

DIGITAL TONE GENERATOR

FEATURES:

- Tunable 30 Hz to 5 KHz Range
- Revert to "0" Output
- Continuous or Tone Burst Operation
- Adjustable Output Amplitude
- Operation to 50 Hz
- Separate Enable/Timing Gate with Override

APPLICATIONS:

- Systems requiring audio tones in the 30 Hz to 5 KHz range.

DESCRIPTION:

The MX205 is a monolithic PMOS tone generator useful in applications where an audio tone in the 30 Hz to 5 KHz range is required. The output is a sinusoidally weighted series of eight current steps per cycle. Principal undesired harmonics are the 3rd, down 50 dB, and the 7th, down 18 dB from the fundamental (without external capacitive smoothing).

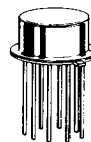
Operation to 50 KHz may be obtained by applying an external clock operating at eight times the desired output frequency. Tones to 5 KHz are "tuned" by selecting external R and C values. Output amplitude is adjustable over a 70% range via a DC reference voltage applied to a control pin. The tone output may be continuous or pulsed under control of an on-chip, one-shot timer, whose period is externally controlled.

Frequency stability of the MX205 is 0.06% per 1% change in supply voltage and 0.015% per degree change in operating temperature. The circuit is designed to always start and end tone generation at the minimum current step, i.e. the most negative output voltage.

The output frequency, f_o , can be obtained from the following formula:

$$f_o = \frac{1}{5.6 (R_2 + 2R_1) C_1} \text{ Hz}$$

where R_1 and R_2 are expressed in megaohms, C_1 is in microfarads, and the value of "5.6" is a device constant, subject to a $\pm 10\%$ tolerance.



MX205
(8p metal can)



MX205P
(8p PDIP)

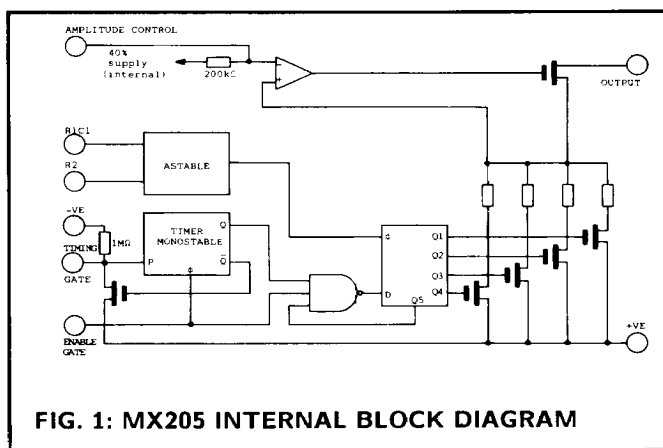
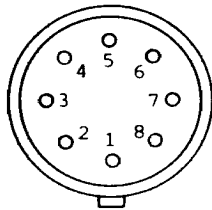


FIG. 2:MX205 PINOUT DIAGRAM

MX205

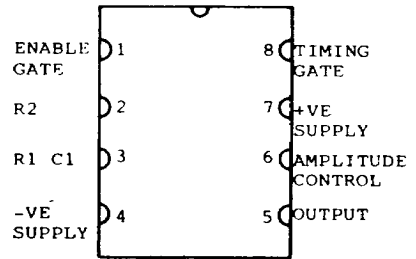


View on pins

1. R1 C1
2. -VE Supply
3. Output
4. Amplitude Control
5. +VE Supply
6. Timing Gate
7. Enable Gate
8. R2

Note: Pin 5 is internally connected to the case.

MX205P

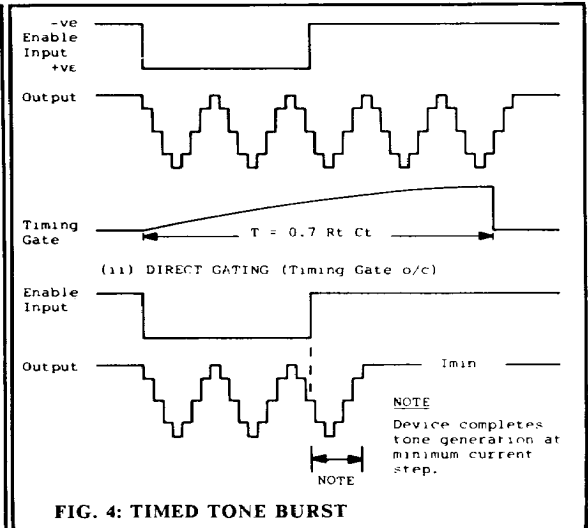
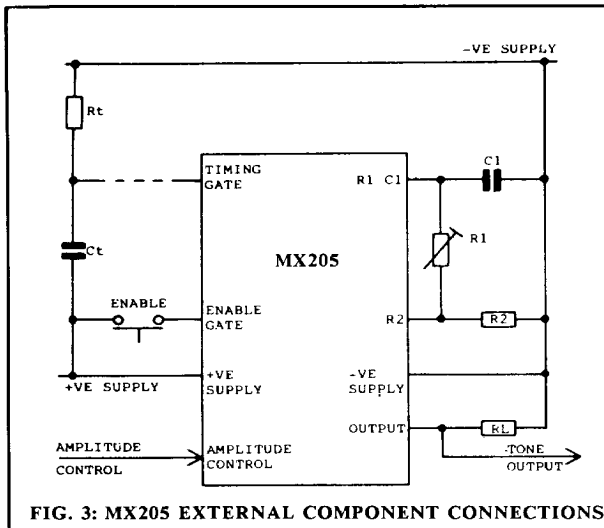


DEVICE OPERATION

The MX205 will generate an output for the period of time that the ENABLE GATE is held positive. Alternatively, a resistor (R_t) and capacitor (C_t) can be provided, as shown in the Component Connection Diagram. This ensures that the output is generated for a minimum duration, given by the following formula: $T = 0.7 \cdot R_t \cdot C_t$ seconds. Here, R_t is expressed in megaohms, C_t in microfarads, and 0.7 the device constant with a $\pm 5\%$ tolerance.

The monostable multivibrator is not retriggerable, and a further time period can be initiated only after completion of the original tone burst. Should the ENABLE input be held positive for longer than time T , the device will continue generating a tone until disabled.

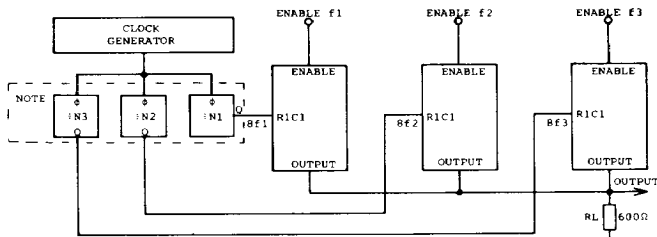
The output voltage can be adjusted over a range of $\pm 35\%$ from the nominal level by applying a voltage (V_b) to the AMPLITUDE CONTROL input as shown below. V_b can range from 25% to 55% of the supply voltage (internal bias is 40% nominally).



FIGURES 5-10: APPLICATIONS DIAGRAMS

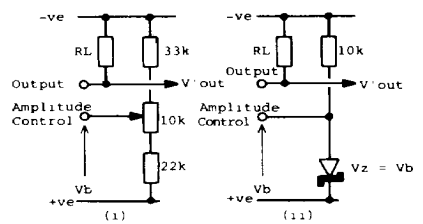
MULTI-TONE OUTPUT USING A MASTER CLOCK AND PROGRAMMABLE DIVIDERS.

$$V_{out} = iR_L(\sin \omega_1 t + \sin \omega_2 t + \sin \omega_3 t)$$



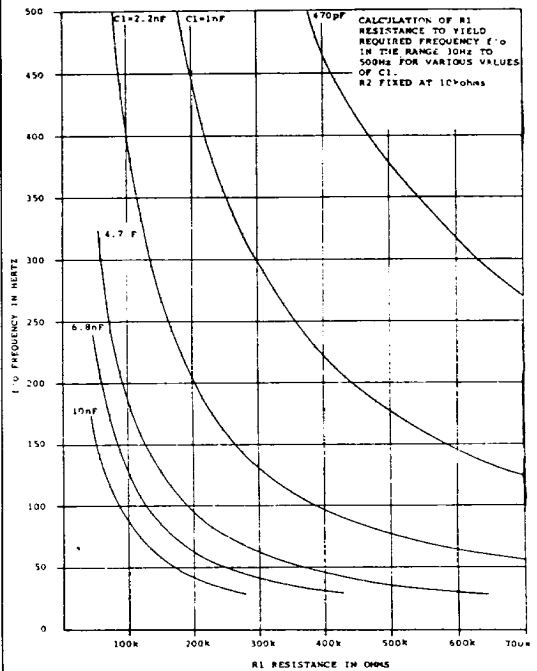
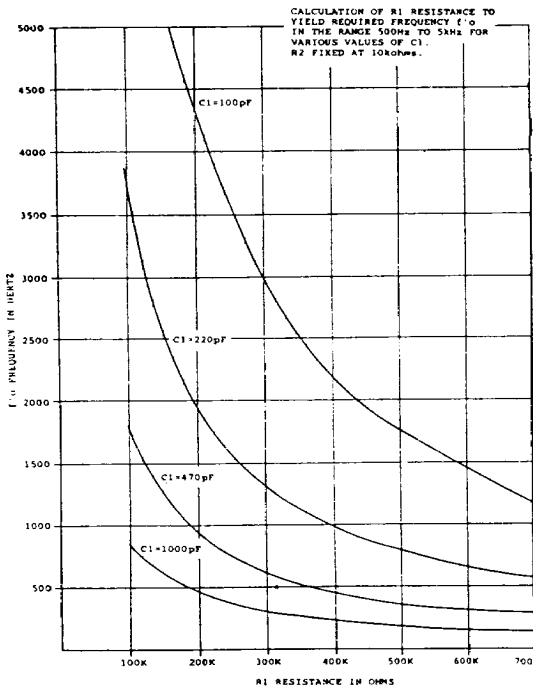
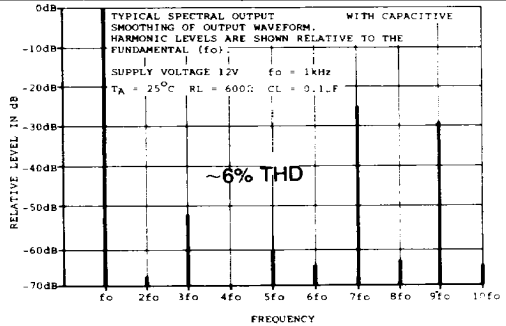
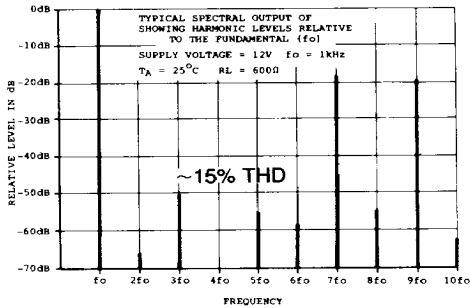
NOTE CMOS Programmable Synchronous \div by 'N' Counters e.g. CD4059 or similar

EXTERNAL AMPLITUDE CONTROL



$$V'_{out} = \frac{V_b}{6800} \times R_L \text{ V.r.m.s.}$$

where R_L is in ohms and 6800 is a device constant (subject to $\pm 20\%$ tolerance)



MX205 ELECTRICAL SPECIFICATIONS

MAXIMUM RATINGS. Exceeding maximum rating may result in device damage.

Maximum Voltage between any pin and +ve supply		– 20v to +0.3v
Operating Temperature Range	MX205	– 30°C to +85°C
	MX205P	– 10°C to +60°C
Storage Temperature Range	MX205	– 55°C to +125°C
	MX205P	– 40°C to +85°C
Device Dissipation at 85°C at 60°C	MX205	200mW
	MX205P	120mW

OPERATING CHARACTERISTICS

Unless otherwise stated: Supply voltage = 12v T_{amb} = 25°C
Output Frequency ≤ 3kHz

SYMBOL	CHARACTERISTICS	MIN.	TYP.	MAX.	UNITS
V _s	Supply Voltage (+ve supply = 0v)	– 10	– 12	– 15	V
I _s	Supply Current (no load current)		7		mA
f _o	Output Frequency Range (determined by R1, C1 & R2)	30		5k	Hz
f _o	Output Frequency Range (determined by external clock)	0		50k	Hz
Δf _o	Frequency Variation per 1% change in V _s		0.06		%
Δf _o	Frequency Variation per 1°C change in temperature		0.015		%
V _o	Pulse Width of External Clock Output Voltage (R _L = 600Ω, Amplitude Control Pin o/c)	1.25	550		μs mV r.m.s.
ΔV _o	Output Amplitude adjustment range (V _b applied to Amplitude Control Pin)		± 35		%
	Input Level to Enable Device			– 1.5	V
	Input Level to Disable Device	– 9			V
	Enable Input Pulse width	10			μs
	Input Impedance of Enable Input		100k		Ω
	Value of R1	47k		1M	Ω
	Value of R2		10k		Ω
	Value of R _L		600		Ω
	Value of R _t	100k		10M	Ω
	Value of C1	1 × 10 ^{–4}		0.1	μF
	Value of C _t	1 × 10 ^{–4}		1.5	μF
T	Period of Timed Tone Burst (T = 0.7 R _t C _t)	1/f _o		10	seconds