Dual J-K Master-Slave Flip-Flop

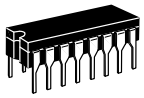
MC10135

The MC10135 is a dual master–slave dc coupled J–K flip–flop. Asynchronous set (S) and reset (R) are provided. The set and reset inputs override the clock.

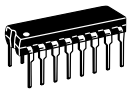
A common clock is provided with separate $\overline{J}$–$\overline{K}$ inputs. When the clock is static, the J–K inputs do not effect the output.

The output states of the flip–flop change on the positive transition of the clock.

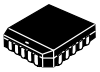
P_D = 280 mW typ/pkg (No Load)
f_{Tog} = 140 MHz typ
t_{pd} = 3.0 ns typ
t_r, t_f = 2.5 ns typ (20%–80%)



L SUFFIX
CERAMIC PACKAGE
CASE 620–10

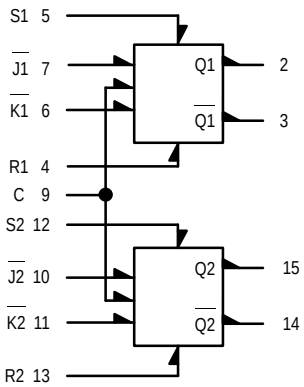


P SUFFIX
PLASTIC PACKAGE
CASE 648–08



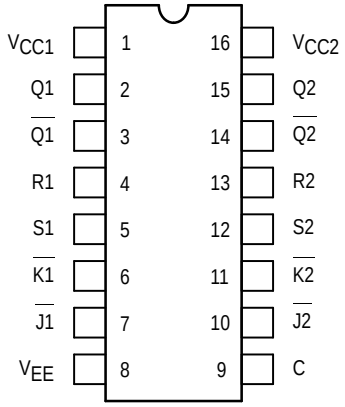
FN SUFFIX
PLCC
CASE 775–02

LOGIC DIAGRAM



V_{CC1} = PIN 1
V_{CC2} = PIN 16
V_{EE} = PIN 8

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).

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

CLOCK J–K TRUTH TABLE*

$\overline{J}$	$\overline{K}$	Q_{n+1}
L	L	$\overline{Q_n}$
H	L	L
L	H	H
H	H	Q_n

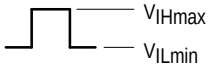
*Output states change on positive transition of clock for J–K input condition present.

MOTOROLA

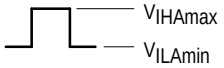
ELECTRICAL CHARACTERISTICS

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		75		54	68		75	mAdc
Input Current	I_{inH}	6,7,9,10,11 4,5,12,13		425 620			265 390		265 390	µAdc
	I_{inL}	4,5,6,7,9, 10,11,12,13	0.5 0.5		0.5 0.5			0.3 0.3		µAdc
Output Voltage Logic 1	V_{OH}	2 2 (**3.**)	–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 (**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 (**4.**)	–1.080 –1.080		–0.980 –0.980			–0.910 –0.910		Vdc
Threshold Voltage Logic 0	V_{OLA}	3 3 (**4.**)		–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+} t_{9+2-}	2 2	1.8 1.8	5.0 5.0	1.8 1.8	3.0 3.0	4.5 4.5	1.8 1.8	4.6 4.6	
Rise Time (20 to 80%)	t_{2+}, t_{3+}	2, 3	1.1	4.8	1.1	2.0	4.5	1.1	4.7	
Fall Time (20 to 80%)	t_{2-}, t_{3-}	2, 3	1.1	4.8	1.1	2.0	4.5	1.1	4.7	
Set Input										ns
Propagation Delay	t_{5+2+} t_{12+15+} t_{5+3-} t_{12+14-}	2 15 3 14	1.8 1.8 1.8 1.8	5.6 5.6 5.6 5.6	1.8 1.8 1.8 1.8	3.0 3.0 3.0 3.0	5.0 5.0 5.0 5.0	1.8	5.2 5.2 5.2 5.2	
Reset Input										ns
Propagation Delay	t_{4+2-} t_{4+3-} t_{13+15-} t_{13+14+}	2 3 15 14	1.8 1.8 1.8 1.8	5.6 5.6 5.6 5.6	1.8 1.8 1.8 1.8	3.0 3.0 3.0 3.0	5.0 5.0 5.0 5.0	1.8 1.8 1.8 1.8	5.2 5.2 5.2 5.2	
Setup Time	t_{setup}	7	2.5		2.5	1.0		2.5		ns
Hold Time	t_{hold}	7	1.5		1.5	1.0		2.5		ns
Toggle Frequency (Max)	f_{tog}	2	125		125	140		125		MHz

1. Individually test each input; apply V_{IHmax} to pin under test.
2. Individually test each input; apply V_{ILmin} to pin under test.
3. Output level to be measured after a clock pulse has been applied to the $\overline{C}_E$ Input (Pin 6)



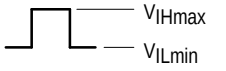
4. Output level to be measured after a clock pulse has been applied to the $\overline{C}_E$ Input (Pin 6)



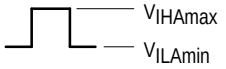
ELECTRICAL CHARACTERISTICS (continued)

			TEST VOLTAGE VALUES (Volts)					
		@ Test Temperature	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}	6,7,9,10,11 4,5,12,13	Note 1. Note 1.				8 8	1, 16 1, 16
	I_{inL}	4,5,6,7,9, 10,11,12,13		Note 2. Note 2.			8 8	1, 16 1, 16
Output Voltage Logic 1	V_{OH}	2 2 (**3.**)	5 6				8 8	1, 16 1, 16
Output Voltage Logic 0	V_{OL}	3 3 (**3.**)	5 6				8 8	1, 16 1, 16
Threshold Voltage Logic 1	V_{OHA}	2 2 (**4.**)	6		5		8 8	1, 16 1, 16
Threshold Voltage Logic 0	V_{OLA}	3 3 (**4.**)	6		5		8 8	1, 16 1, 16
Switching Times (50Ω Load) Clock Input					**Pulse In**	**Pulse Out**	**–3.2 V**	**+2.0 V**
Propagation Delay	t_{9+2+} t_{9+2-}	2 2			9 9	2 2	8 8	1, 16 1, 16
Rise Time (20 to 80%)	t_{2+}, t_{3+}	2, 3			9	2, 3	8	1, 16
Fall Time (20 to 80%)	t_{2-}, t_{3-}	2, 3			9	2, 3	8	1, 16
Set Input Propagation Delay	t_{5+2+} t_{12+15+} t_{5+3-} t_{12+14-}	2 15 3 14			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_{4+3-} t_{13+15-} t_{13+14+}	2 3 15 14			4 4 13 13	2 3 15 14	8 8 8 8	1, 16 1, 16 1, 16 1, 16
Setup Time	t_{setup}	7			6, 9	2	8	1, 16
Hold Time	t_{hold}	7			6, 9	2	8	1, 16
Toggle Frequency (Max)	f_{tog}	2			9	2	8	1, 16

1. Individually test each input; apply V_{IHmax} to pin under test.
2. Individually test each input; apply V_{ILmin} to pin under test.
3. Output level to be measured after a clock pulse has been applied to the $\overline{C}_E$ Input (Pin 6)



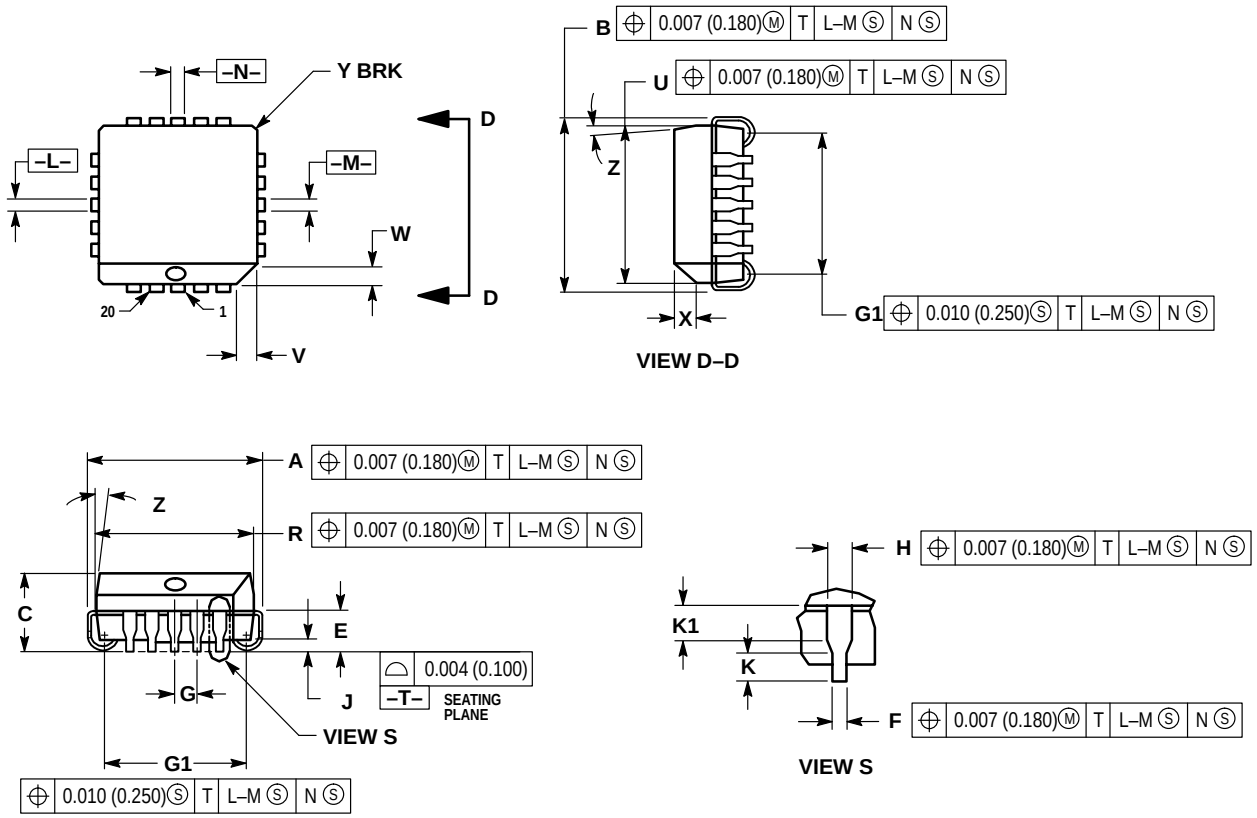
4. Output level to be measured after a clock pulse has been applied to the $\overline{C}_E$ Input (Pin 6)



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.

OUTLINE DIMENSIONS

FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 775–02
ISSUE C

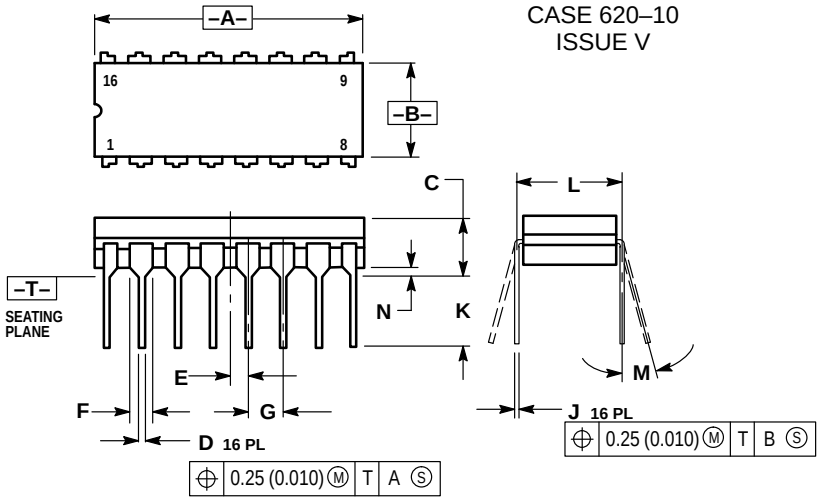


NOTES:
1. DATUMS –L–, –M–, AND –N– DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM –T–, SEATING PLANE.
3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING 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).

	INCHES		MILLIMETERS	
DIM	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

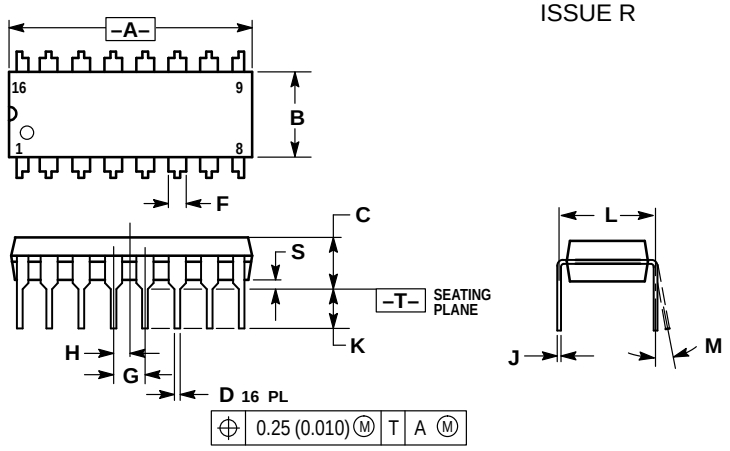
L SUFFIX
CERAMIC DIP PACKAGE
CASE 620–10
ISSUE V



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.

	INCHES		MILLIMETERS	
DIM	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

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.

	INCHES		MILLIMETERS	
DIM	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

How to reach us:
USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 303–675–2140 or 1–800–441–2447

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. 81–3–3521–8315

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