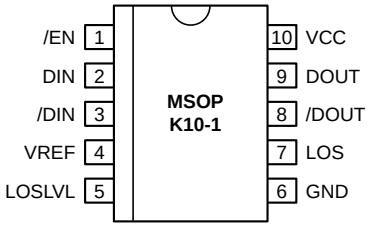
PACKAGE/ORDERING INFORMATION



10-Pin MSOP (K10-1)

Ordering Information

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY88993AVKI	K10-1	Industrial	993A	Sn-Pb
SY88993AVKITR[1]	K10-1	Industrial	993A	Sn-Pb
SY88993AVKG	K10-1	Industrial	993A with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY88993AVKGTR[1]	K10-1	Industrial	993A with Pb-Free bar-line indicator	Pb-Free NiPdAu

Note:

1. Tape and Reel.

PIN NAMES

Pin	Type	Function
D_{IN}	Data Input	Data Input
$/D_{IN}$	Data Input	Inverting Data Input
LOS_{LVL}	Input	Loss of Signal Level Set
/EN	TTL Input	Output Enable (Active Low)
LOS	TTL Output (Open Collector)	Loss of Signal Indicator (Active High)
GND	Ground	Ground
D_{OUT}	CML Output	Data Output
$/D_{OUT}$	CML Output	Inverting Data Output
V_{CC}	Power Supply	Positive Power Supply
V_{REF}	Output	Reference Voltage Output for LOS Level Set (see Fig. 3)

GENERAL DESCRIPTION

General

The SY88993AV is an integrated limiting amplifier intended for high-frequency fiber-optic applications. The circuit connects to typical transimpedance amplifiers found within a fiber-optics link. The linear signal output from a transimpedance amplifier can contain significant amounts of noise, and may vary in amplitude over time. The SY88993AV limiting amplifier quantizes the signal and outputs a voltage-limited waveform.

The /EN pin allows the user to disable the output signal without removing the input signal.

ABSOLUTE MAXIMUM RATINGS[1]

Symbol	Rating	Value	Unit
V_{CC}	Power Supply Voltage	0 to +7.0	V
D_{IN}, $/D_{IN}$	Input Voltage	0 to V_{CC}	V
T_A	Operating Temperature Range	–40 to +85	°C
T_{STORE}	Storage Temperature Range	–55 to +85	°C

Note:

1. Permanent device damage may occur if absolute maximum ratings are exceeded. This is a stress rating only and functional operation is not implied at conditions other than those detailed in the operational sections of this data sheet. Exposure to absolute maximum ratlng conditions for extended periods may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

V_{CC} = +3.3V ±10% or +5V ±10%, R_{LOAD} = 50Ω to V_{CC}

Symbol	Parameter	T_A = –40°C		T_A = 0°C		T_A = +25°C			T_A = +85°C		Unit
		Min.	Max.	Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_{CC}	Power Supply Current[1] 5V 3.3V	— —	55 50	— —	55 50	— —	43 40	55 50	— —	65 60	mA
I_{IL}	/EN Input LOW Current	–0.3[4]	—	–0.3[4]	—	–0.3[4]	—	—	–0.3[4]	—	mA
I_{IH}	/EN Input HIGH Current	— —	20[5] 100[6]	— —	20[5] 100[6]	— —	— —	20[5] 100[6]	— —	20[5] 100[6]	µA
I_{OH}	LOS Output Leakage[2]	—	100	—	100	—	—	100	—	100	uA
LOS_{LVL}	LOS_{LVL} Level	V_{REF}	V_{CC}	V_{REF}	V_{CC}	V_{REF}	—	V_{CC}	V_{REF}	V_{CC}	V
V_{OL}	LOS Output Low Level[3]	—	0.5	—	0.5	—	—	0.5	—	0.5	V
V_{REF}	Reference Voltage	V_{CC} –1.38	V_{CC} –1.26	V_{CC} –1.38	V_{CC} –1.26	V_{CC} –1.38	V_{CC} –1.32	V_{CC} –1.26	V_{CC} –1.38	V_{CC} –1.26	V
V_{IH}	/EN Input HIGH Voltage	2.0	—	2.0	—	2.0	—	—	2.0	—	V
V_{IL}	/EN Input LOW Voltage	—	—	0.8	—	0.8	—	—	0.8	—	V
V_{OFFSET}	Differential Output Offset	—	±80	—	±80	—	±9	±80	—	±80	mV
V_{CMR}	Common Mode Range	GND±2	V_{CC}–0.2	GND±2	V_{CC}–0.2	GND±2	—	V_{CC}–0.2	GND±2	V_{CC}–0.2	V

Notes:

1. No output load.
2. V_{OH} = 5.5V.
3. I_{OL} = +2mA.
4. V_{IN} = 0.5V.
5. V_{IN} = 2.7V.
6. V_{IN} =$V_{CC.}$

AC ELECTRICAL CHARACTERISTICS

V_{CC} = +3.3V ±10% or +5V ±10%, R_{LOAD} = 50Ω to V_{CC}

Symbol	Parameter	T_A = –40°C		T_A = 0°C		T_A = +25°C			T_A = +85°C		Unit
		Min.	Max.	Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
HYS	LOS Hysteresis	2	8	2	8	2	4.6	8	2	8	dB
PSRR	Power Supply[1] Rejection Ratio	—	—	—	—	—	35	—	—	—	dB
t_{OFFL}	LOS Release Time[2] Minimum Input	—	0.5	—	0.5	—	0.1	0.5	—	0.5	µs
t_{OFFH}	LOS Release Time[2] Maximum Input	—	0.5	—	0.5	—	0.1	0.5	—	0.5	µs
t_{ONL}	LOS Assert Time[2]	—	0.5	—	0.5	—	0.2	0.5	—	0.5	µs
t_r t_f	Differential Output[3] Rise/Fall Time (20%-80%)	—	120	—	120	—	60	120	—	120	ps
V_{ID}	Input Voltage Range	4	1800	4	1800	4	—	1800	4	1800	mV_{PP}
V_{OD}	Differential Output Voltage Swing[4]	600	—	600	—	600	800[5]	1200	600	—	mV_{PP}
V_{SR}	LOS Sensitivity Range	4	50	4	50	4	—	50	4	50	mV_{PP}
Output Spec (D_{OUT} and $/D_{OUT}$)											
V_{OH}	Output HIGH Voltage	V_{CC} –20	V_{CC}	V_{CC} –20	V_{CC}	V_{CC} –20	V_{CC} –5	V_{CC}	V_{CC} –20	V_{CC}	mV
V_{OL}	Output LOW Voltage[6]	—	V_{CC} –300	—	V_{CC} –300	—	V_{CC} –400	V_{CC} –300	—	V_{CC} –300	mV
Z_O	Single-Ended Output[7] Impedance	40	60	40	60	40	50	60	40	60	Ω
Input Spec (D_{IN} and $/D_{IN}$)											
$A_{V(Diff)}$	Differential Voltage Gain	—	—	—	—	—	39	—	—	—	dB
B_{-3dB}	3dB Bandwidth	—	—	—	—	—	2.5	—	—	—	GHz
S_{21}	Single-Ended Small Signal-Gain	26	—	26	—	26	33	—	26	—	dB

Notes:

1. Input referred noise = RMS output noise/low frequency gain. Input referred, 55MHz.
2. Input is a 200MHz square wave, t_r < 300ps, $1.8V_{PP}$.
3. With input signal V_{ID} > $50mV_{PP}$ with 50Ω load.
4. Input is a 200MHz square wave, t_r < 300ps, 50Ω load.
5. V_{ID} > $10mV_{PP}$.
6. Output levels are based on 50Ω impedance. If the load impedance is different, the output level will be changed.
7. See output structure.

APPLICATION NOTE

Output Termination

The SY88993AV outputs must be terminated with a 50Ω load to VCC.

Layout and PCB Design

Since the SY88993AV is a high-frequency component, performance can largely be determined by board layout and design. A common problem with high-gain amplifiers is feedback from the large swing outputs to the input via power supply.

The SY88993AV ground pin should be connected to the circuit board ground. Use multiple PCB vias close to the part to connect to ground. Avoid long, inductive runs which can degrade performance.

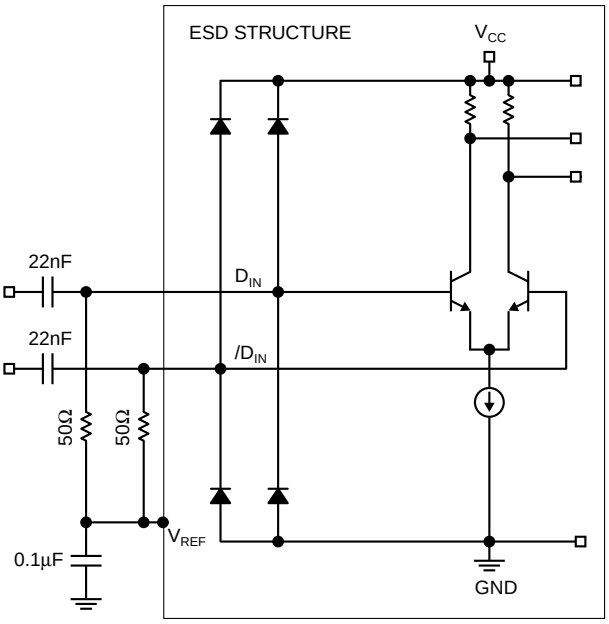


Figure 1. Differential Input Configuration

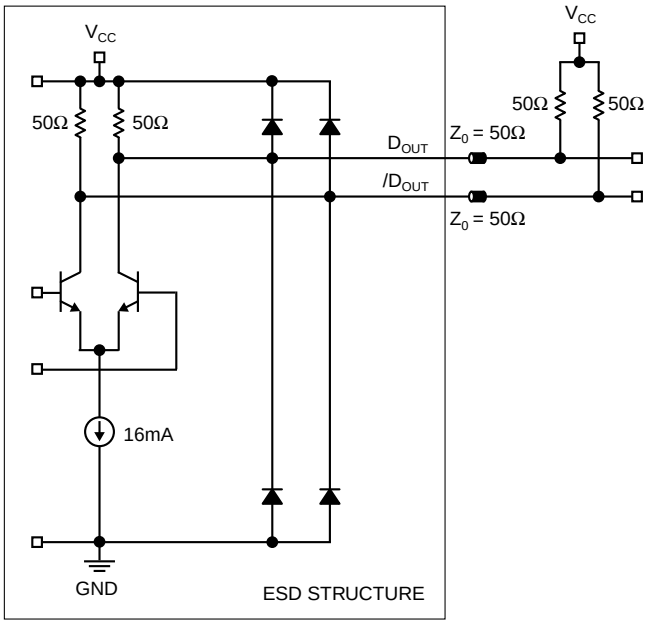
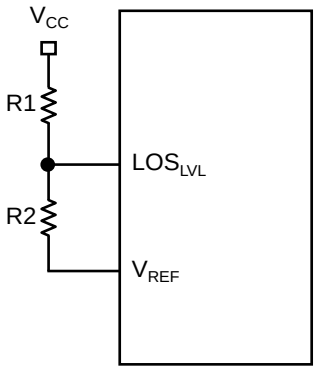


Figure 2. Differential Output Configuration



NOTES:

1. Resistor Divider = R2/ (R1 + R2)
2. R1 + R2 ≥ 5kΩ

Figure 3. LOS_{LVL} Circuit

PERFORMANCE CURVE

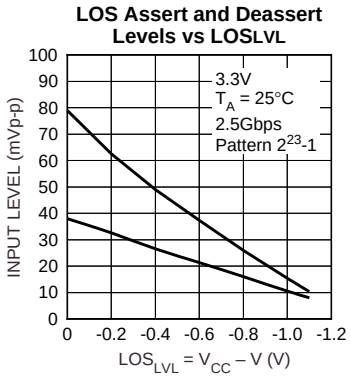


Figure 4.

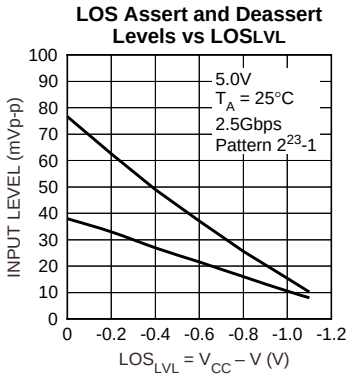


Figure 5.

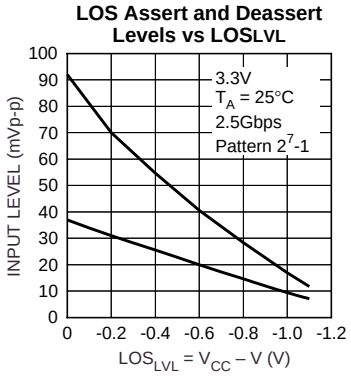


Figure 6.

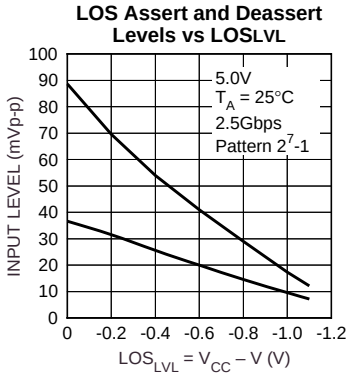
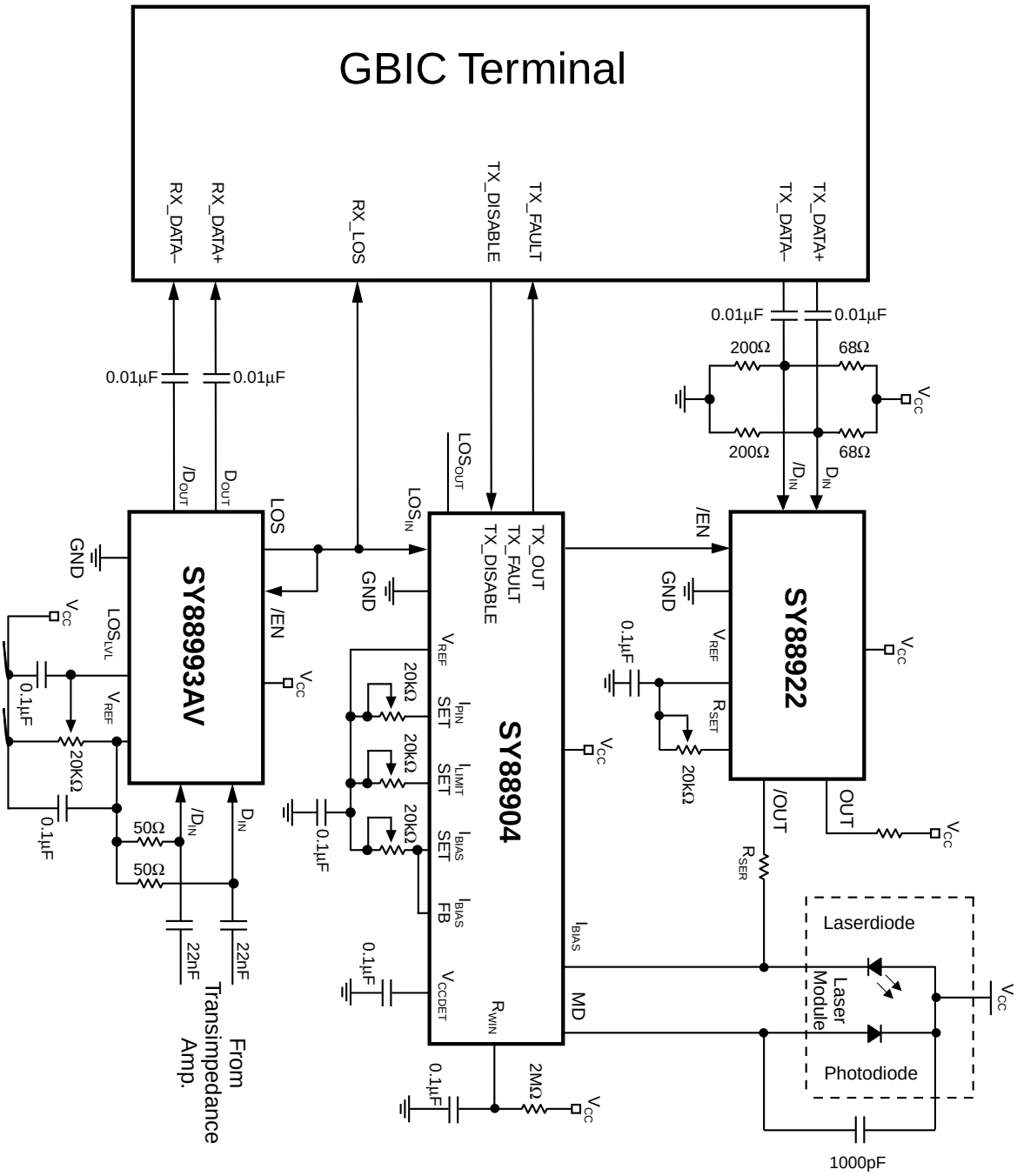
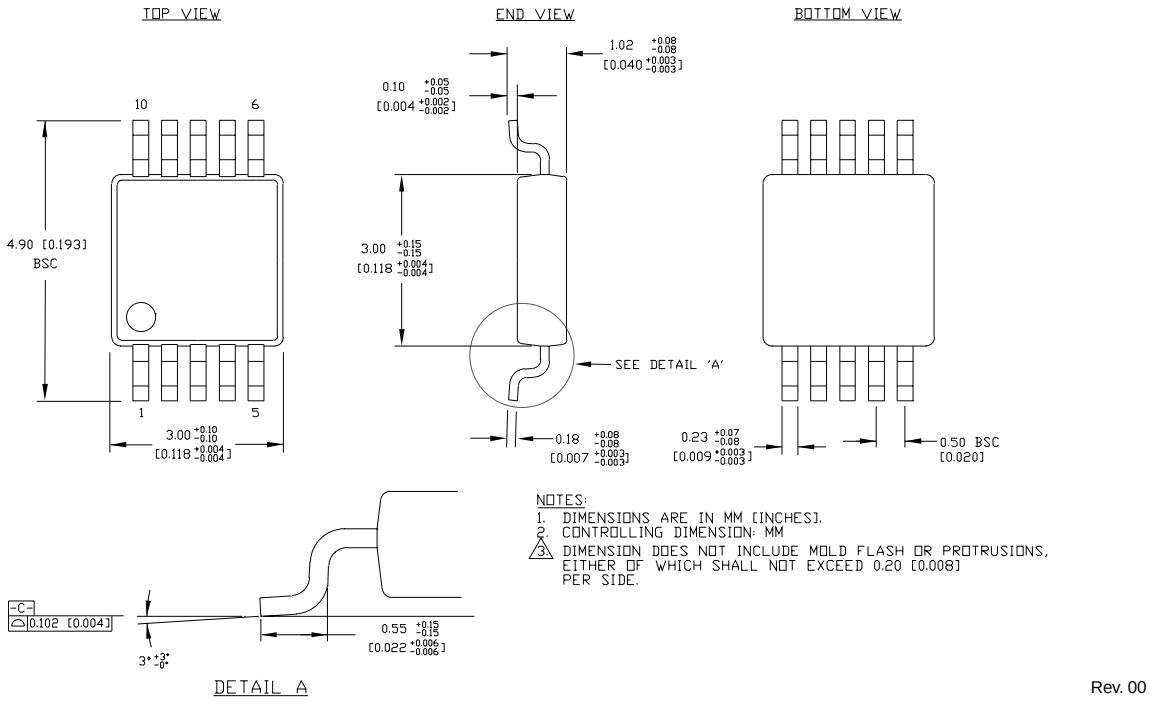


Figure 7.

APPLICATION EXAMPLE FOR 3-CHIP SET SOLUTION



10 LEAD MSOP (K10-1)



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