



MOTOROLA

130 MHz Voltage Controlled Multivibrator

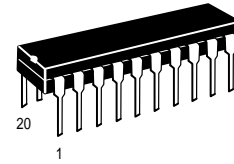
- High Frequency VCM Ideal for PLL Applications
- Single External Resistor Determines Center Frequency; Additional Resistor Determines f/V Sensitivity
- Internal Ripple Counter (1/2, 1/4, 1/8) for Low Frequency Applications, TTL/ECL Outputs
- VCO Output Enable Pins (TTL/ECL Level)
- +5.0 V Single Supply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

Order this document by MC12101/D

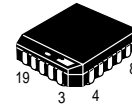
MC12101

130 MHz VOLTAGE CONTROLLED MULTIVIBRATOR

SEMICONDUCTOR TECHNICAL DATA



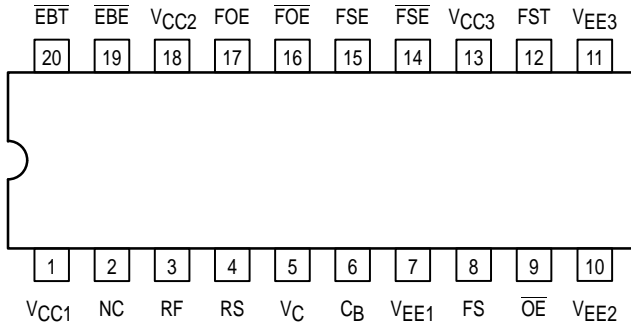
P SUFFIX
PLASTIC PACKAGE
CASE 738



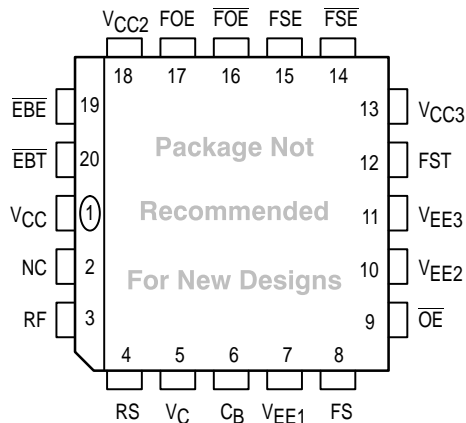
FN SUFFIX
PLASTIC PACKAGE
CASE 775
(PLCC)

Not Recommended For New Designs

Pinout: 20-Lead Plastic Package (Top View)



Pinout: 20-Lead PLCC Package (Top View)



PIN NAMES

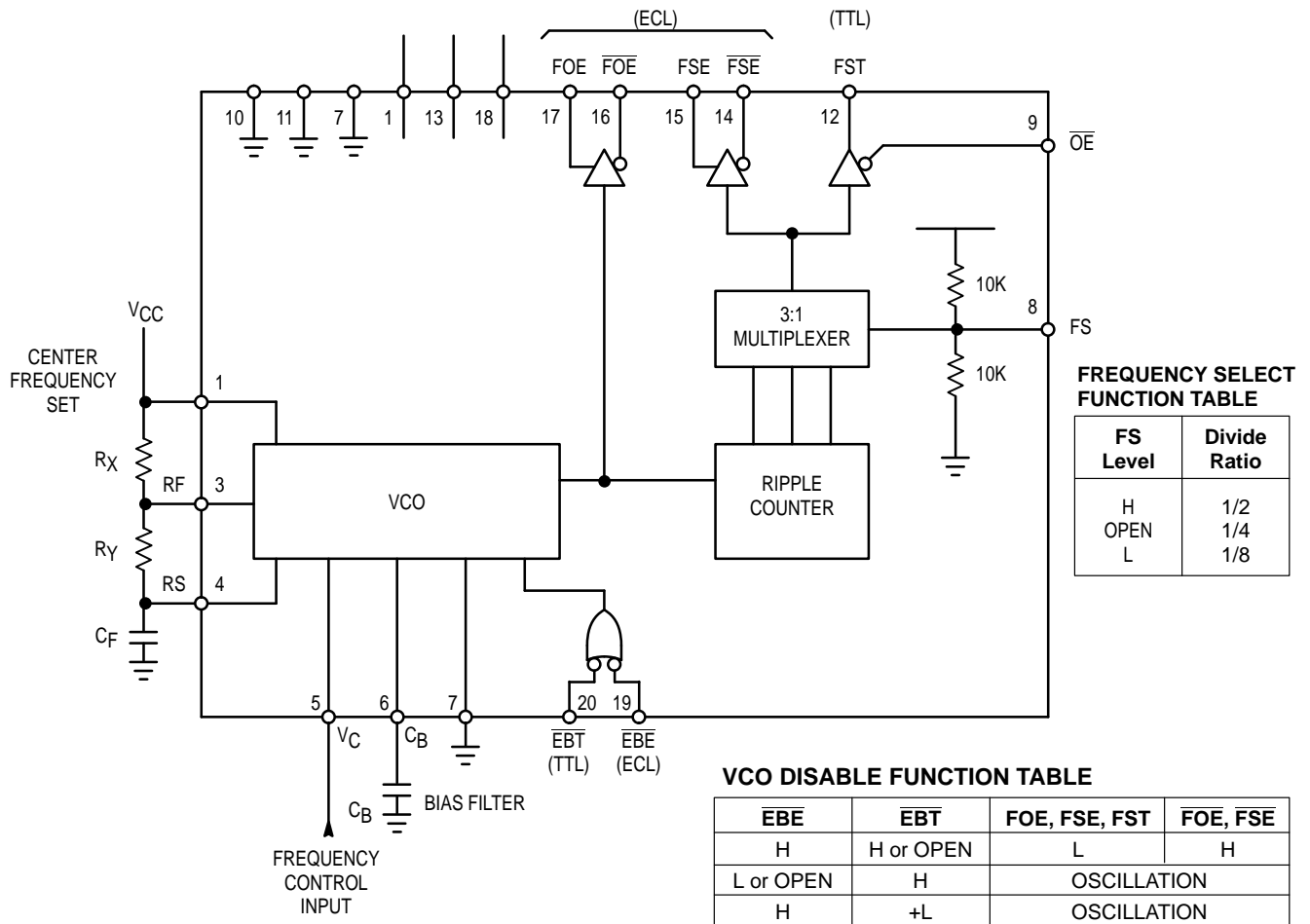
Pin	Function
RF, RS	Center Frequency Inputs
V_C	Frequency Control Input
C_B	Bias Filter Input
FS	Frequency Select Input
$\overline{\text{OE}}$	TTL Output Enable
FST	TTL +2, +4, +8 Output
$\text{FSE}, \overline{\text{FSE}}$	Diff ECL +2, +4, +8 Outputs
$\text{FOE}, \overline{\text{FOE}}$	Diff ECL +1 Outputs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

ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC12101P	$T_A = -40^\circ \text{ to } +75^\circ \text{C}$	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	-	-	μA	$V_{IN} = 0.4 \text{ V}$
\overline{EBT} Input High Current	I_{IHT}	-	-	-	-	20	-	-	μA	$V_{IN} = 2.7 \text{ V}$
		-	-	-	-	100	-	-	μA	$V_{IN} = 7.0 \text{ V}$
\overline{EBE} Input High Current	I_{INHE}	-	-	-	-	250	-	-	μA	$V_{IN} = 4.19 \text{ V}$
\overline{EBE} Input Low Current	I_{INLE}	-	-	1.0	-	-	-	-	μA	$V_{IN} = 3.05 \text{ V}$
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}	-	-	± 1.1	± 1.3	± 1.5	-	-	V	$V_{CC} = 5.0 \text{ V}$
C_B Output Voltage	V_{CB}	-	-	2.35	2.50	2.65	-	-	V	$V_{CC} = 5.0 \text{ V}$

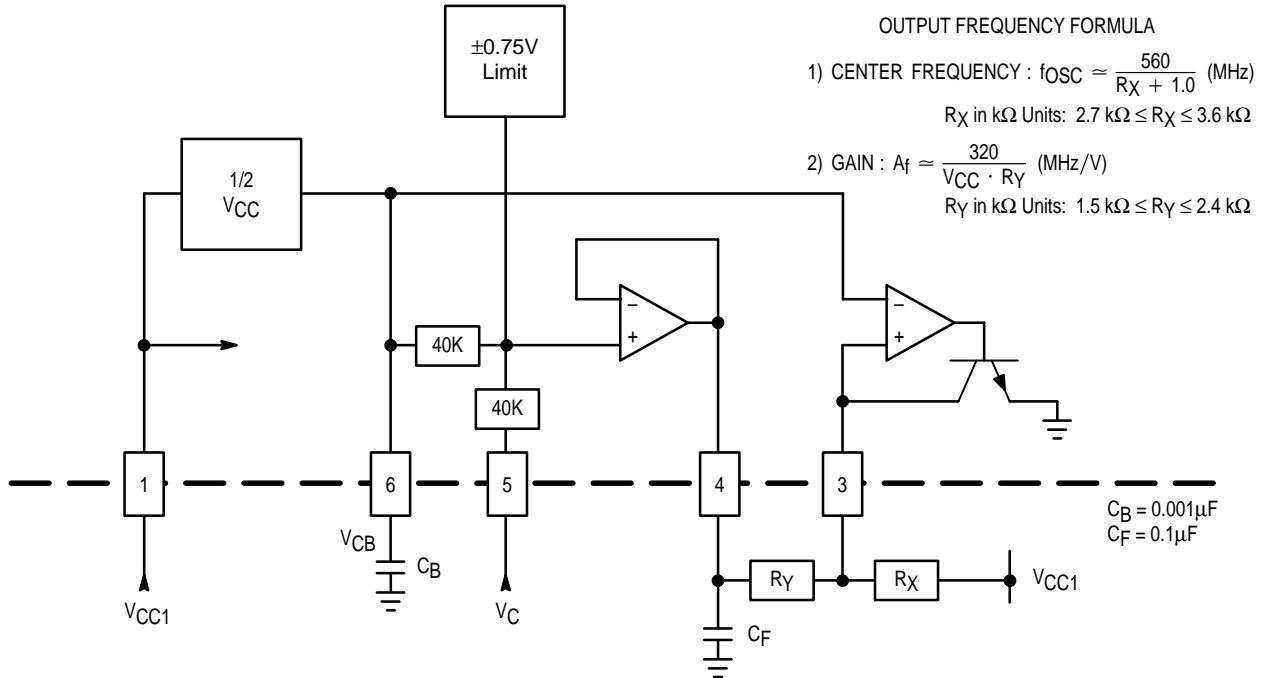
AC CHARACTERISTICS ($V_{CC} = 5.0 \text{ V}$; $R_X = 2.4 \text{ k}\Omega$; $R_Y = 1.5 \text{ k}\Omega$; $C_B = 0.001 \text{ }\mu\text{F}$; $V_T = 3.0 \text{ V}$, unless otherwise noted.)

Characteristic	Symbol	0°C		25°C			75°C		Unit	Condition
		Min	Max	Min	Typ	Max	Min	Max		
Center Frequency ($V_C - V_{CB} = 0\text{V}$)	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	$\overline{EBT} \sim \overline{FOE}/\text{FOE}$
Reset Time	TTS	-	-	-	-	35	-	-	ns	$\overline{EBT} \sim \text{FSE}/\overline{FSE}$
Reset Time	TET	-	-	-	-	32	-	-	ns	$\overline{EBE} \sim \text{FST}$
Reset Time	TEO	-	-	-	-	12	-	-	ns	$\overline{EBE} \sim \overline{FOE}/\text{FOE}$
Reset Time	TES	-	-	-	-	30	-	-	ns	$\overline{EBE} \sim \text{FSE}/\overline{FSE}$

NOTE: Loading: ECL = 50 Ω to V_T ; TTL = 500 Ω , 50 pF

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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)

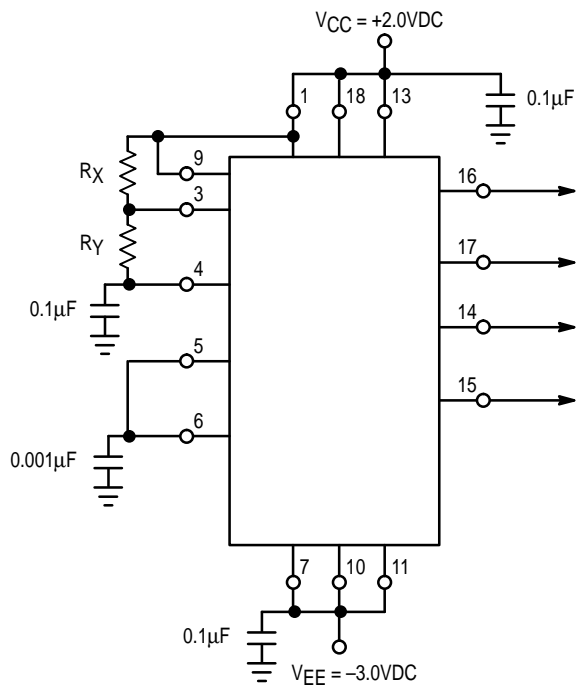
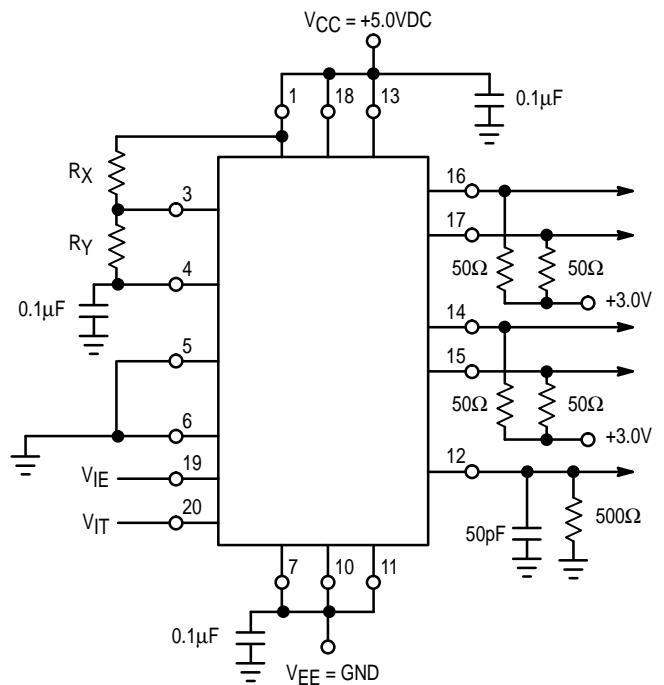
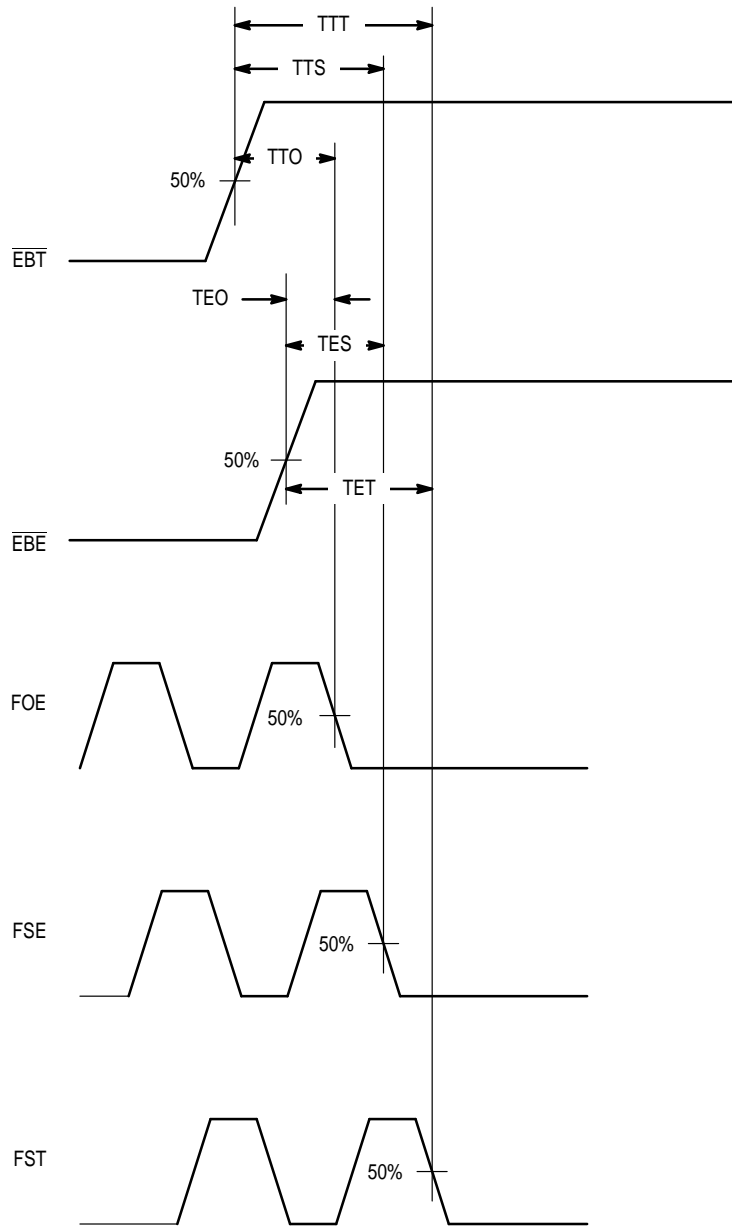


Figure 4. AC Test Circuit (Other Measurements)



MC12101

Figure 5. Switching Waveforms



VCO DISABLE FUNCTION TABLE

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

Figure 6. V_C versus Output Frequency

(Varying R_x @ $V_{CC} = 5.0\text{ V}$; $T_A = 25^\circ\text{C}$; $R_y = 2.0\text{ k}\Omega$)

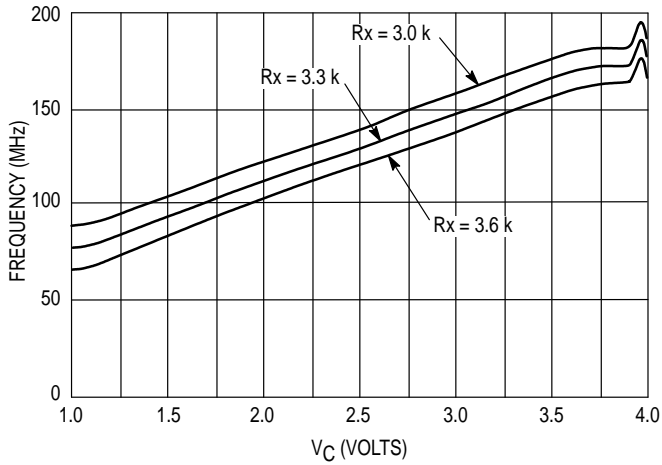


Figure 7. V_C versus Output Frequency

(Varying R_y @ $V_{CC} = 5.0\text{ V}$; $T_A = 25^\circ\text{C}$; $R_x = 3.3\text{ k}\Omega$)

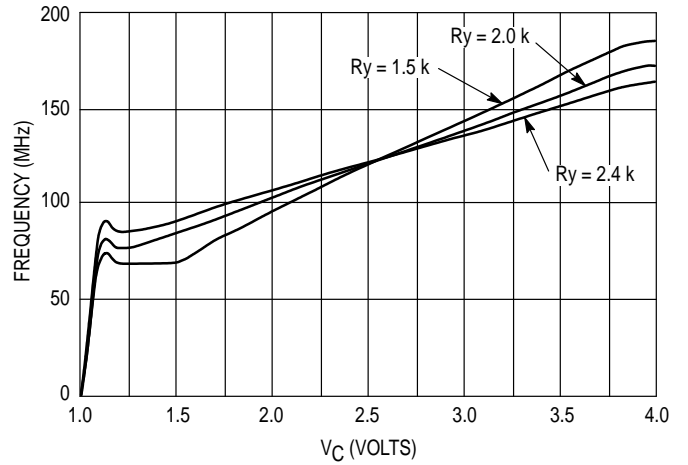


Figure 8. V_C versus Output Frequency

(Varying T_A @ $V_{CC} = 5.0\text{ V}$; $R_x = 3.3\text{ k}\Omega$; $R_y = 2.0\text{ k}\Omega$)

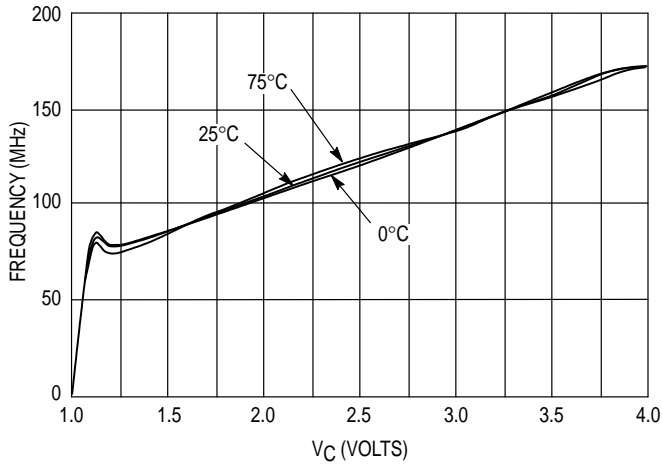
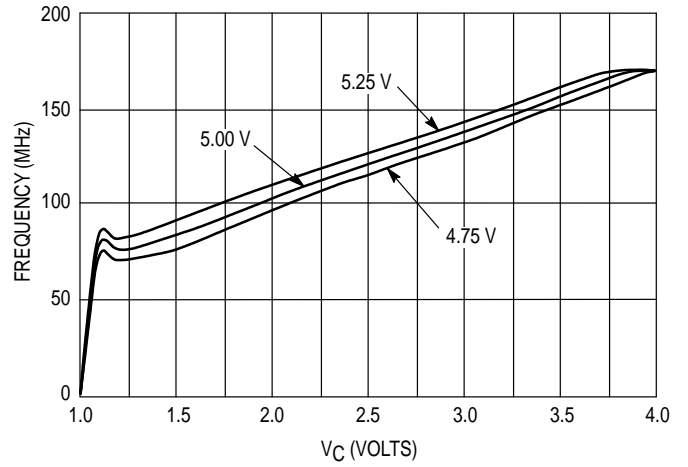


Figure 9. V_C versus Output Frequency

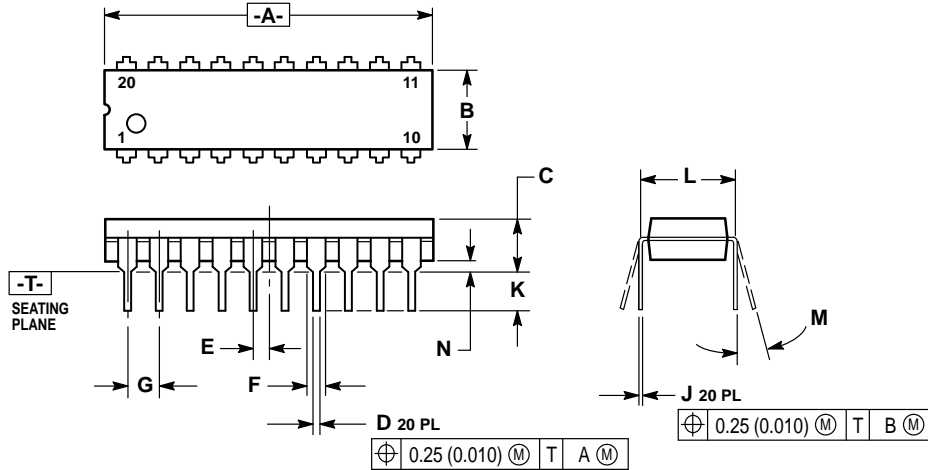
(Varying V_{CC} @ $R_x = 3.3\text{ k}\Omega$; $R_y = 2.0\text{ k}\Omega$; $T_A = 25^\circ\text{C}$)



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		1.27	
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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