



**5V/3.3V 1:9 DIFFERENTIAL  
CLOCK DRIVER (w/o ENABLE)**

**ClockWorks™  
SY10E111A/L  
SY100E111A/L**

**FEATURES**

- 5V and 3.3V power supply options
- 200ps part-to-part skew
- 50ps output-to-output skew
- Differential design
- VBB output
- Voltage and temperature compensated outputs
- 75KΩ input pulldown resistors
- Fully compatible with Motorola MC100LVE111
- Available in 28-pin PLCC package

**DESCRIPTION**

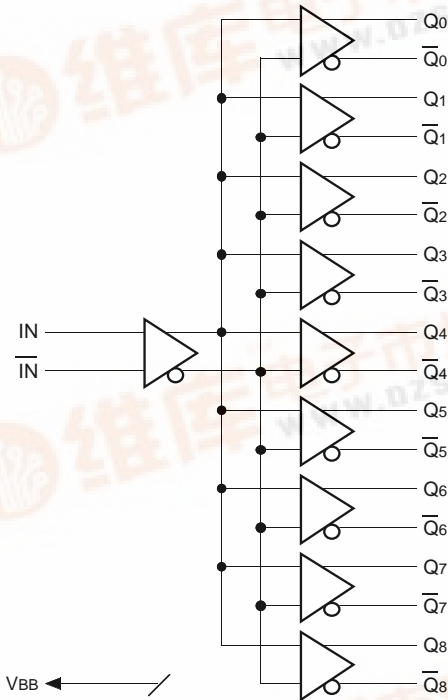
The SY10/100E111A/L are low skew 1-to-9 differential driver designed for clock distribution in mind. The SY10/100E111A/L's function and performance are similar to the popular SY10/100E111, with the improvement of lower jitter and the added feature of low voltage operation. It accepts one signal input, which can be either differential or single-ended if the VBB output is used. The signal is fanned out to 9 identical differential outputs.

The E111A/L are specifically designed, modeled and produced with low skew as the key goal. Optimal design and layout serve to minimize gate to gate skew within a device, and empirical modeling is used to determine process control limits that ensure consistent  $t_{pd}$  distributions from lot to lot. The net result is a dependable, guaranteed low skew device.

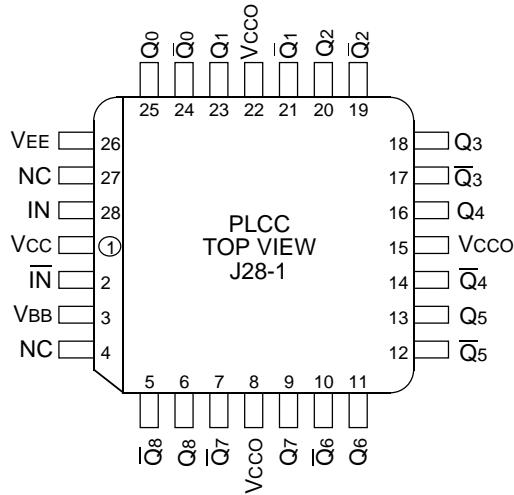
To ensure that the tight skew specification is met it is necessary that both sides of the differential output are terminated into 50Ω, even if only one side is being used. In most applications, all nine differential pairs will be used and therefore terminated. In the case where fewer than nine pairs are used, it is necessary to terminate at least the output pairs on the same package side as the pair(s) being used on that side, in order to maintain minimum skew. Failure to do this will result in small degradations of propagation delay (on the order of 10-20ps) of the output(s) being used which, while not being catastrophic to most designs, will mean a loss of skew margin.

The E111A/L, as with most other ECL devices, can be operated from a positive VCC supply in PECL mode. This allows the E111A/L to be used for high performance clock distribution in +5V/+3.3V systems. Designers can take advantage of the E111A/L's performance to distribute low skew clocks across the backplane or the board. In a PECL environment, series or Thevenin line terminations are typically used as they require no additional power supplies. For systems incorporating GTL, parallel termination offers the lowest power by taking advantage of the 1.2V supply as terminating voltage.

**BLOCK DIAGRAM**



**PIN CONFIGURATION**



**PIN NAMES**

Pin	Function
IN, $\overline{IN}$	Differential Input Pair
Q0, $\overline{Q0}$ — Q8, $\overline{Q8}$	Differential Outputs
VBB	VBB Output
VCCO	Vcc to Output

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

VEE = VEE (Min.) to VEE (Max.); VCC = GND

Symbol	Parameter	TA = -40°C			TA = 0°C			TA = +25°C			TA = +85°C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
VOH	Output HIGH Voltage													mV
	10EL	-1080	—	-890	-1020	—	-840	-980	—	-810	-910	—	-720	
	100EL	-1085	—	-880	-1025	—	-880	-1025	—	-880	-1025	—	-880	
VOL	Output LOW Voltage													mV
	10EL	-1950	—	-1650	-1950	—	-1630	-1950	—	-1630	-1950	—	-1595	
	100EL	-1830	—	-1550	-1810	—	-1620	-1810	—	-1620	-1810	—	-1620	
VIH	Input HIGH Voltage													mV
	10EL	-1230	—	-890	-1170	—	-840	-1130	—	-810	-1060	—	-720	
	100EL	-1165	—	-880	-1165	—	-880	-1165	—	-880	-1165	—	-880	
VIL	Input LOW Voltage													mV
	10EL	-1950	—	-1500	-1950	—	-1480	-1950	—	-1480	-1950	—	-1445	
	100EL	-1810	—	-1475	-1810	—	-1475	-1810	—	-1475	-1810	—	-1475	
VBB	Output Reference Voltage													V
	10EL	-1.43	—	-1.30	-1.38	—	-1.27	-1.35	—	-1.25	-1.31	—	-1.19	
	100EL	-1.38	—	-1.26	-1.38	—	-1.26	-1.38	—	-1.26	-1.38	—	-1.26	
I <sub>IH</sub>	Input HIGH Current	—	—	150	—	—	150	—	—	150	—	—	150	μA
I <sub>IL</sub>	Input LOW Current													μA
	10EL	0.5	—	—	0.5	—	—	0.5	—	—	0.3	—	—	
	100EL	0.5	—	—	0.5	—	—	0.5	—	—	0.5	—	—	
I <sub>EE</sub>	Power Supply Current													mA
	10EL	35	—	65	35	—	65	35	—	65	35	—	65	
	100EL	35	—	65	35	—	65	35	—	65	35	—	75	

**NOTE:**

- Parametric values specified at:
 

5 volt Power Supply Range	100E111A Series:	-4.2V to -5.5V.
	10E111A Series	-4.75V to -5.5V.
3 volt Power Supply Range	10/100E111L Series:	-3.0V to -3.8V.

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

VCC = +3.0V to +3.8V, VEE = GND

Symbol	Parameter	TA = -40°C			TA = 0°C			TA = +25°C			TA = +85°C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
VOH	Output HIGH Voltage <sup>(2)</sup>													mV
	10EL	2220	—	2110	2280	—	2460	2320	—	2490	2390	—	2580	
	100EL	2215	—	2120	2275	—	2420	2275	—	2420	2275	—	2420	
VOL	Output LOW Voltage <sup>(2)</sup>													mV
	10EL	1350	—	1650	1350	—	1670	1350	—	1670	1350	—	1705	
	100EL	1470	—	1750	1490	—	1680	1490	—	1680	1490	—	1680	
VIH	Input HIGH Voltage <sup>(2)</sup>													mV
	10EL	2070	—	2410	2130	—	2460	2170	—	2490	2240	—	2580	
	100EL	2135	—	2420	2135	—	2420	2135	—	2420	2135	—	2420	
VIL	Input LOW Voltage <sup>(2)</sup>													mV
	10EL	1350	—	1800	1350	—	1820	1350	—	1820	1350	—	1855	
	100EL	1490	—	1825	1490	—	1825	1490	—	1825	1490	—	1825	
VBB	Output Reference Voltage <sup>(2)</sup>													V
	10EL	1.87	—	2.00	1.92	—	2.03	1.95	—	2.05	1.99	—	2.11	
	100EL	1.92	—	2.04	1.92	—	2.04	1.92	—	2.04	1.92	—	2.04	
I <sub>IH</sub>	Input HIGH Current	—	—	150	—	—	150	—	—	150	—	—	150	μA
I <sub>IL</sub>	Input LOW Current													μA
	10EL	0.5	—	—	0.5	—	—	0.5	—	—	0.3	—	—	
	100EL	0.5	—	—	0.5	—	—	0.5	—	—	0.5	—	—	
IEE	Power Supply Current													mA
	10EL	—	—	66	—	—	66	—	—	66	—	—	66	
	100EL	—	—	66	—	—	66	—	—	66	—	—	78	

**NOTES:**

- Parametric values specified at: 3 volt Power Supply Range 10/100E111L Series: +3.0V to +3.8V.
- These values are for VCC = 3.3V. Level specifications will vary 1:1 with VCC.

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

VCC = VCC (Min.) to VCC (Max.); VEE = GND

Symbol	Parameter	TA = -40°C			TA = 0°C			TA = +25°C			TA = +85°C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
VOH	Output HIGH Voltage <sup>(2)</sup>													mV
	10EL	3920	—	4110	3980	—	4160	4020	—	4190	4090	—	4280	
	100EL	3915	—	4120	3975	—	4120	3975	—	4120	3975	—	4120	
VOL	Output LOW Voltage <sup>(2)</sup>													mV
	10EL	3050	—	3350	3050	—	3370	3050	—	3370	3050	—	3405	
	100EL	3170	—	3450	3190	—	3380	3190	—	3380	3190	—	3380	
VIH	Input HIGH Voltage <sup>(2)</sup>													mV
	10EL	3770	—	4110	3830	—	4160	3870	—	4190	3940	—	4280	
	100EL	3835	—	4120	3835	—	4120	3835	—	4120	3835	—	4120	
VIL	Input LOW Voltage <sup>(2)</sup>													mV
	10EL	3050	—	3500	3050	—	3520	3050	—	3520	3050	—	3555	
	100EL	3190	—	3525	3190	—	3525	3190	—	3525	3190	—	3525	
VBB	Output Reference Voltage <sup>(2)</sup>													V
	10EL	3.57	—	3.70	3.62	—	3.73	3.65	—	3.75	3.69	—	3.81	
	100EL	3.62	—	3.74	3.62	—	3.74	3.62	—	3.74	3.62	—	3.74	
I <sub>IH</sub>	Input HIGH Current	—	—	150	—	—	150	—	—	150	—	—	150	μA
I <sub>IL</sub>	Input LOW Current													μA
	10EL	0.5	—	—	0.5	—	—	0.5	—	—	0.3	—	—	
	100EL	0.5	—	—	0.5	—	—	0.5	—	—	0.5	—	—	
IEE	Power Supply Current													mA
	10EL	—	—	66	—	—	66	—	—	66	—	—	66	
	100EL	—	—	66	—	—	66	—	—	66	—	—	78	

**NOTES:**

- Parametric values specified at: 5 volt Power Supply Range 100E111A Series: +4.2V to +5.5V.  
10E111A Series: +4.75V to +5.5V.
- These values are for VCC = 5V. Level specifications will vary 1:1 with VCC.

**AC ELECTRICAL CHARACTERISTICS**

VEE = VEE (Min.) to VEE (Max.); VCC = GND

Symbol	Parameter	TA = -40°C			TA = 0°C			TA = +25°C			TA = +85°C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
tPLH tPHL	Propagation Delay to Output IN (differential) <sup>(2)</sup> IN (single-ended) <sup>(3)</sup>	380 280	— —	680 780	430 330	— —	630 730	430 330	— —	630 730	430 330	— —	630 730	ps
t <sub>skew</sub>	Within-Device Skew <sup>(4)</sup> Part-to-Part Skew (Diff.)	— —	— —	75 250	— —	— —	50 200	— —	— —	50 200	— —	— —	50 200	ps
V <sub>PP</sub>	Minimum Input Swing <sup>(5)</sup>	250	—	—	250	—	—	250	—	—	250	—	—	mV
V <sub>CMR</sub>	Common Mode Range <sup>(6)</sup>	-1.5	—	-0.4	-1.5	—	-0.4	-1.5	—	-0.4	-1.5	—	-0.4	V
t <sub>r</sub> t <sub>f</sub>	Rise/Fall Times 20% to 80%	200	—	650	200	—	600	200	—	600	200	—	600	ps

**NOTES:**

- Parametric values specified at:
 

5 volt Power Supply Range	100E111A Series:	-4.2V to -5.5V.
	10E111A Series	-4.75V to -5.5V.
3 volt Power Supply Range	10/100E111L Series:	-3.0V to -3.8V.
- The differential propagation delay is defined as the delay from the crossing points of the differential input signals to the crossing point of the differential output signals.
- The single-ended propagation delay is defined as the delay from the 50% point of the input signal to the 50% point of the output signal.
- The within-device skew is defined as the worst case difference between any two similar delay paths within a single device.
- V<sub>PP</sub> (min) is defined as the minimum input differential voltage which will cause no increase in the propagation delay. The V<sub>PP</sub> (min) is AC limited for the E111A/L as a differential input as low as 50mV will still produce full ECL levels at the output.
- V<sub>CMR</sub> is defined as the range within the V<sub>IH</sub> level may vary, with the device still meeting the propagation delay specification. The V<sub>L</sub> level must be such that the peak-to-peak voltage is less than 1.0V and greater than or equal to V<sub>PP</sub> (min).  
For PECL operation: V<sub>CMR</sub> (max) = V<sub>CC</sub> - |V<sub>CMR</sub> (max)| and  
V<sub>CMR</sub> (min) = V<sub>CC</sub> - |V<sub>CMR</sub> (min)|

**PRODUCT ORDERING CODE****5V**

Ordering Code	Package Type	Operating Range	VEE Range (V)
SY10E111AJC	J28-1	Commercial	-4.75 to -5.5
SY10E111AJCTR	J28-1	Commercial	-4.75 to -5.5
SY100E111AJC	J28-1	Commercial	-4.2 to -5.5
SY100E111AJCTR	J28-1	Commercial	-4.2 to -5.5

**5V**

Ordering Code	Package Type	Operating Range	VEE Range (V)
SY10E111AJI	J28-1	Industrial	-4.75 to -5.5
SY10E111AJITR	J28-1	Industrial	-4.75 to -5.5
SY100E111AJI	J28-1	Industrial	-4.2 to -5.5
SY100E111AJITR	J28-1	Industrial	-4.2 to -5.5

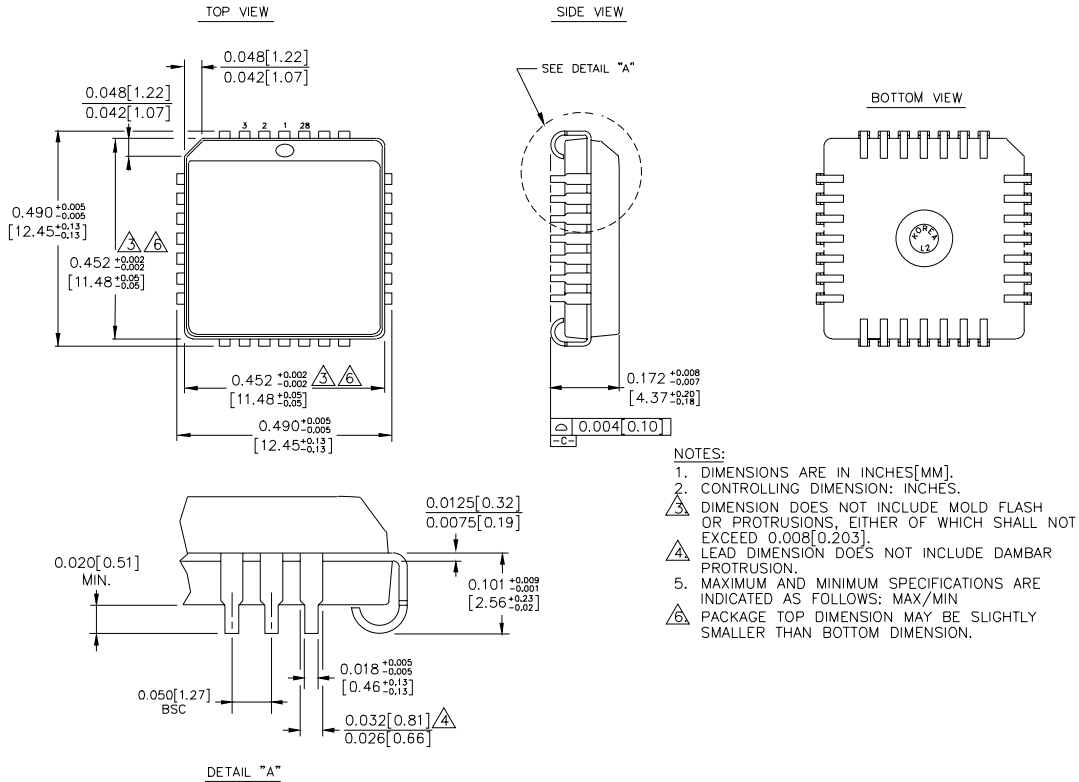
**3.3V**

Ordering Code	Package Type	Operating Range	VEE Range (V)
SY10E111LJC	J28-1	Commercial	-3.0 to -3.8
SY10E111LJCTR	J28-1	Commercial	-3.0 to -3.8
SY100E111LJC	J28-1	Commercial	-3.0 to -3.8
SY100E111LJCTR	J28-1	Commercial	-3.0 to -3.8

**3.3V**

Ordering Code	Package Type	Operating Range	VEE Range (V)
SY10E111LJI	J28-1	Industrial	-3.0 to -3.8
SY10E111LJITR	J28-1	Industrial	-3.0 to -3.8
SY100E111LJI	J28-1	Industrial	-3.0 to -3.8
SY100E111LJITR	J28-1	Industrial	-3.0 to -3.8

**28 LEAD PLCC (J28-1)**



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