

## 3-Bit Differential Flip-Flop

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

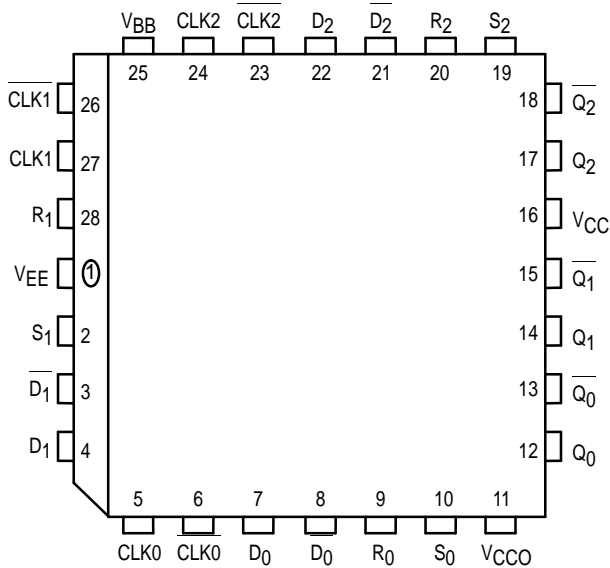
The asynchronous Set and Reset controls are edge-triggered rather than level controlled. This allows the user to rapidly set or reset the flip-flop and then continue clocking at the next clock edge, without the necessity of de-asserting the set/reset signal (as would be the case with a level controlled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

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

**Pinout: 28-Lead PLCC (Top View)**



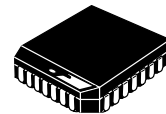
\* All V<sub>CC</sub> and V<sub>CCO</sub> pins are tied together on the die.

### 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 <sub>BB</sub>	V <sub>BB</sub> Reference Output
Q[0:2], $\overline{Q}$ [0:2]	Differential Data Outputs

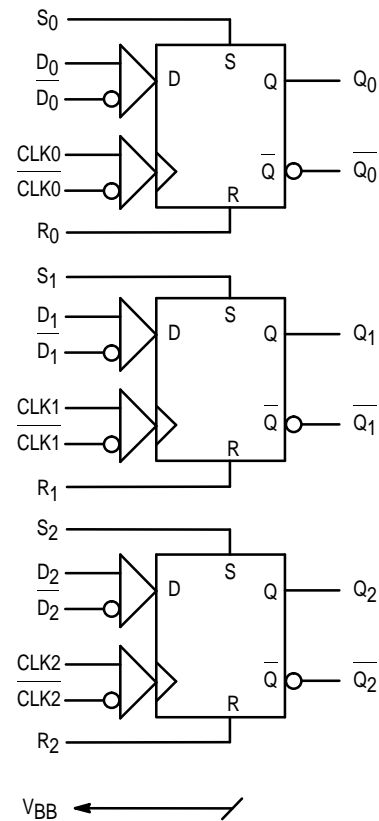
**MC10E431**  
**MC100E431**

**3-BIT DIFFERENTIAL**  
**FLIP-FLOP**



**FN SUFFIX**  
PLASTIC PACKAGE  
CASE 776-02

### LOGIC DIAGRAM



# MC10E431 MC100E431

## 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 $V_{EE}(\max)$ ; $V_{CC} = V_{CCO} = GND$ )

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit	Cond
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
$V_{BB}$	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			$\mu A$		
$I_{EE}$	Power Supply Current	10E	110	132	110	132	110	132	110	132	110	132	mA		
		100E	110	132	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	-1.5	0	V	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  $V_{PP}$ .

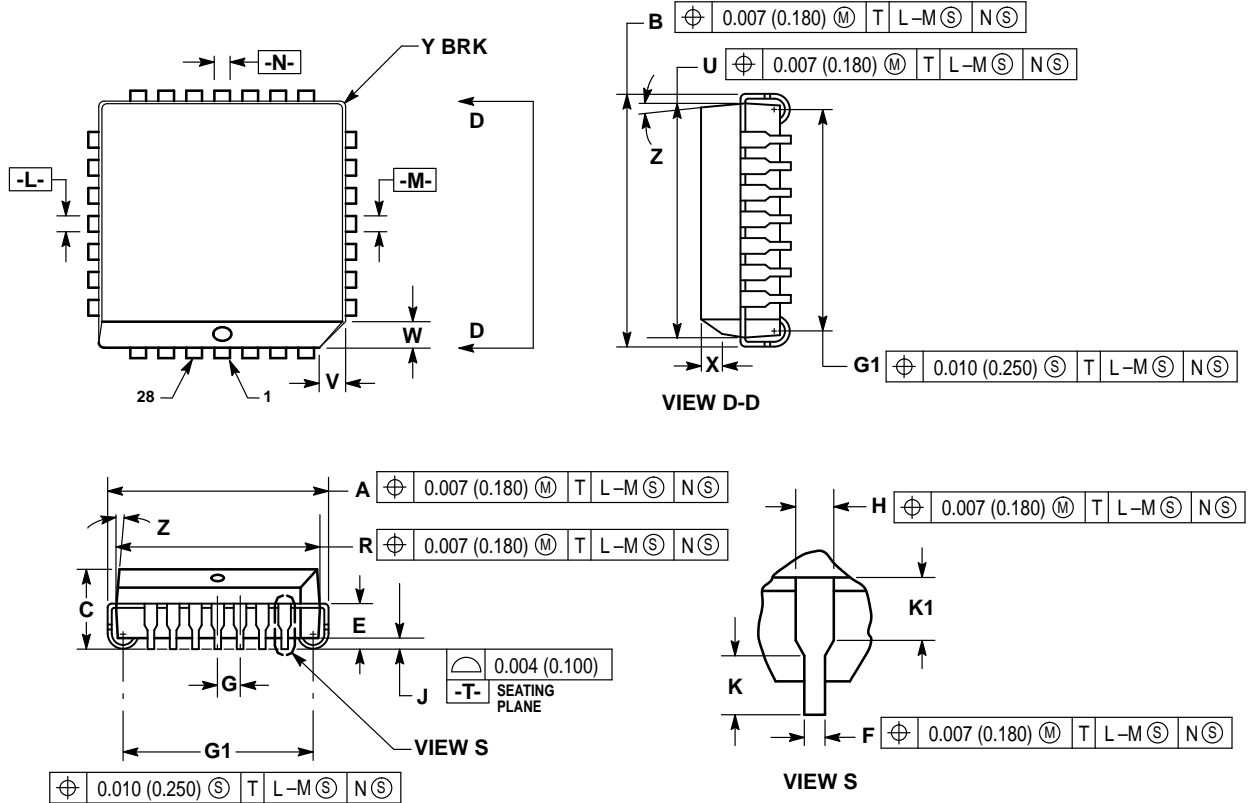
## AC CHARACTERISTICS ( $V_{EE} = V_{EE}(\min)$ to $V_{EE}(\max)$ ; $V_{CC} = V_{CCO} = GND$ )

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	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	1	
		R	1100	700		1000	700			
		S	1100	700		1000	700			
$t_H$	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%

- 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.
- Within-device skew is defined as identical transitions on similar paths through a device.
- Minimum input swing for which AC parameters are guaranteed.

OUTLINE DIMENSIONS


FN SUFFIX  
 PLASTIC PLCC PACKAGE  
 CASE 776-02  
 ISSUE D



NOTES:

- DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
- DIM G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
- DIM R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- 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.
- 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).

DIM	INCHES		MILLIMETERS	
	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°	
G1	0.410	0.430	10.42	10.92
K1	0.040	—	1.02	—

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