3.3V/5V 800MHz PRECISION PECL AMPLIFIER WITH LOW GAIN FEEDBACK

FEATURES

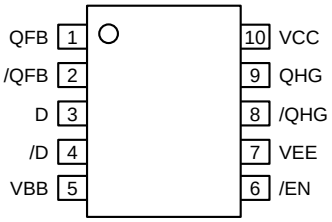
- 3.3V and 5V ±10% power supply options
- Guaranteed AC parameters over temperature:
  - f_{MAX} = 800MHz
  - < 200ps differential propagation delay (D to Q_{FB})
  - < 730ps differential propagation delay (D to Q_{HG})
  - < 250ps t_r / t_f
- Low gain feedback path Q_{FB} = +10V/V
- Output enable
- V_{BB} reference output voltage
- Wide temperature range: –40°C to +85°C
- Available in 10-pin (3×3mm) MSOP

DESCRIPTION

The SY100EL16VO is a differential receiver amplifier optimized for crystal oscillator applications. The device includes an additional low gain (+10V/V) output stage (Q_{FB}) ideal for feedback applications common in crystal oscillator gain blocks. The SY100EL16VO is fully differential, with a bandwidth > 800MHz over temperature and voltage. For applications that require output disable control, an Enable pin (/EN) will force the differential output into a fixed logic state. The SY100EL16VO also includes a V_{BB} reference voltage for single-ended or AC-coupled applications.

The SY100EL16VO PECL logic is 100k ECL compatible. Operation is guaranteed over the –40°C to +85°C temperature range and 3.3V to 5V nominal supply voltage range.

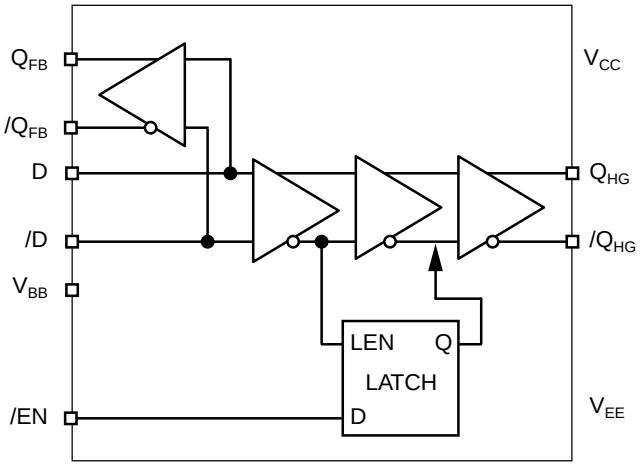
PIN CONFIGURATION



TRUTH TABLE

/EN	QHG Out	/QHG Out
0	Data	/Data
1	Logic Low	Logic High

BLOCK DIAGRAM



PIN NAMES

Pin	Function
Q_{FB}, /Q_{FB}	Differential clock outputs for feedback path: Nominal DC gain +10.
D, /D	PECL, LVPECL, ECL, LVECL differential inputs: Internal 75kΩ pull-down resistor.
V_{BB}	V_{CC} –1.32V reference voltage for single-ended inputs: It provides the switching reference for the input differential amplifier. When unused, it can be left open. For single-ended PECL applications connect V_{BB} to /D input, and bypass with a 0.01µF capacitor to V_{CC}.
/EN	Enable: PECL compatible input control with internal 75kΩ pull-down resistor. It controls the high-gain output (Q_{HG}). When HIGH, Q_{HG} is low and /Q_{HG} is high. /EN is synchronous so that the outputs will only be enabled/disabled when they are in the LOW state.
V_{EE}	Negative power supply: For ECL/LVECL operation, connect to negative supply. For PECL/ LVPECL operation, connect to GND.
Q_{HG}, /Q_{HG}	Differential high-gain outputs: Nominal DC gain is greater than +200.
V_{CC}	Positive power supply: For ECL/LVECL operation, connect to V_{CC} = 0V. For PECL/ LVPECL operation, connect to either 3.3V or 5.0V. Bypass with 0.1µF// 0.01µF low ESR capacitors.

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating		Value	Unit
$V_{CC} - V_{EE}$	Power Supply Voltage		+6.0	V
V_{IN}	PECL Input Voltage		0 to V_{CC} +0.5	V
V_{OUT}	Voltage Applied to Output at High State (V_{EE} = 0V)		–0.5 to +5.5	V
I_{OUT}	Output Current	–Continuous –Surge	50 100	mA
T_A	Operating Temperature Range		–40 to +85	°C
T_{store}	Storage Temperature Range		–65 to +150	°C
θ_{JA}	Package Thermal Resistance (Junction-to-Ambient)	–Still-Air –500lfpm	113 96	°C/W
θ_{JC}	Package Thermal Resistance (Junction-to-Case)		42	°C/W

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

Symbol	Parameter	T_A = –40°C			T_A = +25°C			T_A = +85°C			Unit	Condition
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
V_{CC}	Power Supply Voltage										V	V_{EE} = GND
	(PECL)	4.5	5.0	5.5	4.5	5.0	5.5	4.5	5.0	5.5		
	(LVPECL)	3.0	3.3	3.8	3.0	3.3	3.8	3.0	3.3	3.8		
	(ECL)	–5.5	–5.0	–4.5	–5.5	–5.0	–4.5	–5.5	–5.0	–4.5	V	V_{CC} = GND
	(LVECL)	–3.8	–3.3	–3.0	–3.8	–3.3	–3.0	–3.8	–3.3	–3.0		
I_{CC}	Power Supply Current	—	—	46	—	—	46	—	—	46	mA	V_{CC} = 5.5V
V_{BB}	Reference Voltage	V_{CC}–1.26	V_{CC}–1.32	V_{CC}–1.38	V_{CC}–1.26	V_{CC}–1.32	V_{CC}–1.38	V_{CC}–1.26	V_{CC}–1.32	V_{CC}–1.38	V	
I_{IH}	Input HIGH Current	—	—	150	—	—	150	—	—	150	µA	V_{IN} = V_{IH}(Max)
I_{IL}	Input LOW Current	0.5	—	—	0.5	—	—	0.5	—	—	µA	V_{IN} = V_{IL}(Min)
C_{IN}	Input Capacitance	—	—	—	—	0.75	—	—	—	—	pF	

100K 5V PECL DC ELECTRICAL CHARACTERISTICS

V_{CC} = 5.0V ±10%; V_{EE} = GND

Symbol	Parameter	T_A = –40°C			T_A = +25°C			T_A = +85°C			Unit	Condition
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
V_{OH}	Output High Voltage(1)	3.915	4.005	4.120	3.975	4.005	4.12	3.975	4.005	4.12	V	50Ω to V_{CC} –2V
V_{OL}	Output Low Voltage(1)	3.170	3.305	3.445	3.190	3.295	3.380	3.190	3.295	3.380	V	50Ω to V_{CC} –2V
V_{IH}	Input HIGH Voltage(1)	3.835	—	4.120	3.835	—	4.120	3.835	—	4.120	V	
V_{IL}	Input LOW Voltage(1)	3.525	—	3.819	3.525	—	3.819	3.525	—	3.819	V	
V_{IHCMR}	Input High Voltage(2) Common Mode Range	2.0	—	V_{CC}–0.8	2.0	—	V_{CC}–0.8	2.0	—	V_{CC}–0.8	V	

NOTES:

1. Input and output parameters are at V_{CC} = +5.0V. Level specifications will vary 1:1 with V_{CC}.
2. V_{IHCMR} is referenced to the most positive side of the differential input signal.

100K 3V PECL DC ELECTRICAL CHARACTERISTICS

V_{CC} = 3.3V ±10%; V_{EE} = GND

Symbol	Parameter	T_A = –40°C			T_A = +25°C			T_A = +85°C			Unit	Condition
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
V_{OH}	Output High Voltage(1)	2.215	—	2.42	2.275	2.305	2.42	2.275	2.305	2.42	V	50Ω to V_{CC} –2V
V_{OL}	Output Low Voltage(1)	1.470	—	1.745	1.490	1.595	1.680	1.490	1.595	1.680	V	50Ω to V_{CC} –2V
V_{IH}	Input HIGH Voltage(1)	2.135	—	2.420	2.135	—	2.420	2.135	—	2.420	V	
V_{IL}	Input LOW Voltage(1)	1.490	—	1.825	1.490	—	1.825	1.490	—	1.825	V	
V_{IHCMR}	Input High Voltage(2) Common Mode Range	2.0	—	V_{CC}–0.8	2.0	—	V_{CC}–0.8	2.0	—	V_{CC}–0.8	V	

NOTES:

1. Input and output parameters are at V_{CC} = +3.3V. Level specifications will vary 1:1 with V_{CC}.
2. V_{IHCMR} is referenced to the most positive side of the differential input signal.

100K ECL/LVECL DC ELECTRICAL CHARACTERISTICS

V_{EE} = –3.0V to –5.5V; V_{CC} = GND

Symbol	Parameter	T_A = –40°C			T_A = +25°C			T_A = +85°C			Unit	Condition
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
V_{OH}	Output High Voltage	–1.085	–1.005	–0.880	–1.025	–0.955	–0.880	–1.025	–0.955	–0.880	V	50Ω to V_{CC} –2V
V_{OL}	Output Low Voltage	–1.830	–1.695	–1.555	–1.810	–1.705	–1.620	–1.810	–1.705	–1.620	V	50Ω to V_{CC} –2V
V_{IH}	Input HIGH Voltage	–1.165	—	–0.880	–1.165	—	–0.880	–1.165	—	–0.880	V	
V_{IL}	Input LOW Voltage	–1.181	—	–1.475	–1.181	—	–1.475	–1.181	—	–1.475	V	
V_{IHCMR}	Input High Voltage Common Mode Range(1)	V_{EE}+2.0	—	–0.8	V_{EE}+2.0	—	–0.8	V_{EE}+2.0	—	–0.8	V	

NOTE:

1. V_{IHCMR} is referenced to the most positive side of the differential input signal.

AC ELECTRICAL CHARACTERISTICS

V_{CC} = 3.0 to 5.5V; V_{EE} = GND; V_{EE} = –3.0 to –5.5V; V_{CC} = GND

Symbol	Parameter	T_A = –40°C			T_A = +25°C			T_A = +85°C			Unit	Condition
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
f_{MAX}	Maximum Frequency	800	—	—	800	—	—	800	—	—	MHz	
t_{PLH} t_{PHL}	Propagation Delay to Q_{FB}, $/Q_{FB}$ (Diff.)	—	—	200	—	—	200	—	—	200	ps	
	(Single)	—	—	230	—	—	230	—	—	230	ps	
	to Q_{HG}, $/Q_{HG}$ (Diff.)	—	—	650	—	—	650	—	—	730	ps	
	(Single)	—	—	700	—	—	700	—	—	780	ps	
t_S	Set-Up Time(1)	150	—	—	150	—	—	150	—	—	ps	Enable Pin
t_H	Hold Time(1)	150	—	—	150	—	—	150	—	—	ps	Enable Pin
t_{JITTER}	Cycle-to-Cycle Jiiter	—	0.2	—	—	0.2	—	—	0.2	—	ps	RMS
t_{SKEW}	Duty Cycle Skew(2)	—	5	20	—	5	20	—	5	20	ps	
V_{PP}	Minimum Input Swing(3)	150	—	—	150	—	—	150	—	—	mV	
t_r t_f	Output Rise/Fall Times (20% to 80%)	—	—	250	—	—	250	—	—	250	ps	

NOTES:

1. See “Timing Waveform.”
2. Duty cycle skew is the difference between t_{PLH} and t_{PHL} propagation delay through the device.
3. The device has a DC gain of 10 for Q, /Q outputs, and DC gain of 200 or higher for Q_{HG}, $/Q_{HG}$. See “Timing Waveform” minimum input swing.

TIMING WAVEFORMS

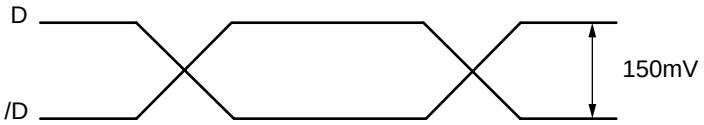


Figure 1. Minimum Input Swing

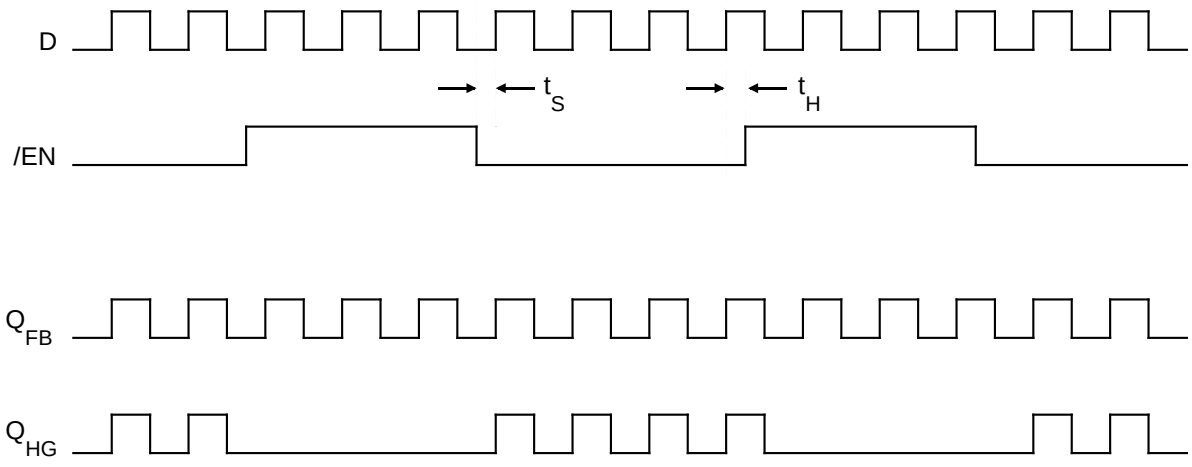


Figure 2. Set-Up and Hold Timing

TERMINATION RECOMMENDATIONS

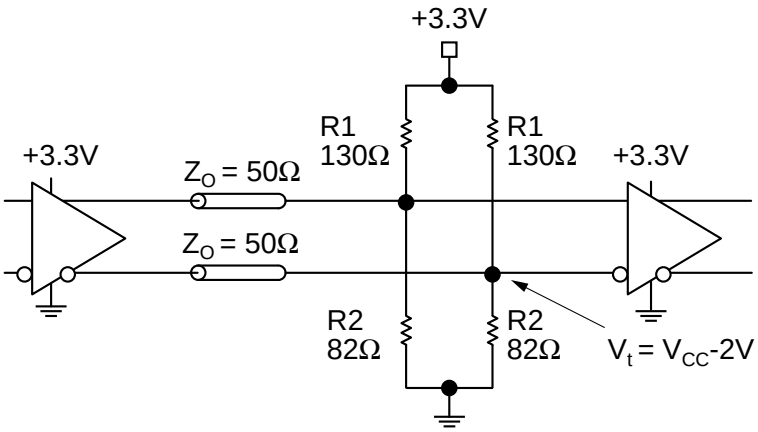


Figure 3. Parallel Termination–Thevenin Equivalent

NOTES:

1. For +5V systems:

R1 = 82Ω

R2 = 130Ω

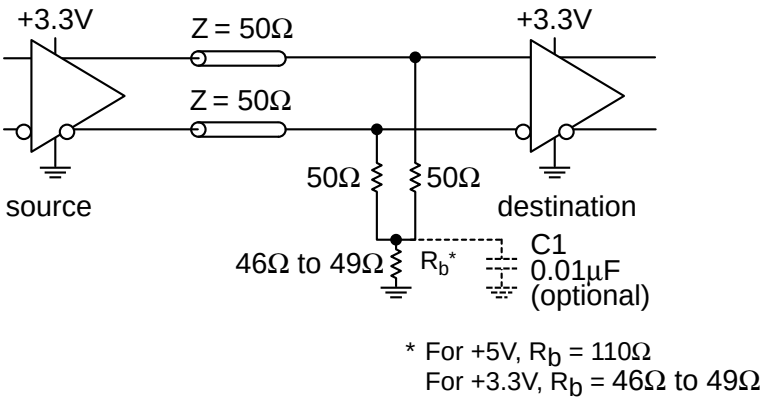


Figure 4. Three-Resistor "Y–Termination"

NOTES:

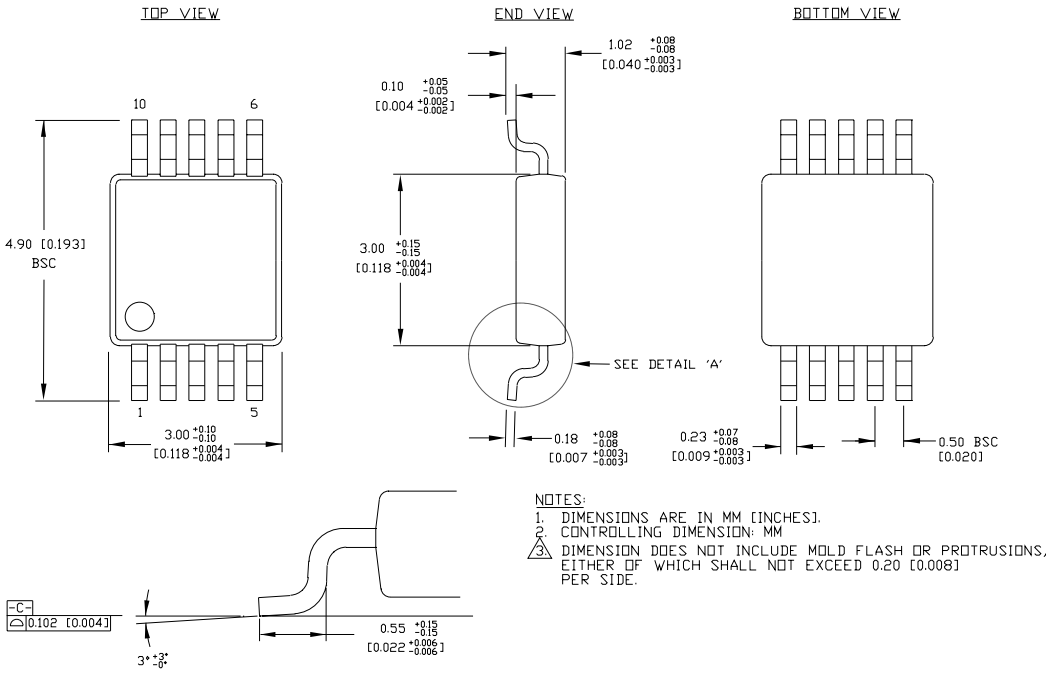
1. Power-saving alternative to 4-resistor, Thevenin termination.
2. Place termination resistors as close to destination inputs as possible.
3. R_b resistor sets the DC bias voltage, equal to V_t. For +5V, R_b = 100Ω

PRODUCT ORDERING CODE

Ordering Code	Package Type	Operating Range	Package Marking
SY100EL16VOKI	K10-1	Industrial	X16O
SY100EL16VOKITR*	K10-1	Industrial	X16O

*Tape and Reel

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