



**MOTOROLA**

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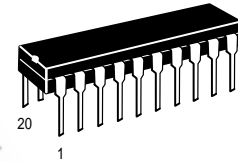
# 200 MHz Voltage Controlled Multivibrator

- High Frequency VCM Ideal for PLL Applications
- Single External Resistor Determines Center Frequency; Additional Resistor Determines f/V Sensitivity
- Internal Ripple Counter (1/2, 1/4, 1/8) For Low Frequency Applications – TTL/ECL Outputs
- VCO Output Enable Pins (TTL/ECL Level)
- +5.0 V Single Supply Voltage

## MC12100

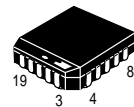
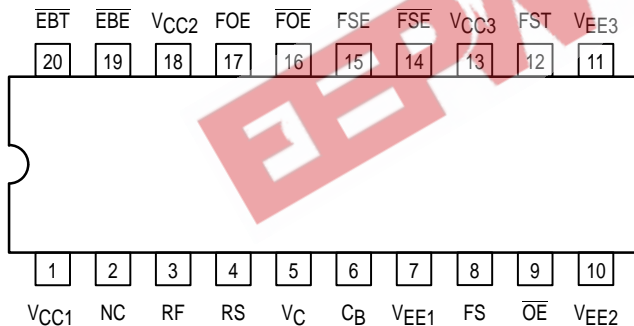
### 200 MHz VOLTAGE CONTROLLED MULTIVIBRATOR

SEMICONDUCTOR TECHNICAL DATA



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 738

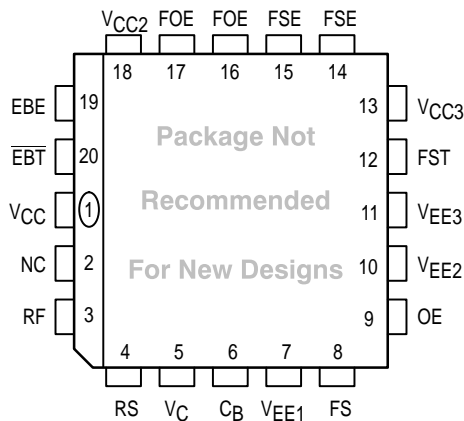
**Pinout: 20-Lead Plastic Package (Top View)**



**FN SUFFIX**  
PLASTIC PACKAGE  
CASE 775  
(PLCC)

*Not Recommended For New Designs*

**Pinout: 20-Lead PLCC Package (Top View)**



#### PIN NAMES

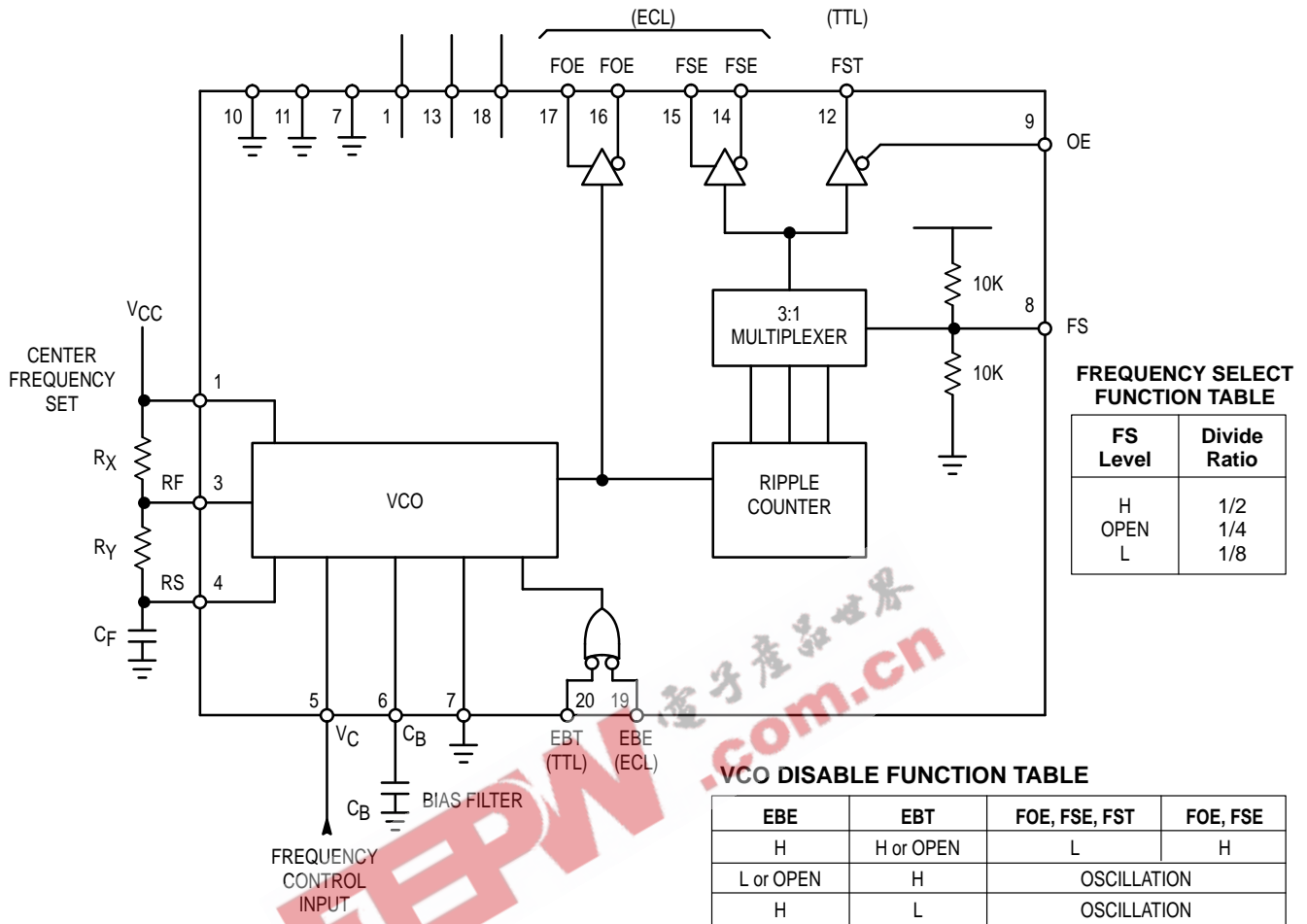
Pin	Function
RF, RS	Center Frequency Inputs
VC	Frequency Control Input
CB	Bias Filter Input
FS	Frequency Select Input
OE	TTL Output Enable
FST	TTL +2, +4, +8 Output
FSE, FSE	Diff ECL +2, +4, +8 Outputs
FOE, FOE	Diff ECL +1 Outputs
EBE	VCO Disable, ECL Level Input
EBT	VCO Disable, TTL Level Input

#### ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC12100P	T <sub>A</sub> = -40° to +75°C	Plastic

# MC12100

Figure 1. Block Diagram



## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Power Supply Voltage	V <sub>CC1</sub> V <sub>CC2</sub> V <sub>CC3</sub>	-0.5 to 8.0	V
Input Voltage	V <sub>IN</sub> (TTL)	-0.5 to V <sub>CC</sub>	V
Input Voltage	V <sub>IN</sub> (ECL)	-0.5 to V <sub>CC</sub>	V
Output Source Current – Surge	I <sub>OUT</sub> (ECL)	100	mA
Output Source Current – Continuous		50	mA
Junction Operating Temperature	T <sub>J</sub>	140	°C
Storage Temperature	T <sub>STG</sub>	-55 to 150	°C

NOTE: ESD data available upon request.

## OPERATING CONDITIONS

Parameter	Symbol	Value	Unit
Ambient Temperature	T <sub>A</sub>	0 to 75	°C
Supply Voltage	V <sub>CC</sub>	4.75 to 5.25	V
TTL High Output Current	I <sub>OH</sub> (TTL)	-1.0	mA
TTL Low Output Current	I <sub>OL</sub> (TTL)	20	mA

## MC12100

**DC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V} \pm 5\%$ ;  $R_X = 2.4\text{ k}\Omega$ ;  $R_Y = 1.5\text{ k}\Omega$ ;  $C_B = 0.001\text{ }\mu\text{F}$ , unless otherwise noted.)

Characteristic	Symbol	0°C		25°C			75°C		Unit	Condition
		Min	Max	Min	Typ	Max	Min	Max		
Supply Current	$I_{CC}$	75	120	65	90	110	80	135	mA	$\overline{EBT} = \overline{EBE} = V_{CC}$ (ECL, TTL)
Output Low Voltage, TTL	$V_{OLT}$	-	-	-	-	0.5	-	-	V	$F_S = \text{GND}$
Output High Voltage, TTL	$V_{OHT}$	-	-	2.4	-	-	-	-	V	$F_S = \text{GND}$
Output Low Voltage, ECL	$V_{OLE}$	-	-	3.0	-	3.4	-	-	V	$V_{CC} = 5.0\text{V}$ , $R_L = 50\Omega$ , $V_T = 3.0\text{V}$
Output High Voltage, ECL	$V_{OHE}$	-	-	3.9	-	4.19	-	-	V	$V_{CC} = 5.0\text{V}$ , $R_L = 50\Omega$ , $V_T = 3.0\text{V}$
$\overline{EBT}$ Input Low Current	$I_{ILT}$	-	-	-	-	400	-	-	$\mu\text{A}$	$V_{IN} = 0.4\text{V}$
$\overline{EBT}$ Input High Current	$I_{IHT}$	-	-	-	-	20	-	-	$\mu\text{A}$	$V_{IN} = 2.7\text{V}$
		-	-	-	-	100	-	-	$\mu\text{A}$	$V_{IN} = 7.0\text{V}$
$\overline{EBE}$ Input High Current	$I_{INHE}$	-	-	-	-	250	-	-	$\mu\text{A}$	$V_{IN} = 4.19\text{V}$
$\overline{EBE}$ Input Low Current	$I_{INLE}$	-	-	1.0	-	-	-	-	$\mu\text{A}$	$V_{IN} = 3.05\text{V}$
FS Input, Max "L" Level	$V_{ILS}$	-	-	-	-	1.2	-	-	V	$V_{CC} = 5.0\text{V}$
FS Input, "Medium" Level	$V_{IMS}$	-	-	2.0	-	3.0	-	-	V	$V_{CC} = 5.0\text{V}$
FS Input, Min "H" Level	$V_{IHS}$	-	-	3.8	-	-	-	-	V	$V_{CC} = 5.0\text{V}$
$\overline{EBT}$ Input Low Voltage	$V_{ILT}$	-	0.8	-	-	0.8	-	0.8	V	
$\overline{EBT}$ Input High Voltage	$V_{IHT}$	2.0	-	2.0	-	-	2.0	-	V	
$\overline{EBE}$ Input High Voltage	$V_{IHE}$	-	-	3.87	-	4.19	-	-	V	$V_{CC} = 5.0\text{V}$
$\overline{EBE}$ Input Low Voltage	$V_{ILE}$	-	-	3.05	-	3.52	-	-	V	$V_{CC} = 5.0\text{V}$
$V_C$ Input Voltage, $V_C = V_{CC} \div 2$	$V_{LM}$	-	-	$\pm 1.1$	$\pm 1.3$	$\pm 1.5$	-	-	V	$V_{CC} = 5.0\text{V}$
$C_B$ Output Voltage	$V_{CB}$	-	-	2.35	2.50	2.65	-	-	V	$V_{CC} = 5.0\text{V}$

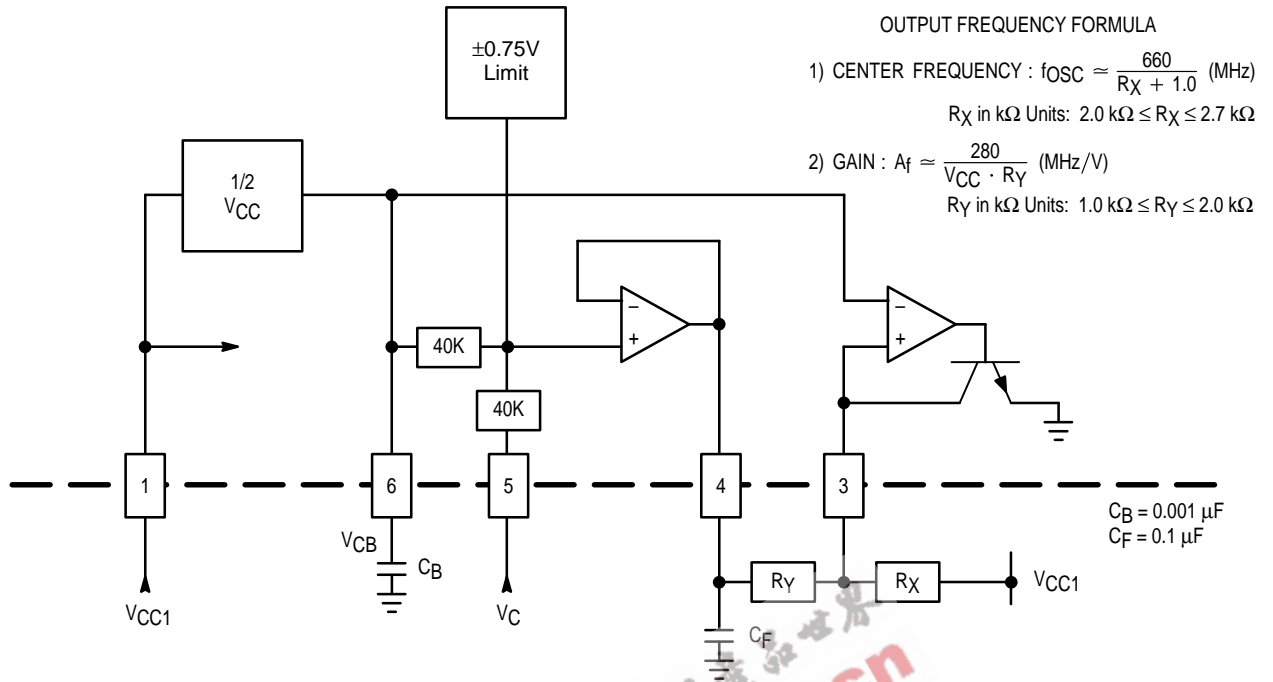
**AC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ;  $R_X = 2.4\text{ k}\Omega$ ;  $R_Y = 1.5\text{ k}\Omega$ ;  $C_B = 0.001\text{ }\mu\text{F}$ ;  $V_T = 3.0\text{ V}$ , unless otherwise noted.)

Characteristic	Symbol	0°C		25°C			75°C		Unit	Condition
		Min	Max	Min	Typ	Max	Min	Max		
Center Frequency ( $V_{VC} - V_{CB} = 0\text{V}$ )	FO	-	-	180	200	220	-	-	MHz	$V_{CC} = +2.0\text{V}$ $V_{EE} = -3.0\text{V}$
Frequency Range ( $V_C = 1/2 V_{CC} \pm 1.5\text{V}$ , $V_{CC} = 5.0\text{V}$ )	$F_{MAX} - F_{MIN}$	-	-	85	100	115	-	-	MHz	
FOE/ $\overline{FOE}$ /FSE/ $\overline{FSE}$ Rise Time	$t_{rE}$	-	-	0.5	-	2.4	-	-	ns	
FOE/ $\overline{FOE}$ /FSE/ $\overline{FSE}$ Fall Time	$t_{fE}$	-	-	0.5	-	2.4	-	-	ns	
Reset Time	TTT	-	-	-	-	35	-	-	ns	$\overline{EBT} \sim \text{FST}$
Reset Time	TTO	-	-	-	-	25	-	-	ns	$\overline{EBT} \sim \text{FOE}/\overline{\text{FOE}}$
Reset Time	TTS	-	-	-	-	30	-	-	ns	$\overline{EBT} \sim \text{FSE}/\overline{\text{FSE}}$
Reset Time	TET	-	-	-	-	37	-	-	ns	$\overline{EBE} \sim \text{FST}$
Reset Time	TEO	-	-	-	-	12	-	-	ns	$\overline{EBE} \sim \text{FOE}/\overline{\text{FOE}}$
Reset Time	TES	-	-	-	-	25	-	-	ns	$\overline{EBE} \sim \text{FSE}/\overline{\text{FSE}}$

**NOTE:** Loading: ECL = 50  $\Omega$  to  $V_T$ ; TTL = 500  $\Omega$ , 50 pF

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Figure 2. VCO Detail



**Notes:**

- For optimum VCO linearity (MHz/V), the following resistor ranges are recommended:  
 $2.0\text{ k}\Omega \leq R_X \leq 2.7\text{ k}\Omega$  ( $R_Y = 1.5\text{ k}\Omega$ )  
 $1.0\text{ k}\Omega \leq R_Y \leq 2.0\text{ k}\Omega$  ( $R_X = 2.4\text{ k}\Omega$ )
- TTL output maximum frequency = 50 MHz
- Simultaneous use of both ECL and TTL outputs are not recommended due to excessive power consumption for the EIAJ Type II SO package

Figure 3. AC Test Circuit (FO/t<sub>RE</sub>/t<sub>fE</sub> Measurement)

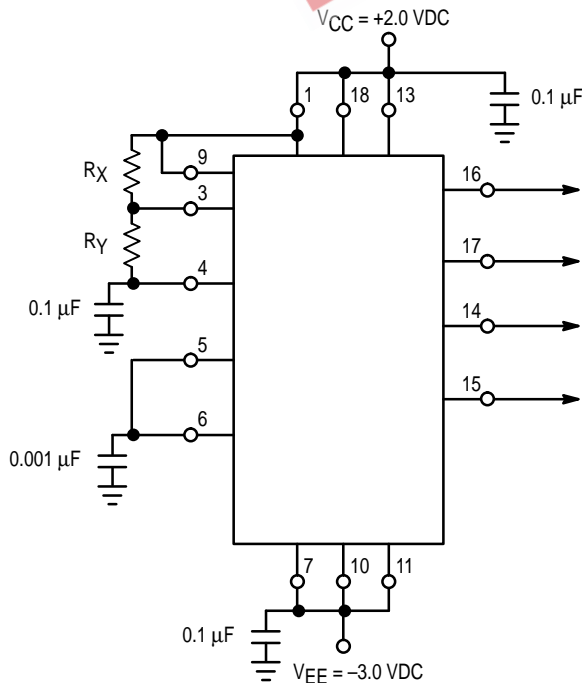
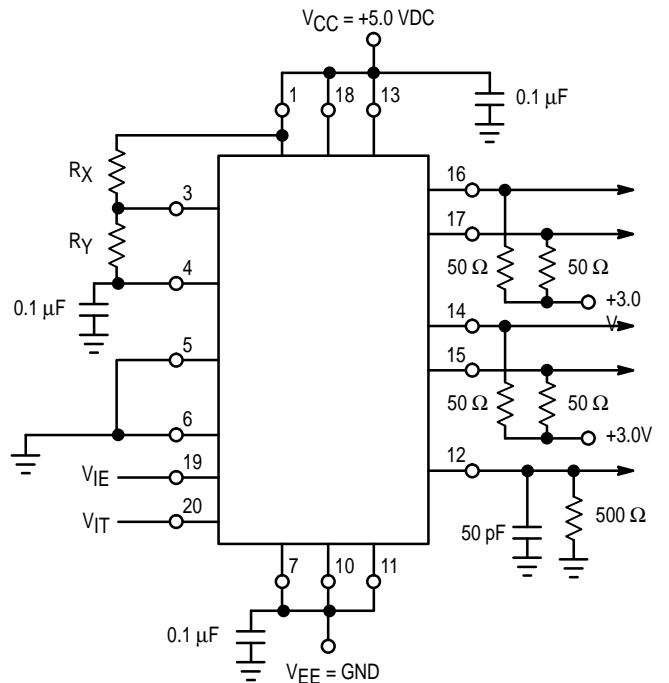
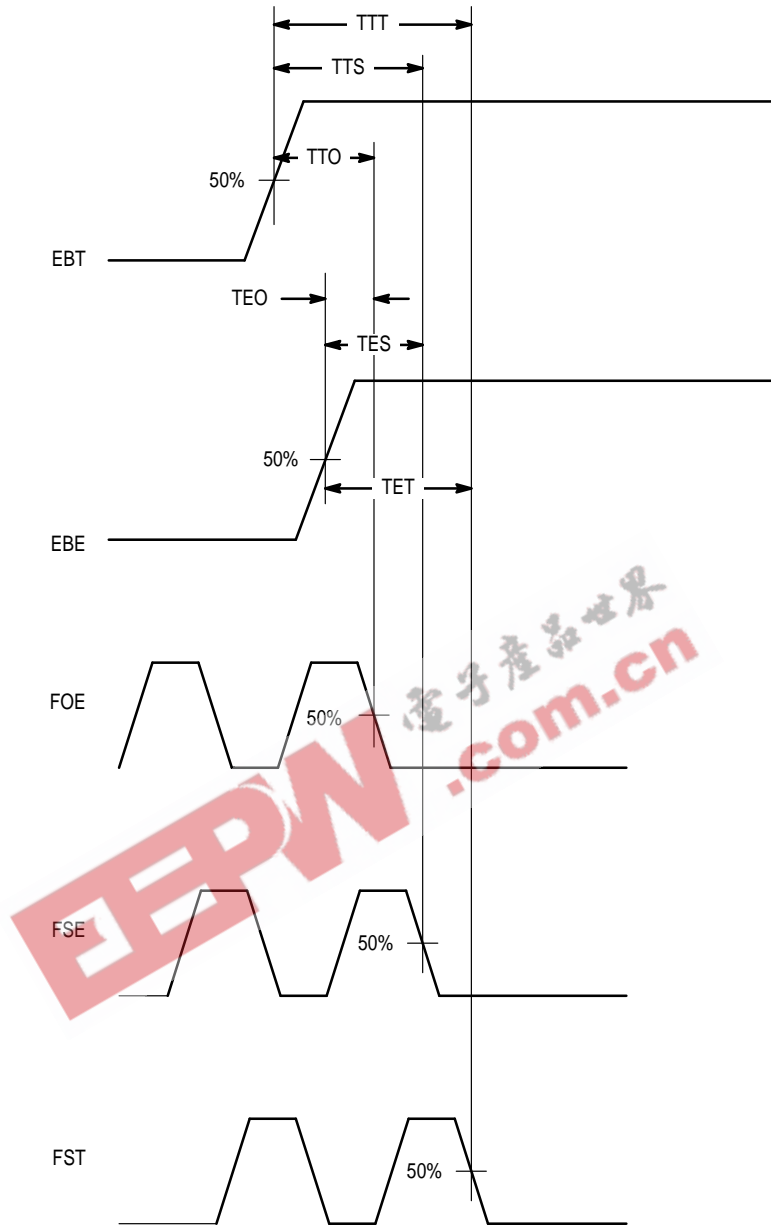


Figure 4. AC Test Circuit (Other Measurements)



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Figure 5. Switching Waveforms

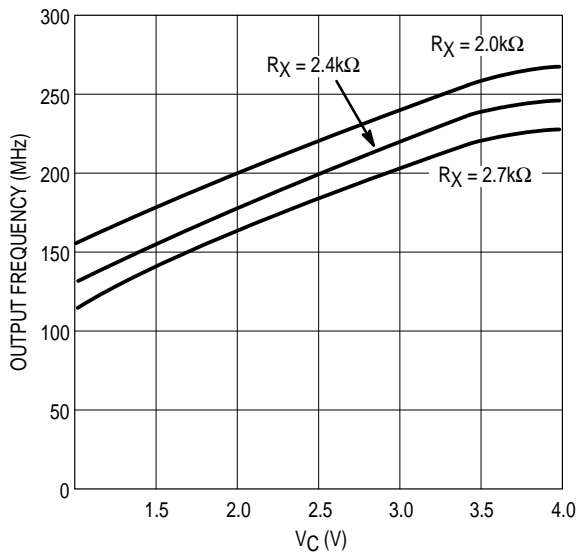


VCO DISABLE FUNCTION TABLE

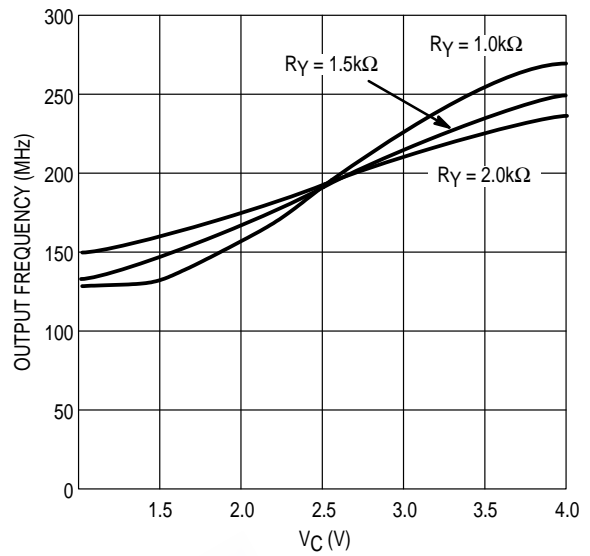
EBE	EBT	FOE, FSE, FST	FOE, FSE
H	H or OPEN	L	H
L or OPEN	H	OSCILLATION	
H	L	OSCILLATION	

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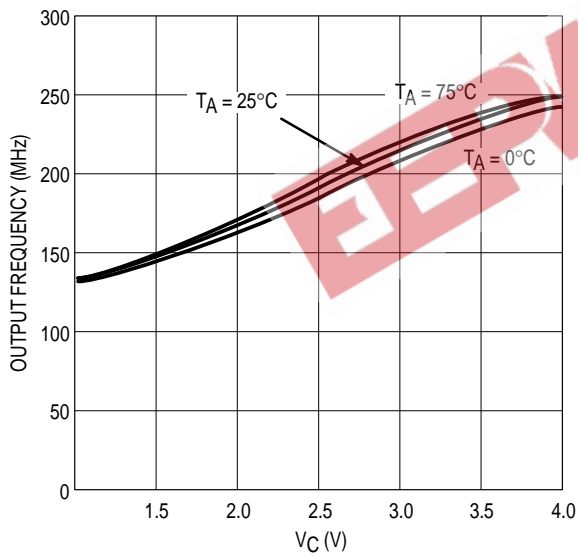
**Figure 6.  $V_C$  versus Output Frequency**  
(Varying  $R_X$  @  $V_{CC} = 5.0\text{ V}$ ;  $T_A = 25^\circ\text{C}$ ;  $R_Y = 1.5\text{ k}\Omega$ )



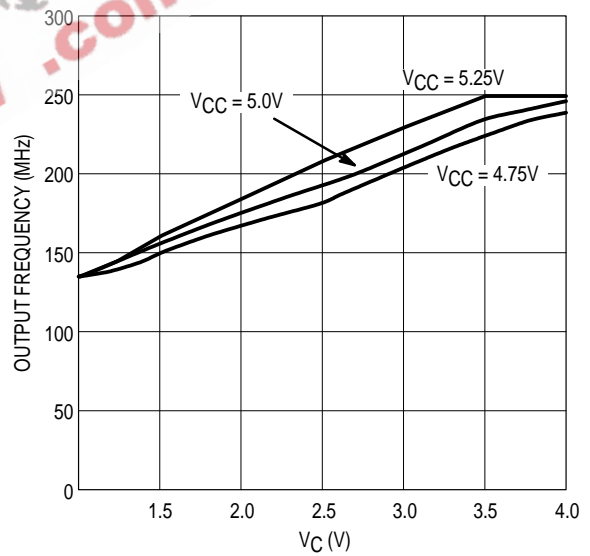
**Figure 7.  $V_C$  versus Output Frequency**  
(Varying  $R_Y$  @  $V_{CC} = 5.0\text{ V}$ ;  $T_A = 25^\circ\text{C}$ ;  $R_X = 2.4\text{ k}\Omega$ )



**Figure 8.  $V_C$  versus Output Frequency**  
(Varying  $T_A$  @  $V_{CC} = 5.0\text{ V}$ ;  $R_X = 2.4\text{ k}\Omega$ ;  $R_Y = 1.5\text{ k}\Omega$ )



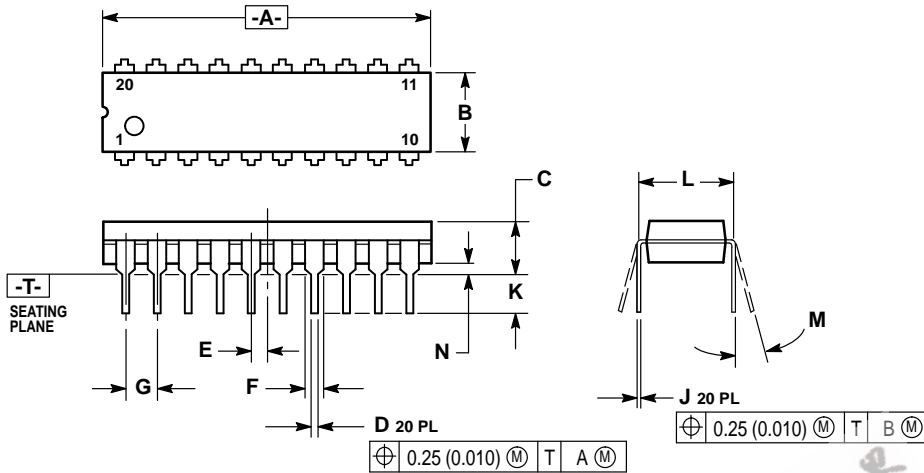
**Figure 9.  $V_C$  versus Output Frequency**  
(Varying  $V_{CC}$  @  $R_X = 2.4\text{ k}\Omega$ ;  $R_Y = 1.5\text{ k}\Omega$ ;  $T_A = 25^\circ\text{C}$ )



# MC12100

## OUTLINE DIMENSIONS

P SUFFIX  
PLASTIC PACKAGE  
CASE 738-03  
ISSUE E



### 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 B DOES NOT INCLUDE MOLD FLASH.

DIM	INCHES	MILLIMETERS
A	1.010	25.66
B	0.240	6.10
C	0.150	3.81
D	0.015	0.39
E	0.050 BSC	1.27 BSC
F	0.050	1.27
G	0.100 BSC	2.54 BSC
J	0.008	0.21
K	0.110	2.80
L	0.300 BSC	7.62 BSC
M	0°	15°
N	0.020	0.51

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