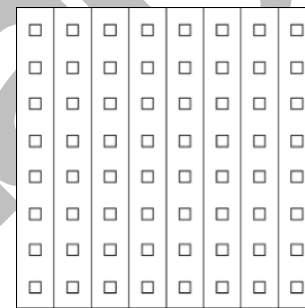


5G era is coming soon. Massive deployment is expected in 2021 worldwide. IMT-2020 defines eMBB, URLLC and mMTC which are keys to successful 5G communications. TMYTEK has developed a compact size Antenna-in-Package (AiP) for 5G beamforming applications. The AiP module scalable in size which can fit customer’s various needs. Please contact TMYTEK for more details.

Our AiP is made ready to help users to prepare, design, test and deploy beamforming solutions for base stations and 5G researches. More details are outlined below.

Features

- Antenna designed for n261 band in accordance with 3GPP release 15.2
- Operating Frequency: 27.5 to 28.35 GHz (dependent on antenna design)
- 8x8 series patch antenna array (scalable modules, ex. 8x16 array = two 8x8 array)
- 64 RF channels
- Each channel provides:
 - 6-bit phase shifter with 360° coverage
 - RMS phase error: 3° (typical)
 - 5-bit attenuation range up to 35 dB
 - RMS attenuation error: 0.4 dB (typical)
 - Input / Output matching: -10 dB (typical)
- T/R half duplex operation
- 100 ns T/R mode switching time (typical)
- 20 ns gain and phase settling time (typical)
- PC software control via ethernet RJ-45 interface



Top View

Figure 1. 64 element AiP (Picture only shows Antenna side)

System Specifications

Parameter	Conditions	Unit	Min.	Typ.	Max.
Operating Frequency Range	With standard 8x8 series patch antennas	GHz	27.5	---	28.35
IF Frequency Range	RF Com Port	GHz	0.01	---	6
Number of RF Channels		---	---	64	---
Transmitter Total Gain	Maximum gain setting	dB	---	53	---
Transmitter EIRP	Maximum gain setting	dBm	---	53	---
Maximum Input Power	Maximum gain setting	dBm	---	0	---
Receiver Total Gain	Maximum gain setting	dB	---	27	---
Receiver EIRP	Maximum gain setting	dBm	---	-33	---
Output P1dB	Maximum gain setting	dBm	---	12	---

Electrical Specifications

Antenna Specification

Parameter	Conditions	Unit	Min.	Typ.	Max.
Operating Frequency Range		GHz	27.5	---	28.35
Number of Elements		---	---	64	---
Antenna Gain	8x8 series patch antennas	dBi	---	23	---

Single Channel Transmitter (TX) Mode Specification

Parameter	Conditions	Unit	Min.	Typ.	Max.
Operating Frequency Range	Without antenna	GHz	24	---	31
Gain	Maximum gain setting, without antenna	dB	---	12	---
Phase Shifting Range		deg	---	360	---
RMS Phase Error		deg	---	3	---
Attenuator Range		dB	---	32	---
RMS Attenuation Error		dB	---	0.4	---
Return Loss		dB	---	10	---
Channel-to-Channel Isolation	Maximum gain setting	dB	---	40	---

Single Channel Receiver (RX) Mode Specification

Parameter	Conditions	Unit	Min.	Typ.	Max.
Operating Frequency Range	Without antenna	GHz	24	---	31
Gain	Maximum gain setting, without antenna	dB		22	
Noise Figure	Maximum gain setting	dB		8	
Phase Shifting Range		deg		360	
RMS Phase Error		deg		3	
Attenuator Range		dB		32	
RMS Attenuation Error		dB		0.4	
Return Loss		dB		10	
Channel-to-Channel Isolation	Maximum gain setting	dB		40	

Package

TMYTEK's compact connectorized packaging. Size TBD.

DC Specifications

Parameter	Conditions	Unit	Min.	Typ.	Max.
Power Consumption		W	---	TBD	---
Current Consumption		A	---	TBD	---
Supply Voltage		Vdc	---	12 or 24	---
Switching Time	Between Tx and Rx modes	ns	---	100	---
Gain Settling Time	97% settling time	ns	---	20	---
Phase Settling Time	97% settling time	ns	---	20	---

AC Specifications

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

Operating Condition

Parameter	Absolute Maximum
Operating Temperature	-40°C to +105°C
Storage Temperature	-40°C to +150°C

Control Interface

The AiP can be controlled through software API designed by us. This interface can be controlled either by RJ-45 ethernet cable or USB cable. All 64 RF channel phases and amplitudes can be controlled separately through the software commands.

Connector Specifications

Parameter	Location	Type and Function
Ethernet RJ-45		Software API control port
DC IN		TBD
RF COM		SMA connector RF common port