



EB-GS2985-S

Evaluation Board User Guide

Version	ECR	Date	Changes and / or Modifications
1	152007	June 2009	Changed inductor value in Section 2.1 EB-GS2985-S Schematic and Section 4. Bill of Materials. Modified Section 1.8 Measuring ORL.
0	151624	May 2009	New document.

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General Description

The GS2985-S evaluation package is designed to accelerate the evaluation process of the GS2985 Multi-rate SDI Reclocker with Equalization and De-emphasis.

It is strongly recommended to read the GS2985 Data Sheet (Doc ID: 36663_DocX.pdf) before using this evaluation kit.

Evaluation Kit Contents

- Gennum EB-GS2985-S Evaluation Board
- Gennum USB Dongle with Ribbon Cable
- CD containing GS2985 Evaluation Software, Drivers and Collateral

Overview

Together with the EB-GS2985-S (single-channel) Evaluation Board, this document serves as a guide for evaluating the GS2985, a Gennum 3Gb/s, HD, SD SDI serial digital reclocker. This document contains four main sections:

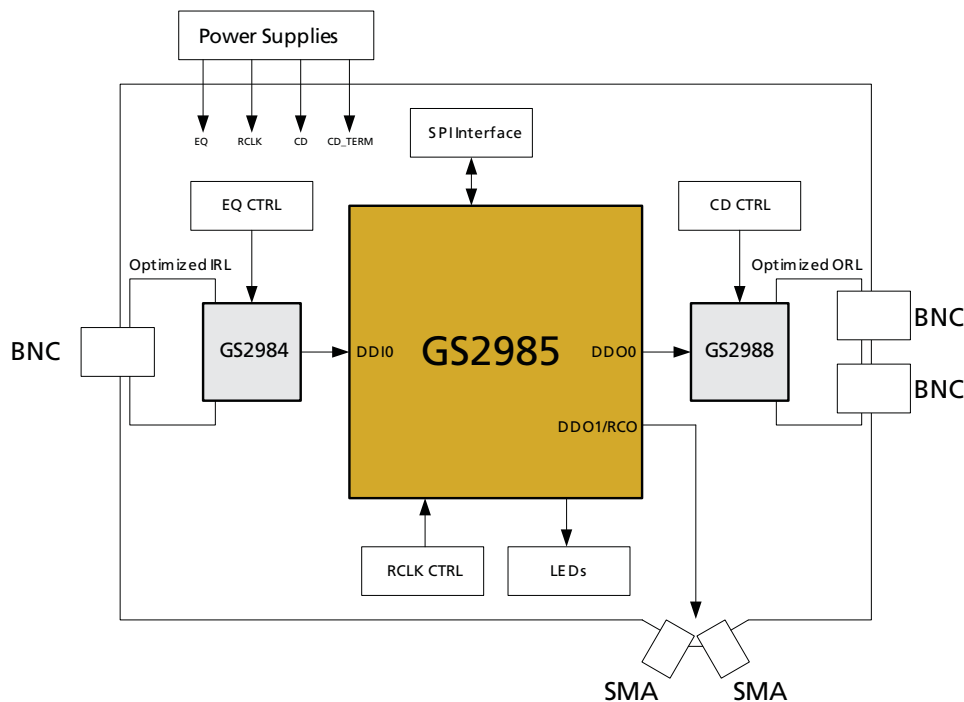
1. Evaluation Board User Guide.
2. Evaluation Board Schematics.
3. Evaluation Board Layout.
4. Evaluation Board Bill of Materials

The figure below shows a block diagram of the features and the functions of the EB-GS2985-S.

The purpose of the EB-GS2985-S single-channel evaluation board is to evaluate the GS2985 3G Video Reclocker (RCLK). It also features the GS2984 3G Equalizer (EQ) and the GS2988 3G Cable Driver (CD). The GS2985 is designed to automatically recover the embedded clock from a SMPTE-424M, SMPTE 292M, or SMPTE 259-C compliant digital video signal, and re-time the incoming video data.

The GS2984 and the GS2988 are high-speed BiCMOS integrated circuits. The GS2984 is designed to equalize and restore signals received over 75Ω coaxial cable, and the GS2988 is designed to drive one to two 75Ω coaxial cables.

The EB-GS2985-S also provides access to the GS2985's internal registers via SPI. A Gennum SPI dongle is included in the kit, to communicate with the GS2985 through a USB connection.



Block Diagram of the EB-GS2985-S

1. Evaluation Board User Guide

Figure 1-1 shows the inputs, outputs and power connections for the EB-GS2985-S.

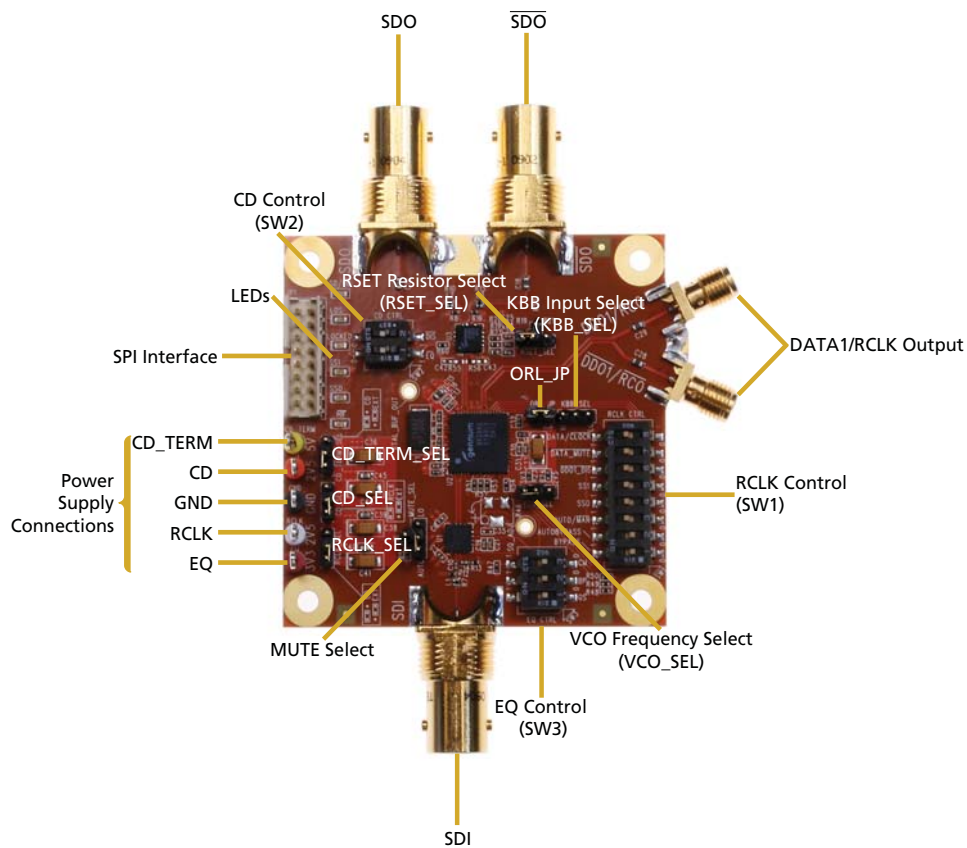


Figure 1-1: GS2985 Single-channel Evaluation Board (EB-GS2985-S)

1.1 SDI Inputs and Outputs

EB-GS2985-S features a single ended 75Ω input through a BNC connector (SDI) and two single ended 75Ω outputs through two BNC connectors (SDO, $\overline{\text{SDO}}$).

1.2 DDO1/RCO Output

The EB-GS2985-S features two SMA connectors ($\overline{\text{DDO1/RCO}}$, DDO1/RCO) for the recovered clock RCO and $\overline{\text{RCO}}$ or the data DDO1 and $\overline{\text{DDO1}}$. This can be selected using the position on SW1 marked DATA/ $\overline{\text{CLOCK}}$.

1.3 SPI Interface

The EB-GS2985-S features an SPI interface (JP1) which is used to access all of the GS2985 registers. The SPI interface is automatically enabled when the Gennum USB dongle is connected. The Gennum USB Dongle can connect the EB-GS2985-S to a computer via USB. When the ribbon cable on JP1 is removed, the SPI interface is automatically disabled and the board goes into legacy mode. The GS2985 registers will maintain their settings until the board is powered-down, or reset via the SPI interface. [Table 1-1](#) describes the two modes of operation.

Table 1-1: SPI Interface Modes of Operation

Mode	Setting
Legacy Mode	$\overline{\text{HIF}} = 1$
SPI Mode	$\overline{\text{HIF}} = 0$

1.4 GS2985 RCLK Control I/O

There are a variety of components on the EB-GS2985-S board to facilitate manual control of the GS2985 device. These are described in the tables below.

Table 1-2: SW1 Positions

Switch Position	Label	Description	HIGH (1)	LOW (0)	Default
1	BYPASS	Bypass	Bypass On	Bypass Off	0
2	AUTOBYPASS	Autobypass	Autobypass On	Autobypass Off	1
3	AUTO/ $\overline{\text{MAN}}$	Auto/Manual	Automatically locks to incoming data rate	Manual data rate select	1
4	SS0	Data rate select [0]	SS[1:0]		0
5	SS1	Data rate select [1]	0 - Reserved 1 - 270 (Mb/s) 2 - 1485 or 1485/1.001 (Mb/s) 3 - 2970 or 2970/1.001 (Mb/s)		0

Table 1-2: SW1 Positions

Switch Position	Label	Description	HIGH (1)	LOW (0)	Default
6	$\overline{\text{DDO1_DIS}}$	DDO1 Disable	DDO1 Mute Off	DDO1 Mute On	1
7	$\overline{\text{DATA_MUTE}}$	Data Mute	Data Mute Off	Data Mute On	1
8	$\text{DATA}/\overline{\text{CLOCK}}$	Data/Clock select	$\text{DDO1}/\overline{\text{DDO1}}$ selected	$\text{RCO}/\overline{\text{RCO}}$ selected	1

Table 1-3: VCO Frequency Select (VCO_SEL)

Position	Connection	Description
3V3 (default)		Sets correct VCO voltage for a 3.3V power supply
2V5		Sets correct VCO voltage for a 2.5V power supply

Table 1-4: KBB Input Select (KBB_SEL)

Position	Connection	Description
HI		KBB = VCC
LOW		KBB = GND
Not connected (default)		KBB = unconnected

1.5 GS2984 EQ Control I/O

A switch (SW3) and a jumper (MUTE_SEL) facilitate the manual configuration of the GS2984 Equalizer on the EB-GS2985-S evaluation board. These are described in the tables below.

Table 1-5: SW3 Positions

Switch Position	Label	Description	HIGH (1)	LOW (0)	Default
1	GS	Gain Select	Compensation for 6dB flat attenuation	No change in gain	0
2	BP	Bypass	Bypass On	Bypass Off	0
3	CM	Common Mode Set NOTE: CM should be set to 1 when using a 2.5V supply for the Reclocker.	Output CM set to 2.1V	Output CM set to 2.9V	0

Table 1-6: MUTE Select (MUTE_SEL)

Label	Connection	Description
AUTO (default)		Auto Mute
HI		Mute On
LO		Mute Off

1.6 GS2988 CD Control I/O

A switch (SW2) and a jumper (RSET_SEL) facilitate the manual configuration of the GS2988 Cable Driver on the EB-GS2985-S evaluation board. These are described in the tables below.

Table 1-7: SW2 Positions

Switch Position	Label	Description	HIGH (1)	LOW (0)	Default
1	$\overline{\text{EQ}}$	Input trace equalization	Input trace equalization Off	Input trace equalization On	1
2	$\overline{\text{DIS}}$	Output disable	Output 1 enabled	Output 1 disabled	1

Table 1-8: RSET Resistor Select (RSET_SEL)

Label	Connection	Description
R19 (default)		800mV output swing
R20		1.8V output swing NOTE: The CD_TERM post should be connected to 5V, and the CD_TERM_SEL jumper should be set to EXT in order to achieve this output swing.
R21		500mV output swing

1.7 Power Pins

The default supply configuration allows for quick power-up of the EB-GS2985-S by applying 3.3V to the EQ post and grounding the GND post. Power supply connections can be changed to evaluate each device separately over their specified range of supply voltages.

The GS2984 EQ accepts a 3.3V power supply, while the GS2985 RCLK and GS2988 CD accept either 3.3V or 2.5V. Furthermore, the termination voltage (CD_TERM) on the GS2988 CD accepts up to 5V when a high output swing is desired.

Please refer to [Figure 1-2](#). The EB-GS2985-S evaluation board uses an external power supply through a power post labelled “EQ” to power the EQ at 3.3V. Optionally, a second power supply can be connected to the post labelled “RCLK” to power the GS2985 and a third power supply can be connected to the post labelled “CD” to power-up the GS2988 device. Alternatively, the “RCLK” supply can track the “EQ” supply by properly configuring the RCLK_SEL jumper. Similarly, the “CD” supply can track the “RCLK” supply by properly configuring the CD_SEL jumper. By default, the jumpers are configured so that all three devices are powered off the same supply connected to the “EQ” post. The power supply configuration jumpers are described in [Table 1-9](#), [Table 1-10](#) and [Table 1-11](#).

NOTE: The cable driver power supply (CD) cannot have a higher potential than the reclocker power supply (RCLK).

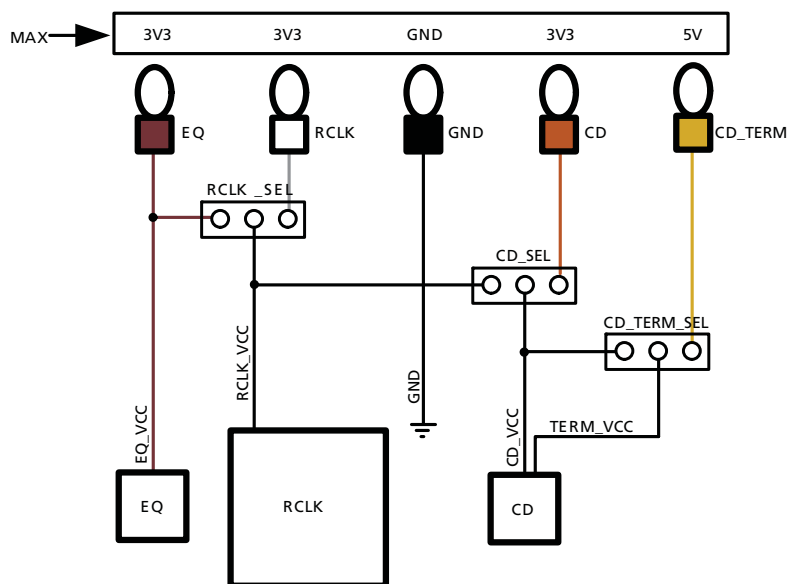


Figure 1-2: Power Supply Connections

Table 1-9: Reclocker Supply Select (RCLK_SEL)

Position	Connection	Description
EQ (default)		Reclocker supply tracks Equalizer supply
EXT		Reclocker uses a separate power supply (RCLK post)

Table 1-10: Cable Driver Supply Select (CD_SEL)

Position	Connection	Description
RCLK (default)		Cable Driver supply tracks Reclocker supply
EXT		Cable Driver uses a separate power supply (CD post)

Table 1-11: Cable Driver Termination Supply (CD_TERM_SEL)

Position	Connection	Description
CD (default)		Termination voltage supply tracks Cable Driver supply
EXT		Termination voltage uses separate power supply (CD_TERM post)

1.8 Measuring ORL

To measure Output Return Loss (ORL) on the EB-GS2985-S board, follow the next steps:

1. Disconnect ORL_JP
2. Set the SW2 position marked $\overline{EQ}$ to LOW "0". This sets the $\overline{EQ}$ input of the cable driver to LOW "0".
3. The cable driver outputs are now balanced.

ORL can now be measured single-endedly using a Network Analyzer.

Please refer to the GS2988 data sheet for more information regarding balance mode.

Table 1-12: ORL Jumper Settings (ORL_JP)

Connection	Description
	Normal Operation (Default)
	ORL Measurement

1.9 Board & Software Setup Instructions

1.9.1 Installing the Gennum USB Dongle Board Software

Connect the Gennum USB Dongle Board to a Computer.

Insert one end of the USB cable to the computer USB port, and the other end to the Gennum USB Dongle Board. The microcontroller will come pre-programmed with firmware.

Install the USB Device Driver (if required):

1. Insert CD.
2. Double-click on the *MCHPFSUSB_Setup.exe* icon on the CD-ROM and proceed with installation.
3. For Windows XP users, follow instructions below.

4. Click **Install from a list or specific location (Advanced)**.



Figure 1-3: Install window for the Gennum USB Dongle Board

5. Select *Include this location...* and navigate (browse) to the directory D:\MCHPFSUSB\PC\MCHPUSB Driver\Release and click **Open**. De-Select *Search removable media...*

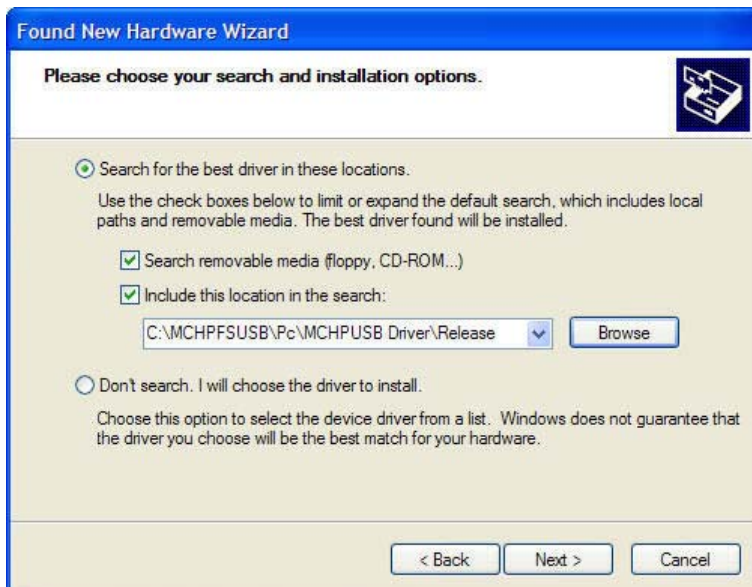


Figure 1-4: Select the location of the files

6. The final dialogue will indicate that the driver has been successfully installed. Click **Finish**. It is not required to restart the system.



Figure 1-5: Completed installation of the Gennum USB Dongle Board

1.9.2 Installing the GS2985 Control Software

Install the GS2985 Control Software (one time installation per computer):

1. Insert the Gennum GS2985 Evaluation Board CD.
2. Traverse to the GS2985_GUI folder.
3. Click setup.exe and follow instructions to install.

The GS2985 Control Installation Wizard will begin.

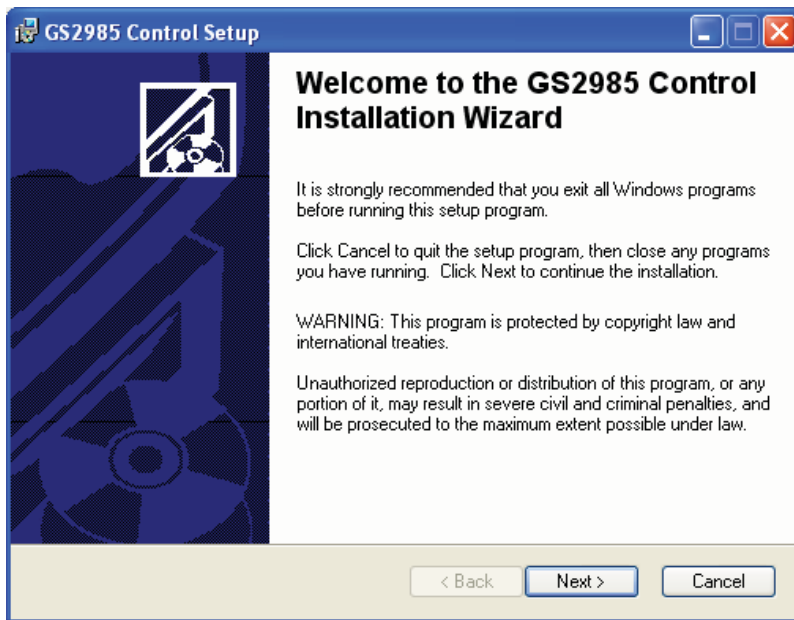


Figure 1-6: GS2985 Control Welcome Screen

You will be prompted to select a directory location to install the GS2985 software.

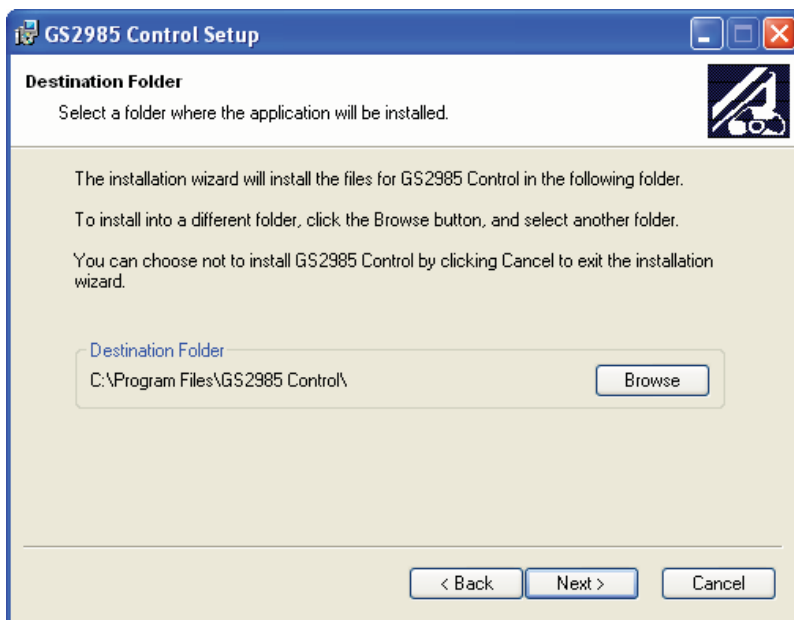


Figure 1-7: GS2985 Control File Location Window

The next screen is to verify your choices.

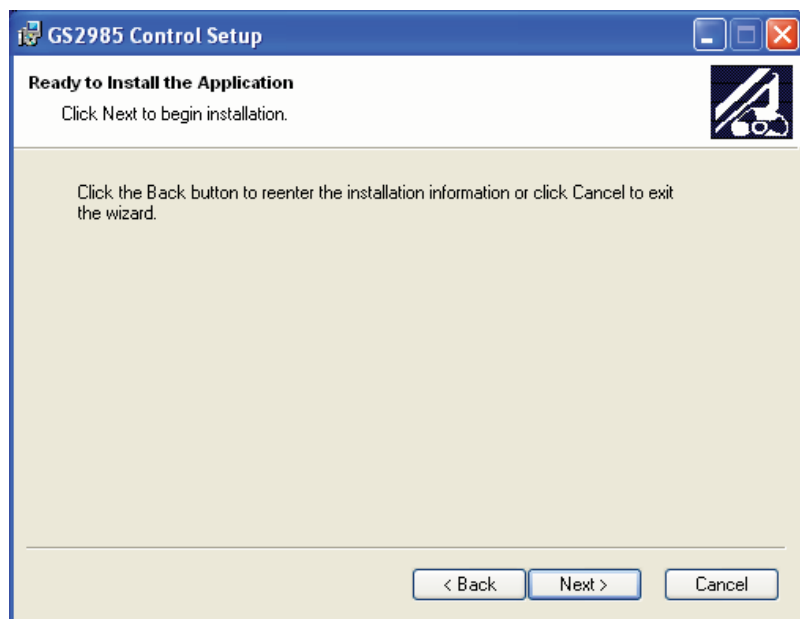


Figure 1-8: GS2985 Control Ready to Begin Installation Window

The window below will appear once the wizard finished the installation.



Figure 1-9: GS2985 Control Successful Completion Window

1.9.3 Setting Up the Hardware

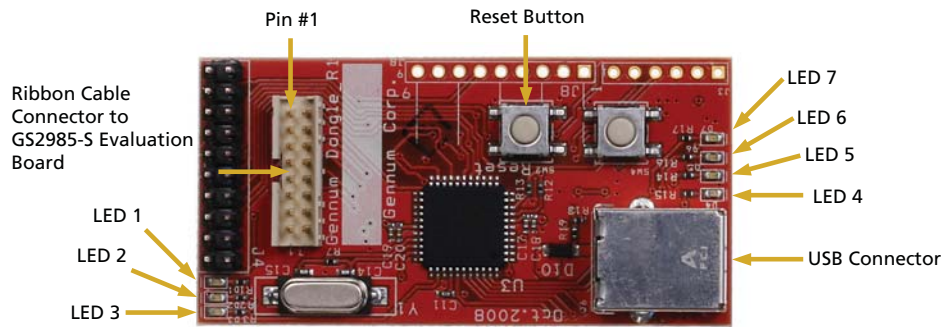


Figure 1-10: Gennum USB Dongle Board

When the Gennum USB Dongle is configured properly, the LEDs D6 and D7 will blink alternately.

The Master Reset Button is pushed to reset the Gennum USB Dongle Board, in case the LEDs D6 and D7 stop blinking.

Connect the EB-GS2985-S Board to the USB Dongle Board as per [Figure 1-11](#).

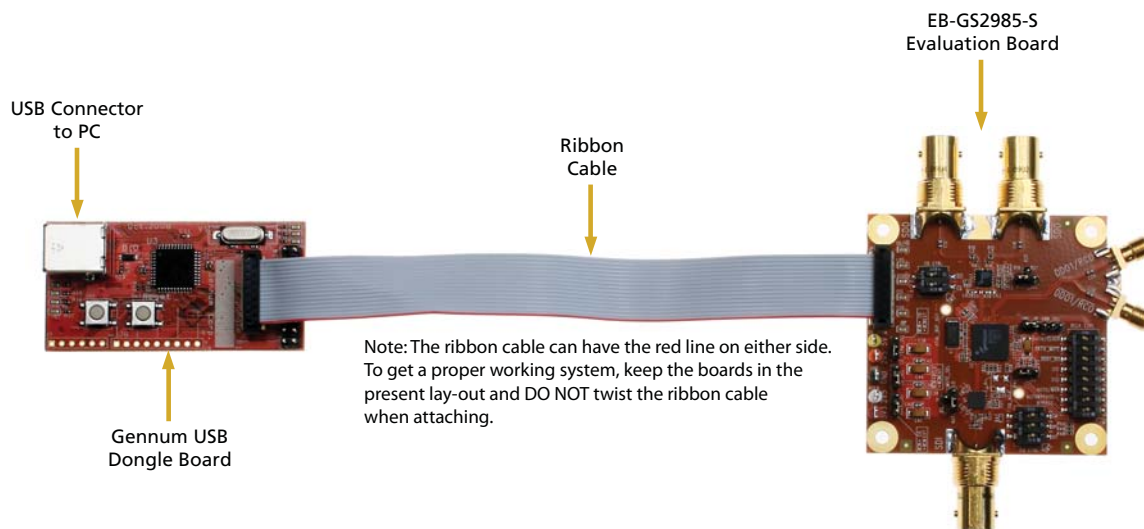


Figure 1-11: EB-GS2985-S Board + USB Dongle Board setup

When the Gennum USB Dongle Board is connected to the EB-GS2985-S, the GS2985 automatically switches from Legacy mode to SPI mode. As an indicator, the HIF LED on the EB-GS2985-S board turns off.

1.9.4 GS2985 Control Software

1. Start GS2985 Control Software by clicking on the appropriate link on the Start Menu.
2. Control SPI Register Settings & Observe Outputs.

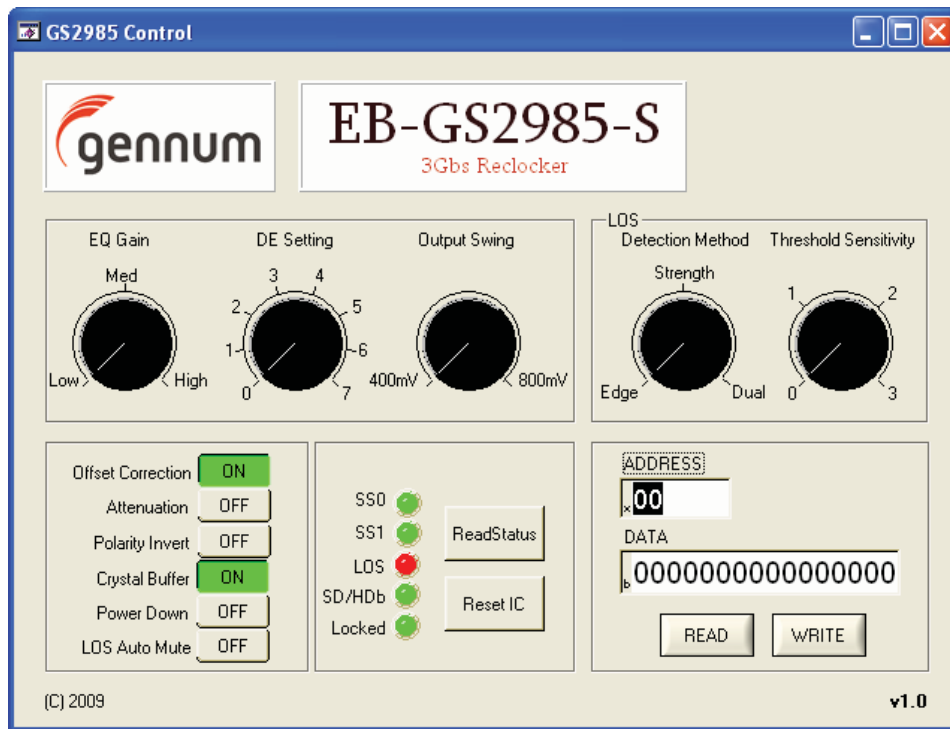


Figure 1-12: Gennum GS2985 Control Interface

Functionality of Buttons

Offset Correction	Equalizer offset correction enable
Attenuation	Input attenuation enable. Should be enabled for input signals above 1Vpp differential
Polarity Invert	Data polarity invert
Crystal Buffer	Crystal buffer disable
Power Down	Chip powers down when asserted
LOS Auto Mute	When enabled the output will automatically mute if Loss of Signal is HIGH
Read	Read DATA from a GS2985 register (x00 - x0D)
Write	Write DATA to a GS2985 register (x00 - x0D)
ReadStatus	Reads status of outputs SS0, SS1, LOS, SD/$\overline{\text{HD}}$, Locked • SS1 and SS0 indicate the selected data rate (00 - Reserved, 01 - 270Mbps, 10 - 1485Mbps, 11 - 2970Mbps) • LOS indicates when a Loss of Signal occurs • SD/$\overline{\text{HD}}$ indicates when SD mode is selected • LOCKED indicates when the PLL is locked
Reset IC	Resets the GS2985

Functionality of Knobs

EQ Gain	Equalizer gain setting
DE Setting	De-emphasis boost amplitude control (0 = lowest setting, 7 = highest setting)
Output Swing	Sets the output amplitude (400mV swing/800mV swing)
LOS Detection Method	Legacy = edge detection method, New = signal strength detection method, Dual = combination of edge detection and signal strength
LOS Threshold Sensitivity	LOS Threshold Adjust. 0 = least sensitive, 3 = most sensitive

1.9.5 Start-up Process

1. Ensure the software and drivers are installed on your PC.
2. Connect the Gennum USB Dongle Board to the EB-GS2985-S using the supplied ribbon cable as per [Figure 1-11](#).
3. Connect the power supplies as per [Section 1.7](#) and power up the board.
4. Connect the Gennum USB Dongle Board to a PC USB port via a USB cable.
5. Perform a hard reset, via the Reset button on the Gennum USB Dongle board as per [Figure 1-10](#).
6. Launch the GS2985 Control Software on the PC connected to the Gennum USB Dongle Board.
7. The GS2985 registers can now be controlled through the SPI.

1.10 Optional Connectors

The EB-GS2985-S board also features footprints for two optional test points (SQ_ADJ and XTAL_BUF_OUT).

2. Schematics

2.1 EB-GS2985-S Schematic

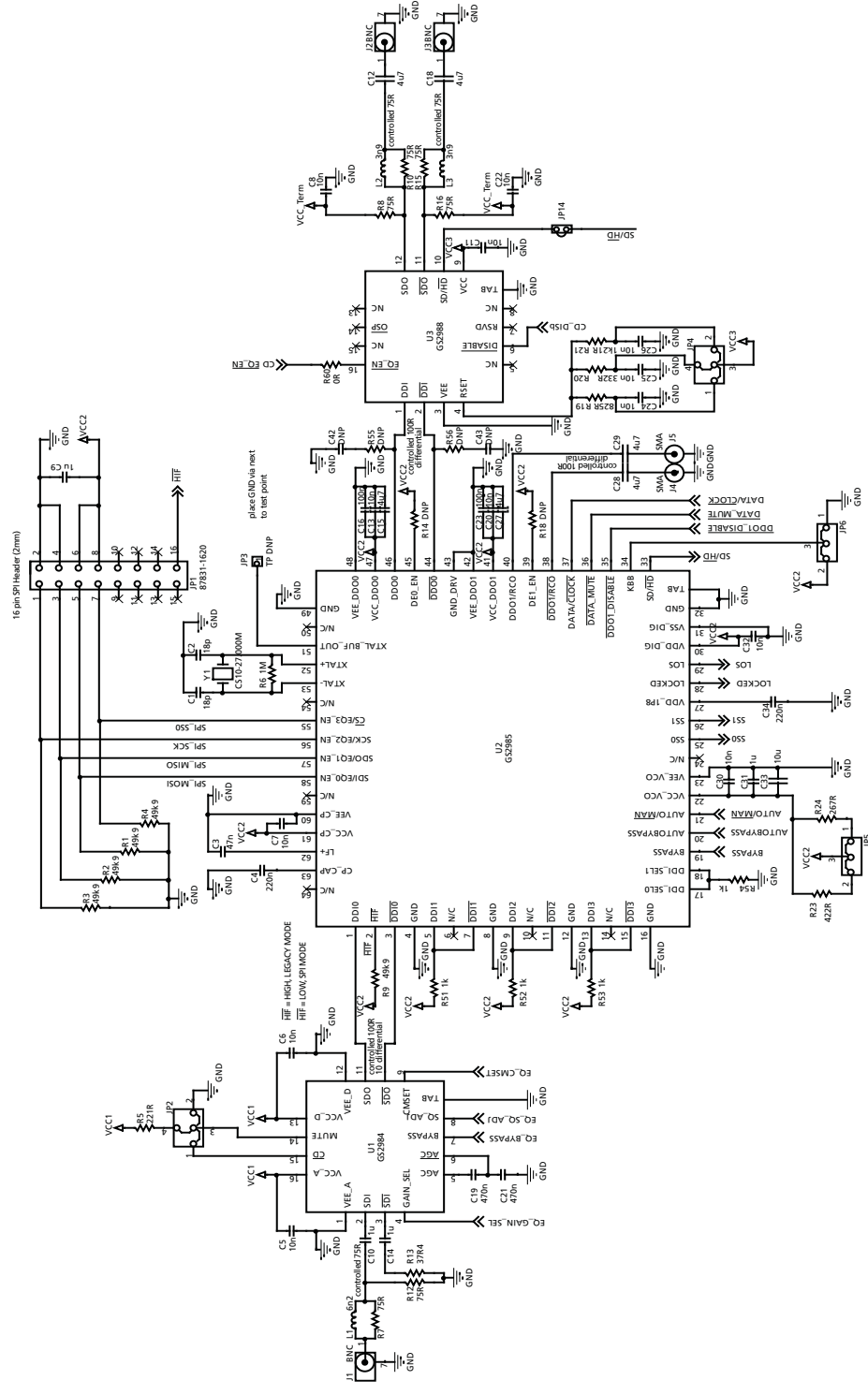


Figure 2-1: EB-GS2985-S Schematic

2.2 Power & Control Schematic

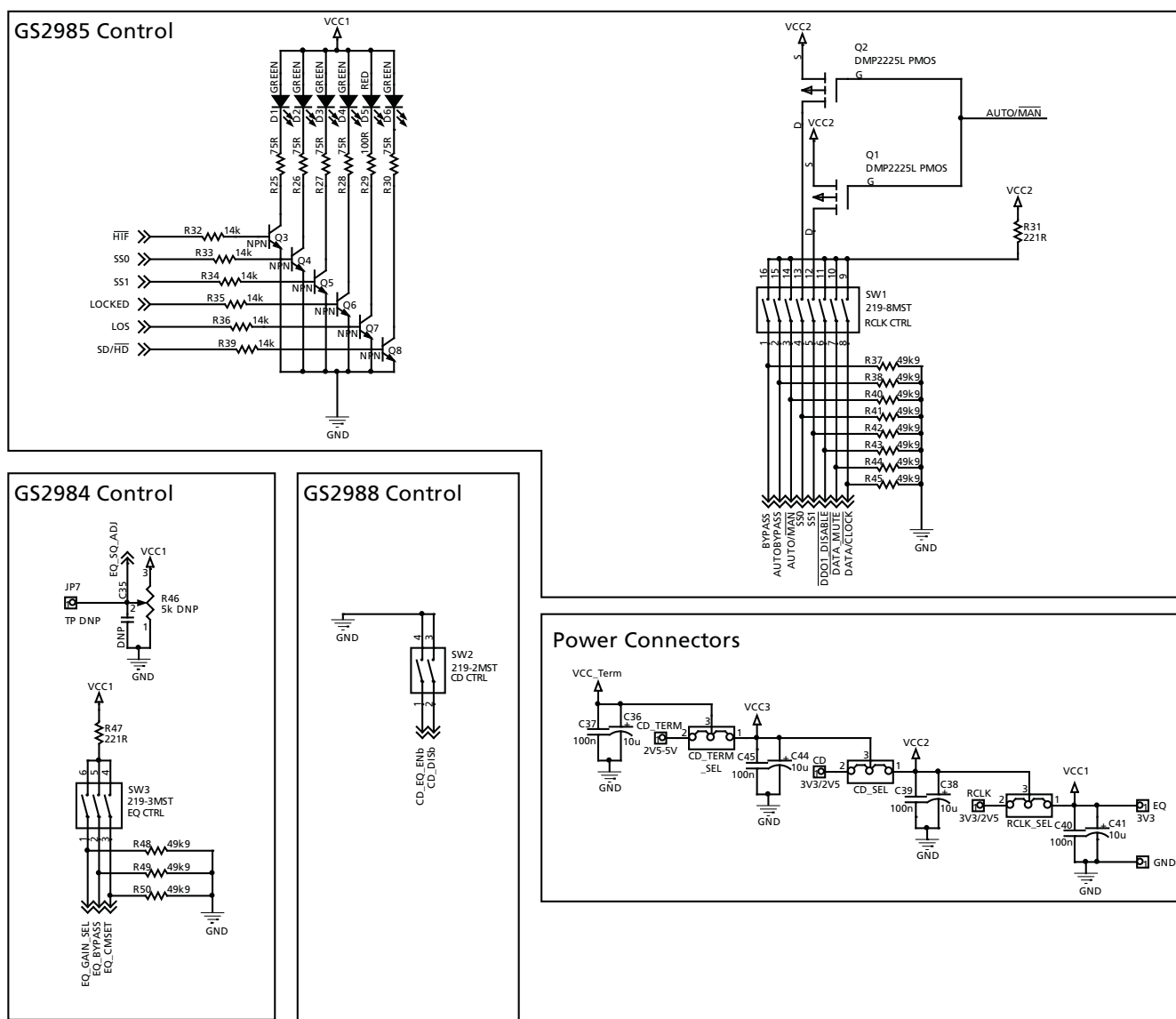


Figure 2-2: Power & Control Schematic

3. Board Layout

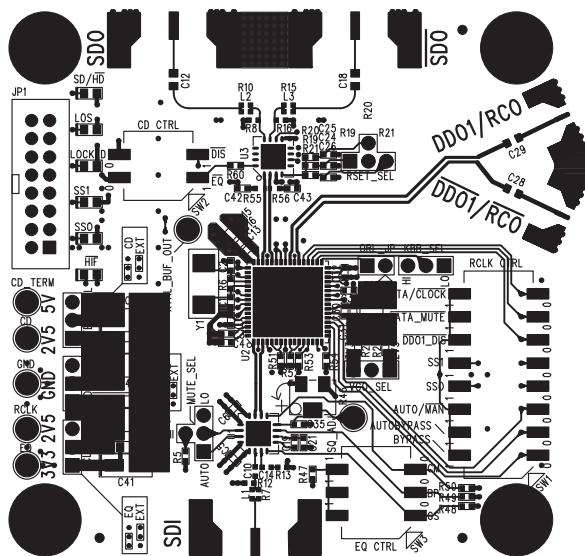


Figure 3-1: Layer 1 (Top Layer)

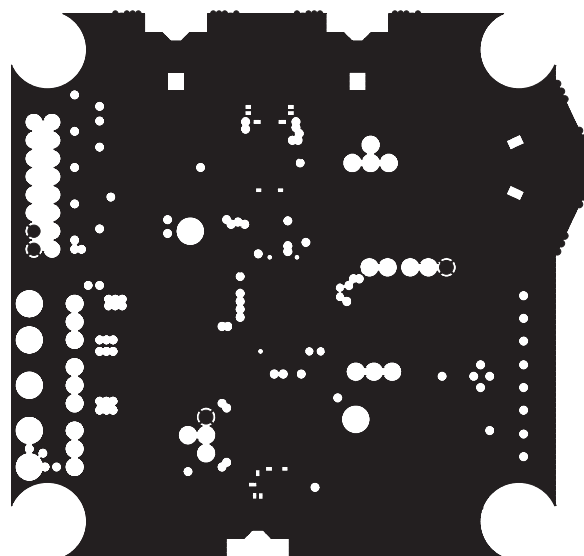


Figure 3-2: Layer 2 (Ground Layer)

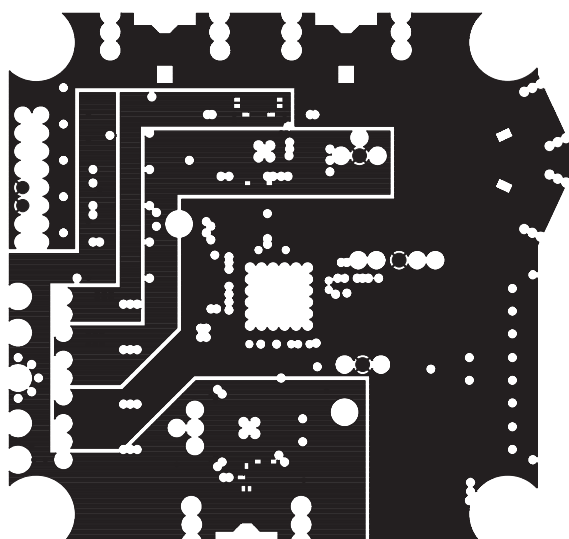


Figure 3-3: Layer 3 (Power Layer)

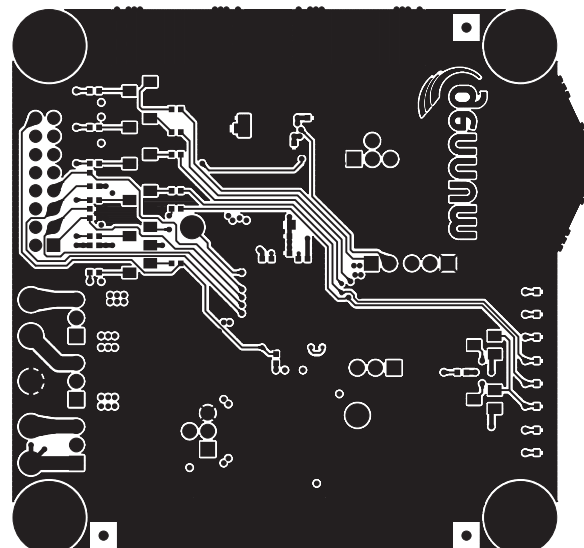


Figure 3-4: Layer 4 (Bottom Layer)

4. Bill of Materials

Table 4-1: Bill of Materials

Quantity	Reference	Part
2	C1, C2	Capacitor; ceramic, 18pF 50V 5% C0G 0402
6	C12, C15, C18, C27, C28, C29	Capacitor; ceramic, 4.7 μ F 10V X5R 0603
2	C16, C23	Capacitor; ceramic, 0.1 μ F 16V X7R 0402
4	C37, C39, C40, C45	Capacitor; ceramic, 0.1 μ F 16V 10% X7R 0603
2	C19, C21	Capacitor; ceramic, 0.47 μ F 10V X5R 0402
1	C3	Capacitor; ceramic, 47000pF 10V 10% X7R 0402
5	C33, C36, C38, C41, C44	Capacitor; tantalum 10 μ F 10V 10% SMD
2	C4, C34	Capacitor; ceramic, 0.22 μ F 10V X5R 0402
13	C5, C6, C7, C8, C11, C13, C20, C22, C24, C25, C26, C30, C32	Capacitor; ceramic, 10000pF 16V 10% X7R 0402
4	C9, C10, C14, C31	Capacitor; ceramic, 1 μ F 10V 10% X5R 0402
5	D1, D2, D3, D4, D6	LED; green TSS type SMD 2.03V
1	D5	LED; red TSS type SMD 1.72V
3	J1, J2, J3	Connector; PCB, BNC edge-mount (UCBBJE20-1)
2	J4, J5	Connector; PCB, SMA edge-mount (142-0791-881)
1	JP1	Connector; header 16-position 2mm Vert Gold
1	JP10	Clip, test point (white)
1	JP12	Clip, test point (red)
1	JP13	Clip, test point (black)
1	JP14	Header; male 2-pole 2mm
1	JP16	Clip, test point (orange)
2	JP2, JP4	Header; male, 4-pole 2mm
5	JP5, JP6, JP9, JP11, JP15	Header; male, 3-pole 2mm

Table 4-1: Bill of Materials

Quantity	Reference	Part
1	JP8	Clip, test point (yellow)
1	L1	Inductor; 6.2nH 300mA 0402
2	L2, L3	Inductor; 3.9nH 300mA 0402
2	Q1, Q2	Transistor; MOSFET, P-channel 20V 2.6A SOT-23
6	Q3, Q4, Q5, Q6, Q7, Q8	Transistor; GP NPN AMP SOT-23
16	R1, R2, R3, R4, R9, R37, R38, R40, R41, R42, R43, R44, R45, R48, R49, R50	Resistor; 49.9k Ω 1/16W 1% 0402 SMD
1	R13	Resistor; 37.4 Ω 1/16W 1% 0402 SMD
1	R19	Resistor; 332 Ω 1/16W 1% 0402 SMD
1	R20	Resistor; 825 Ω 1/16W 1% 0402 SMD
1	R21	Resistor; 1.21k Ω 1/16W 1% 0402 SMD
1	R23	Resistor; 422 Ω 1/16W 1% 0402 SMD
1	R24	Resistor; 267 Ω 1/16W 1% 0402 SMD
1	R29	Resistor; 100 Ω 1/16W 1% 0402 SMD
6	R32, R33, R34, R35, R36, R39	Resistor; 14k Ω 1/16W 1% 0402 SMD
3	R5, R31, R47	Resistor; 221 Ω 1/16W 1% 0402 SMD
4	R51, R52, R53, R54	Resistor; 1k Ω 1/16W 1% 0402 SMD
1	R6	Resistor; 1M Ω 1/16W 1% 0402 SMD
1	R60	Resistor; 0 Ω 1/16W 5% 0402 SMD
11	R7, R8, R10, R12, R15, R16, R25, R26, R27, R28, R30	Resistor; 75 Ω 1/16W 1% 0402 SMD
1	SW1	Switch; tape seal 8-position SMD
1	SW2	Switch; tape seal 2-position SMD
1	SW3	Switch; tape seal 3-position SMD
1	U1	Gennum GS2984 3Gb/s Equalizer
1	U2	Gennum GS2985 3Gb/s Reclocker
1	U3	Gennum GS2988 3Gb/s Cable Driver
1	Y1	Crystal; 27.0000MHz 18pF SMD (CS10-27.000M)

DOCUMENT IDENTIFICATION USER GUIDE

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