

NXP NEW GENERATION LINEAR RE-DRIVER FOR USB4, DP2.0, THUNDERBOLT3 & PCIE GEN4

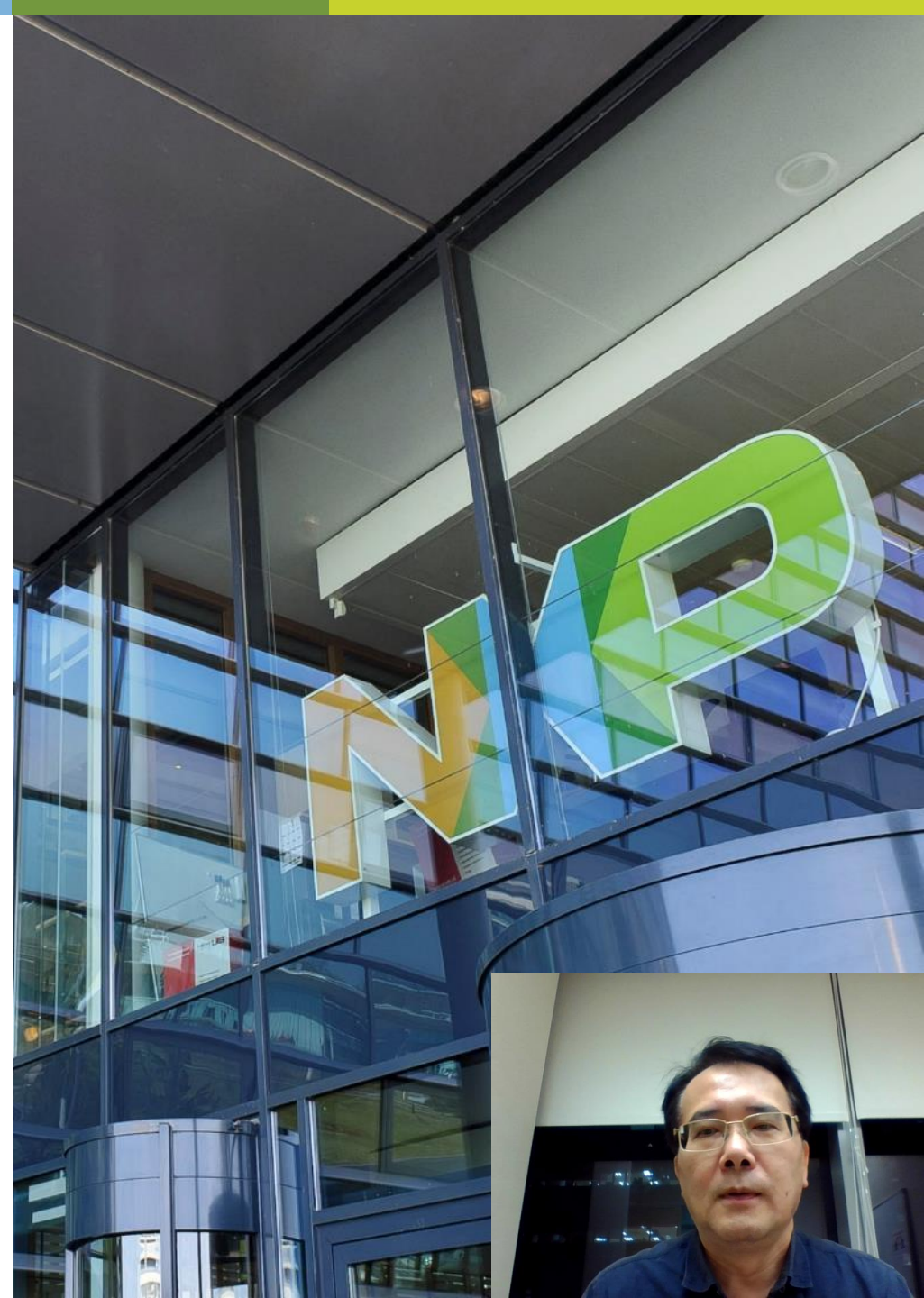
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AGENDA

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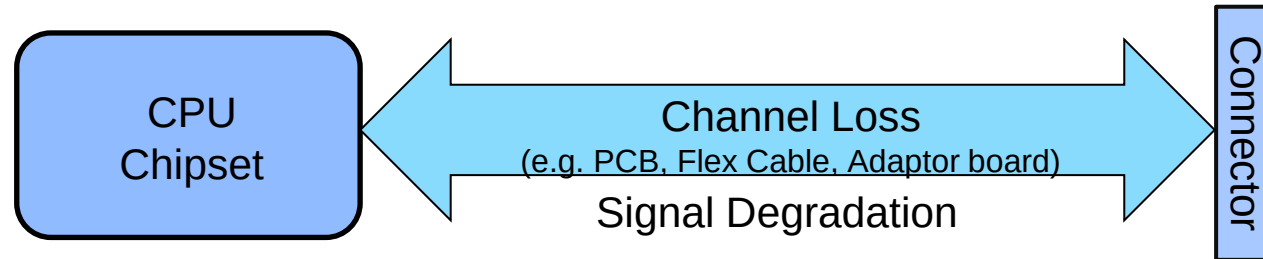
- Why is a signal conditioner needed?
- What conditioners is NXP focusing?
- Overview of NXP's Thrust Signal Conditioner Products

Michael Huang

- Technical Introduction on
 - PTN38003A
 - PTN38007
 - PTN3816
 - PTN3944



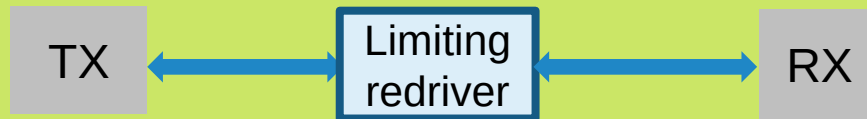
WHY IS A SIGNAL CONDITIONER NEEDED?



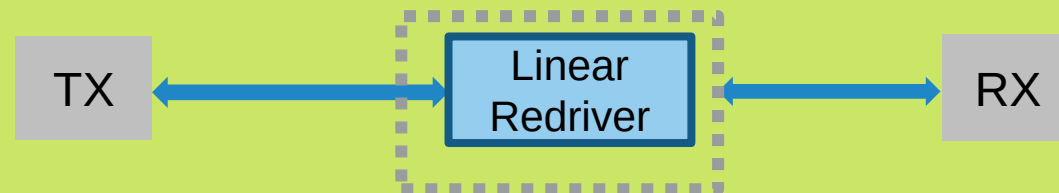
**NXP's
Focused
Conditioners**



- Passive channel – PCB, cable, etc.
- TX-RX supports specified link budget



- Targeted moderate data rate up to ~5 Gbps
- Example: PTN36001



- Supports 10 Gbps and beyond
- May support cascaded redrivers & retimers
- Examples: PTN38003A, PTN38007



- Various retimer types exist
- > power consumption, > p and > area vs. redriver
- Tackles very lossy and no



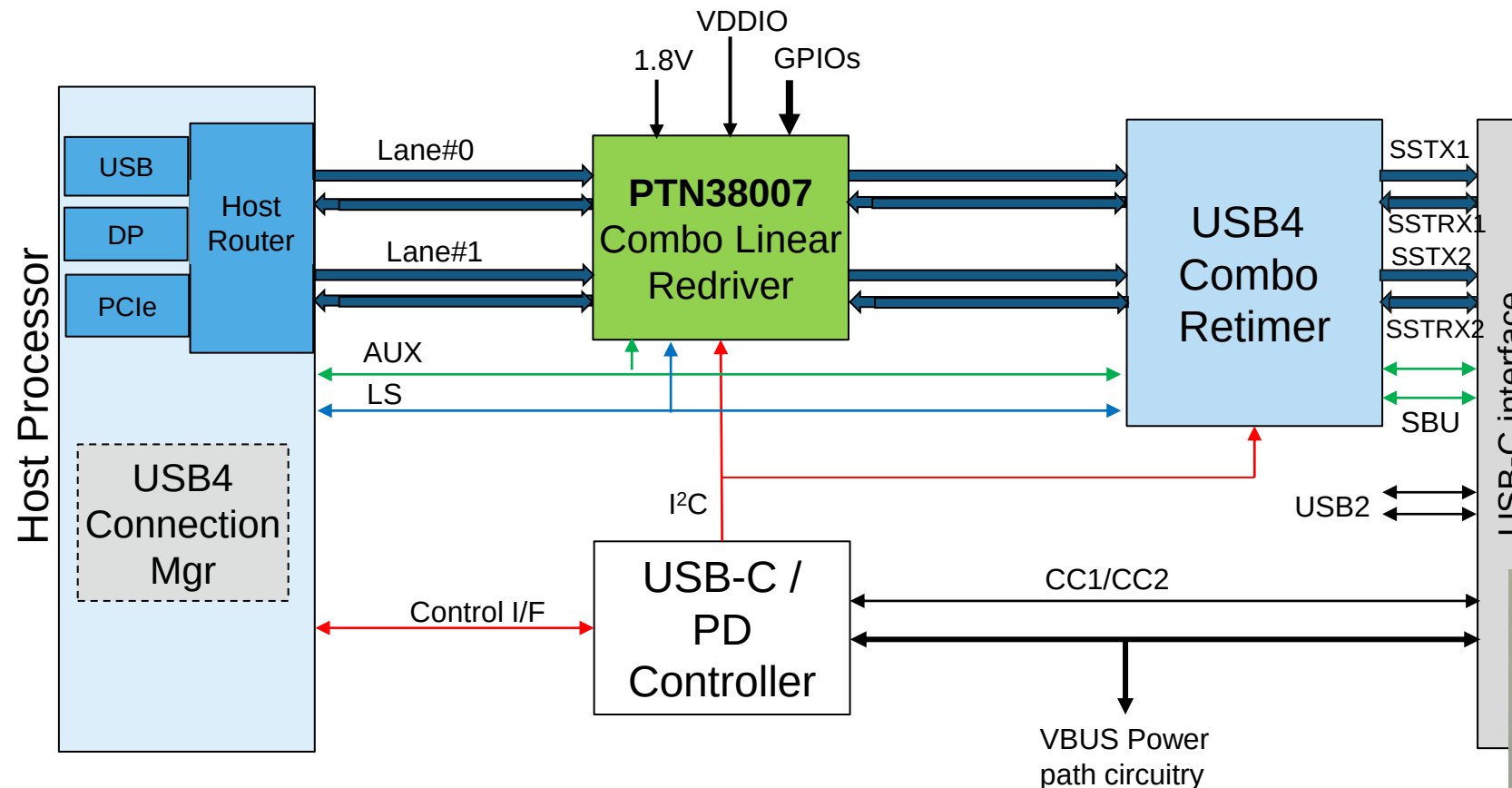
NXP'S THRUST SIGNAL CONDITIONER PRODUCTS

	New	New	New	New				
	PTN38007	PTN3944	PTN38003A	PTN3816	PTN36502	PTN36043A	PTN36241G	PTN36001
Features	Combo USB4 20 Gbps TBT3 , DP 2.0, USB3 Linear redriver	PCIe Gen4 16Gbps 4-channel linear equalizer	Combo USB3/DP 2.0 10Gbps Linear redriver	DP1.4/DP2.0 4-lane 20Gbps Linear Redriver	Combo USB 5 Gbps DP 1.2 Limiting redriver	USB 5 Gbps Limiting redriver	USB 5 Gbps Limiting redriver	USB 5 Gbps Limiting redriver
Port Configuration	4 : 4	4-Channel	4 : 4	4-lane	4 : 4	1 x 2	Single Port	Single Port
Power Supply	1.8 V	1.8 V	1.8 V	1.8 V	1.8 V	1.8 V	1.8 V	1.8 V
Rx Equalizer TX De-Emphasis Control	I ² C	I ² C	I ² C	GPIO	I ² C & GPIO	GPIO	GPIO	GPIO
Power Consumption (all lanes active at highest data rate)	450 mW	450 mW	450 mW	450 mW	405 mW	203 mW	189 mW	200 mW
Package	HWFLGA36 2.1 x 6.0 x 0.6 mm, 0.4 mm pitch	HWFLGA36 2.1 x 6.0 x 0.6 mm, 0.4 mm pitch)	HWFLGA36 2.1 x 6.0 x 0.6 mm, 0.4 mm pitch	HWFLGA36 2.1 x 6.0 x 0.6 mm, 0.4 mm pitch)	DHXQFN24 2.4 x 3.2 x 0.35 mm, 0.4 mm pitch	DHXQFN18 2.4 x 2.0 x 0.35 mm, 0.4 mm pitch	X2QFN12 1.25 x 2.1 x 0.35 mm, 0.4 mm pitch	X2QFN12 1.25 x 2.1 x 0.35 mm, 0.4 mm pitch
Target Application	Computing	Enterprise Server	Mobile/ Computing	Computing	Mobile	Mobile	Mob	
Availability	Production	Production	Production	Production	Production	Production	Produ	



INDUSTRY'S FIRST USB4 RE-DRIVER: PTN38007

- Supports USB4, USB3.2, 4 lane DP2.0 and TBT modes of operation
- SiGe process provides industry's best signal integrity
- Proven use with one of Top suppliers' Laptop PC chipset



COMPARISON: USB4 COMBO LINEAR EQUALIZER VERSUS RE-TIMER (CLOSED SYSTEM)

Comparison Items	PTN38007 Linear Redriver	Retimer	NXP Comment
BOM List	1pc PTN38007 - AC Caps & Decoupling Cap 1.8V power rail can be share with system 1.8V	1pc Retimer 1pc Crystal Reference 1pc EEPROM - Additional DC/DC needed to support different power rail	Redriver requires fewer supporting BOM components for cascading mode. Estimate ~\$0.50 extra for supporting BOM for Retimer
Package Size	2.1mm x 6mm QFN	6 x 6 mm BGA	Redriver solution has smaller PCB footprint
Power Consumption	- Active: ~ 450mWatt @ 20Gbps - Standby U2/U3: 0.7mA - Power down: 10uA	- Active: 750mWatt - Standby: ? - Power down : ?	Generally, retimers have higher power consumption than redrivers
SI Conditioner Cascading	CPU → PTN38007 → Retimer Intel RVP	CPU → Retimer → Retimer	Using Redriver in the middle of CPU and Retimer reduces overall link latency



官方网站 for PTN38003A, 38007, 3816 & 3944

Application note on public web:

<https://www.nxp.com.cn/docs/en/application-note/AN13260.pdf>

AN13260

PTN38007/38003A/3816/3944 USB Type-C USB3.2, DisplayPort v2.0, Thunderbolt 3, and USB4 v1.0 combo redriver design guidelines

Rev. 1.0 — 14 June 2021

Application note

Document information

Information	Content
Keywords	PTN38007 PTN38003A, PTN3816, PTN3944, PTN5150A, PTN5110, NX5P3090, USB Type-C, CC Logic, Orientation Detection, USB3.2, SuperSpeed, DisplayPort, USB4 v1.0, Thunderbolt3 redriver
Abstract	This application note presents design guidelines for PTN38007/38003A/3816/3944 in a system.





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