MOTOROLA

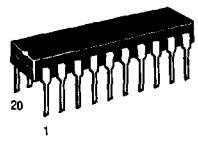
200 MHz Voltage Controlled Multivibrator

- 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

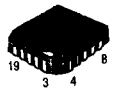
MC12100

200 MHz VOLTAGE CONTROLLED MULTIVIBRATOR

SEMICONDUCTOR TECHNICAL DATA



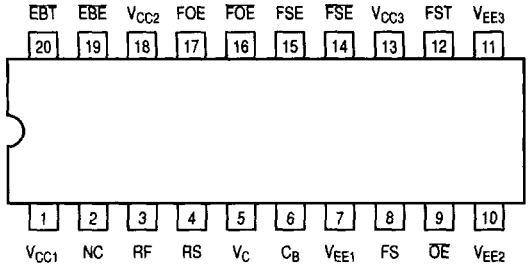
P SUFFIX
PLASTIC PACKAGE
CASE 738



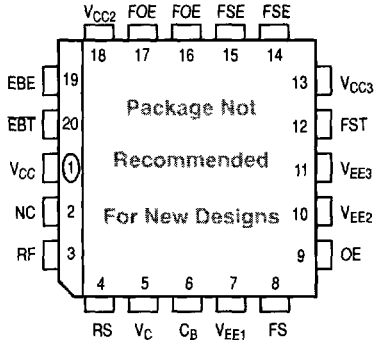
FN SUFFIX
PLASTIC PACKAGE
CASE 775
(PLCC)

Not Recommended For New Designs

Pinout: 20-Lead Plastic Package (Top View)



Pinout: 20-Lead PLCC Package (Top View)



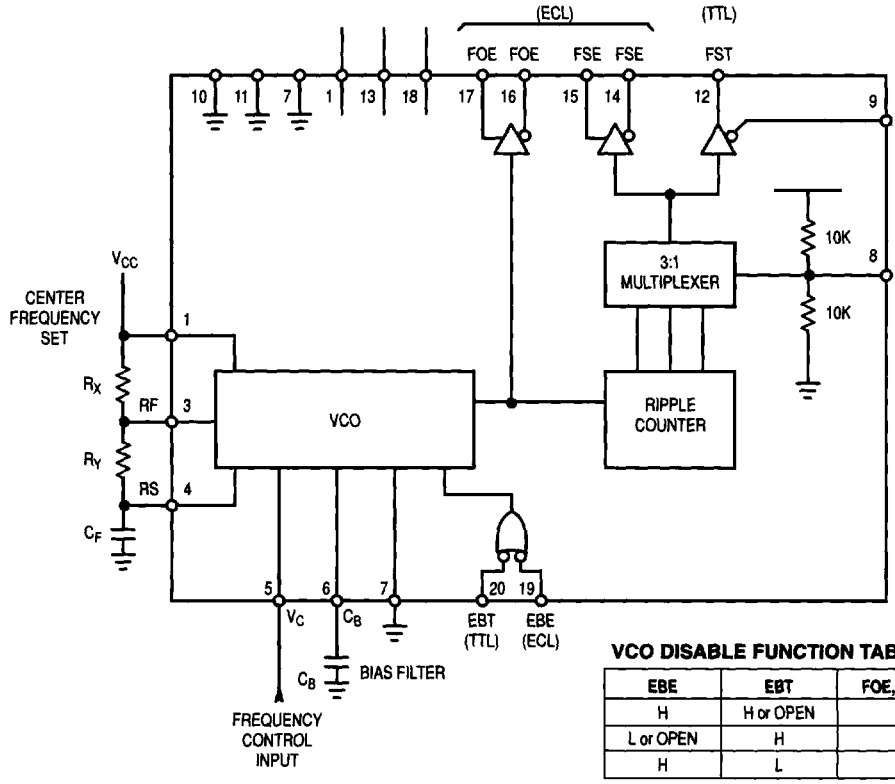
PIN NAMES

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
MC12100P	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

EBE	EBT	FOE, FSE, FST	FOE, 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.)

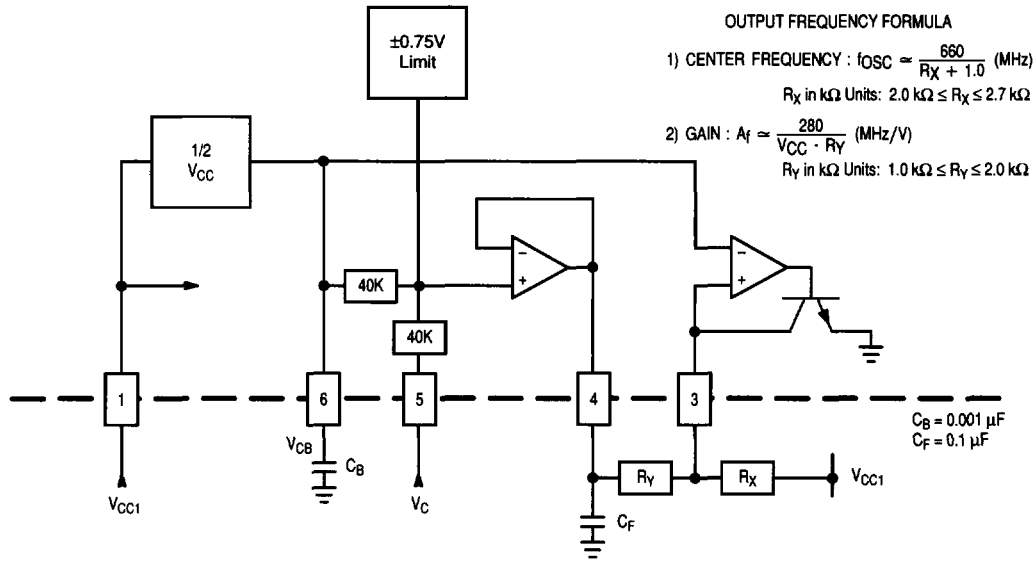
Characteristic	Symbol	0°C		25°C			75°C		Unit	Condition
		Min	Max	Min	Typ	Max	Min	Max		
Supply Current	I_{CC}	75	120	65	90	110	80	135	mA	$\overline{EBT}$ = $\overline{EBE}$ = V_{CC} (ECL, TTL)
Output Low Voltage, TTL	V_{OLT}	-	-	-	-	0.5	-	-	V	F_S = GND
Output High Voltage, TTL	V_{OHT}	-	-	2.4	-		-	-	V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

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	-	-	180	200	220	-	-	MHz	V_{CC} = +2.0V V_{EE} = –3.0V
Frequency Range (V_C = 1/2 V_{CC} ±1.5V, V_{CC} = 5.0V)	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	$\overline{EBT}$ ~ FST
Reset Time	TTO	-	-	-	-	25	-	-	ns	$\overline{EBT}$ ~ FOE/$\overline{FOE}$
Reset Time	TTS	-	-	-	-	30	-	-	ns	$\overline{EBT}$ ~ FSE/$\overline{FSE}$
Reset Time	TET	-	-	-	-	37	-	-	ns	$\overline{EBE}$ ~ FST
Reset Time	TEO	-	-	-	-	12	-	-	ns	$\overline{EBE}$ ~ FOE/$\overline{FOE}$
Reset Time	TES	-	-	-	-	25	-	-	ns	$\overline{EBE}$ ~ FSE/$\overline{FSE}$

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

Figure 2. VCO Detail



OUTPUT FREQUENCY FORMULA

1) CENTER FREQUENCY : $f_{OSC} \simeq \frac{660}{R_X + 1.0}$ (MHz)

R_X in kΩ Units: 2.0 kΩ ≤ R_X ≤ 2.7 kΩ

2) GAIN : $A_f \simeq \frac{280}{V_{CC} \cdot R_Y}$ (MHz/V)

R_Y in kΩ Units: 1.0 kΩ ≤ R_Y ≤ 2.0 kΩ

Notes:

- For optimum VCO linearity (MHz/V), the following resistor ranges are recommended:
  2.0 kΩ ≤ R_X ≤ 2.7 kΩ (R_Y = 1.5 kΩ)
  1.0 kΩ ≤ R_Y ≤ 2.0 kΩ (R_X = 2.4 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)

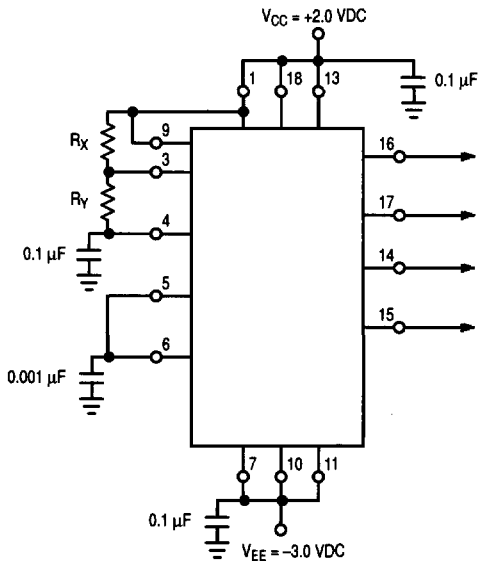


Figure 4. AC Test Circuit (Other Measurements)

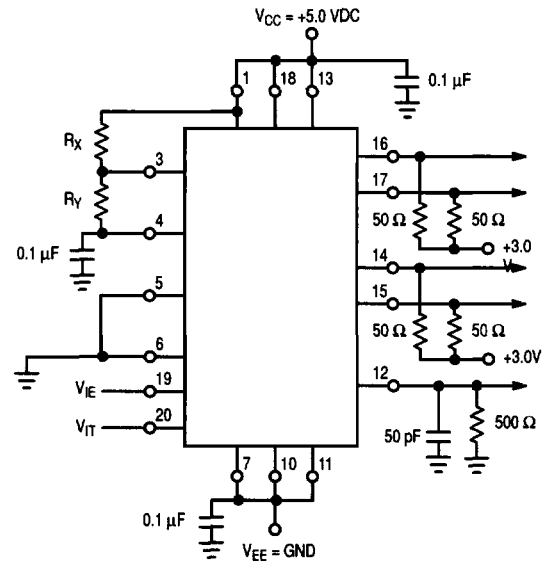
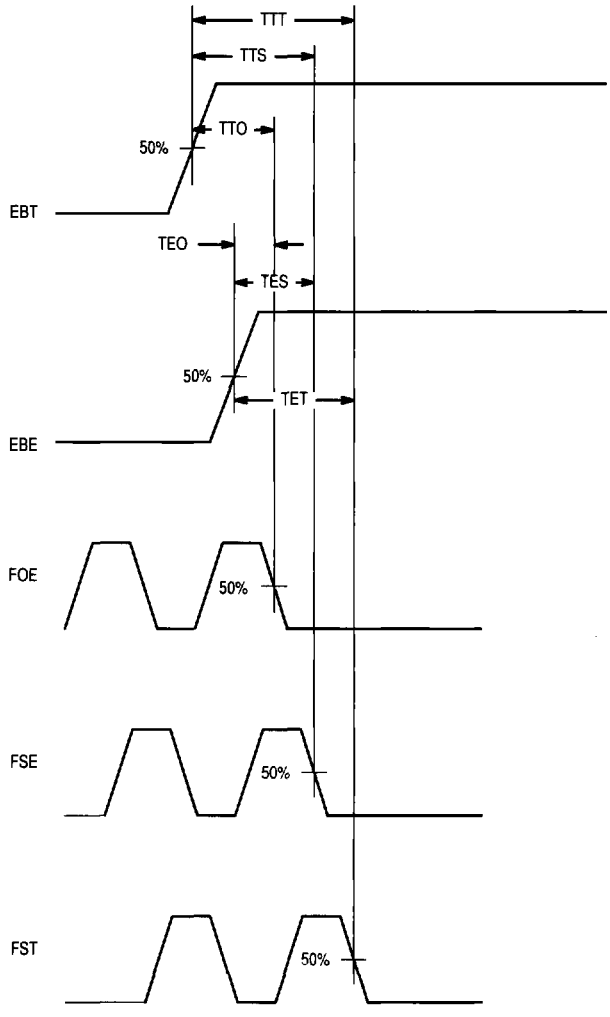


Figure 5. Switching Waveforms



VCO DISABLE FUNCTION TABLE

EBE	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 V; T_A = 25°C; R_Y = 1.5 kΩ)

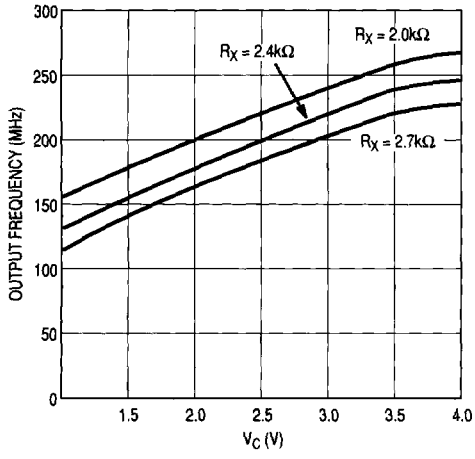


Figure 7. V_C versus Output Frequency
(Varying R_Y @ V_{CC} = 5.0 V; T_A = 25°C; R_X = 2.4 kΩ)

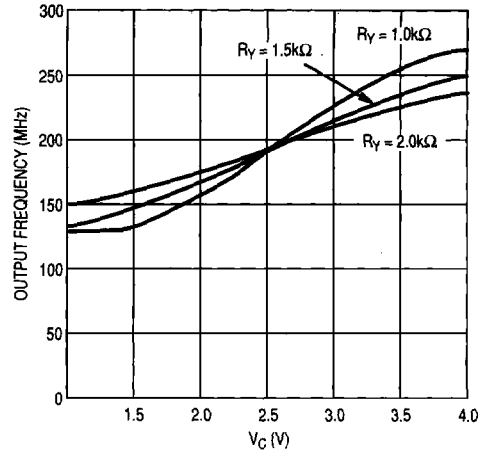


Figure 8. V_C versus Output Frequency
(Varying T_A @ V_{CC} = 5.0 V; R_X = 2.4 kΩ; R_Y = 1.5 kΩ)

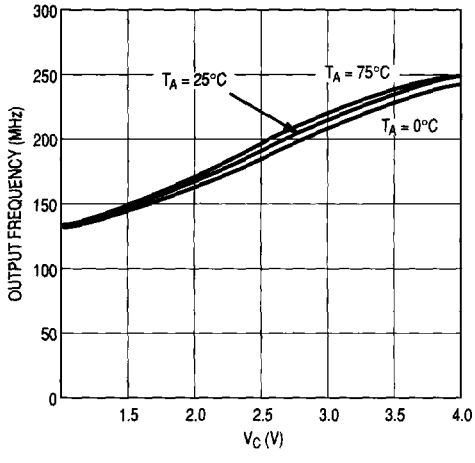


Figure 9. V_C versus Output Frequency
(Varying V_{CC} @ R_X = 2.4 kΩ; R_Y = 1.5 kΩ; T_A = 25°C)