solutions

Semtech Products

Short Form Catalog v.30

This Short Form Catalog is a quick introduction to the Semtech product families and is available from your Semtech sales representative and distribution partner in the U.S. and Canada.

www.semtech.com

SEMTECH

Semtech Story

Semtech Corporation is a leading supplier of analog and mixed-signal semiconductor platforms for high-end consumer, computing, communications and industrial applications. Our vision is to be the global leader in analog and mixed-signal platforms enabling architectural and performance differentiation. Semtech, publicly traded since 1967, is listed on the NASDAQ Global Select Market under the symbol SMTC and has more than 32 sales and application support offices in 14 countries as well as representatives and distribution support locations in more than 30 countries. Our proprietary platforms, differentiated by innovation, size, efficiency, performance and reach, are used in some of the most innovative systems and products in the market today. Semtech products can be found in a wide range of fast-growing market segments, including Smart Phones, LED TVs, Tablets, Wireless LAN Modems, Automated Meter Reading, Ultra-Low Power Medical, Satellite Communication, Cellular Infrastructure, Optical Transport, Datacenters and state-of-the-art Broadcast Video industries. More than 5,000 customers worldwide rely on our diverse product portfolio and world class technology roadmap to provide them with solutions for 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.

1960 – 1990

- Company founded High-Reliability Power products for military (1960)
- Initial Public Offering (1967)
- Started Power Management product line with Lambda acquisition – Corpus Christi, TX. (1990)

1991 – 1995

- Adapted military TVS technology; Protection product line formed internally
- Expanded Power Management ECI acquisition – Santa Clara, CA. (1995)
- First ISO 9000 certification (1995)

1996 – 2000

- Test & Measurement product line created with Edge acquisition – San Diego, CA. (1997)
- Advanced Communications product line with Acapella acquisition – Romsey, U.K. (1998)
- Acquisition of USAR, New York (1999)

2001 – 2005

- Transition to Fabless Model (2001 - 2002)
- Began Wireless and Sensing product line with XEMICS acquisition – Neuchatel, Switzerland (2005)

2006

- New CEO
- New Management Team
- New Strategy / Advanced Communication & Sensing

2006 – 2011

- Record Annual Revenue 4/5 years
- Shipping over 2 billion units/year
- Opened Design/Applications Center in Shenzhen, China
- Acquisition/Integration of Sierra Monolithics (2010)

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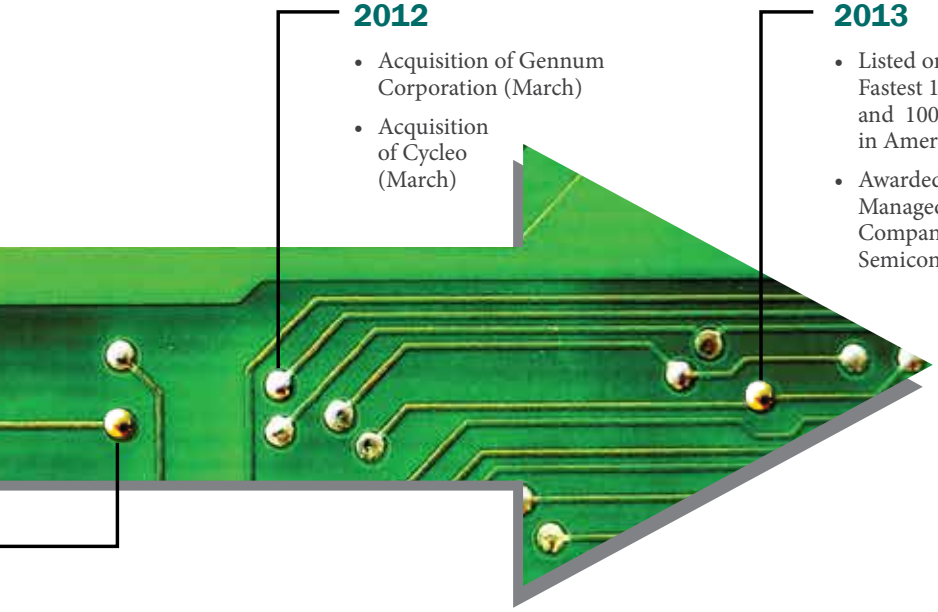


2012

- Acquisition of Gennum Corporation (March)
- Acquisition of Cycleo (March)

2013

- Listed on Fortune Magazine's Fastest 100 Growing Companies and 100 Best Small Companies in America
- Awarded Best Financially Managed Semiconductor Company by Global Semiconductor Alliance

AEC-Q100 Automotive Qualified Devices

Our Expanding Commitment

As automotive market demand increases so does our commitment to power, protect and connect you 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 expand our list of certified products for future applications.

Transient Voltage (TVS) Protection Family - AEC-Q100 Qualified

Part Number	Vrwm (V)	Lines	ESD Rating (air/contact)	Surge (8x20us)	Cap (pF)	Pkg Size (mm)	Interface to Protect
RClamp® 2574NQ	2.5	4	±30kV/±30kV	40A	1.7	3.0 x 2.0 x 0.6	Standard Ethernet
RClamp® 3374N	3.3	4	±30kV/±30kV	40A	1.7	3.0 x 2.0 x 065	
RClamp® 0582BQ	5	2	±30kV/±25kV	15A	1.2	1.6 x 1.6 x 0.75	2-Wire Ethernet Single Twisted Pair
RClamp® 0531TQ	5	1	±20kV/±12kV	4A	0.5	1.0 x 0.6 x 0.5	
RClamp® 2574NQ	2.5	4	±30kV/±30kV	40A	1.7	3.0 x 2.0 x 0.6	LVDS Links
RClamp® 3324P	3.3	4	±17kV/±20kV	4.5A	0.6	2.5 x 1.0 x 0.5	
RClamp® 3374N	3.3	4	±30kV/±30kV	40A	1.7	3.0 x 2.0 x 065	
RClamp® 3346P	3.3	6	±17kV/±20kV	4.5A	0.65	2.7 x 0.8 x 0.5	USB 3.0
RClamp® 3324P	3.3	4	±17kV/±20kV	4.5A	0.6	2.5 x 1.0 x 0.5	
RClamp® 3552T	3.5	2	±12kV/±17kV	4A	0.4	1.0 x 0.6 x 0.4	
RClamp® 0582N	5	3	±20kV/±12kV	5A	0.5	1.2 x 1.0 x 0.58	USB 2.0
RClamp® 0531TQ	5	1	±20kV/±12kV	4A	0.5	1.0 x 0.6 x 0.5	
RClamp® 0582BQ	5	2	±30kV/±25kV	15A	1.2	1.6 x 1.6 x 0.75	
EClamp® 8052P	5	2	±25kV/±30kV	6A	1.2	1.9 x 1.7 x 0.55	
RClamp® 0531TQ	5	1	±20kV/±12kV	4A	0.5	1.0 x 0.6 x 0.5	Antenna Interfaces
RClamp® 1521PQ	15	1	±15kV/±8kV	4A	0.3	1.0 x 0.6 x 0.5	
RClamp® 0582BQ	5	2	±30kV/±25kV	15A	1.2	1.6 x 1.6 x 0.75	
RClamp® 2431TQ	24	1	±13kV/±8kV	2A	0.35	1.0 x 0.6 x 0.5	
µClamp® 0511PQ	5	1	±30kV/±30kV	12A	75	1.0 x 0.6 x 0.5	Audio
µClamp® 3601P	36	1	±20kV/±15kV	2A	25	1.0 x 0.6 x 0.5	CAN bus
µClamp® 3603T	36	3	±20kV/±15kV	2A	50	1.7 x 1.0 x 0.4	
µClamp® 2671P	26	1	±30kV/±30kV	23A	155	1.6 x 1.0 x 0.57	
EClamp® 8052P	5	2	±25kV/±30kV	6A	1.2	1.9 x 1.7 x 0.55	HDMI, MPPI, MHL
SLVU2.8Q	2.8	2	±25kV/±30kV	24A	100	2.9 x 2.37 x 0.90	Analog Video
µClamp® 3311PQ	3.3	1	±25kV/±30kV	5A	12	1.0 x 0.6 x 0.5	Multimedia Touchpoint
µClamp® 0511PQ	5	2	±30kV/±30kV	12A	75	1.0 x 0.6 x 0.5	

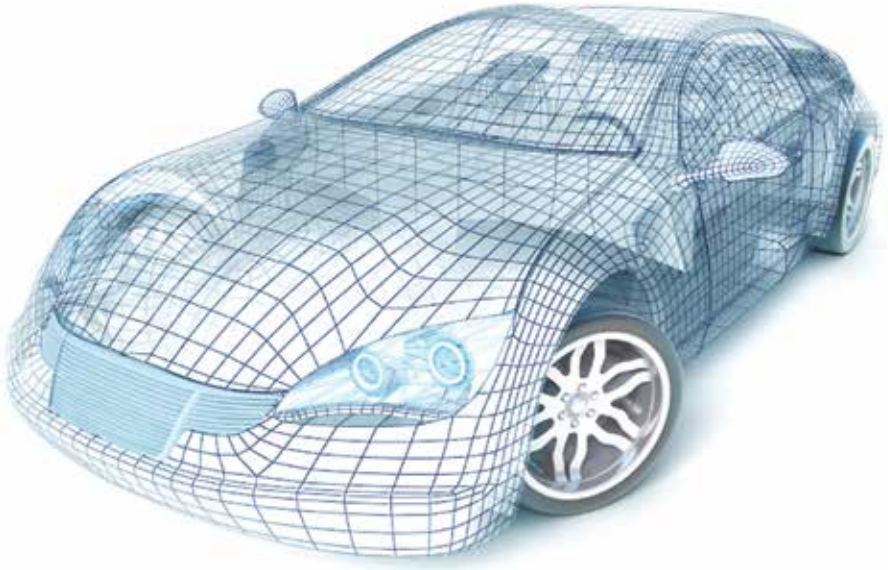
AEC-Q100 Automotive Qualified Devices

Single-line DC Bus Protection - AEC-Q100 Qualified							
Part Number	Vrwm (V)	Lines	ESD Rating (air/contact)	Surge (8x20us)	Cap (pF)	Pkg Size (mm)	Typ Application
µClamp® 0571P	5	1	±30kV / ±30kV	80A	675	1.6 x 1.0 x 0.57	Single-line DC Bus Protection
µClamp® 0871P	8	1	±30kV / ±30kV	65A	475	1.6 x 1.0 x 0.57	
µClamp® 1071P	10	1	±30kV / ±30kV	60A	350	1.6 x 1.0 x 0.57	
µClamp® 1271P	12	1	±30kV / ±30kV	45A	275	1.6 x 1.0 x 0.57	
µClamp® 1571P	15	1	±30kV / ±30kV	40A	220	1.6 x 1.0 x 0.57	
µClamp® 1871P	18	1	±30kV / ±30kV	35A	220	1.6 x 1.0 x 0.57	
µClamp® 2271P	22	1	±30kV / ±30kV	25A	165	1.6 x 1.0 x 0.57	
µClamp® 2671P	26	1	±30kV / ±30kV	23A	155	1.6 x 1.0 x 0.57	
µClamp® 3671P	36	1	±30kV / ±30kV	18A	150	1.6 x 1.0 x 0.57	

Filter Devices (TVS + EMC Filter) - AEC-Q100 Qualified							
Part Number	Vrwm (V)	Lines	ESD Rating (air/contact)	Filter type	Cap (pF)	Pkg Size (mm)	Typ Application
EClamp® 2410PQ	5	6	±17kV / ±12kV	SD Card Termination	15	4.0 x 1.6 x 0.5	SD Card
EClamp® 2357NQ	5	6	±20kV / ±12kV	RC filter SD Card Termination	20	3.0 x 3.0 x 0.6	

Automotive AEC-Q100 Qualified

For a full list of Semtech Automotive certified products and a copy of our Automotive Product Selector Guide visit www.semtech.com/applications/automotive-ic-solutions



Circuit Protection For Popular Applications

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.

Key Features

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

Products

TClamp® = TransClamp
High lightning current handling capability

RClamp® = RailClamp
Low capacitance for high speed applications

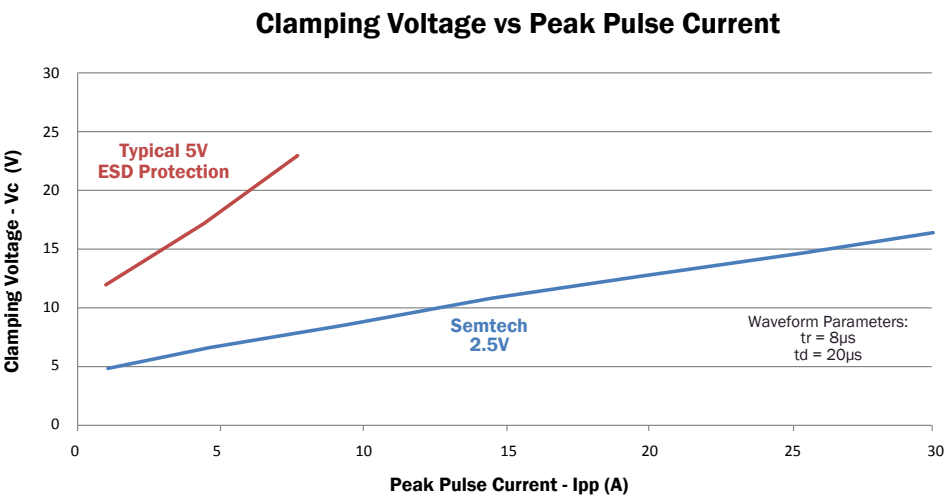
µClamp® = MicroClamp
Single TVS or TVS arrays
Standard TVS Process

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

Application (Port)	Part Number	# of Lines	Voltage (V)	Max Capacitance (Line-GND)	Protection level (8/20µs)*
USB 2.0 (Data Lines)	RClamp® 0552T	2	5	0.4	3A
USB 2.0 (Data Lines + Vbus)	RClamp® 0582N	3	5	0.5	5A
USB (OTG)	RClamp® 1624T	2+1	5+12	0.8	5A
USB 3.0	RClamp® 3346P	6	3.3	0.65	4.5A
HDMI, DisplayPort	RClamp® 3328P	8	3.3	0.65	5A
LCD Panel	RClamp® 3324T	4	3.3	0.65	5A
LCD Panel (EMI filter)	EClamp® 2388P	8	5	27	5A
Single Line	µClamp® 3311Z µClamp® 0541Z µClamp® 1211Z	1 1 1	3.3 5 12	9 9 25	4A 2A 5A
Single Line High Speed	RClamp® 0531Z	1	5	0.4	3A
10/100 Ethernet	RClamp® 0534N RClamp® 3354S	4 4	5 3.3	3** 5	25A 25A
Gigabit Ethernet	RClamp® 3374N TClamp® 3302N	4 2	3.3 3.3	1.7** 25	40A 95A
T1/E1	TClamp® 0602N	2	6	25	95A
CAN Bus	µClamp® 3601P µClamp® 3603T	1 3	33 36	25 50	– 2A
RS485	SM712 TClamp® 1202P	2 2	12/-7 12	75 12	17A 100A
RS232	RClamp® 1224S	4	12	3	15A
Keyboard, I/O	µClamp® 0555T	5	5	9	2A
xDSL	TClamp® 1272S	2	12	5	25A

**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*

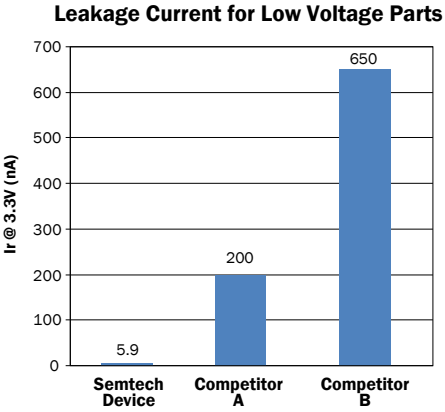
Semtech Advantages



Low Clamping Voltage – Better Protection and less stress on transceiver

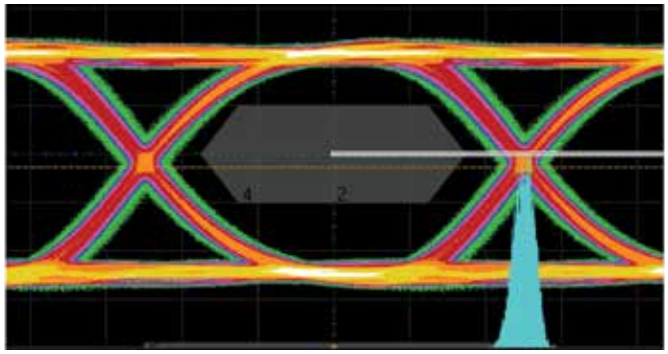
Low Leakage

Increases battery life in handheld electronic devices

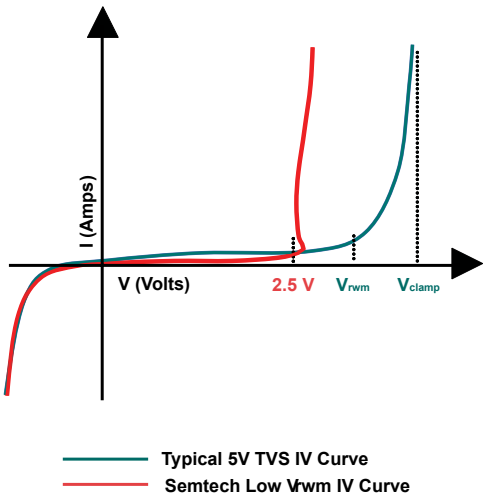


Low Capacitance

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



Lower Working Voltage To Reduce Stress Energy



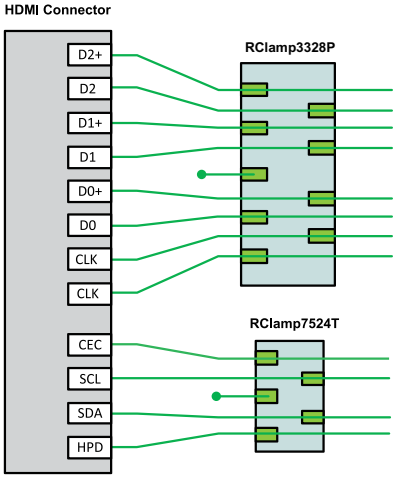
Gigabit Ethernet		
Existing Devices	Next Generation Improved Performance & Packaging	Pin to Pin Improved Performance
RClamp2504N	RClamp2574N	–
RClamp3304N(A)	RClamp3374N	–

10/100 Ethernet		
SLVU2.8-4	RClamp3374N	µClamp2804L
SRV05-4(A)	RClamp0534N	RClamp0554S RClamp3354S
LC03-3.3	–	RClamp2502L
LC03-6	–	TClamp0602L

HDMI, Ethernet & USB 3.0

HDMI Space Saving Solution

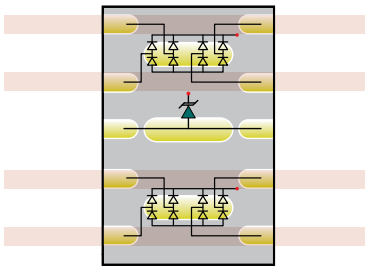
- RClamp7524T - 1.3mm x 0.7mm
- Flow-through layout
- More than 50% PCB savings
- Low capacitance (0.25 typ) to minimize signal degradation

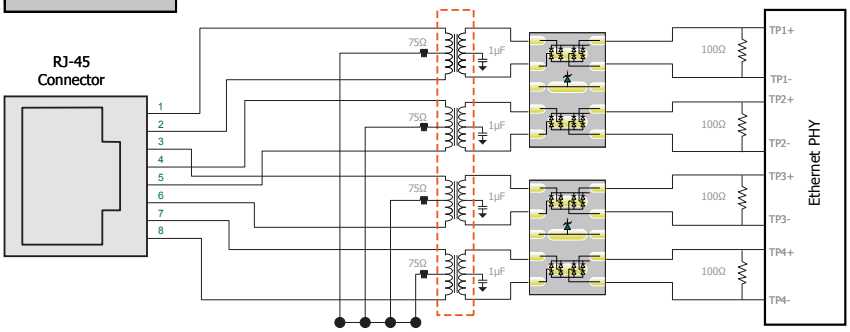


Gigabit Ethernet Protection

- 3.3V working voltage
- Low capacitance: 1.7 I/O to I/O
- Routing possible on one signal layer
- Low clamping voltage performace
- High surge rating: 40A Ipp (8x20µs)

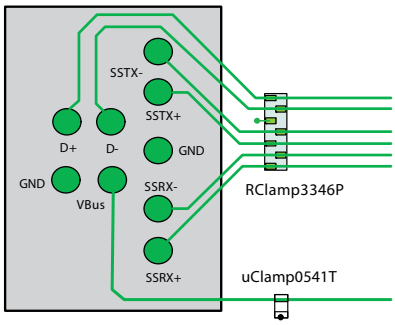
RClamp3374N





USB 3.0 Protection

- Extremely low clamp across entire ESD event
- Low capacitance to minimize signal attenuation
- Low dynamic resistance



Wide Input Voltage Regulators & Controllers

Semtech's Power Management products include feature-rich, highly integrated devices for the telecom industry, and low power, small-package, high-efficiency products for cell phones, handsets, notebook PCs and other portable devices.

Products

- Buck
- Boost
- LDOs
- LED Drivers
- Charge Pumps
- Load Switches
- Battery Chargers
- DDR termination

EcoSpeed® Wide Input Synchronous Buck Regulators

Part Number	Input Voltage	Current	Package (mm)	Features
SC3303	5.5V – 28V	3A	MLPD-10, 3x3	0.75V - 7.5V, Int. LDO, Ultrasonic PSAVE
SC401B	3V – 17V	15A	MLPQ-32, 5x5	0.6V - 85%V_{in}, Programmable Soft Start, Prog. LDO, Ultrasonic PSAVE
SC402B	3V – 28V	10A	MLPQ-32, 5x5	0.6V - 85%V_{in}, Programmable Soft Start, Prog. LDO, Ultrasonic PSAVE
SC403B	3V – 28V	6A	MLPQ-32, 5x5	0.6V - 85%V_{in}, Programmable Soft Start, Prog. LDO, Ultrasonic PSAVE
SC414/424	3V – 28V	6A	MLPQ-28, 4x4	0.75V - 85%V_{in}, 5V LDO, Ultrasonic/Regular PSAVE
SC417/427	3V – 28V	10A	MLPQ-32, 5x5	0.5V - 85%V_{in}, Prog. LDO, Ultrasonic/Regular PSAVE
SC418/9	3V – 28V	30A	MLPQ-20, 3x3	Ext. FETs, 0.5V - 85%V_{in}, Prog. LDO, Ultrasonic/Regular PSAVE
SC461	3V – 28V	30A	MLPQ-20, 3x3	Ext. FETs, Hiccup, 0.6V - 85%V_{in}, 5V LDO, Ultrasonic/Regular PSAVE
SC508(A)*	4.5V – 46V	30A	MLPQ-20, 3x3,Vo	Ext. FETs, Hiccup, 0.6V - 85%V_{in}, 5V LDO, Ultrasonic/Regular PSAVE
SC9301	3V – 28V	10A	MLPQ-34, 5x5	Hiccup, 0.6V - 85%V_{in}, 5V LDO

EcoSpeed® is a registered trademark of Semtech Corporation.

Automotive AEC-Q100 Qualified

Wide Input Asynchronous Buck Regulators

Part Number	V_{in} (V)		V_{out} (V)		I_{out} Max (A)	Isw Min (A)	Shutdown Current (µA)	Fsw (kHz)	Package (mm)	Features
	Min	Max	Min	Max (% Vin)						
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	–
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	93	3.0	3.9	40	350	SO-8 EDP	Programmable Soft Start, hiccup overload protection with frequency foldback

Regulator Solutions for <6V Input

Low Dropout Regulators

Part Number	V_{IN} (V) Min	V_{IN} (V) Max	V_{OUT} (V) Min	I_{OUT} (A) Max	$V_{dropout}$ (V) Max O.T.	$V_{dropout}$ @ Full Load (V) Typ	Package (mm) *Exposed die pad
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
SC4212	1.5	6	0.5	1	0.5	0.2	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*

Dual Linear Dropout Regulator

Part Number	V_{IN} (V) Min	V_{IN} (V) Max	V_{OUT} (V) Min	I_{OUT} (A) Max	$V_{dropout}$ (V) Max O.T.	Output options	Package (mm)
SC560	2.5	5.5	1.2	0.3	200mV	Many fixed outputs available	MLPQ-8 1.5x1.5

Buck Regulator Solutions

Part Number	Current	Package (mm)	Features
SC195/B	0.5A	MLPQ-8, 1.5x1.5 CSP-8, 0.8x0.8	Low BOM 4 bit VID
SC197	2 x 0.5A	MLPQ-18, 2x3	Low BOM 4 bit VID
SC202A	0.5A	MLPQ-13, 2.5x3	Integrated inductor
SC220	0.65A	SOIC 8	PCB trace inductor
SC4626	1A	SOT23-5	Fixed V_{out} Low BOM
SC189	1.5A	MLPD-6, 2x2	Small size fixed V_{out} Low BOM
SC283	2 x 1.8A	MLPQ-18, 2x3	Low BOM 4 bit VID
SC284	2 x 1.8A	MLPQ-20, 3x3	Low BOM 4 bit VID
SC284P	2 x 2A	MLPQ-20, 3x3	3 bit VID, PSAVE, PGOOD
SC183C	2A	MLPQ-16, 3x3	Low BOM 4 bit VID
SC3102	2A	MLPQ-16, 3x3	Fixed V_{out} selectable forced PSAVE
SC185	4A	MLPQ-16, 3x3	Fixed V_{out} Low BOM
SC186	4A	MLPQ-16, 3x3	Low BOM 4 bit VID
SC286	2 x 4A	MLPQ-28, 4x4	Low BOM 4 bit VID

DDR1 to DDR4 Memory Termination LDO Regulator

Part Number	VCC (V) Min	VCC (V) Max	VDDQ (V)	VTT (V)	IVTT (A) Max	DDR Type	Package	Features
NEW SC2597	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

Boost Regulators

Part Number	V_{IN} (V) Min	V_{IN} (V) Max	V_{OUT} (V) Min	V_{OUT} (V) Max	I_{OUT} Min	Shutdown Current (µA)	Iq (mA)	Switching Freq (MHz)	Package (mm)	Features
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
SC122	0.7	1.6	3.3	3.3	0.35	8.5	0.04	1.2	MLPD-6, 1.5x2	Power Save mode at all loads
SC4501	1.4	16	1.4	32	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
SC631	2.9	5.5	–	4.4	0.25	0.1	1.5	0.2	MLPD-8, 2x2	Buck-Boost <30mV ripple, Soft Start
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	0.275	0.1	1.5	0.2	MLPD-8, 2x2	Buck-Boost <30mV ripple, Soft Start

LED Drivers

LED Inductor Based

Part Number	V_{IN} (V)		V_{OUT} (V) Max	Fsw (MHz)	# LEDs per string*	# 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-16 EDP	Open/short string disable OCP, OTP and OVP
SC442	4.5	21	42	0.2 - 1.0	12	10	30	up to 50kHz	TSSOP-20 EDP	Open/short string disable OCP, OTP, OVP and FFLAG
SC443	4.5	27	42	0.2 - 1.2	3	12	30	up to 50kHz	MLPQ-UT-16, 3x3x0.6	Adj freq Open LED string disable OCP, OTP and OVP
SC445	4.5	27	42	0.7	12	4	150	up to 50kHz	TSSOP-20 EDP	Open/short string disable OCP, OTP, OVP and FFLAG
SC446	4.5	27	42	0.8	3	12	100	up to 50kHz	MLPQ-28, 4x4	Open/short string disable OCP, OTP and OVP
SC4541	2.9	20	25	1.25	7	1	200	up to 1kHz	SOT23-6, MLPD-6, 2x2	No external compensation High side Schotky rectifier
SC5010/H	4.5	27	50	2.2	12	8	30	up to 30kHz	MLPQ-28, 4x4	No external compensation 10-bit dimming resolution
SC5012/Q	4.5	45	65	2.2	15	4	150	up to 30kHz	MLPQ-24, 4x4	5000:1 dimming and phase shifted
SC5014	4.5	27	50	2.2	12	4	120	up to 30kHz	MLPQ-20, 4x4	Advanced phase shifted
SC5014A	4.5	27	50	2.2	12	2	240	up to 30kHz	MLPQ-20, 4x4	Advanced high efficiency

**Maximum number of LEDs depends on LED Forward Voltage*

Load Switches

	Part Number	V_{IN} (V)		I_{OUT} Max (A)	RDS ON (mΩ)	Shutdown Current (µA)	Quiescent Current (mA)	Enable Pin	Auto Discharge	ESD (kV HBM)	Package
		Min	Max								
NEW	SC704	1.1	3.6	0.5	90	0.1	2	Yes	No	5	0.76x0.76mm, 4-Bump CSP
NEW	SC705	1.1	3.6	0.5	90	0.1	2	Yes	Yes	5	0.76x0.76mm, 4-Bump CSP

Wireless RF

Semtech provides integrated, short range wireless connectivity solutions. Our wireless RF products consist of RF transceiver, RF transmitter, and RF receiver components covering the Industrial, Scientific and Medical (ISM) band radio frequency spectrum from 100MHz up to 1GHz. Customers worldwide use our wireless RF ICs for applications such as automated wireless remote controls, meter readers, wireless security systems, building automation equipment, and smart lighting systems.

Products

- ISM RF transceivers
- RF transmitters
- RF receivers
- Low-noise amplifier

Complete Line of Semtech RF ICs

Part Number	Tx/Rx	Band (MHz)	Modulation	Max Bit Rate (kbps)	Rx Sensitivity (FSK) (dBm)	Tx Power (dBm)	Link Budget (dB)	Tx Current (FSK) (mA)	Rx Current (mA)
SX1230	Tx	290 – 1020	G/F/MSK & OOK	300 (FSK) 32.7 (OOK)	–	-20 ~ +17	–	33 @ +10dBm	–
SX1243	Tx	310 – 928	FSK & OOK	100 (FSK) 32.7 (OOK)	–	+10	–	15 @ +10dBm	–
SX1239	Rx	290 – 1020	G/F/MSK & OOK	300 (FSK) 32.7 (OOK)	-120	–	–	–	16
SX1210	Rx	863 – 960	FSK & OOK	200 (FSK) 32.7 (OOK)	-107	–	–	–	3
SX1213	Rx	300 – 510	FSK & OOK	200 (FSK) 32.7 (OOK)	-104	–	–	–	3
SX1231	Tx/Rx	290 – 1020	G/F/MSK & OOK	300 (FSK) 32.7 (OOK)	-120	-20 ~ +17	137	33 @ +10dBm	16
SX1231H	Tx/Rx	290 – 1020	G/F/MSK & OOK	300 (FSK) 32.7 (OOK)	-120	-20 ~ +20	140	33 @ +10dBm / 130 @ +20dBm	16
SX1232	Tx/Rx	862 – 1020	G/F/MSK & OOK	300 (FSK) 32.7 (OOK)	-123	-1 ~ +20	143	28 @ +13dBm / 125 @ +20dBm	9.3
NEW SX1236	Tx/Rx	137 – 1020	G/F/MSK & OOK	300 (FSK) 32.7 (OOK)	-123	-20 ~ +20	143	120 @ +20dBm	9.9
SX1233	Tx/Rx	290 – 1020	G/F/MSK & OOK	600 (FSK) 32.7 (OOK)	-120	-20 ~ +17	137	33 @ +10dBm	16
SX1235	Tx/Rx	862 – 1020	G/F/MSK & OOK	300 (FSK) 32.7 (OOK)	-123	-1 ~ +20	143	28 @ +13dBm / 125 @ +20dBm	9.3
SX1211	Tx/Rx	863 – 960	FSK & OOK	200 (FSK) 32.7 (OOK)	-104	-8.5 ~ +12.5	116.5	25 @ +10dBm	3
SX1212	Tx/Rx	300 – 510	FSK & OOK	200 (FSK) 32.7 (OOK	-107	-8.5 ~ +12.5	119.5	25 @ +10dBm	3
SX1257	Tx/Rx	862 – 1020	OFDM, O-QPSK, G/F/MSK & OOK	800kb/s (IEEE Std 802.15.4g-2012: MR-OFDM Option 2 MCS5)	NF=7 dB	–	–	58 @ +5dBm	20
NEW SX1710	Tx	100-1000	G/F/MSK & OFDM	1000kbps	–	+34.5	–	1260mA	+ 20
NEW SX1238	Tx/Rx	902-928	G/F/MSK & OOK	300kbps	-124	+27	151	408mA @ 27dBm	+ 20

LoRa™ Solution

What Is LoRa?

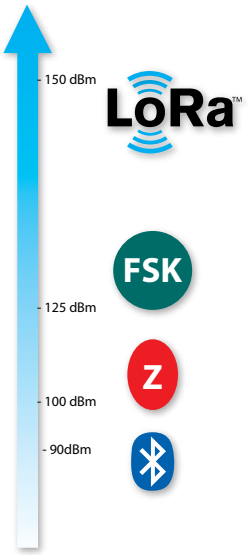
LoRa™ is a disruptive wireless long range technology delivering dramatic performance improvements for the industrial and consumer markets.

Features Include

- A smart PHY layer
- A long range technology
- A modulation scheme, increasing sensitivity dramatically
- An extremely smart and efficient modern architecture
- Same platform enables Long Range,
- Ranging, localization

LoRa Enables

- Ultimate long range solution, 10x existing systems
- Low power, 3x longer battery lifetime
- Improved network capacity, 5x improvement with LoRa concentrator



LoRa™

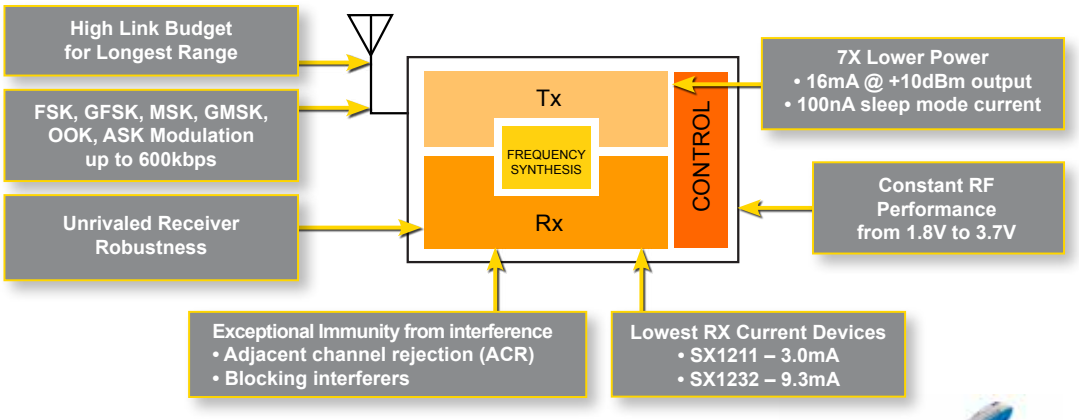
Part Number	Frequency Range (MHz)	Link Budget (dB)	RX Current (mA)	FSK max DR (kbps)	LoRa DR (kbps)	Max Sensitivity (dBm)	TX Power (dBm)
SX1272	862 – 1020	158	10	300	0.3 – 40	-138	+ 20
SX1273	862 – 1020	150	10	300	1.7 – 40	-130	+ 20
SX1276	137 – 1020	168	11	300	0.018 – 40	-148	+ 20
SX1277	137 – 1020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

Part Number	Tx/Rx	LoRa Rx Modem	FSK Modem	Capacity
SX1301	Tx/Rx	9	1	10 – 50K nodes/SX1301

LoRa™ - Ultimate Long Range Solutions

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

10-50x range improvement versus existing solutions



Advanced metering infrastructure

Set top box to devices

Machine to machine

Internet of things (IOT)

Capacitive Touch

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

Applications

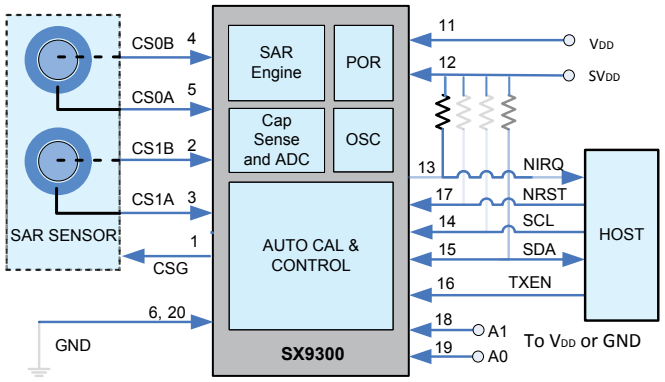
- Tablet eBook
- Flat panel TV
- LCD monitors
- White goods & appliances
- Printers
- Automotive audio console
- Personal media players
- Set Top Box (STBs)
- Game consoles
- Industrial systems

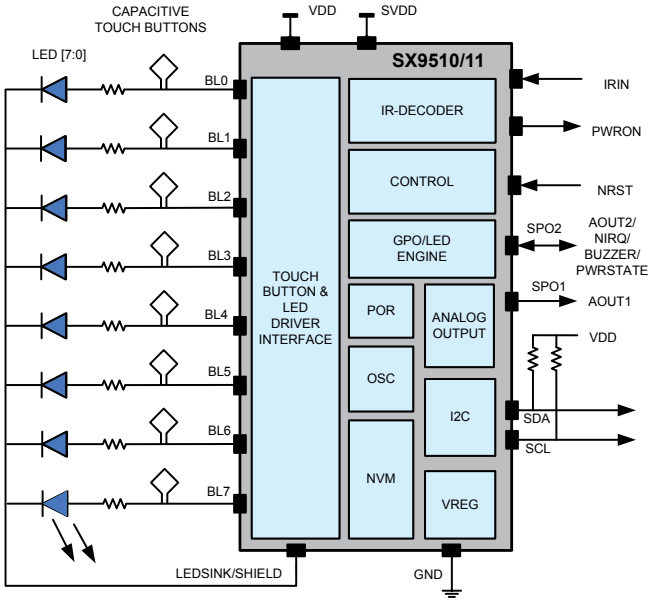
Part Number	Button #	LED Driver	Interface	Prox.	Button	Slider	Wheel	Intensity	Fade-in/out	Auto Light.	Package (mm)
SX8633	12	8	I²C	✓	✓			Lin./Log.	✓	✓	QFN 5x5
SX8634	12	8	I²C	✓	✓	✓		Lin./Log.	✓	✓	QFN 5x5
SX8635	12	8	I²C	✓	✓		✓	Lin./Log.	✓	✓	QFN 5x5
SX8636	8	8	I²C	✓	✓			Lin./Log.	✓	✓	QFN 4x4
SX8638	8	8	I²C	✓	✓	✓		Lin./Log.	✓	✓	QFN 4x4
SX8639	8	8	I²C	✓	✓		✓	Lin./Log.	✓	✓	QFN 4x4
SX8643	12	8	I²C		✓			Lin./Log.	✓	✓	QFN 5x5
SX8644	12	8	I²C		✓	✓		Lin./Log.	✓	✓	QFN 5x5
SX8645	12	8	I²C		✓		✓	Lin./Log.	✓	✓	QFN 5x5
SX8646	8	8	I²C		✓			Lin./Log.	✓	✓	QFN 4x4
SX8647	8	8	I²C				✓	Lin./Log.	✓	✓	QFN 4x4
SX8648	8	8	I²C		✓	✓		Lin./Log.	✓	✓	QFN 4x4
SX8649	8	8	I²C		✓		✓	Lin./Log.	✓	✓	QFN 4x4
SX8660	8	8	I²C/Analog		✓			Lin./Log.	✓	✓	QFN 4x4
SX8661	8	8	I²C/Analog	✓	✓			Lin./Log.	✓	✓	QFN 4x4
SX8662	36	36	I²C		✓			Lin./Log.	✓	✓	QFN 5x5
SX8663	36	36	I²C	✓	✓			Lin./Log.	✓	✓	QFN 5x5
SX9300	2	–	I²C	✓	✓	SAR Engine		–			QFN 3x3
SX9500	4	–	I²C	✓	✓			–			QFN 3x3
SX9501	4	–	Analog	✓	✓			–			QFN 3x3
SX9510	8	8	I²C/Analog	✓	✓	IR Detect		Lin./Log.	✓	✓	QFN 4x4, TSSOP 4.4x7.8
SX9511	8	8	I²C/Analog		✓	IR Detect		Lin./Log.	✓	✓	QFN 4x4, TSSOP 4.4x7.8
SX9512	8	8	I²C/Analog	✓	✓			Lin./Log.	✓	✓	QFN 4x4, TSSOP 4.4x7.8
SX9513	8	8	I²C/Analog		✓			Lin./Log.	✓	✓	QFN 4x4, TSSOP 4.4x7.8

Capacitive Touch

World's First Smart Proximity SAR Compliant Solution

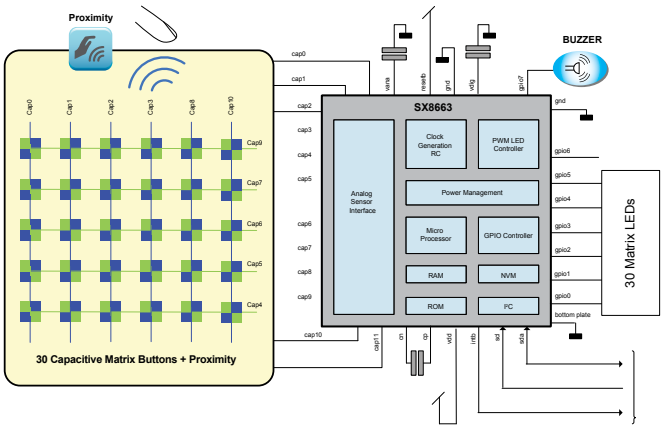
Unlike traditional capacitive controllers which can be easily triggered by a range of different elements, Semtech's proprietary SX9300 features a unique design to discriminate between an inanimate object and a human body. Wireless devices are now able to maintain maximum performance and reduce the RF emission only when it is necessary (i.e. presence of a human body). With power consumption as low as 2.5µA and high sensitivity for small sensor design make it an ideal solution for SAR compliant devices.





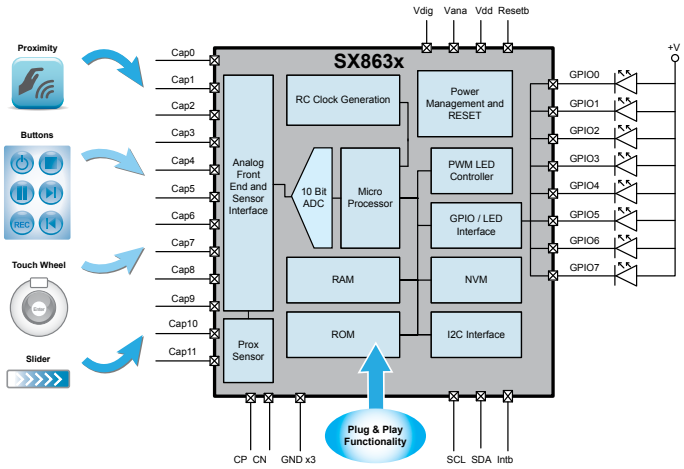
Ultra Low Power, Capacitive Touch Button Matrix Solution With Proximity & Individual LED Drivers

The versatile SX8662/63 platform provides a cost effective solution to support various touch user interface designs (up to 36 buttons) in a space saving 5x5mm footprint. It also comes with individual LED drivers for visual feedback as well as buzzer control for audible feedback.



World's Lowest Power, Fully Integrated Capacitive Touch Sensors With Enhanced LED Drivers & Proximity Sensing

The superior sensitivity of the SX863x/4x touch sensor platform enables sensing through a thick overlay material as well as proximity detection with an extended range (>10cm) all in a tiny footprint with zero components per input. The low power consumption and advanced, built-in LED drivers make it the ideal solution for a wide range of sensing applications in mobile phone, media players, notebooks and white goods.



Resistive Touch

Wireless, Sensing & Timing Products

Semtech's ultra-low power, fully integrated touchscreen controller platform enables multi-touch gestures on regular 4-wire resistive touchscreens and supports proximity on any panel. It also features advanced haptics control as well as robust on-chip ESD protection in a small footprint.

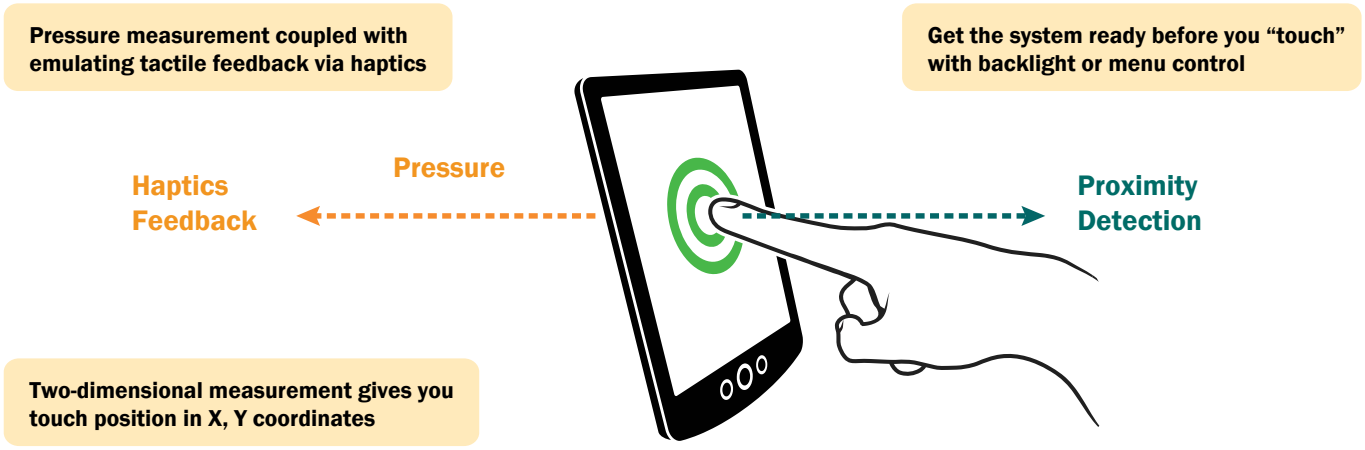
Applications

- Portable navigation device
- Automotive center console
- Digital photo frame
- DSC, video camera
- Handheld games & mobile
- POS terminals
- Control panel

Key Features

- Low power (0.4µA)
- Compatible with a wide range of resistive panels
- Enable 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
- Robust ESD protection (±25kV air & ±15kV contact)
- 50kSPS Eq. Throughput
- Digital filters

Part Number	Interface	Multi-touch	Proximity Sensing	Haptics	Package (mm)
SX8650	I²C	No	No	No	WLCSP 1.5x2.0, QFN 3x3
SX8651	I²C	✓	No	No	WLCSP 1.5x2.0, QFN 3x3
SX8652	SPI	No	No	No	WLCSP 1.5x2.0, DFN 4x3
SX8653	SPI	✓	No	No	WLCSP 1.5x2.0, DFN 4x3
SX8654	I²C	No	✓	Generic	WLCSP 2x2, QFN 4x4
SX8655	I²C	No	No	Generic	WLCSP 2x2, QFN 4x4
SX8656	I²C	No	✓	No	WLCSP 2x2, QFN 4x4
SX8657	I²C	No	✓	Immersion	WLCSP 2x2, QFN 4x4
SX8658	I²C	No	No	Immersion	WLCSP 2x2, QFN 4x4
SX8674	I²C	✓	✓	Generic	WLCSP 2x2, QFN 4x4
SX8675	I²C	✓	No	Generic	WLCSP 2x2, QFN 4x4
SX8676	I²C	✓	✓	No	WLCSP 2x2, QFN 4x4
SX8677	I²C	✓	✓	Immersion	WLCSP 2x2, QFN 4x4
SX8678	I²C	✓	No	Immersion	WLCSP 2x2, QFN 4x4



Wireless, Sensing & Timing Products

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 IOs 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.

Applications

- Cell phones, PDAs, MP3 players
- Digital camera
- Portable multimedia player
- Notebooks
- GPS Units
- Industrial, ATE
- Any battery powered equipment

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 2-wire I2C compatible slave interface
- Open drain active low interrupt output (NINT) Bit maskable Programmable edge sensitivity
- Power-On Reset and reset input (NRESET)
- Ultra low current consumption of typ. 1uA
- -40°C to +85°C operating temperature range
- Ultra-Thin 3x3mm QFN-UT-20 package (SX1501/SX1502)
- Ultra-Thin 4x4mm QFN-UT-28 package (SX1503)

Semtech GPIO Family

Part Number	I/O Chan.	I/O Volt. Range (V)	Inter-face	Max Current (mA)	Dual I/O Supplies	Pull Up/ Pull Down	PLD Function	Lin./Log. Intensity	Blink	Breath	Keypad Scan. Engine	Polarity Inversion	Current (µA)	I²C Add.	Package (mm)
SX1501	4	1.2 - 5.5	I²C	12/24	–	✓	✓	–	–	–	–	–	1	2	3x3
SX1502	8	1.2 - 5.5	I²C	12/24	✓	✓	✓	–	–	–	–	–	1	2	3x3
SX1503	16	1.2 - 5.5	I²C	12/24	✓	✓	✓	–	–	–	–	–	1	1	4x4
SX1504	4	2.3 - 5.5	I²C	12/24	–	✓	✓	–	–	–	–	–	1	2	3x3
SX1505	8	2.3 - 5.5	I²C	12/24	✓	✓	✓	–	–	–	–	–	1	2	3x3
SX1506	16	2.3 - 5.5	I²C	12/24	✓	✓	✓	–	–	–	–	–	1	1	4x4
SX1508B	8	1.2 - 3.6	I²C	15	✓	✓	–	✓	✓	✓	✓	✓	1	4	3x3
SX1509B	16	1.2 - 3.6	I²C	15	✓	✓	–	✓	✓	✓	✓	✓	1	4	4x4
SX1511B	8	1.2 - 3.6	SPI	15	✓	✓	–	✓	✓	✓	✓	✓	1	–	3x3
SX1512B	16	1.2 - 3.6	SPI	15	✓	✓	–	✓	✓	✓	✓	✓	1	–	4x4

✓ Enable direct I/O expansion for latest low core voltage chipsets *✓ Multiple configurations/features optimized for different applications*

Industry-Leading High-Performance Synchronization PLL

The new extremely flexible synchronization PLL from Semtech builds on 15 years' experience in providing single-chip synchronization devices. Semtech has integrated class leading low jitter clock generation that is designed to meet the timing requirements of today's high-speed data interfaces - the key metric for achieving robust, low error, communication over real-life links. Highly integrated and ready for use in dense applications, this new device marries Semtech's telecom synchronization expertise with the requirements of the latest generation of high speed platforms including software controlled time-locked loops.

As designers wrestle with combining accurate low jitter clock generation, software synchronization such as IEEE1588 and standards-based clock synchronization the ACS8652 brings a complete all-in-one solution to the market. The new device is the perfect partner for applications ranging from small cells through wireless backhaul to telecom core infrastructure equipment.

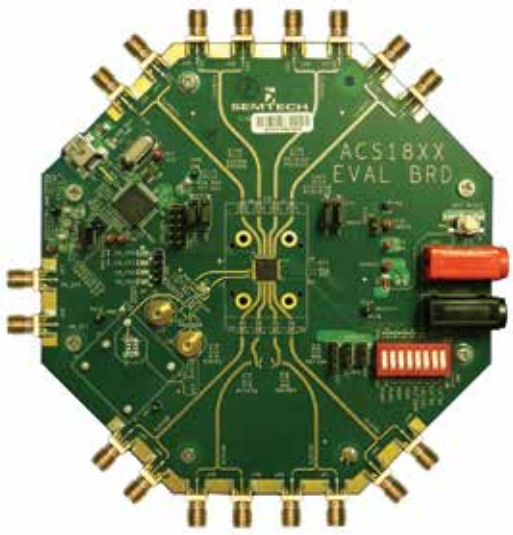
Extremely flexible internal dividers allow any-to-any frequency mapping making the ACS8652 ideal for applications involving multiple interface types. The inbuilt digitally controlled oscillator (DCO) is fully self-contained eliminating the need for external loop-filter components or tunable crystal oscillators. The extended bandwidth of the ACS8652 together with features such as hitless switching and sophisticated input monitoring allows these devices to provide the wander filtering capabilities required by G.8262-compliant Synchronous Ethernet Equipment Clocks (EECs) and other telecom-class equipment. The DCO can be controlled directly by an external CPU to allow the device to be used as a frequency synthesizer with very fine resolution. The ACS8652 can be connected to a local CPU through an SPI or I2C interface for configuration and status monitoring. Additionally, an internal OTP memory can be factory-programmed to create customer-specific variants that can be used without additional configuration.

Features

- Jitter cleaner and linecard PLL
- Telecom PLL for Synchronous Ethernet and SONET/SDH
  - G.812/G.813/G.8262 etc.
- Frequency synthesizer mode for programmable clock generation
  - Ultra-fine resolution-better than 5x10-11
- Single and Dual PLL operation
- Hitless switching between any input at any frequency
- RMS jitter < 300 fs (12 kHz – 20 MHz)
- Four inputs with frequency monitoring
  - Any Input frequency 1 Hz – 850 MHz
  - Including Time-to-frequency conversion (eg. 1pps to any frequency)
- Four outputs supporting multiple differential and single-ended standards
  - Any Output frequency 2 kHz – 850 MHz (continuous)
  - Also spot frequencies 1.25 GHz (maximum)
- Full holdover with programmable averaging and hold-off
- Loop bandwidth 50 mHz – 8.4 kHz
- SPI or I2C interface for local CPU connection
- Programmable control configuration and status pins
  - Full OTP configuration memory
  - Factory OTP customization options
  - 4 configurable setups (OTP) selected by pin strapping
- 2.5V or 3.3V operation
- QFN 7x7 package

Applications

- Telecom and datacom linecards
- 1G and 10G Synchronous Ethernet switches and routers
- SONET/SDH equipment
- General purpose jitter cleaning
- Software controlled time locked loop (e.g. IEEE1588 client)
- High resolution frequency synthesis



ToPSync® Integrated Sync Solutions

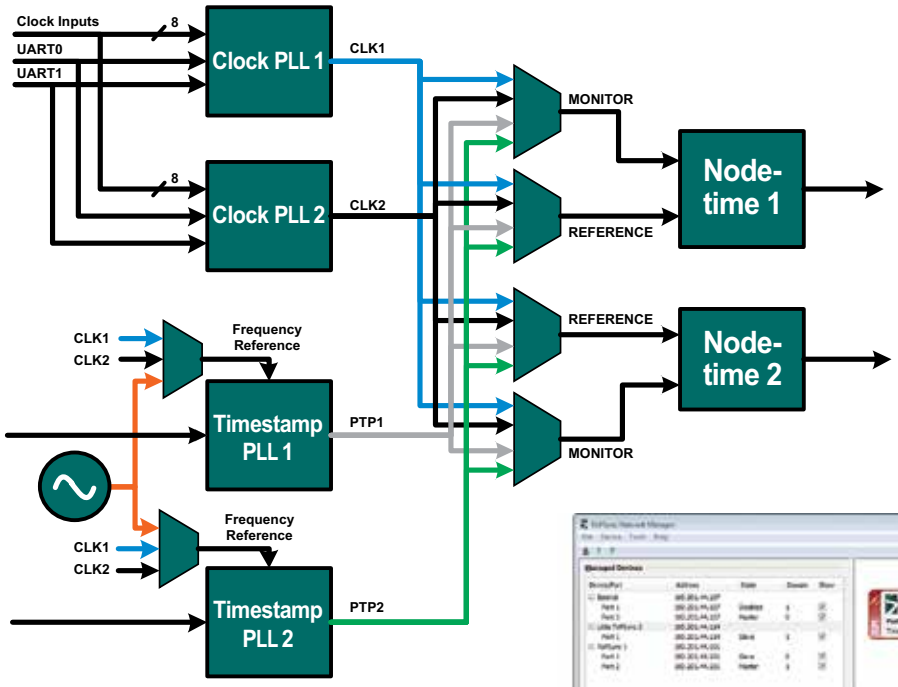
ToPSync is the world's most integrated sync solution and is suitable for use in applications ranging from single port end devices such as an LTE small cell to multiport core routers. A 6-PLL architecture allows simultaneous use of two physical layer clock sources and two PTP flows with hitless switching between sources. Two fully independent PTP Master functions are provided for use as grandmasters or as part of a boundary clock.

The advanced time recovery algorithm in ToPSync employs a number of techniques to achieve high precision time alignment using PTP, even over heavily-loaded, multihop, legacy networks and provides a performance versus cost tradeoff by enabling lower cost TCXOs to be used in many applications.

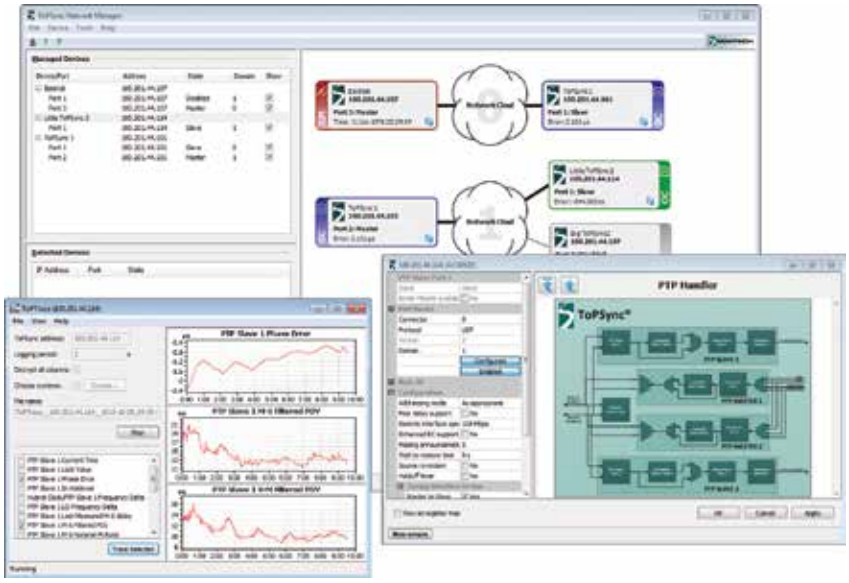
The ToPSync Toolkit allows easy evaluation and debug of a ToPSync-based system from an Ethernet-attached PC and includes the Network Manager GUI for configuration and control and ToPTrace – a powerful data capture and analysis tool. ToPTrace can display real-time performance data including network delay measurements and output TIE, MTIE and TDEV analyse.

Features

- World's most integrated sync solutiona true single-chip device
- Physical layer and packet timing in a single device
- IEEE1588 (PTP) master, slave and boundary clock functionality
- Embedded CPU and memory eliminates external real-time software
- Innovative 6-PLL architecture provides flexibility for multiple applications
- Industry's leading PTP algorithm achieves sub-microsecond performance over legacy networks
- Synchronous Ethernet + PTP hybrid mode operation achieves better than 100 ns alignment
- Dual SGMII Ethernet ports for PTP traffic and control and SPI port for control
- Support for internal or external time stamping
- Available with hardware Stratum 3/3E support
- Master-only part available for costsensitive applications
- Includes ToPSync Toolkit – advanced management software for evaluation and debug



ToPSync PLL Architecture



Network Manager and ToPTrace

OEM Modules & ToPPORT

Semtech's range of ToPSync-based sync modules allows equipment manufacturers to include advanced sync features with minimal effort.

Semtech makes available a ToPSync reference design which includes the local oscillator and associated circuitry on a convenient 70 x 44mm plug-in module. The module concept allows the system builder to add synchronization as a customizable option in an efficient manner.

The ACS2677 is an enhanced GNSS holdover module with PTP capability. Patented algorithms allow the embedded oven-controlled oscillator to provide the holdover requirements demanded by latest generation wireless systems. The PTP function can be used as both a Slave and a Master, providing a backup to GNSS and protection against jamming and spoofing while delivering time-of-day to associated nodes that do not have direct GNSS access.

ToPSync Reference Design

- ToPSync® on a module
- Simple and time-saving route to market
- On-module or external oscillator options
- On-module power supply option for ease of integration
- SGMII, SPI, frequency and time-of-day inputs and outputs

Features ACS2677

- GNSS Holdover module replacement
- Provides extended holdover capability and IEEE1588 (PTP) in a single module
- +/- 1.5 µs holdover for 24 hours
- Ideal for use in LTE base stations and aggregators
- Can be used with GNSS receiver to provide PTP Master
- PTP Slave can be used to protect against GNSS jamming and spoofing
- Concurrent PTP Master and Slave (for GNSS distribution and protection)
- Automatic detection and correction of PTP link asymmetry

The Semtech ACS9860 ToPPORT is a unique and innovative solution featuring an IEEE1588 boundary clock and master and slave ordinary clock in an SFP form-factor module compatible with triple-speed SFP ports on legacy switches and routers. Slotting the ToPPORT into a legacy Ethernet device can immediately add IEEE1588 boundary clock capabilities allowing existing networks to support emerging customer requirements that call for precise time alignment.

Applications include LTE-TDD as well as techniques such as eICIC, eMBMS and CoMP.

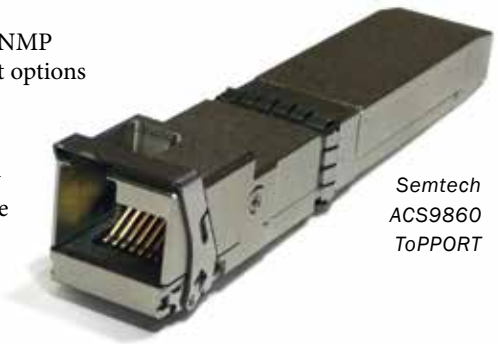
The advanced features of the embedded ToPSync allow GNSS and PTP to be used together to provide the most robust time synchronization solution available with the ability to compensate for network asymmetry and GNSS availability issues. Management of the ToPPORT can be integrated into a customer's existing management system or provided by our partner's SNMP-based management option. Zero-touch configuration allows initial setup via a remote server facilitating minimal-effort installation.

Features

- The world's most complete IEEE1588 solution, now in a pluggable module
- Boundary clock and master/slave ordinary clock in a plug-in module
- Standard SFP form-factor
- Extends useful life of legacy network equipment
- Facilitates LTE-TDD backhaul over existing networks
- Ideal for supplementing GNSS to increase system availability
- Host powered
- Clock and time-of-day input and output
- Multiple advanced SNMP capable management options available
- Zero-touch configuration option
- Available as complete solution or OEM product

Applications

- LTE-TDD
- eICIC
- eMBMS
- CoMP



Semtech ACS9860 ToPPORT

Networking Solutions

Enabling High Performance & Speed:

- Class leading IC solutions for 100G applications in CFP, CFP2/4 and QSFP 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 signal conditioners with integrated DML or EML driver
- Low power, reference-free CDRs
- Limiting amplifiers (LA) that provide wideband, low noise post-amplification
- Transimpedence amplifiers (TIAs) that exceed the IEEE 10GbE 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 10 Gb/s CDR, enabling long reach Infiniband® QDR, 40 GbE and 100 GbE applications
- Protocol-independent repeaters/redrivers
- SFP+ reference design kits for optical module and copper cable assemblies to decrease design time

Building The Future Together

As networking requirements continue to evolve, so will we, 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.

Technologies

CDRs

- Market leader in CDRs
- Reference-Free operation
- Integrated solutions to address power requirements of emerging SFP+ SONET market
- Spanning data rates from 9.95G to 28.05G

ROSAs

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

TIAs

- Proven reliability, with over 44 million sold

Laser Drivers & Limiting Amps

- Only integrated solution among industry leaders

Markets

100G Ethernet

- Class leading CDRs, TIAs and drivers
- Solutions for CFP, CFP2/4 and QSFP

16G Fibre Channel

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

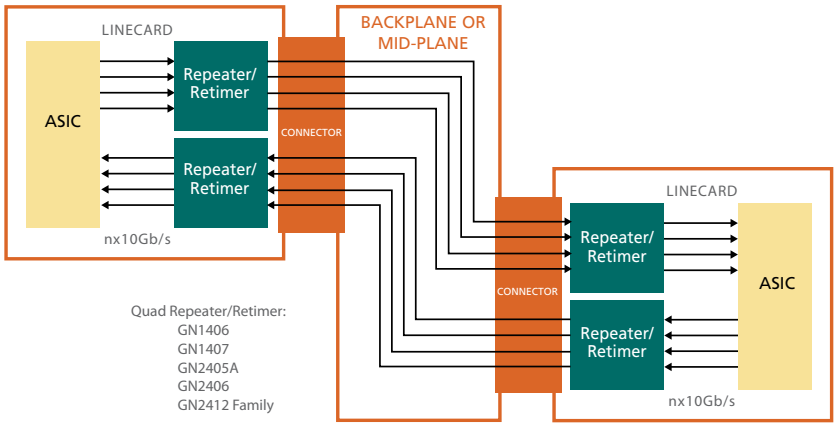
10G

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

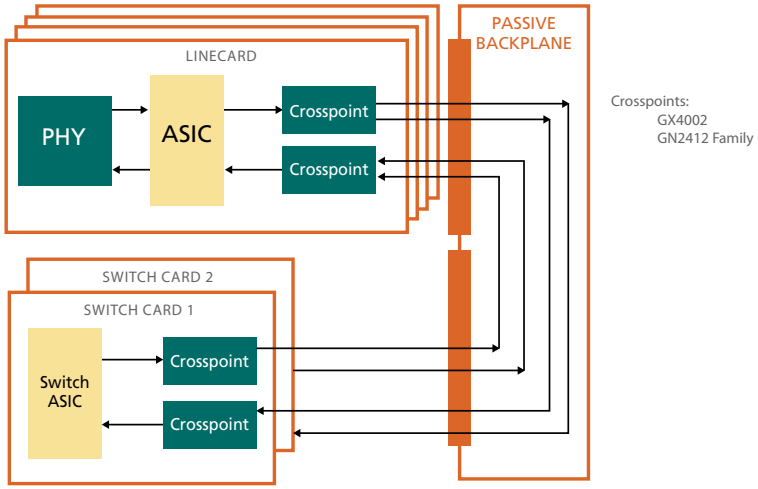
PON/FTTH

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

High-Speed Backplanes



Redundancy Switching



Networking Solutions

Dual-Lane CDRs

Part Number	Data Rate (Gb/s)	Lanes	Laser Driver	Slice Level Adjust	Pin Compatibility	Supply (V)	Package (mm)	Applications
NEW GN2042	9.8-11.3	2 (1 Rx + 1 Tx)	DML	Yes	GN2010D	1.8 & 3.3	QFN 32	XFP and SFP+ 10GbE and OC-192 Enables 1W Retimed SFP+ 10km
NEW GN2044	9.8-11.3	2 (1 Rx + 1 Tx)	EML	Yes	GN2010EA	1.8 & 3.3	QFN 32	XFP and SFP+ 10GbE, OC-192 and DWDM Enables 1.5W Retimed SFP+ 40/80km
NEW GN2040	9.8-11.3	2 (1 Rx + 1 Tx)	–	Yes	GN2012A	1.8	QFN 32	XFP and SFP+ 10GbE, OC-192 and DWDM
GN2017A	9.95-11.7, 14.025	2 (1 Rx + 1 Tx)	VCSEL	No	GN2010X	3.3	QFN 32	16G FC, 10G FCoE
GN2425	25.7 - 28.05	2 Tx	–	Yes	–	3.3	QFN 32	100Gb/s Ethernet, 100Gb/s OTN, and Infiniband EDR
GN2426	25.7 - 28.05	2 Rx	–	Yes	–	3.3	QFN 32	100Gb/s Ethernet, 100Gb/s OTN, and Infiniband EDR

Multi-Lane Signal Conditioners

Part Number	Data Rate (Gb/s)	Lanes	CDR	Ref Clock	Input Stage	De-emphsis	Pin Compa-tibility	Supply (V)	Package (mm)	Applications
GN1406	2.5, 3.125, 5.0, 6.25	4	Yes	Required	Equalizer (Program-mable)	Yes	GN1407	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
GN1407	1 - 8	4	–	N/A	Equalizer (Program-mable)	–	GN1406	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
GN2405A	9.8 – 10.95	4	Yes	Not Required	Equalizer	Yes	GN2406	3.3	QFN 48	10GbE, 40GbE, 100GbE, Infiniband®, QDR
GN2405A-S	9.95 – 11.3	4	Yes	Not Required	Equalizer	Yes	GN2405A, GN2406	3.3	QFN 48	10GbE, 40GbE, CPRI
GN2406	9.95 – 11.3	4	Yes	Not Required	Limiting Amp	Yes	GN2405A	3.3	QFN 48	10GbE, 40GbE, 100GbE, Infiniband®, QDR
GN2406-S	9.8 – 10.95	4	Yes	Not Required	Limiting Amp	Yes	GN2405A, GN2406	3.3	QFN 48	10GbE, 40GbE, CPRI
GX4002	9.95 - 11.3, 14.025	2	Yes	Not Required	Equalizer	Yes	–	3.3	QFN 32	10GbE,40GbE, 100GbE, 16G Fibre Channel
GN2402	9.8 - 11.1	4	Yes	Not Required	Equalizer	Yes	–	3.3	QFN 44	10GbE, 40GbE, 100GbE, CPRI
GN2404 Family	1.25 - 12.8	4	Yes	Required	Adaptive Equalizer + 5-tap DFE	Yes	–	0.9 & 1.8	BGA 144	10GbE, 40GbE, 100GbE, Infiniband®, QDR, CPRI
GN2408 Family	1.25 - 12.8	8	Yes	Required	Adaptive Equalizer + 5-tap DFE	Yes	–	0.9 & 1.8	BGA 144	10GbE, 40GbE, 100GbE, Infiniband®, QDR, CPRI
GN2412 Family	1.25 - 12.8	12	Yes	Required	Adaptive Equalizer + 5-tap DFE	Yes	–	0.9 & 1.8	BGA 144	10GbE, 40GbE, 100GbE, Infiniband®, QDR, CPRI
GN2415	1.2 - 15.0	8	–	–	–	–	–	–	–	16G Fiber Channel, Infiniband FDR, Backplanes > 12.5Gb/s
GT1706	1.25 - 14.5	6	Yes	Required	Adaptive Equalizer	Yes	–	0.9 & 1.8	BGA 144	HD/3G/4K/8K Video Broadcast testing Fibre Channel/Infiniband/Ethernet Link Testing BERT Developments

Optical Solutions

LASER DRIVERS

Part Number	Overview	Data Rate (Gb/s)	Max Mod / Bias Current	Supply (V)	Pkg.	Applications
NT20042	300 Mb/s LED Driver	0.3	100mA	3.3/5.0	QSOP 16	OC-3, Fast Ethernet
NT22L33	1.25 Gb/s FP/DFB Laser Driver	1.25	70mA /80mA	3.3/5.0	QFN 24 4mm	OC-3, OC-12, GbE
GN1153	DFB/FP Laser Driver	to 11.3	80mA /120mA	3.3 (opt. 5V output stage)	QFN 24	10GbE, OC-192
GN1160	DFB driver	to 11.3	90mA/ 120mA	3.3 (Opt. 2.9)	QFN 28	10GE SFP+ 10GBASE-LR
GN1161	VCSEL driver	to 11.3	20mA/15mA	3.3 (Opt. 2.9)	QFN 28	10GE SFP+ 10GBASE-SR

LIMITING AMPLIFIERS

Part Number	Overview	Data Rate (Gb/s)	Gain	BW	Supply (V)	Noise Figure	Applications
NT20045	200 Mb/s Limiting Amp	0.2	60dB	0.125	3.3/5.0	80uV	OC-3, Fast Ethernet
NT24L71	1.25 Gb/s Limiting Amp	1.25	46dB	0.938	3.3	300uV	OC-3, OC-12, GbE
NT24L73	1.25 Gb/s Limiting Amp	1.25	46dB	0.938	3.3	300uV	OC-3, OC-12, GbE
GN1250L	10/14G Limiting Amp	to 14.5	33.7dB	14.7GHz	+3.3	13dB	10GbE, OC-192, 8G and 16GFC

TRANSCEIVER IC (LD&LA)

Part Number	Overview	Data Rate (Gb/s)	Max Mod / Bias Current	Supply (V)	Pkg.	Applications
NT25L91	2.5 Gb/s Burst Mode LDD & LA	2.5	90mA /100mA	3.3	QFN 28	EPON, GPON, BOSA-on-Board
NT28L90	10 Gb/s Burst Mode LDD & LA	Rx 10.3 Tx 2.5	90mA /100mA	3.3	QFN 28	10GEPON, XG-PON1 (Asymmetric)
GN7354	Burst Mode DFB + Receive LA & CDR	Rx: 10.3 Tx: to 2.5	90mA /90mA	3.3 (3.3 or 5V output stage)	QFN 32	10GEPON, XG-PON (Asymmetric)
GN7355	Burst Mode DFB + Receive LA & CDR	10.3	90mA /90mA	3.3 +5 output stage (optional 3.3V)	QFN 32	10GEPON, XG-PON (Symmetric)
GN1411	DFB/FB Laser Driver + Receive LA	to 11.3G	80mA /120mA	3.3	QFN 32	10GbE, OC-192
GN1412	EML Laser Driver + Receive LA	to 11.3G	2.5Vpp /120mA	3.3	QFN 32	10GbE, OC-192
GN1444	EML Laser Driver + Receive LA	to 11.3G	2.5Vpp /120mA	1.8 & 3.3	QFN 32	10GbE, OC-192
GN1157	DML Laser Driver + Receive LA	to 11.3G	90mA /120mA	3.3	QFN 28	10GbE LR SFP+
GN1158	VCSEL Laser Driver + Receive LA	to 11.3G	20mA /15mA	3.3	QFN 28	10GbE SR SFP+
GN25L95	Burst Mode DFB + Receive LA	to 2.5G	90mA /100mA	3.3	QFN 28	EPON, GPON, BOSA-on-Board

Optical Solutions

TIAs

Part Number	Overview	Data Rate (Gb/s)	Gain	BW (GHz)	Supply (V)	Noise	Applications
NT20R67	155 Mb/s AGC TIA	0.155	44.6kΩ	0.165	3.3/5.0	11 nA	OC-3, Fast Ethernet
NT20067	155 Mb/s AGC TIA	0.155	23.4kΩ	0.165	3.3/5.0	11 nA	OC-3, Fast Ethernet
NT23L50	622 Mb/s AGC TIA	0.622	50kΩ	0.32	3.3	60 nA	OC-12, BPON
NT24L50	1.25 Gb/s AGC TIA	1.25	25kΩ	0.75	3.3	92 nA	GbE, EPON
NT24L55	1.25 Gb/s High Sensitivity AGC TIA	1.25	46kΩ	0.75	3.3	74 nA	EPON
NT25L51	2.5 Gb/s AGC TIA	2.5	8kΩ	1.7	3.3	230 nA	OC-48, GPON (APD)
GN25L52	2.5 Gb/s AGC TIA	2.5	6.5kΩ	1.85	3.3	455 nA	OC-48, GPON (APD)
NT25L59	2.5 Gb/s High Sensitivity AGC TIA	2.5	29kΩ	1.5	3.3	108 nA	GPON (PD)
NT28L52	10G Limiting	to 10.3	2.35kΩ	7	3.3	1.2µA	10BASE-SR
GN1056	10G Linear	to 11.3	500/1kΩ	12	3.3	1µA	OC-192
GN1058	10G AGC	to 11.3	4kΩ	12	3.3	1µA	10GBASE-LRM & DWDM
GN7068	10G Limiting	to 11.3	3kΩ	12	3.3	1µA	APD ROSAs for 10G PON ONU & 10GBASE-ZR
GN1068	14G Limiting	to 14.3	6.75kΩ	12	3.3	1.2µA	10GBASE-SR/LR/ER & 16G FC
GN7050	1.25G Burst mode Limiting	1.25	12kΩ	*	*	*	1G EPON OLT
GN7051	2.5G Burst mode Limiting	2.5	1.5kΩ	*	*	*	2.5G XG-PON OLT
GN7052	Tri-rate PON TIA	1.25/2.5 /10.3	2kΩ	*	*	*	1.25G EPON/2.5G XG-PON/ 10G EPON OLT
GN7053	1G GPON Burst mode Limiting	1.25	1.25kΩ	*	*	*	1G GPON OLT
GN1083	Quad 25G Limiting	100	6.3kΩ	*	*	*	100GBASE-LR4

ROSAs & SUPER HIGH GAIN ROSAs

Part Number	Overview	Data Rate (Gb/s)	Gain	Supply	RSSI	Unstressed Sensitivity	Stressed Sensitivity	ORL
GN3150	SR *Rchip* Limiting	to 11.3	10kΩ	+3.3V ± 10%	Yes	-15dBm OMA	-13.5dBm OMA (BASE-SR)	-14dB
GN3050	10km *Rchip* Limiting	to 11.3	10kΩ	+3.3V ± 10%	Yes	-21dBm	-16.8dBm OMA (BASE-L)	-14dB
GN3250	40km *Rchip* Limiting	to 11.3	10kΩ	+3.3V ± 10%	Yes	-21dBm	-16.0dBm OMA (BASE-E)	-27dB
GN3052	LRM *Rchip* AGC	to 11.3	9kΩ	+3.3V ± 10%	Yes	-17dBm OMA	-12dBm OMA (LRM Symmetric, 6" FR4)	-14dB
GN3257	PIN with AGC	to 11.3	8.5kΩ	+3.3V ± 10%	Yes	-19dBm OMA	–	-27dB
GN3352	APD with AGC	to 11.3	4kΩ	+3.3V ± 10%	VAPD	-27dBm	–	-27dB
GN3357	APD with AGC	to 11.3	8.5kΩ	+3.3V ± 10%	VAPD	-27dBm	–	-27dB
GN3055	10km Super High Gain Rchip	to 11.3	35kΩ	+3.3V ± 10%	–	-21dBm	Eliminate LA in SFP+	-14dB
GN3155	SR Super High Gain Rchip	to 11.3	35kΩ	+3.3V ± 10%	Yes	-15dBm OMA	Eliminate LA in SFP+	-14dB
GN3255	40km Super High Gain Rchip	to 11.3	35kΩ	+3.3V ± 10%	Yes	-21dBm	Eliminate LA in SFP+	-27dB
GN3355	High Gain APD Rchip	to 11.3	13kΩ	+3.3V ± 10%	Yes	-27dBm	Eliminate LA in SFP+	-27dB
GN3068	10km Low Power Limiting	to 11.3	7kΩ	+3.3V ± 10%	Yes	-21dBm	94 mW power dissipation	-14dB
GN3268	40km Low Power Limiting	to 11.3	7kΩ	+3.3V ± 10%	Yes	-21dBm	94mW power dissipation	-27dB
GN3485	100G BASE-LR4	to 100	5kΩ	+3.3V ± 10%	Yes	-14dBm	400mW Typ power dissipation	*

** Please contact your sales representative for a detailed datasheet.*

Optical Transport Solutions

Semtech designs innovative optical, analog and mixed signal semiconductor solutions to serve the rising global demand for high-speed data transmission—our robust products improve performance, reliability, simplify design, lower system costs and speed time-to-market.

Semtech offers a comprehensive portfolio of optical transceiver ICs, ranging from 100Mb/s-100Gb/s.

Highly differentiated products providing improves performance and reliability, simplifying design, lowering costs and improving time-to-market speed.

Semtech's multi-lane and multi-rate 10Gb/s-100Gb/s backplane solutions are cost-effective, low power, high performance products for next-generation networks.

Products

- 40/100 Gbps Mux
- 40/100 Gbps Demux
- TIAs
- ROSAs
- Single-lane CDRs
- Dual-lane CDRs
- Multi-lane signal conditioners
- Laser drivers
- Limiting amplifiers
- Transceiver ICs
- Optical & copper reference design kits

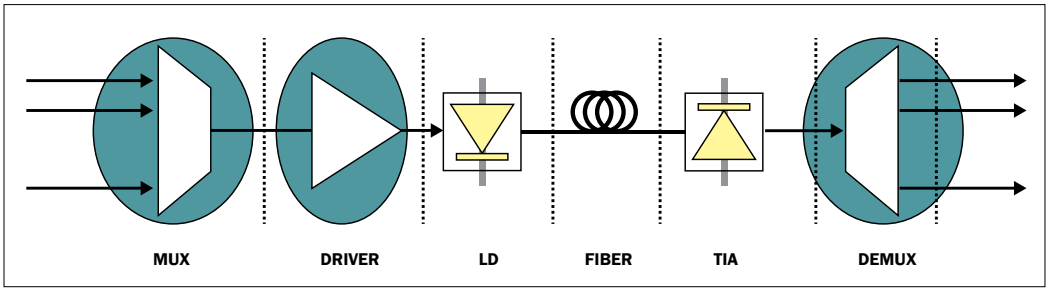
Complete Solutions For 40 & 100 Gbps

- Direct detect SerDes (Mux/Demux)
- Mach-Zehnder modulator drivers
- 100 Gbps coherent solutions

Solutions For Optical Transport Networks

- Ultra high-speed SerDes for transport communication
- High performance modulator drivers for DWDM applications
- High performance transceivers for datacenter applications

Semtech converts electrical data signals to optical formats and back again



ACS8530B Block Diagram

Broadcast Video

As a pioneer in digital video, Semtech - Gennum Products continues to lead the way in proven SD, HD and 3Gb/s and emerging UHD-SDI technologies. 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 and signal integrity, while reducing time to market and design risks.

Comprehensive Portfolio Of Industry Leading SDI Products, SD, HD, 3G, 6G & Beyond...

We offer the most comprehensive, end-to end portfolio of broadcast video solutions available, including our new family of long-reach, low power, high-density adaptive cable equalizers, high performance reclockers, next generation cable drivers and the industry's most feature-rich crosspoint switches.

UHD-SDI Solutions

As next generation broadcast television and D-Cinema applications; such as UHDTV-1, 4K D-Cinema and UHDTV-2 high frame rate (HFR) and high dynamic range (HDR) production become more prolific in the marketplace, new high speed SDI solutions are becoming necessary. UHD-SDI enabled equipment provides the ideal solution for the transport of high quality, multi-media content. For more information on UHD-SDI, please contact your Semtech representative.

Dedicated To Customer Success

Our commitment to customer success is evident in everything we do. That's 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.

And this commitment to the broadcast market is demonstrated by our ongoing contributions to and investments in SD, HD, 3G and UHD-SDI standardization and technologies. We ease the migration path for customers to get to market quickly with differentiated solutions that are future-proofed for next generation video formats, ever-increasing data rates, and evolving I/O and distance requirements.

Adaptive Equalizers

Part Number	Application	Data Rate (Mb/s)	Power (mW)	Outputs	Cable Length (m)	Cable Length Indication
NEW GS6140	Multi-rate, low power, long reach	1 - 5940	84	1	6G (90), 3G(200), HD (280), SD (500)	Yes
GS3440 GS3441	Long Reach	125 - 2970	169 212	1 2	3G (210), HD (250), SD (500)	No Yes
GS2993 GS2994	Long Reach	143 - 2970	165 165	2 1	3G (140), HD (200), SD (400)	Yes No
GS1674	HD/SD	143 - 1485	195	1	3G (NA), HD (220), SD (400)	No

Cable Drivers

Part Number	Application	Data Rate (Mb/s)	Power (mW)	Input Trace EQ	Outputs	Max Output Swing (mV)
GS6080 GS6081	6Gb/s Single or Dual output cable driver	143 - 5940	135 210	Yes	2 4	1800
GS2988 GS2989	3Gb/s Single or Dual output	143 - 2970	110 180	Yes	2 4	1800

Broadcast Video

Reclockers

Part Number	Application	Data Rate (Mb/s)	Input MUX	Input Trace EQ	Output De-emphasis	Package (mm)
NEW GS6150	Multi-rate Reclocking, low power	270, 1485, 2970, 5940	4:1	Yes	Yes	6x6
NEW GS6151	Multi-rate Reclocking, low power, high density	270, 1485, 2970, 5940	2:1	Yes	Yes	4x4
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 (Mb/s)	Power (mW)	Outputs	Cable Reach	DVB-ASI
GS3490	Integrated EQ/CD	125 - 2970	EQ: 202 CD:215	EQ:1, CD:1	3G: 140, HD: 250, SD: 550	Yes

Serializers

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

Deserializers

Part Number	Data Rate (Mb/s)	Equalizer	Audio Embedded	Video Processing	Audio Clock Generator	Power (mW)
GS2971A	270, 1465, 2970	Yes	Yes	Yes	Yes	525
GS2961A	270, 1465, 2970	Yes	No	Yes	No	500
GS2970A	270, 1485, 2970	No	Yes	Yes	Yes	350
GS2960A	270, 1465, 2970	No	No	Yes	No	320
GS1661A	270, 1465	Yes	No	Yes	No	460
GS1660A	270, 1465	No	No	Yes	No	250

Crosspoint

Part Number	Data Rate (Gb/s)	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

Security & Surveillance

The complete Aviia™ HD-VLC™ reference design can be used to implement converter boxes, enabling extended cable reach transmission for existing 1.485 Gb/s based HD products and solutions.

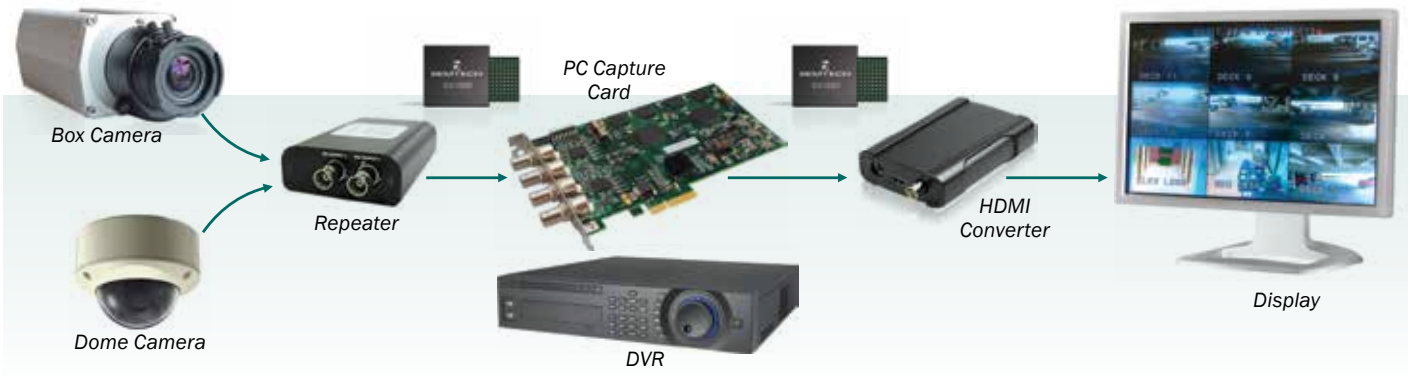
Semtech's Aviia™ products for HDcctv enable upgrade of analog CCTV installations to full digital HD, leveraging the installed base of cabling. Our fully integrated transmit and receive products enable the highest performance, longest reach, HDcctv standards-compliant designs.

GV7600 - Serial digital video transmitter for standard and high definition component video
GV7601A - Extended Reach Serial digital video receiver for standard and high definition component video
GV8500 - Serial digital HD video cable driver
GV8601 - Serial digital HD video cable equalizer
HDVLC-REF - Aviia™ Visually Lossless CODEC (HD-VLC™) and reference design

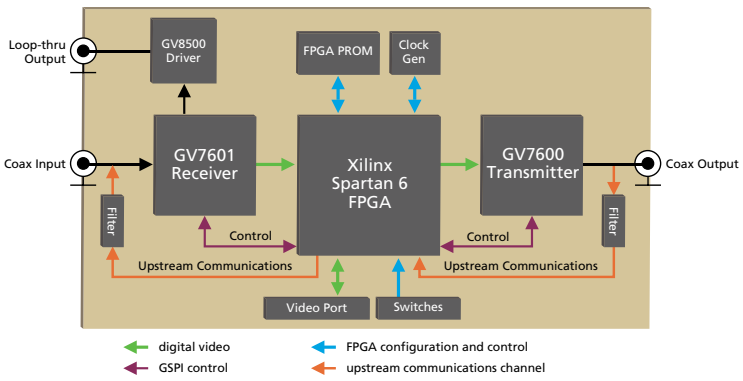
Products

- HDcctv Transmitters
- HDcctv Receivers
- HDcctv Cable Drivers
- HDcctv Cable Equalizers

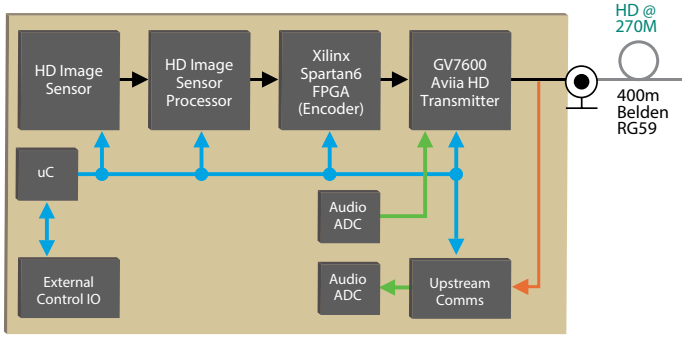
HD Surveillance Application



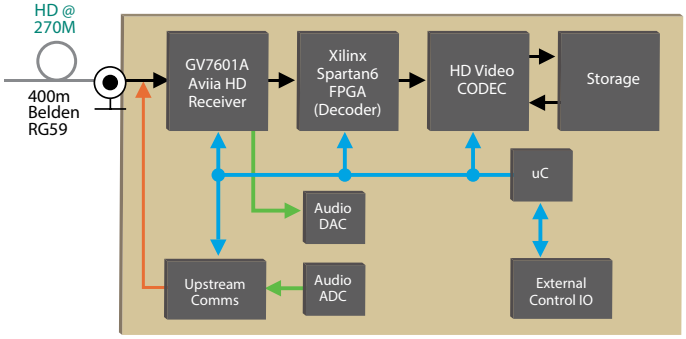
Aviia™ HD-VLC™ Reference Design



Aviia™ HD-VLC™ Camera Application



Aviia™ HD-VLC™ DVR Application



High Reliability Discrete Semiconductors

Semtech designs and manufactures power products in axial, surface-mount discrete and various custom assembly configurations. These high performance/rugged products, in high-current, high-voltage configurations, are employed in a wide range of devices used primarily in military, aerospace, industrial and medical applications.

Products

- Half wave discrete rectifiers (QPL)
- TVS rectifiers (QPL)
- Zener voltage regulators (QPL)
- Half wave, high current and voltage assemblies
- Single and three phase full wave bridge assemblies
- Center tap and doubler assemblies
- High voltage / High current ISOPAC devices
- High voltage capacitors

JANS - Qualified Diodes For Space / Critical Programs

- MIL-PRF-19500 / 356, 5W Zener voltage regulators (Available in axial lead and surface mount packages)
- MIL-PRF-19500 / 406, 1.5W Zener voltage regulators (Available in axial and surface mount)
- MIL-PRF-19500 / 411, Rectifiers (Available in axial lead packages)
- MIL-PRF-19500 / 420, Rectifiers (Available in axial lead packages)
- MIL-PRF-19500 / 427, Rectifiers (Available in axial lead packages)
- MIL-PRF-19500 / 429, Rectifiers (Available in axial lead packages)
- MIL-PRF-19500 / 477, Rectifiers (Available in axial lead and surface mount packages)
- MIL-PRF-19500 / 516, TVS Devices (Available in axial lead and surface mount packages)

Strong Application Support

Strong Worldwide FAE team

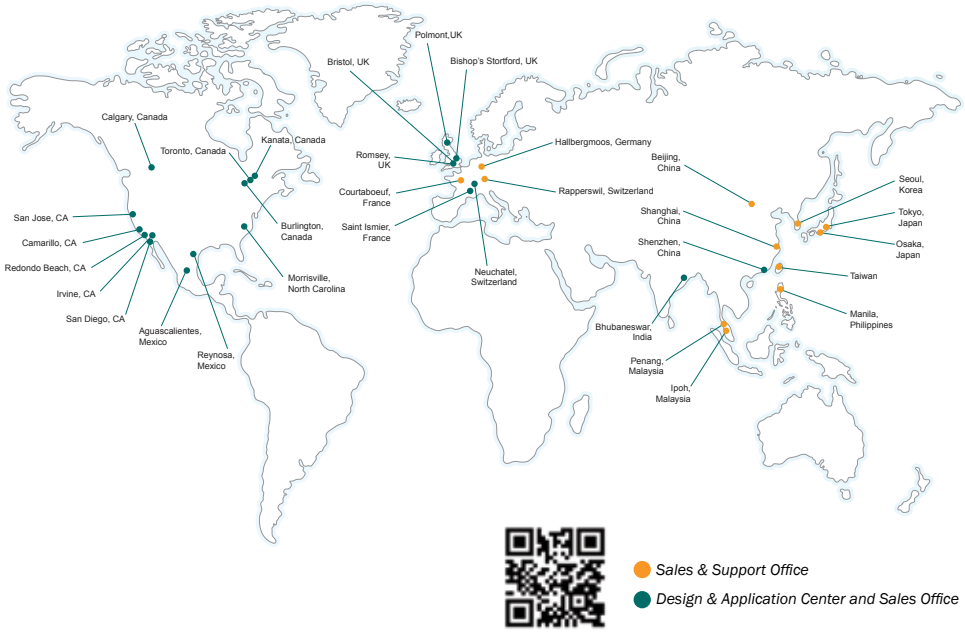
- Dispatch to customer site to solve any issues

Custom Application Development

- Customized Evaluation Boards
- Customer schematic and PCB layout review and suggestions
- Software drivers and customer software debug
- ESD testing and debug

Semtech Worldwide Locations

With 32 offices in 14 countries we can offer on-site custom application development worldwide



Quality & Reliability

ISO 9001:2008 Certified Company

- Reynosa location is also AS91000 and DSCC certified
- TS16949 - Pursuing certification for PHR BU in Reynosa in 2015
- ISO 14001- Semtech HQ Certified July 2012
- OSHA 18001; Semtech HQ Certified March 2013
- TL 9000; Pursuing certification for Semtech HQ in 2015

Commitment to Quality

- SVP Of Q&R reports directly to the CEO
- Shift of Q&R organizational focus to earlier engagement with product development cycle and manufacturing organization

Semtech's Commitment To The Environment

- Green technology and product
- Environmental KPIs posted on our website

Why Semtech

- Strong analog & mixed-signal expertise
- Products differentiated by innovation, size, efficiency and performance
- Custom product solutions for your design challenges
- Custom application support for your product
- Superior field application support
- Solid financial strength & stability with 50+ year history

Pb

RoHS COMPLIANT

REACH COMPLIANT

Semtech is a Leader in offering transition to "Pb-free" and "Green" products.
93% of Semtech products are "Pb-free, RoHS and REACH compliant".

Innovation, Size, Efficiency & Performance

Semtech products are used in some of the most innovative systems and fast growing markets today: communications, computing, high-end consumer, industrial equipment and more.

To see our full line of products visit semtech.com.

SEMTECH

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