



**MOTOROLA**

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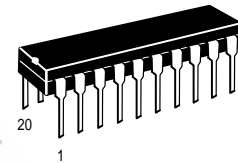
# 130 MHz Voltage Controlled Multivibrator

- 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
- Packages: DIP, PLCC

## MC12101

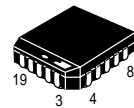
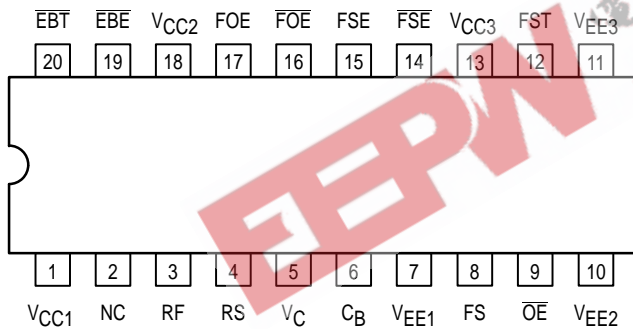
### 130 MHz VOLTAGE CONTROLLED MULTIVIBRATOR

SEMICONDUCTOR TECHNICAL DATA



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 738

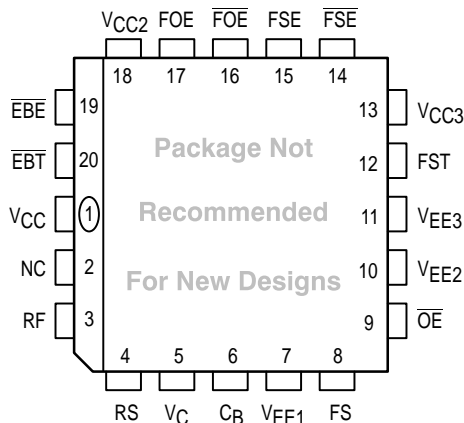
**Pinout: 20-Lead Plastic Package (Top View)**



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

*Not Recommended For New Designs*

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



Package Not Recommended For New Designs

#### PIN NAMES

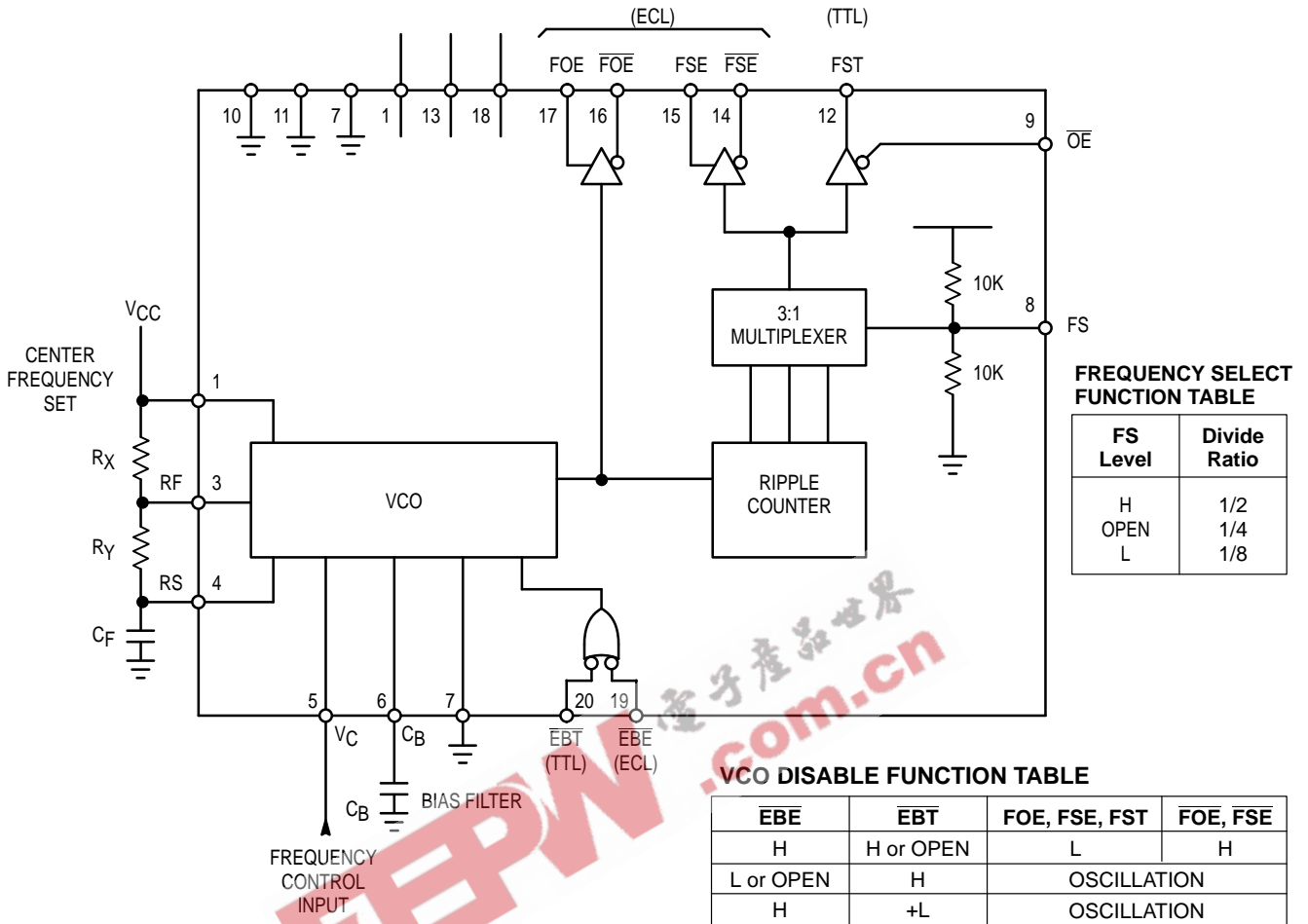
Pin	Function
RF, RS	Center Frequency Inputs
VC	Frequency Control Input
CB	Bias Filter Input
FS	Frequency Select Input
OE	TTL Output Enable
FST	TTL +2, +4, +8 Output
FSE, $\overline{FSE}$	Diff ECL +2, +4, +8 Outputs
FOE, $\overline{FOE}$	Diff ECL +1 Outputs
EBE	VCO Disable, ECL Level Input
EBT	VCO Disable,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

#### ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC12101P	T <sub>A</sub> = -40° to +75°C	Plastic

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Figure 1. Block Diagram



## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Power Supply Voltage	$V_{CC1}$ $V_{CC2}$ $V_{CC3}$	-0.5 to 8.0	V
Input Voltage	$V_{IN}$ (TTL)	-0.5 to $V_{CC}$	V
Input Voltage	$V_{IN}$ (ECL)	-0.5 to $V_{CC}$	V
Output Source Current – Surge	$I_{OUT}(ECL)$	100	mA
Output Source Current – Continuous		50	mA
Junction Operating Temperature	$T_J$	140	°C
Storage Temperature	$T_{STG}$	-55 to 150	°C

NOTE: ESD data available upon request.

## OPERATING CONDITIONS

Parameter	Symbol	Value	Unit
Ambient Temperature	$T_A$	0 to 75	°C
Supply Voltage	$V_{CC}$	4.75 to 5.25	V
TTL High Output Current	$I_{OH}$ (TTL)	-1.0	mA
TTL Low Output Current	$I_{OL}$ (TTL)	20	mA

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**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	$I_{CC}$	80	135	70	100	120	85	150	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	$V_{CC} = 5.0\text{ V}$ , $R_L = 50\text{ }\Omega$ , $V_T = 3.0\text{ V}$
Output High Voltage, ECL	$V_{OHE}$	–	–	3.9	–	4.19	–	–	V	$V_{CC} = 5.0\text{ V}$ , $R_L = 50\text{ }\Omega$ , $V_T = 3.0\text{ V}$
$\overline{EBT}$ 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	$V_{CC} = 5.0\text{ V}$

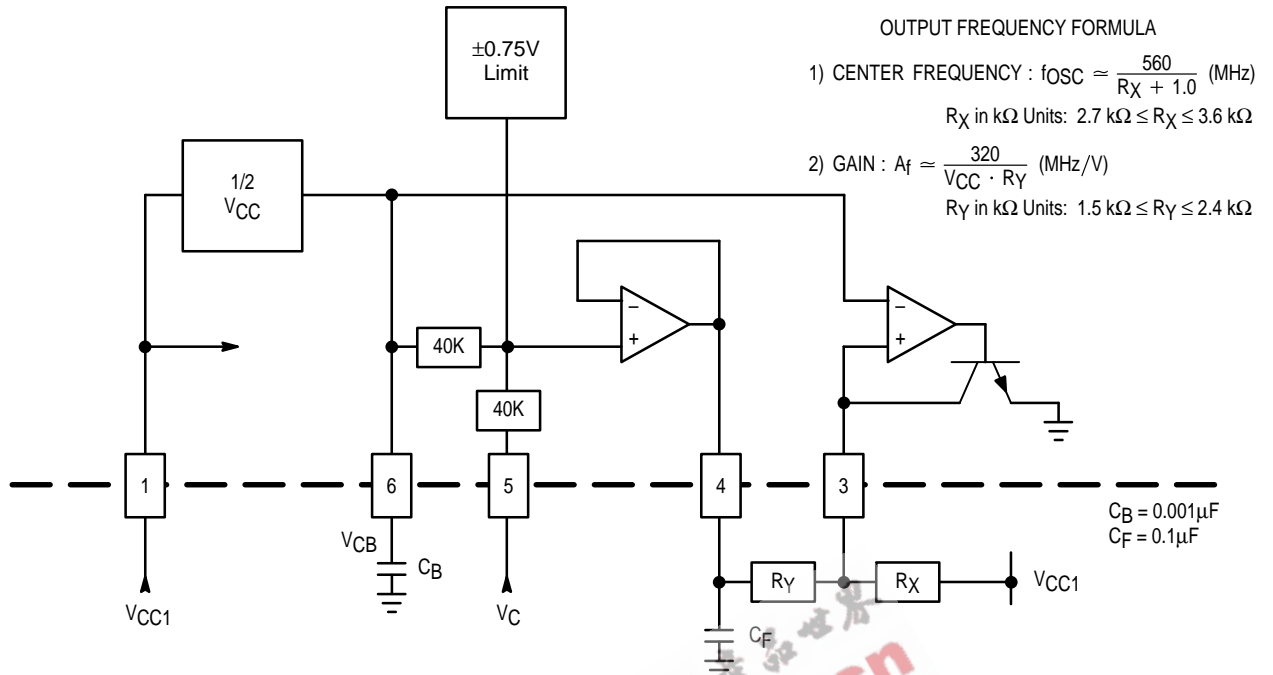
**AC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ;  $R_X = 2.4\text{ k}\Omega$ ;  $R_Y = 1.5\text{ k}\Omega$ ;  $C_B = 0.001\text{ }\mu\text{F}$ ;  $V_T = 3.0\text{ V}$ , unless otherwise noted.)

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	–	–	117	130	143	–	–	MHz	$V_{CC} = 2.0\text{ V}$ $V_{EE} = -3.0\text{ V}$
Frequency Range ( $V_C = 1/2 V_{CC} \pm 1.5\text{V}$ , $V_{CC} = 5.0\text{V}$ )	$F_{MAX} - F_{MIN}$	–	–	68	80	92	–	–	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	–	–	–	–	40	–	–	ns	$\overline{EBT} \sim \text{FST}$
Reset Time	TTO	–	–	–	–	25	–	–	ns	$\overline{EBT} \sim \overline{FOE}/\overline{FOE}$
Reset Time	TTS	–	–	–	–	35	–	–	ns	$\overline{EBT} \sim \overline{FSE}/\overline{FSE}$
Reset Time	TET	–	–	–	–	32	–	–	ns	$\overline{EBE} \sim \text{FST}$
Reset Time	TEO	–	–	–	–	12	–	–	ns	$\overline{EBE} \sim \overline{FOE}/\overline{FOE}$
Reset Time	TES	–	–	–	–	30	–	–	ns	$\overline{EBE} \sim \overline{FSE}/\overline{FSE}$

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

# MC12101

Figure 2. VCO Detail



**Notes:**

- For optimum VCO linearity (MHz/V), the following resistor ranges are recommended:  
 $3.6\text{ k}\Omega \leq R_X \leq 4.6\text{ k}\Omega$  ( $R_Y = 2.0\text{ k}\Omega$ )  
 $1.5\text{ k}\Omega \leq R_Y \leq 2.4\text{ k}\Omega$  ( $R_X = 3.3\text{ k}\Omega$ )
- 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/ $t_{rE}$ / $t_{fE}$  Measurement)

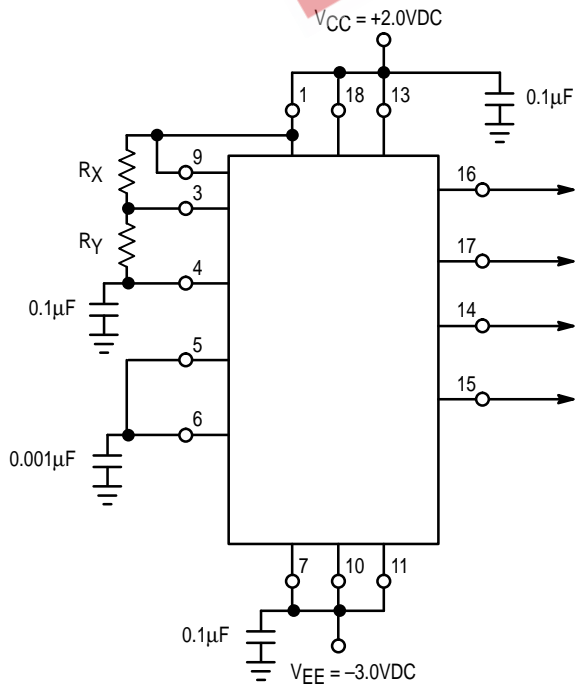
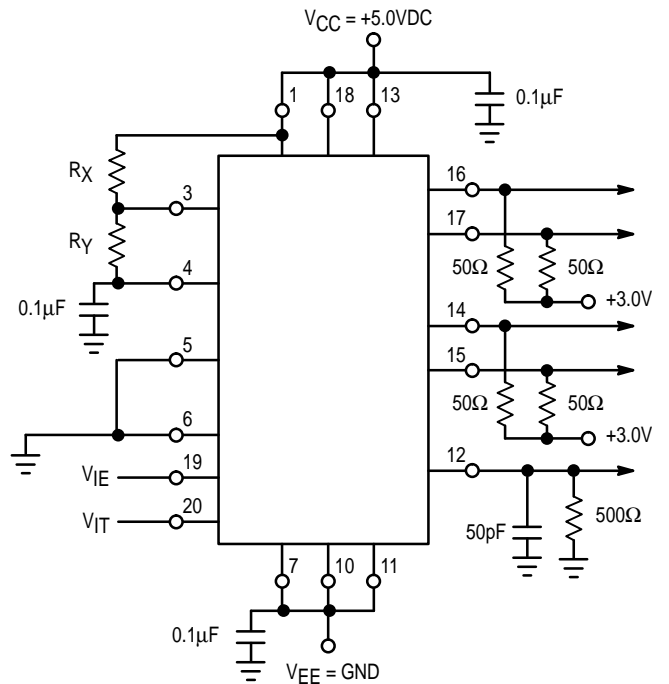
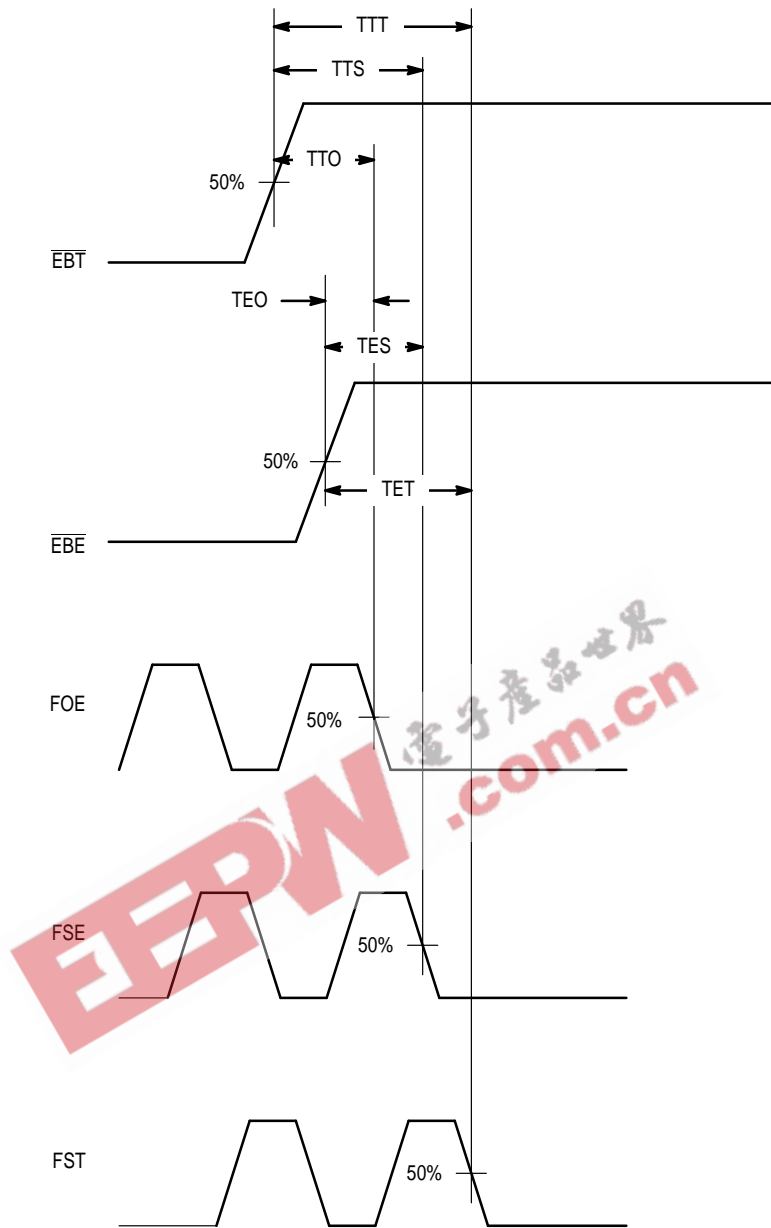


Figure 4. AC Test Circuit (Other Measurements)



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Figure 5. Switching Waveforms

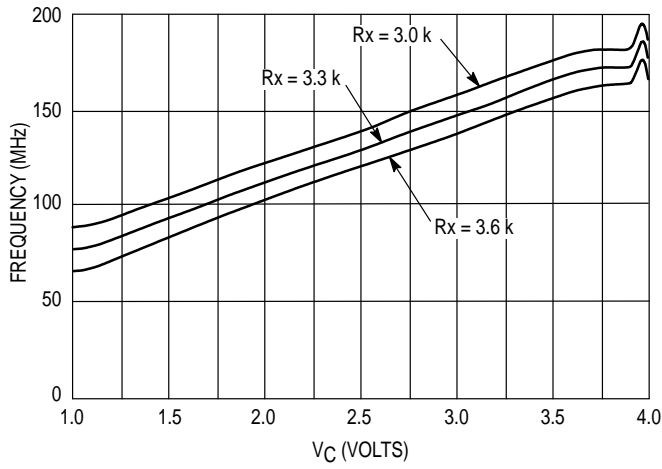


VCO DISABLE FUNCTION TABLE

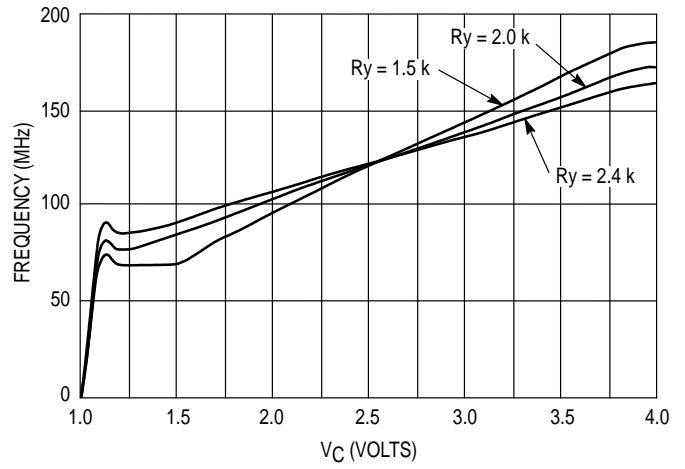
$\overline{EBE}$	$\overline{EBT}$	FOE, FSE, FST	$\overline{FOE}, \overline{FSE}$
H	H or OPEN	L	H
L or OPEN	H	OSCILLATION	
H	L	OSCILLATION	

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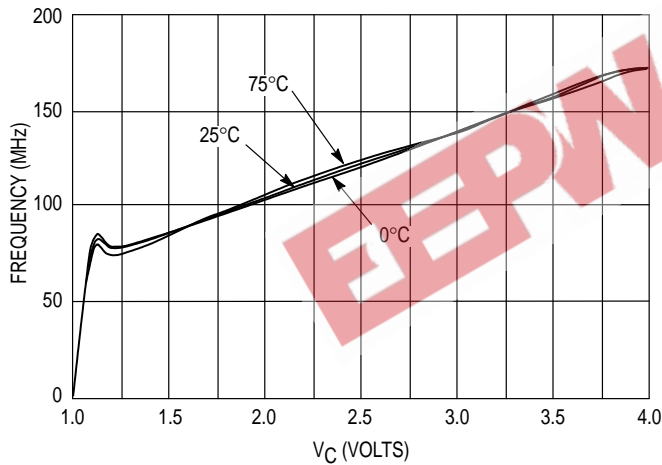
**Figure 6.  $V_C$  versus Output Frequency**  
(Varying  $R_x$  @  $V_{CC} = 5.0$  V;  $T_A = 25^\circ\text{C}$ ;  $R_y = 2.0$  k $\Omega$ )



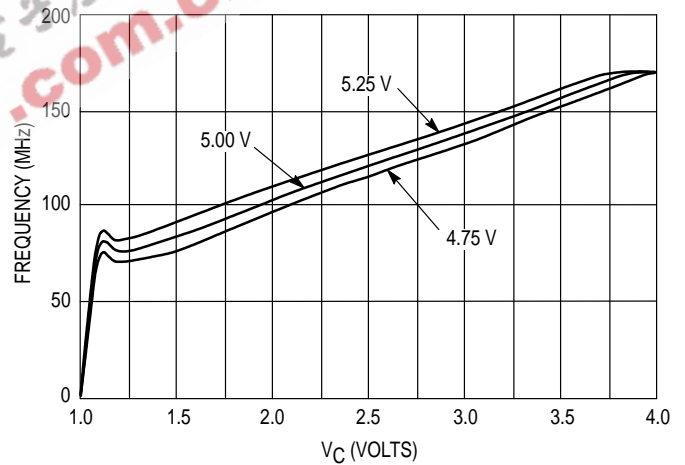
**Figure 7.  $V_C$  versus Output Frequency**  
(Varying  $R_y$  @  $V_{CC} = 5.0$  V;  $T_A = 25^\circ\text{C}$ ;  $R_x = 3.3$  k $\Omega$ )



**Figure 8.  $V_C$  versus Output Frequency**  
(Varying  $T_A$  @  $V_{CC} = 5.0$  V;  $R_x = 3.3$  k $\Omega$ ;  $R_y = 2.0$  k $\Omega$ )



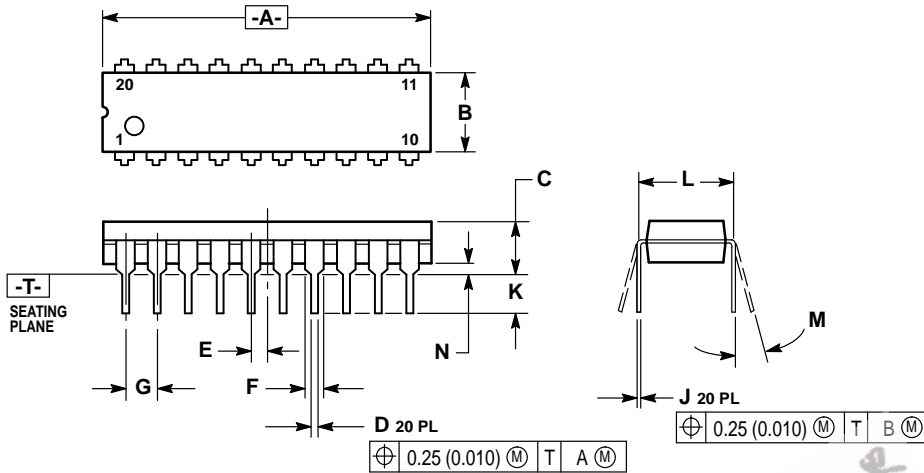
**Figure 9.  $V_C$  versus Output Frequency**  
(Varying  $V_{CC}$  @  $R_x = 3.3$  k $\Omega$ ;  $R_y = 2.0$  k $\Omega$ ;  $T_A = 25^\circ\text{C}$ )



# MC12101

## 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	
	MIN	MAX	MIN	MAX
A	1.010	1.070	25.66	27.17
B	0.240	0.260	6.10	6.60
C	0.150	0.180	3.81	4.57
D	0.015	0.022	0.39	0.55
E	0.050 BSC		1.27 BSC	
F	0.050	0.070	1.27	1.77
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

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