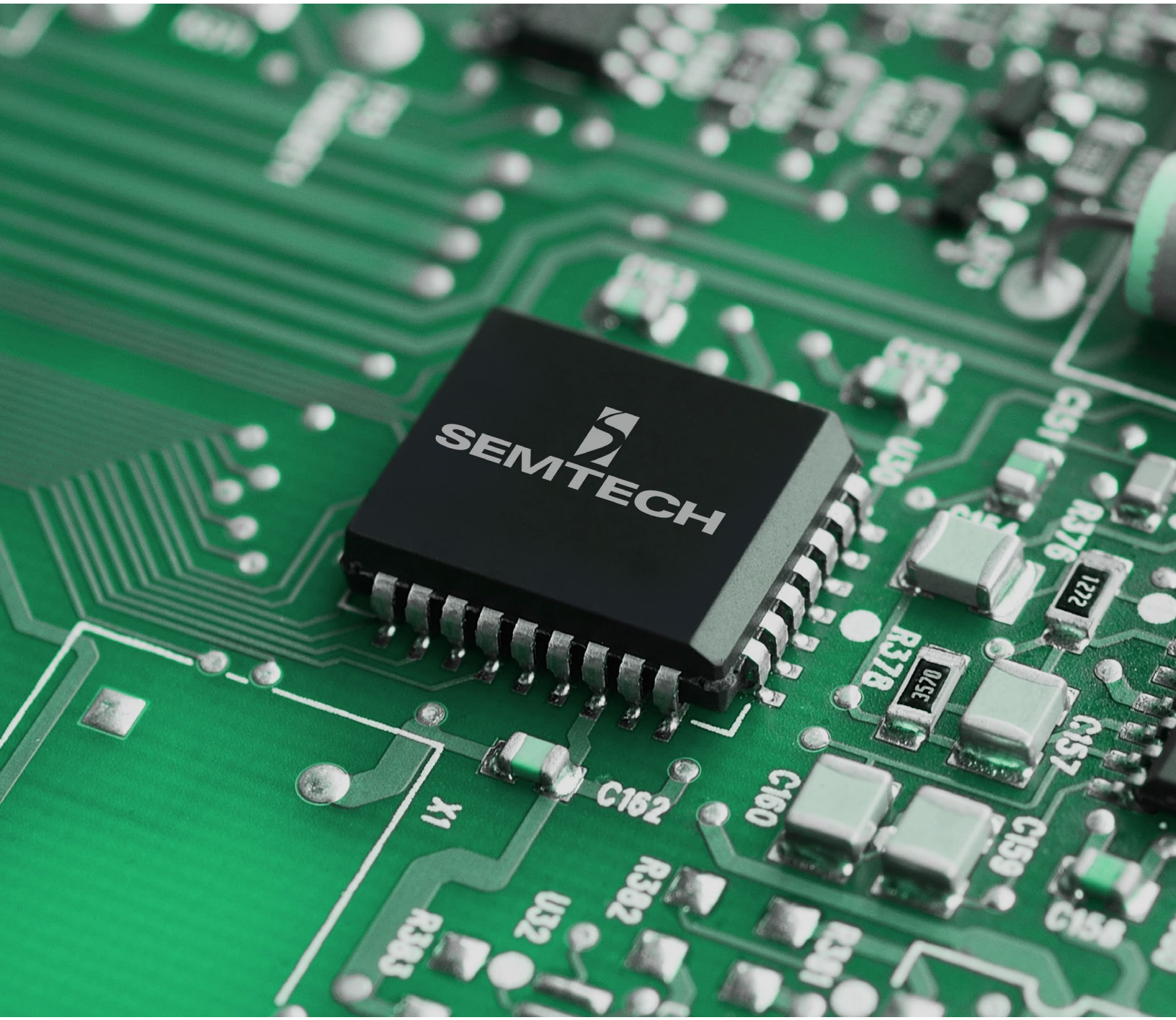
Semtech Products

Short Form Catalog



www.semtech.com

Contents

This catalog is a quick introduction to the key Semtech product families and is available from your Semtech sales representative and distribution partner. For the complete product portfolio, visit semtech.com

LoRa®

Changed the Internet of Things

Semtech's Revolutionary Edge to Cloud LoRaWAN® Platforms

LoRa Edge™ | LoRa Cloud™ | LoRa Basics™

Simple, easy-to-use and deploy

Available Now

SEMTECH

semtech.com/LoRa

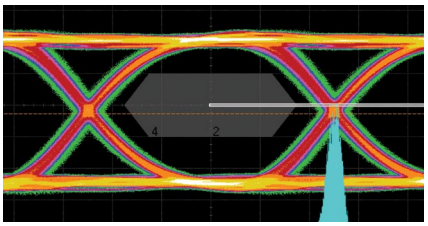
Circuit Protection

Semtech Shield Protection

Semtech Shield protection products safeguard circuits against damage or latch-up caused by ESD, lightning and other destructive voltage transients. Our protection devices feature low clamping voltage, low capacitance and low leakage current.

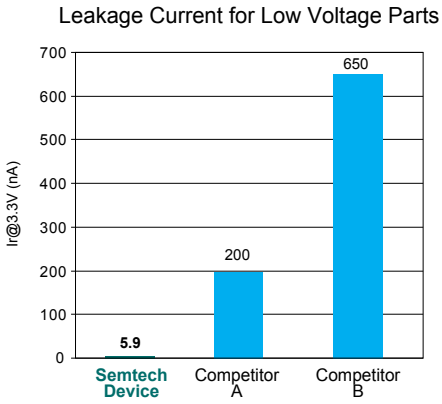
Low Capacitance

Provides robust protection while preserving signal integrity in high-speed video and data interfaces



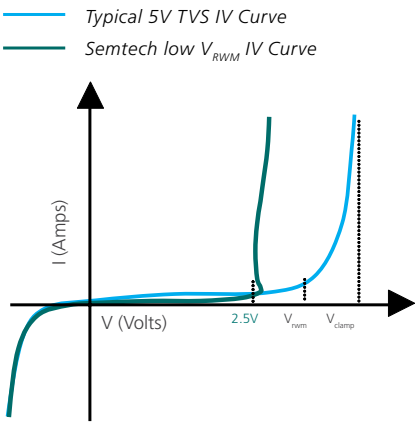
Low Leakage

Increases battery life in handheld electronic devices



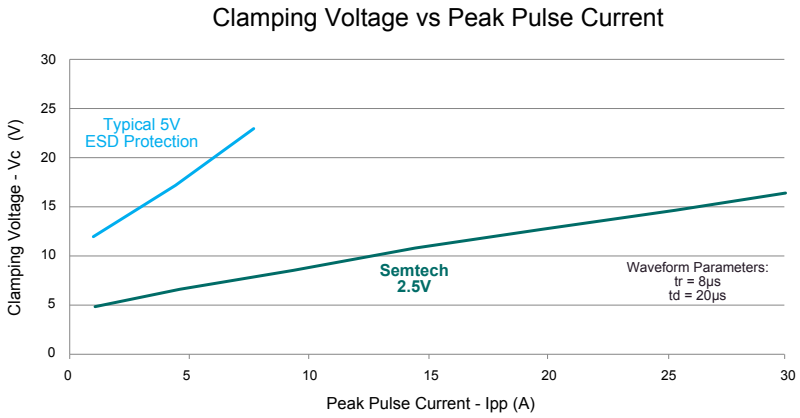
Lower Working Voltage

Reduces stress energy to protected IC



Low Clamping Voltage

Better protection and less stress on transceiver



Key ESD Protections

- ESD
- ESD-EMI filter
- High-current lightning
- Low capacitance ESD
- Low voltage ESD

Product Platforms

TClamp® = TransClamp
High surge lightning current handling capability

RClamp® = RailClamp
Low capacitance for high-speed applications

µClamp® = MicroClamp
Single TVS or TVS arrays for general purpose, standard TVS process

EClamp® = EMIClamp
ESD and EMI protection with integrated inductor or resistor

SEMTECH PROTECTION

Short Form Catalog

Key Applications

Application (Port)	Part Number	# of Lines	Voltage (V)	Max Capacitance (Line-GND)	Protection level (A) (8/20µs)*
USB 2.0 (Data Lines)	RClamp® 0552T	2	5	0.4	3
USB 2.0 (Data Lines + Vbus)	RClamp0582N	3	5	0.5	5
USB (OTG)	RClamp1624T	2+1	5+12	0.8	5
USB 3.0	RClamp3346P	6	3.3	0.65	4.5
HDMI, DisplayPort	RClamp3328P	8	3.3	0.65	5
LCD Panel	RClamp3324T	4	3.3	0.65	5
LCD Panel (EMI filter)	EClamp® 2388P	8	5	27	5
Single Line	µClamp® 3321ZA µClamp0541Z µClamp1211Z	1 1 1	3.3 5 12	5 9 25	4 2 5
Single Line High Speed	RClamp0531ZA	1	5	0.45	4
10/100 Ethernet	RClamp0534N RClamp3354S	4 4	5 3.3	3** 5	25 25
Gigabit Ethernet	RClamp3374N TClamp® 3302N	4 2	3.3 3.3	1.7** 25	40 95
T1/E1	TClamp0602N	2	6	25	95
CAN Bus	µClamp3601P µClamp3603T	1 3	33 36	25 50	– 2
RS485	SM712 TClamp1202P	2 2	12/-7 12	75 12	17 100
RS232	TClamp1282S	2	12	2.5	30
Keyboard, I/O	µClamp0541Z	1	5	9	2
xDSL	TClamp1282S TClamp2472S	2 2	12 24	2.5 3.5	30 –
2.5G Ethernet	RClamp0512TQ	2	5	3	–

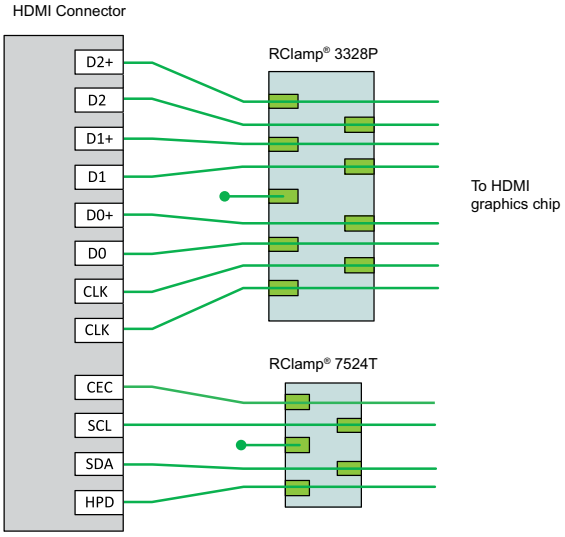
**All devices will protect at a minimum to IEC61000-4-2 (ESD) ±15kV (air), ±8kV (contact) and IEC 61000-4-4 (EFT) 40A (5/50ns) ** I/O to I/O Capacitance*

Gigabit and 10/100 Ethernet

Existing Devices	Next-Generation Improved Performance & Packaging	Pin-to-Pin Improved Performance
RClamp2504N	RClamp2574N	–
RClamp3304N(A)	RClamp3374N	–
SLVU2.8-4	RClamp3374N	µClamp2804L
SRV05-4(A)	RClamp0534N	RClamp0554S | RClamp3354S
LC03-3.3	–	RClamp2502L

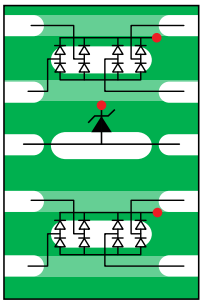
HDMI Protection

- RClamp®3328P (3.8x1.0mm)
- RClamp 7524T (1.3x0.7mm)
- Flow-through layout
- More than 50% PCB savings
- Low capacitance (0.25 typ) to minimize signal degradation

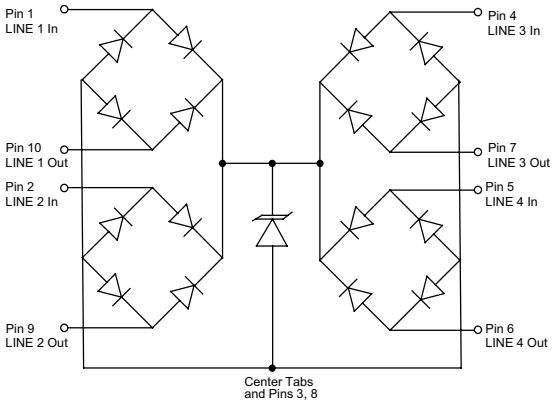


Gigabit Ethernet Protection

- RClamp3374N (3x2x0.60mm)
- 3.3V working voltage
- Low capacitance: 1.7pF I/O to I/O
- Flow-through layout
- Low clamping voltage performace
- High surge rating: 40A Ipp (8x20µs)

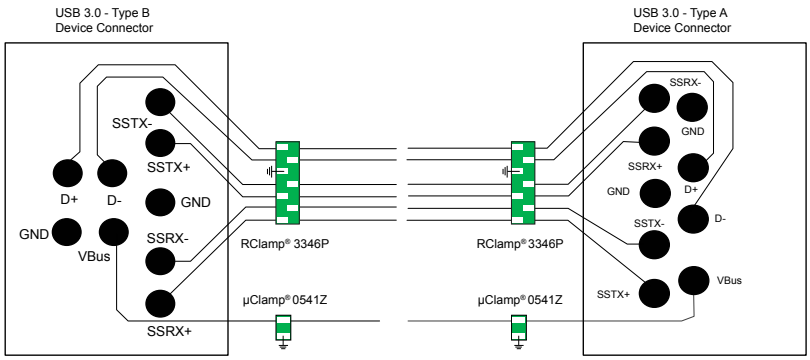


RClamp®3374N



USB 3.0 Protection

- RClamp3346P (2.7x0.8x0.50mm)
- µClamp®0541Z (0.6x0.3x0.25mm)
- Extremely low clamp across entire ESD event
- Low capacitance to minimize signal attenuation
- Low dynamic resistance



Download the Full TVS Products Guide

Download the Full TVS Auto Solutions

AEC-Q Automotive Qualified

As the electronic content in automobiles increases dramatically, so does our commitment to protect and connect customers with optimized IC solutions. Semtech has provided leading performance ICs for the automotive industry for many years. Applications include protection of sensitive electronics, ADAS safety, in-cabin lighting, and safeguarding of touch screen interfaces. Today, we continue to work on expanding our list of AEC-Q certified products for future applications.

Two-wire Ethernet
ADAs, 360° Camera View, Audio

Antennas
AM/FM, DAB, GPS, Satellite, Wi-Fi, Telematics Applications

USB 2.0
Infotainment, Phone Connectivity

USB 3.0/HDMI
Audio Video Infotainment, Back-end Display

CAN, LIN
Control Bus, Networking

SD Card/Memory
Navigation Applications

Analog Video, LVDS
ADAS, Back-up Camera Applications

Standard Ethernet
On-board Diagnostics, Networking

Audio
Infotainment, Console Display

Transient Voltage (TVS) Protection - AEC-Q100 Qualified

Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20µs)	Cap (pF)	Package (mm)	Interface To Protect
RClamp®3552TQ	3.5	2	±20kV/±17kV	4A	0.4	1.0x0.6x0.5	LVDS/APIX links
RClamp0582BQ	5	2	±30kV/±25kV	15A	1.2	1.6x1.6x0.75	Two wire ethernet single twisted pair USB 2.0 Antenna interfaces
RClamp0531TQ	5	1	±20kV/±12kV	4A	0.5	1.0x0.6x0.5	Two wire ethernet single twisted pair USB 2.0 Antenna interfaces
RClamp2574NQ	2.5	4	±30kV/±30kV	40A	1.7	3.0x2.0x0.6	LVDS links
RClamp1521PQ	15	1	±15kV/±8kV	4A	0.3	1.0x0.6x0.5	Antenna interfaces
RClamp2431TQ	24	1	±13kV/±8kV	2A	0.35	1.0x0.6x0.5	Antenna interfaces
µClamp® 0511PQ	5	1	±30kV/±30kV	12A	75	1.0x0.6x0.5	Audio Keypads & Multimedia touch-points
SLVU2.8Q	2.8	2	±30kV/±25kV	24A	100	2.9x2.37x0.90	Analog video
µClamp3311PQ	3.3	1	±30kV/±25kV	5A	12	1.0x0.6x0.5	Keypads & Multimedia touch-points
RClamp0512TQ	5	2	±30kV/±30kV	20A	2	1.0x0.6x0.4	Ethernet, USB2.0, LVDS, antennas
µClamp0301PQ	3	1	±30kV/±25kV	5A	25	1.0x0.6x0.5	Keypads & Multimedia touch-points
RClamp0524PQ	5	4	±25kV/±15kV	5A	0.4	2.5x1.0x0.58	HDMI

Single-line DC Bus Protection - AEC-Q100 Qualified

Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20µs)	Cap (pF)	Package (mm)	Application
µClamp®-0571P	5	1	±30kV/±30kV	80A	675	1.6x1.0x0.57	Single-line DC Bus protection
µClamp0871P	8	1	±30kV/±30kV	65A	475	1.6x1.0x0.57	
µClamp1071P	10	1	±30kV/±30kV	60A	350	1.6x1.0x0.57	
µClamp1271P	12	1	±30kV/±30kV	45A	275	1.6x1.0x0.57	
µClamp1571P	15	1	±30kV/±30kV	40A	220	1.6x1.0x0.57	
µClamp1871P	18	1	±30kV/±30kV	35A	220	1.6x1.0x0.57	
µClamp2271P	22	1	±30kV/±30kV	25A	165	1.6x1.0x0.57	
µClamp2671P	26	1	±30kV/±30kV	23A	155	1.6x1.0x0.57	
µClamp3671P	36	1	±30kV/±30kV	18A	150	1.6x1.0x0.57	

Filter Devices (TVS+EMC Filter) Protection - AEC-Q100 Qualified

Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Filter type	Cap (pF)	Package (mm)	Application
EClamp®-2410PQ	5	6	±17kV/±12kV	SD card termination	15	4.0x1.6x0.5	SD card
EClamp2357NQ	5	6	±20kV/±12kV	RC filter SD card termination	20	3.0x3.0x0.6	SD card
EClamp2374KQ	5	4	±15kV/±8kV	RC filter	10	1.7x1.3x0.5	Color LCD

Power Management - Regulators and Controllers - AEC-Q100 Qualified

Part Number	Type	V_{IN}		I_{OUT} Max (A)	PowerGood flag	Enable	Soft Start	PSAVE	Package (mm)
		Min	Max						
SC508A	Controller	4.5	46	30	Yes	Yes	Programmable	Yes	MLPQ-20, 3x3
SC284AQ	Regulator	2.7 5	5.5	1.7 2	Yes	Yes	Yes	No	MLPQ-20, 3x3
SC220Q	Regulator	2.7	5.5	0.6	No	Yes	Yes	Yes	SOIC-8

Power Management - LED Drivers - AEC-Q100 Qualified

Part Number	V_{IN} (V)		V_{OUT} (V) Max	Fsw (MHz)	# LEDs per string* V_f=(3.5V)	# of Strings	String Current (mA)	Dimming Max Freq.	Package (mm)	Features
	Min	Max								
SC5012/Q	4.5	45	65	0.2–2.2	18	4	150	up to 30kHz	MLPQ-24, 4x4	I²C, FSYNC, 5000:1 Phase shifted PWM dimming

Signal Integrity

Optical & Networking Solutions

Semtech offers one of the industry's most comprehensive portfolios of optical transceiver IC products ranging from 100Mbps to over 100Gbps, supporting key industry standards such as Fibre Channel, InfiniBand®, Ethernet, CPRI, PON, OTN, SONET, and PCI Express®. Semtech is also investing in leading-edge technologies to enable communication systems at 800Gbps and beyond.

Technologies

PAM4

- Chipsets for both 28 and 56Gbaud applications
- Industry leading linear performance
- Data center and wireless markets served

Tri-Edge™ & ClearEdge® CDRs

- Market leader in CDRs
- Reference-free operation
- Integrated solutions enable best performance, lowest power and ultra-low latency

TIAs

Industry leading performance and proven reliability

Laser Drivers & Limiting Amplifiers

High performance and discrete integrated solutions for single- and multi-channel applications

ROSAs

Best-in-class sensitivity, based on Semtech's patented Rchip technology

Markets

Data Center

- 56 and 28Gbaud PAM4 for SRx modules and AOCs
- n x 25Gbps NRZ solutions

5G Wireless

Market leading 10Gbps and 25Gbps solutions for SFP28 modules

PON/FTTH

- PON-X® portfolio driving the future of PON
- Industry's first fully integrated 10G PON OLT solutions
- Highly integrated chipset solutions for 10G PON ONU

TriEdge CDRs

GN2538	Dual PAM4 CDR re-timer with integrated VCEL array driver
GN2539	Dual PAM4 CDR with integrated transimpedance amplifier (TIA) array
GN2558	Quad PAM4 CDR re-timer with integrated VCSEL array driver
GN2559	quad PAM4 CDR with integrated transimpedance amplifier (TIA) array

ClearEdge CDRs

Part Number	Data Rate (Gbps)	Lanes	Laser Driver	TIA	Slice Level Adjust	Pin Compatibility	Package	Applications
GN2106ST*	24–28	4	EML	–	Yes	–	BGA	100Gbps Ethernet/OTN, Infiniband EDR
GN2146*	24–28.1	2 (Rx + Tx)	EML	–	Yes	–	FC-LFBGA	DWDM and Tunable up to 80km
GN2148*	24–28.1	1 Tx	VCSEL	–	–	–	Die	SFP28 SR
GN2149*	24–28.1	1 Rx	–	Yes	–	–	Die	SFP28 SR
GN2152*	24–28	2 (Rx + Tx)	DML	–	–	CSP	CSP	SFP28 LR
GN2152B*	24-28.1	2 (Rx + Tx)	EML/MZM	–	Yes	CSP	–	SFP28 LR, BiDi, CWDM
GN2154*	24-28.1	2 (Rx + Tx)	SE-EML	–	Yes	–	–	SFP28 DWDM and LAN-WDM up to 80km

** Please contact your sales representative for more details.*

Transceiver IC (LD and LA)

Part Number	Overview	Data Rate (Gbps)	Max Mod/Bias Current (mA)	Supply (V)	Package	Applications
GN1196*	1.0 to 12.5Gbps LR Transceiver Chip with Digital Diagnostics	to 12.5	100/120	2.4 and 3.3	QFN-32	10GbE LR SFP+, CPRI
GN28L97B	10Gb/s Limiting Post Amplifier & 2.5Gbps Burst Mode Laser Driver	10.3	100/120	3.3	QFN-32	10Gbps Asymmetric PON Applications
GN7155B	10G EML Driver CDR/2.5G Burst-mode LAM Combo	to 10.3	100/140	1.8 and 3.3	QFN-32	OLT modules for XGPON

TIAs

Part Number	Overview	Data Rate (Gbps)	Gain (kΩ)	BW (GHz)	Supply (V)	Noise	Applications
GN1069	12.5G Limiting	to 12.5	9	11.5	3.3	0.86µA	-
GN1086*	28G Limiting	25-28	6	23	3.3	1.25uA	25Gbps and 100Gbps Ethernet/ OTN, Infiniband EDR
GN1088*	Quad 28G Limiting	28	5	23	3.3	-	-
GN25L54	2.5Gbps High Sensitivity AGC TIA	2.5	42	1.4	3.3	80nA	GPON (PD)
GN7055	Multi-rate PON Burst Mode TIA	10.3/ 2.5/ 1.25	3.6/ 4.6/ 11.5	8.7/ 2.2/ 1.14	3.3	*	10G XGS-PON/10G EPON/ 2.5G XG-PON/1.25 EPON
GN7069	10G Limiting	to 11.3	8	10	3.3	0.9µA	APD ROSAs for 10G PON ONU
GN7053*	1G GPON Burst Mode Limiting	1.25	1.25	1.5	3.3	*	1G GPON OLT
NT24L55	1.25Gbps High Sensitivity AGC TIA	1.25	46	0.75	3.3	74nA	EPON
NT25L51	2.5Gbps AGC TIA	2.5	8	1.7	3.3	230nA	OC-48, GPON (APD)
GN1089	Single Channel PAM4 Linear	100	5	34	3.3	2.4µA	56GBd Ethernet PAM4 modules (100GBASE and 400GBASE)
GN1810	Quad PAM4 Linear	100	5	34	3.3	2.4µA	56GBd Ethernet PAM4 modules (400GBASE)
GN1812	Quad PAM4 Linear	100	5.5	35	3.3	1.9µA	56GBd Ethernet PAM4 modules (400GBASE)

Limiting Amplifiers

Part Number	Overview	Data Rate (Gbps)	Gain (dB)	BW	Supply (V)	Noise Figure (uV)	Applications
NT20045	200Mbps Limiting Amp	0.2	60	0.125	3.3/5.0	80	OC-3, Fast Ethernet
NT24L73	1.25Gbps Limiting Amp	1.25	46	0.938	3.3	300	OC-3, OC-12, GbE

Laser Drivers

Part Number	Overview	Data Rate (Gbps)	Max Mod/Bias Current (mA)	Supply (V)	Package	Applications
GN1185*	Quad DFB driver	25-28	55m/70	2.3/3.3	Bare Die	100GbE Ethernet active TOSA
GN1190	Quad VCSEL Driver	to 14.3	12/12	3.3	Bare Die	40Gbps Ethernet, Infiniband, QSFP+
NT20042	300Mbps LED Driver	0.3	100	3.3/5.0	QSOP-16	OC-3, Fast Ethernet
NT22L33	1.25Gbps FP/DFB Laser Driver	1.25	70/80	3.3/5.0	QFN-24 (4mm)	OC-3, OC-12, GbE

** Please contact your sales representative for more details.*

ROSAs and Super High Gain ROSAs

Part Number	Overview	Data Rate (Gbps)	Gain (kΩ)	Supply	RSSI	Unstressed Sensitivity	Comments	ORL
GN3257*	PIN with AGC	to 11.3	8.5	+3.3V ±10%	Yes	-19dBm	–	-27dB
GN3357*	High Gain APD with AGC	to 11.3	8.5	+3.3V ±10%	VAPD	-27dBm	–	-27dB
GN3358*	High Gain APD Rchip	to 11.3	13	+3.3V ± 10%	VAPD	-27dBm	Ideal for non-retimed SFP+	-27dB
GN3289*	56GBd Linear AGC ROSA	to 100	5	+3.3V ±10%	Yes	-7.7dBm OMA	100Gbps Ethernet operation using PAM4 modulation	-27dB
GN3361*	High Gain APD with AGC	to 11.3	8.5	+3.3V ±10%	VAPD	-26.5dBm	–	-27dB
GN3362*	Limiting APD ROSA	to 11.3	8	+3.3V ±10%	VAPD	-27.5dBm	–	-27dB

Multi-Lane Signal Conditioners

Part Number	Data Rate (Gbps)	Lanes	CDR	Ref Clock	Input Stage	De-emphasis	Supply (V)	Package	Applications
GN2406/6S*	9.95–10.95	4	Yes	Not Req.	Limiting Amp	Yes	3.3	QFN-48	10G/40G Linecards
GN2408*	1.25–12.8	8	Yes	Req.	Adaptive Equalizer DFE	Yes	0.9 1.8	BGA-144	>nx10G Backplanes,10G/40G Linecards, 10G-KR, Crosspoint Switching, CPRI
GN2412*	1.25–12.8	12	Yes	Req.	Adaptive Equalizer DFE	Yes	0.9 1.8	BGA-144	>nx10G Backplanes,10G/40G/100G Linecards, 10G-KR, 40G-KR4, 40G-CR4, Crosspoint Switching, CPRI
GN2504*	25.6–28.1	4	Yes	Not Req.	Adaptive Equalizer	Yes	1.8	QFN-54	25G/50G/100G Linecards, nx28G Backplanes, 25G/50G/100G Active Copper Cables
GT1706*	1.25–14.5	6	Yes	Req.	Adaptive Equalizer	Yes	0.9 1.8	BGA-144	HD/3G/4K/8K Video Broadcast testing Fibre Channel/Infiniband/Ethernet Link Testing BERT Developments
GX4002	9.9–11.3, 14.025	2	Yes	Not Req.	Equalizer	Yes	3.3	QFN-32	nx10G Backplanes,10G/40G Linecards, Infiniband FDR, 16G Fibre Channel, Crosspoint Switching

**Please contact your sales representative for more details.*

Download the Full Optical & IC Guide

Watch Tri-Edge™ Video

PerSe™ Smart Sensing

Technology That Makes More Sense

Semtech PerSe is for every personal connected consumer device. The technology intelligently senses human presence for optimized connectivity and enhanced user experience. PerSe offers best-in-class sensing performance and is commonly used in a wide range of applications such as smartphones, laptops, tablets, and wearables.

PerSe Connect

PerSe Connect enhances connectivity for a wide range of wireless technologies such as 5G sub-6/4G/Wi-Fi. Featuring best-in-class sensitivity, PerSe Connect devices enable highly accurate human proximity detection. PerSe Connect not only improves user experience, it also ensures specific absorption rate(SAR) compliance for personally connected consumer devices.

Features

- High sensitivity programmable capacitive sensor inputs
- Integrated high performance RF shield for enhanced noise immunity
- Extremely low temperature drift ensures stable and accurate measurements
- Patented on-chip smart engine for human detection
- Built-in automatic calibration
- Compact footprint

Applications

- Smartphones (5G sub-6/4G/Wi-Fi)
- Tablets (5G sub-6/4G/Wi-Fi)
- Laptops (5G sub-6/4G/Wi-Fi)
- Wireless Printers (Wi-Fi)
- Set Top Boxes (Wi-Fi)
- Game Consoles (Wi-Fi)

PerSe Connect Pro

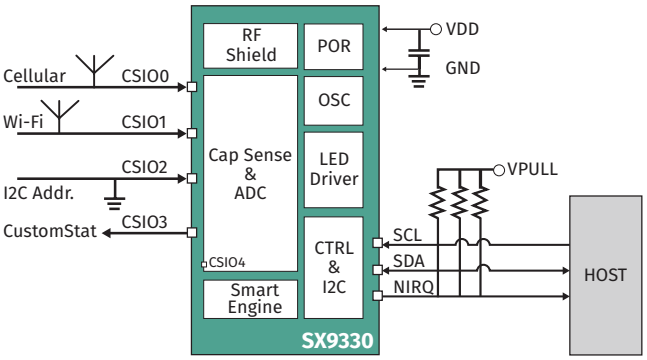
PerSe Connect Pro is a portfolio of Power Density (PD) sensors that improves connectivity in smartphones, tables and laptops. The focus of PerSe Connect Pro is high performance and high band 5G mmWave applications.

Features

- Multi-channel sensor inputs designed for Power Density (PD) applications
- Ultra-high resolution optimal for 5G High-Band proximity detection
- Semtech patented smart engine
- Advanced temperature compensation
- Built-in automatic calibration
- Ultra-low power consumption extends battery life
- Compact footprint

Applications

- Smartphones (5G mmWave)
- Tablets (5G mmWave)
- Laptops (5G mmWave)
- Broadband Hotspots (5G mmWave)
- Fixed Wireless Modems (5G mmWave)



PerSe Control

PerSe Control supports low power human detection and elevates user experience in wearable products. Equipped with advanced slider, tap and wheel algorithms, PerSe Control enhances wear detection and enables advanced gesture control in wearable products.

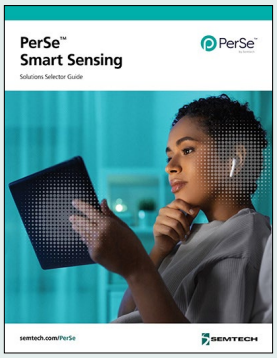
Features

- Multiple channel sensor inputs
- Advanced slider/tap/wheel algorithms
- Patented on-chip smart human sensing
- Automatic calibration
- Ultra-low power optimal for battery operations

Applications

- Smartwatches
- Fitness bands
- Wireless earbuds
- Hearing aids
- AR/VR headsets
- Smart locks

PerSe™ by Semtech



Download the Full PerSe Product Guide

PerSe™ by Semtech

Watch PerSe™ Video

Next Generation BlueRiver® AV Processors

Bringing the disruptive power of Ethernet to traditional AV signal distribution, the BlueRiver AVP chipset delivers a single programmable system on chip (SoC), to replace traditional AV/KVM extenders, matrix switchers, video wall controllers, and windowing processors with a simple network of transmitters, receivers and off-the-shelf Ethernet switches. Sharing a common API interface with Software Defined Video over Ethernet (SDVoE™) infrastructure, the BlueRiver AVP chipset includes the AVP1000, AVP2000 and AVP2000T, which are interoperable with the installed base of SDVoE products and can be installed in various combinations to address a variety of market applications.

BlueRiver AVP1000

- Enables switching and extension of AV over Ethernet networks
- Supports 4K60 RGB/4:4:4, HDR, 3D and broadcast-friendly 4K60 10-bit 4:2:2
- HDMI audio embedding, de-embedding and breakaway
- Audio down-mixing engine from multi-channel PCM audio to stereo
- Independent switching with near zero-latency for all signal types
- Supports 10GBaseT copper infrastructure over category cabling
- Single device for transmitter or receiver products
- Combine with AVP2000 or AVP2000T for fast switching

BlueRiver AVP2000

- All features of the AVP1000 plus a powerful AV processing engine and optical fiber transmission
- Broadcast quality scaler, programmable to scale up or down any resolution
- Compositing engine for combining multiple sources into a single display with user-defined layouts
- Supports 10G Ethernet over category cabling and optical fiber

BlueRiver AVP2000T

- All features of the AVP2000 with simultaneous video transmit and receive functionality
- Independent video scaling on both transmit and receive paths

BlueRiver AVP Chipset Comparison

	AVP 1000	AVP 2000	AVP 2000T
Video Support			
4K 60 8-bit 4:4:4	✓	✓	✓
4K 60 10-bit 4:2:2	✓	✓	✓
4K 60 12-bit 4:2:0 (HDR)	✓	✓	✓
Transceiver Mode (Video TX and RX)	N/A	N/A	✓
Transport Medium			
Copper (10GBaseT, nBaseT)	✓	✓	✓
Multi-mode fiber (SFP+)	N/A	✓	✓
Single-mode fiber (SFP+)	N/A	✓	✓
AV Processing			
Zero-frame latency custom scaling to display	•	✓	✓
Single-frame switching	•	✓	✓
Video wall with bezel correction	•	✓	✓
Multi-view compositing	N/A	✓	✓
Audio down-mixing	✓	✓	✓
Auxiliary Interfaces			
1G Ethernet	✓	✓	✓
USB-HID for mouse/keyboard	✓	✓	✓
USB 2.0 with third-party chipset	✓	✓	✓
Quad RS-232, Infrared I/O, CEC, GPIO	✓	✓	✓
Single Part Number Design and Procurement			
Transmit or receive mode	✓	✓	✓
Transmit and receive mode	N/A	N/A	✓

• Supported by combinations of AVP1000 TX and AVP2000/AVP2000T RX

UHD-SDI Products

Semtech's UHD-SDI products extend a over 30 year leadership in SDI technology with a complete line of advanced chipsets. Semtech's multi-rate device lineup enables differentiated and pioneering baseband video products. We offer the world's most advanced devices designed specifically for real world broadcast challenges, including the latest innovations that help push the boundaries of performance, reach, power, and signal integrity while reducing time to market and design risks.

Comprehensive Portfolio of Industry-Leading UHD-SDI Products

We have the most comprehensive, end-to-end portfolio of UHD-SDI video products available, including our new family of long-reach, dual-input, multi-rate 12G retiming equalizers and cable drivers, low power 3G equalizers, cable drivers, reclockers, receivers, transmitters, gearboxes, and innovative HDMI/SDI bridge devices.

UHD-SDI: The Next Generation Broadcast Television Production Interface

New UHD-SDI solutions are needed to enable next-generation broadcast television and D-Cinema applications. UHD-SDI is fully standardized for next-generation broadcast television production of high definition television (HDTV), ultra-high definition television (UHDTV), high dynamic range (HDR), high frame rate (HFR), and wide color gamut (WCG) services

Dedicated to Customer Success

Our commitment to customer success drives everything we do. We are unique in providing:

- Comprehensive testing for each component in production, assuring high yield on assembled boards
- Complementary design support, including review and feedback to shorten development cycles, reduce risks and optimize performance

Equalizers

Part Number	Data Rate (Mbps)	Launch Swing Compensation	Output Coupling (V)	No. of Inputs	No. of Outputs	Cable Length (m)					Temp Range (°C)	Power (mW)	Package (mm)
						12G	6G	3G	HD	SD			
GS12341	1–11880	YES	1.2–2.5	1	2	80	100	190	260	450	-40 to +85	405*	QFN-40 (6x4)
GS12142	1–11880	YES	1.2–2.5	2	2	80	100	190	260	450	-40 to +85	385*	QFN-40 (6x4)
GS6042	125–5940	YES	1.2–3.3	1	1	–	80	210	300	550	-40 to +85	180	QFN-16 (4x4)
GS3241	1–2970	YES	1.2–2.5	1	2	–	–	190	260	450	-40 to +85	405*	QFN-40 (6x4)
GS3140	1–2970	YES	1.0–2.5	1	1	–	–	200	280	500	-40 to +85	83	QFN-16-COL (4x4)

Reclockers

Part Number	Data Rate (Mbps)	Power Supply (V)	Integrated Eye Monitor	Output Jitter (UI)	Input Trace EQ	Output Pre-/ De-emphasis	Input MUX	No. of Inputs	No. of Outputs	Temp Range (°C)	Power (mW)	Package (mm)
GS12150	11880 5940 2970 1485 270	1.8	YES	12G:0.08 6G:0.05 3G:0.04 HD:0.03 SD:0.03	YES	YES	2:1	2	2	-40 to +85	385	QFN-40 (6x4)
GS6151	5940 2970 1485 270	1.8	YES	6G:0.13 3G:0.09 HD:0.06 SD:0.03	YES	YES	2:1	2	2	-40 to +85	130	QFN-32 (4x4)
GS6152	5940 2970 1485 270	1.8	YES	6G:0.13 3G:0.09 HD:0.06 SD:0.03	YES	YES	4:1	4	2	-40 to +85	130	QFN-48 (6x6)

Cable Drivers

Part Number	Data Rate (Mbps)	Power (mW)	Power Supply (V)	No. of Inputs	No. of Outputs	Input Trace EQ	Max Output Swing (mV)	ORL (dB)	Circuit Compatible with	Temp Range (°C)	Package (mm)
GS12281	1–11880	360*	1.8, 2.5	1	2	YES	1000	12G:-10 6G:-10 3G:-15 HD:-19	GS12181 GS3281 GS12081 GS3590 GS12090 GS12190	-40 to +85	QFN-40 (6x4)
GS12182	1–11880	360*	1.8, 2.5	2	2	YES	1000	12G:-10 6G:-10 3G:-15 HD:-19	GS12281 GS12081 GS12181 GS3281	-40 to +85	QFN-40 (6x4)
GS12081	1 -11880	170	1.8, 2.5	1	2	YES	1000	12G:-10 6G:-10 3G:-15 HD:-19	GS12281 GS3590 GS12181 GS3281 GS12090 GS12190	-40 to +85	QFN-40 (6x4)
GS6080	143–5940	135	2.5 or 3.3	1	2	YES	1800	6G:-10 3G:-15 HD:-19	GS2988	-40 to +85	QFN-16 (4x4)
GS6081	143–5940	205	2.5 or 3.3	1	4	YES	1800	6G:-10 3G:-15 HD:-19	GS2989	-40 to +85	QFN-16 (4x4)
GS3281	1–2970	375*	1.8, 2.5	1	2	YES	1000	3G:-15 HD:-19	GS12281 GS12090 GS12181 GS3590 GS12081 GS12190	-40 to +85	QFN-40 (6x4)

Configurable SDI Equalizer/Cable Driver

Part Number	Data Rate (Mbps)	Power (mW)	No. of Outputs	Cable Reach (m)	Integrated Reclocking	Circuit Compatible with	DVB-ASI and MADI	Temp Range (°C)	Package (mm)
GS12190	1–11880	EQ: 430* CD: 375*	EQ: 1 CD: 1	12G:70 6G:90 3G:170 HD:240 SD:400	YES	GS3281 GS3590** GS12081 GS12090 GS12181 GS12281	YES	-40 to +85	QFN-40 (6x4)
GS3590	1–2970	EQ: 430* CD: 375*	EQ: 1 CD: 1	3G:160 HD:240 SD:300	YES	GS3281 GS12081 GS12090 GS12181 GS12190** GS12281	YES	-40 to +85	QFN-40 (6x4)
GS3490	125–2970	EQ: 202 CD: 215	EQ: 1 CD: 1	3G:140 HD:260 SD:500	NO	–	YES	-40 to +85	QFN-32 (5x5)

AV Interface & Protocol Conversion

Part Number	Data Rate (Mbps)	Number of Video Inputs	Number of Video Outputs	Number of Audio Input Channels	Number of Audio Output Channels	Temp Range (°C)	Package (mm)
GS12170	270-11880	4	4	16 (8 stereo pairs)	16 (8 stereo pairs)	-40 to +85	BGA-196 (12x12)
GS12070	270-11880	4	4	–	–	40 to +85	BGA-196

SDI Transmitters

Part Number	Data Rate (Mbps)	Video Processing	DVB/ ASI	Ancillary Data Insert	Audio Embed	Cable Driver	Output Jitter (ps)	Parallel Bus Width	CEA 861 Timing	Temp Range (°C)	Power (mW)	Package
GS2972	270 1485 2970	YES	YES	YES	YES	YES	3G:40 HD:50 SD:200	10 or 20	YES	-40 to +85	400	BGA 100
GS2962	270 1485 2970	YES	YES	YES	NO	YES	3G:40 HD:50 SD:200	10 or 20	YES	-40 to +85	350	BGA 100

SDI Receivers

Part Number	Data Rate (Mbps)	Integrated Equalizer	Number of SDI Inputs	Audio De-embed	Audio Clock Generator	I/O Supply Voltage (V)	Power (mW)	Package (mm)
GS3471	270, 1485, 2970	Yes	2	Yes	Yes	1.8 or 2.5	300	BGA 100 (9x9)
GS3470	270, 1485, 2970	No	2	Yes	Yes	1.8 or 2.5	220	BGA 100 (9x9)
GS2971A	270, 1485, 2970	Yes	1	Yes	Yes	1.8 or 3.3	525	BGA 100 (11x11)
GS2961A	270, 1485, 2970	Yes	1	No	No	1.8 or 3.3	500	BGA 100 (11x11)
GS2970A	270, 1485, 2970	No	1	Yes	Yes	1.8 or 3.3	350	BGA 100 (11x11)
GS2960A	270, 1485, 2970	No	1	No	No	1.8 or 3.3	320	BGA 100 (11x11)

Crosspoint Switches

Part Number	Data Rate (Gbps)	Inputs	Input Sensitivity (mV)	Input Trace EQ	Outputs	Output De-emphasis	DC Coupling	Temp Range (°C)	Power (W)	Package (mm)
GX3290	3.5	290	80	YES	290	YES	1.2V, 1.8V, 2.5V	0 to +85	34	BGA 2377 (50x50)
GX3202	3.5	202	80	YES	202	YES	1.2V, 1.8V, 2.5V	0 to +85	24	BGA 2377 (50x50)
GX3146	3.5	146	80	YES	146	YES	1.2V, 1.8V, 2.5V	0 to +85	18	BGA 2377 (50x50)

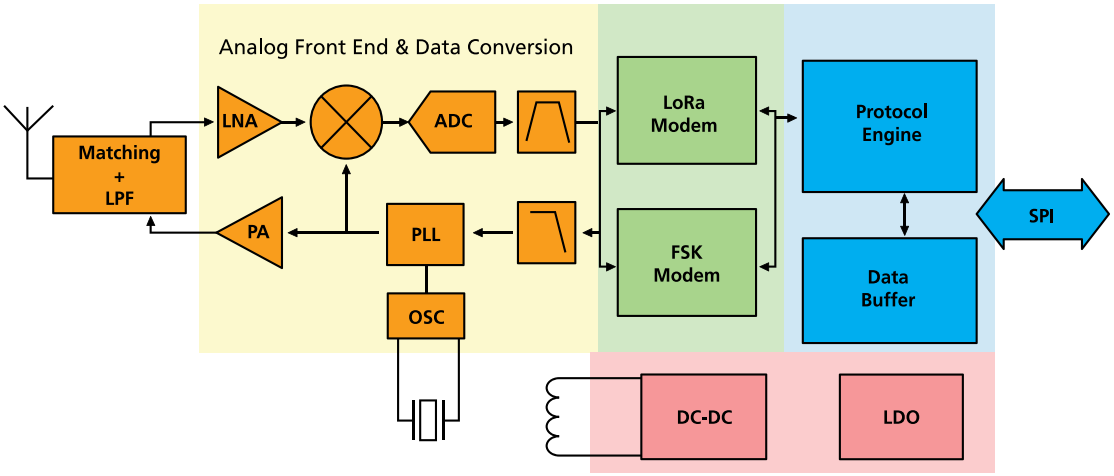
Download the Full Broadcast Video Guide

LoRa® – The Ultimate Long-Range Solution

LoRa Devices

- Long range of up to 30 miles outdoor line of sight
- Deep indoor coverage for hard to reach areas
- Available for any environment
- Bidirectional communication link with adaptive data rates
- Low power sensors with extended battery lifetime of up to 20 years
  - 100nA sleep mode
  - 4.2mA active receive mode
- LoRa, LoRaWAN® and FSK compliant
- GFSK modes supported by a single radio
- Scalable, multi-channel, high-capacity gateways powered by SX1301/SX1308
- LoRa modulation offers 30dB improvement over FSK for co-channel interference rejection
- Programmable registers for maximum flexibility
- Footprint-compatible ICs for global coverage
- Supported by members of LoRa Alliance® that defines the open LoRaWAN standard (an ITU-T standard)
- Dedicated developer forum for LoRa-enabled products in the LoRa Developer Portal
- Public, private and hybrid networks available worldwide

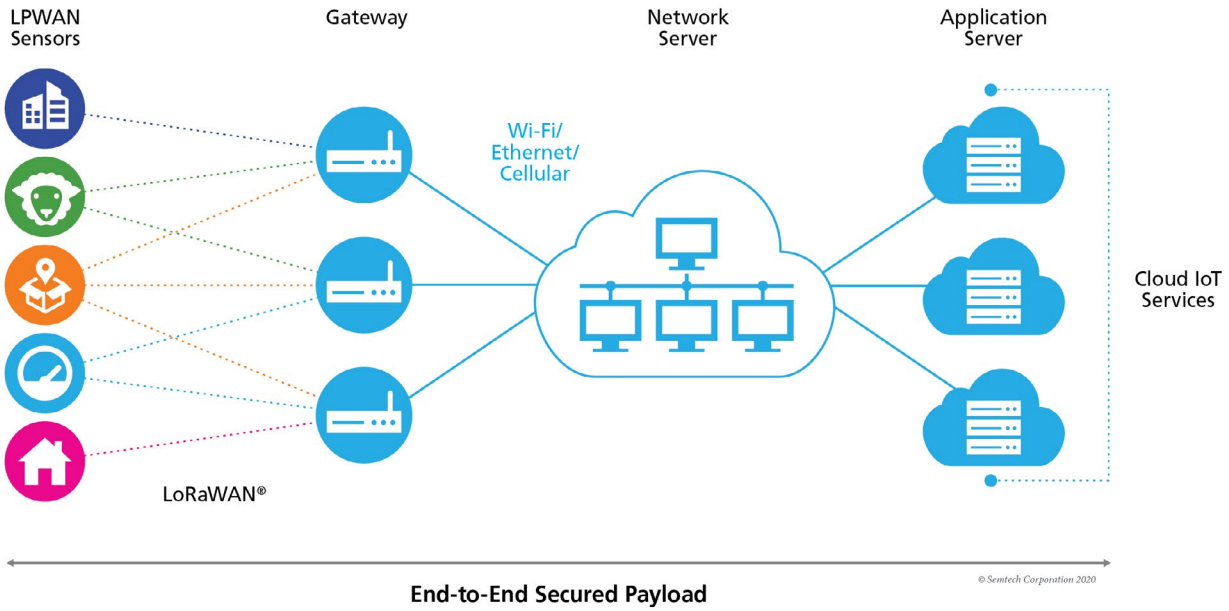
SX126x Block Diagram



LoRa® Products

Part Number	Frequency Range (MHz)	Link Budget (dB)	RXCurrent (mA)	FSK Max DR (kbps)	LoRa DR (kbps)	Max Sensitivity (dBm)	TX Power (dBm)
SX1261	150-960	163	4.2	300	0.018–62.5	-148	+ 15
SX1262	150-960	170	4.2	300	0.018–62.5	-148	+ 22
SX1268	410-810	170	4.2	300	0.018–62.5	-148	+ 22
SX1272	860–1020	158	10	300	0.3–40	-138	+ 20
SX1276	137–1020	168	11	300	0.018–40	-148	+ 20
SX1278	137–525	168	11	300	0.018–40	-148	+ 20

Gateway Using LoRa®



Features of Semtech's LoRa Wireless RF Technology	
Long Range	Penetrates in dense urban and deep indoor environments, connecting to sensors up to 30 miles away in rural areas
Low Power	Designed specifically for low power consumption extending battery lifetime up to 20 years
High Capacity	Supports millions of messages per base station
Geolocation	Enables GPS-free, low power tracking applications
Standardized	LoRaWAN specification ensures global interoperability among applications, IoT solution providers and telecom operators
Secure	Embedded end-to-end AES-128 encryption of data for optimal privacy and protection
Low Cost	Reduces costs three ways: infrastructure investment, operating expenses and end-node sensors

Picocell Solutions

- LoRa picocell platforms are designed for a variety of indoor applications such as home, small business and buildings
- SX1308 picocell IC is coupled with a SX1255 or SX1257 LoRa RF transceiver, and helps bring low cost networks using LoRaWAN to market for consumers and private enterprises

Gateway Solutions

- Multi-channel, multi-modem receiver including LoRa and FSK modems
- Inherent two-way communication
- Simultaneously receives different data rates on same channel

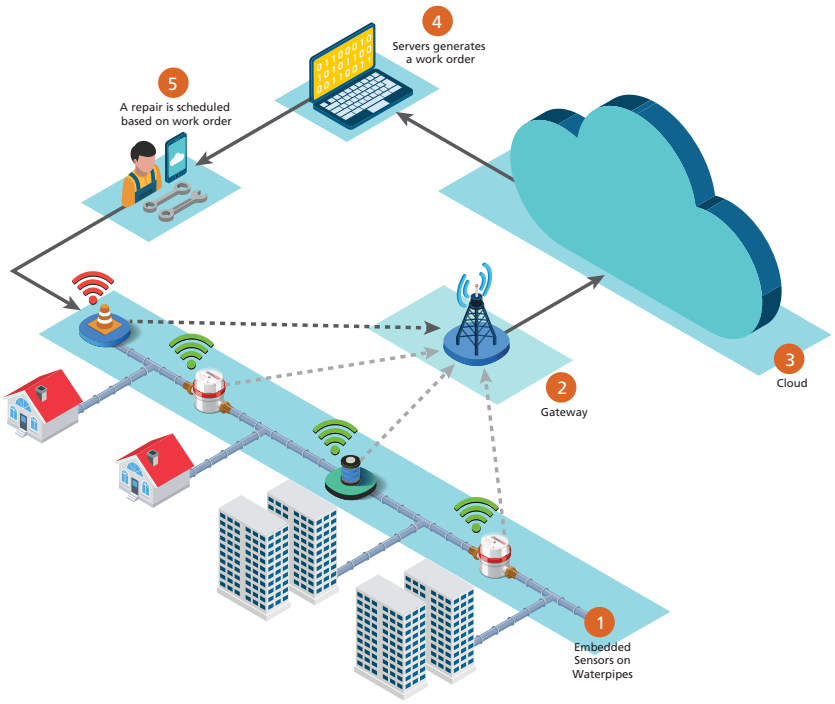
RF ICs for Gateways and Picocells

Part Number	Tx/Rx	Operating Temp. Range	LoRa Modem	FSK Modem	Capacity
SX1301	Tx/Rx	-40–85°C	9	1	Varies by application
SX1308	Tx/Rx	0–70°C	9	1	Varies by application

RF Transceivers

Part Number	Tx/Rx	Band (MHz)	Tx Power	NF
SX1257	Tx/Rx	860–1000	-20–8	7
SX1255	Tx/Rx	400–510	-20–8	7

LoRa®-Enabled Smart Sensors



Use Case Example: Smart Water Flow Monitoring System Using LoRa

With over 20 years of experience providing RF communications and sensing ICs for battery-operated sensors, Semtech offers the widest range of RF ICs for ultra long range M2M communications.

High-Link Budget

- 30dB higher than competing devices when using a low-cost BOM

High Rx Sensitivity Solutions

- Up to -148dBm of sensitivity

7x Lower Power Consumption

- 100nA sleep
- 4.2mA Rx
- 25mA @ +14dBm Tx

Support for Major Wireless Communications Protocols

- LoRaWAN®
- IEEE 802.15.4g
- Wireless M-Bus
- 6LoWPAN

RF ICs for Smart Sensors

Part Number	Description	Link Budget (dB)	Rx Current (mA)	Evaluation Kit
SX1261	150-960MHz Long Range LoRa G/FSK	163	4.2	SX1261DVK1BAS
SX1262	150-960MHz Long Range LoRa G/FSK	170	4.2	SX1262DVK1CAS
SX1268	410-810MHz Long Range LoRa G/FSK	170	4.2	SX1268DVK1GAS
SX1272	860–1020MHz Long Range LoRa G/FSK Transceiver	158	10	SX1272DVK1BAS (868MHz) SX1272DVK1CAS (915MHz)
SX1276	138–1020MHz Long Range LoRa G/FSK Transceiver	168	9.9	SX1276DVK1IAS (169/868MHz) SX1276DVK1IAS (433/868MHz) SX1276DVK1IAS (490/915MHz)
SX1278	138–1510MHz Long Range LoRa G/FSK Transceiver	168	9.9	SX1276DVK

Power Management

nanoSmart® Ultra-Low Power Solutions

Semtech's nanoSmart ultra-low power technology enables energy savings in everyday products. nanoSmart products support multiple energy harvesting technologies including indoor and outdoor solar. Off-active™ switching and ultra-low power design result in dissipation in the nano-ampere range, ensuring more energy delivered to the application or storage element. Implementing advanced system power management and scheduled system wake-up is possible with optional microcontroller and real-time clock based solutions making it ideal for remote sensing and control applications.

Features

- Lowest standby power in the industry
- Eliminates standby power losses
- Quiescent current below battery self-discharge current
- Extends battery life on portable products

Applications

- Portable standalone low-power
- Background energy scavenging
- Off-grid indoor solar energy harvesting
- Autonomous systems that run forever (i.e., wireless sensors)
- Medical and industrial

nanoSmart® Solutions

Part Number	Description	Features	Application
TS14002	Ultra-low power LDO	V_{IN} = 2.5V to 5.5V, V_{OUT} = 1.2V–4.2V @250mA (factory set), 20nA quiescent current	Portable battery-operated electronics

Neo-Iso™ Isolated Power Solutions

Neo-Iso technology from Semtech enhances Internet of Things applications by adding higher levels of intelligence and control. Neo-Iso switches make it possible for low power microcontrollers to control high voltage loads in the system. Reporting of fault conditions from the switch to the controller enables system responses resulting in safer, more efficient operation. Low current draw allows each switch to operate on power harvested from the load eliminating the need for additional supplies.

Features

- Overcurrent protection
- Diagnostic information feedback
- Integrated protection devices
- Energy harvesting
- Energy transfer to primary side control
- Scalable galvanic from primary to secondary sides of the device
- Switch turn-on / turn-off times ~25µS
- Single control signal for on/off input (CLK) Operation Switch
- 60V switch with bidirectional blocking in OFF state
- External FET capability allows scalable switching voltages to 120/240V
- Low profile allows thin and compact end products
- Silent operation improves user experience

Applications

- Internet of Things (IoT)
- HVAC/Thermostats
- Home Automation/Smart Home
- Security
- Smart Metering
- Industrial Control

Ordering Info

Part Number	Package (mm)	Standard Reel Quantity
TS13101-QFNR	QFN-20 (4x4)	3,300
TS13102-QFNR	QFN-16 (3x3)	3,300
TS13103-QFNR	QFN-16 (3x3)	3,300

Wide Input Voltage Regulators & Controllers

Semtech products include feature rich, highly-integrated solutions for the telecom industry and low power, small-package, high-efficiency products for smartphones, handsets, notebook PCs and other portable devices. An established leader in power management ICs across networking and industrial power, handheld power and LED lighting applications, Semtech is pushing performance to higher levels to enable a totally new class of greener, smarter and smaller end products.

Buck Regulators

With a broad selection of buck converters, Semtech offers some of the world's smallest, high-performance point-of-load (POL) regulators. These include our family of EcoSpeed® converters that set a new standard for efficiency, speed, size and simplicity in emerging green energy applications.

Boost Regulators

Semtech's expanded line of boost converters now includes the world's smallest low-voltage regulators, as well as a growing line of single- and multi-string boost LED drivers for demanding, rugged backlighting applications.

LED Drivers

Semtech manufactures an extensive line of LED driver ICs for LCD display, automotive, backlight, and LED camera flash applications. They include inductor-based boost LED drivers for series-connected LEDs and charge pump LED drivers, and low-dropout current sinks for parallel-connected LEDs. Each LED driver topology is designed for optimal high efficiency in the smallest footprint with accurate current regulation, low noise and a wide dimming range.

LDOs

A wide range of ultra-low dropout regulators offers ideal solutions for systems where V_{OUT} is very close to V_{IN}.

Charge Pumps

Semtech's high-performance, charge pump-based converters and LED backlight drivers build on a strong history of charge pump experience providing very high efficiency in the smallest footprint with accurate current regulation, low noise and a wide dimming range.

FemtoBuck™ Load Switches

Semtech's new load switch products focus on lowest RDS(ON) in class for highest system efficiency and extremely robust protection to withstand the harshest circuit conditions.

EcoSpeed® Wide Input Synchronous Buck Regulators / Controllers

Part Number	Input Voltage	Output Current (A)	Package (mm)	Features
SC3303	5.5V–28V	3	MLPD-10 (3x3)	0.75V–7.5V, Int. LDO, Ultrasonic PSAVE
SC414	3V–28V	6	MLPQ-28 (4x4)	0.75V–85%V_{IN}, 5V LDO, Ultrasonic/Regular PSAVE

High Efficiency Wide Input Synchronous Buck Regulators

Part Number	Input Voltage	Output Current (A)	Package (mm)	Features
TS30011	4.5V–24V	1	QFN-16 (3x3)	1MHz Converters, Fixed V_{OUT} options (1.5V, 1.8V, 2.5V, 3.3V, 5.0V) or adjustable V_{OUT} (0.9V to VCC-1V)
TS30012	4.5V–24V	2	QFN-16 (3x3)	
TS30013	4.5V–18V	3	QFN-16 (3x3)	

Wide Input Asynchronous Buck Regulators

Part Number	V_{IN} (V)		V_{OUT} (V)		I_{OUT} Max (A)	Isw Limit (A)	Shutdown Current (µA)	Fsw (kHz)	Package (mm)	Features
	Min	Max	Min	Max (% V_{IN})						
SC4530	3	30	1.23	90	0.3	0.39	0.1	–	MLPD-8 (3x2)	Light load idle mode
SC4524E	3	28	1	96	2.0	2.6	40	200-2000	SO-8 EDP	Programmable Soft Start, hiccup overload protection with frequency foldback
SC4525E	3	28	1	96	3.0	3.9	40	200-2000	SO-8 EDP	

Point of Load (POL) Solutions & LED Drivers & Load Switches

Low Dropout Regulators

Part Number	V_{IN} (V)		V_{OUT} (V) Min	I_{OUT}(A) Max	$V_{DROPOUT}$ (V) Max O.T.	$V_{DROPOUT}$ @ Full Load (V) Typ	Pkg (mm) Exposed die pad
	Min	Max					
SC4212	1.6	6.5	–	1.0	0.15	–	MLPD-8 (3x3)
SC4215	1.6	6.0	0.8	2.0	0.6	0.3	SOIC-8 EDP
SC4215A	1.4	6.0	0.5	2.0	0.6	0.3	SOIC-8 EDP
SC4215H	1.4	6.0	0.5	2A	0.4	–	SOIC-8 EDP
SC4215J*	1.4	6	0.5	2	0.6	0.3	SOIC-8 EDP
SC4216	1.45	5.5	0.5	3.0	0.5	0.3	SOIC-8 EDP
SC4216H	1.45	5.5	0.5	3	0.7	0.45	SOIC-8 EDP

** SC4215J has 1ms internal Soft Start*

Buck Regulators

Part Number	Output Current (A)	Package (mm)	Features
SC195	0.5	MLPQ-8 (1.5x1.5) CSP-8 (0.8x0.8)	Low BOM 4 bit VID
SC195F	0.5	MLPQ-8 (1.5x1.5)	Low BOM 4 bit VID
SC196	1.5	MLPD-10 (3.0x3.0)	Integrated Power Devices
SC196A	1.5	MLPD-10 (3.0x3.0)	Integrated Power Devices
SC202A	0.5	MLPQ-13 (2.5x3)	Integrated Inductor
SC202F	0.5	MLPQ-13 (2.5x3)	Integrated Inductor
SC21150	1.2	WLCSP 6 Bump	Tiny CSP Package
SC21152	1.2	MLPD-6 (1.5x2.0)	Power Good
SC21154	1.2	MLPD-6 (1.5x2.0)	Programmable Soft Start
SC189	1.5	MLPD-6 (2x2)	Small size fixed V_{OUT} Low BOM
SC183C	2	MLPQ-16 (3x3)	Low BOM 4 bit VID

Boost Regulators

Part Number	V_{IN} (V)		V_{OUT} (V)		I_{OUT} / I_{SW}(A) Max	Shutdown Current (µA)	Iq (mA)	Switching Freq (MHz)	Package (mm)	Features
	Min	Max	Min	Max						
SC121	0.7	4.5	1.8	5	/1.2	0.1	3.5	1.2	MLPD-UT-6 (1.5x2)	No Power Save

LED Inductor Based

Part Number	V_{IN} (V)		V_{OUT} (V) Max	F_{SW} (MHz)	# LEDs per string* V_f=(3.5V)	# of Strings	String Current (mA)	Dimming Max Freq.	Package (mm)	Features
	Min	Max								
SC5012/BQ	4.5	45	65	0.2–2.2	18	4	150	up to 30kHz	MLPQ-24 (4x4)	I²C, FSYNC, 5000:1 phase shifted PWM Dimming
SC5012Q	4.5	45	65	0.2-2.2	18	4	150	up to 30kHz	MLPQ-24 (4x4)	I²C, FSYNC, 5000:1 phase shifted PWM Dimming

FemtoSwitch™ Load Switches

Part Number	V_{IN} (V)		IO_{UT} Max (A)	RDS ON (mΩ)	Shutdown Current (µA)	Quiescent Current (µA)	Reverse Current Blocking	Auto Discharge	ESD (kV HBM)	Package (mm)
	Min	Max								
SC725	1.1	3.6	2.0	36	0.2	0.81	–	✓	3	CSP-4 (0.76x0.76)
SC33020HQ	1.6	5.5	2.0	32	0.3	1	✓	–	4	CSP-4 (0.9x0.9)

Automotive AEC-Q100 Qualified

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SEMTECH

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