



# 5V/3.3V DIFFERENTIAL DATA AND CLOCK D FLIP-FLOP WITH SET AND RESET

ECL Pro™  
SY10EP53V

## FEATURES

- 3.3V and 5V power supply options
- 3.0GHz toggle frequency
- 75KΩ internal input pulldown resistors
- Available in 10-pin MSOP package



ECL Pro™

## DESCRIPTION

The SY10EP53V is a differential data, differential clock D flip-flop with set and reset. The EP53V is ideally suited for those applications which require the ultimate in AC performance.

Data enters the master portion of the flip-flop when the clock is LOW and is transferred to the slave, and thus the outputs, upon a positive transition of the clock. The differential clock inputs also allow the EP53V to be used as a negative edge triggered device. Both set and reset inputs are asynchronous, level triggered signals.

The EP53V employs input clamping circuitry so that, under open input conditions (pulled down to  $V_{EE}$ ), the outputs of the device will remain stable.

## PIN NAMES

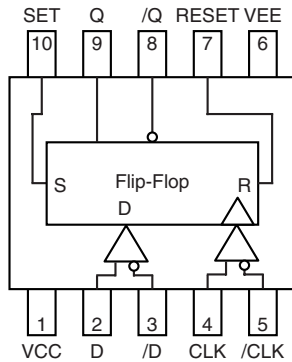
Pin	Function
D, /D	Data Input (ECL)
CLK, /CLK	Clock Input (ECL)
Q, /Q	Data Output (ECL)
$V_{CC}$ , $V_{EE}$	Power Supply
SET	ECL Asynchronous Set
RESET	ECL Asynchronous Reset

## TRUTH TABLE<sup>(1)</sup>

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

Note 1. Z = LOW-to-HIGH transition.

**PACKAGE/ORDERING INFORMATION**



**10-Pin MSOP (K10-1)**

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

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY10EP53VKC	K10-1	Commercial	HEP53V	Sn-Pb
SY10EP53VKCTR <sup>(2)</sup>	K10-1	Commercial	HEP53V	Sn-Pb
SY10EP53VKI	K10-1	Industrial	HEP53V	Sn-Pb
SY10EP53VKITR <sup>(2)</sup>	K10-1	Industrial	HEP53V	Sn-Pb
SY10EP53VKG <sup>(3)</sup>	K10-1	Industrial	HEP53V with Pb-Free bar line indicator	NiPdAu Pb-Free
SY10EP53VKGTR <sup>(2, 3)</sup>	K10-1	Industrial	HEP53V with Pb-Free bar line indicator	NiPdAu Pb-Free

**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
$V_{CC} - V_{EE}$	Power Supply Voltage	6V	V
$V_{IN}$	Input Voltage ( $V_{CC} = 0V$ , $V_{IN}$ not more negative than $V_{EE}$ ) Input Voltage ( $V_{EE} = 0V$ , $V_{IN}$ not more positive than $V_{CC}$ )	-6.0 to 0 +6.0 to 0	V V
$I_{OUT}$	Output Current -Continuous -Surge	50 100	mA
$T_A$	Operating Temperature Range	-40 to +85	°C
$T_{LEAD}$	Lead Temperature (Soldering, 20 sec.)	+260	°C
$T_{store}$	Storage Temperature Range	-65 to +150	°C
$\theta_{JA}$	Package Thermal Resistance -Still-Air -500lfpm	113 96	°C/W
$\theta_{JC}$	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.

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

$V_{CC} = 5.0V$ ,  $V_{EE} = 0V$ <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	—	—	47	—	35	47	—	—	47	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>	3050	3190	3315	3050	3255	3380	3050	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
$V_{IHCMR}$	Input HIGH Voltage <sup>(4)</sup> Common Mode Range (Diff.)	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	D /D	0.5 -150	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu A$

**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  $V_{CC}$ .  $V_{CC}$  can vary -0.5V to +0.5V.

**Note 3.** All loading with 50 $\Omega$  to  $V_{CC} - 2.0V$ .

**Note 4.**  $V_{IHCMR}$  (min) varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  (max) varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

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

$V_{CC} = 3.3V, V_{EE} = 0V^{(2)}$

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	—	—	47	—	35	47	—	—	47	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>	1350	1490	1615	1350	1555	1680	1350	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
$V_{IHCMR}$	Input HIGH Voltage <sup>(4)</sup> Common Mode Range (Diff.)	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	D /D	0.5 -150	— —	0.5 -150	— —	— —	0.5 -150	— —	— —	$\mu A$

**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  $V_{CC}$ .  $V_{CC}$  can vary  $-0.3V$  to  $+0.5V$ .

**Note 3.** All loading with  $50\Omega$  to  $V_{CC} - 2.0V$ .

**Note 4.**  $V_{IHCMR}(\min)$  varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}(\max)$  varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**ECL/LVECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

$V_{CC} = 0V, V_{EE} = -5.5V \text{ to } -3.0V^{(2)}$

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 <sup>(3)</sup>	—	—	47	—	35	47	—	—	47	mA
$V_{OH}$	Output HIGH Voltage <sup>(4)</sup>	-1135		-0885	-1070	-0945	-0820	-1010		-0760	mV
$V_{OL}$	Output LOW Voltage <sup>(4)</sup>	-1950		-1685	-1950	-1745	-1620	-1950		-1560	mV
$V_{IH}$	Input HIGH Voltage	-1210		-0885	-1145	—	-0820	-1085	—	-0760	mV
$V_{IL}$	Input LOW Voltage	-1935		-1610	-1870	—	-1545	-1810	—	-1485	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range <sup>(5)</sup>	$V_{EE}+2.0$		$V_{CC}$	$V_{EE}+2.0$		$V_{CC}$	$V_{EE}+2.0$		$V_{CC}$	V
$I_{IH}$	Input HIGH Current	—	—	150	—	—	150	—	—	150	$\mu A$
$I_{IL}$	Input LOW Current	0.5	—	—	0.5	—	—	0.5	—	—	$\mu A$

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

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

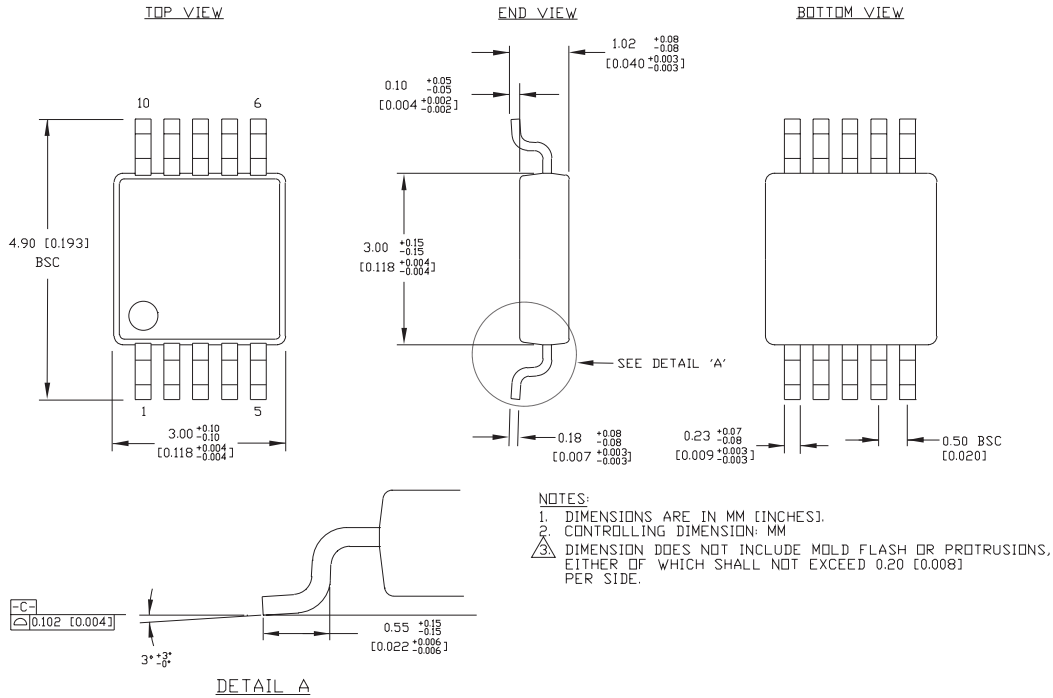
**Note 5.**  $V_{IHCMR} \min$  varies 1:1 with  $V_{EE}$ ,  $\max$  varies 1:1 with  $V_{CC}$ .

**AC ELECTRICAL CHARACTERISTICS** $V_{CC} = 0V$ ,  $V_{EE} = -5.5V$  to  $-3.0V$ ;  $V_{CC} = 3.0V$  to  $5.5V$ ,  $V_{EE} = 0V$ 

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 Toggle Frequency <sup>(1)</sup>	—	3.0	—	—	3.0	—	—	3.0	—	GHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay to Output Differential CLK→ Q, /Q SET, RESET→ Q, /Q	175 200	— —	325 360	200 250	275 330	350 420	250 325	— —	400 475	ps
$t_{RR}$	Reset Recovery Time	225	—	—	200	140	—	185	—	—	ps
$t_S$	Setup Time	150	50	—	150	50	—	150	50	—	ps
$t_H$	Hold Time	150	50	—	150	50	—	150	50	—	ps
$t_{PW}$	Minimum Pulse Width	550	450	—	550	450	—	550	450	—	ps
$V_{PP}$	Input Voltage Swing (Differential)	—	—	—	—	TBD	—	—	—	—	mV
$t_r$ $t_f$	Output Rise/Fall Times (20% to 80%) Q	50	—	180	60	130	200	70	—	220	ps

**Note 1.**  $f_{MAX}$  guaranteed for functionality only.  $V_{OL}$  and  $V_{OH}$  levels are guaranteed at DC only.

**10-PIN MSOP (K10-1)**



Rev. 00

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