

FEATURES

- operation beyond 622 Mb/s
- accepts SMPTE and PECL input levels
- fully differential signal path
- on-chip PECL current loads eliminate need for external pull-down resistors
- capable of driving 100 Ω differential loads
- very low 500 mW power consumption
- additional expansion port input for construction of larger matrices
- auxiliary monitoring output
- easy to configure
- double latched address inputs with separate load and configure
- TTL/CMOS compatible control logic inputs
- single 5 V power supply

APPLICATIONS

- Serial digital video switching
- Datacom or telecom switching

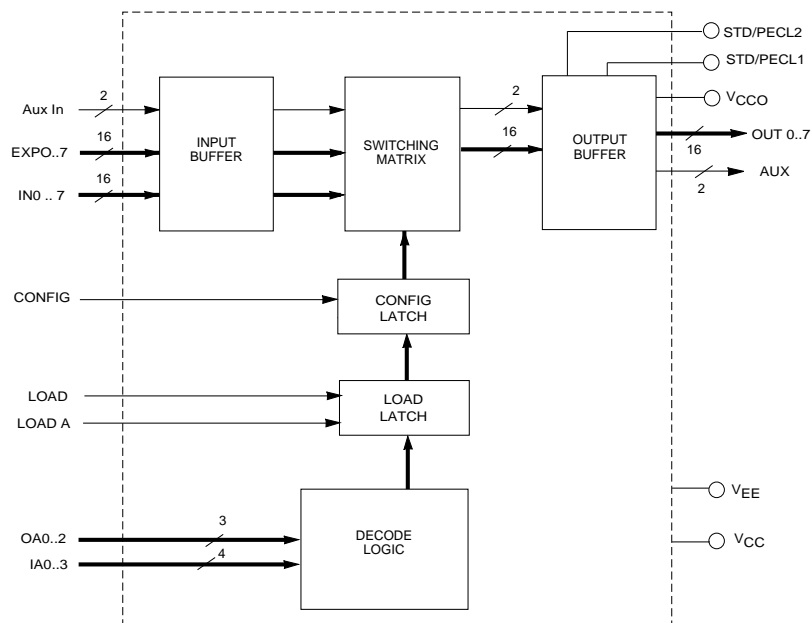
DEVICE DESCRIPTION

The GX9533 is a high speed 8x9 serial digital crosspoint. An expansion input port eases the design of larger switching matrices by reducing PCB layers and eliminating the need for cascaded secondary switching. Decode logic and double level latching to configure the matrix are included on chip. Separate LOAD and CONFIGURE inputs allow for asynchronous configuration and synchronous switching. These latches can also be made transparent for asynchronous switching by pulling the LOAD and CONFIGURE pins high.

In the power saving (PS) mode, the GX9533 has a very low power consumption of 500mW. This is accomplished by driving a 400mV output swing into the on-chip 200Ω differential load termination in the expansion port of the next GX9533. This architecture provides a significant power savings and the elimination of external load resistors or impedance matching resistors. In applications where standard PECL levels are necessary, the GX9533 can be configured in "PECL Mode", to drive 800mV p-p into a 100Ω differential load. The power consumption in this mode increases to 860mW.

ORDERING INFORMATION

Part Number	Package	Temperature
GX9533-CQY	100Pin PQFP	0°C to 70°C
GX9533-CTY	100 Pin PQFP Tape	0°C to 70°C



ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE/UNITS
Supply Voltage ($V_S = V_{CC} - V_{EE}$)	5.5 V
Input Voltage Range (any input)	-0.3 to ($V_{CC} + 0.3$) V
Power Dissipation	975 mW
Operating Temperature Range	0°C to 70°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10 seconds)	260°C

CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
DO NOT OPEN PACKAGES OR HANDLE
EXCEPT AT A STATIC-FREE WORKSTATION



DC ELECTRICAL CHARACTERISTICS $V_{CC} = 5V, V_{EE} = 0V, T_A = 0 - 70C$ unless otherwise shown

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage			4.75	5.0	5.25	V
ECL Input Voltage Swing			200	800	1200	mVpp
ECL Common Mode Input Voltage Range		With 1200 mV input signal swing	2500	-	$V_{CC} - 600$	mV
Logic Input Voltage	High		2.0	-	V_{CC}	V
	Low		0	-	0.8	V

POWER SAVE 1 MODE ($R_{SET} = 4 k\Omega$)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current		$R_L = 100\Omega$	-	115	150	mA
Output Common Mode Voltage			$V_{CC} - 1200$	-	$V_{CC} - 800$	mV
Output Voltage Swing			300	450	600	mV
Output Voltage	High		$V_{CC} - 950$	-	$V_{CC} - 600$	mV
	Low		$V_{CC} - 1400$	-	$V_{CC} - 1000$	mV

POWER SAVE 2 MODE ($R_{SET} = 6 k\Omega$)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current		$R_L = 200\Omega$	-	100	130	mA
Output Common Mode Voltage			$V_{CC} - 1200$	-	$V_{CC} - 800$	mV
Output Voltage Swing			300	450	600	mV
Output Voltage	High		$V_{CC} - 950$	-	$V_{CC} - 600$	mV
	Low		$V_{CC} - 1400$	-	$V_{CC} - 1000$	mV

PECL MODE ($R_{SET} = 2 k\Omega$)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current		$R_L = 100\Omega$	-	170	185	mA
Output Common Mode Voltage			$V_{CC} - 1450$	-	$V_{CC} - 1050$	mV
Output Voltage Swing			700	800	900	mV
Output Voltage	High		$V_{CC} - 1200$	-	$V_{CC} - 650$	mV
	Low		$V_{CC} - 1850$	-	$V_{CC} - 1450$	mV

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5.0V$, $V_{EE} = 0V$, $T_A = 0 - 70C$ unless otherwise shown).

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	
Maximum Input Data Rate		For 90% eye opening	-	850	-	Mbps	
Additive Jitter (Standard Input)		143 to 622 Mbps all hostile crosstalk	-	80	-	ps _{p-p}	
Additive Jitter (Expansion Input)		143 to 622 Mbps all hostile crosstalk	-	70	-	ps _{p-p}	
Data In to Data Out Delay	(Standard Input)	t_{DLY}	Average of all Channels	-	1.7	-	ns
	(Expansion Input)	t_{DLY}		-	1.1	-	ns
Propagation Delay Match	(Standard Inputs)			-	350	-	ps
	(Expansion Input)			-	250	-	ps
CONFIGURE to Data Out Delay	Main Out	t_{CD}		-	10	-	ns
	AUX Out	t_{CD}		-	11	-	ns
LOAD/LOADA Pulse Width	t_{LP}		20	-	-	ns	
CONFIGURE Pulse Width	t_{CP}		20	-	-	ns	
IAi to LOAD/LOADA High Setup time	t_{ILS}		30	-	-	ns	
LOAD/LOADA to IAi Low Hold time	t_{ILH}		0	-	-	ns	
OAi to LOAD HIGH Setup time	t_{OLS}		30	-	-	ns	
LOAD to OAi Low hold time	t_{OLH}		0	-	-	ns	
LOAD High to CONFIGURE High	t_{LC}		0	-	-	ns	
Output Rise/Fall Time			-	700	-	ps	

NOTE: 1. Use RMS addition to calculate additive jitter through cascaded devices.

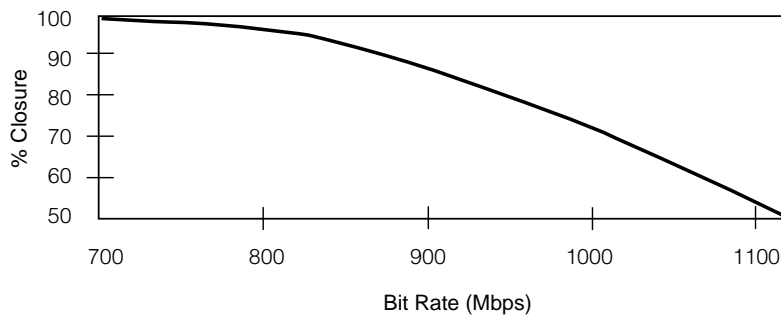


Fig. 1 Typical Eye Closure versus Bit Rate

PIN DESCRIPTIONS

Symbol	Type	Description
$\overline{IN0}$ to $\overline{IN7}$ $IN0$ to $IN7$	I	Differential Data Inputs
$\overline{OUT0}$ to $\overline{OUT7}$ $OUT0$ to $\overline{OUT7}$	O O	Differential Data Outputs
$\overline{AUX_OUT}$ AUX_OUT	O O	Auxiliary Port Output
$\overline{AUX_IN}$ AUX_IN	I	Auxiliary Port Input
OA0 to OA2	I	Output Address Select
IA0 to IA3	I	Input Address Select
LOAD	I	Loads Input & Output Address
LOADA	I	Loads Auxiliary Input Address
STD/ECL1 STD/ECL2		Resistor connection for Power Save mode or PECL mode. Refer to Table 3
CNFG	I	Switch Configuration
EXP0 to EXP07 $\overline{EXP0}$ to $\overline{EXP07}$	I	Expansion Port Inputs
V_{CC}		Positive Power Supply
V_{CC0}		Positive Power Supply (PECL outputs)
V_{EE}		Negative Power Supply

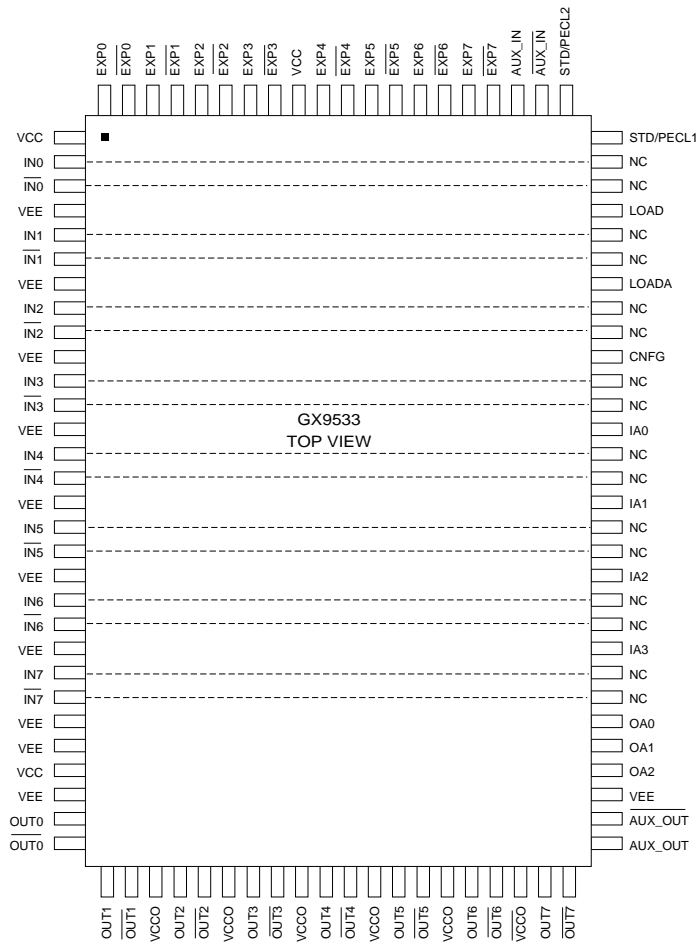


Fig. 2 GX9533 Pin Connections

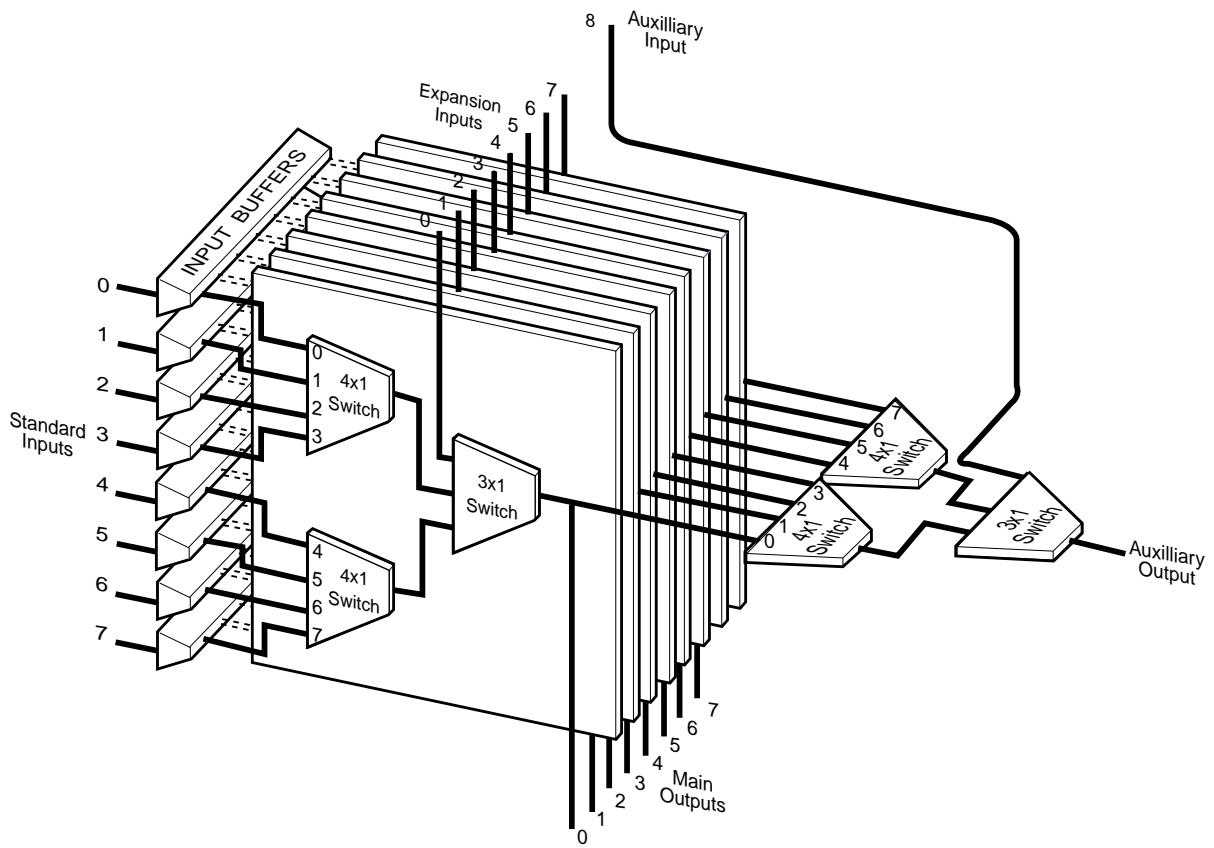


Fig. 3 Data Flow Diagram

DETAILED DEVICE DESCRIPTION

Differential Inputs

The inputs to the GX9533 will accept both SMPTE 259M as well as PECL input levels. The fully differential data path provides low jitter data rates of up to 700 Mbps.

The main inputs (IN0..7) and expansion inputs (EXP0..7) are normally connected to a biased differential data source. The GX9533 inputs are not self biased, so unused inputs should be connected as shown in Figure 3 or Figure 4.

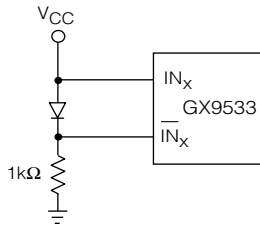


Fig. 4 Preferred Termination of Unused Inputs

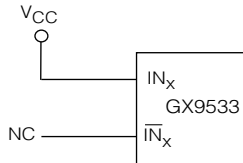


Fig. 5 Alternate Termination of Unused inputs

Terminating the inputs as shown in Figure 3 will provide the highest noise immunity, since there is no possibility of noise coupling into the unconnected input pin.

I/O Address Selection

The GX9533 has a versatile LOAD/CONFIGURE architecture which simplifies IN/OUT switch configuration.

An output is normally connected to an input by a two stage process:

STAGE ONE: LOADING THE CONFIGURATION INTO LATCHES

1) The output address is selected on the OA pins as shown in Table 1.

OA2	OA1	OA0	Output Port
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

Table 1
Output Address Selection

2) The input address is selected on the IA pins as shown in Table 2 below.

IA3	IA2	IA1	IA0	Input Port
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	X	X	EXP
1	1	X	X	Quiet Mode

Table 2
Input Source Address Selection

3) A LOAD pulse then transfers the output and input addresses into the GX9533 LOAD latch.

The above three steps can be repeated up to eight times in order to configure the latch for all eight outputs.

During step 3 above, if the LOADA pulse is also strobed, the latch is configured to connect the selected input to the ninth, auxiliary output.

Note that a QUIET mode is available as shown in Table 2. In QUIET mode, the outputs are latched in a DC state with $OUT_X = 1$ and $\overline{OUT}_X = 0$.

STAGE TWO: CONFIGURING THE MATRIX

A CONFIGURE strobe is applied to transfer the contents of the LOAD latch into the CONFIG latch. This action will cause the data flow through the GX9533 to be switched to the new configuration. Refer to Figure 6 for detailed timing information.

Note that any single output can be asynchronously switched by having LOAD (or LOADA if desired) held high while CONFIG is strobed.

Output Level Select

A single resistor, R_{SET} , is used to set the amplitude of all differential outputs. Table 3 shows the value of R_{SET} vs output drive capability.

R_{SET}	Vout (mV)	Output R_L	Mode
2K	800	100	PECL
4K	450	100	Power Save 1
6K	450	200	Power Save 2

Table 3 R_{SET} vs V_{OUT}

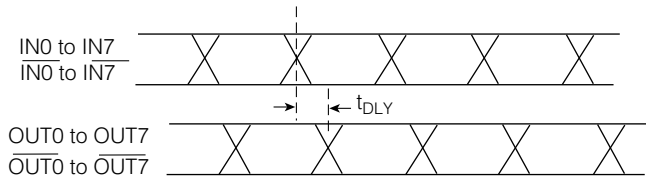


Fig. 6 GX9533 Data Latency

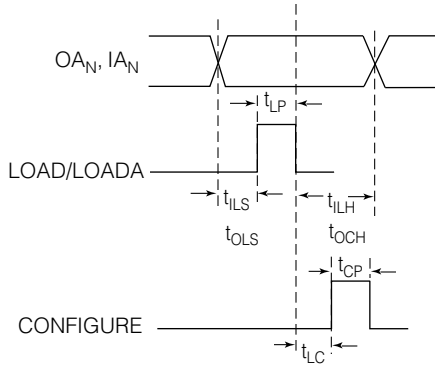


Fig. 7 LOAD/LOAD A and Configure Timing

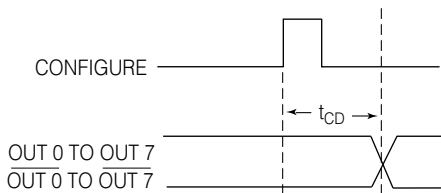


Fig. 8 Configure to Data Out Delay

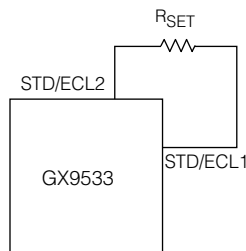


Fig. 9 GX9533 R_{SET} Connection

USING THE GX9533 TO EXPAND LARGER MATRICES

The GX9533 pin-out and architecture provides a number of advantages over other crosspoint switches in the area of switching matrix board layout.

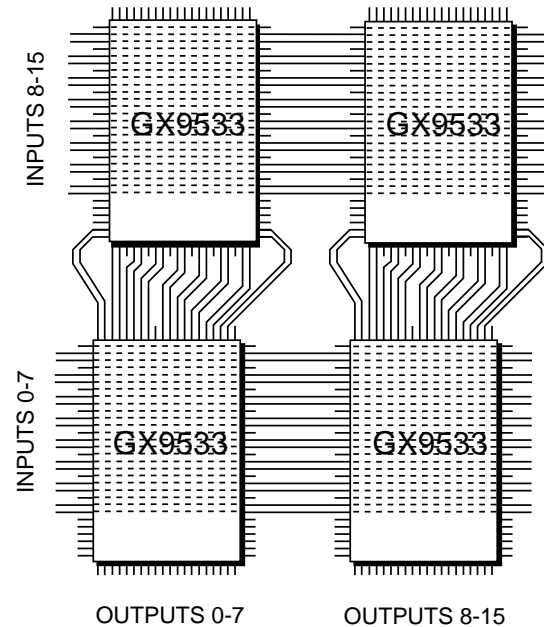


Fig. 10 Crosspoint Matrix Expansion - 16x16 Crosspoint Matrix

Bus Through™ Pin Outs.

To easily facilitate a switching matrix design where inputs can be bussed across a matrix of crosspoint devices, Gennum's crosspoint device has "N/C" pins opposite the input pins as shown by the dotted lines in the pin-out diagram above. This design allows bussing of inputs without having to use "vias" to get below the top layer of the printed circuit board.

Expansion Port Input

The expansion inputs provide the following benefits:

- by not having to run traces from the outputs of the crosspoint switch to a common output bus, crosstalk between output channels can be greatly reduced.
- fewer circuit board layers are required because the outputs of each device simply line up
- there are no transmission line effects caused by connecting high-Z outputs to an output bus
- because the output signal is being routed from the top of the switching matrix to the bottom through the devices, inputs can be simply bussed across the board without having to worry about input/output crosstalk.

REVISION NOTES:
Changes to Block diagram and DC/AC characteristics.

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