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Ethernet Infrastructure 1.0. 05/17

# Ethernet in Infrastructure

Enterprise Infrastructure

Access Network

Industrial IoT



Access Network Industrial IoT

# Ethernet in Infrastructure

Microsemi is a premier supplier for the communications industry and well known for its high value-added semiconductor systems and services for the enterprise, data center, and telecom equipment markets. Microsemi's technology expertise and understanding of the unique challenges facing both OEM system designers and carriers has translated into an industry-leading portfolio that can help drive innovation in your next-generation communications equipment designs.

The following examples are some of the Ethernet infrastructure applications Microsemi serves within Enterprise, Access, and Industrial IoT (IIoT).

### Enterprise Ethernet Switches

Rising demand for various applications, appliances, and bandwidth in the enterprise environment propels the need for high-performance, secure, and reliable Ethernet switches. With the industry's only service-aware architecture embedded in the Ethernet switch itself, Microsemi can help develop highly service-aware, agile, and secure enterprise Ethernet switching equipment. Combined with Microsemi's industry-leading Power over Ethernet (PoE) and clock synchronization offerings, customers can streamline development and accelerate time to market with a complete solution from Microsemi.



### Enterprise Infrastructure

- Leading provider of end-to-end PoE ICs and midspans/ injectors since 1999, with broadest PoE product portfolio for indoor and outdoor deployments including:
- Highest integration, dynamic power management PSE ICs, future-ready to support IEEE 802.3bt standard
- Highest integration, lowest power dissipation ideal diode bridges
- Lowest R<sub>DS(ON)</sub> PD ICs

Category	Part Numbers	Function
Ethernet Networking	VSC7440, VSC7442, VSC7444, VSC7448, VSC7449	Ethernet Switching
	VSC8504, VSC8512, VSC8514, VSC8522	Physical Media Interface
DeF	PD69200	PoE PSE Controller
POE	PD69208M	IEEE 802.3bt PoE PSE Manager
FPGA/SoC	SmartFusion <sup>®</sup> 2 SoC FPGA	System Management
Timing	ZL30702, ZL30251, ZL30267	Clock Management, IEEE 1588/SyncE DPLL
Power Management	LX7309	Isolated Power Conversion
	LX7165, LX7167A, LX8240	Switching and Linear Regulators



- Ethernet networking with nanosecond-accurate IEEE 1588 timing, switches up to 52GE ports, and standalone PHYs with up to 12 ports, delivering low system costs and power, while expediting time to market with robust Ethernet software stacks
- Reliable, low-power, and non-volatile flash-based FPGAs/SoCs with instant-on capabilities, ideal for secure boot Ethernet switch system management
- Ultra-low jitter, small footprint timing ICs, including clock synthesis, rate conversion, and fanout buffers for easier, high-reliability clock tree designs





### Wireless LAN Switch/Controller

Growing demand for wireless access and the need to support 4G/LTE connections with small cells within enterprise networks drives the need for secure and agile Wi-Fi deployment in enterprises. Microsemi's Ethernet switch portfolio is engineered to develop flexible, agile, and secure switch/controller equipment for managing Wi-Fi and small cells. Microsemi also excels in enabling deployment of IEEE 802.3bz 2.5G/5G BASE-T controller/switch equipment for growing bandwidth demand. As a pioneer and innovator in PoE technology, Microsemi uniquely offers future-ready PoE solutions to support the IEEE 802.3bt standard. Industry-leading solutions for IEEE 1588 synchronization round out Microsemi's complete solution for enterprise WLAN switch/controller equipment.



FPGA, switching regulators, and optional CPU for higher-performance designs

# Enterprise Infrastructure

#### **Key Advantages**

- Ethernet networking with nanosecond-accurate IEEE 1588 timing and Nx2.5G switch I/O, simplifying IEEE 802.11ac Wi-Fi migration and expediting time to market
- Leading provider of end-to-end PoE ICs and midspans/ injectors since 1999, with broadest PoE product portfolio for indoor and outdoor deployments, including highest integration, dynamic power management PSE ICs, future-ready to support the IEEE 802.3bt standard

Category	Part Numbers	Function
Ethorpot Notworking	VSC7444, VSC7448, VSC7449	Ethernet Switching
Ethernet Networking	VSC8514, VSC8522	Physical Media Interface
DoE	PD69200	PoE PSE Controller
FOE	PD69208M	IEEE 802.3bt PoE PSE Manager
FPGAs/SoCs*	SmartFusion <sup>®</sup> 2 SoC FPGA	System Management
Timing	ZL30702, ZL30251, ZL30267	Clock Management, IEEE 1588/SyncE DPLL
Power Management	LX7309	Isolated Power Conversion
	LX7165, LX7167A, LX8240	Switching and Linear Regulators

\*Optional for high-performance designs.



- Reliable, low-power, and non-volatile flash-based FPGAs/ SoCs with instant-on capabilities, ideal for secure boot WLAN switch system management (optional for highperformance designs)
- Ultra-low jitter, small footprint timing ICs, including clock synthesis, rate conversion, and fanout buffers for easier, high-reliability clock tree designs



### Enterprise Infrastructure

### WLAN (Wi-Fi) Access Points

Prolific use of multiple wirelessly connected devices by multiple users is today's reality in most enterprise campus environments. Wi-Fi access points based on IEEE 802.11ac drive access point backhaul bandwidth above 1G, enabling higher-density wireless support and more efficient spectrum use for multiple connected devices. Other key benefits include stronger range and performance, as well as greater bandwidth and flexibility. Enterprises must find ways to effect massive and fairly immediate multi-gigabit bandwidth network upgrades over legacy cabling. Microsemi offers a broad IC and systems portfolio for design and deployment of wireless access points in both indoor and outdoor settings.





#### Key Advantages

- Comprehensive portfolio of highest-integration Wi-Fi single/ dual-band FEM, PA, and LNA with several Wi-Fi SoC joint reference designs available
- High-linearity 11ac/1024 QAM performance for 3×3, 4×4, and 8×8 MIMO applications
- Stay-flat DEVM for 8–1250 symbols

- Leading provider of end-to-end PoE ICs and midspans/ injectors for indoor and outdoor deployments with over 200M PoE ports shipped since 1998
- Unique 2.5 Gbps IEEE 802.3bz PoE multiplexers enabling upgrade to IEEE 802.11ac Wave 2 access points without replacing the Ethernet switch
- Highest integration, lowest power dissipation ideal diode bridges

Category	Part Numbers	Function
	5 GHz FEM: LX5586/A/H, LX5598H	
	Dual-Band FEM: LX5591	
	5 GHz PA: LX5531	Wi Ei Front End
	2.4 GHz PA: LX5533	WI-FI FIONLENG
	5 GHz LNA: LX5575, LX5560	
	2.4 GHz LNA: LX5563	
PoE	PDS-EM-8100	2.5G Multiplexer
	PD-9001-25GR	PoE Indoor Midspan
	PD70224	Ideal Diode Bridge
	PD70201	PD Front End with Integrated PWM Controller
Power Management	LX7165, LX7167A	Boost + Buck DC/DC

- Ethernet networking with nanosecond-accurate IEEE 1588 timing and Nx2.5G switch I/O, simplifying IEEE 802.11ac Wi-Fi migration and expediting time to market
- Comprehensive portfolio of highest-integration Wi-Fi single/ dual-band FEM, PA, and LNA with several Wi-Fi SoC joint reference designs available
- High-linearity 11ac/1024 QAM performance for 3×3, 4×4, and 8×8 MIMO applications
- Stay-flat DEVM for 8–1250 symbols

Category	Part Numbers	Function
Ethernet Networking	VSC8211	Physical Media Interface
	5 GHz FEM: LX5586/A/H, LX5598H	
	Dual-Band FEM: LX5591	_
	5 GHz PA: LX5531	N/i Ei Front End
	2.4 GHz PA: LX5533	WI-FI Front End
	5 GHz LNA: LX5575, LX5560	
	2.4 GHz LNA: LX5563	
PoE	PD-OUT/SP11	Lightning Protector
	PD-9501GO	Outdoor PoE Injector
	PD69101	PSE Manager
	PD70224	Ideal Diode Bridge
	PD70211	PD Controller
Power Management	LX7165, LX7167A	Boost + Buck DC/DC

- Leading provider of end-to-end PoE ICs and midspans/ injectors for indoor and outdoor deployments with over 200M PoE ports shipped since 1998
  - Highest integration, lowest bill of materials (BOM)
    PSE ICs
  - Highest integration, lowest power dissipation ideal diode bridges
  - Unique UL-rated outdoor surge protector

### **Enterprise Access Router**

Accelerating demand - from both enterprises and consumers - for high-bandwidth internet access has fundamentally shaped networking challenges for service providers. For enterprise customers, the network's ability for higher bandwidth aggregation of WAN links to the internet is crucial. Microsemi's comprehensive solutions for designing enterprise access routers include a diverse Ethernet switch portfolio with a ready-to-integrate Ethernet software stack, significantly reducing OEM time to market. Microsemi also offers robust link layer security with state of the art 256-bit AES MACsec technology built into our Ethernet PHYs. With futureready IEEE 802.3bt standards-compliant PoE solutions, optional SyncE and IEEE 1588 network synchronization and, system-level hardware security with active tamper detection and resistance, Microsemi provides a comprehensive portfolio to cost-effectively streamline and expedite your time to market with turnkey solutions.



# Enterprise Infrastructure

- Ethernet networking with nanosecond-accurate IEEE 1588 timing and Nx2.5G switch I/O, lowers system cost and power while expediting time to market
- Leading provider of end-to-end PoE ICs and midspans/ injectors since 1999, with broadest PoE product portfolio for indoor and outdoor deployments including highest integration, dynamic power management, and standardscompliant IEEE 802.3bt-ready PSE ICs

Category	Part Numbers	Function
Ethernet Networking	VSC7444, VSC7448, VSC7449	Ethernet Switching
Ethernet Networking	VSC8514, VSC8522	Physical Media Interface
	PD69200	PoE PSE Controller
POE	PD69208M	IEEE 802.3bt PoE PSE Manager
Timing	ZL30702, ZL30251, ZL30267	Clock Management, IEEE 1588/SyncE DPLL
Power Management	LX7309	Isolated Power Conversion
	LX7302, LX7165, LX7167A, LX8240	Switching and Linear Regulators



- Ultra-low jitter, small footprint timing ICs including clock synthesis, rate conversion, and fanout buffers for easier high-reliability clock tree designs

### Access Network

### Carrier Ethernet and Enterprise Access EAD/NID

Carrier-class networking functions are essential for next-generation cloud-based delivery of business services. Network interface devices (NIDs) and Ethernet access devices (EADs) must become service-aware and increasingly manageable to guarantee the security, performance, and access required for business cloud services. Microsemi has the industry's only service-aware architecture embedded into its Ethernet switch portfolio. Microsemi's solutions and technologies for EAD/NID are engineered to meet the converged network needs of Ethernet edge and aggregation networks that manage, provision, and deliver SLA-based last mile carrier service access. Through an extensive ecosystem network, Microsemi offers complete turnkey NID/EAD system solutions, including reference designs with MEF CE 2.0-compliant hardware and software.



#### Key Advantages

- Ethernet networking with nanosecond-accurate IEEE 1588 timing and MEF CE 2.0-compliant hardware/ software, lowering system cost and power while expediting time to market
- State of the art 256-bit AES MACsec technology built into our Ethernet PHYs for robust link layer security
- Comprehensive network synchronization solution with ultra-low jitter, small footprint timing ICs, including clock synthesis, rate conversion, and fanout buffers for easier high-reliability clock tree designs

Category	Part Numbers	Function
Ethernet Networking	VSC7416, VSC7418, VSC7436, VSC7438, VSC7464, VSC7468	Ethernet Switching
	VSC8258, VSC8490, VSC8491	Physical Media Interface (10GE)
	VSC8582, VSC8584	Physical Media Interface (1GE)
Timing	ZL30702, ZL30251, ZL30267	Clock Management, IEEE 1588/SyncE DPLL

### Available Reference Designs



### 1G NID Reference Design—VSC5619EV Microsemi Devices

- 1 × VSC7418 (Serval-1<sup>™</sup>)
- 1 × VSC8574 (SynchroPHY<sup>™</sup>)
- 1 × VSC8221 (SimpliPHY<sup>m</sup>)
- 1 × ZL30343 (SyncE/1588 DPLL)



#### Interfaces

- 4 × 10/100/1000BASE-T or SFP (dual media)
- 4 × SFP 1G
- 2 × SFP 1G/2.5G
- 1 × 10/100/1000BASE-T management port
- 1PPS in/out
- ITU-T G.8271 (RS422) time interface in/out
- Station clock (2.048 MHz/1.544 MHz/10 MHz) in/out

### 10G NID Reference Design—VSC5629EV Microsemi Devices

- 1 × VSC7438 (Serval-2<sup>™</sup>)
- 1 × VSC8584 (SynchroPHY<sup>™</sup>)
- 1 × VSC8221 (SimpliPHY™)
- 1 × ZL30343 (SyncE/1588 DPLL)



#### Interfaces

- 4 × 10/100/1000BASE-T
- 8 × SFP 1G
- $2 \times SFP+$
- 1 × 10/100/1000BASE-T management port
- 1PPS in/out
- ITU-T G.8271 (RS422) time interface in/out
- Station clock (2.048 MHz/1.544 MHz/10 MHz) in/out

#### Options

• PCle 1.x cable interface for external CPU

### Carrier Ethernet Switch Reference Design-VSC5628EV

#### **Microsemi Devices**

- 1 × VSC7468 (Jaguar-2<sup>™</sup>)
- 2 × VSC8584 (SynchroPHY<sup>™</sup>)
- 1 × VSC8221 (SimpliPHY<sup>™</sup>)



#### Interfaces

- 8 × 10/100/1000BASE-T
- 16 × SFP 1G/2.5G
- $4 \times \text{SFP+}$
- 2 × X2
- 1PPS in/out
- 1 x 10/100/1000BASE-T management port
- ITU-T G.8271 (RS422) time interface in/out
- Station clock (2.048 MHz/1.544 MHz/10 MHz) in/out

#### Options:

- SyncE add-on module
- VSC8258 (SynchroPHY<sup>™</sup>) 4 x 10GE MACsec addon module
- PCle 1.x cable interface for external CPU

### FTTX

Aggregating voice, video, and data securely while maintaining network scalability is crucial for service providers offering broadband services. Whether fiber to the home (FTTH), fiber to the premises (FTTP), fiber to the building (FTTB), fiber to the distribution point (FTTdp), fiber to the node (FTTN), or fiber to the curb or cabinet (FTTC), the underlying goal remains the same—enabling delivery of increased broadband bandwidth capabilities beyond those offered by the traditional legacy copper networks. Microsemi offers innovative solutions to address multiple challenges in deploying such hybrid networks, enabling OEMs to optimize cost/performance trade-off while delivering next-generation features.



Access Network

- Voice line circuits with reference designs, ideal for POTS on indoor SFU (HGU) or gateways
- Leading provider of end-to-end PoE ICs and midspans/ injectors since 1999, with broadest PoE product portfolio for indoor and outdoor deployments, including highestintegration PSE ICs with LED driving, no host required for FTTB power management

Category	Part Numbers	Function
Voice Line Circuits	Le9641, Le9651, Le9642, Le9652	Voice Channels
DoE	PD69200	PoE PSE Controller
POE	PD69208M	IEEE 802.3bt PoE PSE Manager
Ethorpot Notworking	VSC7444, VSC7448, VSC7440	Ethernet Switching
Ethernet Networking	VSC8514, VSC8522, VSC8504	Physical Media Interface
Timing	ZL30267	Clock Management
FPGA	SmartFusion <sup>®</sup> 2 SoC FPGA	System Management
Power Management	LX7309	Isolated Power Management
	LX7165, LX7167A, LX8240	Switching and Linear Regulators



- Low system cost and fast time-to-market Ethernet switch and PHY solutions
- Ultra-low jitter, small footprint timing ICs including clock synthesis, rate conversion, and fanout buffers for easier, high-reliability clock tree designs

### FTTdp Distribution Point Unit (DPU)

#### G.999.1 + External Buffer Solution

Microsemi's leading reverse power feeding (RPF) technology enables remote powering of the distribution point unit (DPU) from the customer premise gateway.



# Access Network

- I<sup>2</sup>C-manageable reverse power feeding with FairPower<sup>™</sup> sharing (<3% current match), configurable dynamic power sharing, and multiple reference designs available
- MeLT solutions for voice and line testing with separate SLIC, CODEC, and LTAS for easy debugging, as well as single/dual (EU/NA) LTAS versus four for competition
- G.fast and xDSL line drivers with reference designs, suited for G.fast/VDSL2 analog front end subsystems

Category	Part Numbers	Function
	PD82000	RPF DPU Controller
Reverse Power Feed	PD70101, PD70201	RPF PD
	VE792	MeLT
Voice Line Circuits	ZL79258	NGSLAC Processor
	ZL5816	Drive Test Access Switch
Line Drivers	Le87281	G.fast Signal Amplification
Notworking	WinPath3	Network Processor
Networking	VSC7418	Ethernet Switching
Timing	ZL30265	Dual APLL Multiplier and Synthesizer
	ZL30622	Network Synchronizer
	ZL40241	Clock Fanout Buffer



- Ultra-low jitter, small footprint timing ICs including clock synthesis, rate conversion, and fanout buffers for easier, high-reliability clock tree designs
- Ethernet PHYs and network processors with G.999 support at the processor, and flexible single-quad 10GE PHYs with multiple interface options





### Broadband Gateway (Non-DSL)

The proliferation of connected devices drives consumer demand for high-bandwidth broadband access in the home. Microsemi's semiconductor systems portfolio delivers the right connectivity for voice, data, and power, simplifying your design and delivery of broadband gateway products needed to optimize the service experience for customers. Microsemi's broadband gateway solutions portfolio addresses various key non-DSL applications, including cable customer premises equipment (CPE), Ethernet analog terminal adapters (ATAs), and FTTH optical network terminals (ONTs), both indoor and outdoor.



# Access Network

- Innovator and thought-leader in Ethernet technologies with a broad portfolio specifically designed for Ethernet networking applications, including Ethernet ICs, systems, software, IP and ecosystem solutions
- Leading provider of end-to-end PoE ICs and midspans/ injectors since 1999, with broadest PoE product portfolio for indoor and outdoor deployments including
- Highest integration, lowest power dissipation ideal diode bridges
- Lowest R<sub>DS(ON)</sub> PD ICs

Category	Part Numbers	Function
	VSC7440, VSC7511	Ethernet Switching
Ethernet Networking	VSC8504	Physical Media Interface
DoF	PD70224	AC/DC Conversion
POE	PD70201	PD IC with Integrated PWM Controller
Voice Line Circuit	Le9641, Le9651, Le9642, Le9652	Voice Channels
	5 GHz FEM: LX5586/A/H, LX5598H	Mi Ei Ezent End
	Dual-Band FEM: LX5591	
	5 GHz PA: LX5531	
WI-FI KF	2.4 GHz PA: LX5533	- VVI-FI Front End
	5 GHz LNA: LX5575, LX5560	_
	2.4 GHz LNA: LX5563	
Circuit Protection	PD70224ILQ-TR	Circuit Protection



- Market share leader with >1B voice line circuits shipped
- Comprehensive portfolio of highest-integration Wi-Fi single/ dual-band FEM, PA, and LNA with several Wi-Fi SoC joint reference designs available
- High-linearity 11ac/1024 QAM performance for 3×3, 4×4, and 8×8 MIMO applications
- Stay-flat DEVM for 8–1250 symbols

### G.fast/xDSL Gateway

Microsemi is a leading provider of semiconductor system solutions for G.fast, VDSL2, and other xDSL CPEs, delivering the optimum connectivity solutions for voice, data, and power in your broadband gateway applications.



## Access Network

- Comprehensive portfolio of highest-integration Wi-Fi single/ dual-band FEM, PA, and LNA with several Wi-Fi SoC joint reference designs available
- High-linearity 11ac/1024 QAM performance for 3×3,  $4 \times 4$ , and  $8 \times 8$  MIMO applications
- Stay-flat DEVM for 8–1250 symbols
- Voice line circuits with reference designs, ideal for POTS on indoor SFU (HGU) or gateways

Category	Part Numbers	Function
	5 GHz FEM: LX5586/A/H, LX5598H	
	Dual-Band FEM: LX5591	
	5 GHz PA: LX5531	N/i Fi Front Ford
VVI-FI RF	2.4 GHz PA: LX5533	- VVI-FI Front End
	5 GHz LNA: LX5575, LX5560	
	2.4 GHz LNA: LX5563	
Voice Line Circuits	Le9641, Le9651, Le9642, Le9652	Voice Channels
Line Drivers	Le82751, Le87270, Le87411	xDSL Line Drivers
Ethernet Networking	VSC7440, VSC7551	Ethernet Switching
Ethernet Networking	VSC8504	Physical Media Interface
PoE	PD81101	RPF PSE
	LX7309	Isolated Boost
Power Management	LX7302, LX7104, NX9548, LX7176	Non Isolated DC/DC



- PLC, VDSL, and G.fast line drivers with most integration (lowest BoM cost, space) and low power consumption
- PoE pioneer and market leader with innovative RPF technology enabling G.fast and VDSL2 ultra-broadband deployments
- Broad portfolio of Ethernet technologies specifically architected for Ethernet networking applications, including Ethernet ICs, systems, software, IP, and ecosystem solutions





### Industrial IoT

### Industrial PoE Switch

Subject to harsh environments, industrial network equipment must operate reliably and consistently under extreme conditions. With machines and various equipment types increasingly intelligent and connected, often in remote or hard-to-reach locations, delivering data and power to networked devices is becoming more and more complex. Industrial PoE switches solve the challenge of powering networked devices—such as wireless access points, IP phones, IP surveillance cameras, and other PoE-enabled devices—in rugged industrial environments.

Microsemi provides a comprehensive industrial product portfolio including Ethernet switches, PoE PSE ICs, FPGAs, timing devices, and power management, accelerating time to market with interoperable, scalable solutions, and simplifying network deployment and management.



# Industrial IoT

#### **Key Advantages**

- Only IC, systems, and software provider with poweroptimized, flexible, and reliable industrial networking solutions supporting both Ethernet and fieldbus protocols
- Industry's only complete industrial Ethernet switch solution with optimized switch configurations and software stack
- Industry-pioneering innovator and thought-leader in PoE technology, and a major source of IEEE 802.3af, IEEE 802.3at, IEEE 802.3bt, and HDBaseT standards

Category	Part Numbers	Function
	PD69200	PoE PSE Controller
POE	PD69208M	IEEE 802.3bt PoE PSE Manager
	PolarFire <sup>™</sup> FPGA	Legacy Protocol Support
Ethernet Networking	VSC7514	Ethernet Switch Core
	VSC8584	Physical Media Interface
	VSC8541	Physical Media Interface
Timing	ZL30702	Clock Management, IEEE 1588/SyncE DPLL
Power Manaagement	LX7165	DC/DC Conversion
	LX7186A	DC/DC Conversion
	LX7309	Isolated Power Conversion

With an industry-leading product portfolio including semiconductors, systems, services, and software, Microsemi solutions are engineered to help you design, deploy, or manage virtually any type of communications infrastructure equipment. Contact your local Microsemi sales office today to find the right technologies and products for your communications network infrastructure needs.



- Industry's most comprehensive, field-proven, and cost-effective IEEE 1588 solutions
- Only supplier of flash-based FGPAs with support for legacy industrial interfaces



