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

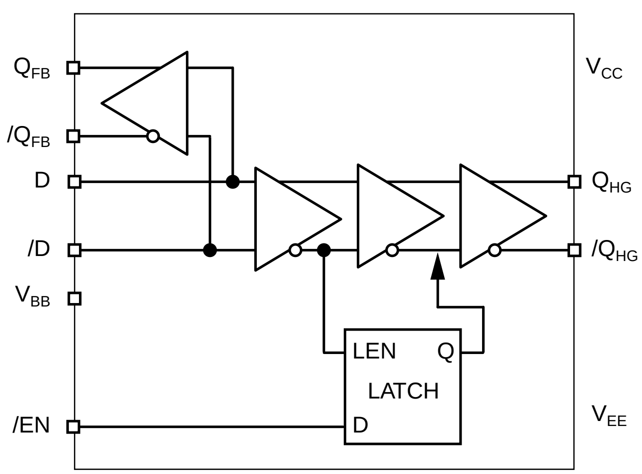
SY100EL16VO

- **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**

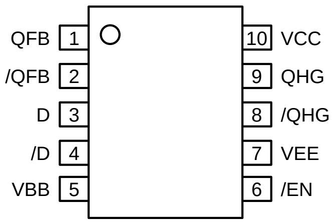
The SY100EL16VO is a differential receiver amplifier optimized for crystal oscillator applications. The device includes an additional low gain (+10V/V) output stage (Q_{FB}) ideal for feedback applications common in crystal oscillator gain blocks. The SY100EL16VO is fully differential, with a bandwidth > 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.

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



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.



10-Pin MSOP (K10-1)

Ordering Information[1]

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY100EL16VOKC	K10-1	Commercial	X16VO	Sn-Pb
SY100EL16VOKCTR[2]	K10-1	Commercial	X16VO	Sn-Pb
SY100EL16VOKI	K10-1	Industrial	X16VO	Sn-Pb
SY100EL16VOKITR[2]	K10-1	Industrial	X16VO	Sn-Pb
SY100EL16VOKG[3]	K10-1	Industiral	X16VO with Pb-Free bar-line indicator	NiPdAu Pb-Free
SY100EL16VOKGTR[2, 3]	K10-1	Industiral	X16VO with Pb-Free bar-line indicator	NiPdAu Pb-Free
SY100EL16VOKG[3]	K10-1	Industiral	X16VO with Pb-Free bar-line indicator	NiPdAu Pb-Free
SY100EL16VOKGTR[2, 3]	K10-1	Industiral	X16VO with Pb-Free bar-line indicator	NiPdAu Pb-Free

Notes:

1. Contact factory for die availability. Dice are guaranteed at T_A = 25°C, DC Electricals only.
2. Tape and Reel.
3. Pb-Free package is recommended for new designs.

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.

		T_A = –40°C			T_A = +25°C			T_A = +85°C				
Symbol	**Parameter**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Unit**	**Condition**
V_{CC}	Power Supply Voltage (PECL) (LVPECL)	4.5 3.0	5.0 3.3	5.5 3.8	4.5 3.0	5.0 3.3	5.5 3.8	4.5 3.0	5.0 3.3	5.5 3.8	V	V_{EE} = GND
	(ECL) (LVECL)	–5.5 –3.8	–5.0 –3.3	–4.5 –3.0	–5.5 –3.8	–5.0 –3.3	–4.5 –3.0	–5.5 –3.8	–5.0 –3.3	–4.5 –3.0	V	V_{CC} = GND
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	

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.

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.

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.

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_{PD}	Propagation Delay to Q_{FB}, $/Q_{FB}$ (Diff.) (Single)	— —	— —	200 230	— —	— —	200 230	— —	— —	200 230	ps ps	
	to Q_{HG}, $/Q_{HG}$ (Diff.) (Single)	— —	— —	650 700	— —	— —	650 700	— —	— —	730 780	ps 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.

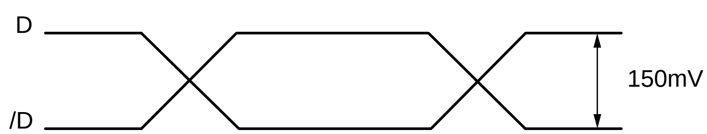


Figure 1. Minimum Input Swing

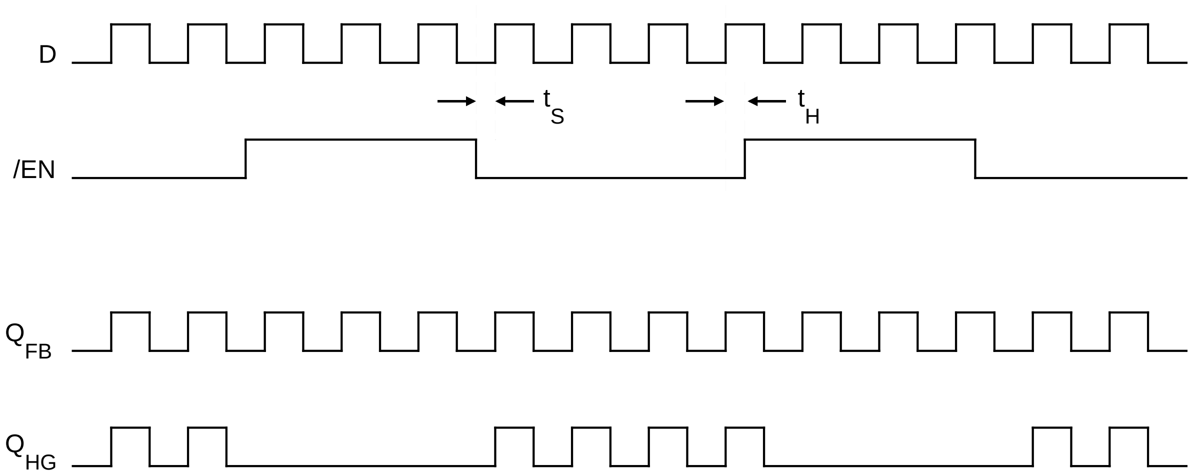


Figure 2. Set-Up and Hold Timing

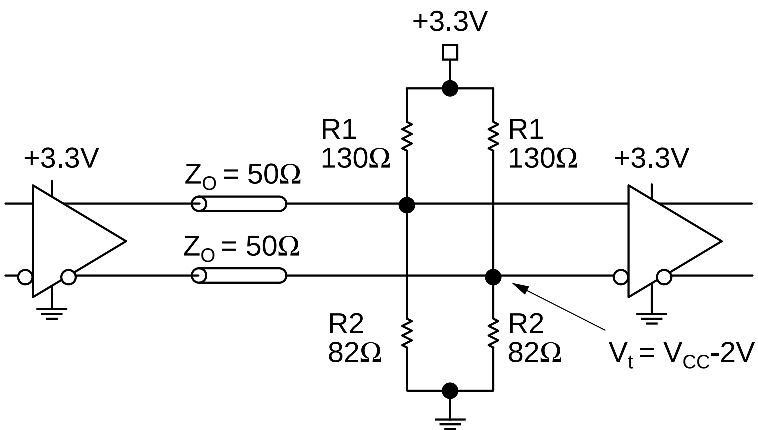


Figure 3. Parallel Termination–Thevenin Equivalent

Notes:

1. For +5V systems:

R1 = 82Ω

R2 = 130Ω

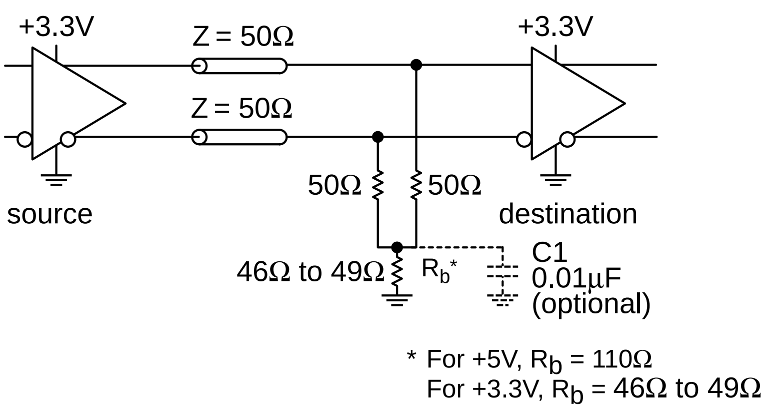
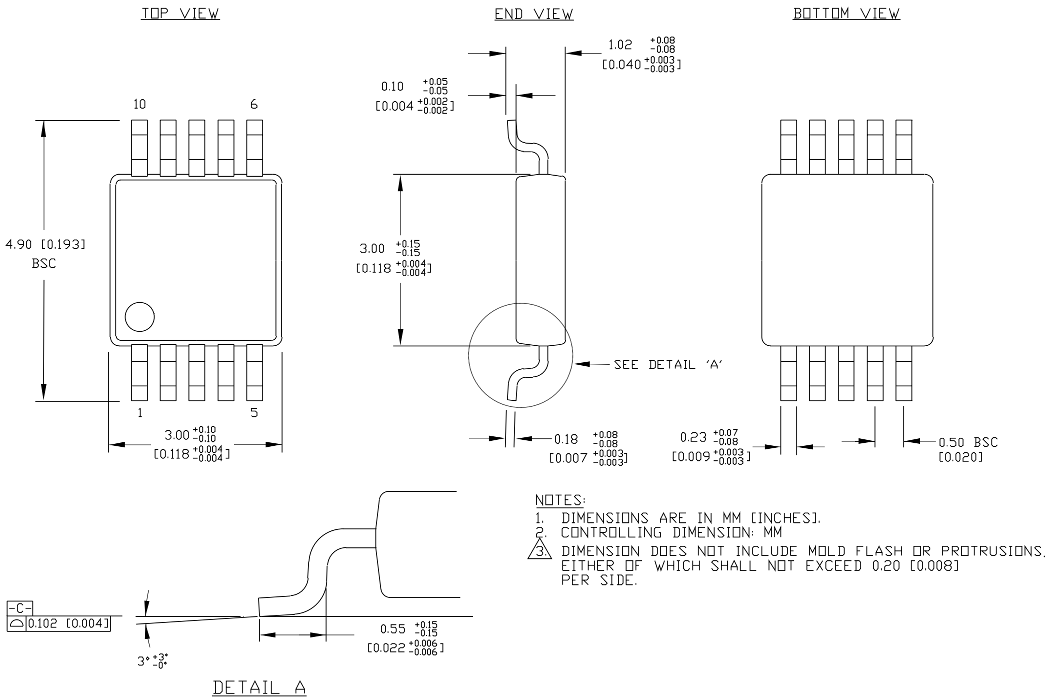


Figure 4. Three-Resistor "Y–Termination"

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



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