

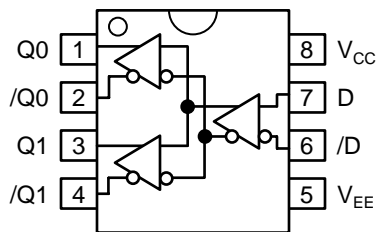
## FEATURES

- 3.3V and 5V power supply options
- 3.0GHz typical toggle frequency
- 310ps typical propagation delay
- 1.6V (5V) and 1.4V (3.3V) swing
- Internal input resistors: pulldown on D, pulldown and pullup on /D
- New differential input common mode range
- Available in 8-pin MSOP and SOIC packages

## DESCRIPTION

The SY10EP89V is a differential fanout gate specifically designed to drive coaxial cables. The device is especially useful in digital video broadcasting applications; for this application, since the system is polarity free, each output can be used as an independent driver. The driver produces swings 70% larger than a standard ECL output. When driving a coaxial cable, proper termination is required at both ends of the line, while maintaining a 800mV (5V) or 700mV (3.3V) swing at the receiving end of the cable. Because of the larger output swings, the device cannot be terminated into the standard  $V_{CC} - 2.0V$ . All of the DC parameters are tested with a  $50\Omega$  to  $V_{CC} - 3.0V$  load. The driver accepts a standard differential ECL input and can run off of the digital video broadcast standard  $-5.0V$  supply.

## PIN CONFIGURATION/BLOCK DIAGRAM



Available in 8-Pin SOIC and MSOP Packages

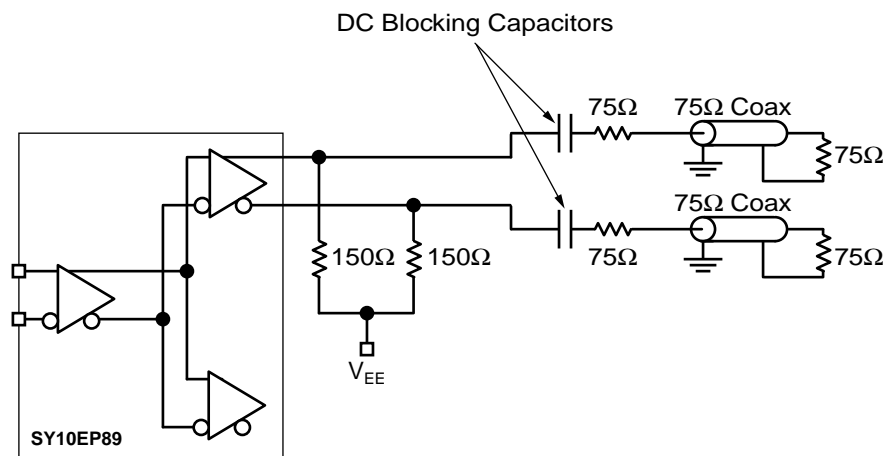
## PIN NAMES

Pin	Function
D, /D	ECL Data Inputs
Q0, Q1, /Q0, /Q1	ECL Data Outputs
$V_{CC}$	Positive Supply
$V_{EE}$	Negative Supply

**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	V
		+6.0 to 0	V
$I_{OUT}$	Output Current	-Continuous	50
		-Surge	100
$T_A$	Operating Temperature Range	-40 to +85	°C
$T_{store}$	Storage Temperature Range	-65 to +150	°C
$\theta_{JA}$	Package Thermal Resistance (Junction-to-Ambient)	-Still-Air (SOIC)	160
		-500lfpm (SOIC)	109
		-Still-Air (MSOP)	206
		-500lfpm (MSOP)	155
$\theta_{JC}$	Package Thermal Resistance (Junction-to-Case)	(SOIC)	39
		(MSOP)	39

**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.



**Figure 1. EP89V Termination Configuration**

**5.0V PECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

$V_{CC} = 5.0V \pm 5\%; V_{EE} = 0V^{(2)}$

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	27	34	45	30	37	45	32	39	50	mA
$V_{OH}$	Output HIGH Voltage <sup>(3)</sup>	3780	3880	3980	3850	3950	4050	3925	4025	4125	mV
$V_{OL}$	Output LOW Voltage <sup>(3)</sup>	2075	2225	2375	2060	2210	2360	2090	2240	2390	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	3770	—	4110	3870	—	4190	3940	—	4280	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	3050	—	3500	3050	—	3520	3050	—	3555	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range <sup>(4)</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	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  $V_{CC}$ .

**Note 3.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 4.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**3.3V LVPECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

$V_{CC} = 3.3V \pm 5\%; V_{EE} = 0V^{(2)}$

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	22	28	34	24	32	38	28	34	40	mA
$V_{OH}$	Output HIGH Voltage <sup>(3)</sup>	2080	2180	2280	2150	2250	2350	2225	2325	2425	mV
$V_{OL}$	Output LOW Voltage <sup>(3)</sup>	620	720	820	630	730	830	670	770	870	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	2070	—	2410	2170	—	2490	2240	—	2580	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	1350	—	1800	1350	—	1820	1350	—	1855	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Diff.) <sup>(4)</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	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  $V_{CC}$ .

**Note 3.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 4.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**LVECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 0V$ ,  $V_{EE} = -3.3V \pm 5\%$ 

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	22	28	34	24	32	38	28	34	40	mA
$V_{OH}$	Output HIGH Voltage <sup>(2)</sup>	-1220	-1120	-1020	-1150	-1050	-950	-1075	-975	-875	mV
$V_{OL}$	Output LOW Voltage <sup>(2)</sup>	-2680	-2580	-2480	-2670	-2570	-2470	-2630	-2530	-2430	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	-1230	—	-890	-1130	—	-810	-1060	—	-720	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	-1950	—	-1500	-1950	—	-1480	-1950	—	-1445	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Diff.) <sup>(3)</sup>	$V_{EE} + 2.0$		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	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.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 3.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**ECL DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>** $V_{CC} = 0V$ ;  $V_{EE} = -5.2V \pm 5\%$ 

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	27	32	41	30	37	44	32	39	50	mA
$V_{OH}$	Output HIGH Voltage <sup>(2)</sup>	-1220	-1120	-1020	-1150	-1050	-950	-1075	-975	-875	mV
$V_{OL}$	Output LOW Voltage <sup>(2)</sup>	-2950	-2800	-2650	-2950	-2850	-2650	-2950	-2800	-2650	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	-1230	—	-890	-1130	—	-810	-1060	—	-720	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	-1950	—	-1500	-1950	—	-1480	-1950	—	-1445	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range <sup>(3)</sup>	$V_{EE} + 2.0$		0	$V_{EE} + 2.0$		0	$V_{EE} + 2.0$		0	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.** All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 3.** The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**AC ELECTRICAL CHARACTERISTICS**
 $V_{CC} = 0V$ ,  $V_{EE} = -3.0V$  to  $-5.5V$ ;  $V_{CC} = 3.0V$  to  $5.5V$ ,  $V_{EE} = 0V^{(1)}$ 

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 Toggle Frequency <sup>(2)</sup>	3	—	—	3	—	—	3	—	—	GHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay to Output Differential	200	—	380	220	310	400	250	—	420	ps
$t_{SKEW}$	Within Device Skew <sup>(3)</sup> Q, /Q Device-to-Device Skew	—	5.0	20 120	—	5	20 120	—	—	20 120	ps
$t_{JITTER}$	Cycle-to-Cycle Jitter	—	0.5	< 1.0	—	0.5	< 1.0	—	0.5	< 1.0	ps
$V_{PP}$	Input Voltage Swing <sup>(4)</sup> (Differential)	150	800	1200	150	800	1200	150	—	1200	mV
$t_r$ $t_f$	Output Rise/Fall Times Q, /Q (20% to 80%)	120	—	350	130	250	350	150	—	350	ps

**Note 1.** Measured using a 750mV source, 50% duty cycle clock source. All loading with  $50\Omega$  to  $V_{CC} - 3.0V$ .

**Note 2.**  $f_{MAX}$  guaranteed for functionality only.  $V_{OL}$  and  $V_{OH}$  levels are guaranteed at DC only.

**Note 3.** Skew is measured between outputs under identical transitions. Duty cycle skew is defined only for differential operation when the delays are measured from the cross point of the inputs to the cross point of the outputs.

**Note 4.**  $V_{IL}$  must not go below  $V_{CC} - 3.0V$ .

**PRODUCT ORDERING CODE**

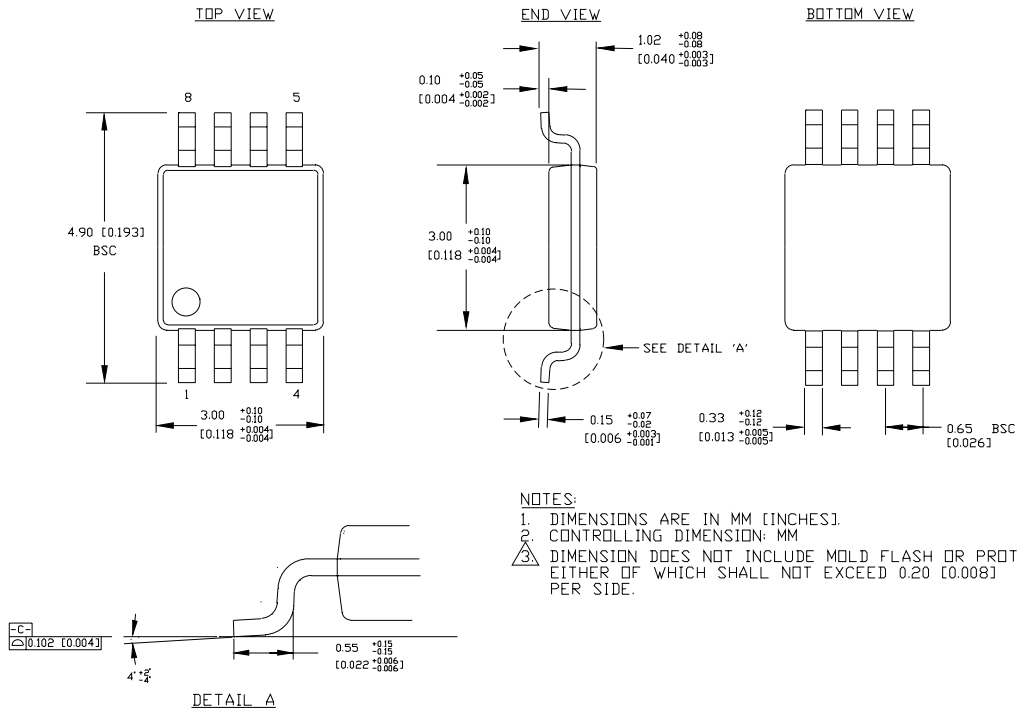
Ordering Code	Package Type	Operating Range	Package Marking
SY10EP89VZC	Z8-1	Commercial	HEP89V
SY10EP89VZCTR <sup>(1)</sup>	Z8-1	Commercial	HEP89V
SY10EP89VKC	K8-1	Commercial	HP89
SY10EP89VKCTR <sup>(1)</sup>	K8-1	Commercial	HP89

Ordering Code	Package Type	Operating Range	Package Marking
SY10EP89VZI <sup>(2)</sup>	Z8-1	Industrial	HEP89V
SY10EP89VZITR <sup>(1,2)</sup>	Z8-1	Industrial	HEP89V
SY10EP89VKI <sup>(2)</sup>	K8-1	Industrial	HP89
SY10EP89VKITR <sup>(1,2)</sup>	K8-1	Industrial	HP89

**Note 1.** Tape and Reel.

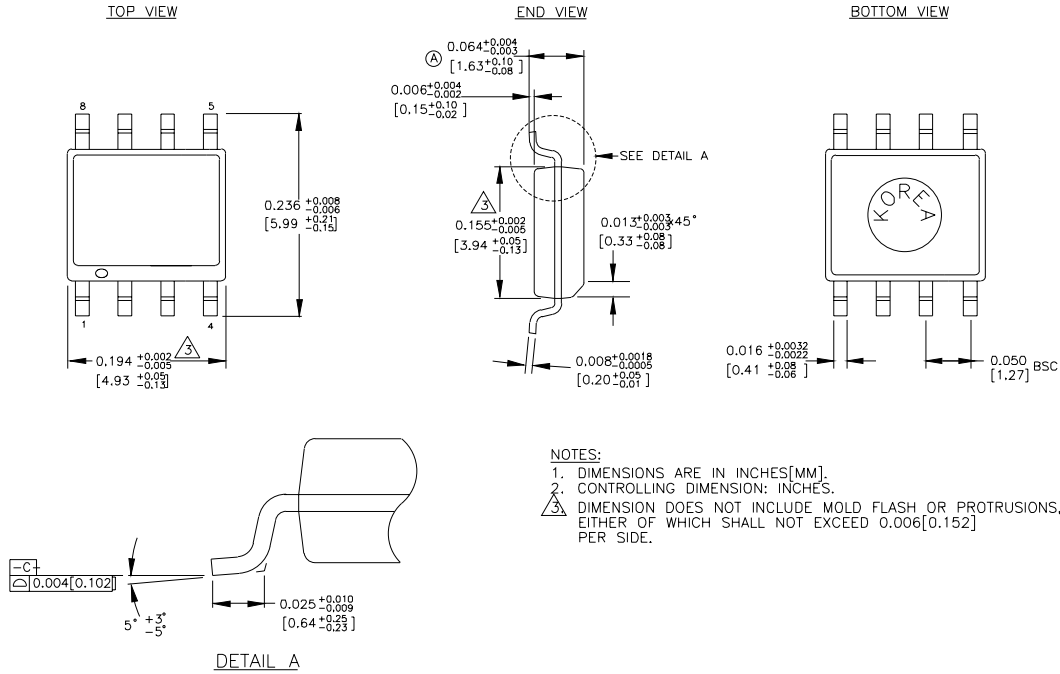
**Note 2.** Recommended for new designs.

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



Rev. 01

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



Rev.03

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