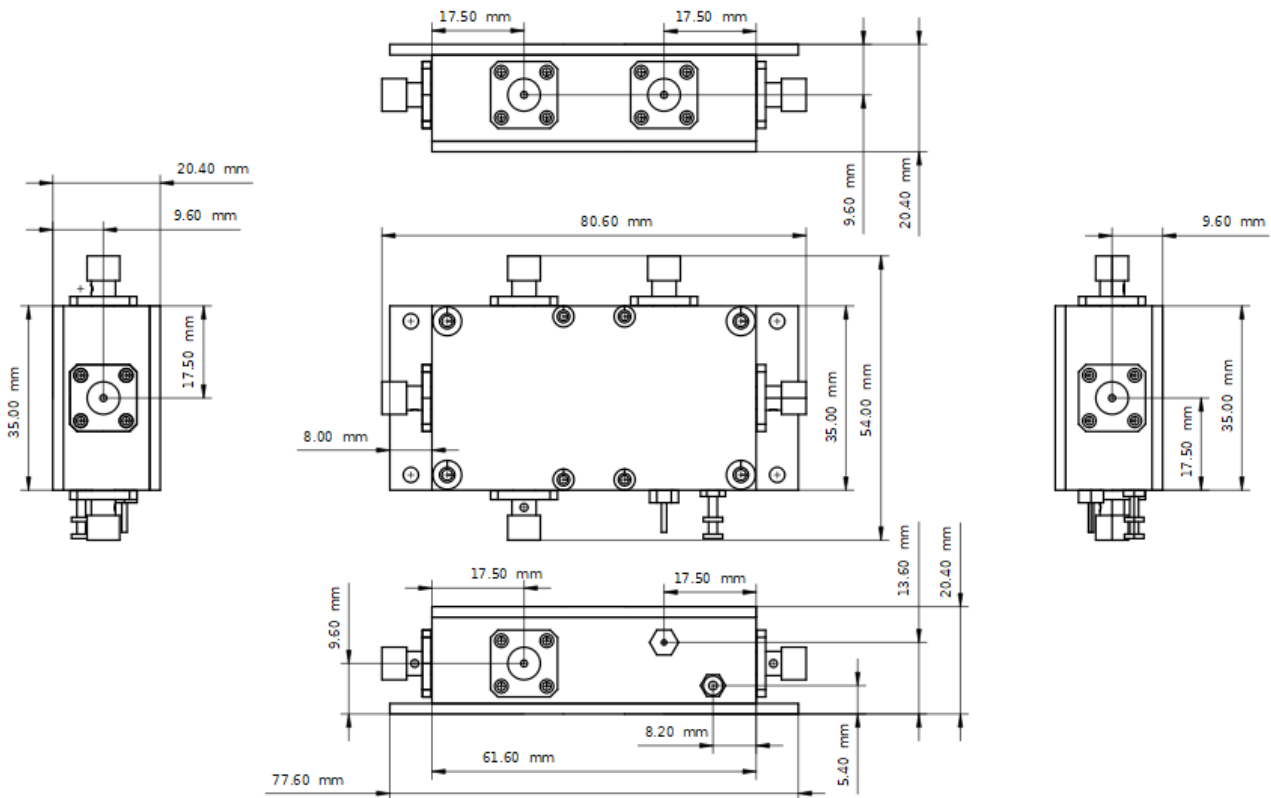
General

| Item | Value | Tolerance | Dimension |
|---|-------------------------|-----------|-----------|
| Number of supported SMA connectors | 5 | - | - |
| Maximum interior height H_TOP: (between PCB top layer and top cover plate) | 9.0 | 0.1 | mm |
| Maximum interior height H_BOTTOM: (between PCB bottom layer and bottom cover plate) | 7.3 minus PCB thickness | 0.1 | mm |
| Enclosure weight | 0.06 | | kg |
| Outer dimensions (width x depth x height) | 61.60 x 35 x 20.4 | 0.1 | mm |
| Suggested PCB dimensions (width x depth) | 53.4 x 26.8 | 0.1 | mm |
| Supported PCB thickness range | 0-1.6 | 0.1 | mm |

Versions

| Type | Feature |
|------------------------------------|-----------------------------|
| RF-ENCL-MINI-EXT-FX- NF -01 | Box without mounting flange |
| RF-ENCL-MINI-EXT-FX- YF -01 | Box with mounting flange |

Enclosure drawings

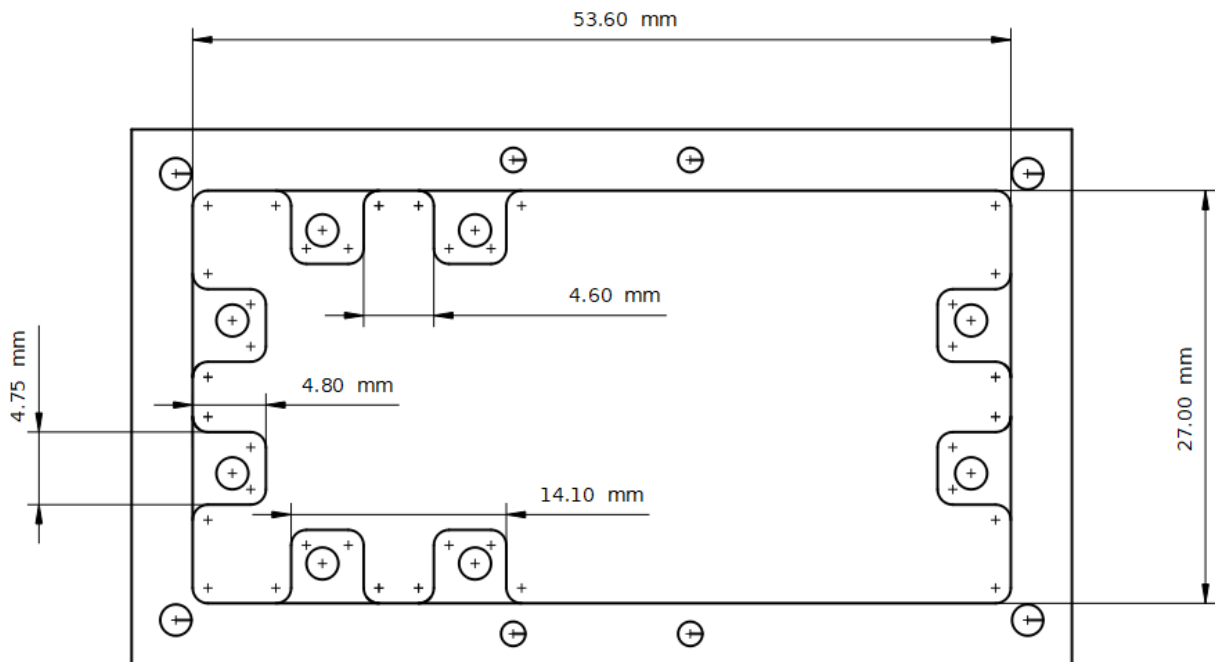


Note 1: All measurements in mm. Tolerance: 0.1 mm.

Note 2: The drawing shows only the RF-ENCL-MINI-EXT-FX-YF-01 version. The RF-ENCL-MINI-EXT-FX-NF-01 version has identical dimensions except that it doesn't have mounting flanges at the bottom of the box.

PCB mounting points

This drawing shows the aluminum mounting points used to fix a PCB into the enclosure. The PCB is attached with up to eight screws. The PCB itself (and the screws) are not included in the drawing.



Note: The top of the PCB is mounted at the bottom of the PCB mounting points, as shown in Illustration 1.

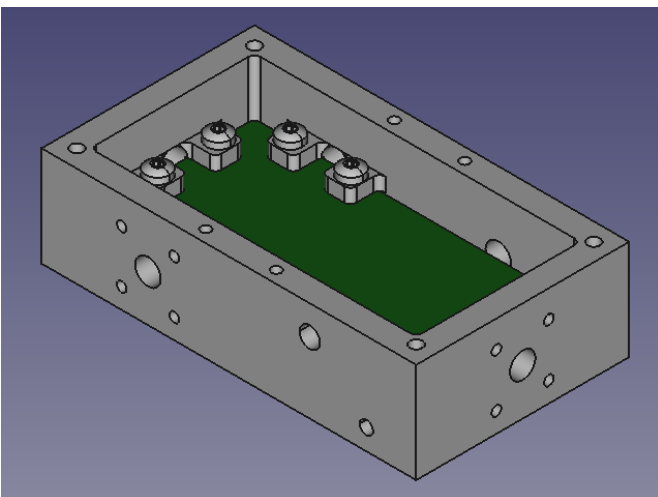


Illustration 1: PCB mounting construction (top cover removed; the green area is the PCB top layer)

SMA ports and PCB mounting point construction

The next two renders show the construction of the PCB mounting points, which are, from an RF wave point of view, part of the SMA-to-PCB transition. At the bottom of the PCB are two additional parts per mounting point: a ground plate and a mounting table. The ground plate is pressed against the bottom of the PCB and the enclosure wall by the mounting table. This ensures that the ground plate will act as a high-quality RF ground for return currents that have to travel to the SMA connector chassis. Please note that the illustrations below do not show the mounting screws.

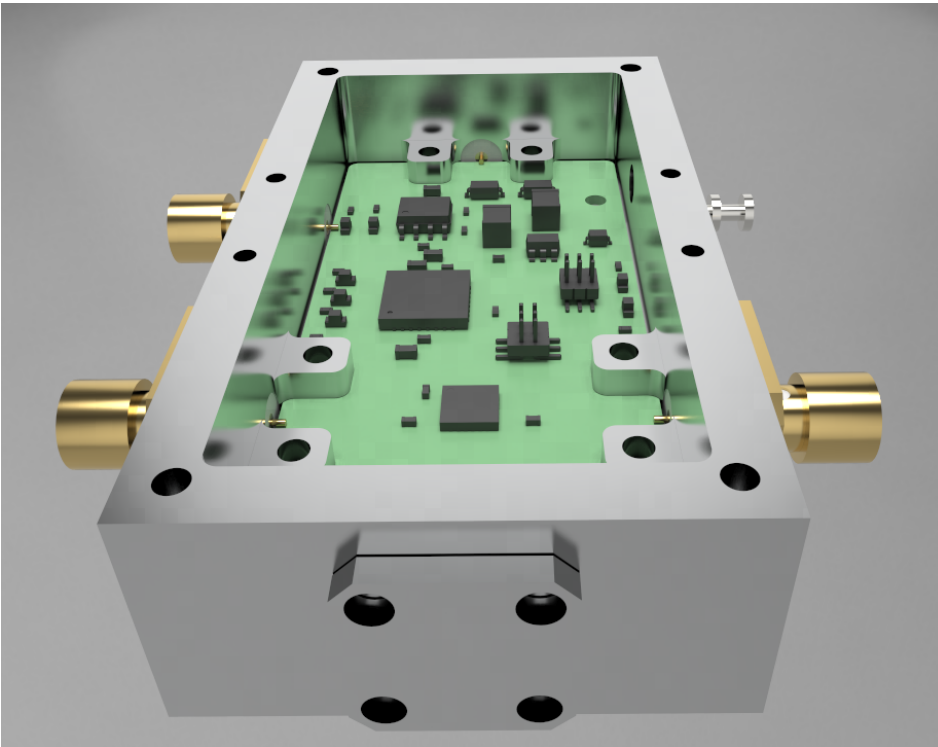


Illustration 2: PCB top view: PCB mounting points

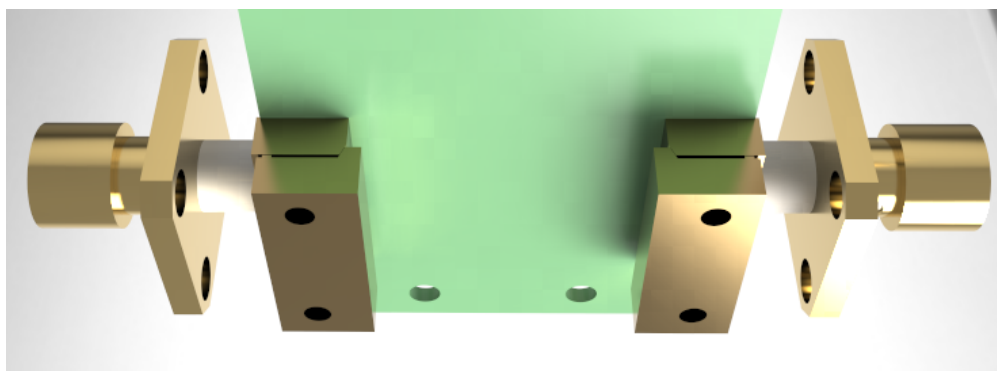
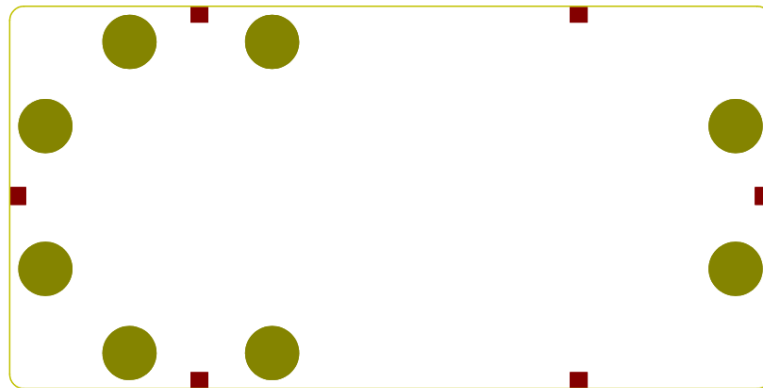
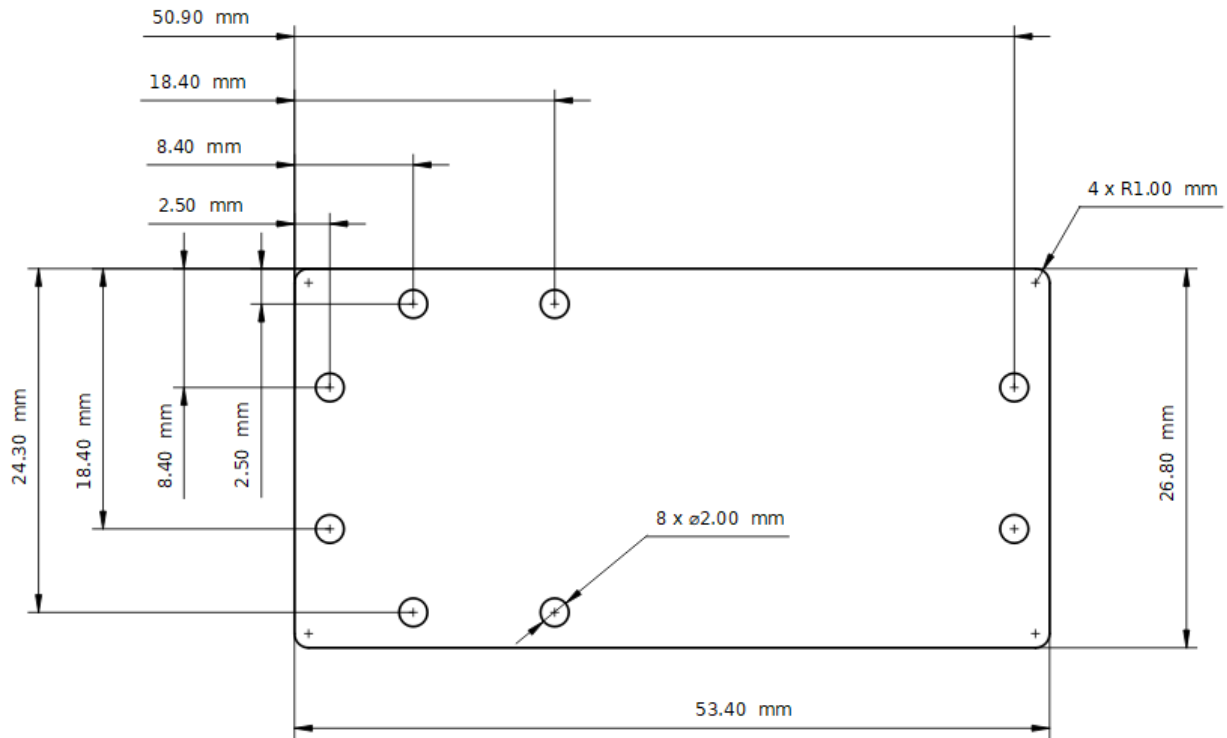


Illustration 3: PCB bottom view: ground plate and mounting table (so these parts can be easily seen, the enclosure body is not shown in this rendering)

Suggested PCB dimension

The figure below shows a suggested PCB layout that will fit in the enclosure and that uses all eight mounting holes.



SMA contact pin

The SMA contact pin has a diameter of 0.5 mm and a length of 1.0 mm.

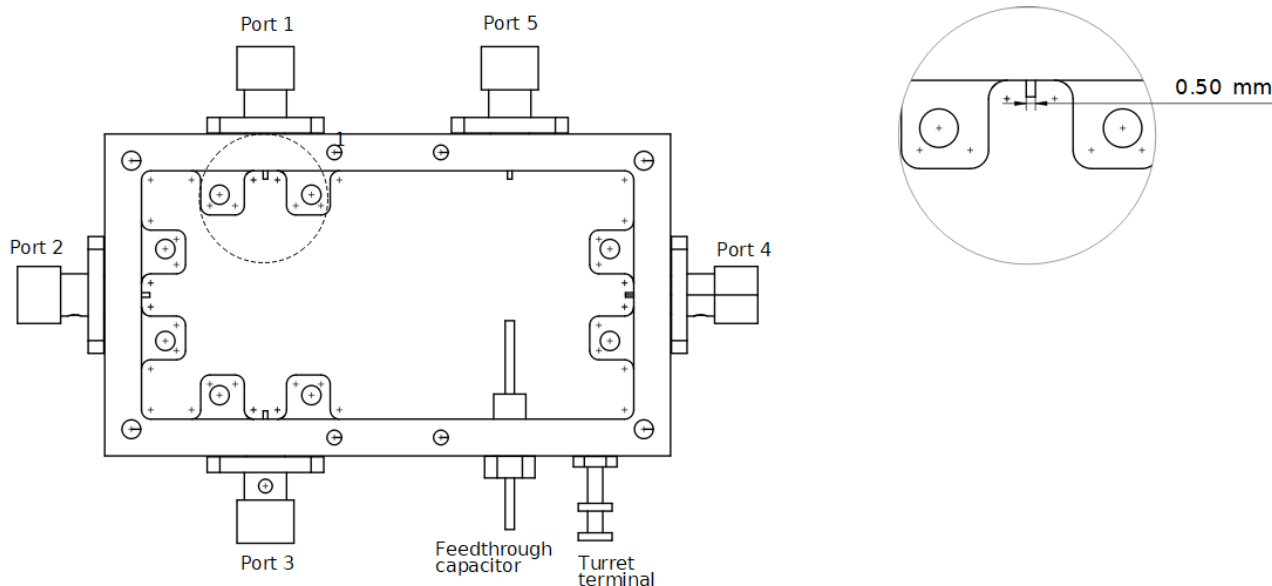



Illustration 4 : Dimensions of the SMA contact pin

Port configurations

SMA ports

- Ports 1 to 4: Full RF ports.
- Port 5: General-purpose port. Because it doesn't use a PCB mounting point, more room is available for components and/or routing traces in this area. This port has a limited RF performance (usable up to 500 MHz).

 Please take care, when ordering the enclosure, to specify the correct number of SMA ports.

- Unused SMA ports are covered by SMA cover plates.

Power port

- DC power can be applied using the feedthrough capacitor. If it's not used, the hole can be closed using the supplied 4-40 UNC screw.

Grounding

- The chassis can be grounded (DC ground) using the turret terminal. If it's not used, the hole can be closed using the supplied 8-32 UNC screw.



Reference designs

There are a series of PCB reference designs that implement a transmission line between SMA ports two and four, in various configurations. It can be used as a quick start for your RF design. The designs are described in an [application note](#) and the [gerber files](#) can be found on Github.

The S-parameters of each design are also shown.

Links:

| |
|--|
| Reference designs RF Enclosure MINI-EXT-FX |
| RF Enclosure Mini EXT-FX Repo in Github |

Assembly instructions

General assembly steps:

1. Fasten the (assembled and soldered) PCB to the frame with the M2 x 8 mm screws.
 - a) Place the PCB top layer against the bottom of the PCB mounting points (it is hanging, not resting, on the mounting points).
 - b) Place the ground plate and mounting table parts as shown in Illustration X.
 - c) Use the M2 x 8 mm screws to fasten the parts together.
 - d) Avoid damage by applying only gentle force to screws.
2. Fix the SMA connectors. Use the M2 screws.
3. Cover unused SMA connector holes with blind plates. Use M2 screws.
4. Solder the SMA connectors to the PCB.
5. Place the feedthrough capacitor if it's needed. Otherwise, fix the hole with the 4-40 UNC screw.
6. Make a solder connection between the feedthrough capacitor and the PCB. Generally, this is done using a very short wire.
7. Fix the bottom cover to the frame using the M2.5 screws.
8. Fix the top cover to the frame using the M2.5 screws.
9. Fasten the turret terminal to the frame if it's needed. Otherwise, fix the hole with the 8-32 UNC screw.

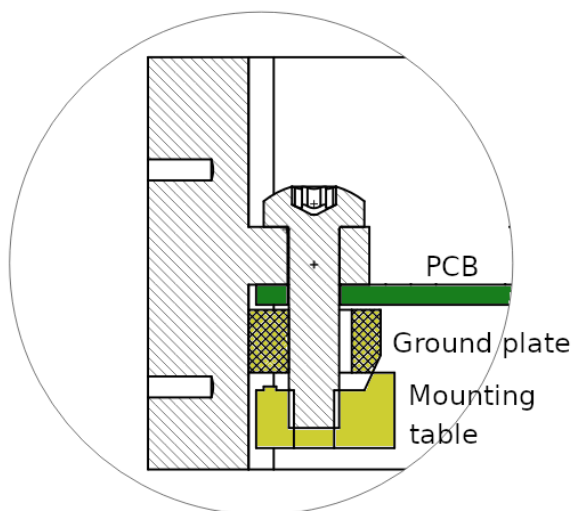


Illustration 5 : PCB Mounting parts and their orientation

General steps to change the PCB

1. Remove the top cover.
2. Unscrew all SMA connectors.
3. Desolder any connection to the feedthrough capacitor, if applicable.
4. Apply heat with a soldering iron to an SMA connector pin and gently retract the connector from the frame.
5. Repeat for every SMA connector.
6. Remove the PCB by removing all M2 x 8 mm screws.
7. Follow the general assembly steps to place a new PCB.

Recommended tooling

| Screw | Tool |
|----------|----------------------------|
| M2 | Torx T6 screw driver |
| M2.5 | Torx T8 screw driver |
| 4-40 UNC | Phillips head screw driver |
| 8-32 UNC | Phillips head screw driver |

Application

The RF enclosure is designed to be a solution for some common RF design scenarios. The left side of the enclosure is typically used as an RF deck with one to three SMA ports. Port 4 can be used to create a longer RF path.

The green area is optimized for an effective PCB area. This is where circuits that need more components can be realized (e.g., power supply, microcontroller, communication drivers).

Of course, it is perfectly fine to use the green area as a dedicated RF area too.

Port 5 can be used for frequencies up to 500 MHz; for example, for RF signals with a limited bandwidth, clock signals, or control signals.

If the RF performance of port 5 must be increased, an SMD EMI spring-finger contact can be used to create a shorter RF return path for port 5.

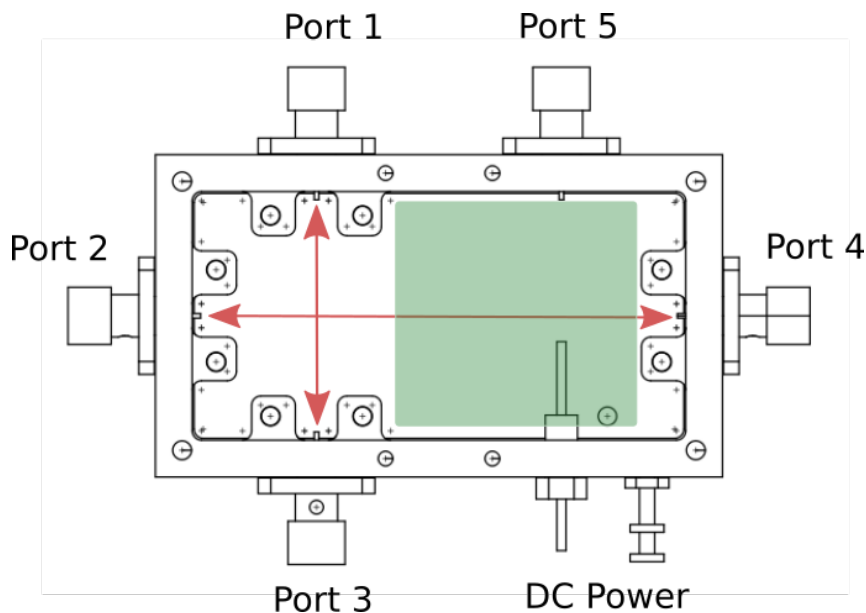


Illustration 6 : Typical application

Documentation

| Document type | Document ID | URL |
|------------------|--|------------------------|
| Application note | AN-RF-RF-ENCL-MINI-EXT-FX-Ref-Designs-v001 | Link.. |

Ordering information

- There are two products to select from:
 - with mounting flange: RF-ENCL-MINI-EXT-FX-YF-01
 - no mounting flange: RF-ENCL-MINI-EXT-FX-NF-01
- Specify the correct number of SMA connectors for your application.

Revision

| Revision | Status | Date |
|----------|----------|---------------|
| 005 | Released | June 04, 2024 |

Legal

Specifications are subject to change without notice.

www.gequipment.com