3-Bit Differential Flip-Flop

MC10E431
MC100E431

3-BIT DIFFERENTIAL FLIP-FLOP

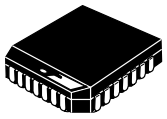
The MC10E/100E431 is a 3-bit flip-flop with differential clock, data input and data output.

The asynchronous Set and Reset controls are edge-triggered rather than level controlled. This allows the user to rapidly set or reset the flip-flop and then continue clocking at the next clock edge, without the necessity of de-asserting the set/reset signal (as would be the case with a level controlled set/reset).

The E431 is also designed with larger internal swings, an approach intended to minimize the time spent crossing the threshold region and thus reduce the metastability susceptibility window.

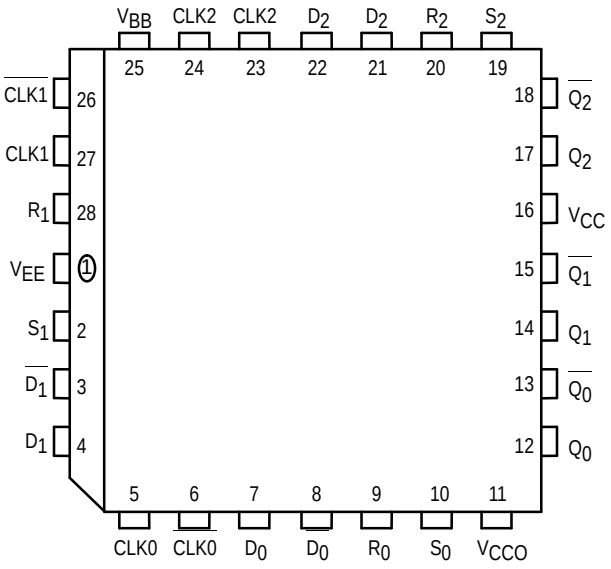
The differential input structures are clamped so that the inputs of unused registers can be left open without upsetting the bias network of the device. The clamping action will assert the D and the CLK sides of the inputs. Because of the edge triggered flip-flop nature of the device simultaneously opening both the clock and data inputs will result in an output which reaches an unidentified but valid state. Note that the input clamps only operate when both inputs fall to 2.5V below V_{CC}.

- Edge-Triggered Asynchronous Set and Reset
- Differential D, CLK and Q; V_{BB} Reference Available
- 1100MHz Min. Toggle Frequency
- Extended 100E V_{EE} Range of – 4.2V to – 5.46V



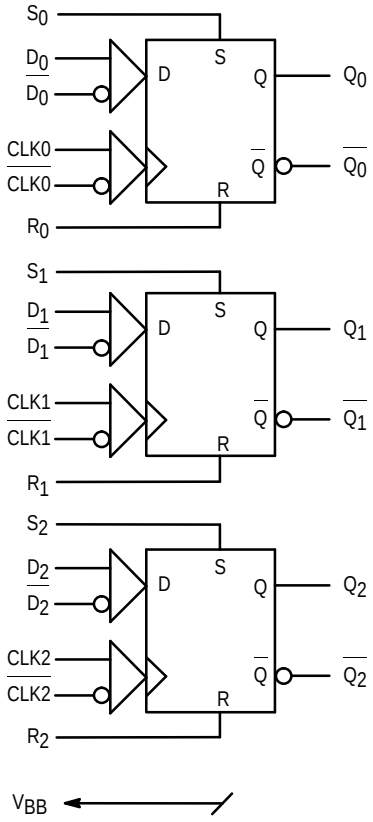
FN SUFFIX
PLASTIC PACKAGE
CASE 776-02

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[0:2], $\overline{D[0:2]}$	Differential Data Inputs
CLK[0:2], $\overline{CLK[0:2]}$	Differential Clock
S[0:2]	Edge Triggered Set Inputs
R[0:2]	Edge Triggered Reset Input
V_{BB}	V_{BB} Reference Output
Q[0:2], $\overline{Q[0:2]}$	Differential Data Outputs

MOTOROLA

FUNCTION TABLE

Dn	CLKn	Rn	Sn	Qn
L	Z	L	L	L
H	Z	L	L	H
X	X	Z	L	L
X	X	L	Z	H

Z = Low to high transition
X = Don't Care

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

		–40°C			0°C			25°C			85°C				
Symbol	Characteristic	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit	Cond
V_{BB}	Output Reference Voltage 10E	–1.43		–1.30	–1.38		–1.27	–1.35		–1.25	–1.31		–1.19	V	
	100E	–1.38		–1.26	–1.38		–1.26	–1.38		–1.26	–1.38		–1.26		
I_{IH}	Input HIGH Current			150			150			150	150			µA	
I_{EE}	Power Supply Current 10E		110	132	110	132		110	132		110	132		mA	
	100E		110	132	110	132		110	132		127	152			
V_{CMR}	Common Mode Range	–1.5		0	–1.5		0	–1.5		0	–1.5		0	V	1

1. V_{CMR} is referenced to the most positive side of the differential input signal. Normal specified operation is obtained when the input signals are within the V_{CMR} range and the input swing is greater than V_{PP}.

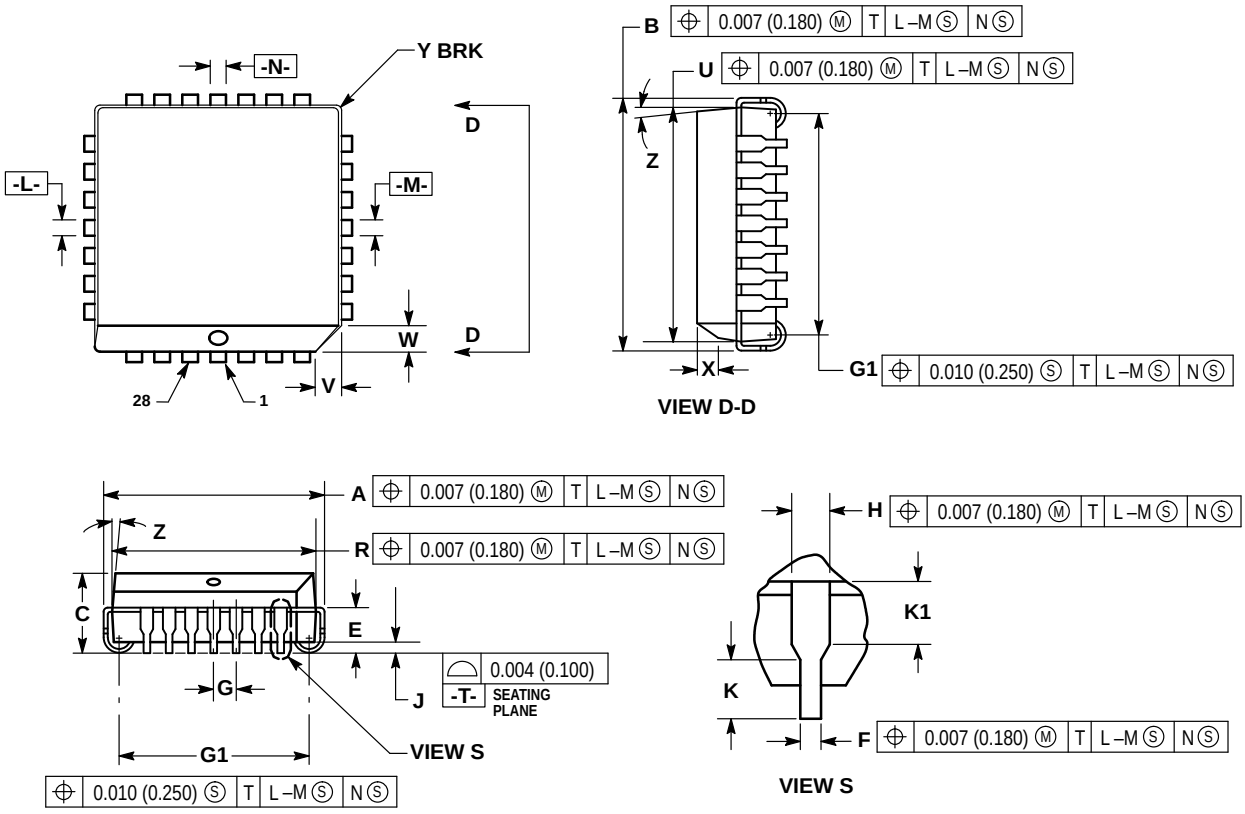
AC CHARACTERISTICS (V_{EE} = V_{EE}(min) to V_{EE}(max); V_{CC} = V_{CCO} = GND)

			–40°C			0°C to 85°C				
Symbol	Characteristic		Min	Typ	Max	Min	Typ	Max	Unit	Condition
f_{MAX}	Maximum Toggle Frequency		1000	1400		1100	1400		MHz	
t_{PLH} t_{PHL}	Propagation Delay to Output	CLK (Diff)	410	600	790	450	600	750	ps	
		CLK (SE)	460	600	840	400	600	800		
		R	500	725	975	550	725	925		
		S	500	725	975	550	725	925		
t_S	Setup Time	D	250	0		200	0		ps	
		R	1100	700		1000	700			1
		S	1100	700		1000	700			1
t_H	Hold Time	D	250	0		200	0		ps	
t_{PW}	Minimum Pulse Width	CLK	400			400			ps	
t_{skew}	Within-Device Skew			50			50		ps	2
V_{PP}	Minimum Input Swing		150			150			mV	3
t_r/t_f	Rise/Fall Times		250	450	700	275	450	650	ps	20–80%

1. These setup times define the minimum time the CLK or SET/RESET input must wait after the assertion of the RESET/SET input to assure the proper operation of the flip-flop.
2. Within-device skew is defined as identical transitions on similar paths through a device.
3. Minimum input swing for which AC parameters are guaranteed.

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	—

How to reach us:
USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1–800–441–2447 or 602–303–5454

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE 602–244–6609
INTERNET: http://Design–NET.com

JAPAN: Nippon Motorola Ltd.; Tatsumi–SPD–JLDC, 6F Seibu–Butsuryu–Center,
3–14–2 Tatsumi Koto–Ku, Tokyo 135, Japan. 03–81–3521–8315

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