

## Ultra-scalable and Universal Broadband SoCs for Home Routers and Gateways

### AnyWAN™ PRODUCTS

URX851 SoC: Quad-Atom, PON MAC, 4 × 2.5GE PHYs + 8 HSIOs

URX850 SoC: Quad-Atom, 4 × 2.5GE PHYs + 9 HSIOs

MxL25641 SoC: Dual-Atom, PON MAC, 5 HSIOs

AnyWAN™ Hardware Development Kit URX851

AnyWAN™ Hardware Development Kit MxL25641

### ADDITIONAL PLATFORM PRODUCTS

WAV615 802.11ax 2.4GHz 4 × 4 up to 1.14Gbps PHY rate

WAV665 802.11ax 5–7GHz 4 × 5 up to 4.8Gbps PHY rate

VRX619 ADSL2+/VDSL/G.fast transceiver

MxL3710 MoCA 2.5 coaxial networking IC

SLC220 2-channel FXS subscriber line interface circuit

### BENEFITS

- Ultra-scalable platform for the best economies of scale with embedded 10G PON MAC
- Coherent 10G SoC design for true 10G service rates (10G interfaces, line-rate routing even for 64-Byte packets, speedtest)

### SOLUTION HIGHLIGHTS

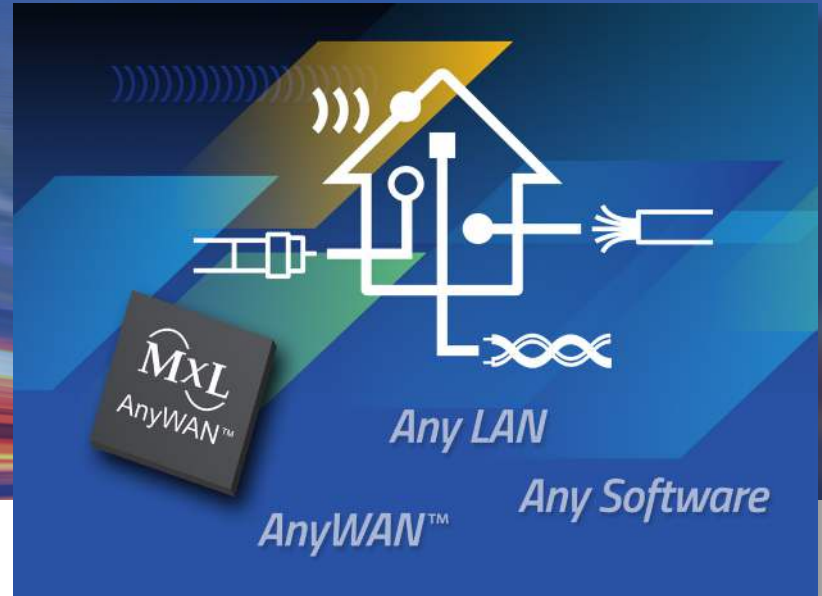
- One BSP, any WAN, any LAN, any software

### MAIN APPLICATIONS

- 10G fiber home gateway units (HGU)
- Home routers
- MultiWAN home gateways
- AnyWAN™: fiber, copper DSL/G.fast, DOCSIS cable, 5G FWA

### SECURITY

- Network-on-chip architecture (separates the secure enclave from the rest of the chip)
- One-time programmable storage
- Secure boot with root-of-trust transfer
- True random number generation (TRNG)
- Hardware-accelerated decryption/encryption/ciphers
- IPsec end-point termination at 10Gbps line rate
- 10Gbps MACsec
- Double data rate (DDR) encryption and secure storage



The AnyWAN™ system-on-a-chip (SoC) URX850, URX851, and MxL25641 devices offer multiple 10G and 2.5G high-speed interfaces, high-performance packet accelerators, and embedded Intel® Atom™ CPU cores. The SoCs are suited for 10G home routers and MultiWAN home gateway units (HGUs) with 10G fiber WAN and tri-band Wi-Fi 6/6E/R2 and Wi-Fi 7.

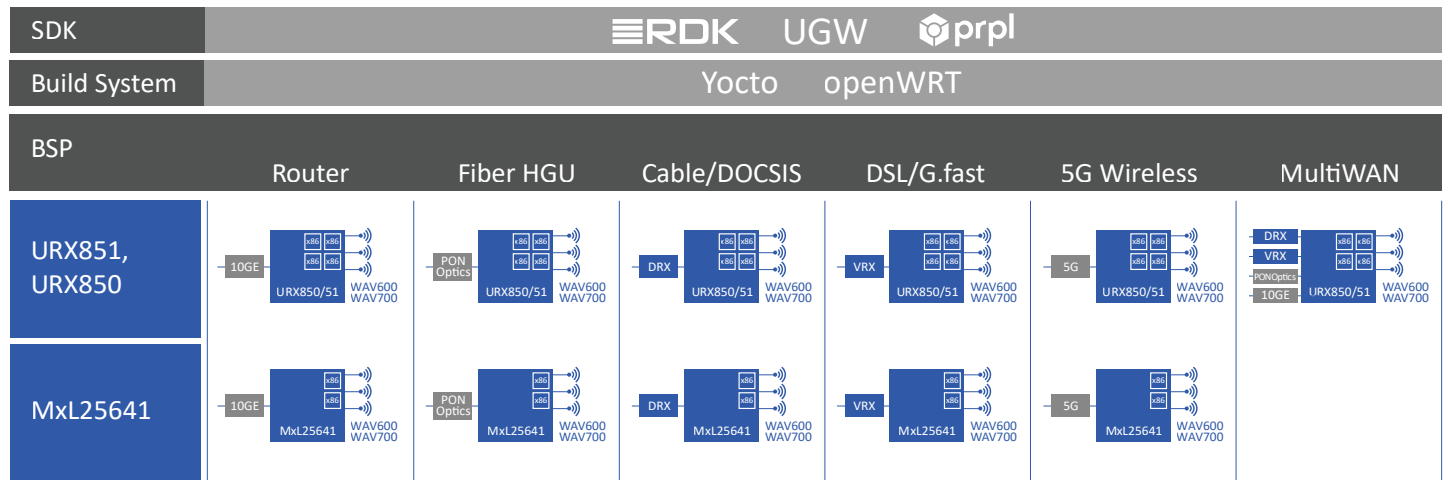
### Universal and Ultra-Scalable

The ultra-scalable architecture provides broadband service providers and original equipment manufacturers (OEMs) or original design manufacturers (ODMs) with a versatile platform for home gateways and SMB customer premise equipment (CPE). This platform covers a wide range of value tiers and WAN technologies such as fiber, DOCSIS cable, Ethernet, 5G fixed wireless access (FWA), and DSL or G.fast. Developers can get access to a versatile hardware and software development kit for multi-gigabit home gateways with 10G PON, 10G Ethernet WAN and LAN, 2.5G Ethernet WAN and LAN, DSL or G.fast, Voice FXS, USB 3.2, and tri-band Wi-Fi 6E R2 and Wi-Fi 7.

The URX850/URX851/MxL25641 AnyWAN Broadband SoCs are software compatible. Their design can easily be modified for use with alternative WAN and LAN configurations. MaxLinear's board support package (BSP) provides a unified base for openWRT and Yocto-based software development kits such as prpIOS and RDK-B.

# AnyWAN™ SoCs URX850, URX851, and MxL25641

## One BSP: Any WAN, Any LAN, Any Software



## All In: High Level of Integration

A high level of hardware integration and 16nm process technology enable cost-efficient and power-efficient, and yet high-performance, home gateways. The SoCs use an innovative network-on-chip architecture for more efficient interconnection between the interfaces, packet accelerators, CPUs, and other hardware blocks on the chip.

The URX850 and URX851 SoCs embed four x86 cores, four 2.5Gbps Ethernet PHYs, four configurable high-speed I/Os (XFI, PCIe, SATA), four additional PCIe interfaces, and one additional high-speed I/O with 10G PON or Ethernet MAC. Including the integrated 2.5G Ethernet PHYs, a total of 9 MACs can be used simultaneously.

The MxL25641 SoC embeds two x86 cores, four configurable high-speed I/O (XFI or PCIe), one USB interface, and one additional high-speed I/O with 10G PON MAC.

## Best-in-Class Performance

The embedded packet processor uses quality of service (QoS) handling and enables packet routing to be fully CPU-offloaded for common networking and tunneling protocols including tri-band Wi-Fi 6E and for Wi-Fi 7. Even IPsec or VPN tunnel endpoint termination is accelerated up to 10Gbps.

While the main use case is Telco Service Provider and Cable MSO gateways with high-end tri-band Wi-Fi 6E or Wi-Fi 7 configurations, the SoCs can also be applied in similar applications such as SMB gateways, NAS storage devices, distribution point units, and cellular small cells.

## TOOL PACKAGE

- Development kit that supports Wi-Fi 6E tri-band, 10G PON, DSL/G.fast and Voice
- Common board support package (BSP) for openWRT and Yocto build systems

## INTERFACES

### URX850/URX851

- Integrated 10G PON MAC / XFI (URX851 only)
- Integrated XFI WAN (URX850)
- 4 x PCIe Gen4/XFI/SGMII/USXGMII/SATA
- 4 x PCIe Gen3
- 4 x 2.5 GE PHY integrated
- 2 x USB 3.2 Gen2
- eMMC 5.1 HS400

### MxL25641

- Integrated 10G PON MAC / XFI
- 4x PCIe gen4/XFI/SGMII
- 1x USB 3.2 (5 Gbps)
- eMMC5.1

### URX850/URX851/MxL25641 OTHER INPUTS/OUTPUTS (I/Os):

- GPIO, UART, I2C, MDIO, SPI, I2S, SD-Card, QSPI

## STANDARDS

- ITU-T PON BBF.247
- TPM 2.0 (ISO/IEC 11889)
- IEEE 802.1AR Secure Device Identity
- IEEE 1588v2 Precision Time Protocol (PTP)
- ITU-T G.8262/Y.1362 Synchronous Ethernet
- IEEE 802.3bz 2.5GBASE-T Ethernet
- FIPS 140-2/3 based Crypto including TRNG
- ITU-T/IEEE Embedded 10G PON MAC

# AnyWAN™ SoCs URX850, URX851, and MxL25641

## Play it Safe: State-of-the-Art Security

Hardware security is at the heart of the URX850, URX851, and MxL25641 SoC design. The user-friendly security meets the highest standards of home and SMB gateways and is hardware-accelerated. Secure boot with root-of-trust transfer allows you to take full ownership of the device. A dedicated secure enclave, separated from the Intel® Atom™ CPU cluster, provides a trusted execution environment, one-time programmable key and asset store, secure storage, hardware-based true random number generator, and hardware-accelerated ciphers.

## Hardware Virtualization: Just Like a Server

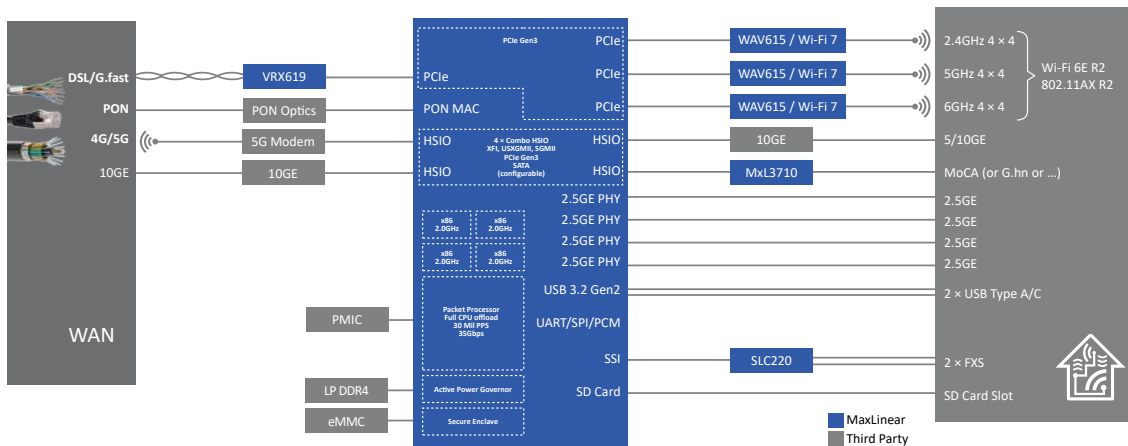
The AnyWAN™ SoC URX850, URX851, and MxL25641 devices combine the benefits of traditionally lean and efficient home gateway SoC architectures with the performance and scalability of x86 CPU cores. While all routine networking traffic is fully CPU offloaded, the CPU remains free to perform software-centric and virtualized services. The x86 CPU benefits from a strong developer

community, large software ecosystem, hardware virtualization, and leading container technologies. The powerful CPU cluster with two (MxL25641) and four URX850 and URX851 64-bit Intel® Atom™ cores and up to 2MB of L2 cache provides developers access to the proven x86/64 instruction set, including powerful extensions such as SSE4.2, AES-NI, VT-x2, and EPT.

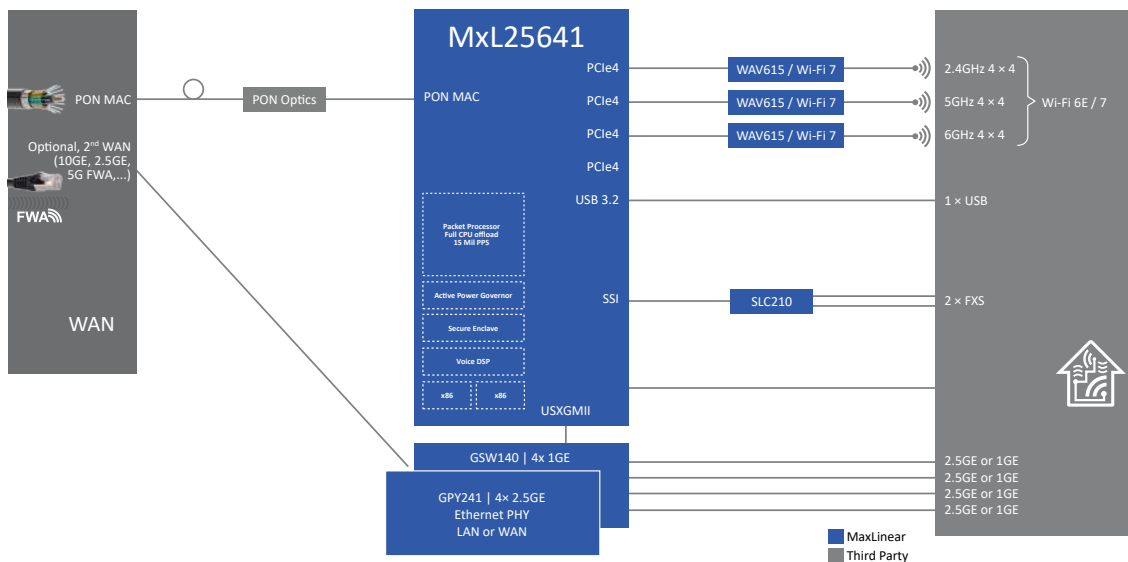
## Active Power Management

The URX series features the most advanced adaptive power management capabilities built into the silicon hardware. State-of-the-art active power management techniques have been implemented to design the SoCs. They scale power consumption of the CPU, hardware accelerators, and interfaces dynamically to the performance needs, and hence minimize power consumption. Examples are dynamic frequency scaling, clock gating, power gating, power state control, Linux thermal zone concept, and dynamic link control to influence PHY link states.

## Application Examples



AnyWAN URX851 MultiWAN Tri-Band Wi-Fi 6E / Wi-Fi 7 Home Gateway



AnyWAN MxL25641 Tri-Band Wi-Fi 6E / Wi-Fi 7 10G Home Gateway Unit

# AnyWAN™ SoCs URX850, URX851, and MxL25641

## SOC FEATURES

### URX850/URX851/MxL25641

- Layer 2-4 wire-speed packet performance
- Packet processor that enables hardware-accelerated full central processing unit (CPU) offload with MaxLinear Wi-Fi, DSL, PON, and Ethernet
- Flash: Boot from NAND or eMMC
- Active power management with dedicated energy processing unit
  - Dynamic clocking/domain shut-off: frequency scaling, clock gating, power gating
  - Power state control: Active, Active/Idle, C6FS, D-states, C-states/P-states, EU Code of Conduct (CoC), energy-related products (ERP)
  - Thermal management: Linux thermal zone concept, cooling methods such as external sensors (PCIe devices), governors
  - Software modes: Linux system suspend/runtime suspend
  - Link control: influence PHY link states dynamic voltage and frequency scaling (DVFS)
- Voice DSP and PCM/SPI interfaces for FXS and DECT support

### URX850/URX851

- Quad-core 2.0GHz Intel® Atom™ with 2MB L2 cache
- IPsec accelerator: 10Gbps
- Speedtest: 10Gbps
- RAM: DDR3, DDR4, LP DDR4, 512MB–16GB, 16/32bit, DDR4 32bit + 8bit ECC

### MxL25641

- Dual-core 1.7GHz Intel® Atom™ with 1MB L2 cache
- IPsec accelerator: 5Gbps
- Speedtest: 10Gbps
- RAM: DDR4, LPDDR4, 512MB–4GB, 16/32bit

## Product Information

Product	Description	Ordering Code	Package
URX851	SoC: Quad-Atom, PON MAC, 4 × 2.5GE PHYs + 8 HSIOs	99LS51	FCBGA-837 (24×26)
URX850	SoC: Quad-Atom, 4 × 2.5GE PHYs + 9 HSIOs	99LS50	FCBGA-837 (24×26)
MxL25641	SoC: Dual-Atom, PON MAC, 5 HSIOs	MXL25641-AV-T	FCBGA-577 (17×17mm)
DevKit	AnyWAN™ Hardware Development Kit URX851	URX851-HDK-1	Board and SDK
DevKit	AnyWAN™ Hardware Development Kit MxL25641	MxL25641-HDK-1	Board and SDK
WAV615	802.11ax 2.4GHz 4 × 4 up to 1.14Gbps PHY rate	99B015	PG-LFBGA-388 (12×17)
WAV665	802.11ax 5–7GHz (up to UNI8) 4 × 5 up to 4.8Gbps PHY rate	99B065	PG-LFBGA-388 (12×17)
VRX619	ADSL2+/VDSL/G.fast transceiver	974934	PG-MRQFN-124
MxL3710	MoCA 2.5 coaxial networking IC	MxL3710-AQ-R, MxL3710-AQ-T	QFN68 (8×8)
SLC220	2-channel FXS subscriber line interface circuit	947705	VQFN-68 (8×8)
GPY241	2.5G Ethernet PHY (4 port), USXGMII-M	999X65	BGA-236



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