Precision Waveform Generator

GENERAL DESCRIPTION

The XR-8038 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. Its operating frequency can be selected over eight decades of frequency, from 0.001 Hz to 200 KHz by the choice of external R-C components. The frequency of oscillatien 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 waveforms, i.e., sinewave, triangle and square wave outputs are available simultaneously, from independent output terminals.

The XR-8038 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-2208, to form stable phase-locked loop circuits.

FEATURES

With Improved Sweep Range, Frequency Drift and Max. Operating Frequency
Simultaneous Sine, Triangle and Square-Wave Outputs
Low Sine Wave Distortion-THD
High FM and Triangle Linearity
Wide Frequency Range
Variable Duty-Cycle

APPLICATIONS

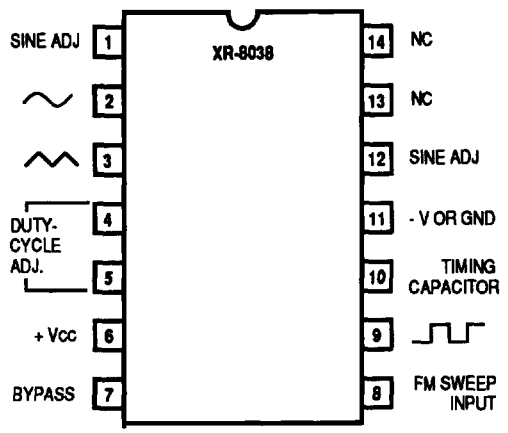
Precision Waveform Generation: Sine, Triangle, Square, Pulse
Sweep and FM Generation
Tone Generation
Instrumentation on and Test Equipment Design
Precision PLL Design

ABSOLUTE MAXIMUM RATINGS

Power Supply	36V
Power Dissipation (package limitation)	
Ceramic package	750 mW
Derate above +25°C	6.0 mW°C
Storage Temperature Range	-65°C to + 150°C

Rev A

FUNCTIONAL BLOCK DIAGRAM



SYSTEM DESCRIPTION

The XR-8038 precision waveform generator produces highly stable and sweepable square, triangle, nd sine waves across eight frequency decades. 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 converter. Three identical frequency waveforms are simultaneously available. Supply voltage can range from 10V to 30V, or ±5V to ±15V with dual supplies.

Unadjusted sine wave distortion is typically less than 0.7%, with Pin 1 open and 82 kΩ from Pin 12 to Pin 11 (- V or ground). Sine wave distortion may be improved by including two 100 kΩ potentiometers between Vcc and - V (or ground), with one wiper connected to Pin 1 and the other connected to Pin 12.

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 typirally 13 of, the supply, and sine wave output reaches 0.22 of the supply voltage.

7

XR-8038 ELECTRICAL PERFORMANCE CHARACTERISTICS

TEST	SYMBOL	CONDITIONS (SEE NOTE 1)		LIMITS		UNIT	GROUP A SUBGROUP
		CONDITIONS	TEMPERATURE	MIN	MAX		
Supply Current	I_{CC} HI Measure Pin 6	V_{CC} = ±18V	T_A = 25°C -55°C≤T_A≤+125°C		60.0 80.0	mA mA	1 2, 3
Supply Current	I_{CC} LO Measure Pin 6	V_{CC} ±10V	T_A = 25°C -55°C≤T_A≤+125°C	3.0 2.0	15.0 25.0	mA mA	1 2, 3
Timing Capacitor Source Current	I_{+CAP}	V_{CC} = ±15V V_{SWEEP} = +10V R_A = R_B = 10kΩ V_{CAP} = 15.5V Measure Current at Pin 10	T_A = 25°C -55°C≤T_A≤+125°C	450 400	550 600	µA1 µA	 2, 3
Timing Capacitor Sink Current	I_{-CAP}	V_{CC} = ±15V V_{SWEEP} = +10V R_A = R_B = 10kΩ V_{CAP} = -5.5V Measure Current at Pin 10	T_A = 25°C -55°C≤T_A≤+125°C	550 -600	-450 -400	µA µA	1 2, 3
Timing Capacitor Source Current	I_{+HIGH}	V_{CC}= ±15V V_{SWEEP} = +12V R_A = R_B = 1kΩ V_{CAP} = +5.5V Measure Current at Pin 10	T_A = 25°C -55°C≤T_A≤+125°C	2.50 2.00	3.50 4.00	mA mA	1 2, 3
Timing Capacitor Sink Current	I_{-HIGH}	V_{CC} = ±15V V_{SWEEP} = +12V R_A = R_B = 1kΩ V_{CAP} = +5.5V Measure Current at Pin 10	T_A = 25°C -55°C≤T_A≤+125°C	-3.50 -4.00	-2.50 -2.00	mA mA	1 2, 3
Timing Capacitor Source Current	I_{+LOW}	V_{CC} = ±15V V_{SWEEP} = +10V R_A = R_B = 1MΩ V_{CAP} = +5.5V Measure Current at Pin 10	T_A = 25°C -55°C≤T_A≤+125°C	2.20 -2.00	15.00 50.00	µA µA	1 2, 3
Timing Capacitor Sink Current	I_{-LOW}	V_{CC} = ±15V V_{SWEEP} = +10V R_A = R_B = 1MΩ V_{CAP} = -55V Measure Current at Pin 10	T_A = 25°C -55°C≤T_A≤+125°C	-15.00 -50.00	-2.20 2.0	µA µA	1 2, 3

Timing Capacitor Sink Current	I_{-IN}	V_{CC} = ±15V V_{SWEEP} = +10V $R_A = R_B = \infty$ V_{CAP} = +5.5V Measure Current at Pin 10	T_A = 25°C	-8.0	1.00	µA	1
			-55°C≤T_A≤+125°C	-20.00	-2.00	µA	2, 3
Timing Capacitor Source Current	I_{+LEAK}	V_{CC} = ±15V V_{SWEEP} = +10V $R_A = R_B$ V_{CAP} = +4.5V Measure Current at Pin 10	T_A = 25°C	-1.00	1.00	µA	1
			-55°C≤T_A≤+125°C	-10.00	10.00	µA	2, 3
Timing Capacitor Sink Current	I_{-LEAK}	V_{CC} = ±15V V_{SWEEP} = +10V $R_A = R_B = \infty$ V_{CAP} = -4.5V Measure Current at Pin 10	T_A = 25°C	-1.00	1.00	µA	1
			-55°C≤T_A≤+125°C	-10.00	10.00	µA	2, 3
FM Sweep Bias Current	V_{BIAS}	V_{CC} = ±15V No V_{SWEEP} $R_A = R_B$ =10KΩ V_{CAP} = GND Measure current at Pin 8	T_A = 25°C	-1.00	1.00	µA	1
			-55°C≤+T_A≤+125°C	-10.00	10.00	µA	2, 3
FM Bias Voltage	V_{BIAS}	V_{CC} = ±15V No V_{SWEEP} $R_A = R_B$ = 10K V_{CAP} = GND Measure Voltage at Pin 7	T_A = 25°C	8.30	9.70	V	1
			-55°C≤T_A≤+125°C	3.00	10.00	V	2, 3
Square Wave Output Saturation Voltage	SQ_{LOW}	V_{CC} = ±15V V_{SWEEP} = GND $R_A = R_B$ = 10KΩ V_{CAP} = +5.5V I_{PIN9} = 2mA Measure Voltage at Pin 9	T_A = 25°C	-15.00	-14.60	V	1
			-55°C≤T_A≤+125°C	-15.00	-14.00	V	2. 3
Square Wave Output Leakage Current	SQ_{HIGH}	V_{CC} = ±15V V_{SWEEP} = GND $R_A = R_B$= 10KΩ V_{CAP} = +55V IPIN9 = +15V Measure Current at Pin 9	T_A = 25°C	-2.5	20.0	µA	1
			-55°C≤T_A≤+125°C	-4.0	300.0	µA	2, 3

7

Sine Output Offset Voltage	V_{OSSIN}	V_{CC}- ±15V V_{SWEEP} = GND $R_A = R_B$ = 10KΩ V_{CAP} = GND Measure Voltage at Pin 2	T_A = 25°C -55°C≤T_A≤+125°C	-100 -600	100 600	mV mV	1 2, 3
Sine Output Voltage	V_{OUT+}	V_{CC} = ±15V V_{SWEEP} = GND $R_A = R_B$ = 10kΩ V_{CAP} = +5V Measure Voltage at Pin 2	T_A = 25°C -55°C≤T_A≤+125°C	2.50 1.70	3.90 4 70	V V	1 2, 3
Sine Output Voltage	V_{OUT-}	V_{CC} = ±15V V_{SWEEP} = GND $R_A = R_B$ = 10KΩ V_{CAP} = -5V Measure Voltage at Pin 2	T_A = 25°C -55°C≤T_A≤+125°C	-3.90 -4.70	-2.50 -1.70	V V	1 2, 3
Sine Adjust Voltage	V_{ADJ+}	V_{CC} = ±15V No V_{SWEEP} $R_A = R_B = \infty$ V_{CAP} = GND Measure Voltage at Pin 1	T_A = 25°C -55°C≤T_A≤+125°C	2.50 1.70	3.90 4.70	V V	1 2, 3
Sine Adjust Voltage	V_{ADJ-}	V_{CC} = ±15V No V_{SWEEP} $R_A = R_B = \infty$ V_{CAP} = GND Measure Voltage at Pin 12	T_A = 25°C -55°C≤T_A≤+125°C	-3.90 -4.70	-2.40 -1 70	V V	1 2, 3

Frequency	Fo	Vcc = ±10V CT = 3000pF RA = RB = 10KΩ Connect Pin 7 to Pin 8 RL = 10KΩ Measure Frequency at Pin 9	TA =25°C -55°C≤TA≤+125°C	8.600 3.400	10.000 10.100	KHz KHz	9 10, 11
Sine Wave Distortion Unadjusted	THD	Vcc = ±10V CT = 3000pF RA = RB = 100KΩ RL = 10KΩ Connect Pin 7 to Pin 8 Measure Distortion at Pin 2	TA =25°C -55°C≤TA≤+125°C	0.0 0.0	5.5 25.0	% %	9 10, 11
Sine Wave Distortion adjusted	THD ADJ	Vcc = ±10V CT = 3000pF RA = RB = 100KΩ RL = 10KΩ Connect Pin 7 to Pin 8 Adjust RA +RB to get 50% Duty Cycle at Pin 9 Measure Distortion at Pin 2	TA =25°C -55°C≤TA≤+125°C	0.0 0.0	2.1 20.0	% %	9 10, 11

Note 1 - 82KΩ between Pin 11 and Pin 12

7