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Precision Waveform Generator

GENERAL DESCRIPTION

The XR-8038A is a precision waveform generator IC capable of producing sine, square, triangular, sawtooth, and pulse waveforms, with a minimum number of external components and adjustments. The 8038A allows the elimination of the external distortion adjusting resistor which greatly improves the temperature drift of distortion, as well as lowering external parts count. Its operating frequency can be selected over eight decades of frequency, from 0.001Hz to 200KHz, by the choice of external R-C components. The frequency of oscillation is highly stable over a wide range of temperature and supply voltage changes. Both full frequency sweeping as well as smaller frequency variations (FM) can be accomplished with an external control voltage. Each of the three basic waveform outputs, (i.e., sine, triangle and square) are simultaneously available from independent output terminals.

The XR-8038A monolithic waveform generator uses advanced processing technology and Schottky-barrier diodes to enhance its frequency performance. It can be readily interfaced with a monolithic phase-detector circuit, such as the XR-2228 to form stable phase-locked circuits.

FEATURES

Low Frequency Drift50ppm/°C, TypicalSimultaneous Sine, Triangle, and Square Wave OutputsLow Sine Wave Distortion — THD ~ 1%High FM and Triangle LinearityWide Frequency Range0.001Hz to 200KHzVariable Duty Cycle2% to 98%Low Distortion Variation with Temperature

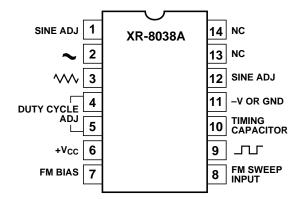
APPLICATIONS

Precision Waveform Generation Sweep and FM Generation Tone Generation Instrumentation and Test Equipment Design Precision PLL Design

ABSOLUTE MAXIMUM RATINGS

Power Supply	36V
Power Dissipation (package limitation)
Ceramic Package	750mW
Derate Above +25°C	6.0mW/°C
Plastic Package	625mW
Derate Above +25°C	5mW/°C
Storage Temperature Range	–65°C to +150°C

PIN ASSIGNMENT



ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-8038AM	Ceramic	–55°C to +125°C
XR-8038AN	Ceramic	0°C to +70°C
XR-8038AP	Plastic	0°C to +70°C
XR-8038ACN	Ceramic	0°C to +70°C
XR-8038ACP	Plastic	0°C to +70°C

SYSTEM DESCRIPTION

The XR-8038A precision waveform generator produces highly stable and sweepable square, triangle, and sine waves across eight frequency decades. The XR-8038A is an advanced version of the XR-8038, with improved sine distortion temperature drift. The device time base employs resistors and a capacitor for frequency and duty cycle determination. The generator contains dual comparators, a flip-flop driving a switch, current sources, buffers, and a sine wave convertor. Three identical frequency outputs are simultaneously available. Supply voltage can range from 10V to 30V, or \pm 5V to \pm 15V with dual supplies.

Unadjusted sine wave distortion is typically less than 0.7% with the sine wave distortion adjust pin (Pin 1) open. Distortion levels may be improved by including a $100k\Omega$ potentiometer between the supplies, with the wiper connected to Pin 1.

Small frequency deviation (FM) is accomplished by applying modulation voltage to Pins 7 and 8; large frequency deviation (sweeping) is accomplished by applying voltage to Pin 8 only. Sweep range is typically 1000:1.

The square wave output is an open collector transistor; output amplitude swing closely approaches the supply voltage. Triangle output amplitude is typically 1/3 of the supply, and sine wave output reaches 0.22 of the supply voltage.

ELECTRICAL CHARACTERISTICS

 $\label{eq:conditions: V_S = \pm 5V to \pm 15V, T_A = 25^{\circ}C, R_L = 1M\Omega, R_A = R_B = 10k\Omega, C_1 = 3300 \text{pF}, S_1 \text{ closed, unless}$ otherwise specified.

PARAMETERS	8038AM/8038A		8038AC					
	MIN	TYP	MAX	MIN	TYP	МАХ	UNITS	CONDITIONS
GENERAL CHARACTERISTICS						I		
Supply Voltage, V _S								
Single Supply	10		30	10		30	V	
Dual Supplies	±5		±15	±5		±15	V	
Supply Current		12	15		12	20	mA	$V_{S} = \pm 10V$ (Note 1)
FREQUENCY CHARACTERISTICS (Me	easured	at Pin 9)					
Range of Adjustment								
Max. Operating Frequency	200			200			KHz	$R_A = R_B$, = 1.5k Ω , C_1 = 680pF R_1 = 10K
Lowest Practical Frequency		0.001			0.001		Hz	$R_A^- = R_B = 1M\Omega$, $C_1 = 500\mu F$ (Low Leakage Capacitor)
Max. Sweep Frequency of FM Input		100			100		kHz	
FM Sweep Range		1000:1			1000:1			S ₁ Open (Notes 2 & 3)
FM Linearity 10:1 Ratio		0.1			0.2		%	S ₁ Open (Note 3)
Range of Timing Resistors	0.5		1000	0.5		1000	kΩ	Values of R _A and R _B
Temperature Stability								
XR-8038AM		50		_		_	ppm/°C	$T_A = -55^{\circ}C$ to +125°C
XR-8038A		50	100					
XR-8038AC					50		ppm/°C	$T_A = 0^{\circ}C$ to +70°C
Power Supply Stability		0.05			0.05		%/V	(Note 4)
OUTPUT CHARACTERISTICS								
Square-Wave								Measured at Pin 9
Amplitude (Peak-to-Peak)	0.9	0.98		0.9	0.98		x V _{SPLY}	$R_{L} = 100 k\Omega$
Saturation Voltage		0.2	0.4		0.2	0.5	V	$I_{sink} = 2mA$
Rise Time		100			100		nsec	$R_{L} = 4.7 k\Omega$
Fall Time		40			40		nsec	$R_{L} = 4.7 k\Omega$
Duty Cycle Adjustment	2		98	2		98	%	
Triangle/Sawtooth/Ramp								Measured at Pin 3.
Amplitude (Peak-to-Peak)	0.3	0.33		0.3	0.33		x V _{SPLY}	$R_L = 100 k\Omega$
Linearity		0.05			0.1		%	
Output Impedance		200			200		Ω	I _{OUT} = 5mA
Sine-Wave Amplitude (Peak-to-Peak)	0.2	0.22		0.2	0.22		x V _{SPLY}	$R_{L} = 100 k\Omega$
Distortion		0.7	1.5		0.8	3	%	$R_{L} = 1M\Omega$ (Notes 5, 6 & 7)
Unadjusted		0.5			0.5		%	$R_{L} = 1M\Omega$ (Notes 5, 6 & 7)
Adjusted		0.5			0.3		%	
ΔTHD/ΔT								

Note 1: Currents through R_A and R_B not included.

Note 2: $V_{\text{SUPPLY}} = 20V$.

Note 3: Apply sweep voltage at Pin 8. $V_{CC} - (1/3~V_{SUPPLY} - 2) \leq V_{PIN~8} \leq V_{CC}$ V_{SUPPLY} = Total Supply Voltage across the IC Note 4: $10V \le V_S \le 30V$ or $\pm 5V \le V_S \le 15V$.

Note 5: Pin 12 open circuited (No. 82kΩ resistor as standard 8038).

Note 6: Triangle duty cycle set at 50%, use R_A and R_B .

Note 7: As R_L is decreased distortion will increase, R_L min $\approx 50 k\Omega$.

Notes

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