

MC10231

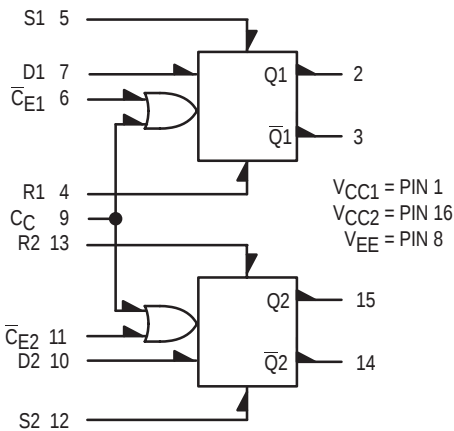
High Speed Dual Type D Master-Slave Flip-Flop

The MC10231 is a dual master-slave type D flip-flop. Asynchronous Set (S) and Reset (R) override Clock (C_C) and Clock Enable ($\overline{C_E}$) 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.

- $P_D = 270 \text{ mW typ/pkg (No Load)}$
- $t_{pd} = 2 \text{ ns typ}$
- $t_{Tog} = 225 \text{ MHz typ}$
- $t_r, t_f = 2.0 \text{ ns typ (20\%–80\%)}$

LOGIC DIAGRAM



CLOCKED TRUTH TABLE

C	D	Q_{n+1}
L	X	Q_n
H	L	L
H	H	H

C = $\overline{C_E} + C_C$. A clock H is a clock transition from a low to a high state.

R-S TRUTH TABLE

R	S	Q_{n+1}
L	L	Q_n
L	H	H
H	L	L
H	H	N.D.

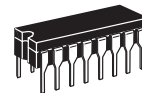
N.D. = Not Defined



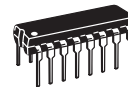
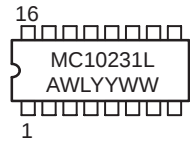
ON Semiconductor

<http://onsemi.com>

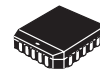
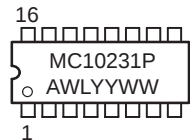
MARKING DIAGRAMS



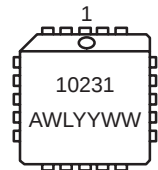
CDIP-16
L SUFFIX
CASE 620



PDIP-16
P SUFFIX
CASE 648

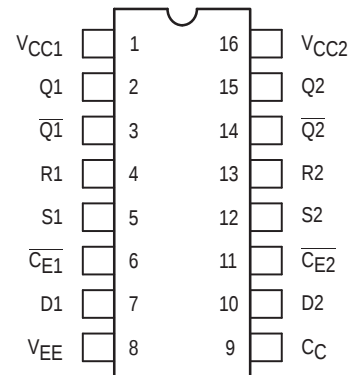


PLCC-20
FN SUFFIX
CASE 775



A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week

DIP PIN ASSIGNMENT



Pin assignment is for Dual-in-Line Package.
For PLCC pin assignment, see the Pin Conversion Tables on page 18 of the ON Semiconductor MECL Data Book (DL122/D).

ORDERING INFORMATION

Device	Package	Shipping
MC10231L	CDIP-16	25 Units / Rail
MC10231P	PDIP-16	25 Units / Rail
MC10231FN	PLCC-20	46 Units / Rail

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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		72		52	65		72	mAdc
Input Current	I _{inH}	4		650			410		410	μAdc
		5		650			410		410	
		6		350			220		220	
		7		350			220		220	
		9		460			290		290	
	I _{inL}	4, 5* 6, 7, 9*			0.5 0.5					μAdc
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}	3 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}	3 3†		−1.655 −1.655			−1.630 −1.630		−1.595 −1.595	Vdc
Switching Times (50Ω Load) Clock Input										ns
Propagation Delay	t _{9+2−}	2	1.5	3.4	1.5	2.0	3.3	1.6	3.7	
	t ₆₊₂₊	2	1.5	3.4	1.5	2.0	3.3	1.6	3.7	
Rise Time (20 to 80%)	t ₂₊	2	0.9	3.3	1.0	1.3	3.1	1.0	3.6	
Fall Time (20 to 80%)	t _{2−}	2	0.9	3.3	1.0	1.3	3.1	1.0	3.6	
Set Input										ns
Propagation Delay	t ₅₊₂₊	2	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
	t ₁₂₊₁₅₊	15	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
	t _{5+3−}	3	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
	t _{12+14−}	14	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
Reset Input										ns
Propagation Delay	t _{4+2−}	2	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
	t _{13+15−}	15	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
	t _{4+3−}	3	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
	t ₁₃₊₁₄₊	14	1.1	3.4	1.1	2.0	3.3	1.2	3.7	
Setup Time	t _{setup}	7	1.5		1.0			1.5		ns
Hold Time	t _{hold}	7	0.9		0.75			0.9		ns
Toggle Frequency (Max)	f _{tog}	2	200		200	225		200		MHz

* Individually test each input; apply V_{ILmin} to pin under test.

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

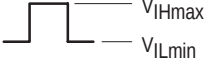


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ELECTRICAL CHARACTERISTICS (continued)

@ Test Temperature			TEST VOLTAGE VALUES (Volts)					(V _{CC}) Gnd
			V _{IHmax}	V _{ILmin}	V _{IHAmin}	V _{ILAmax}	V _{EE}	
			–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 _{CC}) Gnd
			V _{IHmax}	V _{ILmin}	V _{IHAmin}	V _{ILAmax}	V _{EE}	
Power Supply Drain Current	I _E	8					8	1, 16
Input Current	I _{inH}	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 _{inL}	4, 5* 6, 7, 9*		* *			8 8	1, 16 1, 16
Output Voltage Logic 1	V _{OH}	2 2†	5 7				8 8	1, 16 1, 16
Output Voltage Logic 0	V _{OL}	3 3†	5 7				8 8	1, 16 1, 16
Threshold Voltage Logic 1	V _{OHA}	2 2†			5 7	9	8 8	1, 16 1, 16
Threshold Voltage Logic 0	V _{OLA}	3 3†			5 7	9	8 8	1, 16 1, 16
Switching Times (50Ω Load) Clock Input			+1.11Vdc		Pulse In	Pulse Out	–3.2 V	+2.0 V
Propagation Delay	t _{g+2–} t ₆₊₂₊	2 2	7		9 6	2 2	8 8	1, 16 1, 16
Rise Time (20 to 80%)	t ₂₊	2	7		9	2	8	1, 16
Fall Time (20 to 80%)	t _{2–}	2			9	2	8	1, 16
Set Input	Propagation Delay	t ₅₊₂₊ t ₁₂₊₁₅₊ t _{5+3–} t _{12+14–}	2 15 3 14	6 9	5 12 5 12	2 15 3 14	8 8 8 8	1, 16 1, 16 1, 16 1, 16
Reset Input	Propagation Delay	t _{4+2–} t _{13+15–} t _{4+3–} t ₁₃₊₁₄₊	2 15 3 14	6 9	4 13 4 13	2 15 3 14	8 8 8 8	1, 16 1, 16 1, 16 1, 16
Setup Time	t _{setup}	7			6, 7	2	8	1, 16
Hold Time	t _{hold}	7			6, 7	2	8	1, 16
Toggle Frequency (Max)	f _{tog}	2	* *		6	2	8	1, 16

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

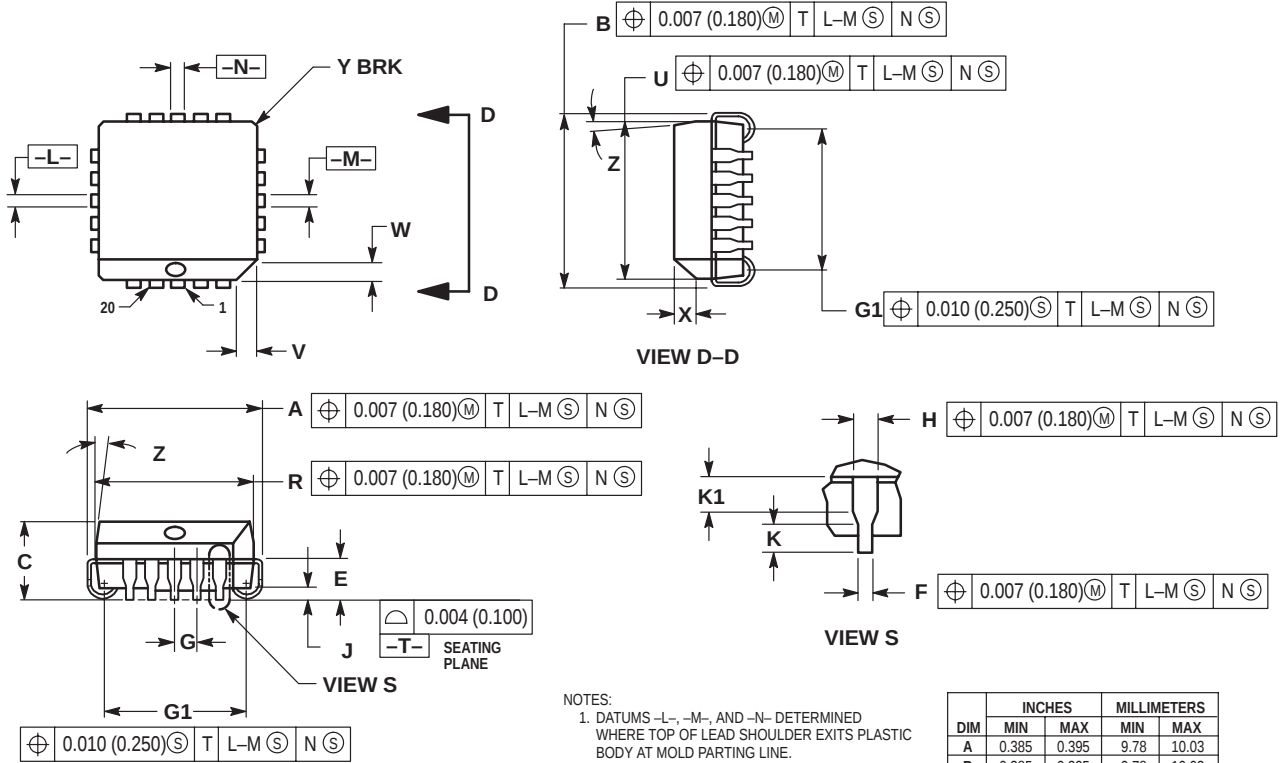
† Output level to be measured after a clock pulse has been applied to the $\overline{C}_E$ Input (Pin 6) 

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.

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PACKAGE DIMENSIONS

PLCC-20
FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 775-02
ISSUE C



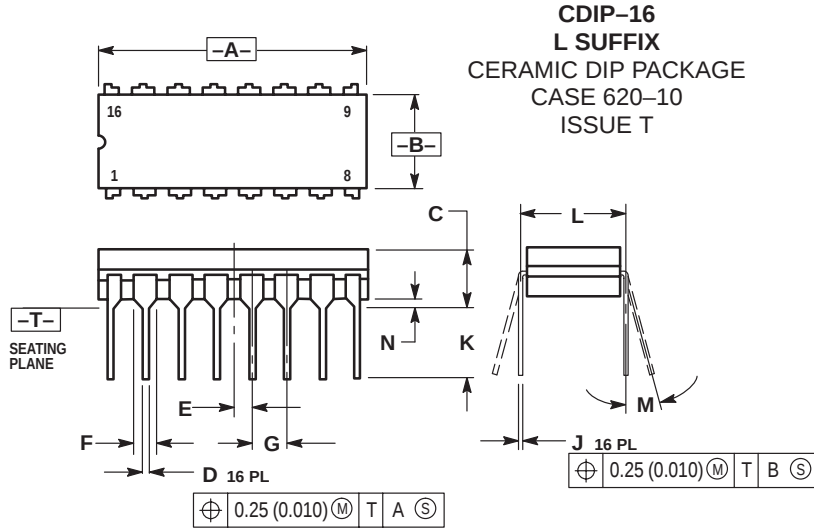
NOTES:

1. DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
3. DIMENSIONS 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).

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	—

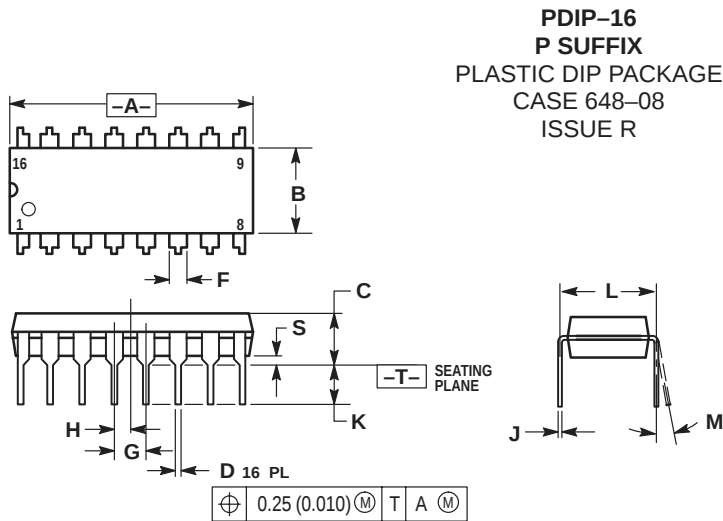
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PACKAGE DIMENSIONS



- 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.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.750	0.785	19.05	19.93
B	0.240	0.295	6.10	7.49
C	—	0.200	—	5.08
D	0.015	0.020	0.39	0.50
E	0.050 BSC		1.27 BSC	
F	0.055	0.065	1.40	1.65
G	0.100 BSC		2.54 BSC	
H	0.008	0.015	0.21	0.38
K	0.125	0.170	3.18	4.31
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01



- 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.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

Notes

Notes

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Email: ONlit-asia@hibbertco.com

JAPAN: ON Semiconductor, Japan Customer Focus Center
4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-8549

Phone: 81-3-5740-2745
Email: r14525@onsemi.com

Fax Response Line: 303-675-2167
800-344-3810 Toll Free USA/Canada

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