

T-73-29



HA-2557

PRELIMINARY

August 1991

Wideband Four Quadrant Current Output Analog Multiplier

Features

- Low Multiplication Error 1.5%
- Input Bias Currents 5 μ A
- Y Input Feedthrough @ 5MHz -60dB
- Wide X and Y Channel Bandwidth 100MHz

Applications

- Military Avionics
- Missile Guidance Systems
- Medical Imaging Displays
- Video Mixers
- Sonar AGC Processors
- Radar Signal Conditioning
- Voltage Controlled Amplifier
- Vector Generator

Description

The HA-2557 is a monolithic, high speed, four quadrant, analog multiplier constructed in Harris' Dielectrically Isolated High Frequency Process. The high frequency performance of the HA-2557 rivals the best analog multipliers currently available including hybrids.

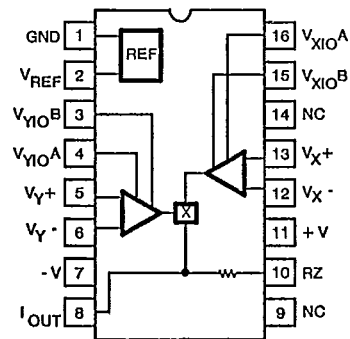
The single-ended current output of the HA-2557 has a 100MHz signal bandwidth ($R_L = 50\Omega$). High bandwidth and low distortion make this part an ideal component in video systems. The suitability for precision video applications is demonstrated further by low multiplication error (1.5%), low feedthrough (-60dB), and differential inputs with low bias currents (5 μ A). The HA-2557 is also well suited for mixer circuits as well as AGC applications for sonar, radar, and medical imaging equipment.

The current output of the HA-2557 allows it to achieve higher bandwidths than voltage output multipliers. Full scale output current is trimmed to 1.6mA. An internal 2500 Ω feedback resistor is also provided to accurately convert the current, if desired, to a full scale output voltage of $\pm 4V$. The HA-2557 is not limited to multiplication applications only; frequency doubling and power detection are also possible.

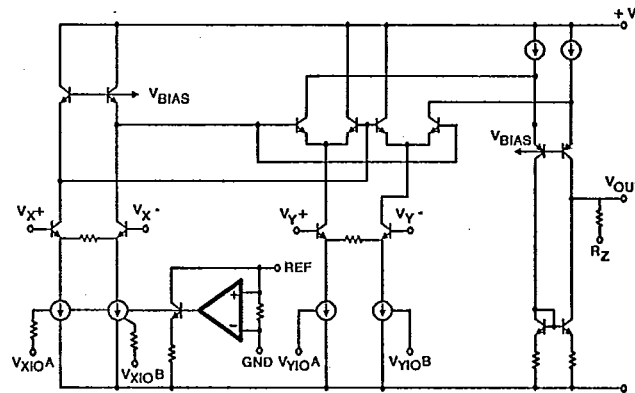
The HA-2557-9 has guaranteed operation from -40 $^{\circ}C$ to +85 $^{\circ}C$, while the HA-2557-5 has guaranteed operation from 0 $^{\circ}C$ to +70 $^{\circ}C$. The HA-2557 is available in a 16 pin Ceramic DIP. For MIL-STD-883 compliant product and LCC packages consult the HA-2557/883 datasheet.

Pinout

HA1-2557 (CERAMIC DIP)
TOP VIEW



Schematic



SPECIAL ANALOG CIRCUITS

CAUTION: These devices are sensitive to electrostatic discharge. Proper I.C. handling procedures should be followed.
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Specifications HA-2557

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Absolute Maximum Ratings (Note 1)

Voltage Between V+ and V- Terminals	35V
Differential Input Voltage.....	6V
Output Current	3mA
Maximum Junction Temperature.....	+175°C

Operating Temperature Range

HA-2557-9	-40°C ≤ TA ≤ +85°C
HA-2557-5	0°C ≤ TA ≤ +70°C
Storage Temperature Range	-65°C ≤ TA ≤ +150°C

Electrical Specifications +V = +15V, -V = -15V, Unless Otherwise Specified

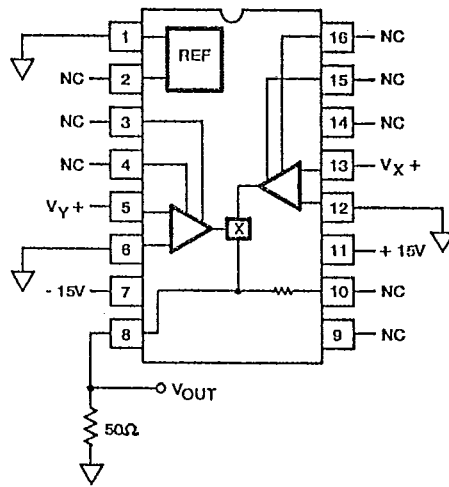
PARAMETER	TEMP	HA-2557-9			HA-2557-5			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
MULTIPLIER PERFORMANCE								
Multiplication Error (Note 2)	+25°C	-	1.5	3	-	1.5	3	%FS
	Full	-	3.0	6	-	3.0	6	%FS
Multiplication Error Drift	Full	-	0.003	-	-	0.003	-	%/°C
Scale Factor	+25°C	-	10	-	-	10	-	kV-Ω
THD+N (Note 3)	+25°C	-	0.03	-	-	0.03	-	%
Output Offset Voltage (Note 4)	+25°C	-	6	15	-	6	15	mV
	Full	-	14	20	-	14	20	mV
Average Offset Voltage Drift	Full	-	-	-	-	-	-	μV/°C
V_X, V_Y, V_Z								
Input Offset Voltage	+25°C	-	4	10	-	4	10	mV
	Full	-	8	20	-	8	20	mV
Average Offset Voltage Drift	Full	-	35	-	-	35	-	μV/°C
Input Bias Current	+25°C	-	5	10	-	5	10	μA
	Full	-	10	15	-	10	15	μA
Input Offset Current	+25°C	-	0.5	1	-	0.5	1	μA
	Full	-	1.0	1.5	-	1.0	1.5	μA
Differential Input Resistance	+25°C	-	720	-	-	720	-	kΩ
Small Signal Bandwidth (-3dB) (Note 5)	+25°C	-	100	-	-	100	-	MHz
Y Input Feedthrough (Note 8)	+25°C	-	-60	-	-	-60	-	dB
Differential Input Range	+25°C	±4	-	-	±4	-	-	Volts
Common Mode Range	+25°C	-	±9	-	-	±9	-	Volts
CMRR (Note 6)	Full	60	78	-	60	78	-	dB
V_X, V_Y TRANSIENT RESPONSE (Note 5)								
Rise Time	+25°C	-	5	-	-	5	-	ns
Propagation Delay	+25°C	-	3	-	-	3	-	ns
OUTPUT CHARACTERISTICS								
Full Scale Output Compliance Voltage	Full	-	4	-	-	4	-	Volts
Full Scale Output Current	+25°C	-	1.6	-	-	1.6	-	mA
Internal Feedback Resistor (R _Z)	+25°C	-	2500	-	-	2500	-	Ω
Output Resistance	+25°C	-	1.5	-	-	1.5	-	MΩ
POWER SUPPLY								
PSRR (Note 7)	Full	-	63	-	-	63	-	dB
I _{CC}	Full	-	18	20	-	18	20	mA

NOTES:

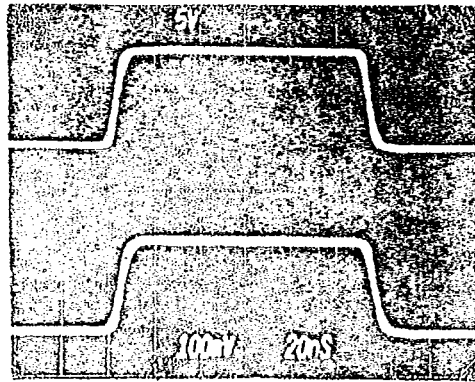
1. Absolute maximum ratings are limiting values, applied individually, beyond which the serviceability of the circuit may be impaired. Functional operation under any of these conditions is not necessarily implied.
2. Error is percent of full scale, 1% = 50mV.
3. f_o = 10kHz, V_Y = 1Vrms, V_X = 4V.
4. V_X = 0V, V_Y = 0V.
5. R_L = 50Ω.
6. V_{CM} = 0 to ±9V.
7. V_S = ±12V to ±15V.
8. f_o = 5MHz. Relative to full scale output.

Test Circuits

AC AND TRANSIENT RESPONSE TEST CIRCUIT



V_Y TRANSIENT RESPONSE
Vertical Scale: Top 5V/Div Bottom: 100mV/Div
Horizontal Scale: 20ns/Div



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