



REALTEK

Realtek NIC PHY HSB Roadmap

Dec, 2022

Driving IC Innovation

Realtek NIC & PHY Solution

PCIe NIC

- PCIe 3.0 to 5GbE
- PCIe 2.0 to 2.5GbE
- PCIe 1.1 to GbE
- PCIe 1.1 to FE



USB NIC

- USB 3.2 Gen 2 to 5GbE
- USB 3.2 Gen 1 to 2.5GbE
- USB 3.2 Gen 1 to GbE
- USB 2.0 to FE



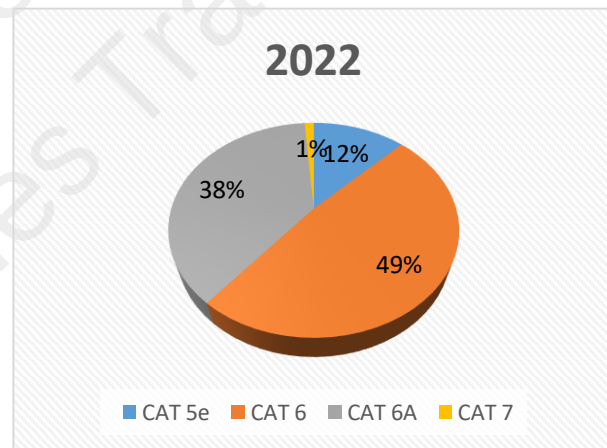
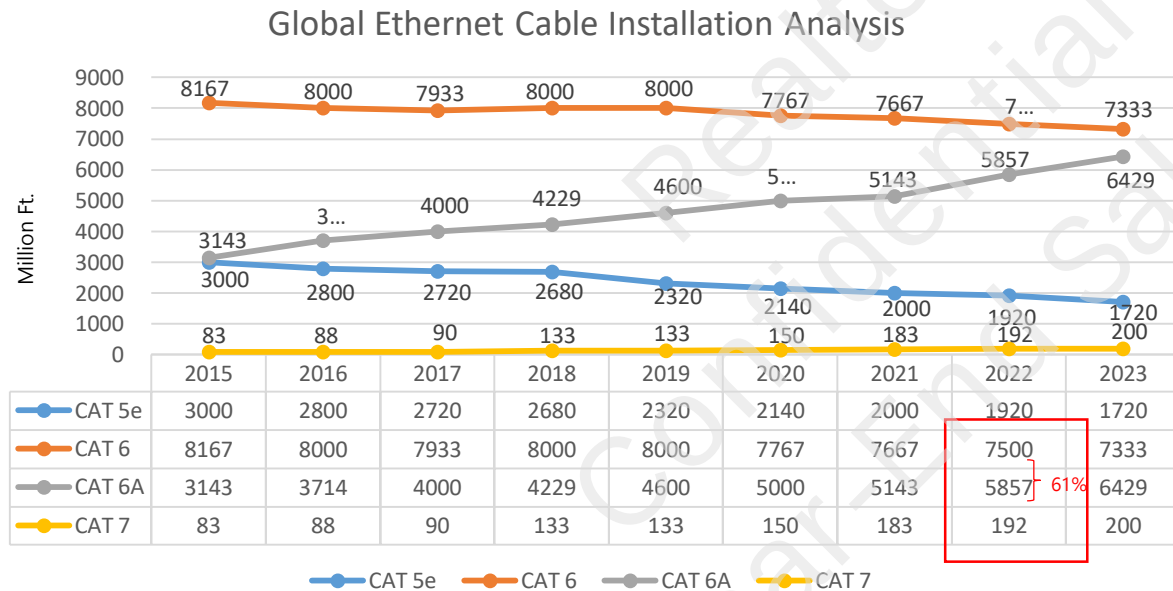
Ethernet PHY

- UXSGMII/XFI/5000Base-R/5000Base-X
HiSGMII/2500Base-X 5GbE PHY
- HiSGMII/2500Base-X /SGMII 2.5GbE PHY
- RGMII/SGMII/GMII GbE PHY
- RMII/MII FE PHY



Global Copper Ethernet Cable Installation Data 2022

- CAT 5e + CAT 6 cable have 61% new installation rate in 2022.
- Existing Ethernet cable Infrastructure has 74% share using CAT 5e & CAT 6
 - Note 10GbE Require CAT 6A Cable.



CAT5e Cable still has 12% installation rate in 2022

Realtek Multi-Gigabit Ethernet Solutions

2.5GbE / 5GbE / 10GbE

RTL8125BG PCIe NIC (QFN48, 6x6)

RTL8156BG USB NIC (QFN56, 6x6)

RTL8221B PHY (QFN48, 6x6)

RTL8126 PCIe NIC (QFN56, 8x8)

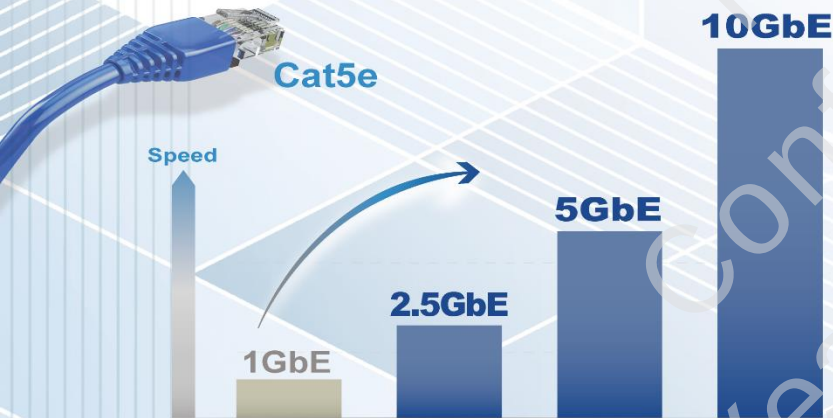
RTL8157 USB NIC (QFN68, 8x8)

RTL8251B PHY (QFN56, 8x8)

RTL8261N Single PHY (aQFN119, 10x10)

RTL8264B 4-port PHY (BGA484, 23x23)

- The smallest QFN package size for Ethernet product
- Lowest Power consumption (2.5GbE < 0.7W, 5GbE < 1.5W)
- Upgrading network speed with the same cable (Cat 5e)



Realtek PHY Roadmap

2018-2022

2023

Multi-G

2.5G PHY



RTL8221B-VB

- 2.5GbE QFN48 (6x6)
- 802.3bz/HiSGMII/2500Base-X
- WoL/Interrupt/EEE
- IEEE1588/Sync. E/802.1AS
- Jumbo Frame 16k
- Max Power ~656mW
- Industrial: RTL8221BI-VB

5G PHY



RTL8251B

- 5 GbE, QFN56 (7x7)
 - **1st 5GbE PHY in QFN Package (Smallest)**
 - Cost Effective 5GbE PHY for Customers
 - Target Markets: Broadband Access, WiFi 6+, Switch...
- ES: 2023'Q1 ; MP: 2023'Q2

NEW

1G

1G PHY



RTL8211F

- RGMII, GbE @ QFN40 (5x5)
- 3.3V/2.5V/1.8V/1.5V
- SWR: RTL8211F(I)
- LDO: RTL8211FD(I)
- IEEE802.3az/WOL
- **Aspeed BMC AST2600 Ref. Design**
- Industrial: RTL8211F(D)I

1G PHY



RTL8211FS-VS

- RGMII/SGMII, GbE @ QFN48 (6x6)
- RTL8211F +
- Support SERDES/Fiber
- PTP, 1588v1,v2, 802.1AS, Sync. Ethernet
- **Aspeed BMC AST2600 Ref. Design**
- Industrial: RTL8211FSI-VS

10/100M

FE PHY



RTL8201F

Series

- MII/RMII, QFN24/32
- 3.3/2.5/1.8/1.5V
- Support 100BASE-TX/100BASE-FX
- RMII/MII to UTP/Fiber
- LDO
- Industrial: RTL8201FI-VC

FE PHY



RTL8201G

Series

- MII/RMII, QFN24/32
- Long distance Ethernet
- Support 100BASE-T1, 100BASE-TX
- RMII/MII to UTP/Coaxial
- LDO
- **Pin to Pin RTL8201F-VB**
- Industrial: RTL8201GI-VB



Realtek 2.5GbE/5GbE Single PHY

	RTL8221B(I)-VB-CG	RTL8221B(I)-VM-CG	RTL8251B(I)-CG	RTL8251B(I)-VM-CG
MP	MP	MP	ES: 2023 Q1 MP: 2023 Q2	ES: 2023 Q1 MP: 2023 Q2
Package, size	QFN48, 6x6mm^2	QFN48, 6x6mm^2	QFN56, 8x8mm^2	QFN56, 8x8mm^2
Industrial version	RTL8221BI-VB-CG	RTL8221BI-VM-CG	RTL8251BI-CG	RTL8251BI-VM-CG
MacSec		✓		✓
10Base-T/100Base-TX 1000Base-T/2500BASE-X	✓	✓	✓	✓
SGMII/HiSGMII	✓	✓	✓	✓
5000BASE-X /5000BASE-R			✓	✓
USXGMII (10G), SFI (10G)			✓	✓
Wake-on-LAN, EEE (802.3az)	✓	✓	✓	✓
1588v1,v2; 802.1AS, Sync. Ethernet	✓	✓	✓	✓

Realtek Single GbE PHY

	RTL8211F(D)(I)-CG	RTL8211FS(I)-CG	RTL8211FS(I)-VS-CG
Quick Guide	RGMII interface, industrial	SGMII interface	SGMII interface + PTP
MP	MP	MP	MP
Package, Size	QFN40, 5x5mm^2	QFN48, 6x6mm^2	QFN48, 6x6mm^2
Industrial version (-40~85C)	RTL8211F(D)I-CG	RTL8211FSI-CG	RTL8211FSI-VS-CG
10Base-T/100Base-TX 1000Base-T	✓	✓	✓
RGMII	✓	✓	✓
SGMII		✓	✓
SERDES/Fiber		✓	✓
3.3V to low voltage	RTL8211F(I)-CG: SWR RTL8211FD(I)-CG: LDO	SWR	SWR
RGMII IO Voltage	3.3V, 2.5V 1.8V, 1.5V	3.3V, 2.5V 1.8V, 1.5V	3.3V, 2.5V 1.8V, 1.5V
EEE (IEEE 802.3az) PHY based WoL	✓	✓	✓
1588v1,v2; 802.1AS Sync. Ethernet			✓

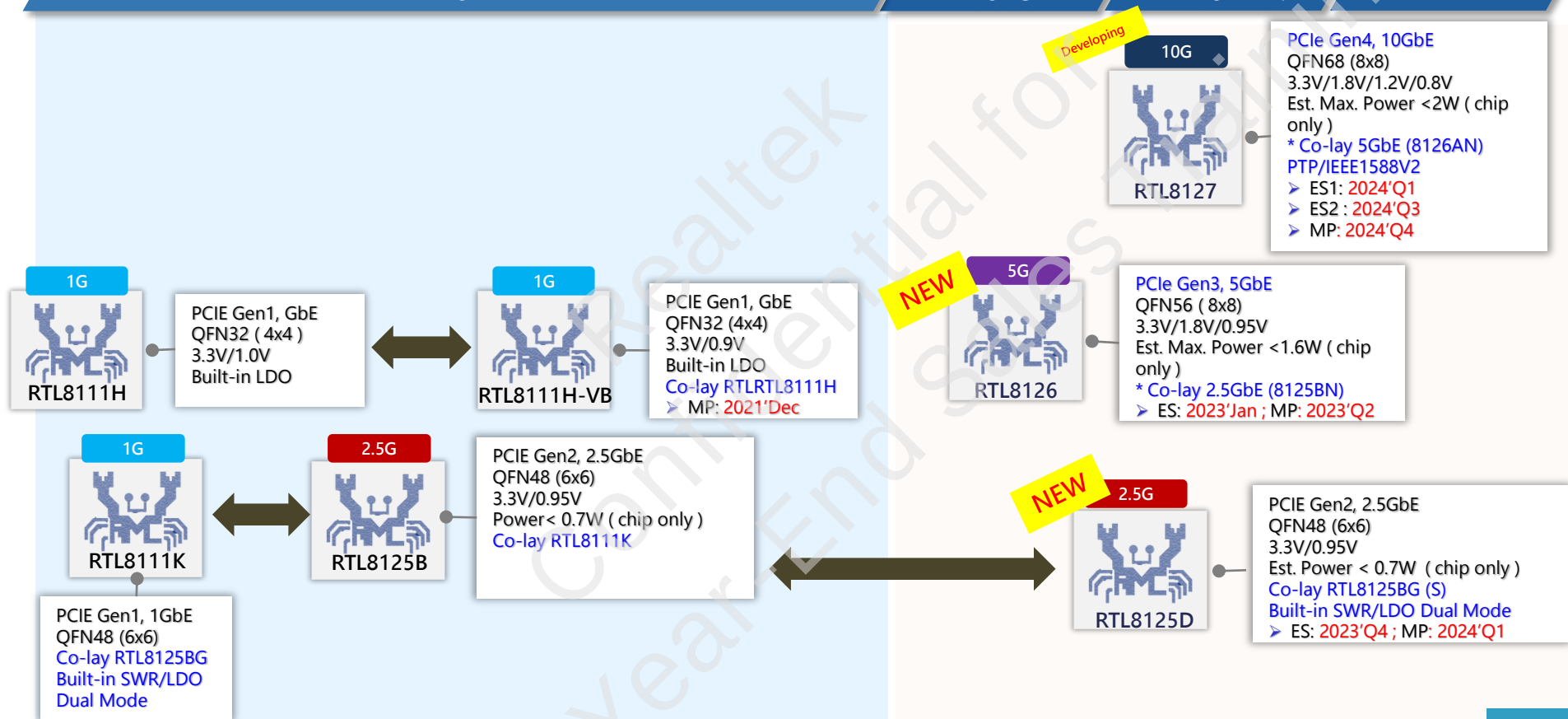
Realtek PCIe NIC Roadmap

~2022

2023

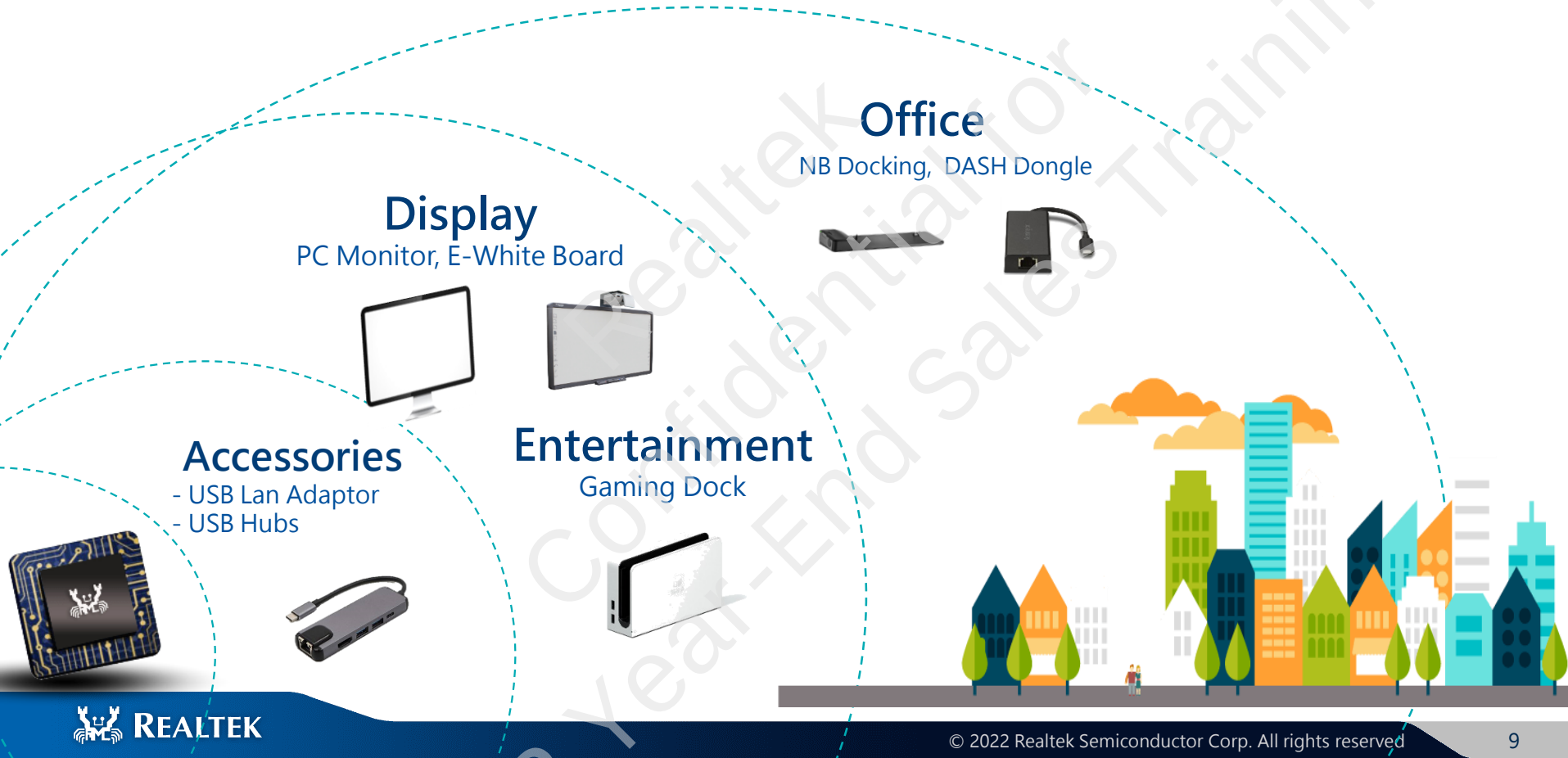
2024

2025



* 8125BN & 8126AN is currently used for early engagement design, verification purpose only

USB NIC Applications



Realtek USB NIC Roadmap

2018-2022

2023

2024~

Premium

2.5G NIC



RTL8156BG

2.5GbE QFN56 (6x6)

- USB 5 Gbps
- Max Power < 0.7W (Chip Only)
- Support Dragon (RTL8156BG)
- P2P Co-layout with RTL8153D

New

5G NIC



RTL8157 Series

5 GbE, QFN64 (9x9)

- USB 10Gbps
- 3.3V/1.8V/0.9V
- <1.6W @5GbE (Chip Only)
- ES: 2023'Q1 ; MP: 2023'Q2

Developing

10G NIC



RTL8158

- USB 20Gbps, 10GbE
QFN68 (8x8)
3.3V/1.8V/1.2V/0.8V
Est. Max. Power <2W
(chip only)
- ES1: 2024'Q1
 - ES2: 2024'Q3
 - MP: 2024'Q4

Main Stream

1G NIC



RTL8153B-VB

1 GbE, QFN40 (5x5)

- USB 5Gbps
- Support Dragon SW (RTL8158)

Co-layout

1G NIC



RTL8153B-VC

1 GbE, QFN40 (5x5)

- USB 5Gbps
- SWR Mode Only

1G NIC



RTL8153-VC

1 GbE, QFN48 (6x6)

- USB 5Gbps
- Last Buy: 6/E '23
- EoL: 12/M '23

Co-layout

New

1G NIC



RTL8153E

1 GbE, QFN40 (5x5)

- USB 5Gbps
- SWR / LDO Dual Mode

Entry

FE NIC



RTL8152B-VB

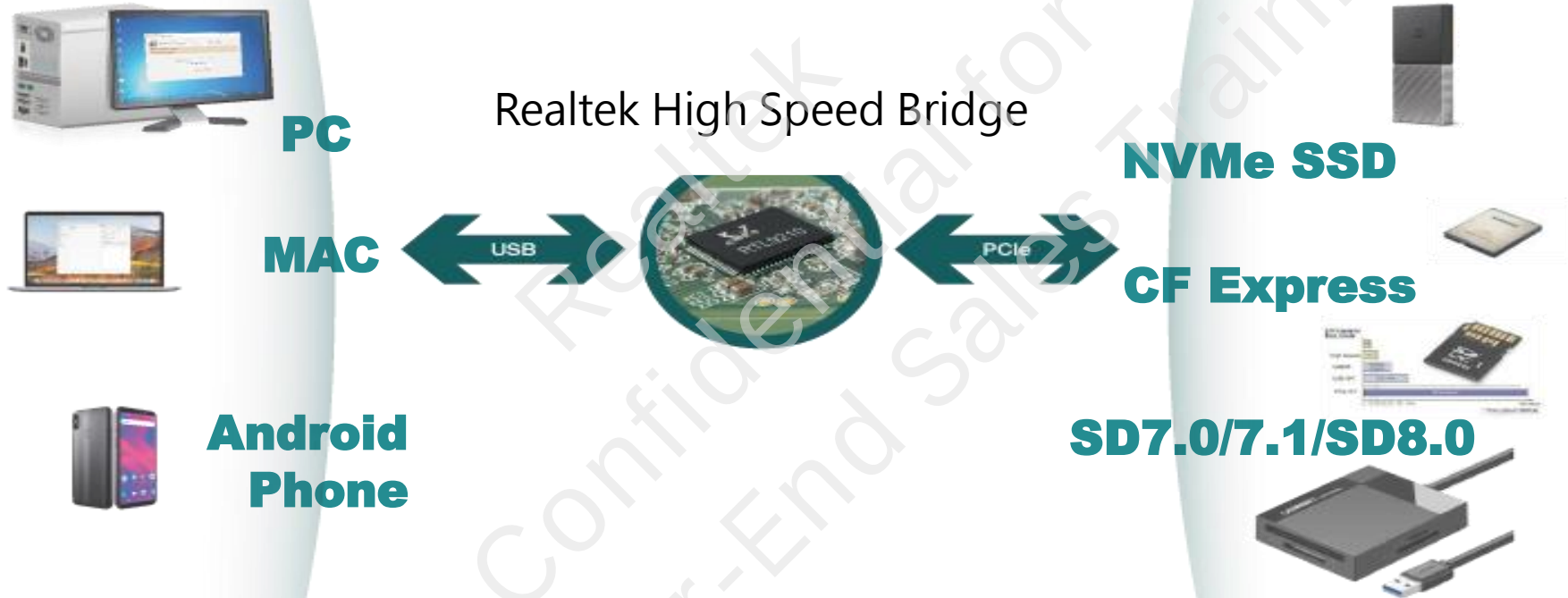
- 10/100M, QFN24 (4x4)
- USB 2.0 High Speed

Realtek USB NIC Product Line-Up

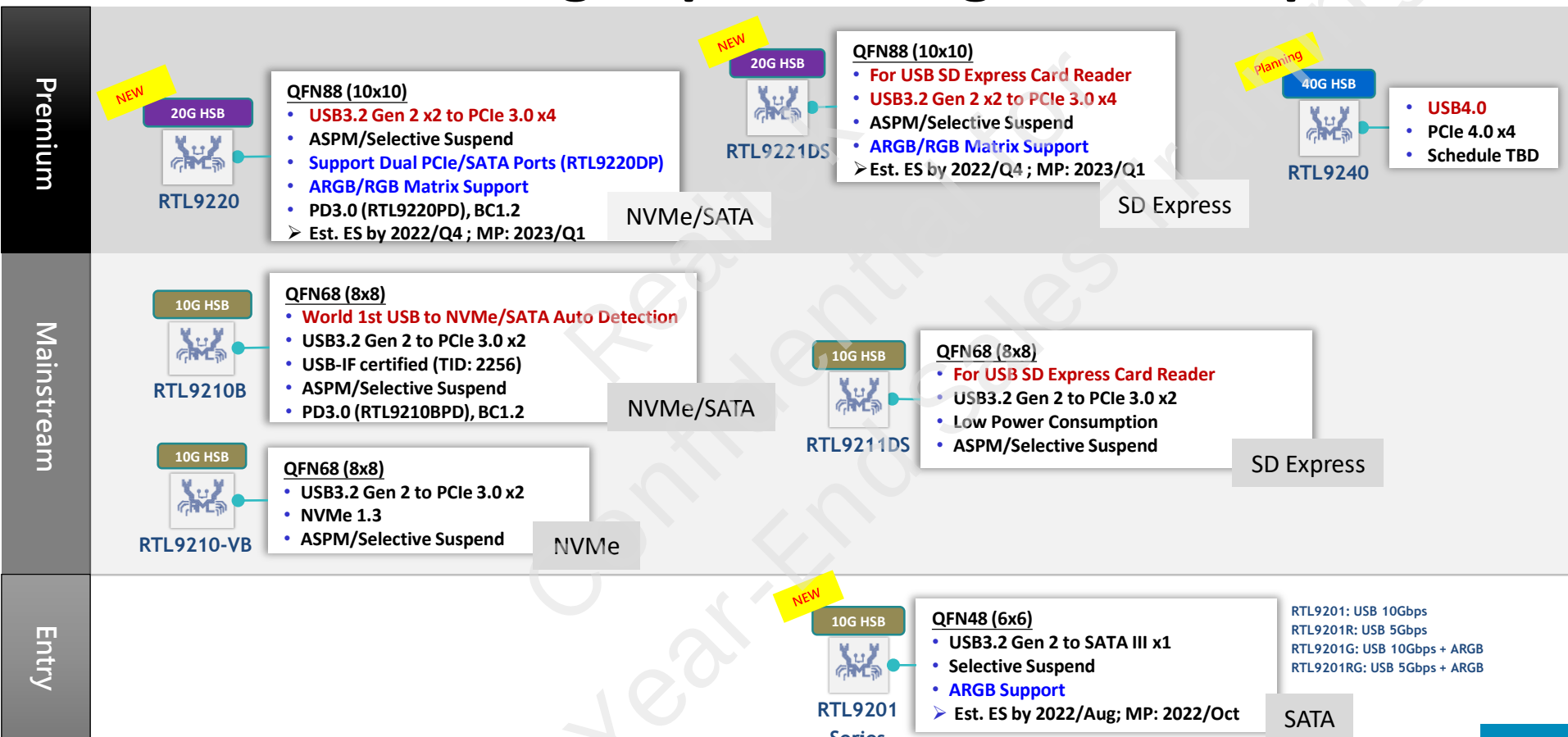
Features	RTL8152B-VB	RTL8153-VC	RTL8153B-VB	RTL8153E	RTL8156B(G)	RTL8157
Package	QFN 24 4x4	QFN48 6x6	QFN40 5x5	QFN40 5x5	QFN56 6x6	QFN64 9x9
Interfaces	USB 2.0	USB3.2 (5Gbps)	USB3.2 (5Gbps)	USB3.2 (5Gbps)	USB3.2 (5Gbps)	USB3.2 (10Gbps)
Speed	100M / 10M	1G / 100M / 10M	1G / 100M / 10M	1G / 100M / 10M	2.5G / 1G / 100M / 10M	5G / 2.5G / 1G / 100M / 10M
Power Rail	3.3V / 1.05	3.3V / 1.2V	3.3V / 1.0V	3.3V / 1.2V	3.3V / 0.95V	3.3V / 1.8V / 0.9V
Built in Regulator	✓	✓	✓	✓	X	X
CDC-NCM/ECM	✓ (ECM Only)	✓ (ECM Only)	✓ (ECM only)	✓ (ECM only)	✓	✓
Clock Input	25MHz	25MHz / 48MHz	25MHz / 48MHz	25MHz	25MHz	50MHz
Dragon SW	X	X	✓ (RTL8158)	✓ (RTL8158-VB) Planning	✓	✓ Planning
DASH	X	X	X	X	X	X
Jumbo Frame	X	9k	9k	9k	16k	16k
Co-layout with	--	--	RTL8153B-VD	RTL8153B-VB	--	--

Co-layout

Product Application



Realtek High Speed Bridge Roadmap



RTL9220 Feature Table

NEW

20G HSB



RTL9220

QFN88 (10x10)

- USB 3.2 Gen2x2 (20G) to PCIe 3.0 x4
- ASPM/Selective Suspend
- 1st USB to NVMe/SATA Auto Detection
- ARGB/RGB Matrix Support

NEW

20G HSB



RTL9220DP

QFN88 (10x10)

- USB 3.2 Gen2x2 (20G) to PCIe 3.0 x4
- ASPM/Selective Suspend
- Dual NVMe Ports or Dual SATA Ports
- Support JBOD / RAID
- ARGB/RGB Matrix Support

Model	Port Counts	SSD Type	Operation Mode	ARGB Controller	Remark
RTL9220	Single Port	NVMe / SATA	SSD Type Auto Detection	Built-in	USB 3.2 Gen2x2 (20G)to NVME or SATA
RTL9220DP	Dual Port JBOD or RAID Mode	NVMe * 2 SATA * 2	JBOD RAID 0 RAID 1*	Built-in	USB 3.2 Gen2x2 (20G) to 2 sets PCIe 3.0 x 2 USB 3.2 Gen2x2 (20G) to 2 sets SATA *

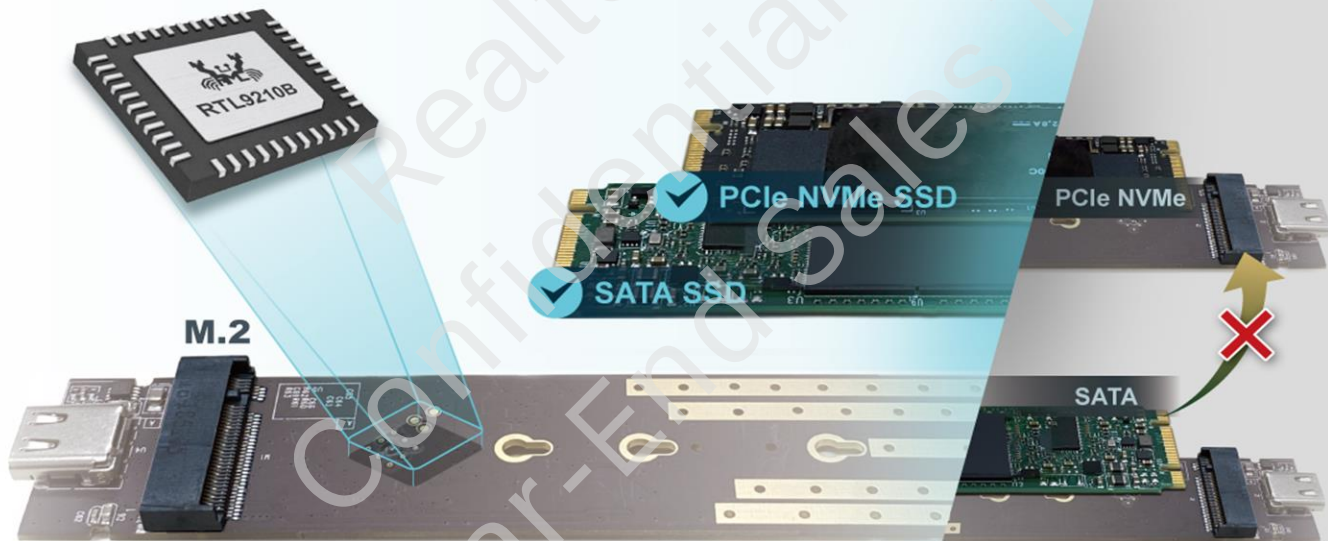
* RTL9220DP RAID 1 & Dual SATA FW is under development

RTL9210B, RTL9220 PCIe/SATA Auto Detection

RTL9210B

World's First

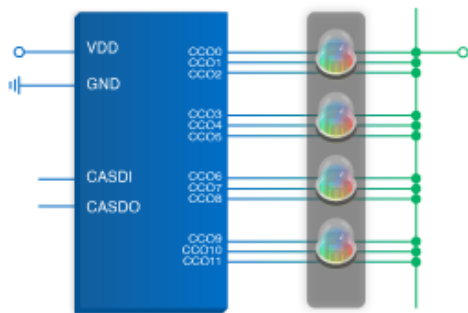
**PCIe NVMe / SATA
auto detection**



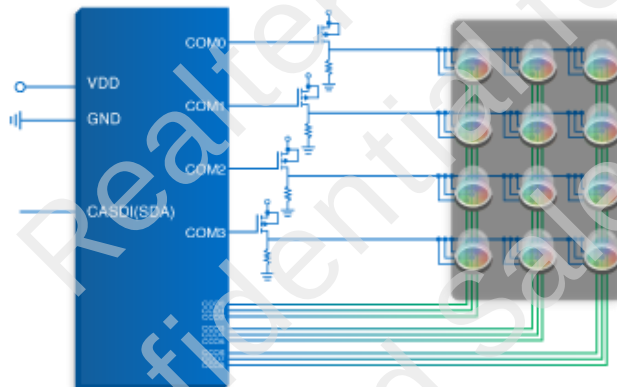
Three Ways of RGB Driving

Direct Driving and RGB Matrix

Direct Driving Mode

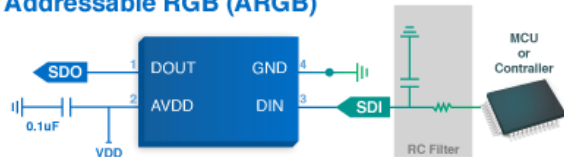


Time-shared Scanning Mode (RGB Matrix)



ARGB

Addressable RGB (ARGB)



Data Communication

D1	1 st 24bit	2 nd 24bit	3 rd 24bit	Reset 50us	1 st 24bit	2 nd 24bit	3 rd 24bit
D2		2 nd 24bit	3 rd 24bit	Reset 50us		2 nd 24bit	3 rd 24bit
D3			3 rd 24bit	Reset 50us			3 rd 24bit

Single Data in 24bit for RGB

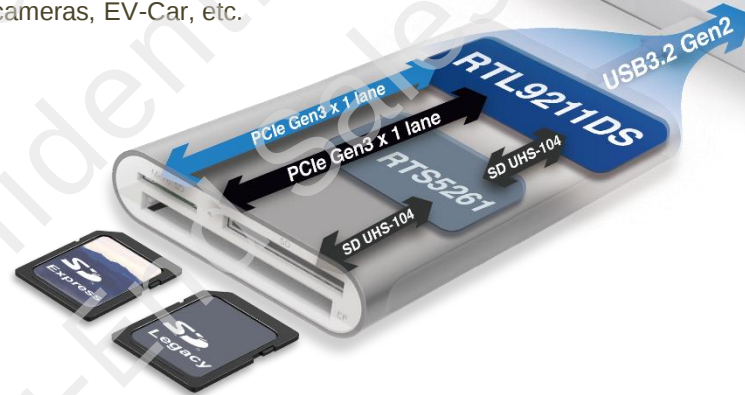
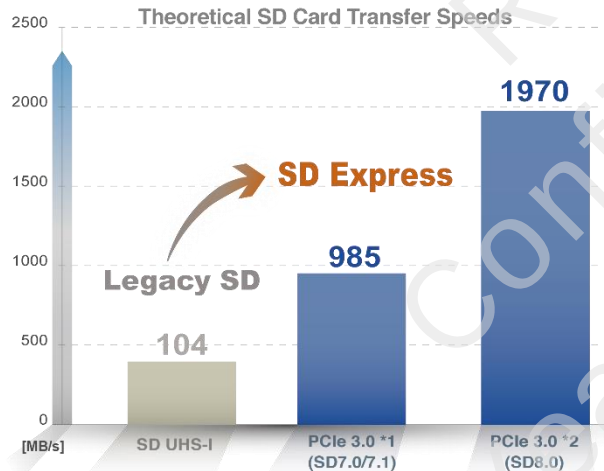
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Realtek World's 1st Mass Production USB-to-SD Express Card Reader Solution

USB to Secure Digital Memory Card SD7.0 / 7.1 / 8.0 Solution

RTL9211DS

- USB3.2 Gen II to PCIe3.0 x 2 lanes, providing 10Gbps bandwidth (1250MB/s)
- Supports NVMe 1.3 for SD Express
- Applications: USB SDE card reader for 8K video recording, high-end drones, super-slow motion, 360-degree cameras, USB flash drive, DSLR cameras, EV-Car, etc.



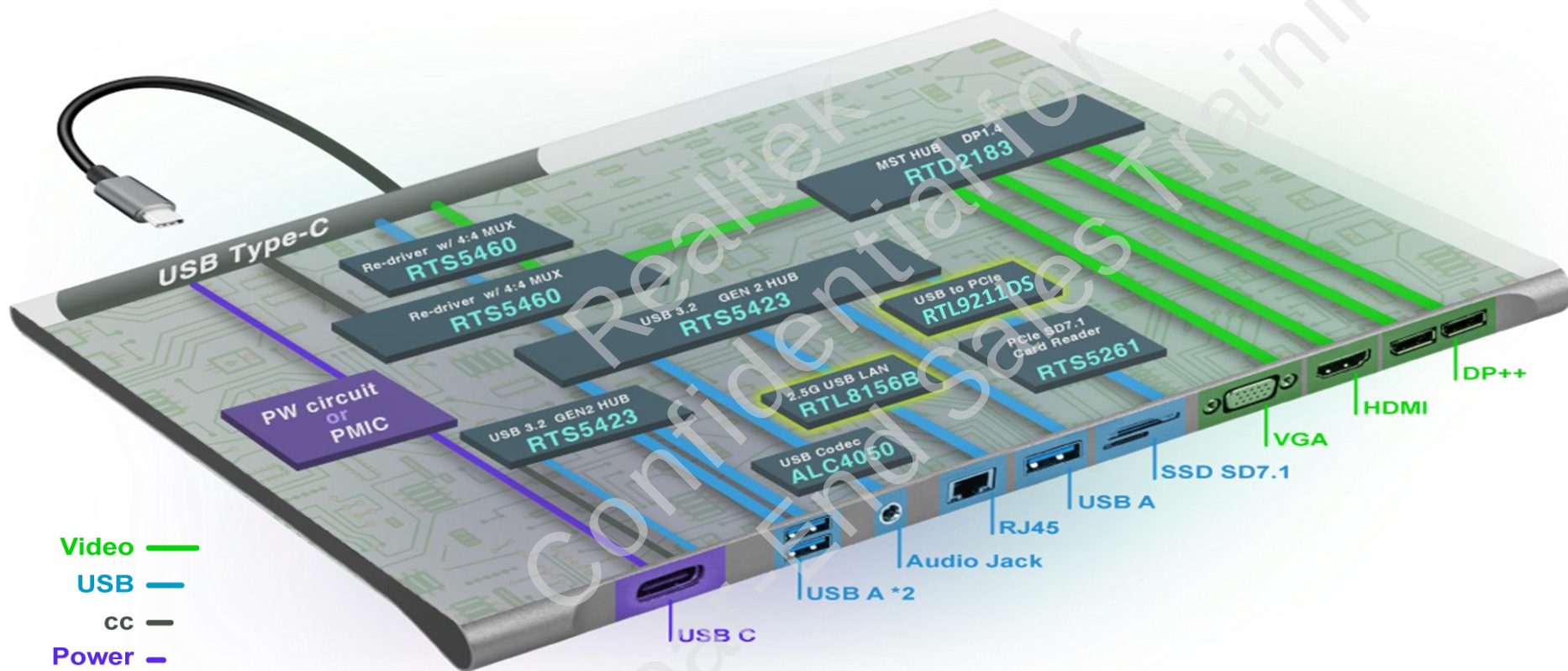
RTL9211DS QFN68 (8mm x 8mm)

USB to SD Express Card Reader Solution

RTS5261 QFN32 (4mm x 4mm)

PCIe to legacy SD/SD7.0/7.1 SDE Card Reader Solution

Realtek Docking Reference Design





Thank You

Realtek Single FEPHY

	RTL8201F-VB-CG	RTL8201FI-VC-CG	RTL8201FR-VB-CG	RTL8201F-VD-CG	RTL8201FR(I)-VD-CG	RTL8201G(I)-VB-CG	RTL8201GR(I)-VB-CG
Quick guide	MII/RMII IO voltage 3.3V	MII/RMII IO voltage 3.3V Industrial version	RMII only IO voltage 3.3V	MII/RMII, IO voltage 3.3V/2.5/1.8/1.5V	RMII only, IO voltage 3.3V/2.5/1.8/1.5V Industrial version	Long Distance PHY	Long Distance PHY RMII interface only
MP	MP	MP	MP	MP	MP	MP	MP
Package, size	QFN32, 5x5mm^2	QFN32, 5x5mm^2	QFN24, 4x4mm^2	QFN32, 5x5mm^2	QFN24, 4x4mm^2	QFN32, 5x5mm^2	QFN24, 4x4mm^2
Pin-to-pin	RTL8201FI-VC-CG RTL8201G-VB-CG	RTL8201F-VB-CG RTL8201GI-VB-CG	RTL8201GR-VB-CG			RTL8201F-VB-CG RTL8201FI-VC-CG	RTL8201FR-VB-CG
Industrial version (-40~85C)	NA	✓	NA	NA	RTL8201FRI-VD-CG	RTL8201GI-VB-CG	RTL8201GRI-VB-CG
Support spec.	IEEE Fast Ethernet					IEEE Fast Ethernet LD10/LD100 100Base-T1	
Support Cable length	Cat5e: • 120m @ IEEE Fast Ethernet					Cat5e: • 130m @ IEEE Fast Ethernet • 500m @ LD100 75-5 Coaxial cable: • 300m @ 100Base-T1 • 800m @ LD10	
MII supported, IO voltage	3.3V	3.3V		3.3V/2.5V/1.8V/1.5V		3.3V	
RMII supported, IO voltage	3.3V	3.3V	3.3V	3.3V/2.5V/1.8V/1.5V	3.3V/2.5V/1.8V/1.5V	3.3V	3.3V
EEE (IEEE 802.3az) PHY-based WoL	✓	✓	✓	✓	✓	✓	✓

Realtek PCIe NIC Roadmap (Server)

~2022

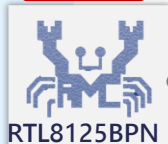
2023

2024

2025 ~

NEW

2.5G



PCIe Gen2, 2.5GbE
QFN88 (10x10)
3.3V/0.95V
SyncE/PTP/IEEE1588V2
NCSI for Shared NIC
➤ ES: 2023'Jul; MP: 2023'Oct

NEW

10G



PCIe Gen4, 10GbE
QFN88 (10x10)
3.3V/1.8V/1.2V/0.8V
Max. Power <2W (chip only)
NCSI for Shared NIC
SyncE/PTP/IEEE1588V2
➤ ES1: 2024' May
➤ ES2 : 2024' Nov
➤ MP: 2025' Jan

Co-layout

NEW

10G



PCIe Gen4, 10GbE
QFN76 (9x9)
3.3V/1.8V/1.2V/0.8V
Max. Power <2W (chip only)
NCSI for Shared NIC
SyncE/PTP/IEEE1588V2
Fiber Mode
➤ ES1: 2024' Jun
➤ ES2 : 2024' Dec
➤ MP: 2025' Feb

NEW

10G



PCIe Gen4 10GbE
Dual Port
SR-IOV / Virtualization
Tunneling : NVGRE/VXLAN
DCB/EVB
RoCE
NCSI for Shared NIC
➤ ES: 2025' Q3 MP: 2025' Q4



PCIe Gen1, GbE
QFN76 (9x9)
3.3V/1.1V
NCSI for Shared
NIC

Realtek PCIe NIC Roadmap (Industrial)

~2022

2023

2024

2025

