3.3V/5V 2.5GHz PECL/ECL DIFFERENTIAL RECEIVER/BUFFER

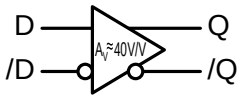
Precision Edge® SY89306/316V

FEATURES

- **f_{MAX} > 2.5GHz**
- **Inputs (D, /D) include 75kΩ pull-down resistors**
- **SY89306V: 100k EP compatible**
- **SY89316V: 10k EP compatible**
- **Industrial temperature range: –40°C to +85°C**
- **Available in an ultra-small 8-pin (2mm × 2mm) MLF® package**

Precision Edge®

BLOCK DIAGRAM



DESCRIPTION

The SY89306V and SY89316V are a high-speed buffer/receivers. The devices are functionally equivalent to the 10/100EP16 buffers, but feature a 70% smaller footprint.

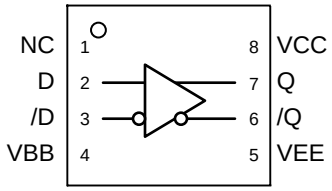
The SY89306/316V includes a V_{BB} reference for single-ended AC-coupling applications. Whenever used, the V_{BB} pin should be bypassed to ground via a 0.01µF capacitor. V_{BB} reference can only sink/source 0.5mA.

Under open input conditions (pulled to V_{EE}), internal input clamps will force the Q output LOW.

FUNCTIONAL CROSS REFERENCE

Micrel Part Number	Logic	Functional Cross
SY89306V	100kEP	100EP16V
SY89316V	10kEP	10EP16V

PACKAGE/ORDERING INFORMATION



8-Pin MLF®
Ultra-Small Outline

Ordering Information

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY89306VMITR	MLF-8	Industrial	306	Sn-Pb
SY89316VMITR	MLF-8	Industrial	316	Sn-Pb
SY89306VMGTR(1)	MLF-8	Industrial	306 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY89316VMGTR(1)	MLF-8	Industrial	316 with Pb-Free bar-line indicator	Pb-Free NiPdAu

Note:

1. Pb-Free package is recommended for new designs.

PIN DESCRIPTION

SY89306V

Pin Number	Pin Name	Type	Pin Function
2, 3	D, /D	100k ECL Input	Differential PECL/ECL Input: The signal inputs include internal 75kΩ pull-down resistors. If inputs are left open, Q output will default to LOW. See "Input Interface Applications" section for single-ended inputs.
7, 6	Q, /Q	100k ECL Output	Differential PECL/ECL Output: Defaults to LOW if D inputs left open. See "Output Interface Applications" section for recommendations on terminations.
8	VCC	Positive Power Supply	Positive Power Supply: Bypass with 0.1µF//0.01µF low ESR capacitors.
5	VEE Exposed Pad	Negative Power Supply	Negative Power Supply: V_{EE} and exposed pad must be tied to most negative supply. For PECL/LVPECL connect to ground.
4	VBB	Reference Voltage Output	Bias Voltage: V_{CC}–1.4V. Used as reference voltage when AC coupling to the D, /D inputs. Max sink/source is ±0.5mA.
1	NC		No connection.

SY89316V

Pin Number	Pin Name	Type	Pin Function
2, 3	D, /D	10k ECL Input	Differential PECL/ECL Input: The signal inputs include internal 75kΩ pull-down resistors. If inputs are left open, Q output will default to LOW. See "Input Interface Applications" section for single-ended inputs.
7, 6	Q, /Q	10k ECL Output	Differential PECL/ECL Output: Defaults to LOW if D inputs left open. See "Output Interface Applications" section for recommendations on terminations.
8	VCC	Positive Power Supply	Positive Power Supply: Bypass with 0.1µF//0.01µF low ESR capacitors.
5	VEE Exposed Pad	Negative Power Supply	Negative Power Supply: V_{EE} and exposed pad must be tied to most negative supply. For PECL/LVPECL connect to ground.
4	VBB	Reference Voltage Output	Bias Voltage: V_{CC}–1.4V. Used as reference voltage when AC coupling to the D, /D inputs. Max sink/source is ±0.5mA.
1	NC		No connection.

Absolute Maximum Ratings[1]

Power Supply Voltage (V_{EE}) (V_{CC} = 0V) ..... –6.0V to 0V
Power Supply Voltage (V_{CC}) (V_{EE} = 0V) ..... +6.0V to 0V
Input Voltage (V_{IN})
(V_{CC} = 0V, V_{IN} not more negative than V_{EE}) –6.0V to 0V
(V_{EE} = 0V, V_{IN} not more negative than V_{CC}) +6.0V to 0V
Output Current (I_{OUT})
Continuous 50mA
Surge 100mA
V_{BB} Sink/Source Current (I_{BB}) ..... ±0.5mA
Lead Temperature (soldering, 20 sec.) ..... 260°C
Storage Temperature (T_S) ..... –65°C to +150°C

Operating Ratings[2]

Power Supply Voltage ($|V_{CC}–V_{EE}|$) ..... 3.0V to 3.6V
..... 4.5V to 5.5V
Ambient Temperature (T_A) ..... –40°C to +85°C
Package Thermal Resistance[3]
MLF® (θ_{JA})
Still-Air ..... 93°C/W
500lfpm ..... 87°C/W
MLF® (ψ_{JB}) ..... 60°C/W

SY89306V (100K ECL) DC ELECTRICAL CHARACTERISTICS

V_{CC} = +3.3V±10% or +5V±10% and V_{EE} = 0V; V_{CC} = 0V and V_{EE} = –3.3V±10% or –5V±10%; T_A = –40°C to +85°C, unless otherwise noted.

Symbol	Parameter	Condition	Min	Typ	Max	Units
I_{EE}	Power Supply Current				48	mA
V_{OH}	Output HIGH Voltage	**Note 4, 5**	V_{CC}–1.085	—	V_{CC}–0.880	V
V_{OL}	Output LOW Voltage	**Note 4, 5**	V_{CC}–1.830	—	V_{CC}–1.555	V
V_{IH}	Input HIGH Voltage		V_{CC}–1.165	—	V_{CC}–0.880	V
V_{IL}	Input LOW Voltage		V_{CC}–1.810	—	V_{CC}–1.475	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range	**Note 6**	V_{EE} +2.0	—	V_{CC}–0.4	V
V_{BB}	Bias Voltage		V_{CC}–1.38	—	V_{CC}–1.26	V
I_{IH}	Input HIGH Current		—	—	150	µA
I_{IL}	Input LOW Current		0.5	—	—	µA

Notes:

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.
2. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
3. Package Thermal Resistance values assumes exposed pad is soldered (or equivalent) to the device's most negative potential on the PCB.
4. Output loaded with 50Ω to V_{CC}–2V.
5. V_{IN} = V_{IL}(min) or V_{IH}(max)
6. V_{IHCMR} (Min) varies 1:1 with V_{EE}, (max) varies 1:1 with V_{CC}.

SY89316V (10K ECL) DC ELECTRICAL CHARACTERISTICS

V_{CC} = +3.3V ±10% or +5V ±10% and V_{EE} = 0V; V_{CC} = 0V and V_{EE} = –3.3V ±10% or –5V ±10%; T_A = –40°C to +85°C, unless otherwise noted.

Symbol	Parameter	Condition	Min	Typ	Max	Units
I_{EE}	Power Supply Current				48	mA
V_{OH}	Output HIGH Voltage	**Note 4, 5**	V_{CC}–1.08	—	V_{CC}–0.72	V
V_{OL}	Output LOW Voltage	**Note 4, 5**	V_{CC}–1.95	—	V_{CC}–1.595	V
V_{IH}	Input HIGH Voltage		V_{CC}–1.23	—	V_{CC}–0.72	V
V_{IL}	Input LOW Voltage		V_{CC}–1.95	—	V_{CC}–1.445	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range	**Note 6**	V_{EE} +2.0	—	V_{CC}–0.4	V
V_{BB}	Bias Voltage		V_{CC}–1.43	—	V_{CC}–1.19	V
I_{IH}	Input HIGH Current		—	—	150	µA
I_{IL}	Input LOW Current		0.5	—	—	µA

Notes:

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.
2. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
3. Package Thermal Resistance values assumes exposed pad is soldered (or equivalent) to the device's most negative potential on the PCB.
4. Output loaded with 50Ω to V_{CC}–2V.
5. V_{IN} = V_{IL}(min) or V_{IH}(max)
6. V_{IHCMR} (Min) varies 1:1 with V_{EE}, (max) varies 1:1 with V_{CC}.

AC ELECTRICAL CHARACTERISTICS

V_{CC} = +3.3V ±10% or +5V ±10% and V_{EE} = 0V; V_{CC} = 0V and V_{EE} = –3.3V ±10% or –5V ±10%; R_L = 50Ω to V_{CC} –2V;
T_A = –40°C to +85°C, unless noted.

Symbol	Parameter	Condition	Min	Typ	Max	Units
f_{MAX}	Maximum Input Frequency	**Note 7**	2.5			GHz
t_{PLH} t_{PHL}	Propagation Delay (Differential)	D to Q, /Q; **Note 8**	100		300	ps
t_{SKEW}	Duty-Cycle Skew	**Note 9**		8	30	ps
t_r,t_f	Output Rise/Fall Times (20% to 80%)	Q, /Q	60	110	180	ps

Notes:

7. f_{MAX} guaranteed for functionality only, $V_{OUT} \geq$ 400mV. V_{OL} and V_{OH} levels are guaranteed at DC only.

8. V_{IN} = 800mV.

9. Duty-cycle skew is the difference between the t_{PLH} and t_{PHL} propagation delay.

INPUT INTERFACE APPLICATIONS

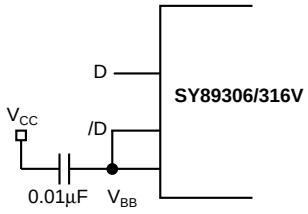


Figure 1. Single-Ended LVPECL Input (Terminating Unused Input)

LVPECL OUTPUT INTERFACE APPLICATIONS

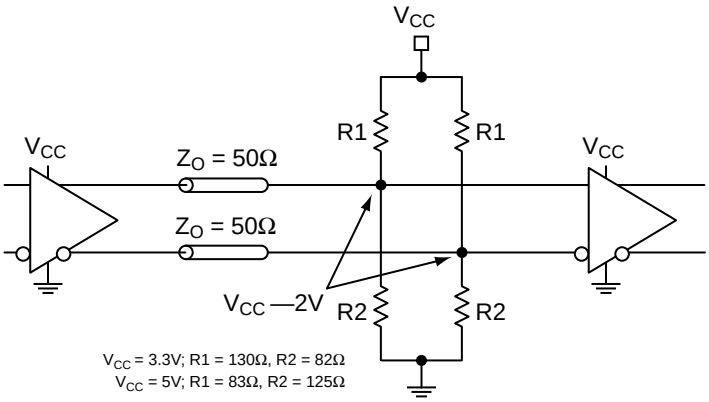


Figure 2a. Parallel Thevenin-Equivalent Termination

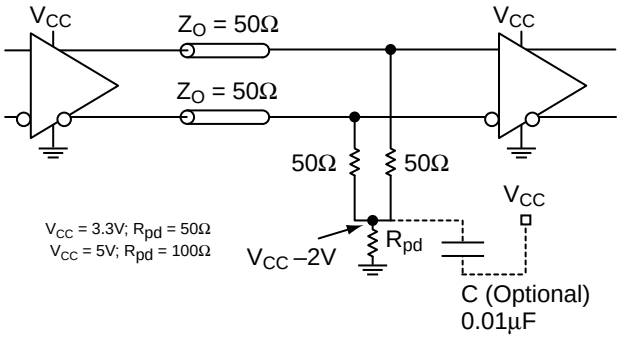


Figure 2b. Three Resistor "Y Termination"

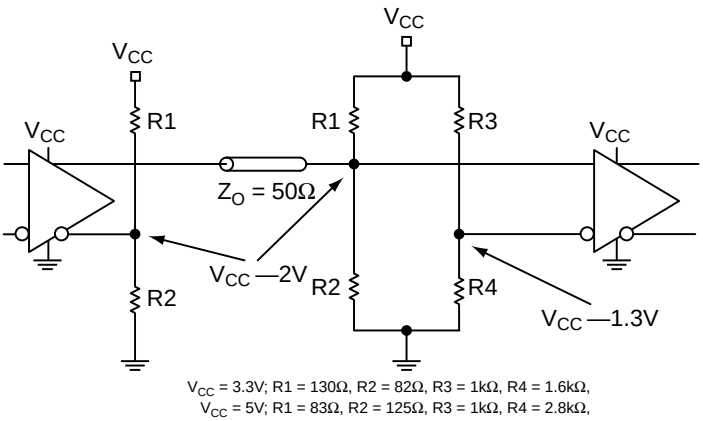
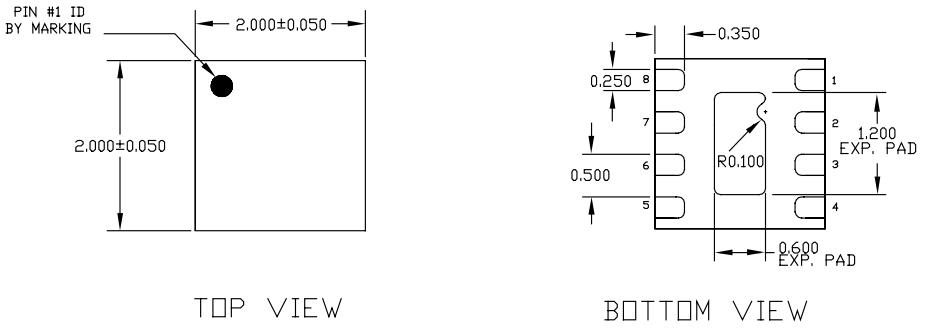


Figure 2c. Terminating Unused I/O

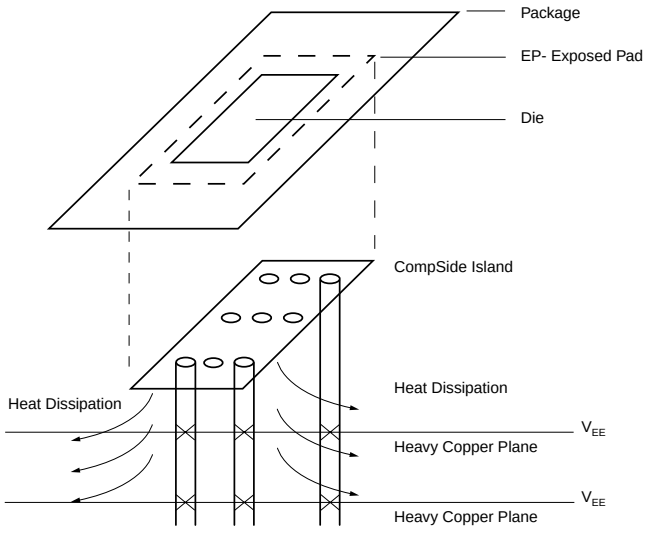
RELATED PRODUCT AND SUPPORT DOCUMENTATION

Part Number	Function	Data Sheet Link
SY89206/216V	3.3V/5V 1GHz Differential PECL/ECL Receiver/Buffer	www.micrel.com/product-info/products/sy89206-216v.shtml
SY89223L	3.3V Dual Differential LVPECL-to-LVTTL Translator	www.micrel.com/product-info/products/sy89223l.shtml
HBW Solutions	New Products and Applications	www.micrel.com/product-info/products/solutions.shtml

8-PIN ULTRA-SMALL EPAD-*Micro*LeadFrame® (MLF-8)



NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. MAX. PACKAGE WARPAGE IS 0.05 mm.
3. MAXIMUM ALLOWABE BURRS IS 0.076 mm IN ALL DIRECTIONS.
4. PIN #1 ID ON TOP WILL BE LASER/INK MARKED.



PCB Thermal Consideration for 8-Pin MLF® Package

Package Notes:

1. Package meets Level 2 Moisture Sensitivity Classification and is shipped in Dry-pack form.
2. Exposed pads must be soldered to the most negative supply plane, equivalent to $V_{EE,}$ for proper thermal management.

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