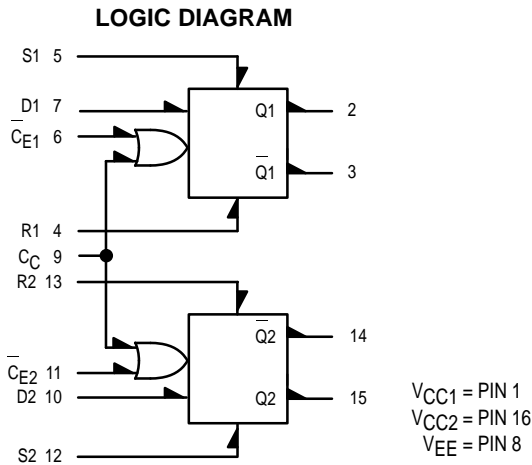


# Dual Type D Master-Slave Flip-Flop

The MC10131 is a dual master-slave type D flip-flop. Asynchronous Set (S) and Reset (R) override Clock (C<sub>C</sub>) and Clock Enable (C<sub>E</sub>) inputs. Each flip-flop may be clocked separately by holding the common clock in the low state and using the enable inputs for the clocking function. If the common clock is to be used to clock the flip-flop, the Clock Enable inputs must be in the low state. In this case, the enable inputs perform the function of controlling the common clock.

The output states of the flip-flop change on the positive transition of the clock. A change in the information present at the data (D) input will not affect the output information at any other time due to master slave construction.

$P_D = 235 \text{ mW typ/pkg (No Load)}$   
 $F_{Tog} = 160 \text{ MHz typ}$   
 $t_{pd} = 3.0 \text{ ns typ}$   
 $t_r, t_f = 2.5 \text{ ns typ (20\%–80\%)}$



**CLOCKED TRUTH TABLE**

C	D	Q <sub>n+1</sub>
L	X	Q <sub>n</sub>
H	L	L
H	H	H

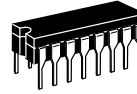
C = C<sub>E</sub> + C<sub>C</sub>. A clock H is a clock transition from a low to a high state.

**R-S TRUTH TABLE**

R	S	Q <sub>n+1</sub>
L	L	Q <sub>n</sub>
L	H	H
H	L	L
H	H	N.D.

N.D. = Not Defined

## MC10131



**L SUFFIX**  
CERAMIC PACKAGE  
CASE 620-10

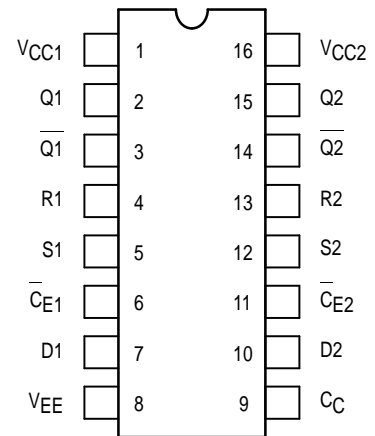


**P SUFFIX**  
PLASTIC PACKAGE  
CASE 648-08



**FN SUFFIX**  
PLCC  
CASE 775-02

**DIP  
PIN ASSIGNMENT**



Pin assignment is for Dual-in-Line Package.  
For PLCC pin assignment, see the Pin Conversion Tables on page 6-11 of the Motorola MECL Data Book (DL122/D).

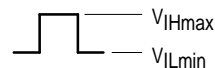


## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Pin Under Test	Test Limits							Unit	
			-30°C		+25°C			+85°C			
			Min	Max	Min	Typ	Max	Min	Max		
Power Supply Drain Current	$I_E$	8		62		45	56		62	mAdc	
Input Current	$I_{inH}$	4		525			330		330	$\mu$ Adc	
		5		525			330		330		
6			350			220		220			
7			390			245		245			
9			425			265		265			
	$I_{inL}$	4, 5* 6, 7, 9*	0.5 0.5		0.5 0.5			0.3 0.3		$\mu$ Adc	
Output Voltage	Logic 1	$V_{OH}$	2 2†	-1.060 -1.060	-0.890 -0.890	-0.960 -0.960		-0.810 -0.810	-0.890 -0.890	-0.700 -0.700	Vdc
Output Voltage	Logic 0	$V_{OL}$	2 3†	-1.890 -1.890	-1.675 -1.675	-1.850 -1.850		-1.650 -1.650	-1.825 -1.825	-1.615 -1.615	Vdc
Threshold Voltage	Logic 1	$V_{OHA}$	2 2†	-1.080 -1.080		-0.980 -0.980			-0.910 -0.910		Vdc
Threshold Voltage	Logic 0	$V_{OLA}$	2 3†		-1.655 -1.655			-1.630 -1.630		-1.595 -1.595	Vdc
Switching Times (50 $\Omega$ Load) Clock Input										ns	
Propagation Delay	$t_{9+2-}$ $t_{9+2+}$ $t_{6+2+}$ $t_{6+2-}$	2	1.7	4.6	1.8	3.0	4.5	1.8	5.0		
		2	1.7	4.6	1.8	3.0	4.5	1.8	5.0		
		2	1.7	4.6	1.8	3.0	4.5	1.8	5.0		
		2	1.7	4.6	1.8	3.0	4.5	1.8	5.0		
Rise Time (20 to 80%)	$t_{2+}$	2	1.0	4.6	1.1	2.5	4.5	1.1	4.9		
Fall Time (20 to 80%)	$t_{2-}$	2	1.0	4.6	1.1	2.5	4.5	1.1	4.9		
Set Input										ns	
Propagation Delay	$t_{5+2+}$ $t_{12+15+}$ $t_{5+3-}$ $t_{12+14-}$	2	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
		15	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
		3	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
		14	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
Reset Input										ns	
Propagation Delay	$t_{4+2-}$ $t_{13+15-}$ $t_{4+3-}$ $t_{13+14+}$	2	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
		15	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
		3	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
		14	1.7	4.4	1.8	2.8	4.3	1.8	4.8		
Setup Time	$t_{setup}$	7	2.5		2.5			2.5		ns	
Hold Time	$t_{hold}$	7	1.5		1.5			1.5		ns	
Toggle Frequency (Max)	$f_{tog}$	2	125		125	160		125		MHz	

\* Individually test each input applying  $V_{IH}$  or  $V_{IL}$  to input under test.


† Output level to be measured after a clock pulse has been applied to the  $C_E$  Input (Pin 6)



**ELECTRICAL CHARACTERISTICS** (continued)

			TEST VOLTAGE VALUES (Volts)					(V <sub>CC</sub> ) Gnd
			V <sub>IHmax</sub>	V <sub>ILmin</sub>	V <sub>IHAmin</sub>	V <sub>ILAmax</sub>	V <sub>EE</sub>	
@ Test Temperature								
-30°C			-0.890	-1.890	-1.205	-1.500	-5.2	
+25°C			-0.810	-1.850	-1.105	-1.475	-5.2	
+85°C			-0.700	-1.825	-1.035	-1.440	-5.2	
Characteristic	Symbol	Pin Under Test	TEST VOLTAGE APPLIED TO PINS LISTED BELOW					
			V <sub>IHmax</sub>	V <sub>ILmin</sub>	V <sub>IHAmin</sub>	V <sub>ILAmax</sub>	V <sub>EE</sub>	
Power Supply Drain Current	I <sub>E</sub>	8					8	1, 16
Input Current	I <sub>inH</sub>	4	4				8	1, 16
		5	5				8	1, 16
		6	6				8	1, 16
		7	7				8	1, 16
		9	9				8	1, 16
	I <sub>inL</sub>	4, 5* 6, 7, 9*		*			8	1, 16
Output Voltage	Logic 1	V <sub>OH</sub>	2	5			8	1, 16
			2†	7			8	1, 16
Output Voltage	Logic 0	V <sub>OL</sub>	2	5			8	1, 16
			3†	7			8	1, 16
Threshold Voltage	Logic 1	V <sub>OHA</sub>	2		5		8	1, 16
			2†		7	9	8	1, 16
Threshold Voltage	Logic 0	V <sub>OLA</sub>	2		5		8	1, 16
			3†		7	9	8	1, 16
Switching Times (50Ω Load)			+1.11Vdc		Pulse In	Pulse Out	-3.2 V	+2.0 V
Clock Input Propagation Delay	t <sub>g+2-</sub> t <sub>g+2+</sub> t <sub>6+2+</sub> t <sub>6+2-</sub>	2			9	2	8	1, 16
		2	7		9	2	8	1, 16
		2	7		6	2	8	1, 16
		2			6	2	8	1, 16
		2			6	2	8	1, 16
Rise Time (20 to 80%)	t <sub>2+</sub>	2	7		9	2	8	1, 16
Fall Time (20 to 80%)	t <sub>2-</sub>	2			9	2	8	1, 16
Set Input Propagation Delay	t <sub>5+2+</sub> t <sub>12+15+</sub> t <sub>5+3-</sub> t <sub>12+14-</sub>	2			5	2	8	1, 16
		15	6		12	15	8	1, 16
		3			5	3	8	1, 16
		14	9		12	14	8	1, 16
Reset Input Propagation Delay	t <sub>4+2-</sub> t <sub>13+15-</sub> t <sub>4+3-</sub> t <sub>13+14+</sub>	2			4	2	8	1, 16
		15	6		13	15	8	1, 16
		3			4	3	8	1, 16
		14	9		13	14	8	1, 16
Setup Time	t <sub>setup</sub>	7			6, 7	2	8	1, 16
Hold Time	t <sub>hold</sub>	7			6, 7	2	8	1, 16
Toggle Frequency (Max)	f <sub>tog</sub>	2			6	2	8	1, 16

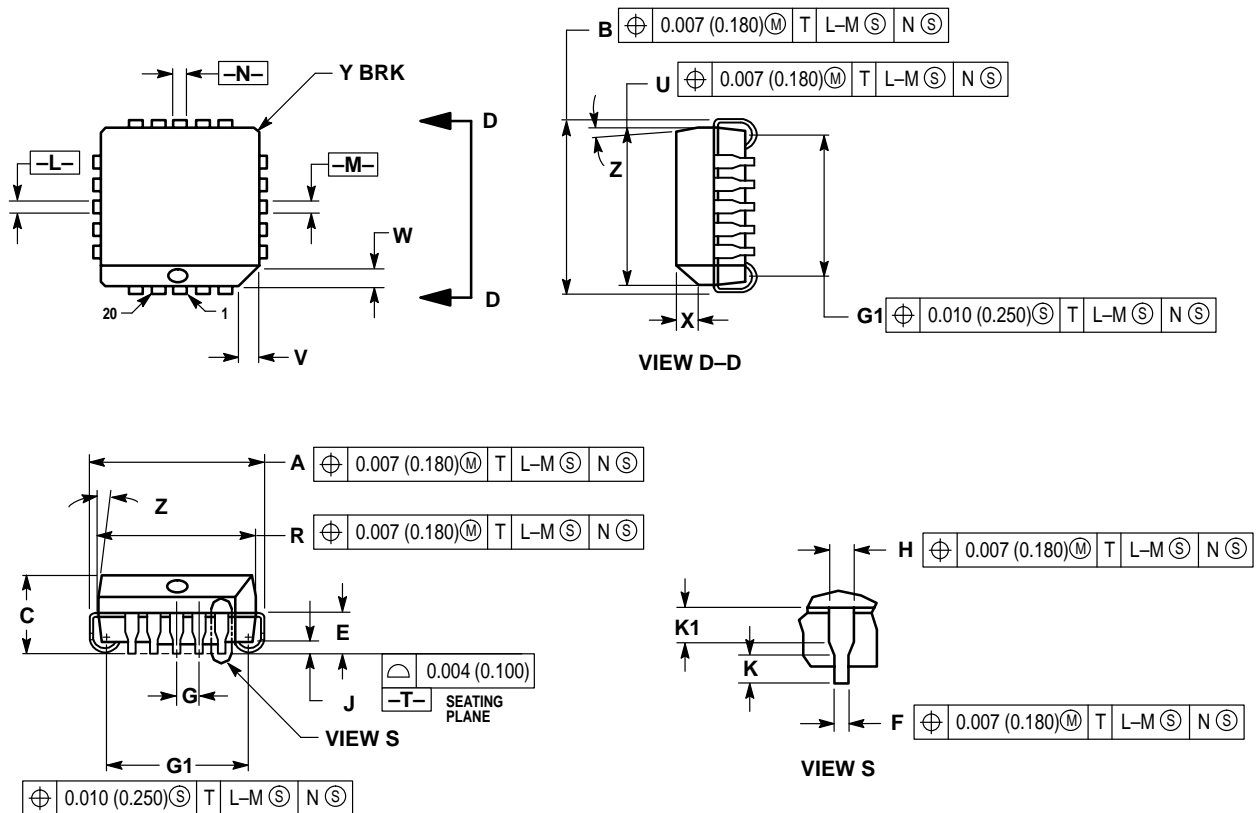
\* Individually test each input applying V<sub>IH</sub> or V<sub>IL</sub> to input under test.

† Output level to be measured after a clock pulse has been applied to the C<sub>E</sub> Input (Pin 6) 

Each MECL 10,000 series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear fpm is maintained. Outputs are terminated through a 50-ohm resistor to -2.0 volts. Test procedures are shown for only one gate. The other gates are tested in the same manner.

OUTLINE DIMENSIONS

FN SUFFIX  
 PLASTIC PLCC PACKAGE  
 CASE 775-02  
 ISSUE C



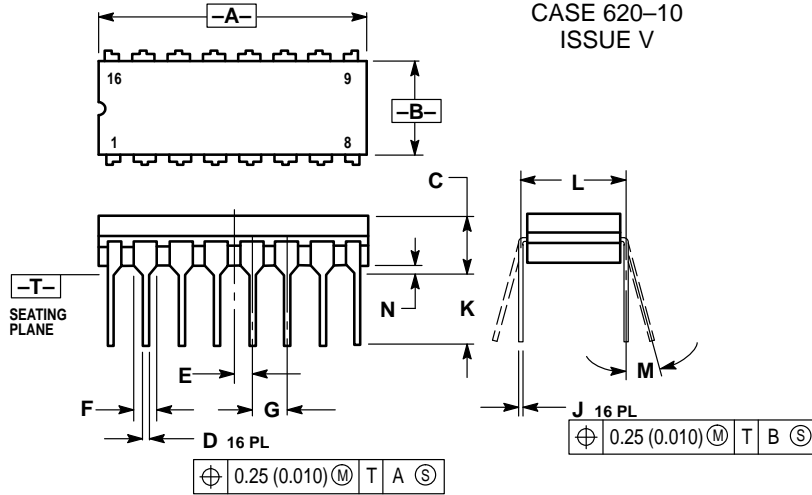
NOTES:

- DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
- DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
- DIMENSIONS 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	0.385	0.395	9.78	10.03
B	0.385	0.395	9.78	10.03
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	0.350	0.356	8.89	9.04
U	0.350	0.356	8.89	9.04
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	0.310	0.330	7.88	8.38
K1	0.040	—	1.02	—

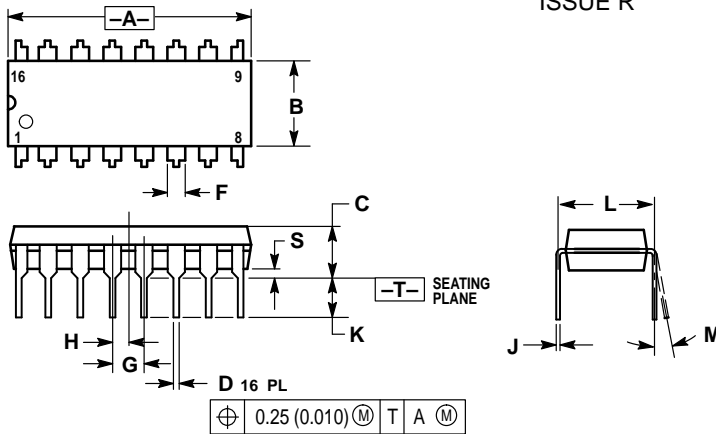
OUTLINE DIMENSIONS

**L SUFFIX**  
**CERAMIC DIP PACKAGE**  
 CASE 620-10  
 ISSUE V



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
  4. DIMENSION F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.

**P SUFFIX**  
**PLASTIC DIP PACKAGE**  
 CASE 648-08  
 ISSUE R



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
  4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
  5. ROUNDED CORNERS OPTIONAL.

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