

## FEATURES

- Guaranteed maximum frequency >4GHz
- 3.3V and 5V power supply options
- Guaranteed propagation delay <460ps over temperature
- Internal 75KΩ input pull-down resistors
- Wide operating temperature range: -40°C to +85°C
- Available in 8-pin MSOP and SOIC packages

## DESCRIPTION

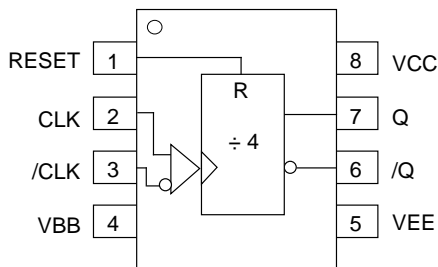
The SY10/100EP33V is an integrated ÷4 divider.

The  $V_{BB}$  pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to  $V_{BB}$  as a switching reference voltage.  $V_{BB}$  may also rebias AC-coupled inputs. When used, decouple  $V_{BB}$  and  $V_{CC}$  via a 0.01μF capacitor and limit current sourcing or sinking to 0.5mA. When not used,  $V_{BB}$  should be left open.

The reset pin is asynchronous and is asserted on the rising edge. Upon power-up, the internal flip-flops will attain a random state; the reset allows for the synchronous use of multiple EP33's in a system.

The 100K Series includes internal temperature compensation circuitry.

## PIN CONFIGURATION/BLOCK DIAGRAM



**TOP VIEW**  
(Available in MSOP or SOIC package)

## PIN NAMES

Pin	Function
CLK, /CLK	ECL Clock Inputs
RESET	ECL Asynchronous Reset
$V_{BB}$	Reference Voltage Output
Q, /Q	ECL Data Outputs

## TRUTH TABLE

CLK	/CLK	RESET	Q	/Q
X	X	Z	L	H
Z	/Z	L	F	F

### NOTES:

- Z = LOW-to-HIGH Transition.
- /Z = HIGH-to-LOW Transition.
- F = Divide by 4 function.

**(10EP) LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = +3.3V \pm 10\%$ ;  $V_{EE} = 0V^{(2)}$ 

Symbol	Parameter	$T_A = -40^\circ C$			$T_A = +25^\circ C$			$T_A = +85^\circ C$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{EE}$	Power Supply Current	—	—	36	—	26	36	—	—	36	mA
$V_{OH}$	Output HIGH Voltage <sup>(3)</sup>	2165	2290	2415	2230	2355	2480	2290	2415	2540	mV
$V_{OL}$	Output LOW Voltage <sup>(3)</sup>	1365	1490	1615	1430	1555	1680	1490	1615	1740	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	2090	—	2415	2155	—	2480	2215	—	2540	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	1365	—	1690	1430	—	1755	1490	—	1815	mV
$V_{BB}$	Output Voltage	1790	1890	1990	1885	1955	2055	1915	2015	2115	mV
$V_{IHCMR}$	Input HIGH Voltage <sup>(4)</sup> Common Mode Range (Differential)	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	V
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu A$
$I_{IL}$	Input LOW Current RESET, CLK /CLK	0.5 -150	— —	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu A$

**NOTES:**

- 10EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained.
- Input and output parameters vary 1:1 with  $V_{CC}$ .
- All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .
- The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(10EP) PECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = +5.0V \pm 10\%$ ;  $V_{EE} = 0V^{(2)}$ 

Symbol	Parameter	$T_A = -40^\circ C$			$T_A = +25^\circ C$			$T_A = +85^\circ C$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{EE}$	Power Supply Current	—	—	36	—	26	36	—	—	36	mA
$V_{OH}$	Output HIGH Voltage <sup>(3)</sup>	3865	3990	4115	3930	4055	4180	3990	4115	4240	mV
$V_{OL}$	Output LOW Voltage <sup>(3)</sup>	3065	3190	3315	3130	3255	3380	3190	3315	3440	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	3790	—	4115	3855	—	4180	3915	—	4240	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	3065	—	3390	3130	—	3455	3190	—	3515	mV
$V_{BB}$	Output Voltage	3490	3590	3690	3555	3655	3755	3615	3715	3815	mV
$V_{IHCMR}$	Input HIGH Voltage <sup>(4)</sup> Common Mode Range (Differential)	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	V
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu A$
$I_{IL}$	Input LOW Current RESET, CLK /CLK	0.5 -150	— —	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu A$

**NOTES:**

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- Input and output parameters vary 1:1 with  $V_{CC}$ .
- All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .
- The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(10EP) ECL/LVECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 0V$ ;  $V_{EE} = -3.3V$  to  $-5.0V \pm 10\%$ <sup>(2)</sup>

Symbol	Parameter	$T_A = -40^\circ C$			$T_A = +25^\circ C$			$T_A = +85^\circ C$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{EE}$	Power Supply Current	—	—	36	—	26	36	—	—	36	mA
$V_{OH}$	Output HIGH Voltage <sup>(3)</sup>	-1135	-1010	-885	-1070	-945	-820	-1010	-885	-760	mV
$V_{OL}$	Output LOW Voltage <sup>(3)</sup>	-1935	-1810	-1685	-1870	-1745	-1620	-1810	-1685	-1560	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	-1210	—	-885	-1145	—	-820	-1085	—	-760	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	-1935	—	-1610	-1870	—	-1545	-1810	—	-1485	mV
$V_{BB}$	Output Voltage	-1510	-1410	-1310	-1445	-1345	-1245	-1385	-1285	-1185	mV
$V_{IHCMR}$	Input HIGH Voltage <sup>(4)</sup> Common Mode Range (Differential)	$V_{EE} + 2.0$		0.0	$V_{EE} + 2.0$		0.0	$V_{EE} + 2.0$		0.0	V
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu A$
$I_{IL}$	Input LOW Current RESET, CLK /CLK	0.5 -150	— —	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu A$

**NOTES:**

- 10EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained.
- Input and output parameters vary 1:1 with  $V_{CC}$ .
- All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .
- $V_{IHCMR}$  (Min) varies 1:1 with  $V_{EE}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(100EP) LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

$V_{CC} = +3.3V \pm 10\%; V_{EE} = 0V^{(2)}$

Symbol	Parameter	$T_A = -40^\circ\text{C}$			$T_A = +25^\circ\text{C}$			$T_A = +85^\circ\text{C}$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{EE}$	Power Supply Current	—	—	36	—	30	36	—	—	40	mA
$V_{OH}$	Output HIGH Voltage <sup>(3)</sup>	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
$V_{OL}$	Output LOW Voltage <sup>(3)</sup>	1355	1480	1605	1355	1480	1605	1355	1480	1605	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	2075	—	2420	2075	—	2420	2075	—	2420	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	1355	—	1675	1355	—	1675	1355	—	1675	mV
$V_{BB}$	Output Voltage	1775	1875	1975	1775	1875	1975	1775	1875	1975	mV
$V_{IHCMR}$	Input HIGH Voltage <sup>(4)</sup> Common Mode Range (Differential)	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	V
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu\text{A}$
$I_{IL}$	Input LOW Current RESET, CLK /CLK	0.5 -150	— —	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu\text{A}$

**NOTES:**

- 100EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained.
- Input and output parameters vary 1:1 with  $V_{CC}$ .
- All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .
- The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(100EP) PECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

$V_{CC} = +5.0V \pm 10\%; V_{EE} = 0V^{(2)}$

Symbol	Parameter	$T_A = -40^\circ\text{C}$			$T_A = +25^\circ\text{C}$			$T_A = +85^\circ\text{C}$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{EE}$	Power Supply Current	—	—	36	—	30	36	—	—	40	mA
$V_{OH}$	Output HIGH Voltage <sup>(3)</sup>	3855	3980	4105	3855	3980	4105	3855	3980	4105	mV
$V_{OL}$	Output LOW Voltage <sup>(3)</sup>	3055	3180	3305	3055	3180	3305	3055	3180	3305	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	3775	—	4120	3775	—	4120	3775	—	4120	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	3055	—	3375	3055	—	3375	3055	—	3375	mV
$V_{BB}$	Output Voltage	3475	3575	3675	3475	3575	3675	3475	3575	3675	mV
$V_{IHCMR}$	Input HIGH Voltage <sup>(4)</sup> Common Mode Range (Differential)	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	2.0	—	$V_{CC}$	V
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu\text{A}$
$I_{IL}$	Input LOW Current RESET, CLK /CLK	0.5 -150	— —	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu\text{A}$

**NOTES:**

- 100EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained.
- Input and output parameters vary 1:1 with  $V_{CC}$ .
- All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .
- The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**(100EP) ECL/LVECL DC ELECTRICAL CHARACTERISTICS(1)**

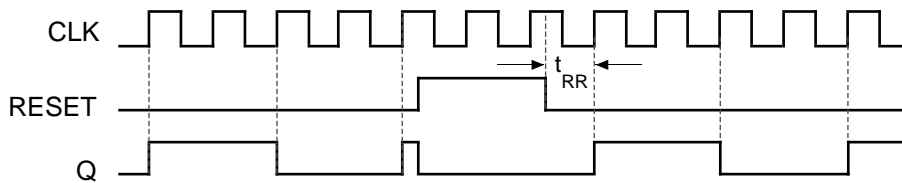
$V_{CC} = 0V$ ;  $V_{EE} = -3.3V$  to  $-5.0V \pm 10\%$ (2)

Symbol	Parameter	$T_A = -40^\circ C$			$T_A = +25^\circ C$			$T_A = +85^\circ C$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{EE}$	Power Supply Current	—	—	36	—	30	36	—	—	40	mA
$V_{OH}$	Output HIGH Voltage(3)	-1145	-1020	-895	-1145	-1020	-895	-1145	-1020	-895	mV
$V_{OL}$	Output LOW Voltage(3)	-1945	-1820	-1695	-1945	-1820	-1695	-1945	-1820	-1695	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	-1225	—	-880	-1225	—	-880	-1225	—	-880	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	-1945	—	-1625	-1945	—	-1625	-1945	—	-1625	mV
$V_{BB}$	Output Voltage	-1525	-1425	-1325	-1525	-1425	-1325	-1525	-1425	-1325	mV
$V_{IHCMR}$	Input HIGH Voltage(4) Common Mode Range (Differential)	$V_{EE} + 2.0$		0.0	$V_{EE} + 2.0$		0.0	$V_{EE} + 2.0$		0.0	V
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu A$
$I_{IL}$	Input LOW Current RESET, CLK /CLK	0.5 -150	— —	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu A$

**NOTES:**

- 100EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and traverse airflow greater than 500lfpm is maintained.
- Input and output parameters vary 1:1 with  $V_{CC}$ .
- All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .
- $V_{IHCMR}$  (Min) varies 1:1 with  $V_{EE}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**TIMING DIAGRAM**



**AC ELECTRICAL CHARACTERISTICS(1)**NECL:  $V_{CC} = 0V$ ,  $V_{EE} = -3.3V$  to  $-5.0V \pm 10\%$ ; PECL:  $V_{EE} = 0V$ ,  $V_{CC} = +3.3V$  to  $+5.0V \pm 10\%$ 

Symbol	Parameter	$T_A = -40^\circ\text{C}$			$T_A = +25^\circ\text{C}$			$T_A = +85^\circ\text{C}$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$f_{MAX}$	Maximum Frequency <sup>(2)</sup>	4	—	—	4	—	—	4	—	—	GHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay to Output Differential CLK → Q RESET → Q	300 370	380 420	440 470	300 370	380 420	440 470	320 400	400 450	460 500	ps
$t_{RR}$	Set/Reset Recovery	200	—	—	200	100	—	200	—	—	ps
$t_{PW}$	Minimum Pulse Width RESET	550	—	—	550	200	—	550	—	—	ps
$t_{JITTER}$	Cycle-to-Cycle RMS Jitter <sup>(2)</sup>	—	0.2	< 1	—	0.2	< 1	—	0.2	< 1	ps(rms)
$V_{PP}$	Input Voltage Swing (Differential)	150	800	1200	150	800	1200	150	800	1200	mV
$t_r$ $t_f$	Output Rise/Fall Times Q, /Q (20% to 80%)	90	170	200	100	180	220	120	200	240	ps

**NOTES:**

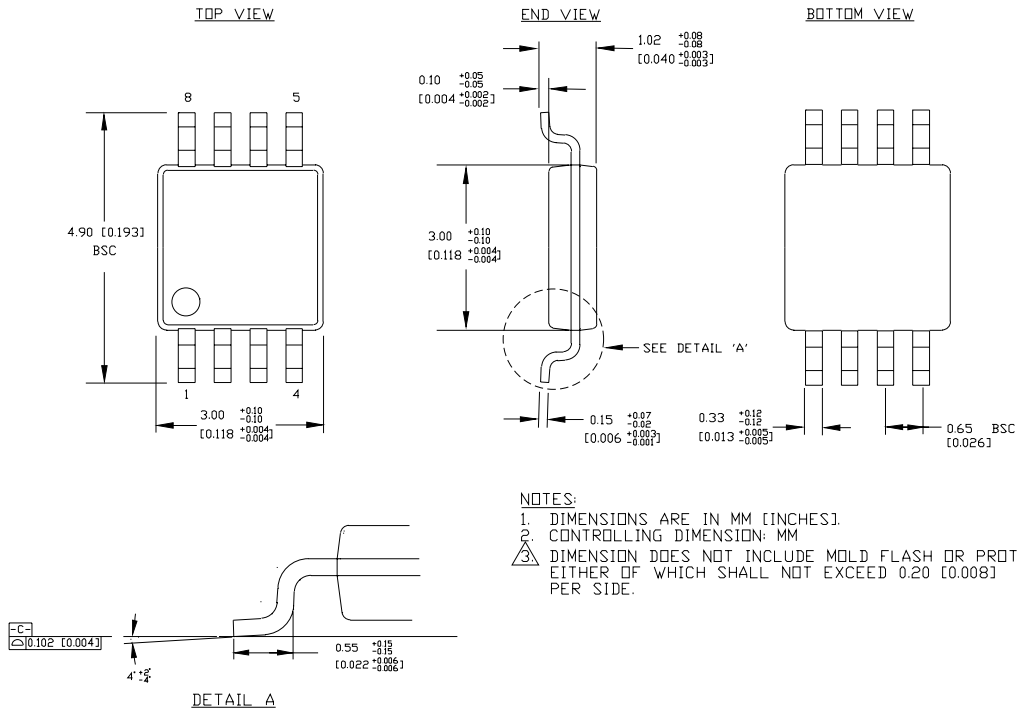
1. Measured using a 750mV source, 50% duty cycle clock source. All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .
2.  $f_{MAX}$  guaranteed for functionality only.  $V_{OL}$  and  $V_{OH}$  levels are guaranteed at DC only.

**PRODUCT ORDERING CODE**

Ordering Code	Package Type	Operating Range	Package Marking
SY10EP33VZI	Z8-1	Industrial	HEP33V
SY10EP33VZITR	Z8-1	Industrial	HEP33V
SY100EP33VZI	Z8-1	Industrial	XEP33V
SY100EP33VZITR	Z8-1	Industrial	XEP33V

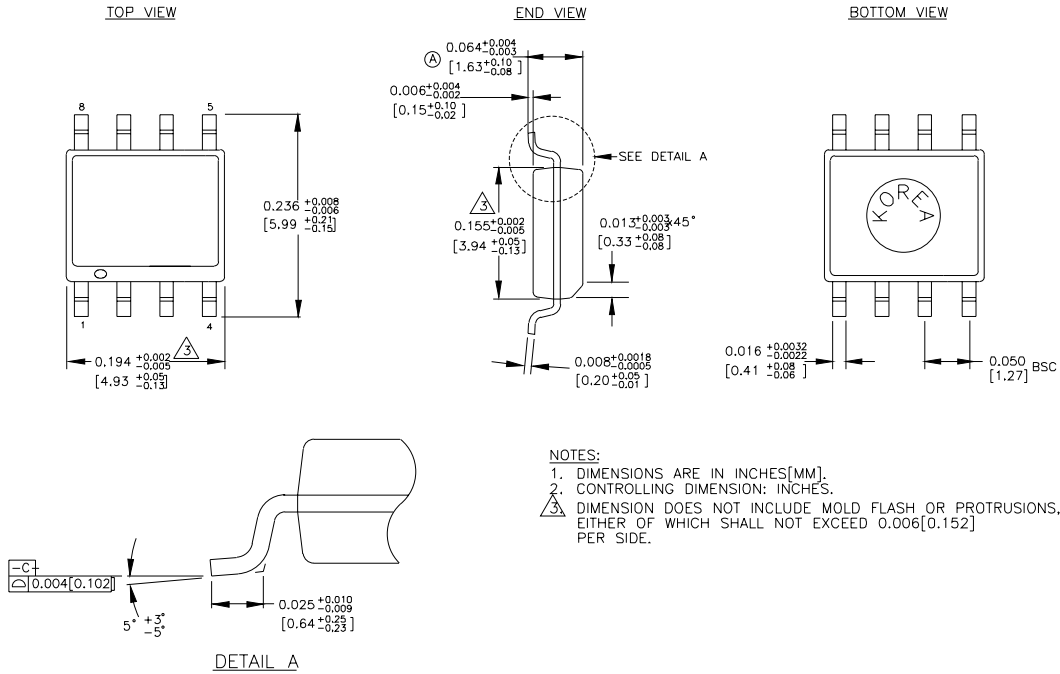
Ordering Code	Package Type	Operating Range	Package Marking
SY10EP33VKI	K8-1	Industrial	HP33
SY10EP33VKITR	K8-1	Industrial	HP33
SY100EP33VKI	K8-1	Industrial	XP33
SY100EP33VKITR	K8-1	Industrial	XP33

**8 LEAD MSOP (K8-1)**



Rev.01

**8 LEAD SOIC .150" WIDE (Z8-1)**



Rev. 03

**MICREL-SYNERGY 3250 SCOTT BOULEVARD SANTA CLARA CA 95054 USA**

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