DATA SHEET

RAA216
I2C remote control LCD display

Product specification

2002 Apr 13

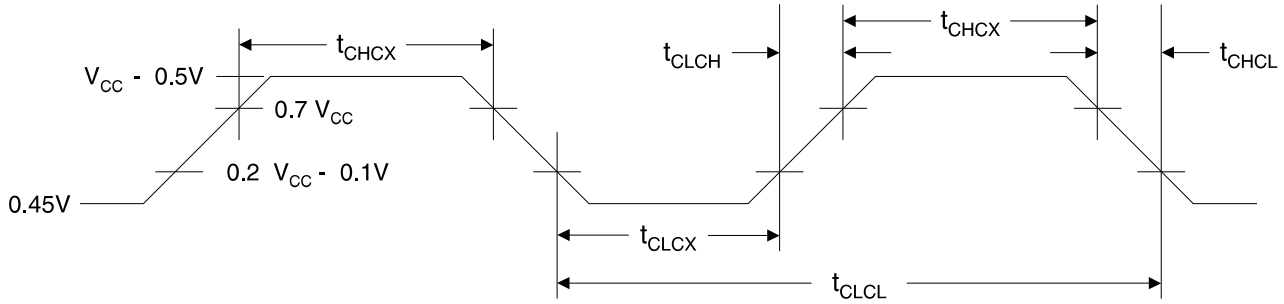
D.C. Characteristics

T_A = -40°C to 85°C, V_{CC} = 2.7 V to 6.0 V (unless otherwise noted)

Symbol	Parameter	Condition	Min	Max	Units
V_{IL}	Input Low Voltage		-0.5	0.2 V_{CC}-0.1	V
V_{IH}	Input High Voltage	(Except XTAL1, RST)	0.2 V_{CC}+0.9	V_{CC}+0.5	V
V_{IH1}	Input High Voltage	(XTAL1, RST)	0.7 V_{CC}	V_{CC}+0.5	V
V_{OL}	Output Low Voltage(1) (Ports 1, 3)	I_{OL} = 20 mA, V_{CC} = 5 V I_{OL} = 10 mA, V_{CC} = 2.7 V		0.5	V
V_{OH}	Output High Voltage (Ports 1, 3)	I_{OH} = -80 µA, V_{CC} = 5 V ± 10%	2.4		V
		I_{OH} = -30 µA	0.75 V_{CC}		V
		I_{OH} = -12 µA	0.9 V_{CC}		V
I_{IL}	Logical 0 Input Current (Ports 1, 2, 3)	V_{IN} = 0.45 V		-50	µA
I_{TL}	Logical 1 to 0 Transition Current (Ports 1, 2, 3)	V_{IN} = 2 V		-750	µA
I_{LI}	Input Leakage Current (Port P1.0, P1.1)	0 < V_{IN} < V_{CC}		±10	µA
V_{OS}	Comparator Input Offset Voltage	V_{CC} = 5 V		20	mV
V_{CM}	Comparator Input Common Mode Voltage		0	V_{CC}	V
RRST	Reset Pulldown Resistor		50	300	KΩ
C_{IO}	Pin Capacitance	Test Freq. = 1 MHz, T_A = 25°C		10	pF
I_{CC}	Power Supply Current	Active Mode, 12 MHz, V_{CC} = 6 V/3 V		15/5.5	mA
		Idle Mode, 12 MHz, V_{CC} = 6 V/3 V P1.0 & P1.1 = 0V or V_{CC}		5/1	mA
	Power Down Mode(2)	V_{CC} = 6 V P1.0 & P1.1 = 0V or V_{CC}		100	µA
		V_{CC} = 3 V P1.0 & P1.1 = 0V or V_{CC}		20	µA

Notes: 1. Under steady state (non-transient) conditions, I_{OL} must be externally limited as follows:
Maximum I_{OL} per port pin:20 mA
Maximum total IOL for all output pins:80 mA
If IOL exceeds the test condition, VOL may exceed the related specification. Pins are not guaranteed to sink current greater than the listed test conditions.
2. Minimum V_{CC} for Power Down is 2 V.

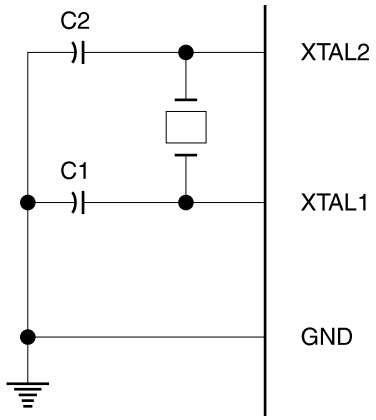
External Clock Drive Waveforms



External Clock Drive

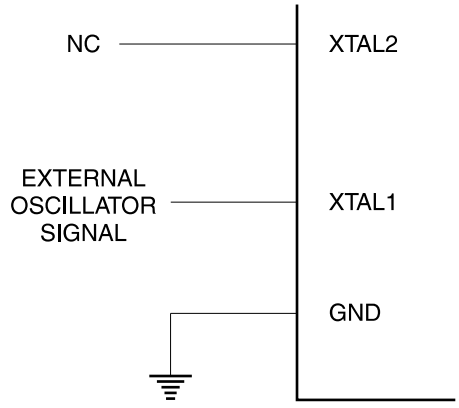
Symbol	Parameter	V_{CC} = 2.7 V to 6.0 V		V_{CC} = 4.0 V to 6.0 V		Units
		Min	Max	Min	Max	
$1/t_{CLCL}$	Oscillator Frequency	0	12	0	24	MHz
t_{CLCL}	Clock Period	83.3		41.6		ns
t_{CHCX}	High Time	30		15		ns
t_{CLCX}	Low Time	30		15		ns
t_{CLCH}	Rise Time		20		20	ns
t_{CHCL}	Fall Time		20		20	ns

Figure 1. Oscillator Connections



Notes: C1, C2 = 30 pF ± 10 pF for Crystals
= 40 pF ± 10 pF for Ceramic Resonators

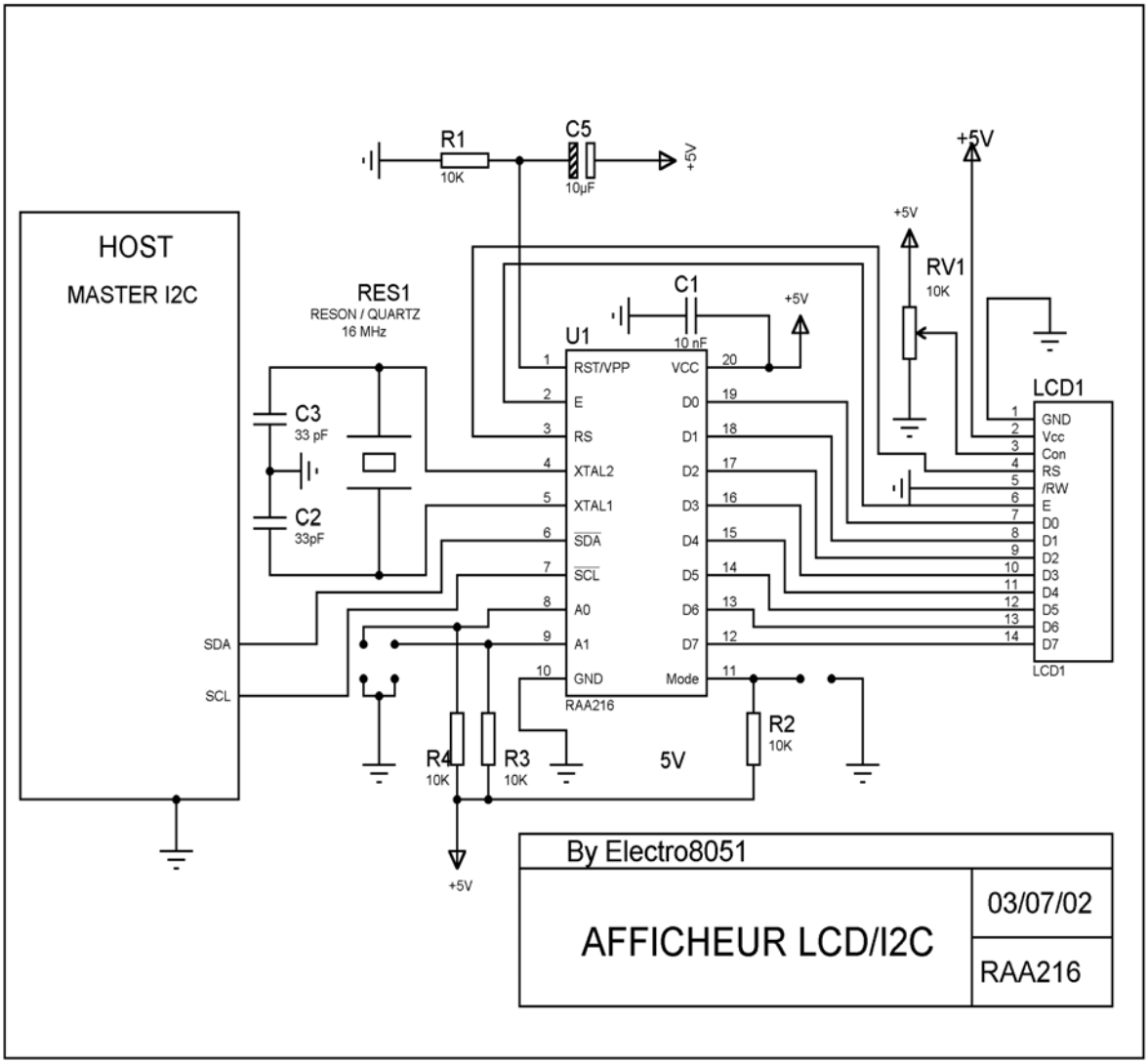
Figure 2. External Clock Drive Configuration



RAA216 DIP 20 package

Pin	Name	Type	Active	Use
1	RST	Input	High	Reset
2	E	Output	High	Enable LCD
3	RS	Output		Low:instruction,high:data
4	Xtal2	Input		To crystal
5	Xtal1	Input		To crystal
6	SDA	Input/Output	Low	SDATA I2C
7	SCL	Output		SCLOCK I2C
8	A0	Input	Must be tired to 0V or 5V	Adress select A0
9	A1	Input	Must be tired to 0V or 5V	Adress select A1
10	GND	Power		
11	Mode	Input	Must be tired to 0V or 5V	Mode=0:1L,Mode=1:2Lines
12	D7	Output	High open colector	Data to LCD
13	D6	Output	High open colector	Data to LCD
14	D5	Output	High	Data to LCD
15	D4	Output	High	Data to LCD
16	D3	Output	High	Data to LCD
17	D2	Output	High	Data to LCD
18	D1	Output	High	Data to LCD
19	D0	Output	High	Data to LCD
20	VCC	Power		

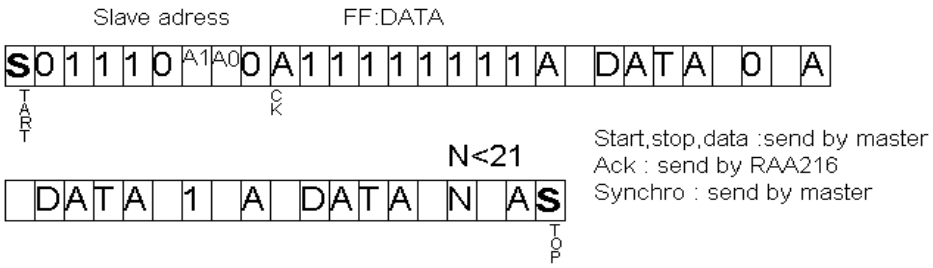
Schematic application



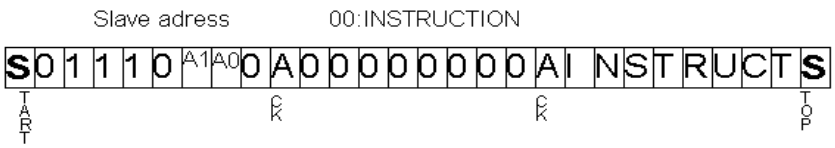
WRITE I2C

WRITE DATA

20 data bytes + 00 max



WRITE INSTRUCTION



See table : List of instructions

List of instructions

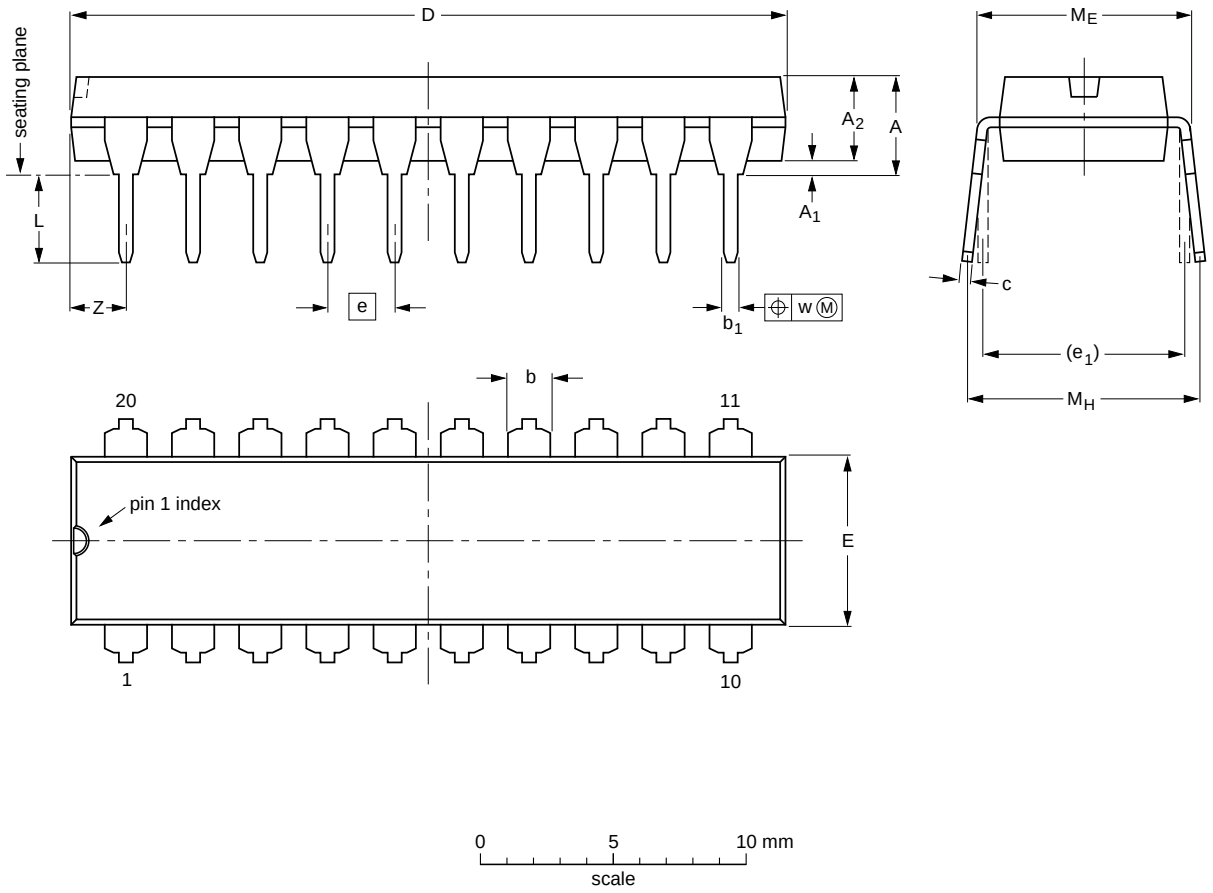
Instruction	Code	Execution time writing I2C
Clear display	0 0 0 0 0 0 0 1	1.52ms *
Return home	0 0 0 0 0 0 1 -	1.52ms *
Entry set Mode	0 0 0 0 0 1 I/D S	0
Display Control	0 0 0 0 1 D C B	0
Cursor or display shift	0 0 0 1 S/C R/L - -	0
Function set	0 0 1 DL N F - -	0
Set CGRAM address	0 1 A A A A A A	0
Set DDRAM address	1 A A A A A A A	0
Jump 2° line	1 1 0 0 0 0 0 0	0

* When writing I2C Clear display or Return home,it's necessary waiting 1.52ms before writing another instruction or data in I2C to LCD display

I/D =1 : Increment
I/D =0 ; Decreemnt
S =1 ; Accompanies display shift
S/C =1 ; Display shift
S/C =0 ; Cursor move
R/L =1 ; Shift to the right
R/L =0 ; Shift to the left
DL =1 ; 8 bits,DL =0 : 4 bits
N =1 ; 2 lines,N = 0 : 1 line
F =1 ; 5*10 dots,F = 0 : 5*8 dots

PACKAGE OUTLINES

DIP20: plastic dual in-line package; 20 leads (300 mil) SOT146-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	0.36 0.23	26.92 26.54	6.40 6.22	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.0
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.014 0.009	1.060 1.045	0.25 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.078

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT146-1			SC603			