



**TRIPLE D
FLIP-FLOP**

SY100S331

FEATURES

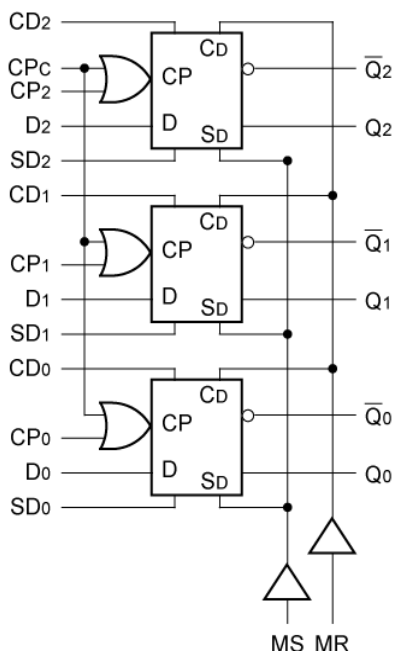
- Max. toggle frequency of 800MHz
- Differential outputs
- IEE min. of -80mA
- Industry standard 100K ECL levels
- Extended supply voltage option:
VEE = -4.2V to -5.5V
- Voltage and temperature compensation for improved noise immunity
- Internal 75kΩ input pull-down resistors
- 150% faster than Fairchild
- 40% lower power than Fairchild
- Function and pinout compatible with Fairchild F100K
- Available in 28-pin PLCC package

DESCRIPTION

The SY100S331 offers three D-type, edge-triggered master/slave flip-flops with true and complement outputs, designed for use in high-performance ECL systems. Each flip-flop is controlled by a common clock (CP_c), as well as its own clock pulse (CP_n). The resultant clock signal controlling the flip-flop is the logical OR operation of these two clock signals. Data enters the master when both CP_c and CP_n are LOW and enters the slave on the rising edge of either CP_c or CP_n (or both).

Additional control signals include Master Set (MS) and Master Reset (MR) inputs. Each flip-flop also has its own Direct Set (SD_n) and Direct Clear (CD_n) signals. The MR, MS, SD_n and DC_n signals override the clock signals. The inputs on this device have 75kΩ pull-down resistors.

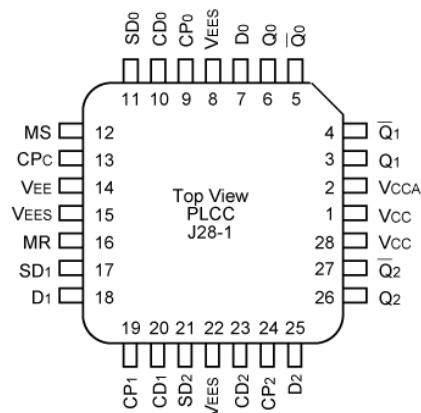
BLOCK DIAGRAM



PIN NAMES

Pin	Function
CP ₀ – CP ₂	Individual Clock Inputs
CP _c	Common Clock Input
D ₀ – D ₂	Data Inputs
CD ₀ – CD ₂	Individual Direct Clear Inputs
SD _n	Individual Direct Set Inputs
MR	Master Reset Input
MS	Master Set Input
Q ₀ – Q ₂	Data Outputs
\bar{Q}_0 – \bar{Q}_2	Complementary Data Outputs
VEES	VEE Substrate
VCCA	VCCO for ECL Outputs

PACKAGE/ORDERING INFORMATION



28-Pin PLCC (J28-1)

Ordering Information

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY100S331JC	J28-1	Commercial	SY100S331JC	Sn-Pb
SY100S331JCTR ⁽¹⁾	J28-1	Commercial	SY100S331JC	Sn-Pb
SY100S331JZ ⁽²⁾	J28-1	Commercial	SY100S331JZ with Pb-Free bar-line indicator	Matte-Sn
SY100S331JZTR ^(1,2)	J28-1	Commercial	SY100S331JZ with Pb-Free bar-line indicator	Matte-Sn
SY100S331JY ⁽²⁾	J28-1	Industrial	SY100S331JY with Pb-Free bar-line indicator	Matte-Sn
SY100S331JYTR ^(1,2)	J28-1	Industrial	SY100S331JY with Pb-Free bar-line indicator	Matte-Sn

Notes:

1. Tape and Reel.
2. Pb-Free package is recommended for new designs.

TRUTH TABLES

Asynchronous Operation ⁽¹⁾					
Inputs					Outputs
D _n	CP _n	CP _c	MS SD _n	MR DC _n	Q _n (t+1)
X	X	X	H	L	H
X	X	X	L	H	L
X	X	X	H	H	U

NOTE:

1. H = High Voltage Level, L = Low Voltage Level, X = Don't Care, U = Undefined, t = Time before CP Positive Transition, t+1 = Time after CP Positive Transition, u = Low-to-High Transition

Synchronous Operation ⁽¹⁾					
Inputs					Outputs
D _n	CP _n	CP _c	MS SD _n	MR DC _n	Q _n
L	u	L	L	L	L
H	u	L	L	L	H
L	L	u	L	L	L
H	L	u	L	L	H
X	L	L	L	L	Q _n (t)
X	H	X	L	L	Q _n (t)
X	X	H	L	L	Q _n (t)

NOTE:

1. H = High Voltage Level, L = Low Voltage Level, X = Don't Care, U = Undefined, t = Time before CP Positive Transition, t+1 = Time after CP Positive Transition, u = Low-to-High Transition

DC ELECTRICAL CHARACTERISTICS

$V_{EE} = -4.2V$ to $-5.5V$ unless otherwise specified, $V_{CC} = V_{CCA} = GND$

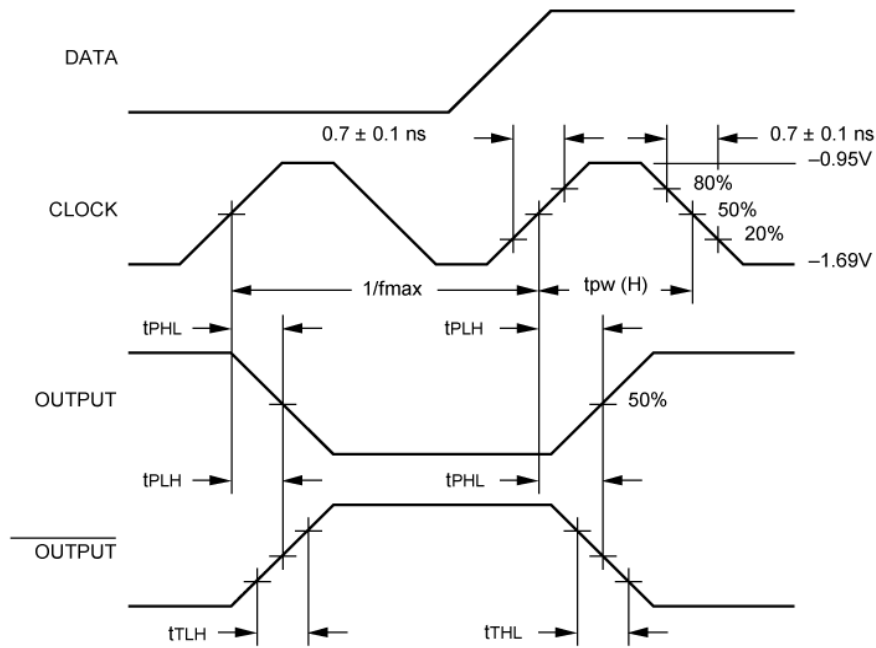
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
I_{IH}	Input HIGH Current, All Inputs	—	—	200	μA	$V_{IN} = V_{IH} (Max.)$
I_{EE}	Power Supply Current	-80	-65	-35	mA	Inputs Open

AC ELECTRICAL CHARACTERISTICS

$V_{EE} = -4.2V$ to $-5.5V$ unless otherwise specified, $V_{CC} = V_{CCA} = GND$

Symbol	Parameter	$T_A = -40^{\circ}C$		$T_A = 0^{\circ}C$		$T_A = +25^{\circ}C$		$T_A = +85^{\circ}C$		Unit	Condition
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
f_{max}	Toggle Frequency	800	—	800	—	800	—	800	—	MHz	
t_{PLH} t_{PHL}	Propagation Delay CP _c to Output	300	700	300	700	300	700	300	700	ps	
t_{PLH} t_{PHL}	Propagation Delay CP _n to Output	300	700	300	700	300	700	300	700	ps	
t_{PLH} t_{PHL}	Propagation Delay CD _n , SD _n to Output	300	800	300	800	300	800	300	800	ps	
t_{PLH} t_{PHL}	Propagation Delay MS, MR to Output	300	900	300	900	300	900	300	900	ps	
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	300	900	300	900	300	900	300	900	ps	
t_s	Set-up Time D _n CD _n , SD _n (Release Time) MS, MR (Release Time)	400 500 800	— — —	400 500 800	— — —	400 500 800	— — —	400 500 800	— — —	ps	
t_H	Hold Time D _n	300	—	300	—	300	—	300	—	ps	
$t_{pw} (H)$	Pulse Width HIGH CP _n , CP _c , DC _n SD _n , MR, MS	800	—	800	—	800	—	800	—	ps	

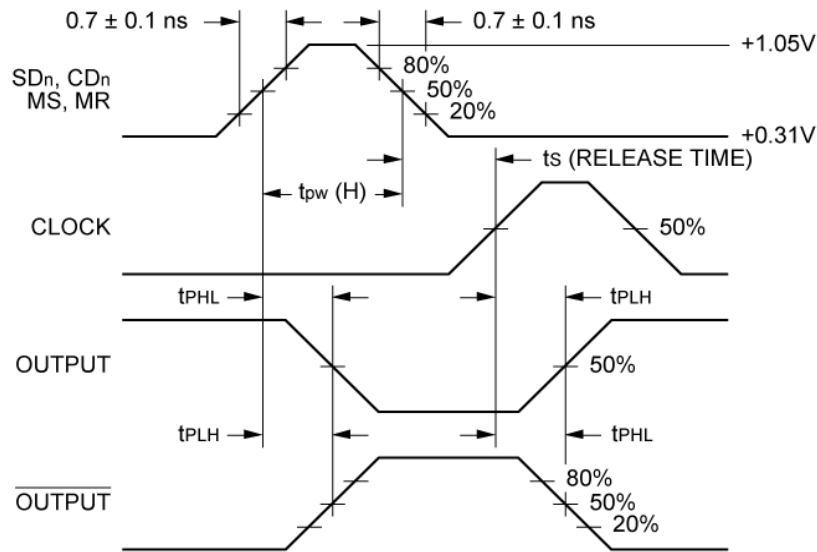
TIMING DIAGRAMS



Propagation Delay (Clock) and Transition Times

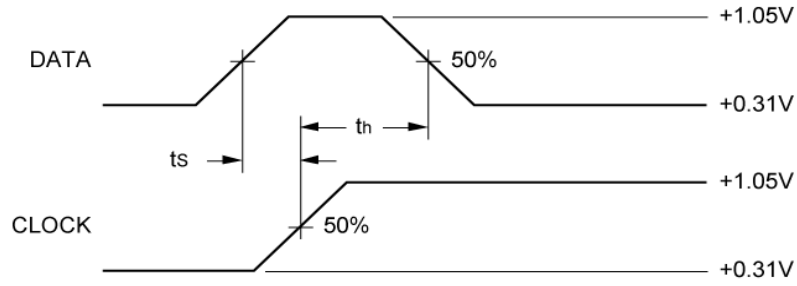
Note:

VEE = -4.2V to -5.5V unless otherwise specified, VCC = VCCA = GND



Propagation Delay (Sets and Resets)

TIMING DIAGRAMS



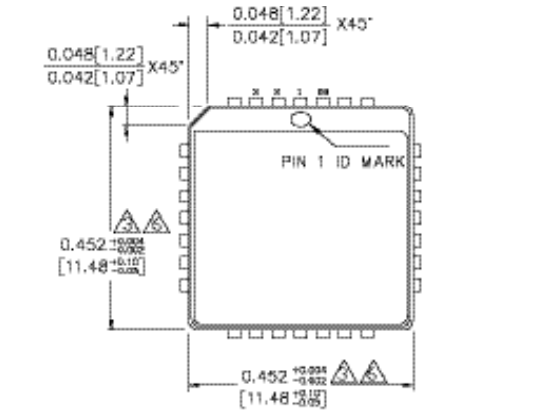
Data Setup and Hold Time

Notes:

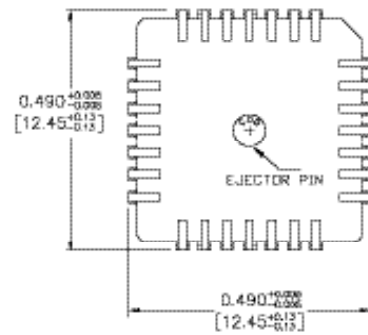
t_s is the minimum time before the transition of the clock that information must be present at the data input.

t_h is the minimum time after the transition of the clock that information must remain unchanged at the data input.

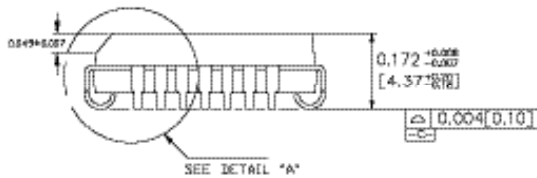
28-PIN PLCC (J28-1)



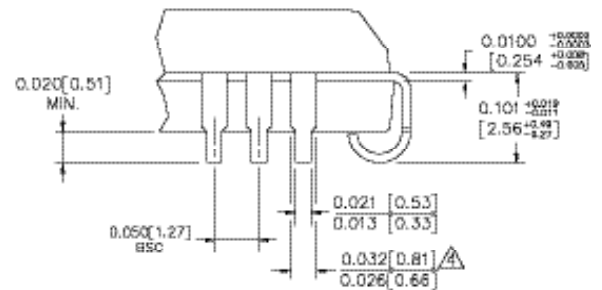
TOP VIEW



BOTTOM VIEW



SIDE VIEW



DETAIL "A"

NOTES:

1. DIMENSIONS ARE IN INCHES [MM].
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.008 [0.203].
4. LEAD DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION.
5. MAXIMUM AND MINIMUM SPECIFICATIONS ARE INDICATED AS FOLLOWS: MAX/MIN
6. PACKAGE TOP DIMENSION MAY BE SLIGHTLY SMALLER THAN BOTTOM DIMENSION.

Rev. A

MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA

TEL + 1 (408) 944-0800 FAX + 1 (408) 474-1000 WEB <http://www.micrel.com>

The information furnished by Micrel in this data sheet is believed to be accurate and reliable. However, no responsibility is assumed by Micrel for its use. Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.

Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is at Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 2006 Micrel, Incorporated.