



solutions



# Semtech Products

## Short Form Catalog

# Product Highlights

A promotional graphic for LinkCharge CT. It features a laptop keyboard, a calculator, and a smartphone with a green battery icon and concentric green circles around it, symbolizing wireless charging. The text "LinkCharge™ CT" is in large bold letters, followed by "Wireless Charging Anywhere" and "(page 18)" in smaller text.

## LinkCharge™ CT

Wireless Charging  
Anywhere

(page 18)

A promotional graphic for Automotive ESD Protection. It features a wireframe car and a black rectangular component labeled "SEMITECH". The text "Automotive ESD Protection 2-Line Surge" is in large bold letters, followed by "RClamp® 0512TQ" and "(page 4)" in smaller text.

## Automotive ESD Protection 2-Line Surge

RClamp® 0512TQ

(page 4)

A promotional graphic for Signal Integrity Products. It features a blue background with a fiber optic cable emitting light. The text "Signal Integrity Products" is in large bold letters, followed by "High Performance ICs for Optical Transceivers" and a list of applications: "Cloud Computing • Social Networking Video Streaming • Mobile Usage Datacenter • Access (PON/FTTx) Wireless Infrastructure". The text "(page 26)" is at the bottom.

## Signal Integrity Products

High Performance ICs  
for Optical Transceivers

Cloud Computing • Social Networking  
Video Streaming • Mobile Usage  
Datacenter • Access (PON/FTTx)  
Wireless Infrastructure

(page 26)

A promotional graphic for New FemtoSwitch Load Switches. It features an orange background with a hand holding a tablet displaying "SC33001A SC33001AH" and another hand holding a smartphone. The text "New FemtoSwitch™ Load Switches" is in large bold letters, followed by "(page 25)" in smaller text.

## New FemtoSwitch™ Load Switches

SC33001A  
SC33001AH

(page 25)

## Join the LoRa® Community

[semtech.com/LoRaCommunity](http://semtech.com/LoRaCommunity)

### Get Involved

Collaborate and Discuss  
Contribute Ideas  
Become Experts  
Find Solutions

### Resources












Training & Webinar  
Video Library  
LPWAN Product Catalog



connect • learn • share



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*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 [www.semtech.com](http://www.semtech.com)*



  
**SEMTECH**  
A World of Solutions™





# AEC-Q100 Automotive Qualified

## OUR EXPANDING COMMITMENT

As the automotive infotainment market increases, so does our commitment to power, protect and connect customers with the perfect IC solutions. Semtech has provided ICs for the automotive industry for many years, and our devices are used in applications ranging from protecting sensitive electronics to in-cabin lighting and touch screen interface. Today, we continue to work on expanding our list of AEC-Q100 certified products for future applications.



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



**Antennas**  
AM/FM, DAB, GPS, Satellite, WiFi,  
Telematics Applications



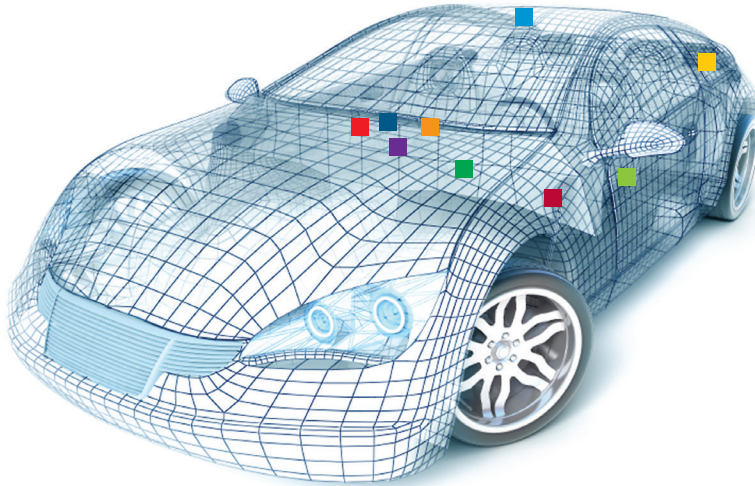
**USB 2.0**  
Infotainment, Phone Connectivity



**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 <sub>RWM</sub> (V)	Lines	ESD Rating (air/contact)	Surge (8x20μs)	Cap (pF)	Package (mm)	Interface To Protect
RClamp® 2574NQ	2.5	4	±30kV/±30kV	40A	1.7	3.0x2.0x0.6	Standard Ethernet
RClamp® 0582BQ	5	2	±30kV/±25kV	15A	1.2	1.6x1.6x0.75	Two wire ethernet single twisted pair
RClamp® 0531TQ	5	1	±20kV/±12kV	4A	0.5	1.0x0.6x0.5	
RClamp® 2574NQ	2.5	4	±30kV/±30kV	40A	1.7	3.0x2.0x0.6	LVDS links
RClamp® 0531TQ	5	1	±20kV/±12kV	4A	0.5	1.0x0.6x0.5	USB 2.0
RClamp® 0582BQ	5	2	±30kV/±25kV	15A	1.2	1.6x1.6x0.75	USB 2.0
RClamp® 0531TQ	5	1	±20kV/±12kV	4A	0.5	1.0x0.6x0.5	Antenna interfaces
RClamp® 1521PQ	15	1	±15kV/±8kV	4A	0.3	1.0x0.6x0.5	Antenna interfaces
RClamp® 0582BQ	5	2	±30kV/±25kV	15A	1.2	1.6x1.6x0.75	Antenna interfaces
RClamp® 2431TQ	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
SLVU2.8Q	2.8	2	±30kV/±25kV	24A	100	2.9x2.37x0.90	Analog video
μClamp® 3311PQ	3.3	1	±30kV/±25kV	5A	12	1.0x0.6x0.5	Multimedia touchpoint
μClamp® 0511PQ	5	2	±30kV/±30kV	12A	75	1.0x0.6x0.5	Multimedia touchpoint
RClamp® 0512TQ	5	2	±30kV/±30kV	20A	2	1.0x0.6x0.4	Ethernet, USB2.0, LVDS, antennas
μClamp® 0301PQ	3	1	±30kV/±25kV	5A	25	1.0x0.6x0.5	Multimedia touchpoint
RClamp® 0524PQ	5	4	±25kV/±15kV	5A	0.4	2.5x1.0x0.58	HDMI



# AEC-Q100 Automotive Qualified

## Single-line DC Bus Protection - AEC-Q100 Qualified

Part Number	V <sub>RWM</sub> (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
μClamp® 0871P	8	1	±30kV/±30kV	65A	475	1.6x1.0x0.57	
μClamp® 1071P	10	1	±30kV/±30kV	60A	350	1.6x1.0x0.57	
μClamp® 1271P	12	1	±30kV/±30kV	45A	275	1.6x1.0x0.57	
μClamp® 1571P	15	1	±30kV/±30kV	40A	220	1.6x1.0x0.57	
μClamp® 1871P	18	1	±30kV/±30kV	35A	220	1.6x1.0x0.57	
μClamp® 2271P	22	1	±30kV/±30kV	25A	165	1.6x1.0x0.57	
μClamp® 2671P	26	1	±30kV/±30kV	23A	155	1.6x1.0x0.57	
μClamp® 3671P	36	1	±30kV/±30kV	18A	150	1.6x1.0x0.577	

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

Part Number	V <sub>RWM</sub> (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
EClamp® 2357NQ	5	6	±20kV/±12kV	RC filter SD card termination	20	3.0x3.0x0.6	SD card
EClamp® 2374KQ	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 <sub>IN</sub>		I <sub>OUT</sub> Max (A)	Power-Good flag	Enable	Soft Start	PSAVE	Package (mm)
		Min	Max						
SC183CQ	Regulator	2.9	5.5	2	No	Yes	Yes	No	MLPD-10, 3x3x1
SC508A	Controller	4.5	46	30	Yes	Yes	Programmable	Yes	MLPQ-20, 3x3
SC4501Q	Regulator	1.4	16	2	No	Yes	Programmable	No	MLPD-10, 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

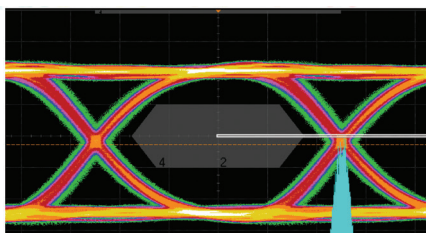
Part Number	V <sub>IN</sub> (V)		V <sub>OUT</sub> (V) Max	Fsw (MHz)	# LEDs per string* V <sub>f</sub> =(3.5V)	# of Strings	String Current (mA)	Dimming Max Freq.	Package (mm)	Features
	Min	Max								
SC441A	4.5	21	36	0.7	10	4	150	up to 50kHz	TSSOP-20 EDP	Open/Short LED string disable, OCP, OTP, OVP, and FFLAG
SC445Q	4.5	27	42	0.7	12	4	150	up to 50kHz	TSSOP-20 EDP	Adj SCP level, Open/Short LED string disable, OCP, OTP, OVP, and FFLAG
SC5012/Q	4.5	45	65	0.2–2.2	18	4	150	up to 30kHz	MLPQ-24, 4x4	I <sup>2</sup> C, FSYNC, 5000:1 Phase shifted PWM dimming

# TVS Protection - Key Advantages

Semtech Transient Voltage Suppressors (TVS) 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.

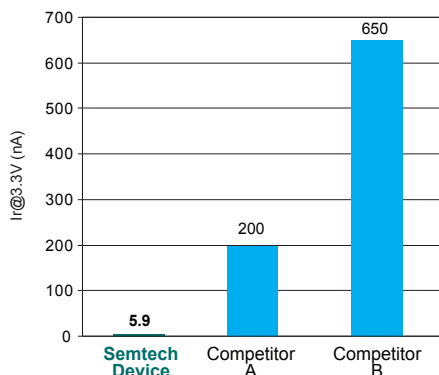
## LOW CAPACITANCE

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



## LOW LEAKAGE

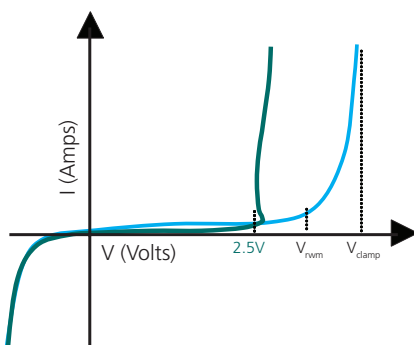
Increases battery life in handheld electronic devices



## LOWER WORKING VOLTAGE

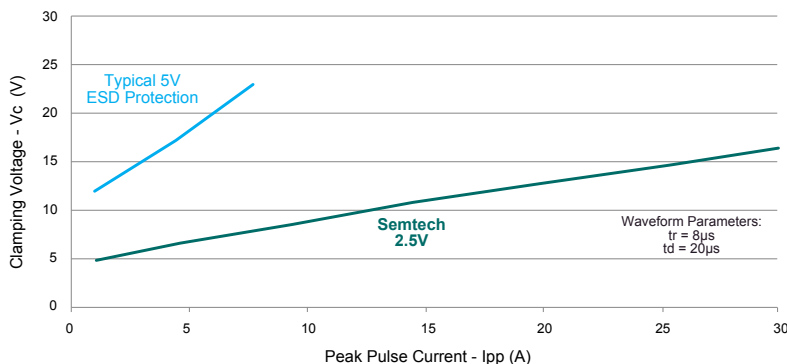
Reduces stress energy to protected IC

— Typical 5V TVS IV Curve  
— Semtech low  $V_{RWM}$  IV Curve



## LOW CLAMPING VOLTAGE

Better protection and less stress on transceiver



## 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

## KEY ESD PROTECTIONS

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

# TVS Key Product Applications

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)	RClamp® 0582N	3	5	0.5	5
USB (OTG)	RClamp® 1624T	2+1	5+12	0.8	5
USB 3.0	RClamp® 3346P	6	3.3	0.65	4.5
HDMI, DisplayPort	RClamp® 3328P	8	3.3	0.65	5
LCD Panel	RClamp® 3324T	4	3.3	0.65	5
LCD Panel (EMI filter)	EClamp® 2388P	8	5	27	5
Single Line	μClamp® 3311Z	1	3.3	9	4
	μClamp® 0541Z	1	5	9	2
	μClamp® 1211Z	1	12	25	5
Single Line High Speed	RClamp® 0531Z	1	5	0.4	3
10/100 Ethernet	RClamp® 0534N	4	5	3**	25
	RClamp® 3354S	4	3.3	5	25
Gigabit Ethernet	RClamp® 3374N	4	3.3	1.7**	40
	TClamp® 3302N	2	3.3	25	95
T1/E1	TClamp® 0602N	2	6	25	95
CAN Bus	μClamp® 3601P	1	33	25	–
	μClamp® 3603T	3	36	50	2
RS485	SM712	2	12/-7	75	17
	TClamp® 1202P	2	12	12	100
RS232	RClamp® 1224S	4	12	3	15
Keyboard, I/O	μClamp® 0541Z	1	5	9	2
xDSL	TClamp® 1272S	2	12	5	25
	TClamp® 2472S	2	24	3.5	–
2.5G Ethernet	RClamp® 0512TQ	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
RClamp® 2504N	RClamp® 2574N	–
RClamp® 3304N(A)	RClamp® 3374N	–
SLVU2.8-4	RClamp® 3374N	μClamp® 2804L
SRV05-4(A)	RClamp® 0534N	RClamp® 0554S RClamp® 3354S
LC03-3.3	–	RClamp® 2502L

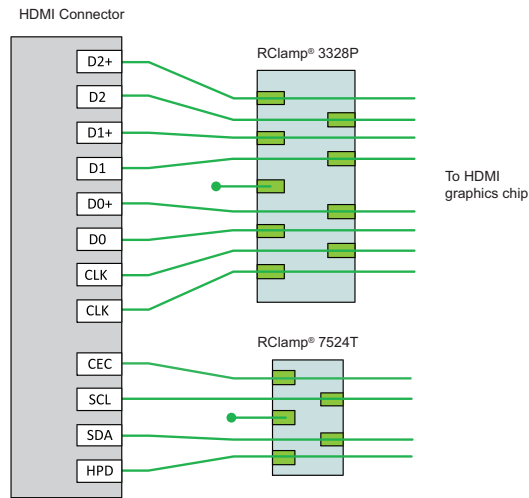




# HDMI, Ethernet & USB 3.0 Protection

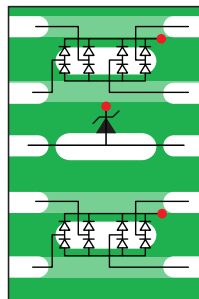
## HDMI PROTECTION

- 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

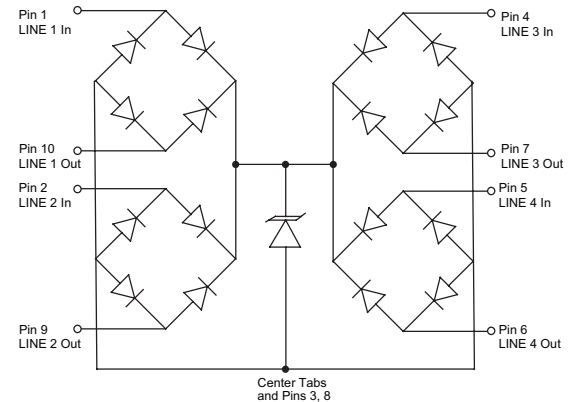


## GIGABIT ETHERNET PROTECTION

- RClamp® 3374N (3x2x0.60mm)
- 3.3V working voltage
- Low capacitance: 1.7pF I/O to I/O
- Flow-through layout
- Low clamping voltage performance
- High surge rating: 40A Ipp (8x20μs)

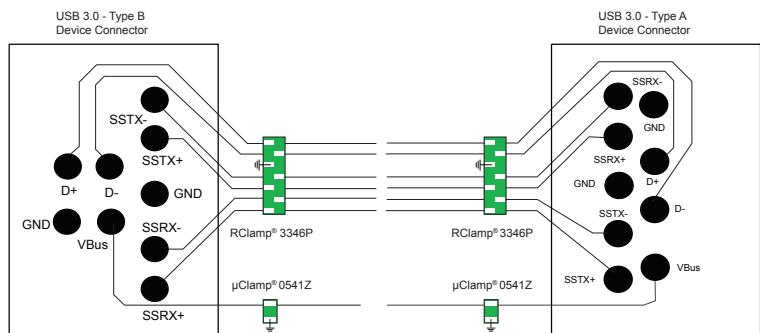


RClamp® 3374N



## USB 3.0 PROTECTION

- RClamp® 3346P (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



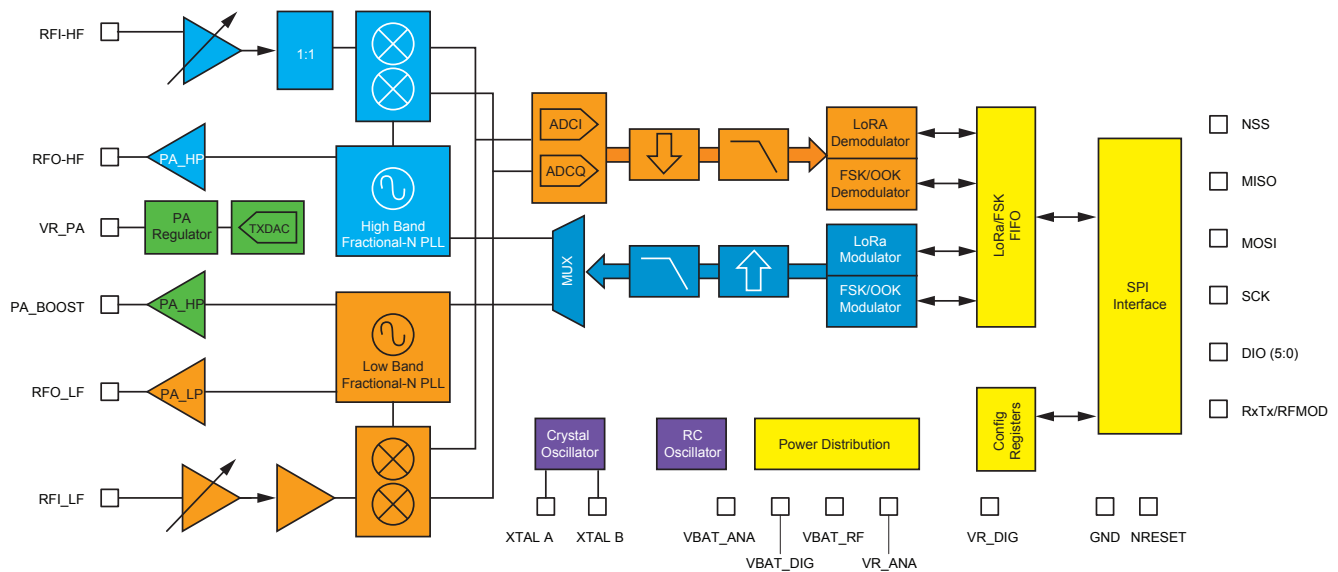
# LoRa® — The Ultimate Long-Range Solutions

Ideal for eliminating repeaters, reducing infrastructure cost, extending battery lifetime, and improving network capacity

## LoRa® PRODUCTS

- Long range of up to 30 miles outdoor line of sight
- Deep indoor coverage for hard to reach areas
- Bi-directional communication link with adaptive data rates
- Low power sensors with extended battery lifetime of up to 20 years
  - 100nA sleep mode
  - 9.7mA 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
- Available for any environment
- 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 over 400 members of LoRa Alliance™ that defines the open LoRaWAN™ protocol
- Large and growing online developer community for LoRa-based products
- Public, semi-private and private networks available worldwide

## SX1276 BLOCK DIAGRAM

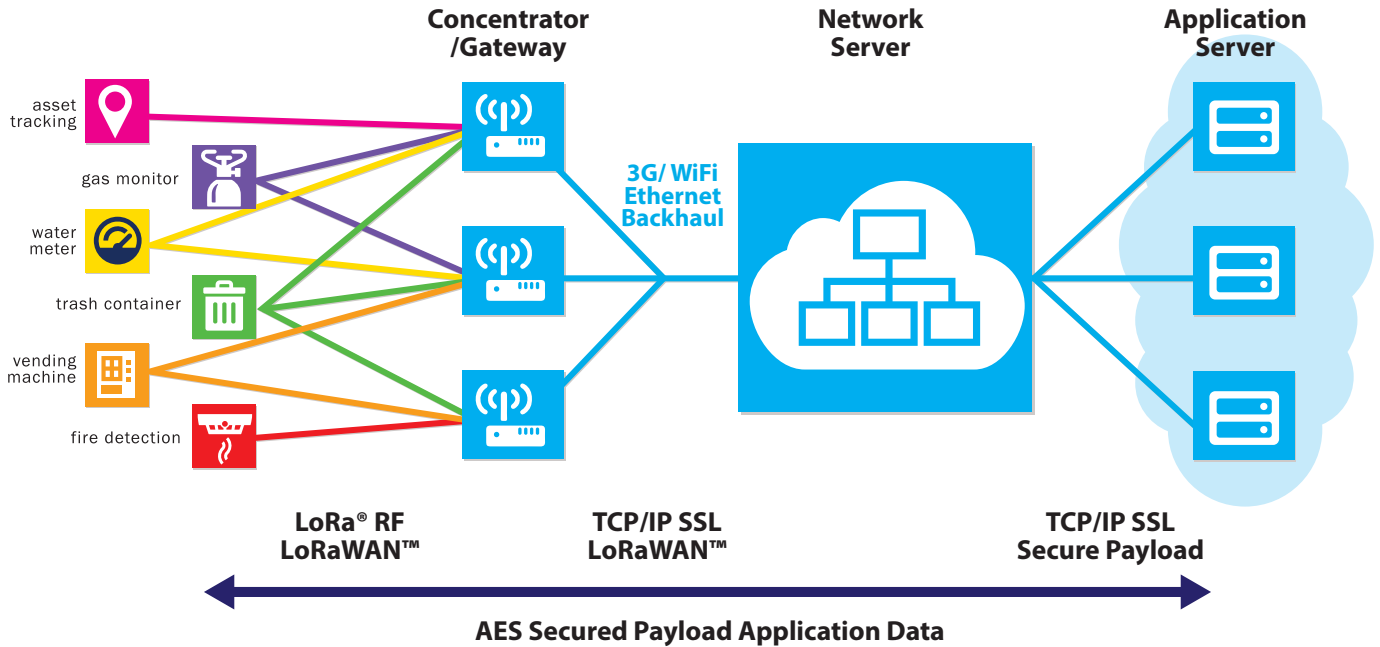


## LoRa® Products

Part Number	Frequency Range (MHz)	Link Budget (dB)	RXCurrent (mA)	FSK Max DR (kbps)	LoRa DR (kbps)	Max Sensitivity (dBm)	TX Power (dBm)
SX1272	862–1020	158	10	300	0.3–40	-138	+ 20
SX1273	862–1020	150	10	300	1.7–40	-130	+ 20
SX1276	137–1020	168	11	300	0.018–40	-148	+ 20
SX1277	137–1020	158	11	300	1.7–40	-138	+ 20
SX1278	137–525	168	11	300	0.018–40	-148	+ 20
SX1279	137–960	168	11	300	0.018–40	-148	+20

# LoRa® Gateway/Concentrator Solutions

The ultimate long-range, high-capacity solution for IoT and M2M networks



## KEY FEATURES OF SEMTECH'S LoRa WIRELESS RF TECHNOLOGY

<b>Long Range</b>	Penetrates in dense urban and deep indoor environments, connecting to sensors up to 30 miles away in rural areas
<b>Low Power</b>	Designed specifically for low power consumption extending battery lifetime up to 20 years
<b>High Capacity</b>	Supports millions of messages per base station
<b>Geolocation</b>	Enables GPS free, low power tracking applications
<b>Standardized</b>	LoRaWAN specification ensures global interoperability among applications, IoT solution providers and telecom operators
<b>Secure</b>	Embedded end-to-end AES-128 encryption of data for optimal privacy and protection
<b>Low Cost</b>	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 is expected to help bring low cost LoRaWAN networks to market for consumers and private enterprises.

## GATEWAY SOLUTIONS

- Multi-channel, multi-modem receiver including LoRa and FSK modems
- Inherent two-way communication
- Receives simultaneously 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

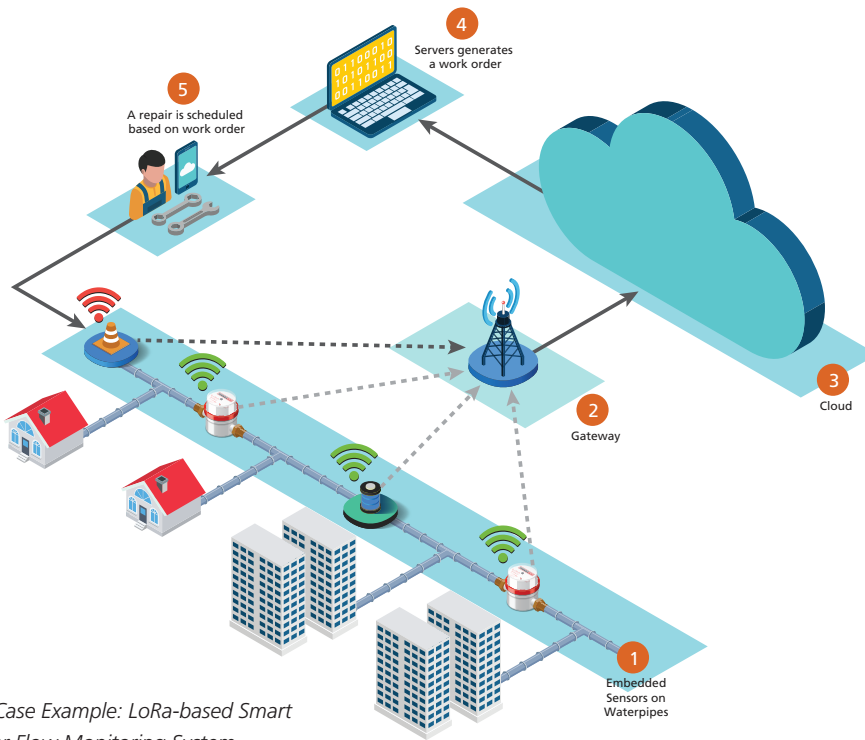
### RF Transceivers

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-based Smart Sensors

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, narrow-band, and wide-band M2M communications.



Use Case Example: LoRa-based Smart Water Flow Monitoring System

## 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
- 2.5mA Rx
- 27mA @ +13dBm 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
SX1232	860–11020MHz Low Power G/FSK/OOK/ASK RF Transceiver	143	9.3	SX1232-32SKA868/915
SX1272	860–11020MHz Long Range LoRa G/FSK Transceiver	158	10	SX1272DVK1BAS (868MHz) SX1272DVK1CAS (915MHz)
SX1273	860–11020MHz Long Range LoRa G/FSK Transceiver	150	10	SX1272DVK
SX1276	138–11020MHz Long Range LoRa G/FSK Transceiver	168	9.9	SX1276DVK1IAS (169/868MHz) SX1276DVK1IAS (433/868MHz) SX1276DVK1IAS (490/915MHz)
SX1277	138–11020MHz Long Range LoRa G/FSK Transceiver	158	9.9	SX1276DVK
SX1278	138–1510MHz Long Range LoRa G/FSK Transceiver	168	9.9	SX1276DVK
SX1279	138–1960MHz Long Range LoRa G/FSK Transceiver	168	9.9	SX1276DVK
SX1231	290–11000MHz G/FSK/OOK/ASK RF Transceiver	140	16	SX1231SKB433/868/915
SX1233	290–11000MHz G/FSK/OOK/ASK RF Transceiver	140	16	SX1233-33SKA868/915
SX1211	862–1960MHz Low Power FSK/OOK/ASK RF Transceiver	125	3	SX1211SKA868/915
SX1212	310–510MHz Low Power FSK/OOK/ASK RF Transceiver	122.5	3	SX1212SKA868/915

# Touch & Proximity Controllers

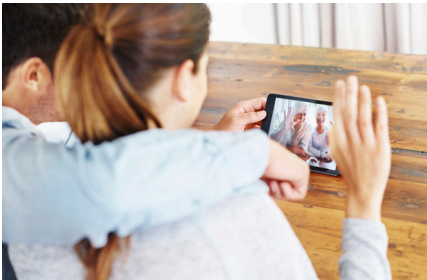
The superior sensitivity of the Semtech touch sensor platform enables sensing through a thick overlay material. Semtech's proximity detection has an extended range (>10cm). These devices all come in a tiny footprint with zero components per input.

## Key Features

- Extreme low power
- Support button, slider and wheel design
- Proximity detection (>10cm)
- Built-in LED drivers (up to 15mA)
- 256-step intensity control (Lin/Log)
- Auto lightening
- Field programmable
- Fast scan time (15ms)
- Overlay (>5mm)
- Smart auto-offset compensation
- Ultra-small footprint
  - QFN-28 (4x4mm)
  - QFN-32 (5x5mm)
  - QFN-32 (4x4mm)
  - TSSOP-24 (4.4x7.8mm)

## Applications

- Tablet eBook
- Flat panel TV
- LCD monitors
- White goods & appliances
- Printers
- Automotive audio consoles
- Personal media players
- Set Top Boxes (STBs)
- Game consoles
- Industrial systems



## Touch & Proximity Controller Products

Part Number	Sensor Inputs	LED Driver	Interface	Proximity	Button	Slider	Wheel	IR Detect	Buzzer	Overlay (mm)	Auto Comp	Intensity (256-step)	Fade-in/out	Auto Lightening	Field Prog. Memory	Package (mm)
SX9510	8	8	I <sup>2</sup> C/ Analog	✓	✓	–	–	✓	✓	>5	✓	Lin./Log.	✓	✓	✓	QFN (4x4) TSSOP (4.4x7.8)
SX9511	8	8	I <sup>2</sup> C/ Analog	✓	✓	–	–	✓	✓	>5	✓	Lin./Log.	✓	✓	✓	QFN (4x4) TSSOP (4.4x7.8)
SX9512	8	8	I <sup>2</sup> C/ Analog	–	✓	–	–	–	✓	>5	✓	Lin./Log.	✓	✓	✓	QFN (4x4) TSSOP (4.4x7.8)
SX9513	8	8	I <sup>2</sup> C/ Analog	–	✓	–	–	–	✓	>5	✓	Lin./Log.	✓	✓	✓	QFN (4x4) TSSOP (4.4x7.8)
SX8633	12	8	I <sup>2</sup> C	✓	✓	–	–	–	–	>5	✓	Lin./Log.	✓	✓	✓	QFN (5x5)
SX8634	12	8	I <sup>2</sup> C	✓	✓	✓	–	–	–	>5	✓	Lin./Log.	✓	✓	✓	QFN (5x5)
SX8635	12	8	I <sup>2</sup> C	✓	✓	–	✓	–	–	>5	✓	Lin./Log.	✓	✓	✓	QFN (5x5)
SX8636	8	8	I <sup>2</sup> C	✓	✓	–	–	–	–	>5	✓	Lin./Log.	✓	✓	✓	QFN (4x4)
SX8638	8	8	I <sup>2</sup> C	✓	✓	✓	–	–	–	>5	✓	Lin./Log.	✓	✓	✓	QFN (4x4)
SX8639	8	8	I <sup>2</sup> C	✓	✓	–	✓	–	–	>5	✓	Lin./Log.	✓	✓	✓	QFN (4x4)

# Smart Proximity Sensors

Semtech advanced capacitive sensing solutions provides best-in-class sensitivity (down to sub fF) with unique human discrimination feature to enhance near range proximity detection. These products are commonly used in wireless-enabled consumer devices (i.e. smartphones, tablets, notebook) for smarter RF control.

## Key Features

- Highest performance sensor on the market that enables longest distance/smallest area
- Strongest immunity to common RF noise (minimize interference)

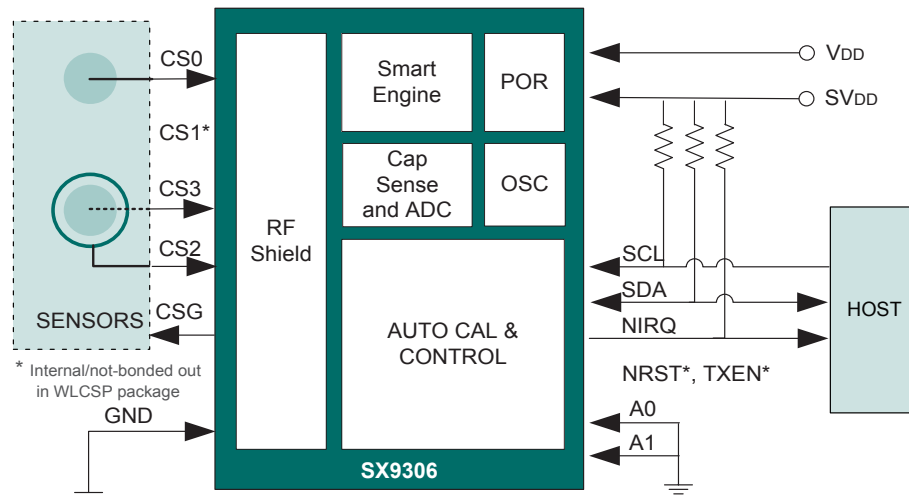


- Lowest power for extended battery life (2.5uA at Sleep, <10uA at Doze)
- Capacitive resolution down to 0.04fF
- Patented on-chip smart engine for human detection
- Built-in automatic calibration
- Advanced temperature comp.
- Active sensor guard
- Programmable I<sup>2</sup>C or standalone mode
- Extremely small footprint

## Applications

- Smartphone
- Tablet
- Wearables
- Notebooks (Ultrabook, Detachable, 2-in-1)
- Hotspot
- Portable gaming devices
- Wireless-enabled devices

Smart Proximity Sensor Products									
Part Number	# of Sensors	Interface	Prox.	Active Guard	Human Sensing	RF Shield	Configurable Proximity Mode	Auto Calibration	Package (mm)
SX9300	2	I <sup>2</sup> C	✓	✓	On-chip Smart Engine	–	–	✓	QFN (3x3)
SX9306	3 or 4	I <sup>2</sup> C	–	✓	On-chip Smart Engine	✓	✓	✓	WLCSP (1.2x1.6) QFN (3x3)
SX9500	4	I <sup>2</sup> C	✓	✓	–	–	–	✓	QFN (3x3)
SX9501	4	Analog	✓	✓	–	–	–	✓	QFN (3x3)



SX9306 Block Diagram



# High Performance Touchscreen Solutions

Semtech offers fully integrated touch controllers in both capacitive and resistive technologies with ultra low power consumption (as low as 0.4uA) and robust on-chip ESD protection (up to  $\pm 15\text{kV}$  ESD) to support different human interface design in portable handheld applications (i.e. smartphones, wearable devices). Many of these products have the capability to sense in the X, Y and Z dimensions allowing for multi-touch and gesture control as well as providing tactile feedback to enhance the user experience.

## Key Features

- Low power (0.4 $\mu\text{A}$ )
- Compatible with a wide range of resistive panels
- Enables multi-touch gestures with 4-wire touch panel
- Built-in proximity detection with any panel (>5cm)
- Integrated haptic motor control (LRA & ERM)
- 12-bit resolution

## Applications

- Portable navigation devices
- Automotive center consoles
- Digital photo frames
- DSC, video cameras
- Handheld games & mobiles
- POS terminals
- Control panels



## Smart Sensing IC Solutions Products

Part Number	Interface	Multi-touch	Proximity Sensing	Haptics	Package (mm)
SX8650	I <sup>2</sup> C	–	–	–	WLCSP (1.5x2.0), QFN (3x3)
SX8651	I <sup>2</sup> C	✓	–	–	WLCSP (1.5x2.0), QFN (3x3)
SX8652	SPI	–	–	–	WLCSP (1.5x2.0), DFN (4x3)
SX8653	SPI	✓	–	–	WLCSP (1.5x2.0), DFN (4x3)
SX8674	I <sup>2</sup> C	✓	✓	Generic	WLCSP (2x2), QFN (4x4)
SX8675	I <sup>2</sup> C	✓	–	Generic	WLCSP (2x2), QFN (4x4)
SX8676	I <sup>2</sup> C	✓	✓	–	WLCSP (2x2), QFN (4x4)
SX8677	I <sup>2</sup> C	✓	✓	Immersion	WLCSP (2x2), QFN (4x4)
SX8678	I <sup>2</sup> C	✓	–	Immersion	WLCSP (2x2), QFN (4x4)

# General Purpose Parallel Input/Output (GPIO)

General Purpose Parallel Input/Output (GPIO) expanders are ideal for low power handheld battery powered equipment. Our IO expanders come in 4-, 8-, and 16-channels of I/Os operating with a VDD range of 1.2V to 5.5V connecting easily to today's low core voltage chipsets in battery powered handheld applications without the need for level translating circuits.

## Key Features

- 4/8/16 channel of I/Os
- True bi-directional style I/O
- Programmable Pull-up/Pull-down Push/Pull outputs
- 1.2V to 5.5V independent operating voltage for all supply rails (VDDM, VCC1, VCC2)
- 5.5V compatible I/Os, up to 24mA output sink (no total sink current limit)
- Fully programmable logic functions (PLD)
- 400kHz two wire I<sup>2</sup>C compatible slave interface

## Applications

- Smartphones, PDAs, MP3 players
- Digital cameras
- Portable multimedia players
- Notebooks
- GPS devices



## GPIO IC Products

Part Number	I/O Chan.	I/O Volt. Range (V)	Interface	Max Current (mA)	Dual I/O Supplies	PLD Function	Lin./Log. Intensity	Blink	Breath	Keypad Scan. Engine	Polarity Inversion	Current (μA)	I <sup>2</sup> C Add.	Package (mm)
SX1501	4	1.2–5.5	I <sup>2</sup> C	12/24	–	✓	–	–	–	–	–	1	2	3x3
SX1502	8	1.2–5.5	I <sup>2</sup> C	12/24	✓	✓	–	–	–	–	–	1	2	3x3
SX1503	16	1.2–5.5	I <sup>2</sup> C	12/24	✓	✓	–	–	–	–	–	1	1	4x4
SX1508B	8	1.2–3.6	I <sup>2</sup> C	15	✓	–	✓	✓	✓	✓	✓	1	4	3x3
SX1509B	16	1.2–3.6	I <sup>2</sup> C	15	✓	–	✓	✓	✓	✓	✓	1	4	4x4
SX1511B	8	1.2–3.6	SPI	15	✓	–	✓	✓	✓	✓	✓	1	–	3x3
SX1512B	16	1.2–3.6	SPI	15	✓	–	✓	✓	✓	✓	✓	1	–	4x4

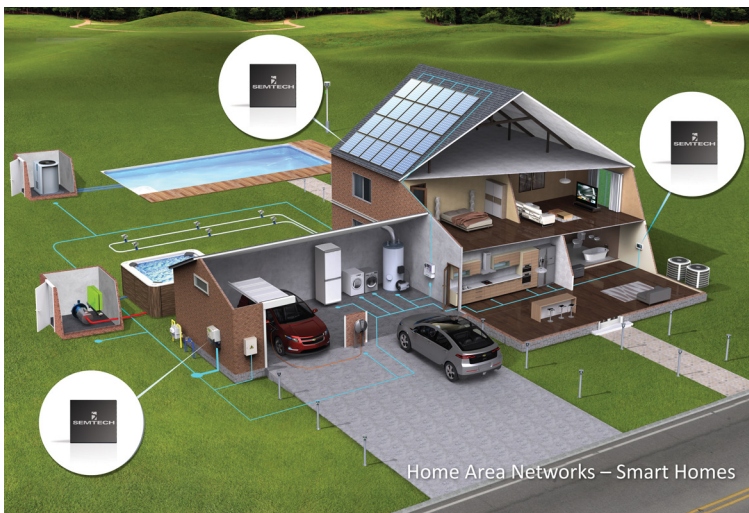
# Power Line Communications

Semtech Power Line Communications (PLC) and Hybrid (PLC+RF) series of products enable communication via low-voltage, medium-voltage power lines and through the air. PLC has long been a favorite application for utility companies because it allows them to reliably move data over infrastructure that they own and control. One of the main benefits of PLC to utilities is that it efficiently addresses their communications needs across a vast array of applications (metering, substation monitoring, load control and load shedding, home energy management, etc.) all focused on collectively addressing energy management tasks. Our PLC and Hybrid products platforms work on medium voltage (MV), low voltage (LV) and over the air networks, and our SoC offers both end-device and DCU/Service Node functionalities throughout the PHY, MAC and Convergence layers with IPV6 addressing.

The EV8600 Series comprises a hybrid sub-GHz RF + narrowband PLC single-chip transceiver SoC with both modems capable of simultaneous or independent operation. The EV8600 Series is a fully programmable single-chip soft PLC solution that not only comprises flexible analog front-end and digital (PHY + MAC) sections, but also supports upper networks layers up to and including IPV6. It also comprises integrated RAM/Flash memory and is designed specifically for the harsh power line and RF environments.

## KEY FEATURES

- EV8000 Series – PLC modem SoC: Multi-standard (G3, IEEE P1901.2, PRIME), Multiband (CA, ARIB, FCC)
  - EV8000, EV8010 – Multi-standard
  - EV8100 – Multi- Multi-standard plus application processor and LCD driver
  - EV8020 – PRIME
- EV8600 Series – PLC + RF modem SoC: Multi-standard (G3, IEEE P1901.2, PRIME, LoRa®, 802.15.4g (WiSUN), Wireless MBUS), Multiband (CA, ARIB, FCC, 137MHz-1020MHz)
  - EV8600
  - EV8610



Home Area Network (HAN)



Substation Communications



# Power Line Communications

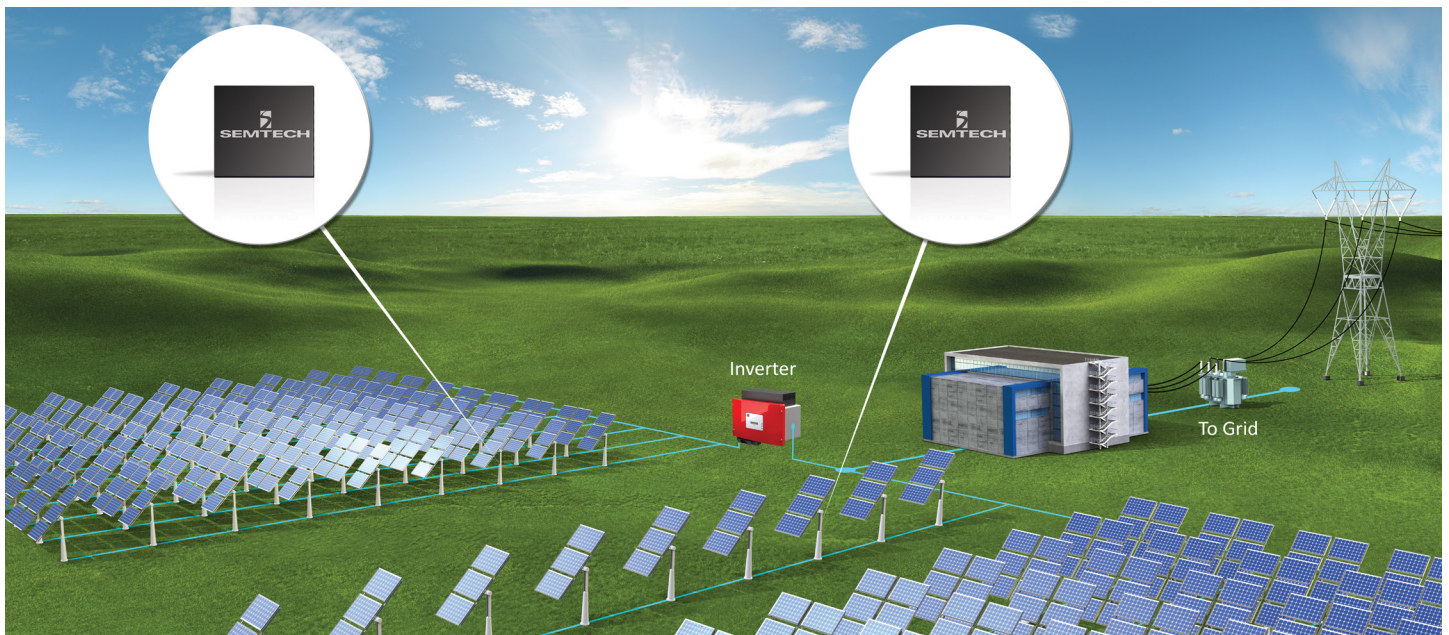
On a broad level, most, if not all, of our PLC SoC applications are tied to Active Energy Management. One of the applications for PLC technology is Advanced Metering Infrastructure (AMI), which allows utility companies to send and retrieve information from residential and industrial meters using power lines that connect directly to their servers. AMI also includes In Home Displays (IHD) and Gateways with which consumers and utility companies can use to control and manage residential energy usage. PLC usage also extends to other applications that use electricity as a source of power and require some (or substantial) intelligence for control and monitoring.

## APPLICATIONS

- Advanced Metering Infrastructure (AMI)
- Airport runway lighting
- Internet of Things (IoT)
- Home Area Networks (HAN)
- Smart appliances
- Solar plant control & monitoring
- Street lighting networks
- Substation communications
- Traffic signal control & monitoring



*Street Lighting Networks*



*Solar Plant Control & Monitoring*

# Wireless Charging Solutions

Semtech offers scalable wireless power transmitter and receiver platforms for both battery charging and power delivery in standard compliant and non-compliant systems. Semtech is a member of the Wireless Power Consortium (WPC) and AirFuel Alliance, and is active in helping shape the future standards for wireless power.

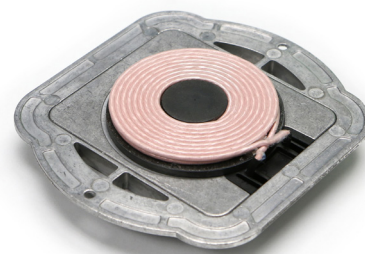
## FEATURES

- Firmware-based and programmable
  - Customizable to meet specific application requirements
  - Firmware is upgradable to support evolving standards
- Supports multiple system configurations
  - Multiple supply voltages and coil configurations with the same architecture
  - Supports custom receiver and transmitter coil sizes and inductance values
- Support for medium and high power Tx and Rx solutions
  - Up to 15W for smart phones and tablets
  - >15W for next-generation consumer products and industrial applications
  - 40W and beyond for high power applications such as notebook computers, power tools, and other industrial applications
- Support for low power (0.1W–2W) Tx and Rx solutions
  - Both standard and proprietary solutions
  - Support for very small coils and form-factors
  - Direct charging of batteries at <50mAh

- Multi-standard solutions based on single Tx hardware
  - WPC Qi® + AirFuel Inductive in a single hardware solution
  - WPC Qi® + AirFuel Inductive + Resonant in a single hardware solution

## EVALUATION MODULE SERIES

- Low Power Wearables <5W
  - LinkCharge™ LP Series
- Medium Power 5W-15W
  - **LinkCharge™ CT Series**
  - LinkCharge™ 10 Series
  - LinkCharge™ 15 Series
- High Power >15W
  - LinkCharge™ 20 Series



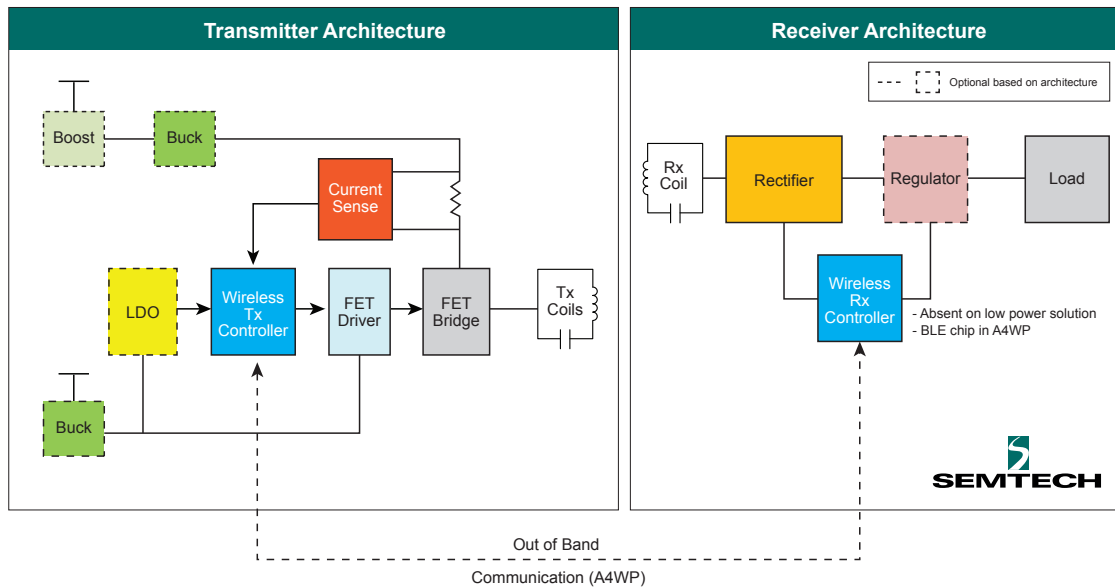
LinkCharge™ CT product photo

Wireless Charging Standard			
Standard	Qi® Wireless Power Consortium	AirFuel Inductive AirFuel Alliance	AirFuel Resonant AirFuel Alliance
Technology	Magnetic induction	Magnetic induction	Magnetic resonance
Coupling Range	10mm (today)	10mm (today)	20-50mm (Today)
Frequency	110-205kHz (RF)	110-300kHz (RF)	6.78MHz (Microwave)
Cost	Lower	Lower	Higher
Power Today	15W at Rx	15W at Rx	10W at Tx
Power Next-Gen	15W at Rx	15W at Rx	22-36W at Tx
Communication	Load Modulation	Load Modulation	Via Bluetooth™
Efficiency	75%-77%	65%-75%	20%-70%
Transmitter	Single or multi-coil	Single or multi-coil	Single, multi-element

# Wireless Charging Solutions



## WIRELESS CHARGING ARCHITECTURE



### Function

Controller	Buck	Boost	LDO	Rectifier	FET Driver	Battery Charge	Vreg	Current Sense
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### Semtech Orderable Part Numbers

		TS80000-QFN	TS80002-QFN	TS81000-QFN	TS81001-QFN	TS30011-M000QFN	TS30012-M000QFN	TS30041-M000QFN	TS30042-M000QFN	TS32105-QFN	TS31023-QFN	TS31223-QFN	TS51111-M22WCSR	TS51223-M000WCSR	TS51231-QFN	TS61005-QFN	TS61002-QFN	TS61001-QFN	SC810ULTR	TS51221-M000QFN	TS94033SKTRC
EVK Part Number		Description																			
NEW	TSDMRX-5V/10W-EVM	Dual mode 5V/10W RX																			
	TSDMRX-5W-EVM	Dual mode 5V/5W RX																			
	TSDMTX-19V2-EVM	Dual mode 19V/15W TX																			
	TSDMTX-5V2-EVM	Dual mode 5V/5W with quick charge TX																			
	TSDMTX-5V-EVM	Dual mode 5V/5W TX																			
NEW	TSWIRX-5V2-EVM	Wearable 5V/<2W Inductive RX																			
	TSWIRX-5V-EVM	Wearable 5V/<2W Inductive RX																			
	TSWIRX-LI-EVM	Wearable 5V/<2W Inductive RX with charger																			
	TSWITX-12V-EVM	Wearable 12V/<2W Half Bridge																			
	TSWITX-EVM	Wearable 5V/1W Inductive TX																			
NEW	TSWITX-G4-EVM	Wearable 5V/1W Inductive TX																			
	TSDMTX-19V2-EVM	High Power 20W Transmitter																			
	TSDMRX-19V/20W-EVM	High power 20W Receiver																			

# Ultra-low Power Solutions

## ULTRA-LOW POWER MANAGEMENT SOLUTIONS

Semtech 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.

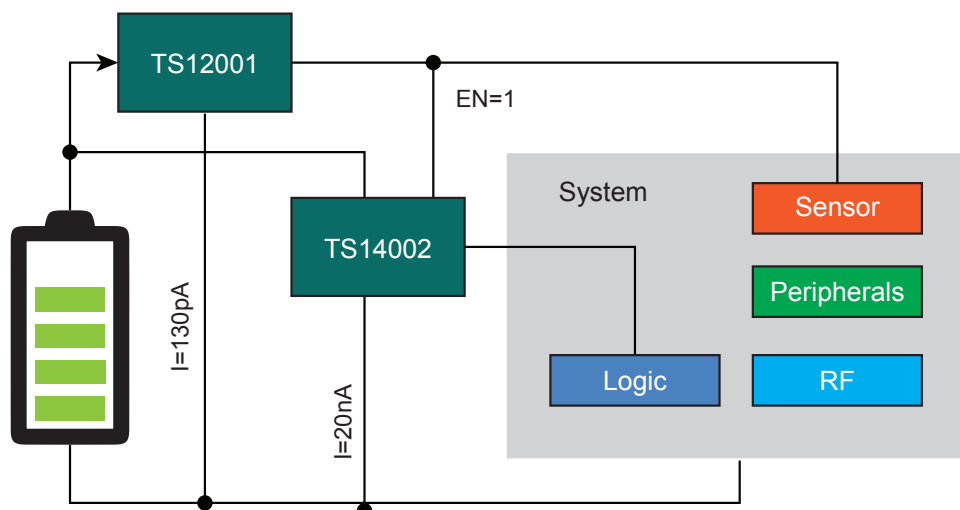
## FEATURES

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

## APPLICATIONS

- Enables 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
TS12001	Battery management under voltage load switch	Trigger voltage options of 1.2V–4.2V (factory set), 70nA quiescent current	Protects batteries from excessive discharge in portable devices
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



TS12001 and TS14002 Block Diagram

# Neo-Iso™ Isolated Power Solutions

## Neo-Iso™ ISOLATED LOAD SWITCH

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. Implemented in proven, volume manufacturing processes, consistently high levels of reliability are achieved throughout the entire operating life. Semiconductor based design allows future scalability and integration options not possible with legacy technologies such as mechanical relays and opto-couplers.

## FEATURES

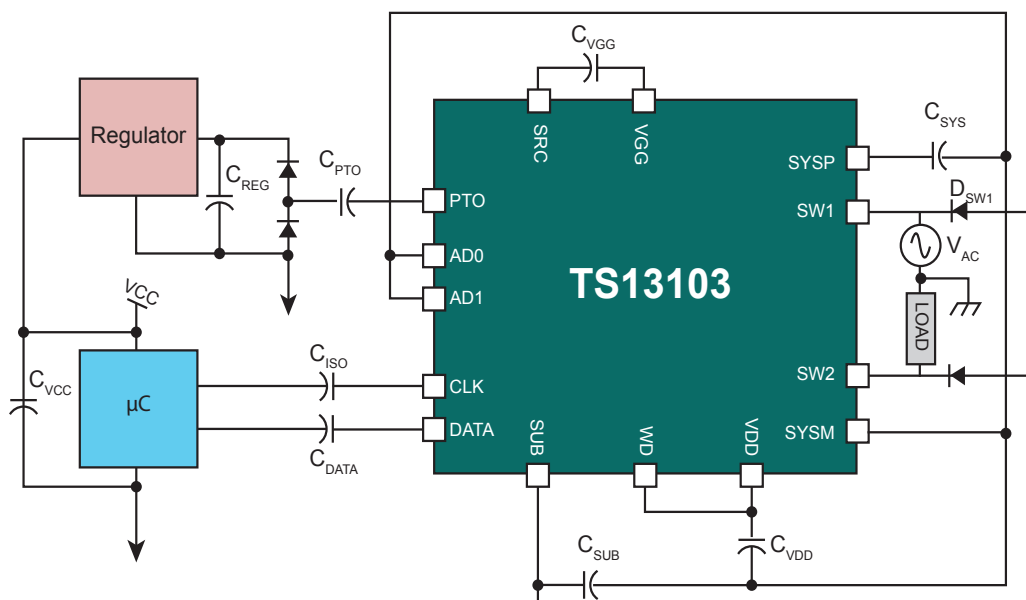
- Overcurrent protection
- Diagnostic information feedback
- Integrated protection devices
- Energy harvesting
- Energy transfer to primary side control
- Scalable galvanic from primary to secondary sides of the device
- Switch Turn-On / Turn-Off Times ~25µs
- Single control signal for on/off input (CLK) Operation Switch
- 60V switch with bi-directional blocking in OFF state
- Low profile allows thin and compact end products
- Silent operation improves user experience

## Ordering Info

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

## APPLICATIONS

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



TS13103 single channel with energy harvesting and Power Take Out (PTO)



# Power Management Solutions

Semtech supplies a wide range of power management ICs used in telecommunications and industrial equipment, portable devices, computers, and networks. Our products include feature rich, highly-integrated products 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 in our quest 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.

## LDOS

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

## 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.

## 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.

# Wide Input Voltage Regulators & Controllers



## 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
SC401B	3V–17V	15	MLPQ-32 (5x5)	0.6V–85% $V_{IN}$ , Programmable Soft Start, Prog. LDO, Selectable PSAVE
SC402B	3V–28V	10	MLPQ-32 (5x5)	0.6V–85% $V_{IN}$ , Programmable Soft Start, Prog. LDO, Selectable PSAVE
SC403B	3V–28V	6	MLPQ-32 (5x5)	0.6V–85% $V_{IN}$ , Programmable Soft Start, Prog. LDO, Selectable PSAVE
SC414/424	3V–28V	6	MLPQ-28 (4x4)	0.75V–85% $V_{IN}$ , 5V LDO, Ultrasonic/Regular PSAVE
SC417/427	3V–28V	10	MLPQ-32 (5x5)	0.5V–85% $V_{IN}$ , Prog. LDO, Ultrasonic/Regular PSAVE
SC418/9	3V–28V	30	MLPQ-20 (3x3)	Ext. FETs, 0.5V–85% $V_{IN}$ , Prog. LDO, Ultrasonic/Regular PSAVE
SC461	3V–28V	30	MLPQ-20 (3x3)	Ext. FETs, Hiccup, 0.6V–85% $V_{IN}$ , 5V LDO, Selectable PSAVE
SC508(A)	4.5V–46V	30	MLPQ-20 (3x3)	Ext. FETs, Hiccup, 0.6V–85% $V_{IN}$ , 5V LDO, Ultrasonic/Regular PSAVE
SC9301	3V–28V	10	MLPQ-32 (5x5)	Hiccup, 0.6V–5.5V, 5V LDO

EcoSpeed® is a registered trademark of Semtech Corporation.

 Automotive AEC-Q100 Qualified

## 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)	1 MHz 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)	
TS30041	4.5V–40V	1	QFN-16 (3x3)	
TS30042	4.5V–40V	2	QFN-16 (3x3)	

## Wide Input Asynchronous Buck Regulators

Part Number	$V_{IN}$ (V)		$V_{OUT}$ (V)		$I_{OUT}$ Max (A)	Isr Limit (A)	Shutdown Current ( $\mu$ A)	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
SC4518H	4.4	24	0.8	85	1.4	2.0	100	600	SO-8 EDP	External synch
SC4519	3	16	1.2	85	2.7	3.0 typ.	5	600	SO-8 EDP	External synch
SC4519H	4.4	24	0.8	85	3.0	3.5	100	600	SO-8 EDP	External synch
SC4520	4.4	24	0.8	85	2.7	3.0	250	100-600	SO-8 EDP	Programmable frequency
SC4521	4.4	24	0.8	85	3.0	3.5	250	600	SO-8 EDP	Programmable Soft Start
SC4524E	3	28	1	96	2.0	2.6	40	200-2000	SO-8 EDP	Programmable Soft Start, hiccup overload protection with frequency foldback
SC4524F	3	18	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	Programmable Soft Start, hiccup overload protection with frequency foldback
SC4525F	3	18	1	96	3.0	3.9	40	200-2000	SO-8 EDP	Programmable Soft Start, hiccup overload protection with frequency foldback

# Point of Load (POL) Solutions

## Low Dropout Regulators

Part Number	V <sub>IN</sub> (V)		V <sub>OUT</sub> (V)	I <sub>OUT</sub> (A)	V <sub>DROPOUT</sub> (V)	V <sub>DROPOUT</sub> @ Full Load (V) Typ	Package (mm)
	Min	Max					
<b>NEW</b> TS31023	5	16	1.25	0.06	0.55	0.45	MLPD-8 (2x2)
TS31223	5	36	1.25	0.06	0.55	0.45	MLPD-8 (2x2)
SC4213H	1.4	6	0.5	0.5	0.15	0.075	SOIC-8
SC4211	1.4	6	0.5	1	0.5	0.2	SOIC-8 EDP
SC4212B	1.6	6	0.5	1	0.175	0.09	MLPD-8 (3x3)
SC4215J*	1.4	6	0.5	2	0.6	0.3	SOIC-8 EDP
SC4216H	1.45	5.5	0.5	3	0.7	0.45	SOIC-8 EDP
SC4217	1.8	5.5	1.24	3	0.6	0.3	TO-263-5

\* SC4215J has 1ms internal soft start

## Low Current, Low Voltage LDO Regulators

Part Number	V <sub>IN</sub> (V)		V <sub>OUT</sub> (V)	I <sub>OUT</sub> (A)	V <sub>DROPOUT</sub> (V)	Output options	Package (mm)
	Min	Max					
SC560	2.5	5.5	1.2	0.3	0.215	Many dual fixed outputs available	MLPQ-UT8 (1.5x1.5)
SC563	2.3	5.5	1.0	0.3	0.540	Dual fixed outputs	MLPD-UT8 (1.6x1.2)
<b>NEW</b> TS14002	2.5	5.5	1.2	0.25	0.160	Ultra-Low I <sub>q</sub> , Fixed output	VDFN (2x2)

## Buck Regulators

Part Number	Output Current (A)	Package (mm)	Features
SC195/B	0.5	MLPQ-8 (1.5x1.5) CSP-8 (0.8x0.8)	Low BOM 4 bit VID
SC197	2x0.5	MLPQ-18 (2x3)	Low BOM 4 bit VID
SC202A	0.5	MLPQ-13 (2.5x3)	Integrated inductor
SC220	0.65	SOIC 8	PCB trace inductor
SC4626	1	SOT23-5	Fixed V <sub>OUT</sub> Low BOM
SC189	1.5	MLPD-6 (2x2)	Small size fixed V <sub>OUT</sub> Low BOM
SC283 SC284 SC284P	2x1.8 2x1.8 2x2	MLPQ-18 (2x3) MLPQ-20 (3x3) MLPQ-20 (3x3)	Low BOM 4 bit VID Low BOM 4 bit VID 3 bit VID, PSAVE, PGOOD
SC183C/Q	2	MLPQ-16 (3x3)	Low BOM 4 bit VID
SC3102	2	MLPQ-16 (3x3)	Fixed V <sub>OUT</sub> selectable forced PSAVE
SC185	4	MLPQ-16 (3x3)	Fixed V <sub>OUT</sub> Low BOM
SC186	4	MLPQ-16 (3x3)	Low BOM 4 bit VID
SC286	2x4	MLPQ-28 (4x4)	Low BOM 4 bit VID

## DDR1 to DDR4 Memory Termination LDO Regulators

Part Number	V <sub>CC</sub> (V)		V <sub>DDQ</sub> (V)	V <sub>TT</sub> (V)	I <sub>VTT</sub> (A)	DDR Type	Package	Features
	Min	Max						
SC2598	2.35	3.6	1–3.6	0.5–1.8	±3	1,2,3,4	SOIC-8 EDP	Integrated DDR VTT LDO with on-board buffered reference, remote sense
SC2599	2.35	3.6	1–3.6	0.5–1.8	±3	1,2,3,4	SOIC-8 EDP MLPD-UT8 (2x2)	Integrated DDR VTT LDO with on-board buffered reference, remote sense




## Boost Regulators

Part Number	V <sub>IN</sub> (V)		V <sub>OUT</sub> (V)		I <sub>OUT</sub> / I <sub>SW</sub> (A)	Shutdown Current (μA)	I <sub>q</sub> (mA)	Switching Freq (MHz)	Package (mm)	Features
	Min	Max	Min	Max						
<b>NEW</b> TS32101	1.8	5.5	1.8	5.5	/1.5	5	0.05	2	MLPQ-16 (3x3)	Synchronous, Power Save mode, bypass mode
SC120	0.7	4.5	1.8	5	/1.2	0.1	0.05	1.2	MLPD, SOT-23 (1.5x2)	Power Save mode for light load efficiency
SC121	0.7	4.5	1.8	5	/1.2	0.1	3.5	1.2	MLPD-UT-6 (1.5x2)	No Power Save
SC4501Q	1.4	16	1.4	30	/2	<18	<1.6	Up to 2	MSOP-8 EDP, MLPD-10 (3x3)	Programmable Soft Start, SEPIC configurable
SC4502(H)	1.4	16	1.4	32(40)	/1.4	<18	<1.6	Up to 2	MLPD-10 (3x3)	Programmable Soft Start, SEPIC configurable
SC4503	2.5	20	3	27	/1.4	<1	<1.1	1.3	TSOT-23, MLPD-8 (2x2)	Programmable Soft Start, SEPIC configurable
SC630A	2.95	5.5	–	3.3	0.3/	0.1	2.5	1	MLPD-8 (2x2)	Buck-Boost 33mV ripple, Soft Start small caps
SC632	2.9	5.5	–	5	0.275/	0.1	1.5	0.2	MLPD-8 (2x2)	Buck-Boost <30mV ripple, Soft Start
SC632A	2.95	5.5	–	5	0.275/	0.1	2.5	1	MLPD-8 (2x2)	Buck-Boost 50mV ripple, Soft Start, small caps
SC633	2.9	5.5	–	5.3	0.4/	0.1	1.5	0.2	MLPD-8 (2x2)	Buck-Boost <30mV ripple, Soft Start

# LED Drivers and Load Switches





## LED Inductor Based


Part Number	V <sub>IN</sub> (V)		V <sub>OUT</sub> (V) Max	F <sub>SW</sub> (MHz)	# LEDs per string* V <sub>F</sub> =(3.5V)	# of Strings	String Current (mA)	Dimming Max Freq.	Package (mm)	Features
	Min	Max								
 SC441A	4.5	21	36	0.7	10	4	150	up to 50kHz	TSSOP-20 EDP	Open/Short LED string disable, OCP, OTP, OVP, and FFLAG
SC442	4.5	21	42	0.2–1.0	12	10	30	up to 50kHz	MLPQ-UT-28 (4x4x0.6)	Adj freq, adj SCP level, Open/Short LED string disable, OCP, OTP, and OVP
SC443	4.5	27	42	0.2–.2	12	3	30	up to 50kHz	MLPQ-UT-16 (3x3x0.6)	Adj freq, Open LED string disable, OCP, OTP, and OVP
 SC445Q	4.5	27	42	0.7	12	4	150	up to 50kHz	TSSOP-20 EDP	Adj SCP level, Open/Short LED string disable, OCP, OTP, OVP and FFLAG
SC446	4.5	27	42	0.7	12	3	100	up to 50kHz	TSSOP-16 EDP	Open/Short LED string disable, OCP, OTP, and OVP
SC4541	2.9	22	25	2	7 (Boost) 5 (Buck)	1	100 (max) Boost 200 (max) Buck	up to 1kHz	SOT23-6, MLPD-UT-6	High-side sensing integrated Schottky rectifier, no external compensation
SC5010/H	4.5	27	50	0.2–2.2	14	8	30 50(H)	up to 30kHz	MLPQ-UT-28 (4x4)	Phase shifted, PWM/I <sup>2</sup> C dimming, extensive protection
 SC5012/Q	4.5	45	65	0.2–2.2	18	4	150	up to 30kHz	MLPQ-24 (4x4)	I <sup>2</sup> C, FSYNC, 5000:1 phase shifted PWM Dimming
SC5014	4.5	27	50	0.2–2.2	14	4	120	up to 30kHz	MLPQ-20 (4x4)	Phase shifted, PWM/I <sup>2</sup> C dimming, extensive protection
SC5014A	4.5	27	50	0.2–2.2	14	2	240	up to 30kHz	MLPQ-20 (4x4)	Advanced high efficiency

\*Maximum number of LEDs depends on LED forward voltage  Automotive AEC-Q100 qualified

## FemtoSwitch™ Load Switches

Part Number	V <sub>IN</sub> (V)		I <sub>OUT</sub> Max (A)	RDS ON (mΩ)	Shutdown Current (μA)	Quiescent Current (μA)	Reverse Current Blocking	Auto Discharge	ESD (kV HBM)	Package (mm)
	Min	Max								
SC704	1.1	3.6	0.5	90	0.1	2	–	–	5	CSP-4 (0.76x0.76)
SC705	1.1	3.6	0.5	90	0.1	2	–	✓	5	CSP-4 (0.76x0.76)
 TS12001	1.2	5.5	1.0	175	0.0001	0.07	–	✓	2	DFN 8-L (2x2)
SC724	1.1	3.6	2.0	36	0.2	0.81	–	–	3	CSP-4 (0.76x0.76)
SC725	1.1	3.6	2.0	36	0.2	0.81	–	✓	3	CSP-4 (0.76x0.76)
 SC33020H	1.6	5.5	2.0	32	0.3	1	✓	–	4	CSP-4 (0.9x0.9)
SC33021	1.6	5.5	2	32	0.3	0.8	✓	✓	5	CSP-4 (0.9x0.9)
SC33001A	1.7	5.5	3	9	0.04	150	–	✓	Class 1C	CSP-6 (0.9x1.4)
SC700	0.75	5.25	4.0	17	0.5	150	–	✓	Class 1C	MLPD-6 (2x2)
SC700H	0.75	5.25	4.0	17	0.5	150	–	–	Class 1C	MLPD-6 (2x2)
SC701	1.7	5.5	4.0	8	3.5	125	–	✓	Class 1C	CSP-6 (0.9x1.4)
SC701H	1.7	5.5	4.0	8	3.5	125	–	–	Class 1C	CSP-6 (0.9x1.4)

## Current Sense Amplifier

Part Number	V <sub>IN</sub> (V)		Gain Temp Coefficient (ppm/°C)	Signal Input Voltage (V)		Quiescent Current (μA)	Input Bias Current (μA)	ESD (kV HBM)	Package (mm)
	Min	Max		Min	Max				
 TS94033	4.0	42	-20	V <sub>dd</sub> -5.5	V <sub>dd</sub> +0.04	140	2.1	2	SOT23-8

# Optical & Networking Solutions

## BUILDING THE FUTURE TOGETHER

As networking requirements continue to evolve, so will Semtech. Working with customers to provide solutions for tomorrow's networking challenges. One thing that won't change, however, is Semtech's commitment to being a reliable partner and providing innovative approaches that deliver unrivaled performance for the most sophisticated applications.

### ENABLING HIGH PERFORMANCE AND SPEED

- Class leading IC solutions for 25G and 100G applications in CFP, CFP2/4, QSFP28, and SFP28 modules
- Receive Optical Sub-Assembly (ROSA) based on Semtech's Rchip technology
- Full portfolio of integrated solutions to address all SFP+ and XFP modules
- Dual-lane Clock and Data Recovery (CDRs) (Tx/Rx) with integrated DML or EML driver
- Low power, reference-free
- Limiting amplifiers (LA) that provide wideband, low noise post-amplification
- Transimpedance amplifiers (TIAs) that exceed IEEE 10GbE and 100GbE Stressed Receiver Sensitivity (SRS) specifications
- High performance, low power laser drivers
- Full portfolio of integrated solutions for all PON applications including complete reference designs
- Industry's first single-chip 10G PON transceivers for symmetric and asymmetric applications
- Industry's first quad 10Gbps CDR, enabling long reach Infiniband® QDR, 40GbE and 100GbE applications
- Protocol-independent repeaters/redrivers
- Reference design kits for optical modules to decrease design time

### MARKETS

#### 100G ETHERNET

- Solutions for QSFP28, CFPx modules

#### 25G ETHERNET

- Market leading module IC and ROSA solutions for SFP28

#### 16G FIBRE CHANNEL

- Industry's first complete integrated IC solution for 16G Fibre Channel

#### 10G

- Complete portfolio of module IC and backplane solutions
- Solutions for XFP, SFP+, QSFP+ modules

#### PON/FTTH

- Industry's first fully integrated 10G PON solutions
- Highly integrated chipset solutions for EPON & GPON ONU/OLT

### TECHNOLOGY

#### CDRS

- Market leader
- Reference-free operation
- Integrated solutions enable best performance and lowest power

#### ROSAS

- Best-in-class sensitivity, based on our patented Rchip technology

#### TIAS

- Industry leading performance and proved reliability with over 300 million sold

#### LASER DRIVERS & TRANSCEIVER ICs

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





# Optical Solutions

Optical Module CDRs								
Part Number	Data Rate (Gbps)	Lanes	Laser Driver	TIA	Slice Level Adjust	Pin Compatibility	Package	Applications
GN2042	9.95–11.3	2 <sup>2</sup> (1Rx + 1Tx)	DML	–	Yes	GN2044	QFN-32	XFP & SFP+ 10GbE & OC-192 Enables 1W Retimed SFP+ 10km
GN2044	9.95–11.3	2 <sup>2</sup> (1Rx + 1Tx)	EML	–	Yes	GN1444, GN2042	QFN-32	XFP & SFP+ 10GbE, OC-192 & DWDM Enables 1.5W Retimed SFP+ 40/80km
GN2044S	9.95–11.3	2 <sup>2</sup> (1Rx + 1Tx)	EML	–	Yes	GN1444S	QFN-32	Tunable SFP+, OC-192 & DWDM Enables 1.5W Retimed TSFP+
GN2040	9.95–11.3	2 <sup>2</sup> (1Rx + 1Tx)	DML	–	Yes	GN204x	QFN-32	XFP and SFP+ 10GbE, OC-192 and DWDM
GN2017A	9.95–11.7 14.025	2 <sup>2</sup> (1Rx + 1Tx)	VCSEL	–	No	GN2010X	QFN-32	16G FC, 10G FCoE
GN2104S	25–28	4	–	–	Yes	–	FC-CSP	100Gbps Ethernet, Infiniband EDR
GN2106PS	25–28	4	EML	–	Yes	–	BGA	100Gbps Ethernet/OTN, Infiniband EDR
GN2108	25	4	VCSEL	–	Yes	–	Die	100Gbps Ethernet SR4
GS2109	25	4	–	Yes	Yes	GN2110	Die	100Gbps Ethernet SR4, PSM4
GN2110	25–28	4	–	Yes	Yes	GN2109	Die	100Gbps Ethernet/OTN PSM4, CWDM4, CLR4
GN2105	25–28	4	DML	–	Yes	–	FC-BGA	100Gbps Ethernet, PSM4, CWDM4, CLR4

Laser Drivers						
Part Number	Overview	Data Rate (Gbps)	Max Mod / Bias Current (mA)	Supply (V)	Package	Applications
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
GN1160	DFB Driver	to 11.3	90/120	3.3 (Opt. 2.8)	QFN-28	10GE SFP+ 10GBASE-LR
GN1163	DFB Driver	to 11.9	90/120	3.3 (Opt. 2.8)	QFN-24	QSFP+ 10GBASE-LR
GN1161	VCSEL Driver	to 11.3	20/15	3.3 (Opt. 2.8)	QFN-28	10GE SFP+ 10GBASE-SR
GN1190	Quad VCSEL Driver	to 14.3	12/12	3.3	Bare Die	40Gbps Ethernet, Infiniband, QSFP+
GN1181	DFB Driver	25–28	55/70	2.3/3.3	Bare Die	25GbE and 100GbE Ethernet active TOSA
GN1185	Quad DFB Driver	25–28	55/70	2.3/3.3	Bare Die	100GbE Ethernet active TOSA

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

# Optical Solutions

Transceiver IC (LD&LA)						
Part Number	Overview	Data Rate (Gbps)	Max Mod/Bias Current (mA)	Supply (V)	Package	Applications
GN25L95	Burst Mode DFB + Receive LA	to 2.5	90/100	3.3	QFN-28	EPON, GPON, BOSA-on-Board
GN25L96	Programmable Burst Mode DFB + Receive LA	to 2.5	90/100	3.3	QFN-28	EPON, GPON, BOSA-on-Board, SFP
GN25L98	Burst Mode DFB + Receive LA + APD Controller	to 2.5	90/100	3.3	QFN-28	EPON, GPON, BOSA-on-Board
GN25L95C	SFP Burst Mode DFB + Receive LA	3.1G to 125M	90/100	3.3	QFN-28	Single and multi rate SFP
NT28L90	2.5Gbps Burst Mode DFB + 10 Gbps Receive LA	Rx 10.3 Tx 2.5	90/100	3.3	QFN-28	10G EPON, XG-PON1 (Asymmetric)
GN7354	Burst Mode DFB + Receive LA & CDR	Rx 10.3 Tx to 2.5	90/90	3.3 (3.3 or 5 output stage)	QFN-32	10G EPON, XG-PON (Asymmetric)
GN7355	Burst Mode DFB + Receive LA & CDR	10.3	90/90	3.3 + 5 output stage (optional 3.3 V)	QFN-32	10G EPON, XG-PON (Symmetric)
GN1412B	EML Laser Driver + Receive LA	to 11.3	2.5Vpp/120mA	3.3	QFN-32	10GbE, OC-192
GN1444S	EML Laser Driver + Receive LA	to 11.3	2.5Vpp/120mA	1.8 & 3.3	QFN-32	10GbE, OC-192
GN1157	DML Laser Driver + Receive LA	to 11.3	90/120	3.3 (Optional 2.8)	QFN-28	10GbE LR SFP+, CPRI
GN1157B	DML Laser Driver + Receive LA	to 12.5	90/120	2.4 & 3.3	QFN-28	10GbE LR SFP+, CPRI
GN1158	VCSEL Laser Driver + Receive LA	to 11.3	20/15	3.3 (Optional 2.8)	QFN-28	10GbE SR SFP+

TIAs							
Part Number	Overview	Data Rate (Gbps)	Gain (kΩ)	BW (GHz)	Supply (V)	Noise	Applications
NT20R67	155Mbps AGC TIA	0.155	63	0.165	3.3/5.0	11 nA	OC-3, Fast Ethernet
NT20067	155Mbps AGC TIA	0.155	23	0.165	3.3/5.0	11 nA	OC-3, Fast Ethernet
NT23L50	622Mbps AGC TIA	0.622	50	0.32	3.3	60 nA	OC-12, BPON
NT24L50	1.25Gbps AGC TIA	1.25	25	0.75	3.3	92 nA	GbE, EPON
NT24L55	1.25Gbps High Sensitivity AGC TIA	1.25	46	0.75	3.3	74 nA	EPON
NT25L51	2.5Gbps AGC TIA	2.5	8	1.7	3.3	230 nA	OC-48, GPON (APD)
GN25L53	3.1Gbps AGC TIA	3.1	5.5	1.9	3.3	335 nA	CPRI, GPON, OC-48 (APD)
GN25L55	2.5Gbps High Sensitivity AGC TIA	2.5	21	1.4	3.3	87 nA	GPON (PD)
NT28L52	10G Limiting	to 10.3	2.35	7	3.3	1.2 μA	PON, 10GBASE-SR
GN1056	10G Linear	to 11.3	500/1	12	3.3	1μA	OC-192
GN1058	10G Linear AGC	to 11.3	4	12	3.3	1μA	10GBASE-LRM & DWDM

# Optical Solutions

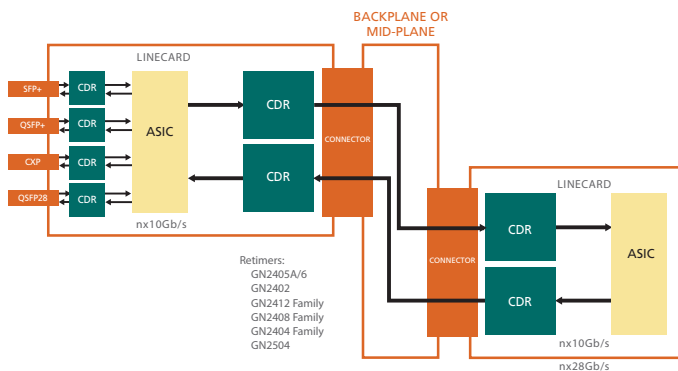
TIAs (Conti.)							
Part Number	Overview	Data Rate (Gbps)	Gain (k $\Omega$ )	BW (GHz)	Supply (V)	Noise	Applications
GN7068	10G Limiting	to 11.3	3	12	3.3	1 $\mu$ A	APD ROSAs for 10G PON ONU & 10GBASE-ZR
GN1068	14G Limiting	to 14.3	6.75	12	3.3	1.2 $\mu$ A	CPRI, 10GBASE-SR/LR/ER & 16G FC
GN1090	Quad 10G limiting	to 14.3	*	*	3.3	0.9 $\mu$ A	40Gbps Ethernet; Infiniband, QSFP+
GN7050	1.25G Burst Mode Limiting	1.25	13	1.0	3.3	*	1G EPON OLT
GN7052	Tri-rate PON TIA	1.25/ 2.5/ 10.3	13/ 1.2/ 2.3	1.1/ 2.5/ 8.7	3.3	*	1.25G EPON/ 2.5G XG-PON/ 10G EPON OLT
GN7053	1G GPON Burst Mode Limiting	1.25	1.25	1.5	3.3	*	1G GPON OLT
GN1081	28G Limiting	28	6	22	3.3	1.78 $\mu$ A	25Gbps and 100Gbps Ethernet/OTN, Infiniband EDR
GN1084	25G Limiting	25	6	22	3.3	2.3 $\mu$ A	25Gbps and 100Gbps Ethernet
GN1085	Quad 28G Limiting	28	6	22	3.3	1.78 $\mu$ A	100Gbps Ethernet / OTN, Infiniband EDR

ROSAs & Super High Gain ROSAs								
Part Number	Overview	Data Rate (Gbps)	Gain (k $\Omega$ )	Supply	RSSI	Unstressed Sensitivity	Comments	ORL
GN3050	10km Rchip Limiting	to 11.3	10	+3.3V $\pm$ 10%	Yes	-21dBm	-16.8dBm OMA (Stressed sens.)	-14dB
GN3250	40km Rchip Limiting	to 11.3	10	+3.3V $\pm$ 10%	Yes	-21dBm	-16.0dBm OMA (Stressed sens.)	-27dB
GN3052	LRM Rchip AGC	to 11.3	9	+3.3V $\pm$ 10%	Yes	-17dBm OMA	-12dBm OMA (Stressed sens.)	-14dB
GN3155	SR Super High Gain Rchip	to 11.3	35	+3.3V $\pm$ 10%	Yes	-15dBm OMA	Eliminates LA in SFP+	-14dB
GN3055	10km Super High Gain Rchip	to 11.3	35	+3.3V $\pm$ 10%	Yes	-21dBm	Eliminates LA in SFP+	-14dB
GN3255	40km Super High Gain Rchip	to 11.3	35	+3.3V $\pm$ 10%	Yes	-21dBm	Eliminates LA in SFP+	-27dB
GN3068	10km Low Power Limiting	to 11.3	7	+3.3V $\pm$ 10%	Yes	-21dBm	94 mW power dissipation	-14dB
GN3268	40km Low Power Limiting	to 11.3	7	+3.3V $\pm$ 10%	Yes	-21dBm	94mW power dissipation	-27dB
GN3257	PIN with AGC	to 11.3	8.5	+3.3V $\pm$ 10%	Yes	-19dBm	–	-27dB
GN3352	APD with AGC	to 11.3	4	+3.3V $\pm$ 10%	VAPD	-27dBm	–	-27dB
GN3357	High Gain APD with AGC	to 11.3	8.5	+3.3V $\pm$ 10%	VAPD	-27dBm	–	-27dB
GN3358	High Gain APD Rchip	to 11.3	13	+3.3V $\pm$ 10%	VAPD	-27dBm	Ideal for Non-Retimed SFP+	-27dB
GN3368	Limiting APD RChip	to 11.3	4	+3.3V $\pm$ 10%	VAPD	-27dBm	–	-27dB
GN3270	25G Limiting PIN ROSA	28	6	+3.3V $\pm$ 10%	Yes	-14dBm	SFP28 LR applications	-27dB

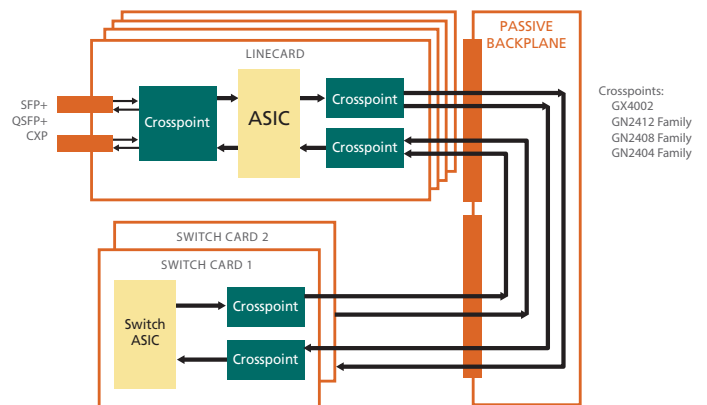
# Networking Solutions

Multi-LANE Signal Conditioners									
Part Number	Data Rate (Gbps)	Lanes	CDR	Ref Clock	Input Stage	De-emphasis	Supply (V)	Pkg	Applications
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 family	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
GN2412 family	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
GN2408 family	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
GN2404 family	1.25–12.8	4	Yes	Req.	Adaptive Equalizer DFE	Yes	0.9 1.8	BGA-144	>nx10G Backplanes, 10G/40G Linecards, 10G-KR, 40G-KR4, 40G-CR4, Crosspoint Switching, CPRI
GN2402	10.3125	4	Yes	Not Req.	Equalizer	Yes	3.3	QFN-44	nx10G Backplanes, 10G/40G Linecards, 10G/40G Active cables
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
GN2405A/5S	9.95–11.3	4	Yes	Not Req.	Equalizer	Yes	3.3	QFN-48	nx10G Backplanes 10G/40G Linecards 10G/40G Active cables
GN2406/6S	9.95–10.95	4	Yes	Not Req.	Limiting Amp	Yes	3.3	QFN-48	10G/40G Linecards
GN1407	1–8	4	No	Not Req.	Equalizer	No	1.2 1.8	QFN-56	PCIe Gen 1/2/3, SNAP-12, POP-4/LX-4/CX-4/KX-4, XAUI/RXAUI and Rapid I/O
GN1406	2.5 3.125 5.0, 6.25	4	Yes	Req.	Equalizer	Yes	1.2 1.8	QFN-56	PCIe Gen 1/2, SNAP-12, POP-4/LX-4/CX-4/KX-4, XAUI/RXAUI and Rapid I/O

## HIGH-SPEED BACKPLANES



## RETIMED CROSSPOINTS



# HD-VLC™ The Future of HD Surveillance

Semtech's next-generation of high-performance, all-digital HD video connectivity solutions for surveillance with integrated HD-VLC™ provide unprecedented levels of cable reach performance and enable long-distance transmission of high-quality HD digital video.

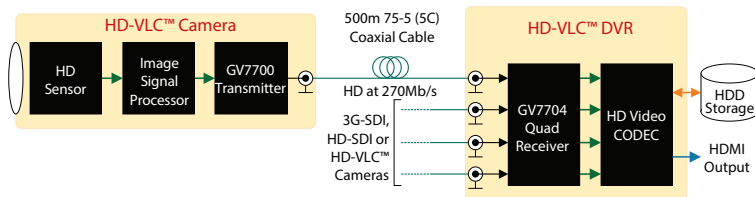
The High-Definition Visually Lossless CODEC (HD-VLC™) has been specifically developed to allow both 720p and 1080p high-definition video to be transmitted at lower data rates over conventional CCTV coaxial cables. Combined with Semtech's industry-leading cable equalizer and CDR technology, cable distances can be extended up to four times the reach of existing HD-SDI and HDcctv 1.0 products, and up to two times the reach of other VLC-based products.



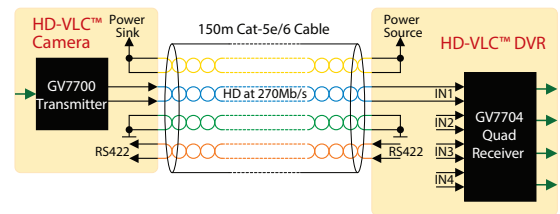
## CABLE REACH COMPARISON

Cable Type	HD-VLC™ 270Mbps	HD-SDI 1.485Gbps
<b>Belden 1694A</b>	700m	230m
<b>Belden 543945</b>	550m	150m
<b>KW-Link SYV 75-5</b>	500m	140m
<b>Canare L-3C2V</b>	300m	100m
<b>KW-Link SYV 75-3</b>	300m	80m
<b>Cat-5e/6 UTP</b>	150m	–

## COAXIAL CABLE APPLICATION: 500M CABLE REACH



## UTP CABLE APPLICATION: 150M CABLE REACH



### GV7700 HD-VLC™ Transmitter

Data Rate (Mbps)	Downstream Data Insert	Downstream Audio Insert	Max Output Jitter (ps)	BT.1120 Bus Width	HD-VLC Encoder	I/O Voltage (V)	Temp Range (°C)	Power (mW)	Package (mm)
270, 540, 1485, 2970	Yes	4 channels	77	8/10 or 16/20 bit	Yes	1.8 or 3.3	-20 to +85	180	Dual Row QFN-84 (7x7)

### GV7704 Quad HD-VLC™ Receiver

Data Rate (Mbps)	Integrated Equalizer	Downstream Data Extract	Downstream Audio Extract	IJT (UI)	Serial Loop Through	BT.1120 Bus Width	HD-VLC Decoder	Temp Range (°C)	Power (mW)	Package (mm)
270, 540, 1485, 2970	Yes	Yes	4 channels	0.06 (@270) 0.11 (@1485)	Yes	8/10 bit	Yes	-20 to +85	810*	BGA-169 (11x11)

\* All four channels active

### GV8601 Adaptive Cable Equalizer

Data Rate (Mbps)	Cable Reach with Belden 543945			Output Jitter (UI)	Output Coupling	Temp Range (°C)	Power (mW)	Package
	3G	HD	SD					
270, 1485, 2970	100m	150m	330m	0.2	2.5/3.3V	-40 to +85	195	QFN-16

### GV8500 Cable Driver

Data Rate (Mbps)	Single Ended Outputs	Output Jitter (ps)	Adjustable Slew Rate	Output Amplitude Adjust	Temp Range (°C)	Power (mW)	Package
270, 1485, 2970	2	<22	Yes	Yes	0 to +70*	168	QFN-16

\* The GV8500 been characterized to meet typical conditions over the -40°C to +85°C extended temperature range.



# Broadcast Video

Semtech's Gennum Products Group extends its 20+ year leadership in SDI technology by being first to market with an array of advanced UHD-SDI solutions. Semtech's multi-rate device line-up enables customer roadmaps, facilitating the creation of differentiated and advanced UHD-SDI products. We offer the world's most advanced solutions designed specifically for real world broadcast challenges, including the latest innovations designed to help push the boundaries of performance, reach, power, and signal integrity while reducing time-to-market and design risks.

## UHD-SDI: THE NEXT-GENERATION BROADCAST TELEVISION PRODUCTION INTERFACE

We offer the most comprehensive end-to-end portfolio of UHD-SDI video solutions available, including our new family of long-reach, multi-rate 12G retiming equalizers and cable drivers, 6G high performance reclockers, low-power 3G equalizer and cable drivers, single-chip configurable cable driver/adaptive cable equalizer (BiDi), and innovative UHD-SDI gearbox solutions.

## 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 the only interface for next-generation broadcast

television production for 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 is evident in everything we do. That is why we:

- Comprehensively test each component in production, assuring high yield on assembled boards
- Offer complimentary design review and feedback on Semtech-based designs to shorten design cycles, reduce risks and optimize performance
- Provide dedicated field and applications engineering support throughout the product's life-cycle

Adaptive Equalizers						
Part Number	Application	Data Rate (Mbps)	Power (mW)	Outputs	Cable Length (m)	Cable Length Indication
GS12141	12G, 6G, 3G, HD, SD, MADI, low power, long reach	1–11880	350*	2	12G(70), 6G(90), 3G(180), HD(240), SD(400)	Yes
GS3140	3G, HD, SD, MADI, low power, long reach	1–2970	85	1	3G(200), HD(280), SD(500)	Yes
GS6042	6G, 3G, HD, SD, MADI, long reach	125–5940	180	1	6G(80), 3G(210), HD(300), SD(550)	No
GS3440 GS3441	3G, HD, SD, MADI, long reach	125–2970	169 212	1 2	3G(210), HD(250), SD(500)	No Yes
GS2994 GS2993	3G, HD, SD, long reach	143–2970	165 165	1 2	3G(140), HD(200), SD(400)	No Yes
GS1674	HD, SD, long reach	143–1485	195	1	HD(220), SD(400)	No

\* Power specifications includes power consumed by integrated retimer

Cable Drivers						
Part Number	Application	Data Rate (Mbps)	Power (mW)	Input Trace EQ	Outputs	Max Output Swing (mV)
GS12181	12G, 6G, 3G, HD, SD, MADI, dual output cable driver	1–11880	340*	Yes	2	1200
GS6080 GS6081	6G, 3G, HD, SD, single or dual output cable driver	143–5940	135 210	Yes	2 4	1800
GS2988 GS2989	3G, HD, SD, single or dual output	143–2970	110 180	Yes	2 4	1800

\* Power specifications includes power consumed by integrated retimer

# Broadcast Video



Reclockers						
Part Number	Application	Data Rate (Mbps)	Input MUX	Input Trace EQ	Output De-emphasis	Package (mm)
GS6151	6G, 3G, HD, SD, MADI, reclocking with eye monitoring, low power, high density	125, 270, 1485, 2970, 5940	2:1	Yes	Yes	4x4
GS6152	6G, 3G, HD, SD, MADI, reclocking with eye monitoring, low power	125, 270, 1485, 2970, 5940	4:1	Yes	Yes	6x6
GS2985	3G, HD, SD reclocking	270, 1485, 2970	4:1	Yes	Yes	9x9
GS2986	3G, HD, SD reclocking	270, 1485, 2970	4:1	Yes	Yes	6x6
GS2965	3G, HD, SD reclocking, high density	270, 1485, 2970	2:1	Yes	Yes	5x5

Configurable SDI Input/Output - Equalizer/Cable Driver						
Part Number	Application	Data Rate (Mbps)	Power (mW)	Outputs	Cable Reach (m, Belden 1694A)	Package (mm)
NEW GS12090*	12G, 6G, 3G, HD, SD, MADI Configurable EQ/CD (BiDi)	1–11880	EQ: 430** CD: 370**	EQ:1, CD:1	12G(60), 6G(70), 3G(160), HD(230), SD(450)	6x4
GS3490	3G, HD, SD, MADI Configurable EQ/CD (BiDi)	125-2970	EQ: 202 CD: 215	EQ:1, CD:1	3G(140), HD(250), SD(550)	5x5

\* GS12090 specifications are preliminary and subject to change \*\* Power specifications includes power consumed by integrated retimer

Gearbox							
Part Number	SDI Rates	Error and Format detection	SMPTE 352M Handling	Input SKEW adjustment	Per Lane output delay adjustment	Temp Range	Package
GS12070	HD, 3G, 6G, 12G, (270 Bypass)	YES	YES	YES	YES	-40 to +85	BGA196

Transmitters						
Part Number	Data Rate (Mb/s)	Audio Embedded	Output Jitter (ps)	Video Processing	Parallel Bus Width	Power (mW)
GS2972	270, 1485, 2970	Yes	3G(40), HD(50), SD(200)	Yes	10 or 20	400
GS2962	270, 1485, 2970	No	3G(40), HD(50), SD(200)	Yes	10 or 20	350
GS1672	270, 1485	Yes	HD(50), SD(200)	Yes	10 or 20	350
GS1662	270, 1485	No	HD(50), SD(200)	Yes	10 or 20	330

Receivers						
Part Number	Data Rate (Mbps)	Equalizer	Audio De-embed	Audio Clock Generator	Package (mm)	Power (mW)
NEW GS3471*	270, 1485, 2970	Yes	Yes	Yes	100 BGA (9x9)	300
GS3470*	270, 1485, 2970	No	Yes	Yes	100 BGA (9x9)	220
GS2971A	270, 1485, 2970	Yes	Yes	Yes	100 BGA (11x11)	525
GS2961A	270, 1485, 2970	Yes	No	No	100 BGA (11x11)	500
GS2970A	270, 1485, 2970	No	Yes	Yes	100 BGA (11x11)	350
GS2960A	270, 1485, 2970	No	No	No	100 BGA (11x11)	320
GS1661A	270, 1485	Yes	No	No	100 BGA (11x11)	460
GS1660A	270, 1485	No	No	No	100 BGA (11x11)	250

\* GS3470/71 specifications are preliminary and subject to change

Crosspoint						
Part Number	Data Rate (Gbps)	Inputs	Outputs	Power (W)	Input Trace EQ	Output De-emphasis
GX3290	3.5	290	290	34	Yes	Yes
GX3190	3.5	146	290	25	Yes	Yes
GX3246	3.5	290	146	18	Yes	Yes
GX3202	3.5	202	202	24	Yes	Yes
GX3146	3.5	146	146	18	Yes	Yes

# High Reliability Discretes & Assemblies



Semtech designs and manufactures discrete power diodes that are listed in the QPL, both in axial and surface mount (US) configuration. These rectifier diodes, Zener diodes and TVS diodes are also configured into custom modules and ISOPAC™ packages.

## PRODUCTS

- Half wave discrete rectifiers (QPL)
- TVS diodes (QPL)
- Zener voltage regulators (QPL)
- Silicon carbide Schottky barrier diodes
- Diode arrays / assemblies in ISOPAC™ and module packages

## JANS – QUALIFIED DIODES

- MIL-PRF-19500/356, 5W Zener voltage regulator (axial and surface mount available)
- MIL-PRF-19500/406, 1.5W Zener voltage regulator (axial and surface mount available)
- MIL-PRF-19500/411, fast recovery rectifier diode (axial available)
- MIL-PRF-19500/420, standard recovery rectifier diode (axial and surface mount available)
- MIL-PRF-19500/427, standard recovery rectifier diode (axial available)
- MIL-PRF-19500/429, fast recovery rectifier diode (axial available)
- MIL-PRF-19500/477, ultra-fast recovery rectifier diode (axial and surface mount available)
- MIL-PRF-19500/516, bipolar transient voltage suppressor (axial and surface mount available)

## AVAILABLE IN SPACE GRADE (UPSCREEN\*)

- MIL-PRF-19500/ 551, transient voltage suppressor (axial and surface mount available)
- MIL-PRF-19500/ 552, transient voltage suppressor (axial and surface mount available)
- \* *Consult factory for other upscreen device options*
- MIL-PRF-19500/578, switching rectifier diode (axial and surface mount available) *Coming Soon*

## MODULES

- Epoxy encapsulated rectifier assemblies
- mA to 130A+ and 50V to 225kV+
- Catalog and custom products to source control drawings available

## ISOPAC™

- High power density, rugged and reliable high current rectifier assemblies
- Fully hermetic open-frame construction
- 15A to 100A+
- Zero lead length connections for optimal thermal resistance
- Catalog and custom products to source control drawings available



15A Ministud Rectifier



45A Three Phase Full Wave Bridge





# Enabling the future of Optical Communications

from 1G to 400G and beyond

With over **half a billion** optical ICs shipped, Semtech's Signal Integrity Products provide the best combination of performance, quality and value in the market.

## >200 DATACOM

### *Single and Multi-Channel Products*

- CDR – Clock & Data Recovery (Tx or Rx)
- TIA – Transimpedance Amplifier
- LD – Laser Driver
- LA – Limiting Amplifier

### *Integrated Variants*

- CDR+LD, CDR+TIA, Rx+Tx CDR, LD+LA

## >200 VIDEO

### *Single Channel Products*

- RCLK – Reclocker (i.e. a CDR)
- EQ – Equalizer
- CD – Cable Driver
- SER, DES – Serializer, Deserializer

### *Integrated Variants*

- EQ+CD, CD+SER, EQ+DES



## SEMTECH CORPORATION



Semtech Corporation is a leading supplier of analog and mixed-signal semiconductor platforms for high-end consumer, computing, communications, and industrial applications. Semtech, publicly traded since 1967, is listed on the Global Select Market under the symbol SMTC and has more than 31 sales and application support offices in 14 countries as well as representatives and distribution support locations in more than 30 countries.

Semtech is dedicated to providing proprietary platforms, differentiated by innovation, size, efficiency, performance and reach. Our solutions are used in some of the most innovative systems and products in the fastest growing markets today.

These markets include smartphones, LCD TVs, notebooks, tablets, smart grid, automotive, automatic meter reading, medical, wireless infrastructure, PON, Internet of Things, optical transport and datacenters. More than 5,000 customers worldwide rely on our diverse product portfolio and world class technology roadmap for solutions in low-power wireless communications, optical data transport, video broadcasting, power management, circuit protection, touch sensing, and more, making Semtech one of the most balanced semiconductor companies in the industry.

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