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MOTOROLA

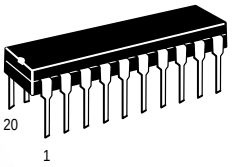
MC12101

130 MHz Voltage Controlled Multivibrator

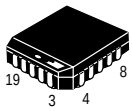
- High Frequency VCM Ideal for PLL Applications
- Single External Resistor Determines Center Frequency; Additional Resistor Determines f/V Sensitivity
- Internal Ripple Counter (1/2, 1/4, 1/8) for Low Frequency Applications, TTL/ECL Outputs
- VCO Output Enable Pins (TTL/ECL Level)
- +5.0 V Single Supply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

130 MHz VOLTAGE CONTROLLED MULTIVIBRATOR

SEMICONDUCTOR TECHNICAL DATA



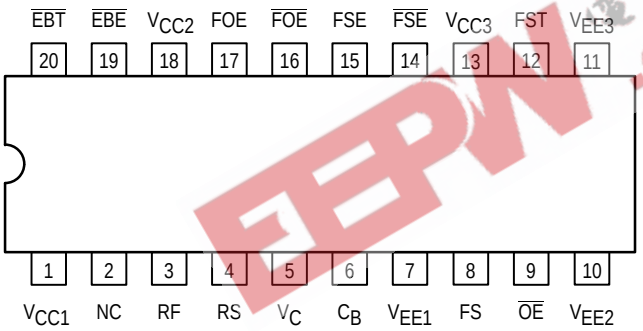
P SUFFIX
PLASTIC PACKAGE
CASE 738



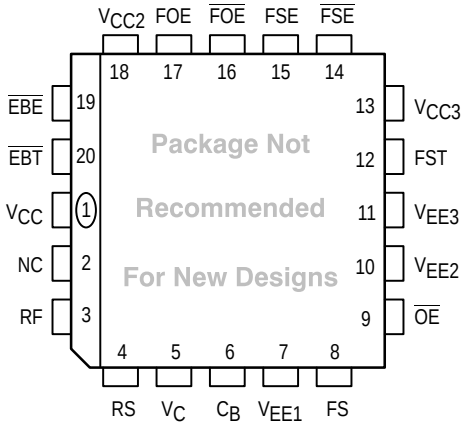
FN SUFFIX
PLASTIC PACKAGE
CASE 775
(PLCC)

Not Recommended For New Designs

Pinout: 20-Lead Plastic Package (Top View)



Pinout: 20-Lead PLCC Package (Top View)



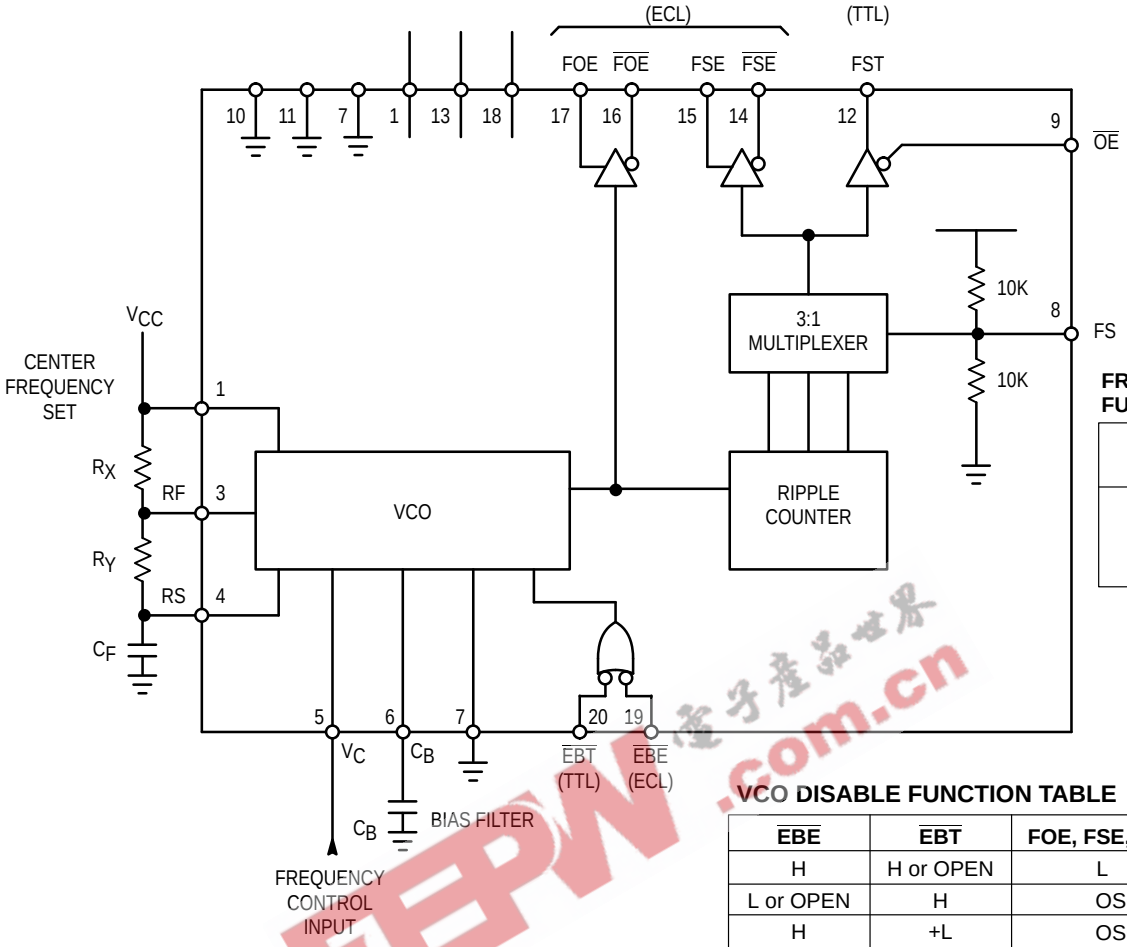
PIN NAMES

Pin	Function
RF, RS	Center Frequency Inputs
V_C	Frequency Control Input
C_B	Bias Filter Input
FS	Frequency Select Input
$\overline{OE}$	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
$\overline{EBE}$	VCO Disable, ECL Level Input
$\overline{EBT}$	VCO Disable, TTL Level Input

ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC12101P	T_A = –40° to +75°C	Plastic

Figure 1. Block Diagram



FREQUENCY SELECT FUNCTION TABLE

FS Level	Divide Ratio
H	1/2
OPEN	1/4
L	1/8

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	

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

DC CHARACTERISTICS (V_{CC} = 5.0 V ±5%; R_X = 2.4 kΩ; R_Y = 1.5 kΩ; C_B = 0.001 µF, unless otherwise noted.)

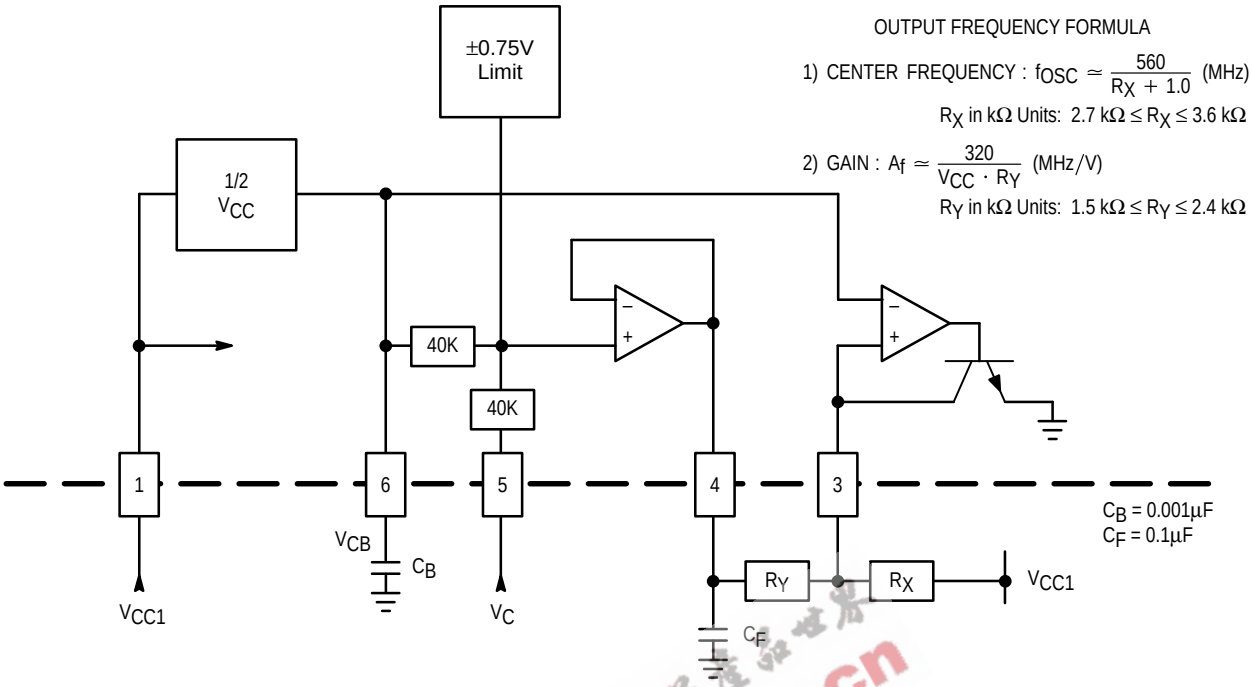
Characteristic	Symbol	0°C		25°C			75°C		Unit	Condition
		Min	Max	Min	Typ	Max	Min	Max		
Supply Current	I_{CC}	80	135	70	100	120	85	150	mA	$\overline{EBT}$ = $\overline{EBE}$ = V_{CC} (ECL, TTL)
Output Low Voltage, TTL	V_{OLT}	–	–	–	–	0.5	–	–	V	F_S = GND
Output High Voltage, TTL	V_{OHT}	–	–	2.4	–		–	–	V	F_S = GND
Output Low Voltage, ECL	V_{OLE}	–	–	3.0	–	3.4	–	–	V	V_{CC} = 5.0 V, R_L = 50 Ω, V_T = 3.0 V
Output High Voltage, ECL	V_{OHE}	–	–	3.9	–	4.19	–	–	V	V_{CC} = 5.0 V, R_L = 50 Ω, V_T = 3.0 V
$\overline{EBT}$ Input Low Current	I_{ILT}	–	–	–	–	400	–	–	µA	V_{IN} = 0.4 V
$\overline{EBT}$ Input High Current	I_{IHT}	–	–	–	–	20	–	–	µA	V_{IN} = 2.7 V
		–	–	–	–	100	–	–	µA	V_{IN} = 7.0 V
$\overline{EBE}$ Input High Current	I_{INHE}	–	–	–	–	250	–	–	µA	V_{IN} = 4.19 V
$\overline{EBE}$ Input Low Current	I_{INLE}	–	–	1.0	–	–	–	–	µA	V_{IN} = 3.05 V
FS Input, Max “L” Level	V_{ILS}	–	–	–	–	1.2	–	–	V	V_{CC} = 5.0 V
FS Input, “Medium” Level	V_{IMS}	–	–	2.0	–	3.0	–	–	V	V_{CC} = 5.0 V
FS Input, Min “H” Level	V_{IHS}	–	–	3.8	–	–	–	–	V	V_{CC} = 5.0 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 V
$\overline{EBE}$ Input Low Voltage	V_{ILE}	–	–	3.05	–	3.52	–	–	V	V_{CC} = 5.0 V
V_C Input Voltage, V_C = V_{CC} ÷ 2	V_{LM}	–	–	±1.1	±1.3	±1.5	–	–	V	V_{CC} = 5.0 V
C_B Output Voltage	V_{CB}	–	–	2.35	2.50	2.65	–	–	V	V_{CC} = 5.0 V

AC CHARACTERISTICS (V_{CC} = 5.0 V; R_X = 2.4 kΩ; R_Y = 1.5 kΩ; C_B = 0.001 µF; V_T = 3.0 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} = 0V)	FO	–	–	117	130	143	–	–	MHz	V_{CC} = 2.0 V, V_{EE} = –3.0 V
Frequency Range (V_C = 1/2 V_{CC} ±1.5V, V_{CC} = 5.0V)	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	$\overline{EBT}$ ~ FST
Reset Time	TTO	–	–	–	–	25	–	–	ns	$\overline{EBT}$ ~ FOE/$\overline{FOE}$
Reset Time	TTS	–	–	–	–	35	–	–	ns	$\overline{EBT}$ ~ FSE/$\overline{FSE}$
Reset Time	TET	–	–	–	–	32	–	–	ns	$\overline{EBE}$ ~ FST
Reset Time	TEO	–	–	–	–	12	–	–	ns	$\overline{EBE}$ ~ FOE/$\overline{FOE}$
Reset Time	TES	–	–	–	–	30	–	–	ns	$\overline{EBE}$ ~ FSE/$\overline{FSE}$

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

Figure 2. VCO Detail



Notes:

- For optimum VCO linearity (MHz/V), the following resistor ranges are recommended:
  3.6 kΩ ≤ R_X ≤ 4.6 kΩ (R_Y = 2.0 kΩ)
  1.5 kΩ ≤ R_Y ≤ 2.4 kΩ (R_X = 3.3 kΩ)
- 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)

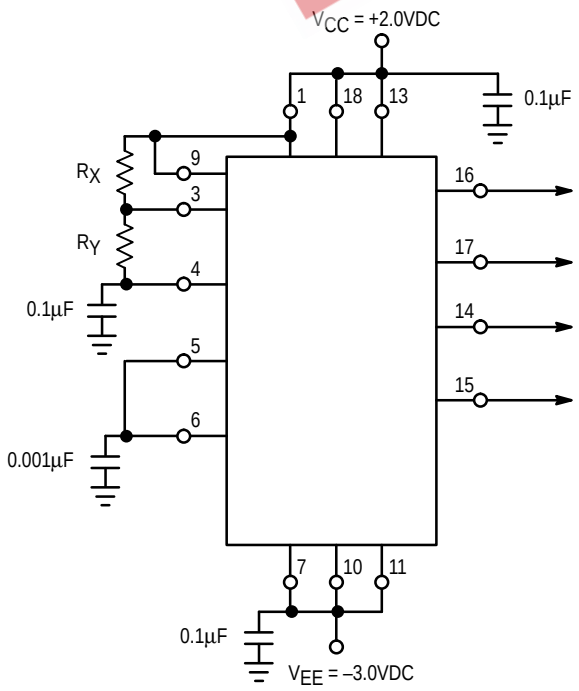


Figure 4. AC Test Circuit (Other Measurements)

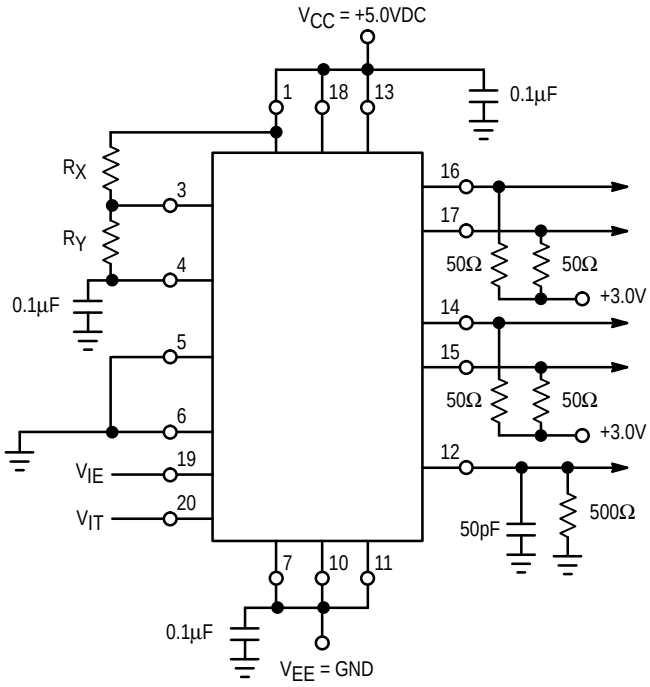
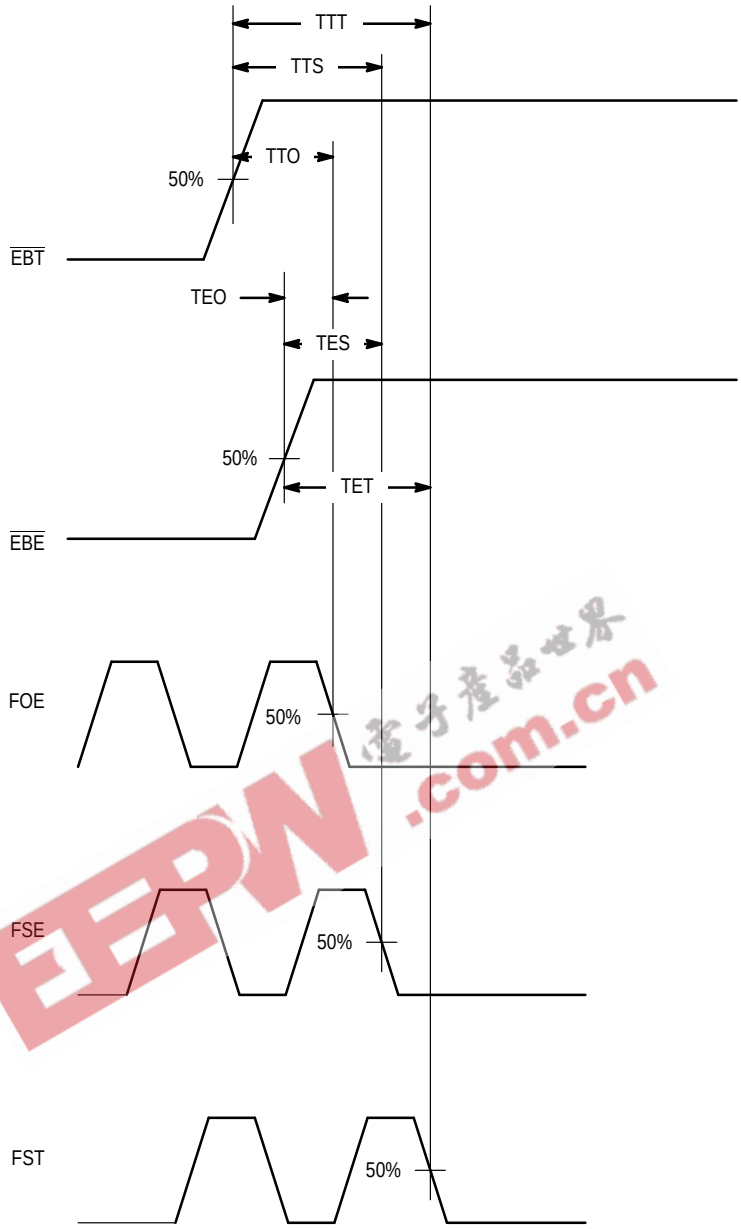


Figure 5. Switching Waveforms



VCO DISABLE FUNCTION TABLE

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

Figure 6. V_C versus Output Frequency
(Varying Rx @ V_{CC} = 5.0 V; T_A = 25°C; Ry = 2.0 kΩ)

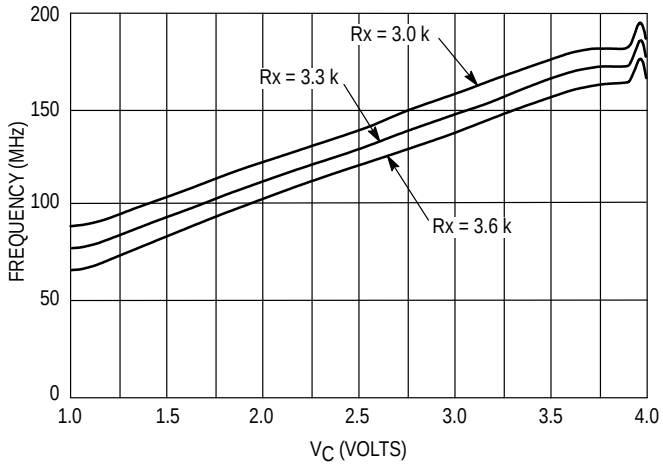


Figure 7. V_C versus Output Frequency
(Varying Ry @ V_{CC} = 5.0 V; T_A = 25°C; Ry = 3.3 kΩ)

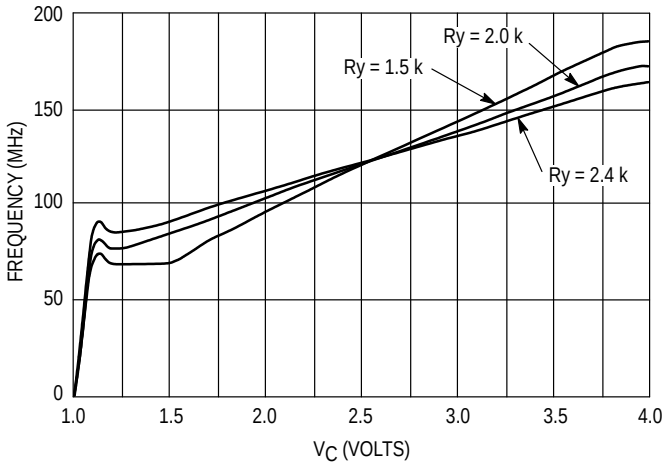


Figure 8. V_C versus Output Frequency
(Varying T_A @ V_{CC} = 5.0 V; Rx = 3.3 kΩ; Ry = 2.0 kΩ)

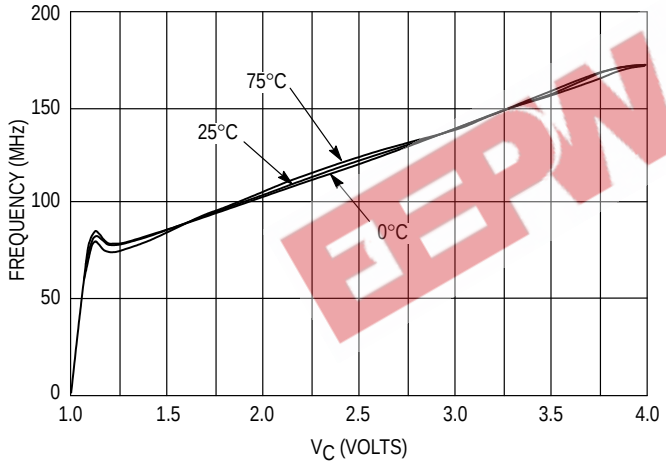
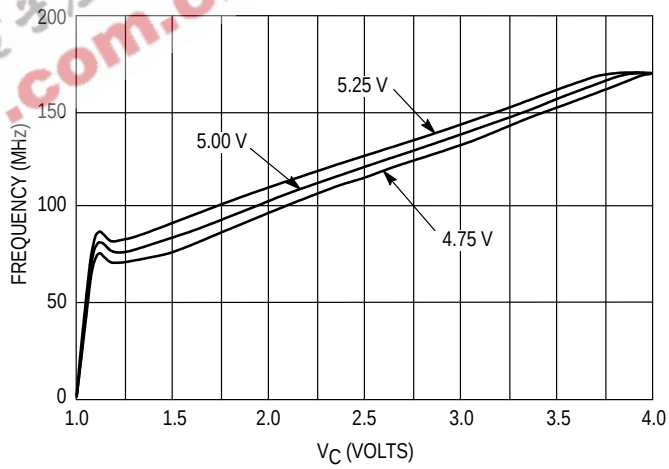
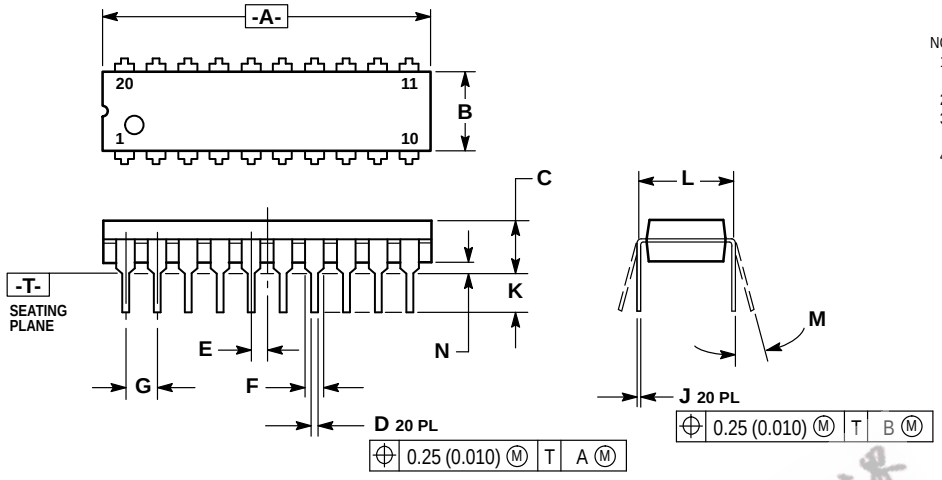


Figure 9. V_C versus Output Frequency
(Varying V_{CC} @ Rx = 3.3 kΩ; Ry = 2.0 kΩ; T_A = 25°C)



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.

	INCHES		MILLIMETERS	
DIM	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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