

Broadcast Video

Featuring UHD-SDI Devices



SEMTECH®

- Equalizers
- Cable Drivers
- Reclockers
- Configurable Equalizer Driver Devices
- Transmitters/Serializers
- Receivers/Deserializers
- Crosspoint Switches



CONTENTS

Equalizers	3
Cable Drivers	4
Reclockers	5
Configurable SDI EQ/CD	6
SDI Transmitters/Serializers and Receivers/Deserializers	8
SDI Crosspoints	11

High-Performance UHD-SDI Products

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

Comprehensive portfolio of industry-leading UHD-SDI products

We offer the most comprehensive, end-to-end portfolio of UHD-SDI video products available, including our family of long-reach, dual-input, multi-rate 12G reclocking equalizers and cable drivers, low power 3G equalizers, cable drivers, and reclockers.

UHD-SDI: The Next Generation Broadcast Television Production Interface

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

Dedicated to customer success

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

- Comprehensive testing for each component in production, assuring high yield on assembled boards
- Complementary design support, including review and feedback to shorten development cycles, reduce risks and optimize performance
- Dedicated field applications engineering support throughout the product's life cycle



Equalizers



Integrated reclocking, low power, long reach, and support for data rates up to 11.88Gbps

SUPPORT UHD-SDI RATES UP TO 12G

Semtech offers multi-rate adaptive cable equalizers that support rates up to 11.88Gbps (12G) while continuing to offer industry-leading performance at 6G, 3G, HD, and SD rates. Semtech's GS12341 adaptive cable equalizer features an integrated reclocker to maximize performance, and a new design which offers superb performance in the presence of UHD-SDI stress patterns. In addition to robust performance, Semtech adaptive cable equalizers comply to SMPTE ST 2082-1, ST 2081-1, ST 424, ST292-1, and ST 259-C standards.

LOW POWER AND SMALL PACKAGE SIZE

PCB board density continues to increase, requiring small package sizes and low power. Semtech's GS12341 adaptive cable EQ with integrated reclocking features a 6x4 QFN package. This manufacturing-friendly asymmetric package facilitates high density designs by accommodating a dense connector pitch with its narrow 4mm package width.

In addition, Semtech features a range of adaptive cable equalizers for applications requiring low power. The GS3140 low power, multi-rate 3G adaptive cable equalizer is ideal for applications requiring both low power and long cable reach.

ADVANCED SIGNAL INTEGRITY DIAGNOSTICS

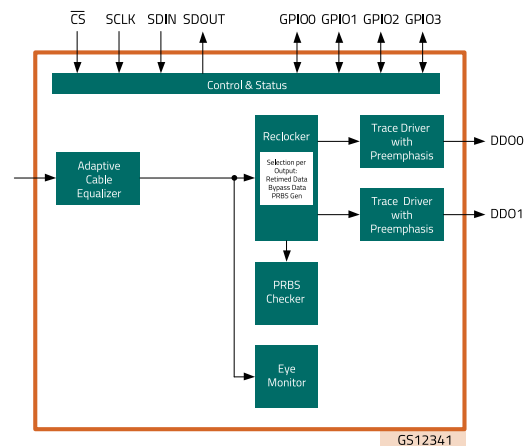
The GS12341 features unique diagnostic capabilities, including pattern generation and error checking, and a high-resolution 3D eye monitor to ease board design and debugging while speeding time to market.

INTEGRATED RECLOCKING, LOWEST JITTER

The GS12341's integrated reclocker, with full bandwidth clock division, allows low output jitter, while maintaining industry leading input jitter tolerance, even at extended cable lengths and at all supported data rates.

CROSSTALK INTERFERENCE ROBUSTNESS

The advanced design minimizes the effect of inter-channel crosstalk interference in high channel density applications.



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

*Power specifications include power consumed by integrated reclocker.

Cable Drivers

Integrated reclocking for the lowest output jitter, sophisticated, easy-to-use eye shaping for SMPTE compliance and data rates up to 11.88Gbps



MULTI-RATE

Semtech's UHD-SDI cable drivers are SMPTE compliant and feature multi-rate operation; our high-performance GS12281 12G UHD-SDI cable driver is the industry's best performing driver. Semtech offers a driver for every UHDTV-1, UHDTV-2, 3G, HD, and SD application.

INTEGRATED RECLOCKING, LOWEST JITTER

The GS12281's integrated reclocker, with full bandwidth clock division, enables the best jitter performance at all rates up to 11.88Gbps.

ADVANCED SIGNAL INTEGRITY DIAGNOSTICS

The GS12281 features unique diagnostic capabilities, including pattern generation and error checking, and a high-resolution 3D eye monitor to ease board design and debugging while speeding time to market.

INPUT TRACE EQUALIZATION

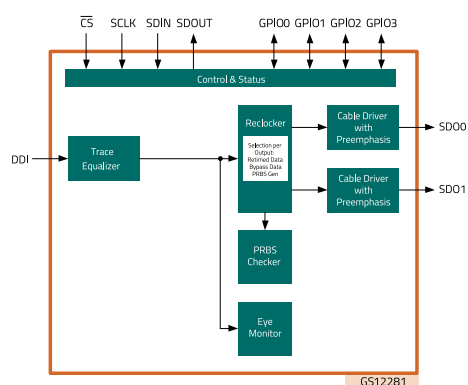
The GS12281 features input trace equalization to compensate for long input trace lengths, which is specially tuned to work with unbalanced SDI signals. Input trace equalization is critical for optimizing performance in 12G UHD-SDI designs.

BEST OUTPUT RETURN LOSS

Output return loss performance that surpasses SMPTE specifications at all rates. This increased margin simplifies board optimization to speed production.

OUTPUT EYE SHAPING

The GS12281 features an output signal presence detector which provides status on the validity of the output. The GS12281 also offers high maximum output swing and sophisticated yet easy to use pre-emphasis to compensate for losses that occur after the cable driver output.



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

*Power specifications include power consumed by integrated reclocker.

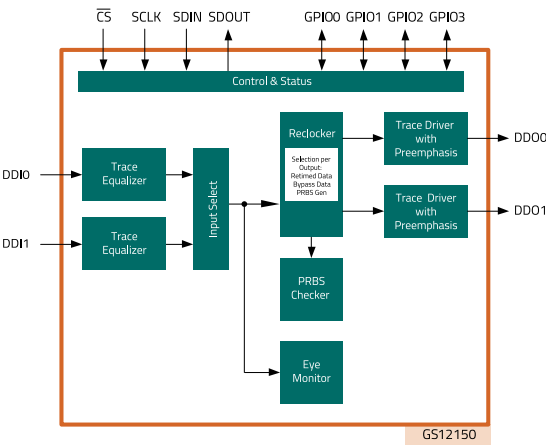
Reclockers

Industry’s best-performing reclockers



Reclocking is an important function required to maintain overall system robustness. As UHD-SDI infrastructure continues to expand and as broadcast products require intensified processing, overall system jitter can increase. Controlling overall system jitter is critical to reliable operation.

Processing devices such as FPGAs can have poor input jitter tolerance (IJT) and frequently require external reclocking to maintain overall system margin. The rapid growth in UHD-SDI infrastructure and the associated higher rates make reclocking mandatory in most applications. Semtech offers a complete family of UHD-SDI reclockers for all data rates. The GS12150 reclocker, with full bandwidth clock division, supports rates up to 11.88Gbps with low power consumption and is ideal for UHD-SDI applications.



GS12150 Functional Block Diagram

ADVANCED SIGNAL INTEGRITY FEATURES

The GS12150 includes programmable trace equalization to compensate for high-frequency losses associated with board level interconnects. It operates without an external frequency reference. Programmable output swing and pre-emphasis provide flexibility for managing signal integrity of the output signals.

The GS12150 features unique diagnostic capabilities, including pattern generation and error checking, and a high-resolution 3D eye monitor to ease board design and debugging while speeding time to market.

SMALL SIZE

The GS12150 features a compact 6x4 40-pin QFN package, which is ideal for high-channel density designs or other applications where the layout is constrained by available PCB real estate.

LOW POWER

The GS12150’s low power consumption is ideal for designs with high channel density or in applications requiring low power consumption.

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



Configurable SDI Equalizer/Cable Driver

High-performance configurable devices for multi-rate applications up to 12Gbps

DESIGN FLEXIBILITY

The GS12190 is a low power, configurable 12G multi-rate reclocking cable equalizer and cable driver. The GS12190 is suitable for systems with limited connector space, and enables individual connectors to function either as an input or an output. In addition, the GS12190 is ideal for multi-function designs requiring connectors be reconfigurable based on customer needs.

Applications suitable for the GS12190 include next-generation 3G, 6G and 12G UHD-SDI infrastructures designed in support of UHD TV1, UHD TV2, 4K D-Cinema, 3D HFR, and HDR production image formats.

ADVANCED SIGNAL INTEGRITY FEATURES

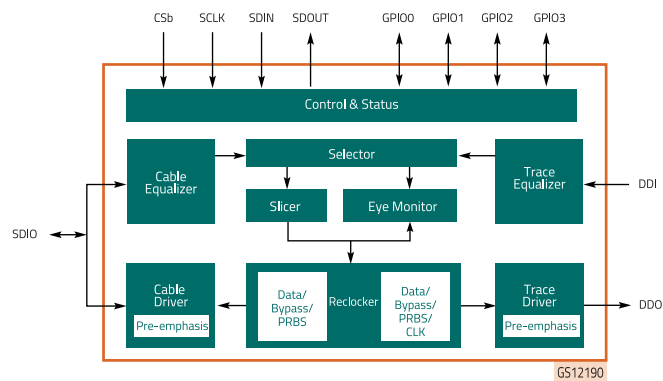
The GS12190 features integrated reclocking with full bandwidth clock division, minimizing output jitter even at extended cable lengths. Its new design offers superb performance, even in the presence of UHD-SDI stress patterns. To compensate for PCB trace losses and to simplify PCB layout optimization, the GS12190 features output pre-emphasis. To facilitate optimal PCB layout, the GS12190 requires no external return loss components or return loss networks.

ADVANCED SIGNAL INTEGRITY DIAGNOSTICS

The GS12190 features unique diagnostic capabilities, including pattern generation and error checking, high-resolution 3D eye monitor to ease board design and debugging, and speed production time.

SMALL PACKAGE SIZE

The GS12190 features a compact 6x4 QFN package and low power consumption.



CONFIGURABLE SDI EQUALIZER/CABLE DRIVER									
Part Number	Data Rate (Mbps)	Power (mW)	No. of Outputs	Cable Reach (m)	Integrated Reclocking	Circuit Compatible with	DVB-ASI and MAD1	Temp Range (°C)	Package (mm)
GS12190	1–11880	EQ: 430* CD: 375*	EQ: 1 CD: 1	12G:70 6G:90 3G:170 HD:240 SD:400	YES	GS3281 GS3590** GS12081 GS12090 GS12181 GS12281	YES	-40 to +85	QFN-40 (6x4)
GS3590	1–2970	EQ: 430* CD: 375*	EQ: 1 CD: 1	3G:160 HD:240 SD:300	YES	GS3281 GS12081 GS12090 GS12181 GS12190** GS12281	YES	-40 to +85	QFN-40 (6x4)
GS3490	125–2970	EQ: 202 CD: 215	EQ: 1 CD: 1	3G:140 HD:260 SD:500	NO	–	YES	-40 to +85	QFN-32 (5x5)

*Power specifications include power consumed by integrated reclocker.

**Contact your local FAE for support designing a circuit for the GS12190, which supports drop-in compatibility for the GS3590.

SDI Transmitters/Serializers and Receivers/Deserializers

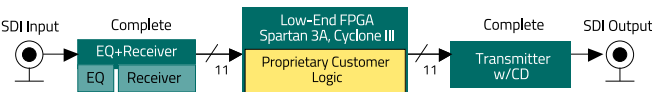
Choose the right SDI transmitter/serializer and SDI receiver/deserializer for your system

Designers can select components from different vendors, but when it comes to designs with SDI transmitters and SDI receivers, designers must first choose an architecture. In implementing a design with an SDI transmitter and/or SDI receiver, there are three architectural choices: Semtech’s complete SDI transmitter/SDI receiver solution architecture, an integrated-transceiver FPGA architecture and a FPGA-helper architecture. Let’s explore these three options with an assessment of the following key parameters: jitter, power consumption, integration (component/features), time-to-market, system size, and cost.

SEMTECH’S COMPLETE SOLUTION ARCHITECTURE

Leveraging our expertise in signal integrity and our deep understanding of broadcast video technologies, Semtech’s SDI transmitter and SDI receiver offering encapsulates all the analog components (SerDes, VCO, CD, EQ, and Reclocker) and digital SMPTE video and audio processing required to transmit and receive SDI video. Integrating all of these components into one package reduces the PCB footprint required to implement SDI transmit/receive, and the solution benefits from Semtech’s superior jitter performance. This optimized, cost effective and power efficient ASIC implementation allows customers to focus on their unique value-added processing for quicker time-to-market. Only Semtech offers a solution that scores high for each evaluation parameter.

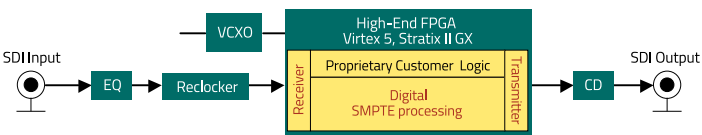
Complete Solution Transmitter/Receiver



INTEGRATED-TRANSCIEVER FPGA ARCHITECTURE

Integrated-transceiver FPGAs typically offer the worst specifications in terms of jitter. Maximum output jitter and input jitter tolerance (IJT) are typically at the limit of the SMPTE standards and, in some cases, actually in violation of industry norms. That is why extra components, namely VCXOs and reclockers, are required to reduce system jitter performance to an acceptable level. This comes at a penalty of higher power consumption, system footprint size and cost. Because of the fine tuning required to enable functioning and because of the IP licensing/development required for the digital SMPTE video processing, this architecture unnecessarily prolongs time-to-market. Finally, while FPGAs integrate transceivers, they do not integrate routing components like cable drivers and equalizers.

Integrated Transceiver FPGAs

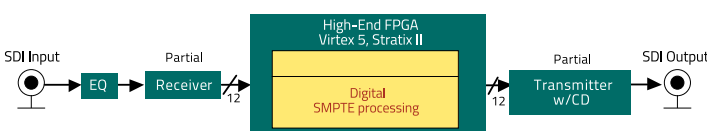


FPGA-HELPER ARCHITECTURE

The FPGA-helper architecture, as depicted below, involves the use of a component that includes the physical media attachment part of a SMPTE SDI receiver/SDI transmitter with the digital SMPTE processing implemented in the FPGA. The result is an architecture that is taxing in terms of power consumption, and those FPGA-helper parts are lacking even basic SMPTE digital processing.

In many cases, product specific FPGA IP already requires high utilization factors in small, low-cost FPGAs, and the added requirement of digital SMPTE video processing in the FPGA may drive adoption of a larger FPGA. This results in further penalties in power consumption, size and system cost. And while this architecture can improve system jitter performance, the added engineering effort in developing (or licensing) and stitching that video processing logic to product specific code allows a slower time-to-market. Finally, while some FPGA-helper parts integrate a cable driver, the offering lacks an integrated equalizer.

FPGA-Helper SERDES



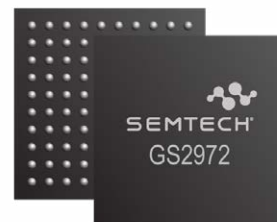
HOW THE SEMTECH SOLUTION STACKS UP

Compare the ratings of each of the three architectures for key parameters in an implementation of 1Rx and 1Tx channel.

	Semtech Complete Solution	Integrated Transceiver FPGA	FPGA-Helper SerDes
Jitter Performance	■	■	■
Time-to-Market	■	■	■
Power Consumption	■	■	■
Integration	■	■	■
Overall PCB Space	■	■	■
System Cost	■	■	■

SDI Transmitters/Serializers

High-performance, integrated, low power solution for SDI transmit links



3Gbps SDI

Semtech's GS2972 and GS2962 are fully compatible with SMPTE ST 424, ST 425, ST 2081-1, and ST 2082-1 UHD-SDI standards. In addition, Semtech SDI transmitters feature integrated SMPTE video processing including scrambling, TRS detection, insertion, and ancillary data insertion.

Semtech's GS2972 SDI transmitter includes an integrated audio embedder and supports AES, I²S and serial audio formats. The fully integrated functionality of Semtech's SDI transmitters provides the lowest power and smallest footprint solution for a complete SDI transmit link.

COMPLETE VIDEO PROCESSING

Semtech SDI transmitters offer the most complete video processing features available. These include, but are not limited to, scrambling, TRS detection or insertion, and ancillary data insertion.

GREAT FOR DVB-ASI

All Semtech SDI transmitters are DVB-ASI capable.

AUDIO EMBEDDING

Semtech's SDI transmitters include an integrated audio embedder supporting AES, I²S and serial audio formats.

EXCELLENT JITTER PERFORMANCE

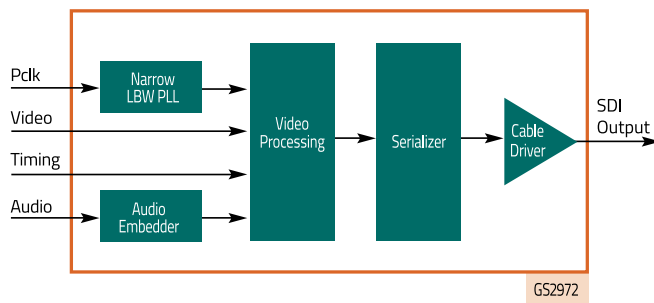
Due to the integrated PLL with narrow loop bandwidth, the SDI transmitters can reject up to 300ps of jitter on the parallel clock, outputting very low jitter, SMPTE-compliant SDI signals.

POWER AND AREA EFFICIENT

The high level of integration in Semtech's SDI transmitters enables low power, low profile SDI link implementation.

APPLICATIONS

Cameras, camera control units, multi viewers, routers, production switchers, master control switchers, VTRs, video servers, encoders/decoders, up/down/cross converters, audio embedders, format detectors, test and measurement equipment.



GS2972 Functional Block Diagram

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

SDI Receivers/Deserializers

High-performance, integrated, low power solution for SDI receive links



3Gbps SDI

The GS3470 and GS3471 are Semtech's latest generation high-performance, single-chip SDI receiver solutions, featuring integrated cable equalization, video and audio processing and dual SDI inputs. All Semtech's SDI receivers are fully compatible with SMPTE ST 424, ST 425, ST 2081-1, and ST 2082-1 UHD-SDI standards. The GS3470 and GS3471 feature two selectable serial video inputs which make them ideal for video monitoring applications. Both parts are optimized for low power designs, providing up to 45 percent power reduction over previous generation SDI receivers.

INTEGRATED EQUALIZER

The GS3471 fully integrates a high-performance long reach adaptive cable equalizer, providing up to 200m reach at 3Gbps. The integration of the cable equalizer reduces overall PCB component footprint and power.

COMPLETE VIDEO PROCESSING

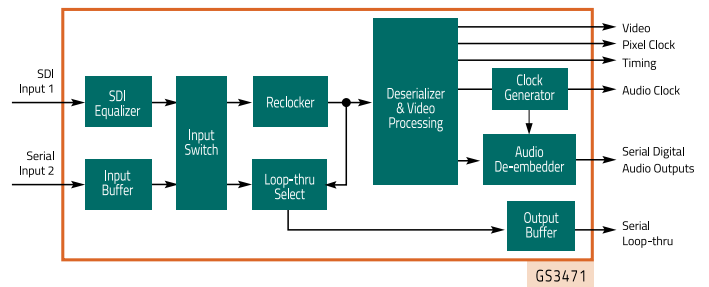
Semtech's SDI receivers offer integrated SMPTE video processing including descrambling, word alignment, comprehensive error detection and correction and ancillary data extraction. Additionally, all Semtech SDI receivers fully support DVB-ASI inputs.

AUDIO DE-EMBEDDING

The GS3470 and GS3471 include an integrated SMPTE compliant audio de-embedder, supporting AES, I²S and serial digital audio output formats. Both parts feature a high performance audio clock generator, further reducing overall system costs.

APPLICATIONS

Monitors, camera control units, multi-viewers, routers, production switchers, master control switchers, video recorders and servers, compression encoders and decoders, video format converters, audio de-embedders, test and measurement equipment.



GS3471 Functional Block Diagram

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

SDI Crosspoints

Semtech crosspoint switches provide an unmatched combination of size, features and performance



MULTIPLE STROBES

Eight update enabled strobe pins allow our crosspoint to be partitioned into independently updatable blocks. This is useful in multi-format environments when the switches need to occur at different points in time. Each update strobe can be assigned on a per-output basis, enabling maximum flexibility.

DATA RATE MARGIN

Supporting data rates up to 3.5Gbps means that there is significant margin for video systems operating up to 2.97Gbps. This margin also means the product can be used in Xaui™, DisplayPort™ and HDMI switching applications.

FULLY INDEPENDENT INPUT AND OUTPUT CHANNELS

All our crosspoints provide independent input trace equalization and output de-emphasis, which can compensate for over 50 inches of PCB trace loss. This provides higher signal integrity and lower jitter in designs utilizing long traces or passive splitting. In addition, with output swing configurable as low as 200mV, system power can be significantly reduced.

ON-CHIP PATTERN GENERATORS

EYE PATTERN DIAGNOSTICS

Independent pattern generators and checkers can be used for testing signal paths on either the input or output side of the system. The pattern checker can be configured to check for bit errors using one of three PRBS patterns or any arbitrary pattern, which is critical for evaluating system performance with video pathological signals. All crosspoint devices can check for bit errors at arbitrary phase offsets from the received data, and jitter margin can be determined by measurement of the horizontal eye opening.

TEMPERATURE SENSORS

Four on-chip temperature sensors monitor the junction temperature of the chip. This enables automated control of fan speed and power down sequences to meet energy conservation requirements.

LOW POWER

When compared to competitive solutions, Semtech crosspoints provide industry leading per channel power consumption, with less than 1W consumed in stand-by mode. System power can be reduced further by the crosspoint's high input sensitivity while using Semtech equalizers configured for minimum output swing levels.

FLEXIBLE FOOTPRINT

All Semtech crosspoints are pin compatible, sharing the same control interface and register set. This allows a single platform design to be easily scaled to the necessary switch size with no re-work required in either hardware or software.

INPUT SENSITIVITY

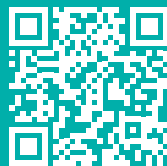
To address losses typical in many router architectures, the Semtech crosspoint family offers high input sensitivity, resulting in additional system margin. High input sensitivity facilitates system optimization, including reduced swing on upstream drivers, providing substantial power savings.

APPLICATIONS

Routers, multi-viewers, production switchers, master control switchers, and broadcast modular equipment.

CROSSPOINT SWITCHES

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



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