LANSDALE Semiconductor, Inc.

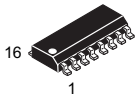
ML12009
ML12011
MECL PLL Components Dual Modulus Prescaler

Legacy Device: *Motorola MC12009, MC12011*

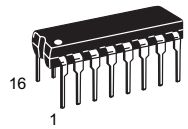
These devices are two–modulus prescalers which will divide by 5 and 6, 8 and 9, respectively. A MECL–to–MTTL translator is provided to interface directly with the Motorola MC12014 Counter Control Logic. In addition, there is a buffered clock input and MECL bias voltage source.

- ML12009 480 MHz (÷5/6), ML12011 550 MHz (÷8/9)
- MECL to MTTL Translator on Chip
- MECL and MTTL Enable Inputs
- 5.0 or –5.2 V Operation*
- Buffered Clock Input — Series Input RC Typ, 20 Ω and 4.0 pF
- VBB Reference Voltage
- 310 mW (Typ)

* When using a 5.0 V supply, apply 5.0 V to Pin 1 (V_{CCO}), Pin 6 (MTTL V_{CC}), Pin 16 (V_{CC}), and ground Pin 8 (V_{EE}). When using –5.2 V supply, ground Pin 1 (V_{CCO}), Pin 6 (MTTL V_{CC}), and Pin 16 (V_{CC}) and apply –5.2 V to Pin 8 (V_{EE}). If the translator is not required, Pin 6 may be left open to conserve DC power drain.



SO 16 = -5P
PLASTIC PACKAGE
CASE 751B



P DIP 16 = EP
PLASTIC PACKAGE
CASE 648

CROSS REFERENCE/ORDERING INFORMATION

PACKAGE	MOTOROLA	LANSDALE
P DIP 16	MC12009P	ML12009EP
SOIC 16	MC12009D	ML12009-5P
P DIP 16	MC12011P	ML12011EP
SO 16W	MC12011D	ML12011-5P

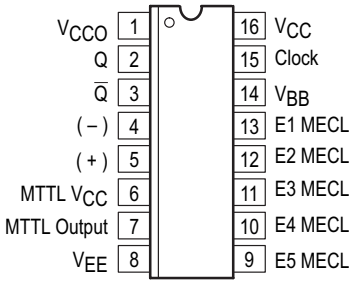
Note: Lansdale lead free (**Pb**) product, as it becomes available, will be identified by a part number prefix change from **ML** to **MLE**.

MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
(Ratings above which device life may be impaired)			
Power Supply Voltage (V_{CC} = 0)	V_{EE}	–8.0	Vdc
Input Voltage (V_{CC} = 0)	V_{in}	0 to V_{EE}	Vdc
Output Source Current Continuous Surge	I_O	 < 50 < 100	mAdc
Storage Temperature Range	T_{stg}	–65 to 175	°C
(Recommended Maximum Ratings above which performance may be degraded)			
Operating Temperature Range ML12009, ML12011	T_A	–30 to 85	°C
DC Fan–Out (Note 1) (Gates and Flip–Flops)	n	70	—

NOTES: 1. AC fan–out is limited by desired system performance.

PIN CONNECTIONS



(Top View)

Figure 1. Logic Diagrams

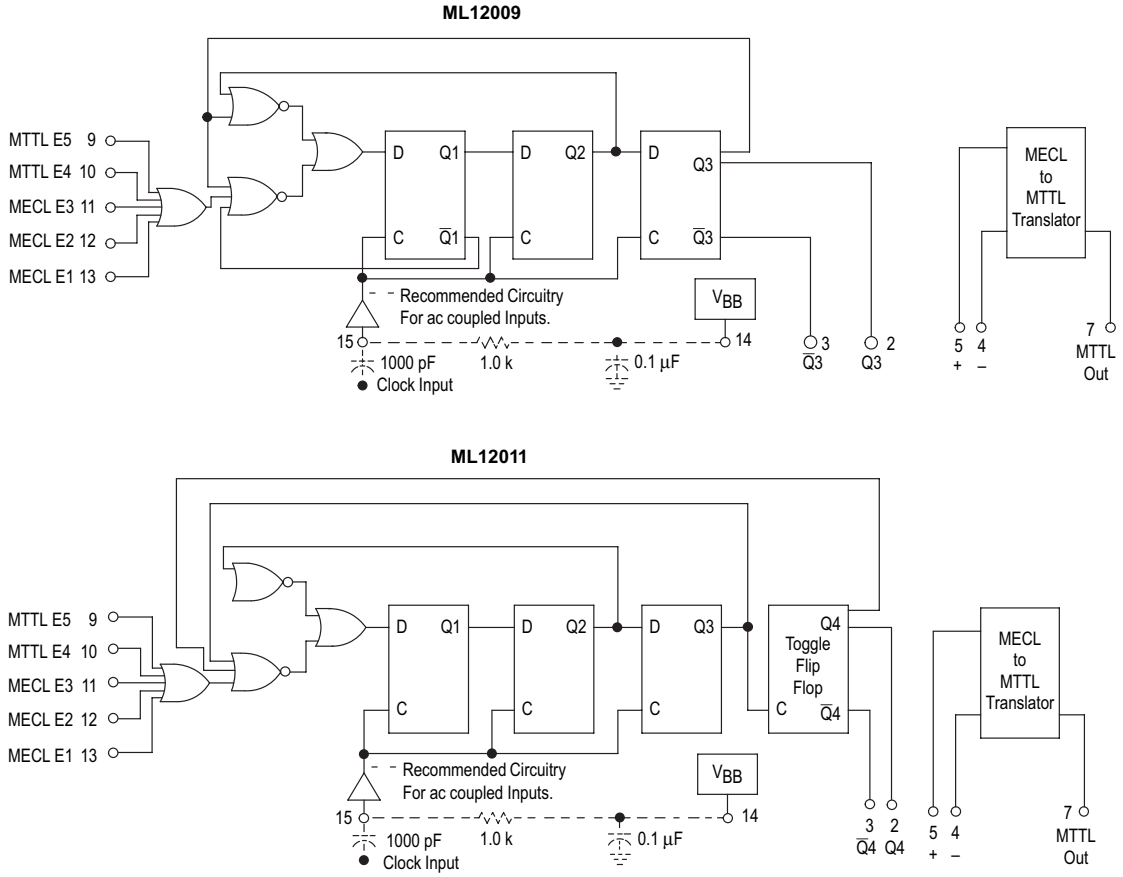


Figure 2. Typical Frequency Synthesizer Application

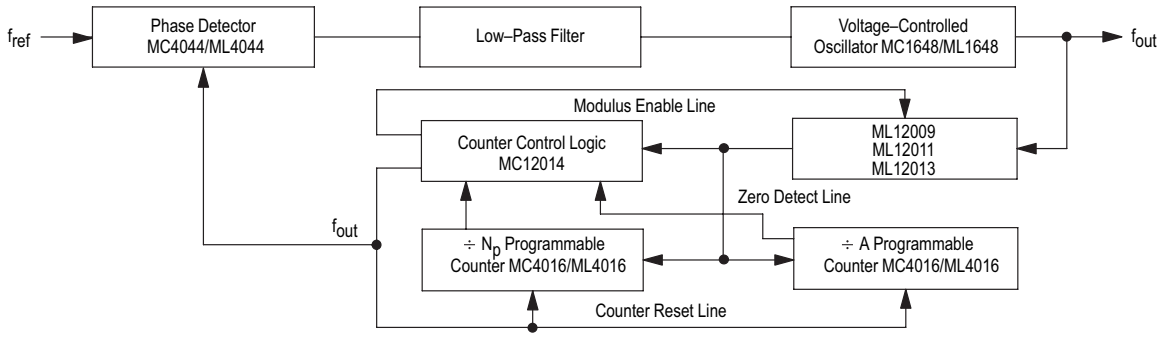


Figure 2b Generic block diagram showing prescaler connection to PLL Device

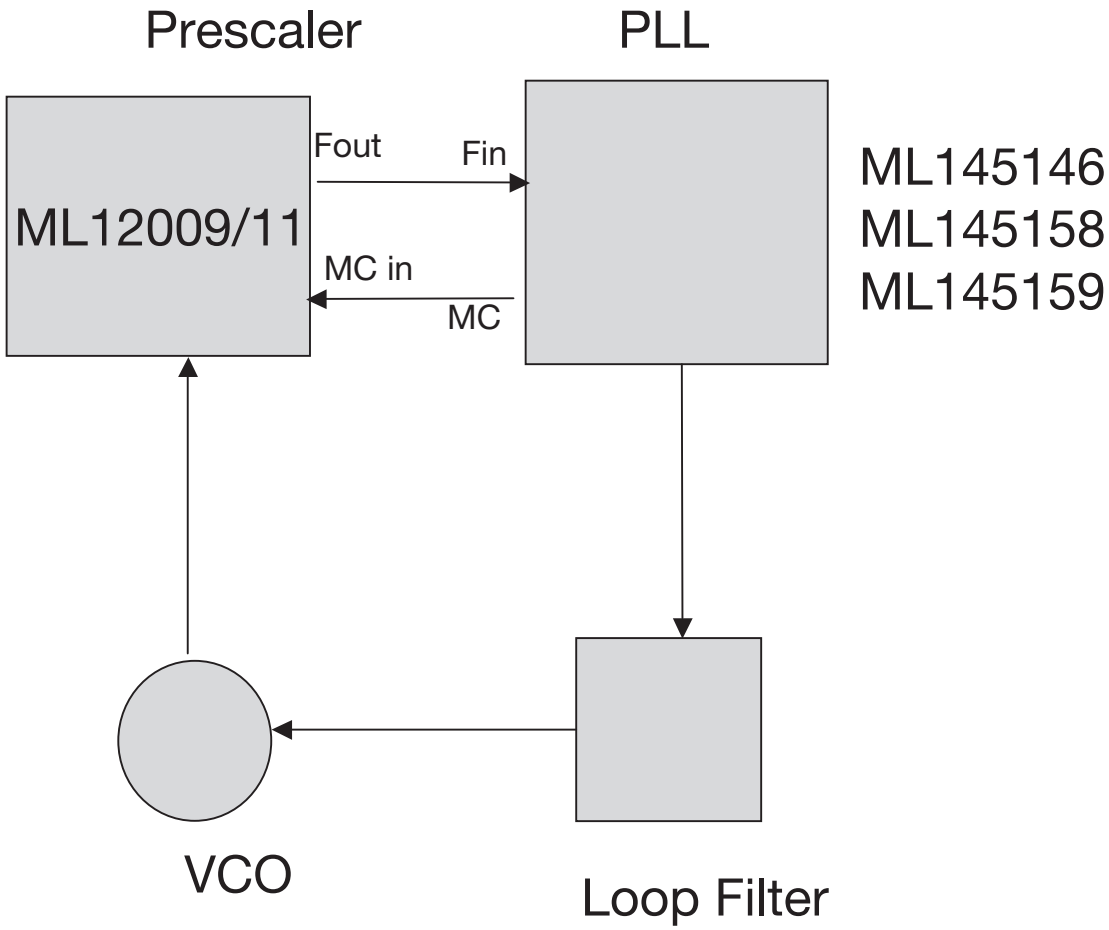
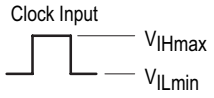


Figure 2b shows a generic block diagram of connecting a prescaler to a PLL device that supports dual modulus controls. Applicataion not AN535 describes using a two–modulus prescaler technique. By using prescaler higher frequencies can be achieved than by a single CMOS PLL device.

ELECTRICAL CHARACTERISTICS (Supply Voltage = –5.2 V, unless otherwise noted.)

Characteristic	Symbol	Pin Under Test	Test Limits						Unit
			–30°C		25°C		85°C		
			Min	Max	Min	Max	Min	Max	
Power Supply Drain Current	I_{CC1}	8	–88		–80		–80		mAdc
	I_{CC2}	6		5.2		5.2		5.2	mAdc
Input Current	I_{inH1}	15 11 12 13		375 375 375 375		250 250 250 250		250 250 250 250	µAdc
	I_{inH2}	4 5	1.7 1.7	6.0 6.0	2.0 2.0	6.0 6.0	2.0 2.0	6.4 6.4	mAdc
	I_{inH3}	5	0.7	3.0	1.0	3.0	1.0	3.6	
	I_{inH4}	9 10		100 100		100 100		100 100	µAdc
Leakage Current	I_{inL1}	15 11 12 13	–10 –10 –10 –10		–10 –10 –10 –10		–10 –10 –10 –10		µAdc
	I_{inL2}	9 10	–1.6 –1.6		–1.6 –1.6		–1.6 –1.6		mAdc
Reference Voltage	V_{BB}	14			–1.360	–1.160			Vdc
Logic ‘1’ Output Voltage	V_{OH1} (Note 1)	2 3	–1.100 –1.100	–0.890 –0.890	–1.000 –1.000	–0.810 –0.810	–0.930 –0.930	–0.700 –0.700	Vdc
	V_{OH2}	7	–2.8		–2.6		–2.4		
Logic ‘0’ Output Voltage	V_{OL1} (Note 1)	2 3	–1.990 –1.990	–1.675 –1.675	–1.950 –1.950	–1.650 –1.650	–1.925 –1.925	–1.615 –1.615	Vdc
	V_{OL2}	7		–4.26		–4.40		–4.48	
Logic ‘1’ Threshold Voltage	V_{OHA} (Note 2)	2 3	–1.120 –1.120		–1.020 –1.020		–0.950 –0.950		Vdc
Logic ‘0’ Threshold Voltage	V_{OLA} (Note 3)	2 3		–1.655 –1.655		–1.630 –1.630		–1.595 –1.595	Vdc
Short Circuit Current	I_{OS}	7	–65	–20	–65	–20	–65	–20	mAdc

NOTES: 1. Test outputs of the device must be tested by sequencing through the truth table. All input, power supply and ground voltages must be maintained between tests. The clock input is the waveform shown.
2. In addition to meeting the output levels specified, the device must divide by 5 or 8 during this test. The clock input is the waveform shown.
3. In addition to meeting the output levels specified, the device must divide by 6 or 9 during this test. The clock input is the waveform shown.

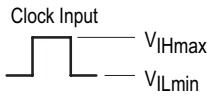


Each MECL 10,000 series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear fpm is maintained. Outputs are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

ELECTRICAL CHARACTERISTICS (continued) (Supply Voltage = –5.2 V, unless otherwise noted.)

			TEST VOLTAGE/CURRENT VALUES						
			Volts						
@ Test Temperature			V_{IHmax}	V_{ILmin}	V_{IHAmin}	V_{ILAmax}	V_{IH}	V_{ILH}	
–30°C			–0.890	–1.990	–1.205	–1.500	–2.8	–4.7	
25°C			–0.810	–1.950	–1.105	–1.475	–2.8	–4.7	
85°C			–0.700	–1.925	–1.035	–1.440	–2.8	–4.7	
			TEST VOLTAGE APPLIED TO PINS LISTED BELOW						
Characteristic	**Symbol**	**Pin Under Test**	V_{IHmax}	V_{ILmin}	V_{IHAmin}	V_{ILAmax}	V_{IH}	V_{IL}	**Gnd**
Power Supply Drain Current	I_{CC1}	8							1,16
	I_{CC2}	6	4	5					6
Input Current	I_{inH1}	15 11 12 13	15 11 12 13						1,16 1,16 1,16 1,16
	I_{inH2}	4 5	5 5	4 4					6 6
	I_{inH3}	5	4	5					6
	I_{inH4}	9 10					9 10		1,16 1,16
Leakage Current	I_{inL1}	15 11 12 13							1,16 1,16 1,16 1,16
	I_{inL2}	9 10						9 10	1,16 1,16
Reference Voltage	V_{BB}	14							1,16
Logic ‘1’ Output Voltage	V_{OH1} (Note 1)	2 3		11,12,13 11,12,13				9,10 9,10	1,16 1,16
	V_{OH2}	7	5	4					6
Logic ‘0’ Output Voltage	V_{OL1} (Note 1)	2 3		11,12,13 11,12,13				9,10 9,10	1,16 1,16
	V_{OL2}	7	4	5					6
Logic ‘1’ Threshold Voltage	V_{OHA} (Note 2)	2 3			11,12,13 11,12,13				1,16 1,16
Logic ‘0’ Threshold Voltage	V_{OLA} (Note 3)	2 3				11,12,13 11,12,13			1,16 1,16
Short Circuit Current	I_{OS}	7	5	4				7	6

NOTES: 1. Test outputs of the device must be tested by sequencing through the truth table. All input, power supply and ground voltages must be maintained between tests. The clock input is the waveform shown.
2. In addition to meeting the output levels specified, the device must divide by 5 or 8 during this test. The clock input is the waveform shown.
3. In addition to meeting the output levels specified, the device must divide by 6 or 9 during this test. The clock input is the waveform shown.



ELECTRICAL CHARACTERISTICS (continued) (Supply Voltage = –5.2 V, unless otherwise noted.)

			TEST VOLTAGE/CURRENT VALUES						
			Volts			mA			
@ Test Temperature			V_{IHT}	V_{ILT}	V_{EE}	I_L	I_{OL}	I_{OH}	
–30°C			–3.2	–4.4	–5.2	–0.25	16	–0.40	
25°C			–3.2	–4.4	–5.2	–0.25	16	–0.40	
85°C			–3.2	–4.4	–5.2	–0.25	16	–0.40	
			TEST VOLTAGE APPLIED TO PINS LISTED BELOW						
Characteristic	**Symbol**	**Pin Under Test**	V_{IHT}	V_{ILT}	V_{EE}	I_L	I_{OL}	I_{OH}	**Gnd**
Power Supply Drain Current	I_{CC1}	8			8				1,16
	I_{CC2}	6			8				6
Input Current	I_{inH1}	15 11 12 13	 9,10 9,10 9,10		8 8 8 8				1,16 1,16 1,16 1,16
	I_{inH2}	4 5			8 8				6 6
	I_{inH3}	5			8				6
	I_{inH4}	9 10			8 8				1,16 1,16
Leakage Current	I_{inL1}	15 11 12 13			8,15 8,11 8,12 8,13				1,16 1,16 1,16 1,16
	I_{inL2}	9 10			8 8				1,16 1,16
Reference Voltage	V_{BB}	14			8	14			1,16
Logic ‘1’ Output Voltage	V_{OH1} (Note 1)	2 3			8 8				1,16 1,16
	V_{OH2}	7			8			7	6
Logic ‘0’ Output Voltage	V_{OL1} (Note 1)	2 3			8 8				1,16 1,16
	V_{OL2}	7			8		7		6
Logic ‘1’ Threshold Voltage	V_{OHA} (Note 2)	2 3	9,10 9,10		8 8				1,16 1,16
Logic ‘0’ Threshold Voltage	V_{OLA} (Note 2)	2 3		9,10 9,10	8 8				1,16 1,16
Short Circuit Current	I_{OS}	7			8				6

NOTES: 1. Test outputs of the device must be tested by sequencing through the truth table. All input, power supply and ground voltages must be maintained between tests. The clock input is the waveform shown.
2. In addition to meeting the output levels specified, the device must divide by 5 or 8 during this test. The clock input is the waveform shown.
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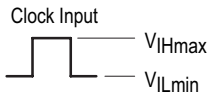
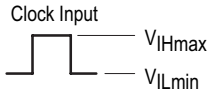


ELECTRICAL CHARACTERISTICS (Supply Voltage = 5.0 V, unless otherwise noted.)

Characteristic	Symbol	Pin Under Test	Test Limits						Unit
			–30°C		25°C		85°C		
			Min	Max	Min	Max	Min	Max	
Power Supply Drain Current	I_{CC1}	8	–88		–80		–80		mAdc
	I_{CC2}	6		5.2		5.2		5.2	mAdc
Input Current	I_{inH1}	15 11 12 13		375 375 375 375		250 250 250 250		250 250 250 250	µAdc
	I_{inH2}	4 5	1.7 1.7	6.0 6.0	2.0 2.0	6.0 6.0	2.0 2.0	6.4 6.4	mAdc
	I_{inH3}	5	0.7	3.0	1.0	3.0	1.0	3.6	
	I_{inH4}	9 10			100 100	100 100		100 100	µAdc
Leakage Current	I_{inL1}	15 11 12 13	–10 –10 –10 –10		–10 –10 –10 –10		–10 –10 –10 –10		µAdc
	I_{inL2}	9 10	–1.6 –1.6		–1.6 –1.6		–1.6 –1.6		mAdc
Reference Voltage	V_{BB}	14			3.67	3.87			Vdc
Logic ‘1’ Output Voltage	V_{OH1} (Note 1)	2 3	3.900 3.900	4.110 4.110	4.000 4.000	4.190 4.190	4.070 4.070	4.300 4.300	Vdc
	V_{OH2}	7	2.4		2.6		2.8		
Logic ‘0’ Output Voltage	V_{OL1} (Note 1)	2 3	3.070 3.070	3.385 3.385	3.110 3.110	3.410 3.410	3.135 3.135	3.445 3.445	Vdc
	V_{OL2}	7		0.94		0.80		0.72	
Logic ‘1’ Threshold Voltage	V_{OHA} (Note 2)	2 3	3.880 3.880		3.980 3.980		4.050 4.050		Vdc
Logic ‘0’ Threshold Voltage	V_{OLA} (Note 3)	2 3		3.405 3.405		3.430 3.430		3.465 3.465	Vdc
Short Circuit Current	I_{OS}	7	–65	–20	–65	–20	–65	–20	mAdc

NOTES: 1. Test outputs of the device must be tested by sequencing through the truth table. All input, power supply and ground voltages must be maintained between tests. The clock input is the waveform shown.
2. In addition to meeting the output levels specified, the device must divide by 5 or 8 during this test. The clock input is the waveform shown.
3. In addition to meeting the output levels specified, the device must divide by 6 or 9 during this test. The clock input is the waveform shown.



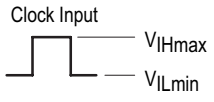
Each MECL 10,000 series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear fpm is maintained. Outputs are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

ELECTRICAL CHARACTERISTICS (continued) (Supply Voltage = 5.0 V, unless otherwise noted.)

@ Test Temperature	V_{IHmax}	V_{ILmin}	V_{IHAmin}	V_{ILAmax}	V_{IH}	V_{ILH}
	TEST VOLTAGE/CURRENT VALUES (Volts)					
–30°C	4.110	3.070	3.795	3.500	2.4	0.5
25°C	4.190	3.110	3.895	3.525	2.4	0.5
85°C	4.300	3.135	3.965	3.560	2.4	0.5

Characteristic	Symbol	Pin Under Test	TEST VOLTAGE APPLIED TO PINS LISTED BELOW						(V_{EE}) Gnd
			V_{IHmax}	V_{ILmin}	V_{IHAmin}	V_{ILAmax}	V_{IH}	V_{IL}	
Power Supply Drain Current	I_{CC1}	8							8
	I_{CC2}	6	4	5					8
Input Current	I_{inH1}	15 11 12 13	15 11 12 13						8 8 8 8
	I_{inH2}	4 5	5 5	4 4					8 8
	I_{inH3}	5	4	5					8
	I_{inH4}	9 10					9 10		8 8
Leakage Current	I_{inL1}	15 11 12 13							8,15 8,11 8,12 8,13
	I_{inL2}	9 10						9 10	8 8
Reference Voltage	V_{BB}	14							8
Logic '1' Output Voltage	V_{OH1} (Note 1)	2 3		11,12,13 11,12,13				9,10 9,10	8 8
	V_{OH2}	7	5	4					8
Logic '0' Output Voltage	V_{OL1} (Note 1)	2 3		11,12,13 11,12,13				9,10 9,10	8 8
	V_{OL2}	7	4	5					8
Logic '1' Threshold Voltage	V_{OHA} (Note 2)	2 3			11,12,13 11,12,13				8 8
Logic '0' Threshold Voltage	V_{OLA} (Note 3)	2 3				11,12,13 11,12,13			8 8
Short Circuit Current	I_{OS}	7	5	4				7	8

NOTES: 1. Test outputs of the device must be tested by sequencing through the truth table. All input, power supply and ground voltages must be maintained between tests. The clock input is the waveform shown.
2. In addition to meeting the output levels specified, the device must divide by 5 or 8 during this test. The clock input is the waveform shown.
3. In addition to meeting the output levels specified, the device must divide by 6 or 9 during this test. The clock input is the waveform shown.



ELECTRICAL CHARACTERISTICS (continued) (Supply Voltage = 5.0 V, unless otherwise noted.)

@ Test Temperature	TEST VOLTAGE/CURRENT VALUES						
	Volts			mA			
	V_{IHT}	V_{ILT}	V_{CC}	I_L	I_{OL}	I_{OH}	
–30°C	2.0	0.8	5.0	–0.25	16	–0.40	
25°C	2.0	0.8	5.0	–0.25	16	–0.40	
85°C	2.0	0.8	5.0	–0.25	16	–0.40	

Characteristic	Symbol	Pin Under Test	TEST VOLTAGE APPLIED TO PINS LISTED BELOW						(V_{EE}) Gnd
			V_{IHT}	V_{ILT}	V_{CC}	I_L	I_{OL}	I_{OH}	
Power Supply Drain Current	I_{CC1}	8			1,16				8
	I_{CC2}	6			6				8
Input Current	I_{inH1}	15 11 12 13	 9,10 9,10 9,10		1,16 1,16 1,16 1,16				8 8 8 8
	I_{inH2}	4 5			6 6				8 8
	I_{inH3}	5			6				8
	I_{inH4}	9 10			1,16 1,16				8 8
Leakage Current	I_{inL1}	15 11 12 13			1,16 1,16 1,16 1,16				8,15 8,11 8,12 8,13
	I_{inL2}	9 10			1,16 1,16				8 8
Reference Voltage	V_{BB}	14			1,16	14			8
Logic ‘1’ Output Voltage	V_{OH1} (Note 1)	2 3			1,16 1,16				8 8
	V_{OH2}	7			6			7	8
Logic ‘0’ Output Voltage	V_{OL1} (Note 1)	2 3			1,16 1,16				8 8
	V_{OL2}	7			6		7		8
Logic ‘1’ Threshold Voltage	V_{OHA} (Note 2)	2 3	9,10 9,10		1,16 1,16				8 8
Logic ‘0’ Threshold Voltage	V_{OLA} (Note 3)	2 3		9,10 9,10	1,16 1,16				8 8
Short Circuit Current	I_{OS}	7			6				8

NOTES: 1. Test outputs of the device must be tested by sequencing through the truth table. All input, power supply and ground voltages must be maintained between tests. The clock input is the waveform shown.
2. In addition to meeting the output levels specified, the device must divide by 5 or 8 during this test. The clock input is the waveform shown.
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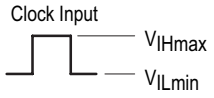


SWITCHING CHARACTERISTICS

Characteristic	Symbol	Pin Under Test	ML12509, ML12511, ML12513									Unit	TEST VOLTAGES/WAVEFORMS APPLIED TO PINS LISTED BELOW:							
			–30°C			25°C			85°C				Pulse Gen.1	Pulse Gen.2	Pulse Gen.3	V_{IHmin} †	V_{ILmin} †	V_F –3.0 V	V_{EE} –3.0 V	V_{CC} +2.0
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max									
Propagation Delay (See Figures 3 and 5)	$t_{15+\ 2+}$	2	—	—	8.1	—	—	8.1	—	—	8.9	ns	15	—	—	—	11,12,13	9,10	8	1,6,16
	$t_{15+\ 2-}$	2	—	—	7.5	—	—	7.5	—	—	8 2		15	—	—	—	11,12,13	9,10	8	1,6,16
	$t_{5+\ 7+}$	7	—	—	8.4	—	—	8.1	—	—	8.9		A	—	—	—	—	—	8	1,6,16
	$t_{5-\ 7-}$	7	—	—	6.5	—	—	6.5	—	—	7.1		A	—	—	—	—	—	8	1,6,16
Setup Time (See Figures 4 and 5)	t_{setup1}	11	5.0	—	—	5.0	—	—	5.0	—	—	ns	15	*	—	—	*	9,10	8	1,6,16
	t_{setup2}	9	5.0	—	—	5.0	—	—	5.0	—	—	ns	15	—	*	—	11,12,13	*	8	1,6,16
Release Time (See Figures 4 and 5)	t_{rel1}	11	5.0	—	—	5.0	—	—	5.0	—	—	ns	15	*	—	—	*	9.10	8	1,6,16
	t_{rel2}	9	5.0	—	—	5.0	—	—	5.0	—	—	ns	15	—	*	—	11,12,13	*	8	1,6,16
Toggle Frequency (See Figure 6)	f_{max}	2										MHz								
ML12509 : 5/6			440	—	—	480	—	—	440	—	—		—	—	—	11	—	—	8	16
ML12511 : 8/9			500	—	—	550	—	—	500	—	—		—	—	—	11	—	—	8	16

*Test inputs sequentially, with Pulse Generator 2 or 3 as indicated connected to input under test, and the voltage indicated applied to the other input(s) of the same type (i.e., MECL or MTTL).

	–30°C	25°C	85°C	
†V_{IHmin}	1.03	1.115	1.20	Vdc
†V_{ILmin}	0.175	0.200	0.235	Vdc

Figure 3. AC Voltage Waveforms

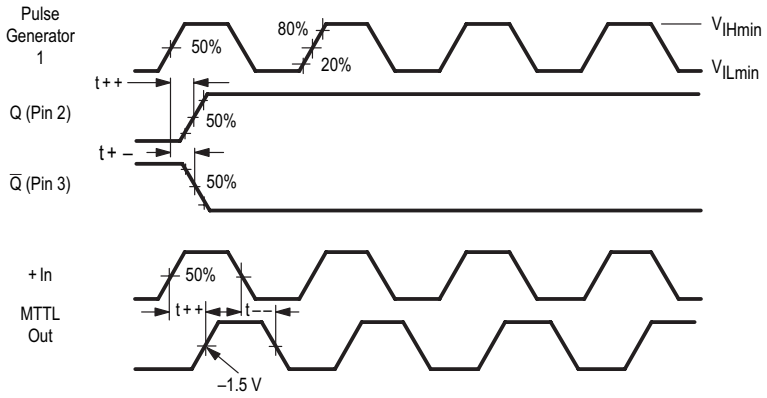


Figure 4. Setup and Release Time Waveforms

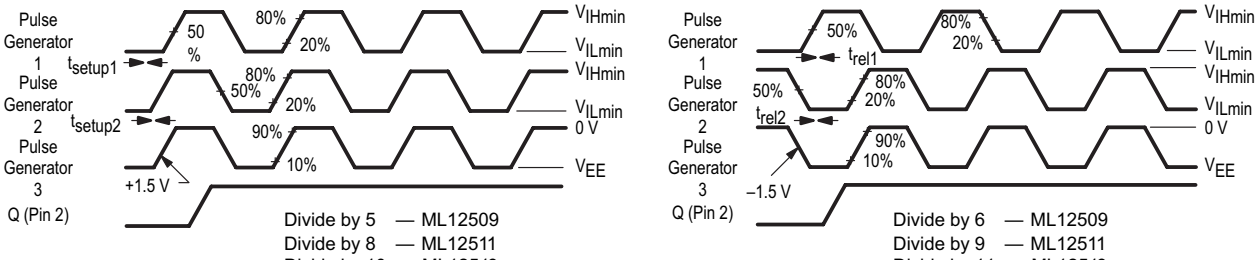
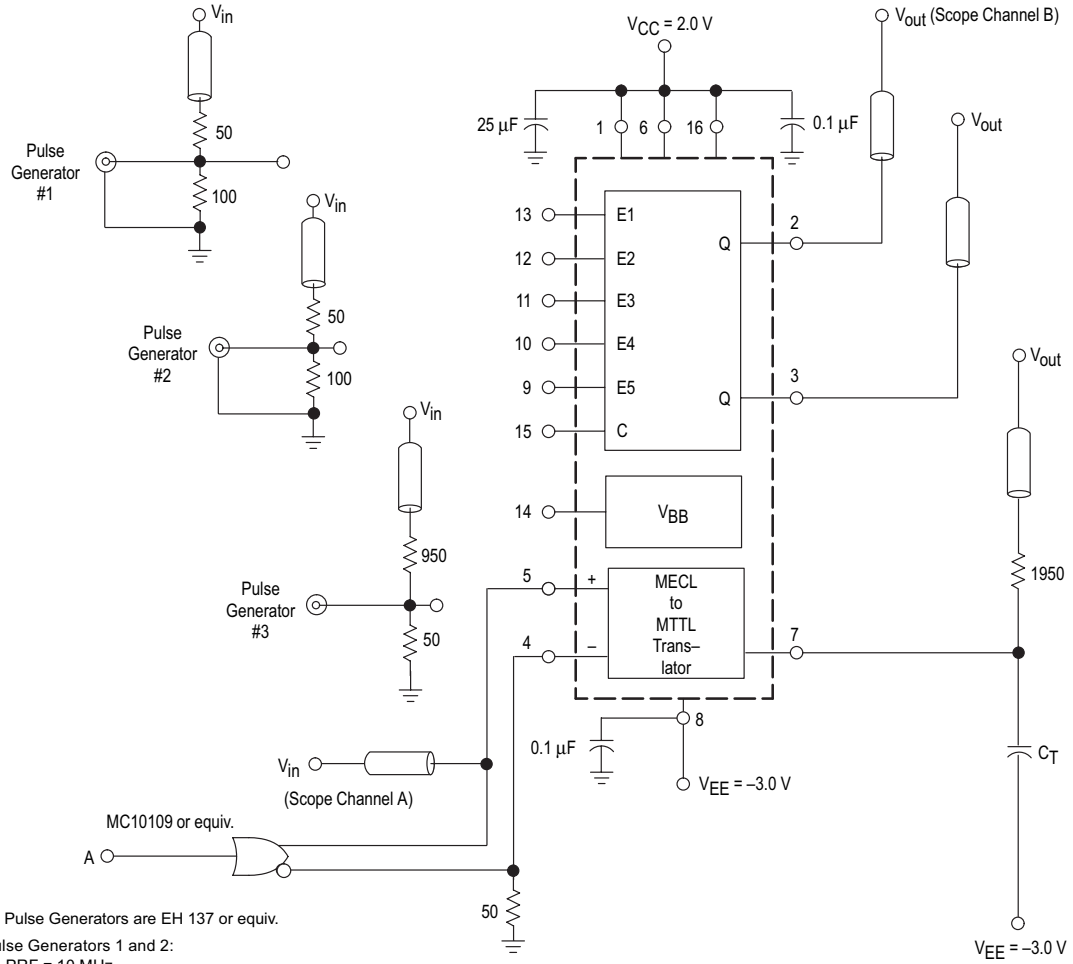


Figure 5. AC Test Circuit



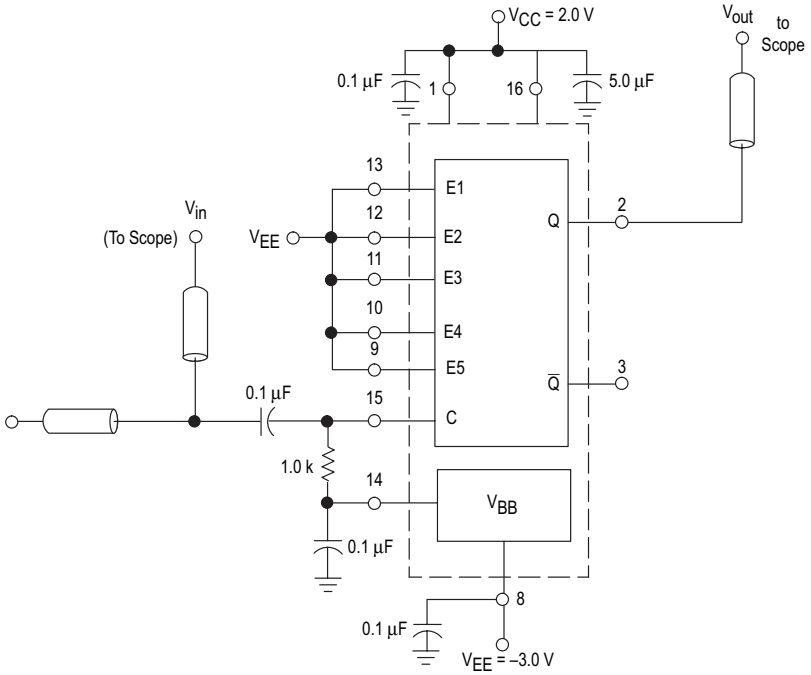
All Pulse Generators are EH 137 or equiv.

Pulse Generators 1 and 2:
PRF = 10 MHz
PW = 50% Duty Cycle
$t_+ = t_- = 2.0 \pm 0.2$ ns

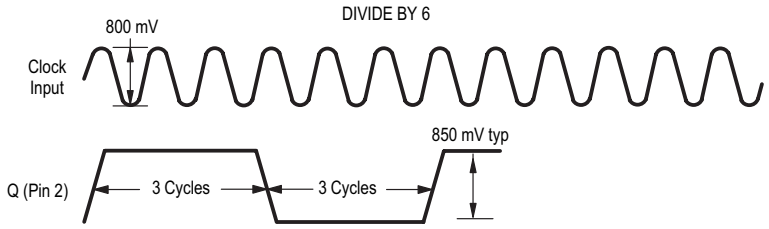
Pulse Generator 3:
PRF = 2.0 MHz
PW = 50% Duty Cycle
$t_+ = t_- = 5.0 \pm 0.5$ ns

All resistors are +1%.
All input and output cables to the scope are equal lengths of 50 Ω coaxial cable.
The 1950 Ω resistor at Pin 7 and the scope termination impedance constitute a 40 :1 attenuator probe.
C_T = 15 pF = total parasitic capacitance which includes probe, wiring, and load capacitance.
Unused output connected to a 50 Ω resistor to ground.

Figure 6. Maximum Frequency Test Circuit



Unused output connected to a 50 Ω resistor to ground



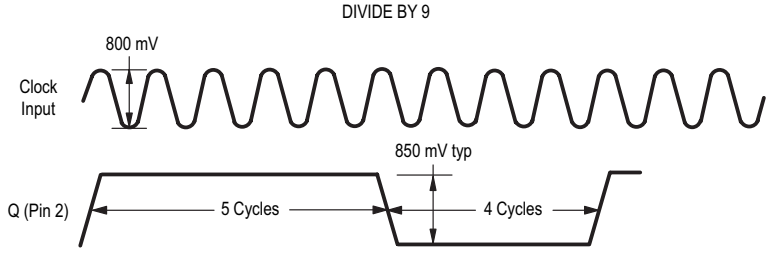
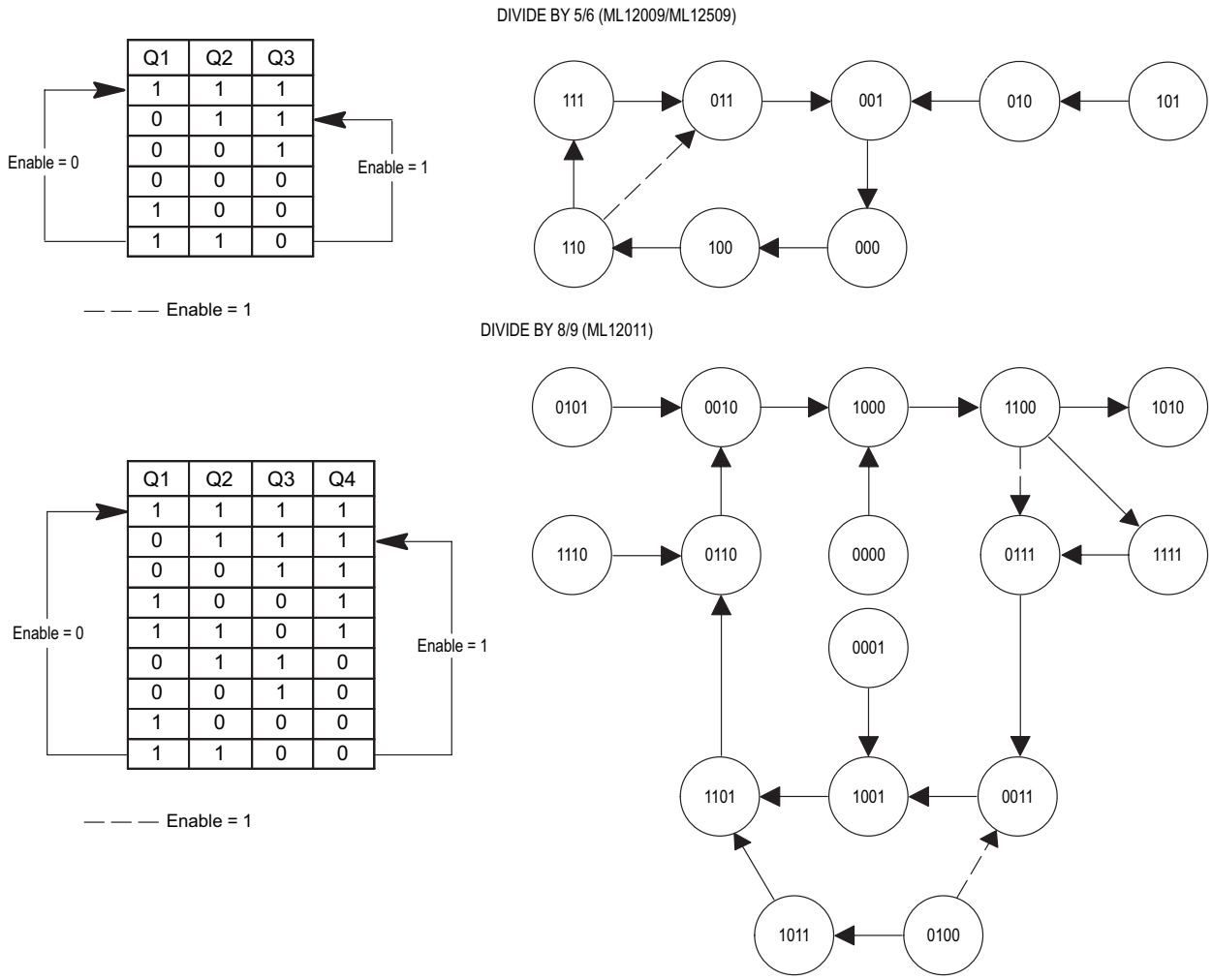


Figure 7. State Diagram



APPLICATIONS INFORMATION

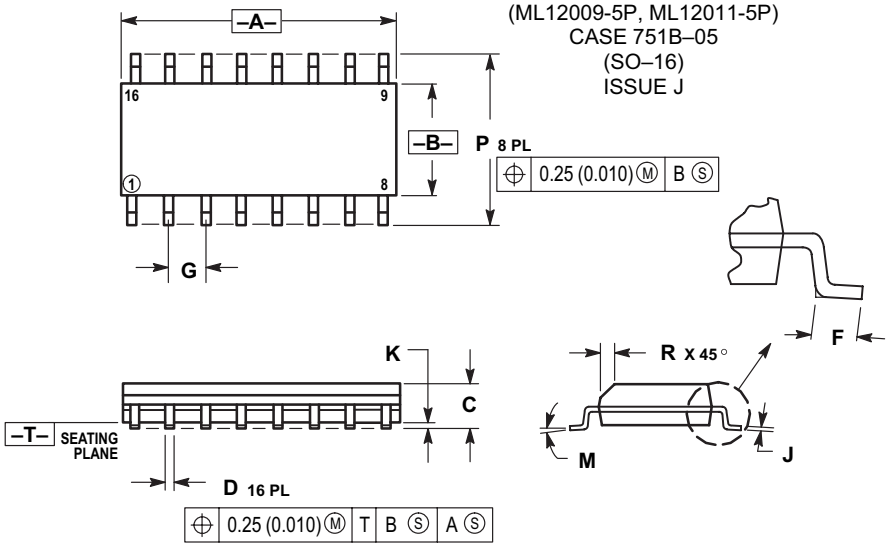
The primary application of these devices is as a high–speed variable modulus prescaler in the divide by N section of a phase–locked loop synthesizer used as the local oscillator of two–way radios.

Proper VHF termination techniques should be followed when the clock is separated from the prescaler by any appreciable distance.

In their basic form, these devices will divide by 5/6 or 8/9. Division by 5, or 8 occurs when any one or all of the five gate inputs E1 through E5 are high. Division by 6, or 9 occurs when all inputs E1 through E5 are low. (Unconnected MTTL inputs are normally high, unconnected MECL inputs are normally low). With the addition of extra parts, many different division configurations may be obtained.

OUTLINE DIMENSIONS

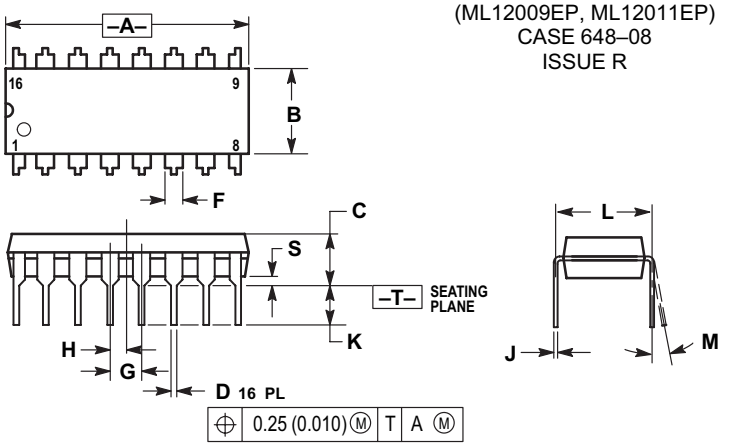
SO 16 = -5P
PLASTIC PACKAGE
(ML12009-5P, ML12011-5P)
CASE 751B–05
(SO–16)
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

P DIP 16 = EP
PLASTIC PACKAGE
(ML12009EP, ML12011EP)
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