1.25Gbps HIGH-SPEED LIMITING POST AMPLIFIER

FEATURES

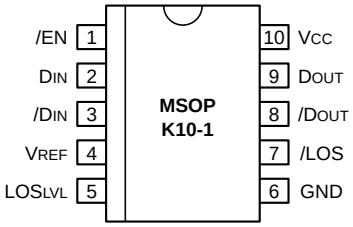
- Up to 1.25Gbps operation
- Low noise
- Chatter-Free /LOS Generation
- PECL /LOS Output
- TTL /EN Input
- Differential PECL inputs for data
- /EN input is TTL with internal 27K pull up
- Single power supply
- Designed for use with SY88902 and SY88904
- Available in a tiny 10-pin (3mm) MSOP

DESCRIPTION

The SY88913 limiting post amplifier with its high gain and wide bandwidth is ideal for use as a post amplifier in fiber-optic receivers with data rates up to 1.25Gbps. Signals as small as 5mVp-p can be amplified to drive devices with PECL inputs. The SY88913 generates a chatter-free PECL Loss of Signal (/LOS).

The SY88913 incorporates a programmble level detect function to identify when the input signal has been lost. This information can be fed back to the /EN input of the device to maintain stability under loss of signal conditions. Using LOSLVL pin the sensitivity of the level detect can be adjusted. The LOSLVL voltage can be set by connecting a resistor divider between VCC and VREF, Figure 2. Figure 3 shows the relationship between input level sensitivity and the voltage set on LOSLVL. Figure 4 shows the relationship between input level sensitivity and resistor divider ratio.

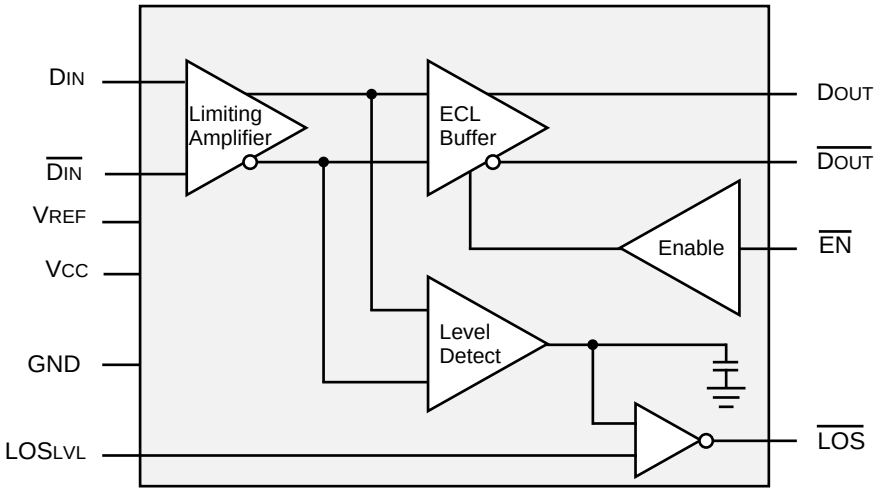
PIN CONFIGURATION



APPLICATIONS

- 1.25Gbps Gigabit Ethernet
- 531Mbps and 1062Mbps Fibre Channel
- 622Mbps SONET
- Gigabit Interface Converter

BLOCK DIAGRAM



Rev.: E Amendment: /1
Issue Date: July 2000

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	PECL Output	Loss of Signal Indicator (active Low)
GND	Ground	Ground
D_{OUT}	PECL Output	Data Output
/D_{OUT}	PECL Output	Inverting Data Output
V_{CC}	Power Supply	Positive Power Supply
V_{REF}	Output	Reference Voltage Output for LOS Level Set (see Fig. 2)

GENERAL DESCRIPTION

General

The SY88913 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 SY88913 limiting amplifier quantizes the signal and outputs a voltage-limited waveform.

The TTL /EN pin allows the user to disable the 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
D_{OUT}, /D_{OUT} , /LOS	Output Voltage (with 50Ω load)	V_{CC} –2.5, V_{CC} +0.3	V
T_A	Operating Temperature Range	–40 to +85	°C
T_{store}	Storage Temperature Range	–55 to +125	°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 RATING conditions for extended periods may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

V_{CC} = +5V ±10%, R_{LOAD} = 50Ω to V_{CC}-2V, T_A = –40°C to +85°C

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)	—	35	—	35	—	21	35	—	35	mA
I_{IL}	/EN Input LOW Current	–0.3(5)	—	–0.3(5)	—	–0.3(5)	—	—	–0.3(5)	—	mA
I_{IH}	/EN Input HIGH Current	— —	20(2) 100(3)	— —	20(2) 100(3)	— —	— —	20(2) 100(3)	— —	20(2) 100(3)	µA
V_{CMR}	Common Mode Range	GND +2.0	V_{CC} -1.0	GND +2.0	V_{CC} -1.0	GND +2.0	—	V_{CC} -1.0	GND +2.0	V_{CC} -1.0	V
V_{offset}	Differential Output Offset	—	±100	—	±100	—	—	±100	—	±100	mV
LOS_{LVL}	LOS_{LVL} Level	V_{REF}	V_{CC}	V_{REF}	V_{CC}	V_{REF}	—	V_{CC}	V_{REF}	V_{CC}	V
V_{OH}	D_{OUT} and /D_{OUT} HIGH Output	V_{CC}-1085	V_{CC}-880	V_{CC}-1025	V_{CC}-880	V_{CC}-1025	V_{CC}-955	V_{CC}-880	V_{CC}-1025	V_{CC}-880	mV
V_{OL}	D_{OUT} and /D_{OUT} LOW Output	V_{CC}-1830	V_{CC}–1555	V_{CC}-1810	V_{CC}–1620	V_{CC}-1810	V_{CC}–1705	V_{CC}–1620	V_{CC}-1810	V_{CC}–1620	mV
V_{REF}	Reference Supply(4)	V_{CC}-2.625	V_{CC}–2.325	V_{CC}-2.625	V_{CC}–2.325	V_{CC}-2.625	V_{CC}–2.475	V_{CC}–2.325	V_{CC}-2.625	V_{CC}–2.325	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	—	0.8	V

NOTES:

1. No Output Load.
2. V_{IN} = 2.7V
3. V_{IN} = V_{CC}
4. I_{REF} must be limited to be within –0.8mA (source) and 0.5mA (sink).
5. V_{IN} = 0.5V

AC ELECTRICAL CHARACTERISTICS

V_{CC} = +5V ±10%, R_{LOAD} = 50Ω to V_{CC} - 2V, T_A = –40°C to +85°C

Symbol	Parameter	T_A = –40°C		T_A = 0°C		T_A = +25°C			T_A = +85°C		Unit	Conditions
		Min.	Max.	Min.	Max.	Min.	Typ.	Max.	Min.	Max.		
PSRR	Power Supply(1) Rejection Ratio	—	—	—	—	—	35	—	—	—	dB	Input referred, 55MHz
V_{ID}	Input Voltage Range	5	1800	5	1800	5	—	1800	5	1800	mVp-p	
t_r, t_f	Output Rise/Fall Time	— —	350 —	— —	350 —	— —	200 t_{rin},t_{fin}	350 —	— —	350 —	ps	V_{ID} > 100mVp-p V_{ID} < 100mVp-p
V_{OD}	Differential Output Voltage Swing(2)	— —	— —	— —	— —	— —	600 200	— —	— —	— —	mV mV	V_{ID} = 15mVp-p V_{ID} = 5mVp-p
t_{OFFL}	/LOS Release Time(3) Minimum Input	—	0.5	—	0.5	—	0.1	0.5	—	0.5	µs	
t_{OFFH}	/LOS Release Time(4) Maximum Input	—	0.5	—	0.5	—	0.1	0.5	—	0.5	µs	
t_{ONL}	/LOS Assert Time(3)	—	0.5	—	0.5	—	0.2	0.5	—	0.5	µs	
V_{SR}	/LOS Sensitivity Range	5	50	5	50	5	—	50	5	50	mVp-p	
HYS	/LOS Hysteresis	2	8	2	8	2	4.6	8	2	8	dB	

NOTES:

1. Input referred noise = RMS output noise/low frequency gain.
2. Input is 622MHz square wave.
3. Input is a 200MHz square wave, tr < 300ps, 8mVp-p.
4. Input is a 200MHz square wave, tr < 300ps, 1.8Vp-p.

APPLICATION NOTE

Output Termination

The SY88913 outputs must be terminated with a 50Ω load to V_{CC} – 2V (or Thevenin equivalent).

Layout and PCB Design

Since the SY88913 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 the power supply.

The SY88913 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.

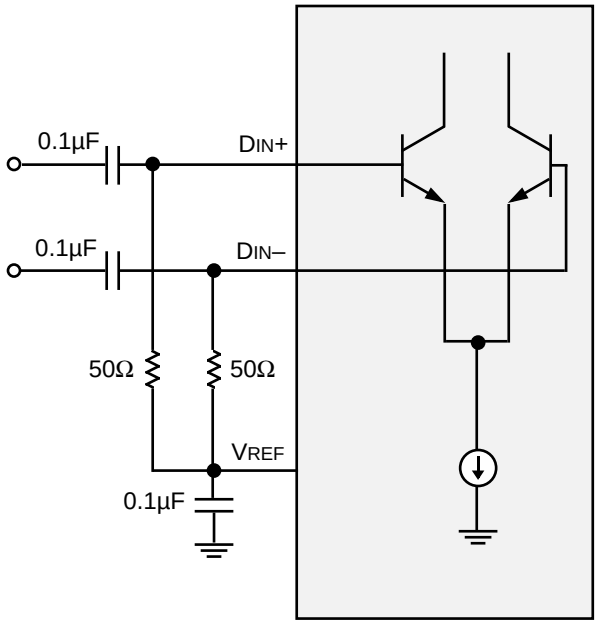
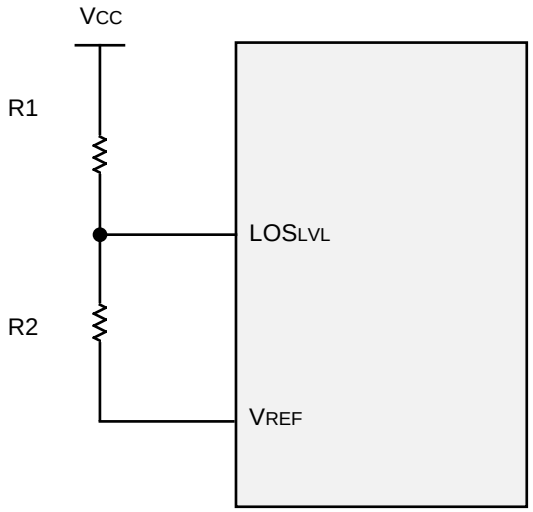


Figure 1. Differential Input Configuration



NOTES:
Resistor Divider = R2/ (R1 + R2)
R1 + R2 ≥ 5kΩ

Figure 2. LOSLVL Circut

PRODUCT ORDERING CODE

Ordering Code	Package Type	Operating Range
SY88913KC	K10-1	Commercial

PERFORMANCE CURVE

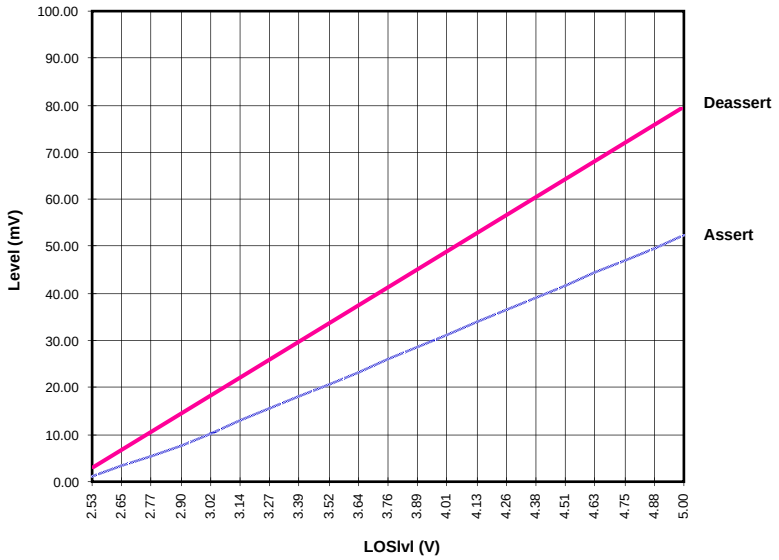


Figure 3. LOS Assert and Deassert Levels vs Resistor Divider

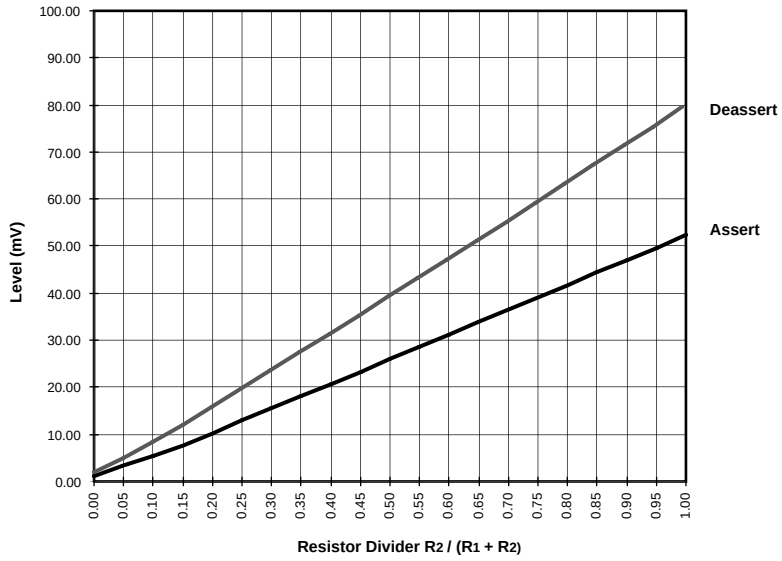
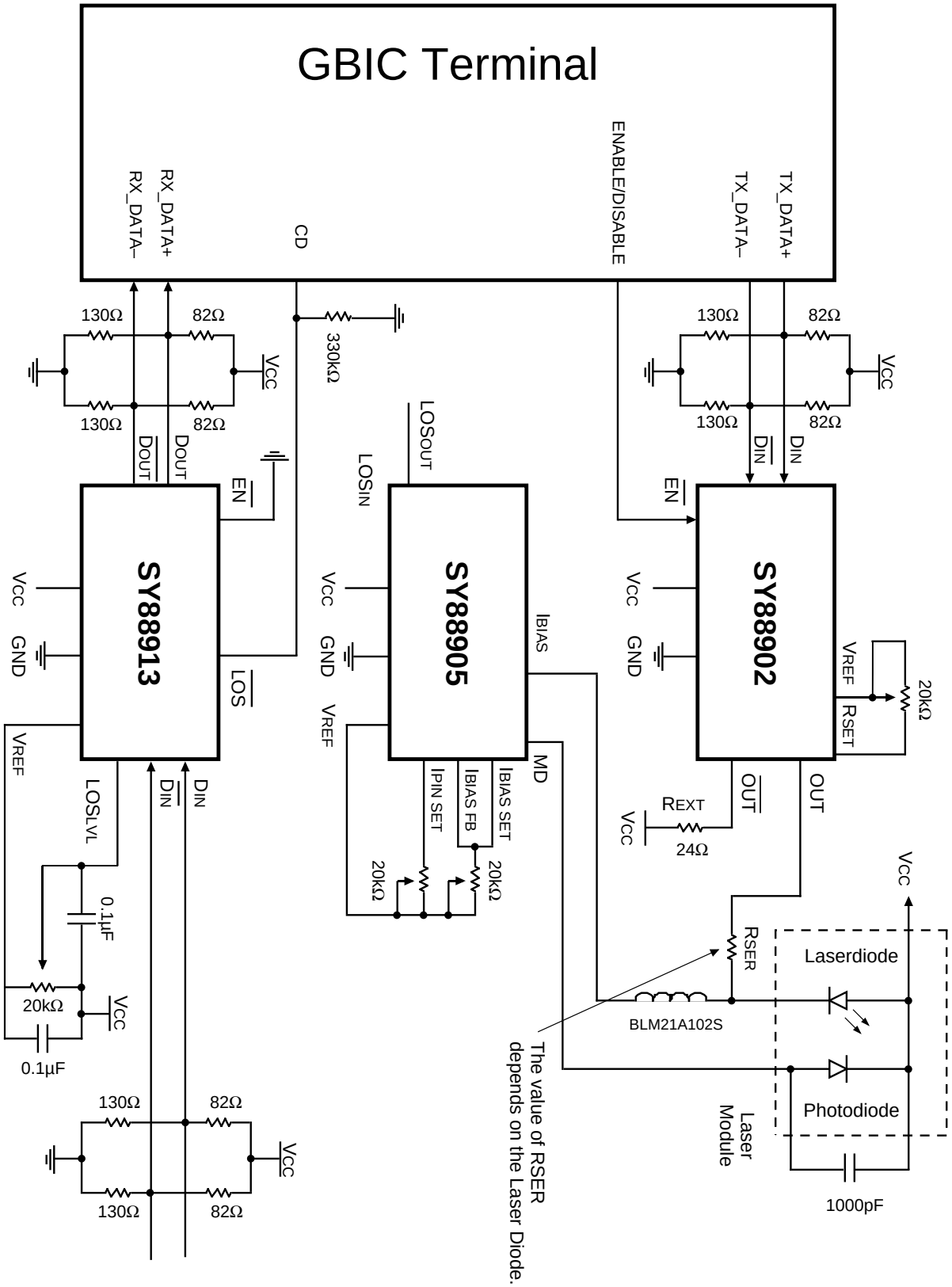
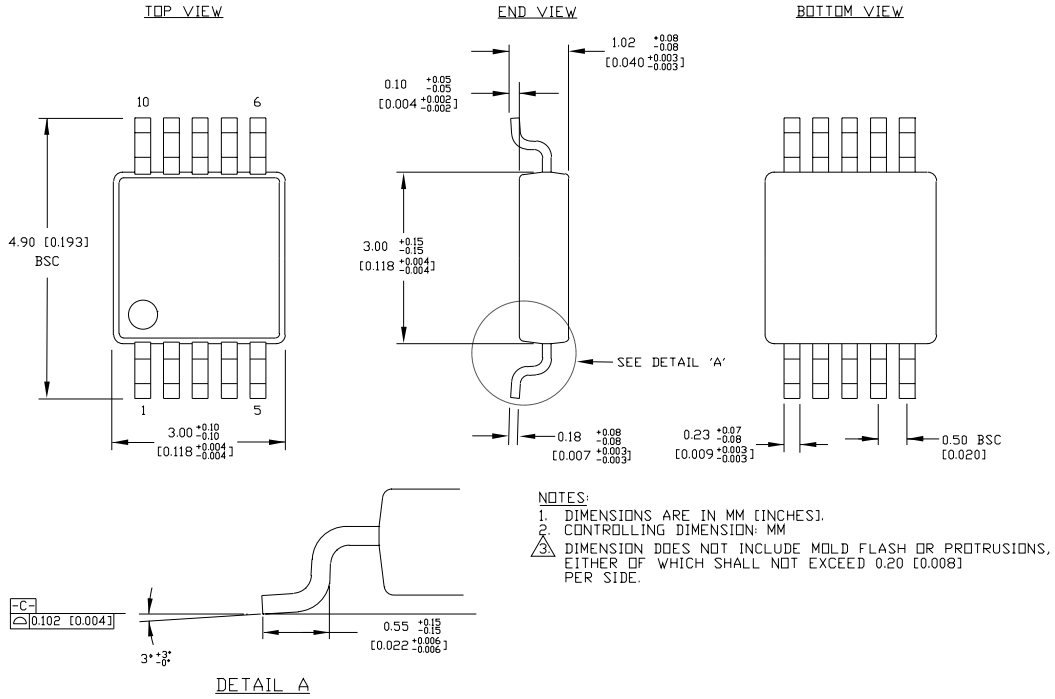


Figure 4. Resistor Divider R_2 / (R_1 + R_2)

APPLICATION EXAMPLE FOR 3-CHIP SET SOLUTION



10 LEAD MSOP (K10-1)



NOTES:
1. DIMENSIONS ARE IN MM [INCHES].
2. CONTROLLING DIMENSION: MM
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.20 [0.008] PER SIDE.

Rev. 00

MICREL-SYNERGY 3250 SCOTT BOULEVARD SANTA CLARA CA 95054 USA

TEL + 1 (408) 980-9191 FAX + 1 (408) 914-7878 WEB http://www.micrel.com

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