

The 5G era has dawned. Massive deployments are expected in 2021-2025 worldwide. IMT-2020 defines eMBB, URLLC and mMTC which are keys to successful 5G communications. TMYTEK has developed an educational kit to support our teaching fellows and partners. It is an even smaller compact development tool that can help our customers in moving onto 5G beamforming developments and tests with ease. We call it the BBoard. It is part of the B series, next in line to BBox™ One and BBox™ Lite. It consists of 4 RF channels and API/GUI software control through ethernet interface.

Similar to our B series products, our BBoard can also control the phase and the amplitude of each channel independently. It is most suitable for educational purposes. Light weight and easy to get started on beamforming. Please find more details below.

Features

- Operating Frequency: 37 to 40 GHz
- Designed for 5G n260 band
- Up to 4 controllable RF channels
- Each channel provides:
 - 360° phase shifter coverage with 5.625° per step
 - RMS phase error: 4° (typical)
 - 15 dB gain control range
 - RMS attenuation error: 0.4 dB (typical)
- T/R half duplex operation
- 2 ms T/R mode switching time (typical)
- 2 ms phase/gain switch time (typical) *1
- PC software control via RJ-45 Ethernet interface

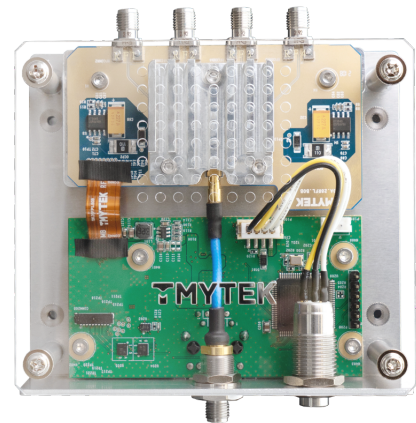


Figure 1. BBoard 5G 39 GHz

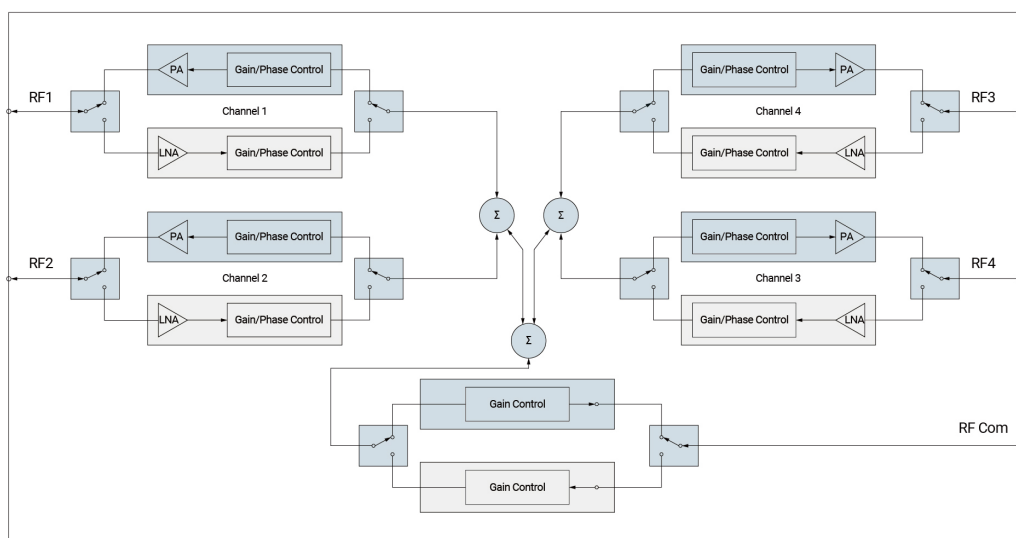


Figure 2. 5G Beamformer System Diagram (4 channels)

*1 The time here is dependent on the CPU speed of the PC in which the control interface (UI or API) is running on.

Single Channel RF Specifications

Tested conditions: 4 channels, $f_{RF} = 39 \text{ GHz}$, $Z_{Sys} = 50 \Omega$ and $T_{AMB} = 25^\circ\text{C}$

Parameter	Conditions	Unit	Min.	Typ.	Max.
Operating Frequency Range	Without antenna	GHz	37	39	40
Maximum Gain	Tx Mode	dB	14	17	---
	Rx Mode	dB	9	12	---
Noise Figure	Rx Mode	dB	---	16	19
OP1dB	Tx Mode	dBm	8	10	12
IP1dB	Rx Mode	dBm	-23	-21	-19
Phase Shifting Range		deg	---	360	---
Phase Shifting Step		deg	---	5.625	---
RMS Phase Error		deg	---	4	8
Gain Control Range		dB	---	15	---
Gain Control Resolution	Common Gain	dB	---	1	---
	Channel Gain	dB	---	0.5	---
RMS Attenuation Error		dB	---	0.4	---
Return Loss	RF Port (Tx)	dB	7	10	---
	RF Port (Rx)	dB	7	10	---
	COM Port	dB	---	7	---
Channel-to-Channel Isolation	Maximum gain setting-Tx	dB	---	25	---
	Maximum gain setting-Rx	dB	---	30	---

DC and Control Specifications

Parameter	Conditions	Unit	Min.	Typ.	Max.
Power Consumption	Tx Mode	W	---	---	7
	Rx Mode	W	---	---	5
Supply Voltage		Vdc	---	5	---
T/R Switching Time	Between Tx and Rx modes	ms	---	2	---
Phase/Gain Switch Time*1	Dependent on CPU speed	ms	---	2	---

AC Specifications

Parameter	Conditions	Unit	Min.	Typ.	Max.
Adapter Input Voltage		Vac	100	---	240
Adapter Input Current Consumption		A			0.7

Software Control Interface

The BBoard software interface offers both UI and API control which are completely designed in house by our software team. The module can be controlled by RJ-45 ethernet cable. Both the UI and API are available for our customers to access and download from the Web. Our developed GUI interface shows the 4-channel phase and gain control as depicted below. To control the parameters, users can turn ON/OFF each channel, control the phase and the gain by using the up/down arrows, or turn ON/OFF the temperature compensation functions.

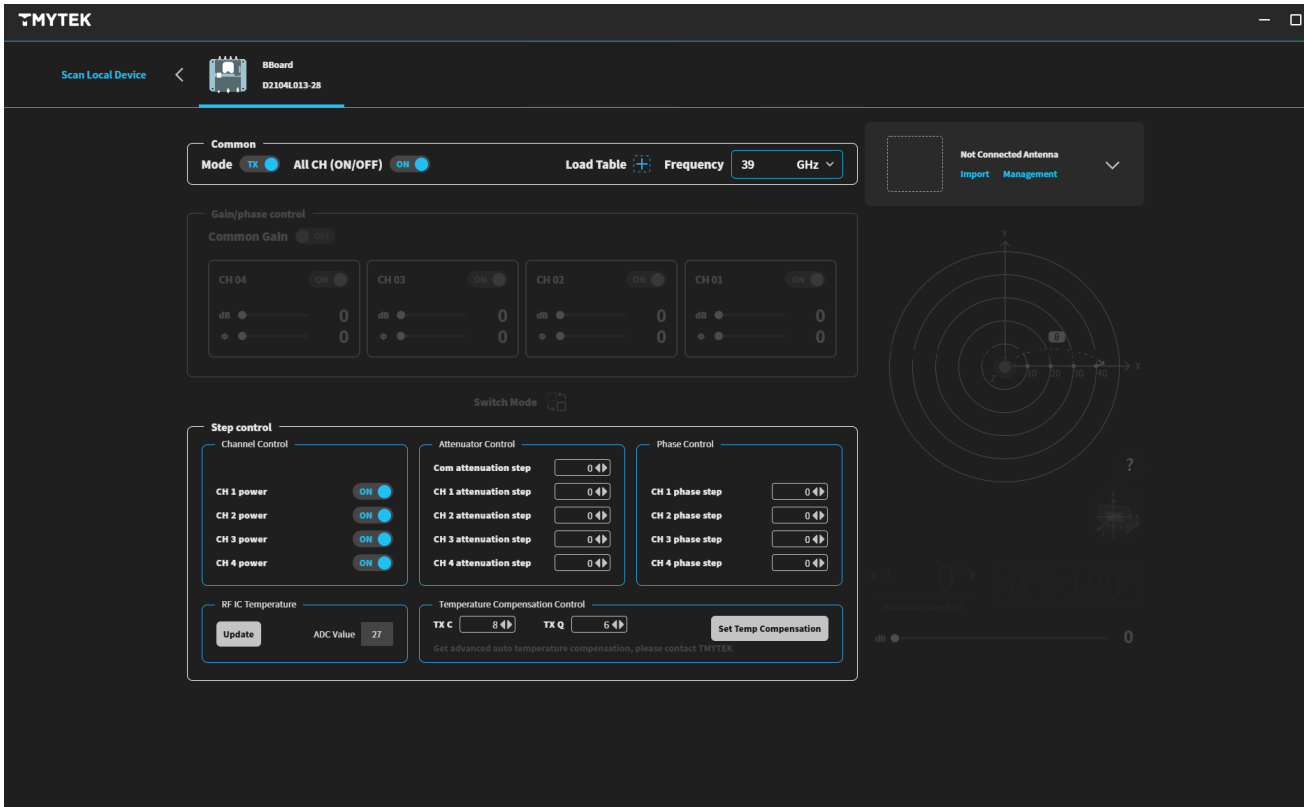


Figure 3. Software GUI for controlling BBoard

Connector Specifications

Parameter	Location	Type and Function
RF1, RF2, RF3, RF4	Front Panel	4 channel RF ports with 2.92 mm (K) Jack connectors
RJ-45 Ethernet	Back Panel	Control port (including UI and API control)
DC IN	Back Panel	Type-C DC input (DC 5V/3A max. adapter included)
RF COM	Back Panel	RF common port with 2.92 mm (K) Jack connector
Switch Button	Back Panel	ON/OFF Switch

Package

TMYTEK's compact connectorized packaging:

Parameter	Condition	Unit	Min	Typ	Max
Dimension	Length	mm	105.6	107.6	109.6
	Width	mm	98.0	100.0	102.0
	Height	mm	37.0	39.0	41.0
Weight		g	---	250	---

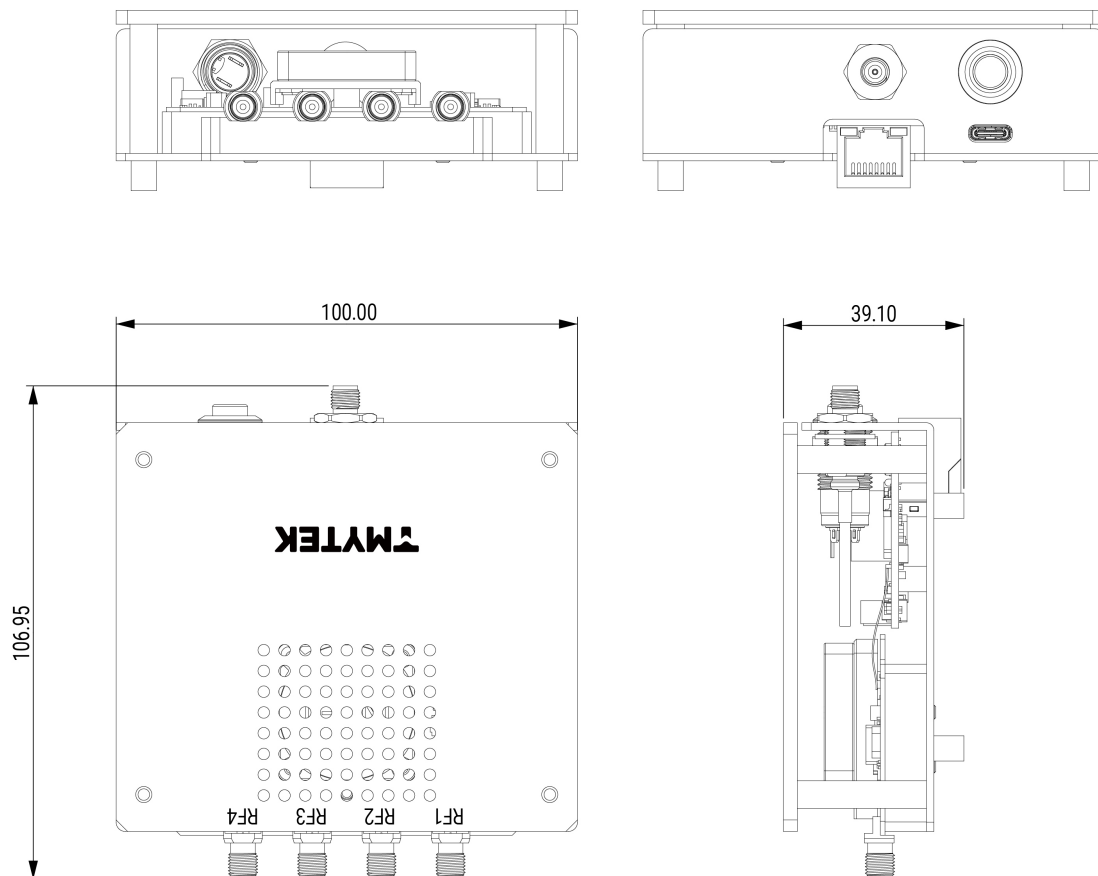


Figure 4. BBaord Dimension Drawing