

intech

ADVANCED ANALOG

FEATURES:

- Slew Rate 90 V/ μ s typ
- Accuracy 0.5% typ
- Nonlinearity 0.4%
- Small Size, 1.5 x 1.5 x 0.4"

DESCRIPTION:

The Models A-701 and A-702 are high-speed, four quadrant multiplier modules using the variable transconductance principle. They also are useful for dividing, square rooting, squaring, frequency doubling and other mathematical computations. Division can be accomplished with the A-701 and A-702 with the addition of only one external potentiometer thereby eliminating the need for an external amplifier. The model A-702 has an internal trim accuracy of 1% and can be externally trimmed to an accuracy better than 0.5%, (Fig. 1).

As can be noted from Fig. 1, accuracies much better than 0.5% can be obtained whenever the requirement is less than full scale, particularly in the range of a 5 V difference between X and Y, an accuracy approaching 0.1% can be realized.

The addition of an internal amplifier suitable for use in divider applications greatly enhances the versatility of the A-701 and A-702, Figure 2. This allows the maximum usage of the module in the

X INPUT (volts)	Y INPUT (volts)	OUTPUT ERROR (millivolts)
-10	+10	+26
-5	-1	-0.8
-1	+0.5	+2.4
-0.5	+5	+1
+0.5	-5	-2.5
+1	-0.5	-4
+5	+1	+16
+10	-10	+51

Figure 1 TYPICAL OUTPUT ERROR (mV) vs X AND Y INPUT VOLTAGE

A-701, A-702

HIGH SPEED, FOUR QUADRANT MULTIPLIER MODULES

minimum amount of space, without the added complication and expense of finding suitable external components.

Some definition of two important parameters of a high speed multiplier module such as the A-701 and A-702 need explanation. Slew rate is measured from worst case conditioning where input changes on either input are 10 V and is measured from 30% to 70% points. In the case of the A-701 and A-702 this rate is better than 80 V/ μ s. Settling time is also measured at worst case (10 V change in input) and is defined as the total time required from start of change to some stated percentage of final value. In the case of the A-701 and A-702 the settling time to 1% of final value is 0.4 μ s for X or Y input changes. Therefore, if the X input were assumed to be at a value of 10V and the Y input were instantaneously changed from -5 V to +5 V, the output would achieve 1% of the final value 0.4 μ s later.

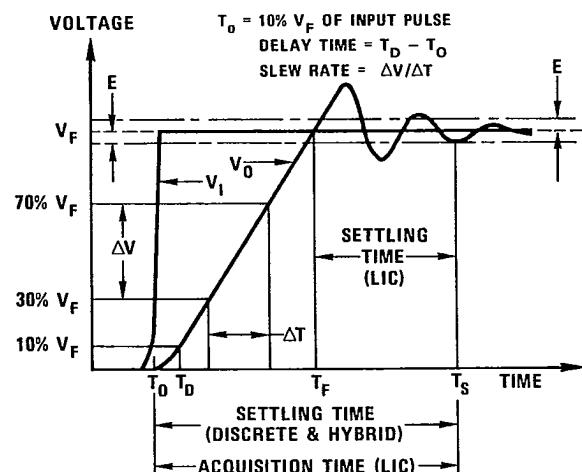


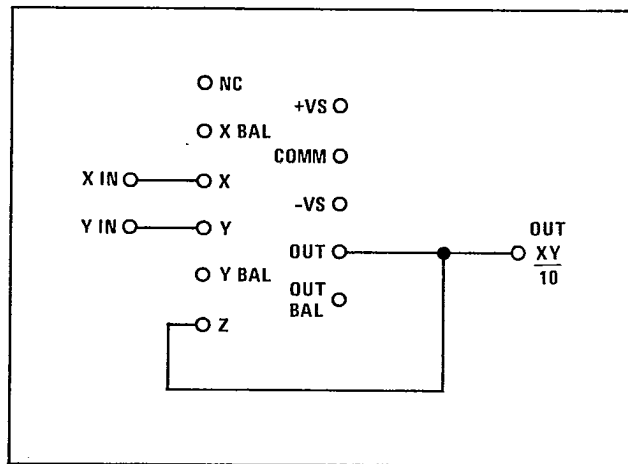
Figure 2 WAVEFORMS FOR SLEW RATE AND SETTLING TIME

SPECIFICATIONS (at +25°C and ±15 VDC) MODELS A-701 and A-702

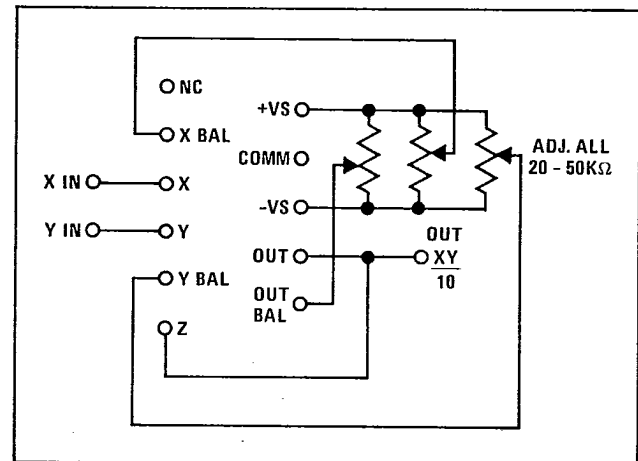
MODEL	X	Y	MIN	TYP	MAX	UNIT
Output Function				XY/10		
Error (internal trim)	±10 V	±10 V			/1	%
Error (external trim)	±10 V	±10 V		0.5		%
Accuracy vs Temp, 0 to 60°C	±10 V	±10 V		0.02	0.04*	%
Accuracy vs Supply	±10 V	±10 V		0.03		%/%
Initial Error	±10 V	±10 V			0.5	%
Avg. vs Temp, 0 to 60°C				0.025		%/°C
Avg. vs Supply				0.03		%/%
Output Offset						
Initial	0	0			20	mV
Avg. vs Temp, 0 to 60°C	0	0		1.0	1.5*	mV/°C
Avg. vs Supply	0	0		1		mV/%
Non-Linearity						
X Input	20 V p-p**	±10 V		0.4		%
Y Input	±10 V	20 V p-p**		0.4		%
Feedthrough	0	20 V p-p**		40	50	mV
	20 V p-p**	0		40		mV
BANDWIDTH						
-3 dB Small Signal			4	5		MHz
Slew Rate, -5 V to +5 V						
30 to 70%			80	90		V/μs
Small Signal Amplitude error				1		%
Small Signal Vector Error				1		%
Settling Time	-5 to +5 V step	±10 V		0.40		μs
Differential Phase						°
Shift ($\theta_X - \theta_Y$) @ 1 MHz				1		°
Overload Recovery				0.15		μs
OUTPUT CHARACTERISTICS						
Noise, 10 Hz to 10 kHz	0	0		0.25		mV rms
10 Hz to 5 MHz	0	0		1.5		mV rms
Output Voltage			±10			V
Output Current			±5			mA
Load Capacitance			0.001	0.01		μF
INPUT CHARACTERISTICS						
Input Bias Current, X Y input				-2	-10	μA
Input Bias Current, Z input				-100		μA
Input Impedance, X, Y input			0.5	1		MΩ
Input Impedance, Z input				10		kΩ
Input voltage for rated acc.					10.3	V
Absolute max input					16	V
POWER SUPPLY						
Rated Performance			±14		±16	V
Derated specifications			±12		±18	V
Quiescent Current				±18		mA
TEMPERATURE RANGE						
Rated Performance			0		+60	°C
Derated specifications			-25		+85	°C
Storage			-55		+125	°C

*A-702 only

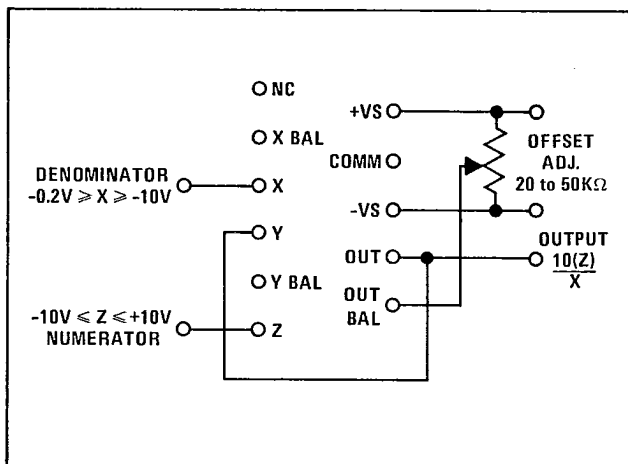
**At 50 Hz



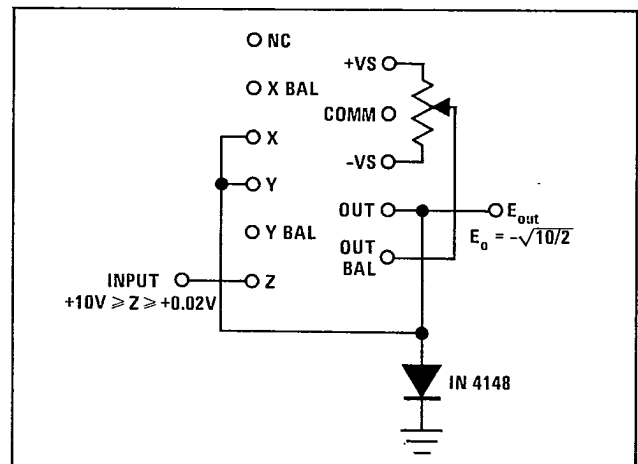
MULTIPLIER (internal trim)



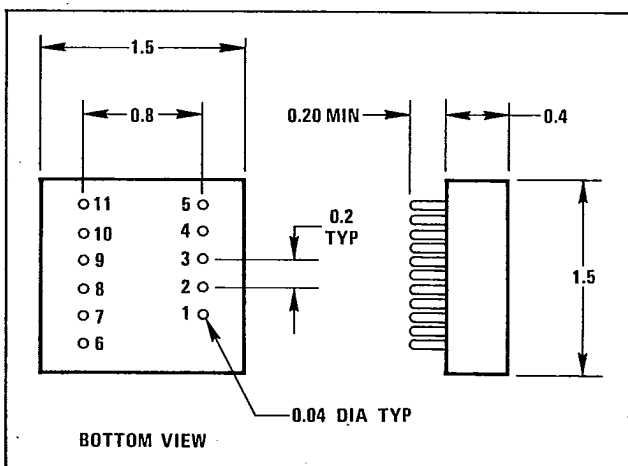
MULTIPLIER (external trim)



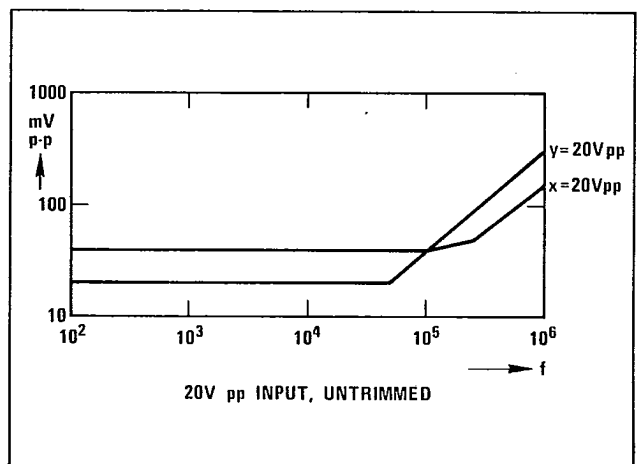
DIVIDER



SQUARE ROOTING



OUTLINE DIMENSIONS

MULTIPLIER FEEDTHROUGH AT
20V p-p INPUT, UNTRIMMED

2-0383

intech
3ADVANCED ANALOG

CUSTOM SERVICE IS OUR STANDARD

2270 MARTIN AVENUE, SANTA CLARA, CALIFORNIA 95050-2781
TELEPHONE (408) 988-4930 TWX 910-338-2213