STANDARD MICROSYSTEMS CORPORATION

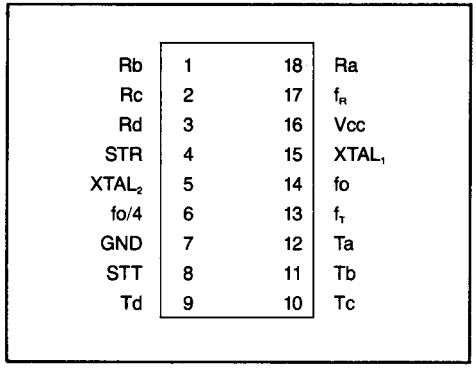
COM 8156
COM 8156T
PRELIMINARY

Dual Baud Rate Generator
Programmable Divider

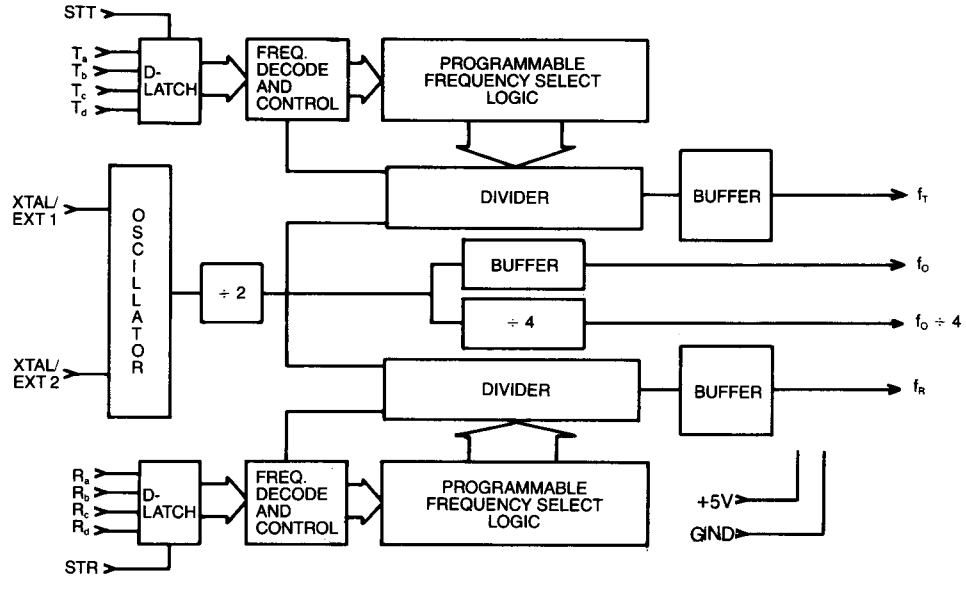
FEATURES

- ☐ On chip crystal oscillator or external frequency input
- ☐ High crystal/clock frequency operation
- ☐ Choice of 2 x 16 output frequencies
- ☐ 16 asynchronous/synchronous baud rates
- ☐ High frequency reference outputs
- ☐ Direct UART/USRT/ASTRO/USYNRT compatibility
- ☐ Full duplex communication capability
- ☐ N-channel silicon gate technology
- ☐ Single $+5_V$ power supply
- ☐ TTL, MOS compatibility
- ☐ Re-programmable ROM technology allows generation of other frequencies

PIN CONFIGURATION



BLOCK DIAGRAM



GENERAL DESCRIPTION

The Standard Microsystem's COM8156 is a dual baud rate generator that operates at twice the crystal/clock frequency of the COM8116/36. It is fabricated using SMC's patented COPLAMOS™ technology and employs depletion mode loads allowing operation from a single +5V supply.

The standard COM8156 is specifically dedicated to generating the full spectrum of 16 asynchronous/synchronous data communication frequencies for 16X UART/USRT devices. A large number of the frequencies available are also useful for 1X and 32X ASTRO/USYNRT devices.

The COM8156 features an internal crystal oscillator which may be used to provide the master reference frequency. Alternatively, an external reference may be supplied by applying complementary TTL level signals to pins 1 and 9. Parts suitable for use only with an external TTL reference are marked COM 8156T. TTL outputs used to drive the COM8156 or COM8156T XTAL/EXT inputs should not be used to drive other TTL inputs, as noise immunity may be compromised due to excessive loading.

The output of the oscillator/buffer is applied to the dividers for generation of the output frequencies f_T, f_R. The dividers are capable of dividing by an integer from 6 to 2^{19} + 1, inclusive. If the divisor is even, the output will be square; otherwise the output will be high longer that it is low by one f_O clock period.

The crystal frequency is divided by two to give (f_O) and again by four to give ($f_{O/4}$). The transmit (f_T) and receive (f_R) frequencies are obtained by dividing (f_O) by N. Up to 32 different divisors can be mask-programmed on custom parts to accommodate different crystal frequencies and divider schemes. Each group of four divisor select bits is held in an externally strobed data latch. The strobe input is level sensitive: while the strobe is high, data is passed directly through to the ROM. Initiation of a new frequency is effected within 3.5us of a change in any of the four divisor select bits (strobe activity is not required). The divisor select bits (strobe activity is not required). The divisor select inputs and the strobe inputs have pull-up resistors.

DESCRIPTION OF PIN FUNCTIONS

PIN NO.	SYMBOL	NAME	FUNCTION
15	XTAL/EXT 1	Crystal	This input receives one pin of the crystal package.
16	V_{CC}	Power Supply	+5 Volt Supply.
17	f_R	Receiver Output	This output runs at a frequency selected by the Receiver Address Inputs.
18 1-3	R_a R_b R_c, R_d	Receiver Divisor Select Address	The logic level on these inputs as shown in Table 1, selects the receiver output frequency, f_R.
4	STR	Strobe-Receiver Address	A high-level input strobe loads the receiver address (R_a, R_b, R_c, R_d) into the receiver address register. This input may be strobed or hard wired to +5V.
5	XTAL/EXT 2	Crystal	This input receives one pin of the crystal package.
6	$f_{o/4}$	Oscillator Output	This output runs at a frequency selected by the crystal ÷ 8.
7	GND	Ground	Ground
8	STT	Strobe-Transmitter Address	A high-level input strobe loads the transmitter address (T_a, T_b, T_c, T_d) into the transmitter address register. This input may be strobed or hard wired to +5V.
9-12	T_d T_c, T_b T_a	Transmitter Divisor Select Address	The logic level on these inputs, as shown in Table 1, selects the transmitter output frequency, f_T.
13	f_T	Transmitter Output Frequency	This output runs at a frequency selected by the Transmitter Address inputs.
14	f_o	Oscillator Output Frequency	This output runs at a frequency selected by the crystal ÷ 2.

MAXIMUM GUARANTEED RATINGS*

Operating Temperature Range ..... 0°C to +70°C
Storage Temperature Range ..... −55° to +150°C
Lead Temperature (soldering, 10 sec.) ..... +325°C
Positive Voltage on any Pin, with respect to ground ..... +8.0V
Negative Voltage on any Pin, with respect to ground ..... −0.3V

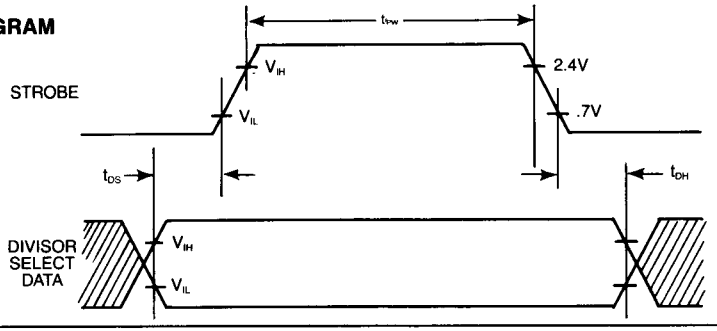
*Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied.

NOTE: When powering this device from laboratory or system power supplies, it is important that the Absolute Maximum Ratings not be exceeded or device failure can result. Some power supplies exhibit voltage spikes or "glitches" on their outputs when the AC power is switched on and off. In addition, voltage transients on the AC power line may appear on the DC output. If this possibility exists it is suggested that a clamp circuit be used.

ELECTRICAL CHARACTERISTICS (T_A = 0°C to 70°C, V_{CC} = +5V ±5%, unless otherwise noted)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
DC CHARACTERISTICS					
INPUT VOLTAGE LEVELS					
Low Level V_{IL}			0.8	V	
High Level V_{IH}	2.0			V	excluding XTAL inputs
OUTPUT VOLTAGE LEVELS					
Low Level V_{OL}			0.4	V	I_{OL} = 1.6 mA, for f_{o4}
			0.4	V	I_{OL} = 3.2 mA, for f_R, f_T
High Level V_{OH}			0.5	V	I_{OL} = 3.2 mA, for f_O
	2.4			V	I_{OH} = −100 µA
INPUT CURRENT					
Low-level, I_{IL}			−0.1	mA	V_{IN} = GND, excluding XTAL inputs
INPUT CAPACITANCE					
All inputs, C_{IN}		5	10	pF	V_{IN} = GND, excluding XTAL inputs
EXT INPUT LOAD		8	10		Series 7400 equivalent loads
POWER SUPPLY CURRENT					
I_{CC}			60	mA	
AC CHARACTERISTICS					
CLOCK FREQUENCY, f_{IN}	5.0		11.0	MHz	XTAL/EXT, 50% Duty Cycle ±5%
STROBE PULSE WIDTH, t_{PW}	150		DC	ns	
INPUT SET-UP TIME					
t_{DS}	50			ns	
INPUT HOLD TIME					
T_{DH}	50			ns	
STROBE TO NEW FREQ. DELAY			3.5	µs	
OUTPUT CLOCKS DUTY CYCLE					
f_O	40		60	%	@ 1.5V LEVEL
f_{O4}	45		55	%	@ 1.5V LEVEL
f_R, f_T	48		52	%	@ 1.5V LEVEL
CRYSTAL CHARACTERISTICS					
Series Crystal Resistance		30	70		@ Resonance
Crystal Shunt Capacitance	2	5	10	pf	

TIMING DIAGRAM



Baud Rate Generator Output Frequency Options

COM8156/COM8156T (16X clock)

CRYSTAL FREQUENCY = 10.1376 MHz

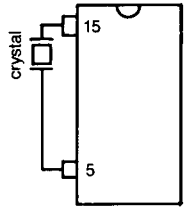
Tr'mit/Receive Address D	C	B	A	Baud Rate	Theoretical Frequency 16X Clock	Actual Frequency 16X Clock	Percent Error	Duty Cycle %	Divisor
0	0	0	0	50	0.8 KHz	0.8 KHz	—	50/50	6336
0	0	0	1	75	1.2	1.2	—	50/50	4224
0	0	1	0	110	1.76	1.76	—	50/50	2880
0	0	1	1	134.5	2.152	2.1523	0.016	50/50	2355
0	1	0	0	150	2.4	2.4	—	50/50	2112
0	1	0	1	300	4.8	4.8	—	50/50	1056
0	1	1	0	600	9.6	9.6	—	50/50	528
0	1	1	1	1200	19.2	19.2	—	50/50	264
1	0	0	0	1800	28.8	28.8	—	50/50	176
1	0	0	1	2000	32.0	32.081	0.253	50/50	158
1	0	1	0	2400	38.4	38.4	—	50/50	132
1	0	1	1	3600	57.6	57.6	—	50/50	88
1	1	0	0	4800	76.8	76.8	—	50/50	66
1	1	0	1	7200	115.2	115.2	—	50/50	44
1	1	1	0	9600	153.6	153.6	—	48/52	33
1	1	1	1	19.200	307.2	316.8	3.125	50/50	16

COM8156-005/COM8156T-005 (16X clock)

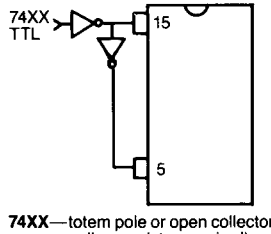
CRYSTAL FREQUENCY = 9.8304 MHz

Tr'mit/Receive Address D	C	B	A	Baud Rate	Theoretical Frequency 16X Clock	Actual Frequency 16X Clock	Percent Error	Duty Cycle %	Divisor
0	0	0	0	50	0.8 KHz	0.8 KHz	—	50/50	6144
0	0	0	1	75	1.2	1.2	—	50/50	4096
0	0	1	0	110	1.76	1.7589	−0.01	*	2793
0	0	1	1	134.5	2.152	2.152	—	50/50	2284
0	1	0	0	150	2.4	2.4	—	50/50	2048
0	1	0	1	300	4.8	4.8	—	50/50	1024
0	1	1	0	600	9.6	9.6	—	50/50	512
0	1	1	1	1200	19.2	19.2	—	50/50	256
1	0	0	0	1800	28.8	28.7438	−0.19	*	171
1	0	0	1	2000	32.0	31.9168	−0.26	50/50	154
1	0	1	0	2400	38.4	38.4	—	50/50	128
1	0	1	1	3600	57.6	57.8258	0.39	*	85
1	1	0	0	4800	76.8	76.8	—	50/50	64
1	1	0	1	7200	115.2	114.306	−0.77	*	43
1	1	1	0	9600	153.6	153.6	—	50/50	32
1	1	1	1	19.200	307.2	307.2	—	50/50	16

Crystal Operation



External Input Operation



74XX—totem pole or open collector output (external pull-up resistor required)

For ROM re-programming SMC has a computer program available whereby the customer need only supply the input frequency and the desired output frequencies. The ROM programming is automatically generated.

Crystal Specifications

User must specify termination (pin, wire, other)
Prefer: HC-18/U or HC-25/U
Frequency: 10.1376 MHz, AT cut
Temperature range 0°C to 70°C
Series resistance <50 Ω
Series Resonant
Overall tolerance ± .01%
or as required

Crystal manufacturers (Partial List)

Northern Engineering Laboratories
357 Beloit Street
Burlington, Wisconsin 53105
(414) 763-3591

Bulova Frequency Control Products
61-20 Woodside Avenue
Woodside, New York 11377
(212) 335-6000

CTS Knights Inc.
101 East Church Street
Sandwich, Illinois 60548
(815) 786-8411

Crystek Crystals Corporation
1000 Crystal Drive
Fort Myers, Florida 33901
(813) 936-2109