

## *Product Preview*

# **Low-Voltage 1:20 Differential ECL/PECL Clock Driver**

The MC100EP221 is a low skew 1-to-20 differential driver, designed with clock distribution in mind. It accepts two clock sources into an input multiplexer. The input signals can be either differential or single-ended if the  $V_{BB}$  output is used. The selected signal is fanned out to 20 identical differential outputs.

- 150ps Part-to-Part Skew
- 50ps Output-to-Output Skew
- Differential Design
- $V_{BB}$  Output
- Voltage and Temperature Compensated Outputs
- Low Voltage  $V_{EE}$  Range of  $-2.375$  to  $-3.8V$
- 75k $\Omega$  Input Pulldown Resistors

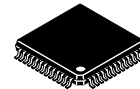
The EP221 is specifically designed, modeled and produced with low skew as the key goal. Optimal design and layout serve to minimize gate-to-gate skew within a device, and empirical modeling is used to determine process control limits that ensure consistent  $t_{pd}$  distributions from lot to lot. The 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 50 $\Omega$ , even if only one side is being used. In most applications, all ten differential pairs will be used and therefore terminated. In the case where fewer than ten 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 MC100EP221, as with most other ECL devices, can be operated from a positive  $V_{CC}$  supply in PECL mode. This allows the EP221 to be used for high performance clock distribution in +3.3V or +2.5V systems. Designers can take advantage of the EP221's performance to distribute low skew clocks across the backplane. In a PECL environment, series or Thevenin line terminations are typically used as they require no additional power supplies. For more information on using PECL, designers should refer to Motorola Application Note AN1406/D.

## **MC100EP221**

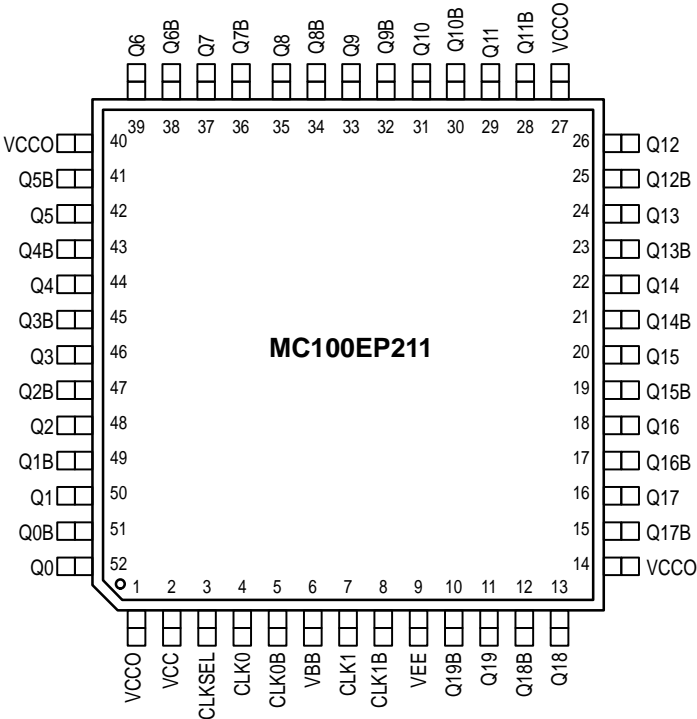
### **LOW-VOLTAGE 1:20 DIFFERENTIAL ECL/PECL CLOCK DRIVER**



**FA SUFFIX**  
52-LEAD TQFP PACKAGE  
CASE 848D-03



Pinout: 52-Lead TQFP  
(Top View)



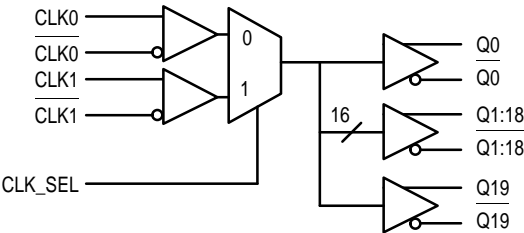
PIN NAMES

Pins	Function
CLKn, $\overline{\text{CLKn}}$ Q0:19, $\overline{\text{Q0:19}}$	Differential Input Pairs Differential Outputs
CLK_SEL	Active Clock Select Input
VBB	VBB Output

FUNCTION

CLK_SEL	Active Input
0	CLK0, $\overline{\text{CLK0}}$
1	CLK1, $\overline{\text{CLK1}}$

LOGIC SYMBOL



## ECL DC CHARACTERISTICS

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V <sub>OH</sub>	Output HIGH Voltage	-1.025	-0.955	-0.880	-1.025	-0.955	-0.880	-1.025	-0.955	-0.880	-1.025	-0.955	-0.880	V
V <sub>OL</sub>	Output LOW Voltage	-1.810	-1.705	-1.620	-1.810	-1.705	-1.620	-1.810	-1.705	-1.620	-1.810	-1.705	-1.620	V
V <sub>IH</sub>	Input HIGH Voltage	-1.165		-0.880	-1.165		-0.880	-1.165		-0.880	-1.165		-0.880	V
V <sub>IL</sub>	Input LOW Voltage	-1.810		-1.475	-1.810		-1.475	-1.810		-1.475	-1.810		-1.475	V
V <sub>BB</sub>	Output Reference Voltage	-1.38		-1.26	-1.38		-1.26	-1.38		-1.26	-1.38		-1.26	V
V <sub>EE</sub>	Power Supply Voltage	-2.375		-3.8	-2.375		-3.8	-2.375		-3.8	-2.375		-3.8	V
I <sub>IH</sub>	Input HIGH Current			150			150			150			150	μA
I <sub>EE</sub>	Power Supply Current													mA

## PECL DC CHARACTERISTICS

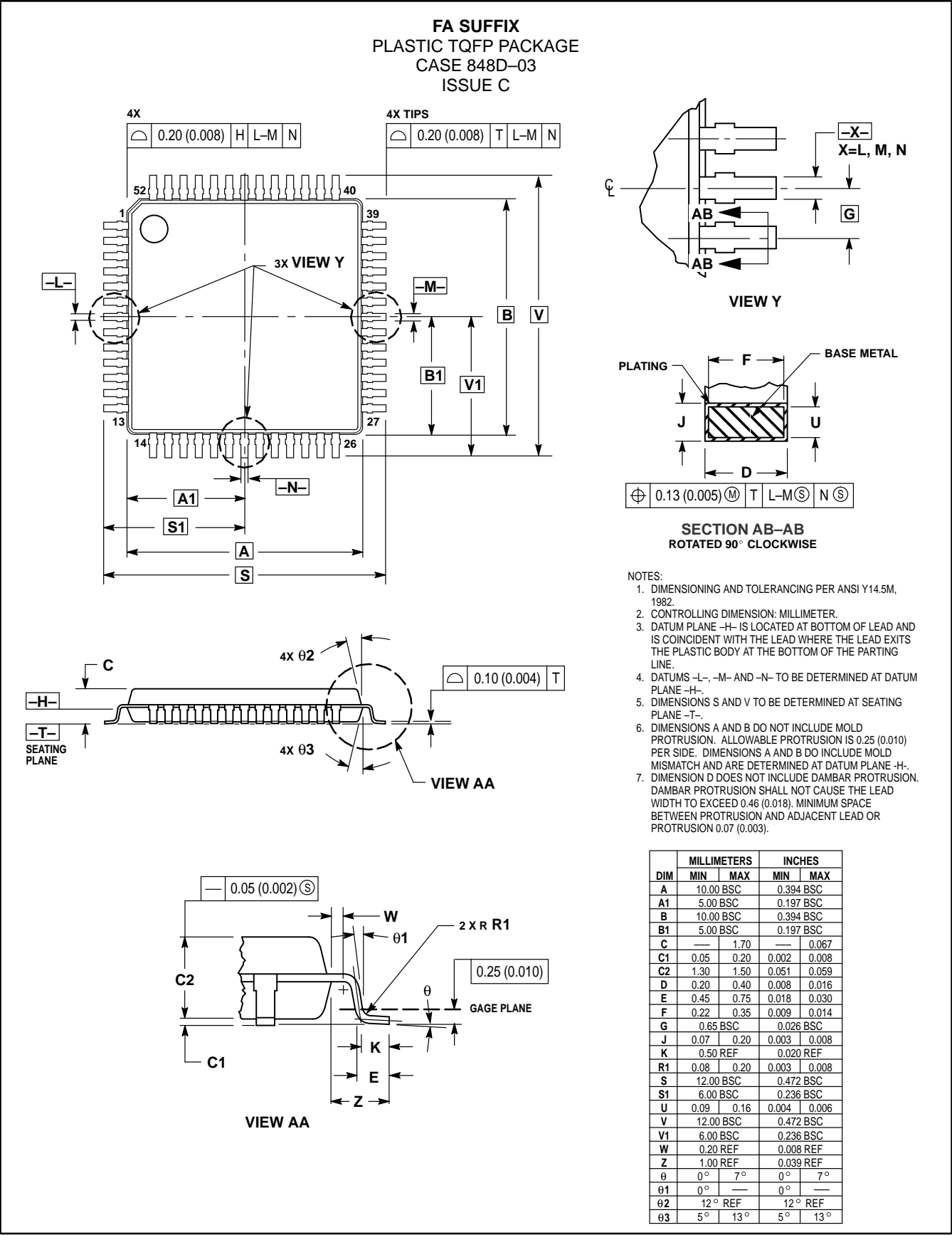
Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V <sub>OH</sub>	Output HIGH Voltage (NO TAG)	2.275	2.345	2.420	2.275	2.345	2.420	2.275	2.345	2.420	2.275	2.345	2.420	V
V <sub>OL</sub>	Output LOW Voltage (NO TAG)	1.490	1.595	1.680	1.490	1.595	1.680	1.490	1.595	1.680	1.490	1.595	1.680	V
V <sub>IH</sub>	Input HIGH Voltage (NO TAG)	2.135		2.420	2.135		2.420	2.135		2.420	2.135		2.420	V
V <sub>IL</sub>	Input LOW Voltage (NO TAG)	1.490		1.825	1.490		1.825	1.490		1.825	1.490		1.825	V
V <sub>BB</sub>	Output Reference Voltage (Note NO TAG)	1.92		2.04	1.92		2.04	1.92		2.04	1.92		2.04	V
V <sub>CC</sub>	Power Supply Voltage	2.375		3.8	2.375		3.8	2.375		3.8	2.375		3.8	V
I <sub>IH</sub>	Input HIGH Current			150			150			150			150	μA
I <sub>EE</sub>	Power Supply Current													mA


1. These values are for V<sub>CC</sub> = 3.3V. Level Specifications will vary 1:1 with V<sub>CC</sub>.

AC CHARACTERISTICS (V<sub>EE</sub> = V<sub>EE</sub> (min) to V<sub>EE</sub> (max); V<sub>CC</sub> = V<sub>CCO</sub> = GND)

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit	Condition
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay to Output IN (differential) IN (single-ended)								500 500					ps	
t <sub>skew</sub>	Within-Device Skew Part-to-Part Skew (Diff)		50 150			50 150			50 150			50 150		ps	
f <sub>max</sub>	Maximum Input Frequency		1.5			1.5			1.5			1.5		GHz	
V <sub>PP</sub>	Minimum Input Swing	500			500			500			500			mV	
V <sub>CMR</sub>	Common Mode Range													V	
t <sub>r</sub> /t <sub>f</sub>	Output Rise/Fall Time		200			200			200			200		ps	20%–80%

OUTLINE DIMENSIONS



Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**How to reach us:**

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution;  
P.O. Box 5405; Denver, Colorado 80217. 303-675-2140 or 1-800-441-2447

**Mfax™:** RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609  
**INTERNET:** <http://www.mot.com/spis/>

**JAPAN:** Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center,  
3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 81-3-3521-8315

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

