

## FEATURES

- Guaranteed >3GHz bandwidth over temperature
- Guaranteed <440ps propagation delay
- 3.3V and 5V power supply options
- Wide operating temperature range: -40°C to +85°C
- Available in 8-pin (3mm) MSOP and SOIC package



ECL Pro™

## DESCRIPTION

The SY10EP31V is a D flip-flop with set and reset. The device is pin and functionally equivalent to the EL31 and LVEL31 devices. With AC performance much faster than the EL31 and LVEL31 devices, the EP31V is ideal for applications requiring the fastest AC performance available. Both SET and RESET inputs are asynchronous, level triggered signals. Data enters the master portion of the flip-flop when CLK is low and is transferred to the slave, and thus the outputs, upon a positive transition of the CLK.

## PIN NAMES

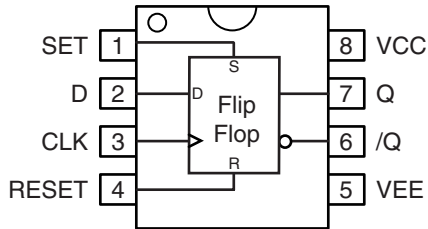
Pin	Function
CLK	ECL Clock Inputs
RESET	ECL Asynchronous Reset
SET	ECL Asynchronous Set
D	ECL Data Input with Internal 75kΩ Pull-Down Resistor, Default State is LOW.
Q, /Q	ECL Data Outputs
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative, 0 Supply

## TRUTH TABLE

D	SET	RESET	CLK	Q
L	L	L	Z	L
H	L	L	Z	H
X	H	L	X	H
X	L	H	X	L
X	H	H	X	UNDEF

Z = LOW to HIGH Transition

**PACKAGE/ORDERING INFORMATION**



**8-Pin MSOP and SOIC Packages**

**Ordering Information<sup>(1)</sup>**

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY10EP31VKC	K8-1	Commercial	HP31	Sn-Pb
SY10EP31VKCTR <sup>(2)</sup>	K8-1	Commercial	HP31	Sn-Pb
SY10EP31VZC	Z8-1	Commercial	HEP31V	Sn-Pb
SY10EP31VZCTR <sup>(2)</sup>	Z8-1	Commercial	HEP31V	Sn-Pb
SY10EP31VKI	K8-1	Industrial	HP31	Sn-Pb
SY10EP31VKITR <sup>(2)</sup>	K8-1	Industrial	HP31	Sn-Pb
SY10EP31VZI	Z8-1	Industrial	HEP31V	Sn-Pb
SY10EP31VZITR <sup>(2)</sup>	Z8-1	Industrial	HEP31V	Sn-Pb
SY10EP31VKG <sup>(3)</sup>	K8-1	Industrial	HP31 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY10EP31VKGTR <sup>(2, 3)</sup>	K8-1	Industrial	HP31 with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY10EP31VZG <sup>(3)</sup>	Z8-1	Industrial	HEP31V with Pb-Free bar-line indicator	Pb-Free NiPdAu
SY10EP31VZGTR <sup>(2, 3)</sup>	Z8-1	Industrial	HEP31V with Pb-Free bar-line indicator	Pb-Free NiPdAu

**Notes:**

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

**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

Symbol	Rating	Value	Unit
V <sub>CC</sub>	Power Supply Voltage (V <sub>EE</sub> = 0)	+6.0 to 0	V
V <sub>EE</sub>	Power Supply Voltage (V <sub>CC</sub> = 0)	-6.0 to 0	V
V <sub>IN</sub>	Input Voltage (V <sub>CC</sub> = 0V, V <sub>IN</sub> not more negative than V <sub>EE</sub> ) Input Voltage (V <sub>EE</sub> = 0V, V <sub>IN</sub> not more positive than V <sub>CC</sub> )	-6.0 to 0 +6.0 to 0	V V
I <sub>OUT</sub>	Output Current -Continuous -Surge	50 100	mA
T <sub>A</sub>	Operating Temperature Range	-40 to +85	°C
T <sub>LEAD</sub>	Lead Temperature (soldering, 20sec.)	+260	°C
T <sub>store</sub>	Storage Temperature Range	-65 to +150	°C
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)		
	SOIC-8 -Still Air -500lfpm	160 109	°C/W °C/W
	MSOP-8 -Still Air -500lfpm	206 155	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)		
	SOIC-8 MSOP-8	39 39	°C/W °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.

**5V PECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

V<sub>CC</sub> = +5.0V ±10%, V<sub>EE</sub> = 0V<sup>(2)</sup>

Symbol	Parameter	T <sub>A</sub> = -40°C			T <sub>A</sub> = +25°C			T <sub>A</sub> = +85°C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
I <sub>EE</sub>	Power Supply Current <sup>(3)</sup>	—	34	44	—	35	45	—	37	47	mA
V <sub>OH</sub>	Output HIGH Voltage <sup>(4)</sup>	3865	3940	4115	3930	4055	4180	3990	4115	4240	mV
V <sub>OL</sub>	Output LOW Voltage <sup>(4)</sup>	3050	3190	3315	3050	3255	3380	3050	3315	3440	mV
V <sub>IH</sub>	Input HIGH Voltage	3790	—	4115	3855	—	4180	3915	—	4240	mV
V <sub>IL</sub>	Input LOW Voltage	3065	—	3390	3130	—	3455	3190	—	3515	mV
I <sub>IH</sub>	Input HIGH Current	—	—	150	—	—	150	—	—	150	μA
I <sub>IL</sub>	Input LOW Current	0.5	—	—	0.5	—	—	0.5	—	—	μA

**Note 1.** 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.

**Note 2.** Input and output parameters vary 1:1 with V<sub>CC</sub>.

**Note 3.** V<sub>CC</sub> = 0V, V<sub>EE</sub> = V<sub>EE</sub>(min) to V<sub>EE</sub>(max), all other pins floating.

**Note 4.** All loading with 50Ω to V<sub>CC</sub> - 2.0V.

**3.3V 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 <sup>(3)</sup>	—	34	44	—	35	45	—	37	47	mA
$V_{OH}$	Output HIGH Voltage <sup>(4)</sup>	2165	2240	2415	2230	2355	2480	2290	2415	2540	mV
$V_{OL}$	Output LOW Voltage <sup>(4)</sup>	1350	1490	1615	1350	1555	1680	1350	1615	1740	mV
$V_{IH}$	Input HIGH Voltage	2090	—	2415	2155	—	2480	2215	—	2540	mV
$V_{IL}$	Input LOW Voltage	1365	—	1690	1430	—	1755	1490	—	1815	mV
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5	—	—	0.5	—	—	0.5	—	—	$\mu\text{A}$

**Note 1.** 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.

**Note 2.** Input and output parameters vary 1:1 with  $V_{CC}$ .

**Note 3.**  $V_{CC} = 0V$ ,  $V_{EE} = V_{EE}(\text{min})$  to  $V_{EE}(\text{max})$ , all other pins floating.

**Note 4.** All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .

**NECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

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

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 <sup>(3)</sup>	—	34	44	—	35	45	—	37	47	mA
$V_{OH}$	Output HIGH Voltage <sup>(4)</sup>	-1135	-1060	-885	-1070	-945	-820	-1010	-885	-760	mV
$V_{OL}$	Output LOW Voltage <sup>(4)</sup>	-1950	-1810	-1685	-1950	-1745	-1620	-1950	-1685	-1560	mV
$V_{IH}$	Input HIGH Voltage	-1210	—	-885	-1145	—	-820	-1085	—	-760	mV
$V_{IL}$	Input LOW Voltage	-1935	—	-1610	-1870	—	-1545	-1810	—	-1485	mV
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5	—	—	0.5	—	—	0.5	—	—	$\mu\text{A}$

**Note 1.** 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.

**Note 2.** Input and output parameters vary 1:1 with  $V_{CC}$ .

**Note 3.**  $V_{CC} = 0V$ ,  $V_{EE} = V_{EE}(\text{Min})$  to  $V_{EE}(\text{Max})$ , all other pins floating.

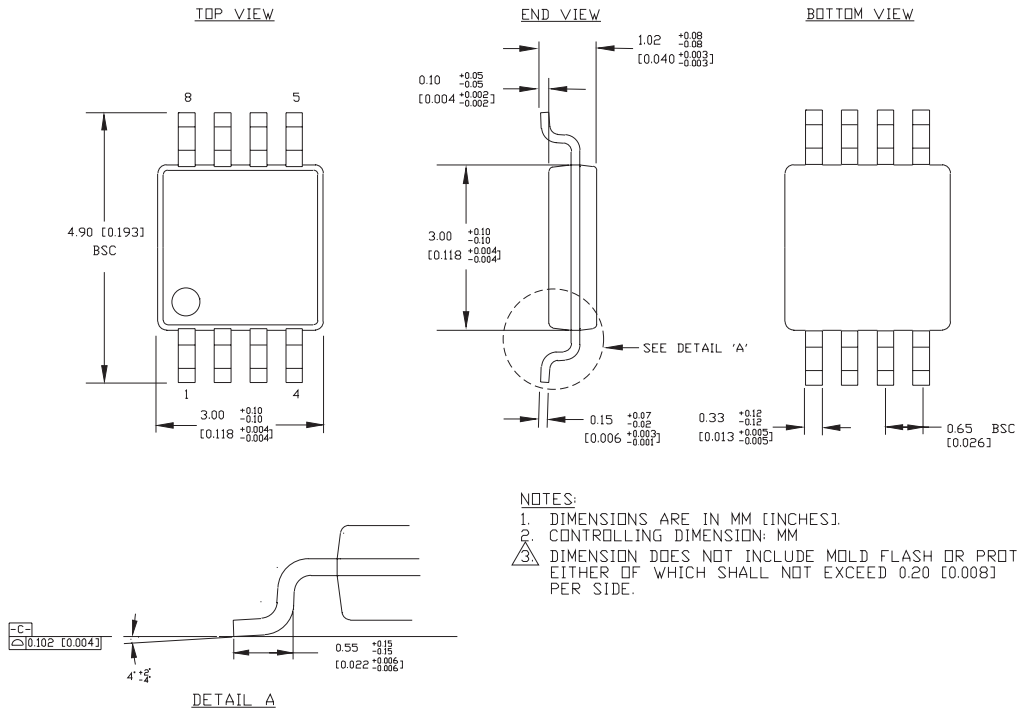
**Note 4.** All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .

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

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.	
$f_{MAX}$	Maximum Frequency <sup>(2)</sup>	3	—	—	3	—	—	3	—	—	GHz
$t_{PD}$	Propagation Delay to Output CLK → Q, /Q SET, RESET → Q, /Q	250 230	330 380	400 450	270 230	340 400	410 410	300 230	370 430	440 500	ps
$t_{RR}$	Set/Reset Recovery	225	—	—	225	—	—	225	—	—	ps
$t_S$	Setup Time	100	—	—	100	—	—	100	—	—	ps
$t_H$	Hold Time	150	—	—	150	—	—	150	—	—	ps
$t_{PW}$	Minimum Pulse Width SET, RESET	550	450	—	550	450	—	550	450	—	ps ps
$t_{JITTER}$	Cycle-to-Cycle RMS Jitter	—	0.2	<1.0	—	0.2	<1.0	—	0.2	<1.0	ps <sub>RMS</sub>
$t_r$ $t_f$	Output Rise/Fall Times Q, /Q (20% to 80%)	50	120	180	60	130	200	70	150	220	ps

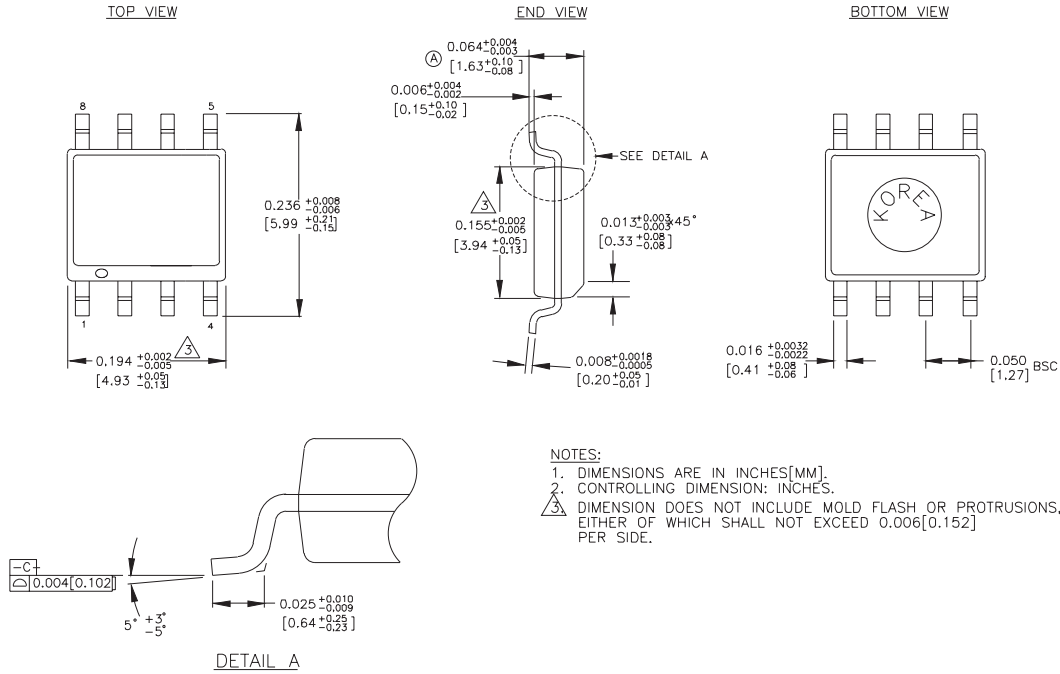
**Note 1.** Measured using a 750mV source, 50% duty cycle clock source. All loading with 50Ω to  $V_{CC} - 2.0V$ .**Note 2.**  $f_{MAX}$  guaranteed for functionality only.  $V_{OL}$  and  $V_{OH}$  levels are guaranteed at DC only.

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



Rev. 01

**8-PIN PLASTIC SOIC (Z8-1)**



Rev. 03

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