4-Bit D Flip-Flop

MC10E131
MC100E131

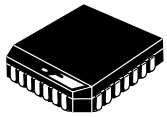
4-BIT
D FLIP-FLOP

The MC10E/100E131 is a quad master-slave D-type flip-flop with differential outputs. Each flip-flop may be clocked separately by holding Common Clock (C_C) LOW and using the Clock Enable ($\overline{CE}$) inputs for clocking. Common clocking is achieved by holding the $\overline{CE}$ inputs LOW and using C_C to clock all four flip-flops. In this case, the CE inputs perform the function of controlling the common clock, to each flip-flop.

Individual asynchronous resets are provided (R). Asynchronous set controls (S) are ganged together in pairs, with the pairing chosen to reflect physical chip symmetry.

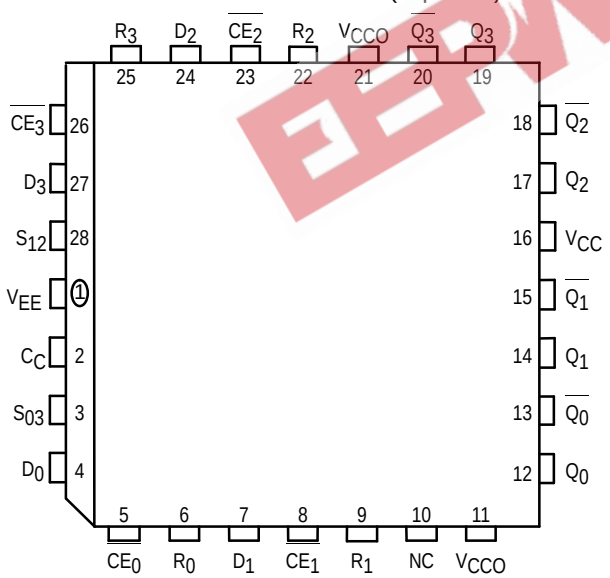
Data enters the master when both C_C and $\overline{CE}$ are LOW, and transfers to the slave when either C_C or CE (or both) go HIGH.

- 1100MHz Min. Toggle Frequency
- Differential Outputs
- Individual and Common Clocks
- Individual Resets (asynchronous)
- Paired Sets (asynchronous)
- Extended 100E V_{EE} Range of – 4.2V to – 5.46V
- 75kΩ Input Pulldown Resistors



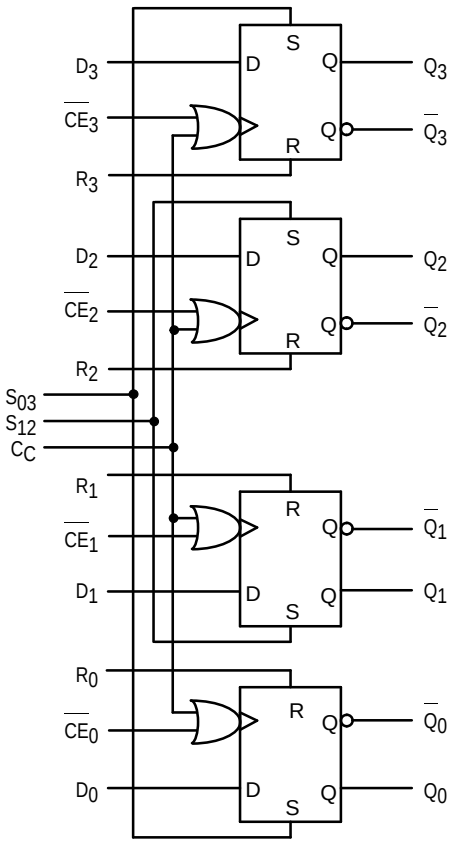
FN SUFFIX
PLASTIC PACKAGE
CASE 776-02

Pinout: 28-Lead PLCC (Top View)



* All V_{CC} and V_{CCO} pins are tied together on the die.

LOGIC DIAGRAM



PIN NAMES

Pin	Function
$D_0 - D_3$	Data Inputs
$CE_0 - CE_3$	Clock Enables (Individual)
$R_0 - R_3$	Resets
C_C	Common Clock
S_{03}, S_{12}	Sets (paired)
$Q_0 - Q_3$	True Outputs
$\overline{Q}_0 - \overline{Q}_3$	Inverting Outputs

DC CHARACTERISTICS (V_{EE} = V_{EE}(min) to V_{EE}(max); V_{CC} = V_{CCO} = GND)

Symbol	Characteristic		–40°C			0°C			25°C			85°C			Unit	Cond
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
I_{IH}	Input HIGH Current	C_C			350			350			350			350	µA	
		$\overline{S}$			450			450			450			450		
		R, CE			300			300			300			300		
		D			150			150			150			150		
I_{IEE}	Power Supply Current	10E		58	70		58	70		58	70		58	70	mA	
		100E		58	70		58	70		58	70		67	81		

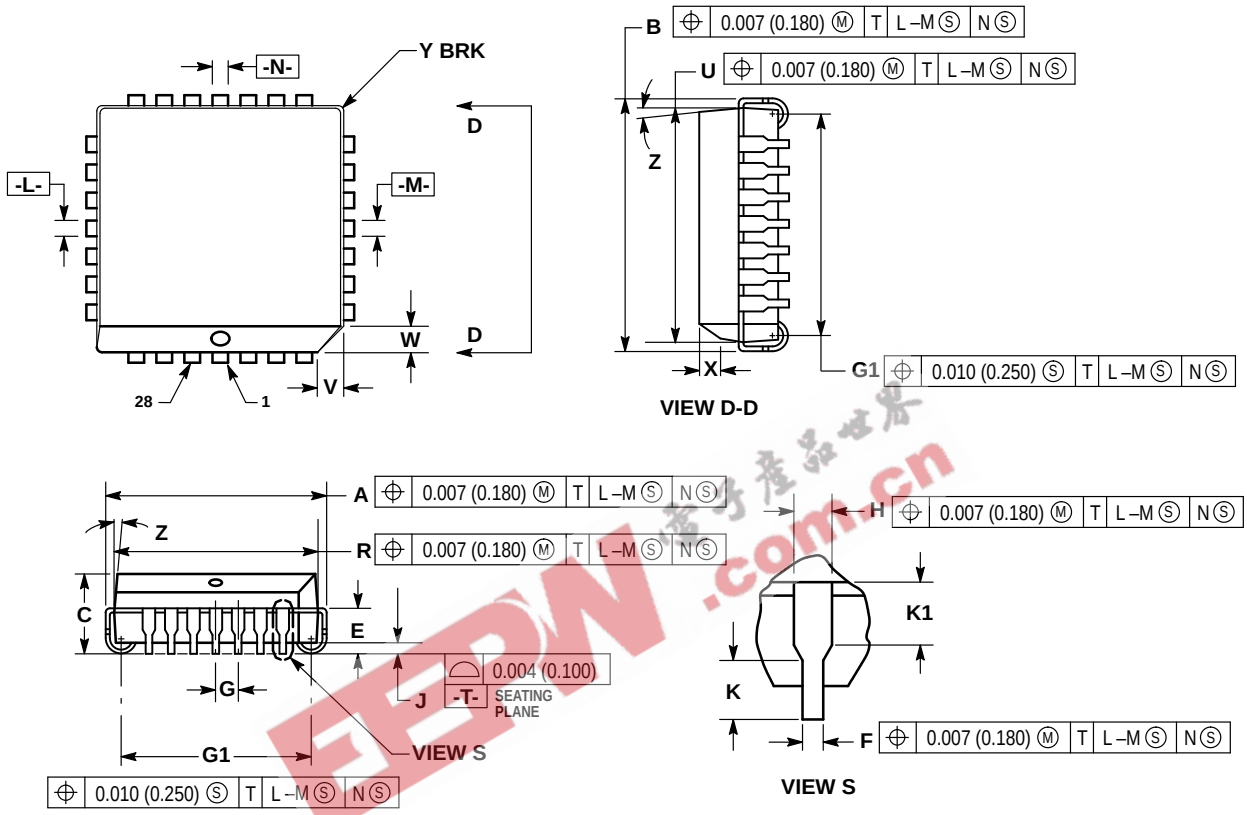
AC CHARACTERISTICS (V_{EE} = V_{EE}(min) to V_{EE}(max); V_{CC} = V_{CCO} = GND)

Symbol	Characteristic		–40°C			0°C to 85°C			Unit	Condition
			Min	Typ	Max	Min	Typ	Max		
f_{MAX}	Maximum Toggle Frequency		1000	1400		1100	1400		MHz	
t_{PLH} t_{PHL}	Propagation Delay to Output	CE	310	600	750	360	500	700	ps	
		C_C	275	600	725	325	500	675		
		R	300	625	775	350	550	725		
		S	300	550	775	350	550	725		
t_S	Setup Time	D	200	20		150	20		ps	1
t_H	Hold Time	D	225	–20		175	–20		ps	1
t_{RR}	Reset Recovery Time		450	150		400	150		ps	
t_{PW}	Minimum Pulse Width	CLK	400			400			ps	
		R, S	400			400				
t_{SKEW}	Within-Device Skew			60			60		ps	2
t_r/t_f	Rise/Fall Time		275	460	725	300	480	675	ps	20–80%

1. Setup/hold times guaranteed for both C_C and CE.
2. Within-device skew is defined as identical transitions on similar paths through a device.

OUTLINE DIMENSIONS

FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 776–02
ISSUE D



NOTES:
1. DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIM G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
3. DIM R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
5. CONTROLLING DIMENSION: INCH.
6. THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
7. DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.485	0.495	12.32	12.57
B	0.485	0.495	12.32	12.57
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.019	0.33	0.48
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	—	0.51	—
K	0.025	—	0.64	—
R	0.450	0.456	11.43	11.58
U	0.450	0.456	11.43	11.58
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	—	0.020	—	0.50
Z	2°	10°	2°	10°
G1	0.410	0.430	10.42	10.92
K1	0.040	—	1.02	—

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