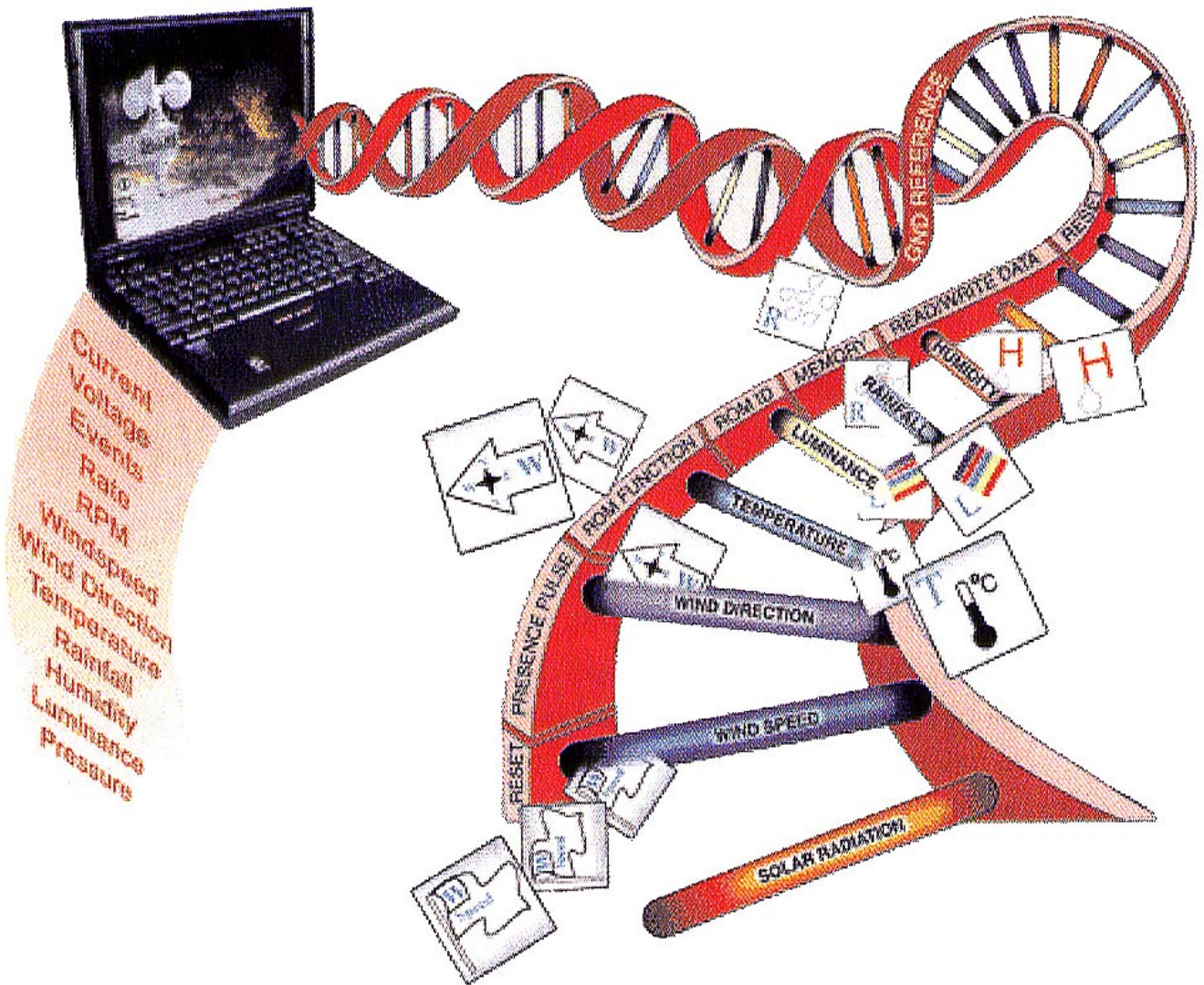


## 1-Wire® FIELD STANDARD PROTOCOL



*Typical applications supplied by 1-Wire® field standard protocol.*

The **1-Wire®** field network is a standard protocol based on a single communication wire, as stated by its name, that includes numerous devices and sensors frequently used in the industrial and domestic applications. Currently there are many components on the market, based on this communication standard, provided of a really interesting price/performance ratio. The cost is furthermore reduced by a simple and economic connection modalità: in fact normally the

complete wiring requires only three wires: two for power supply and a third one for bidirectional communication. On these lines it can be connected all the required devices, on a network, by choosing the physic positions according with application requirements.

Among the available **1-Wire®** devices we remind:

#### **SENSORS.**

Temperature  
Pressure  
Humidity  
Thermostat  
etc.

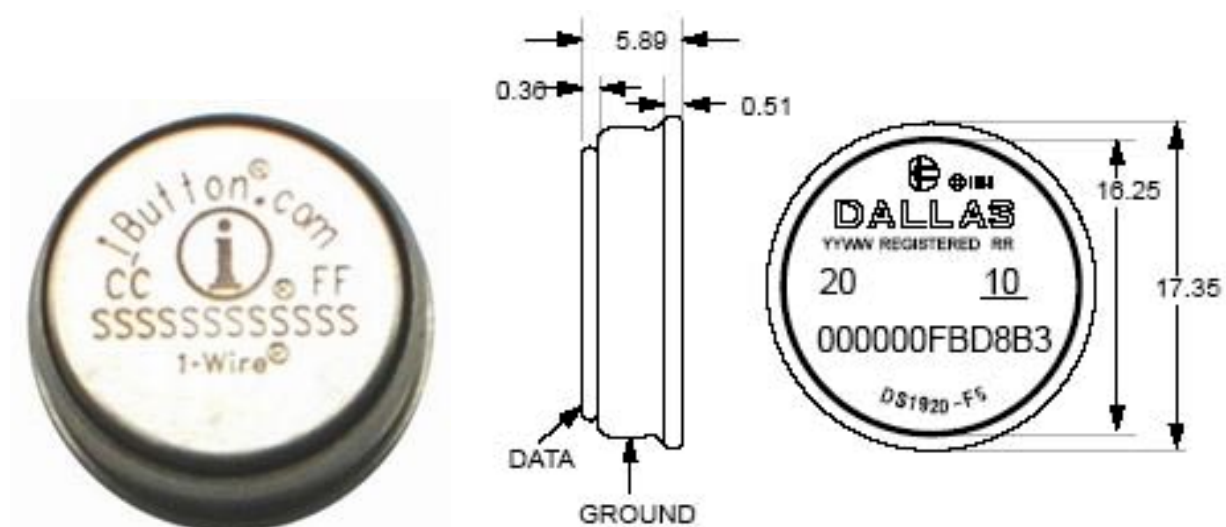
#### **MEMORIES.**

EEPROM  
ROM  
etc

#### **IDENTIFIERS.**

Electronic keys  
Progressive codes  
Variable codes  
etc.

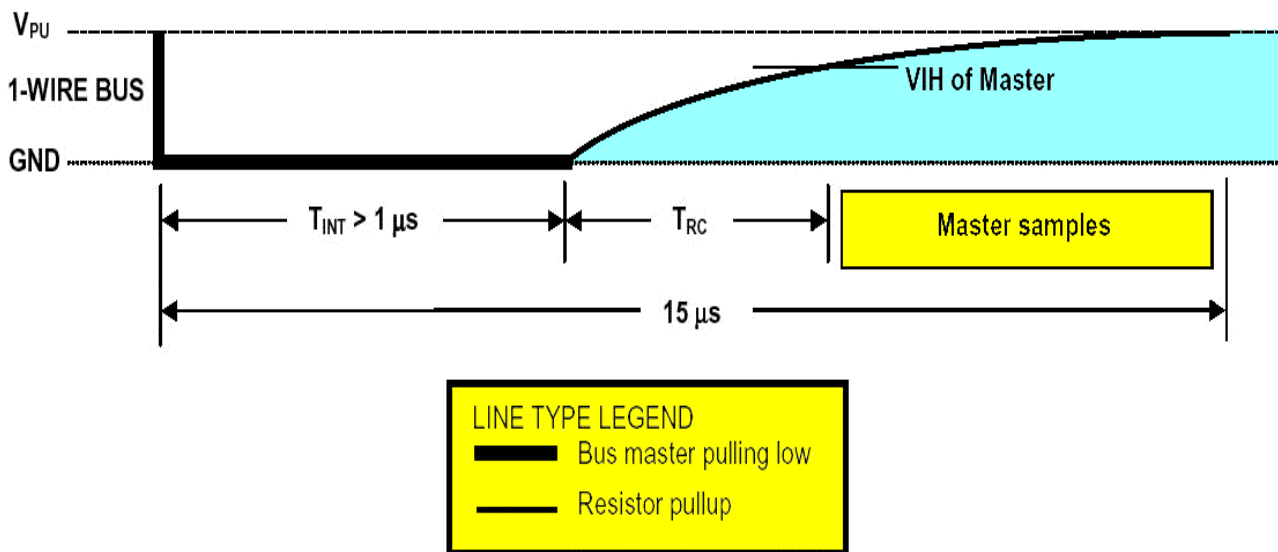
The **1-Wire®** protocol is provided of all the required communication modalities. They allows an high transfer data rate and a remarkable intrinsic security on their validità. This happens through unique addressing techniques, **polinomial CRC** checking, numerous verify commando and complex management algorithms.



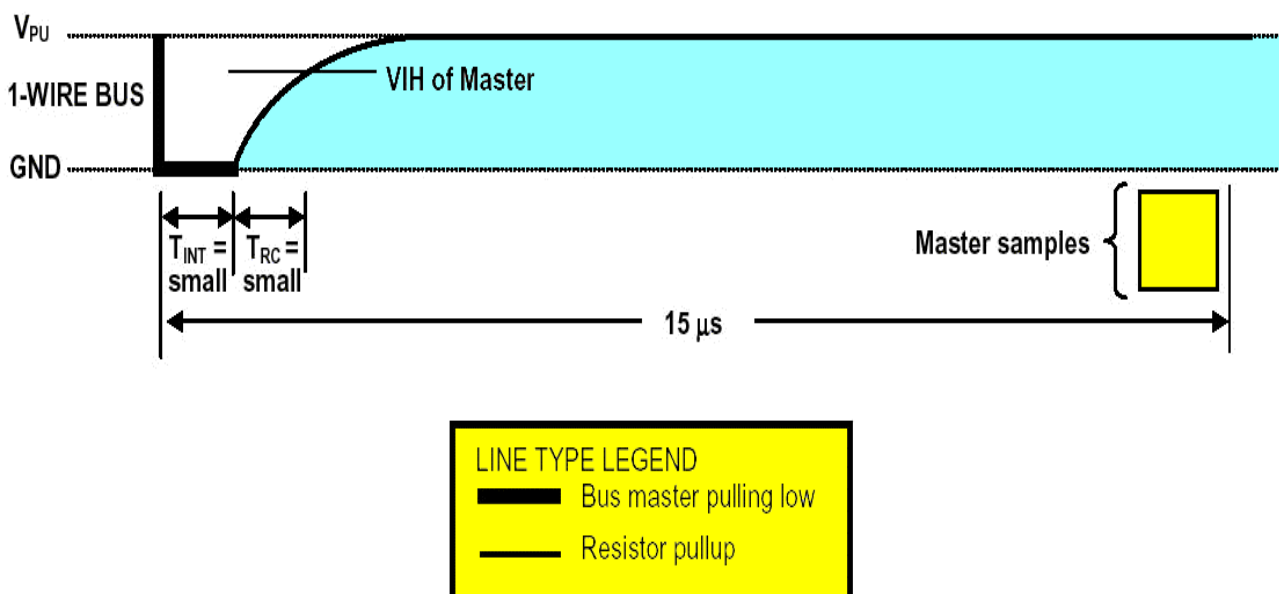
***iButton® devices with 1 Wire® interface.***

By studying the documentation on **1-Wire®** protocol, you can profitably get the necessary know how about its use. For this purpose, from electric point of view it is sufficient that the used device has at least one bidirectional digital **I/O** line.

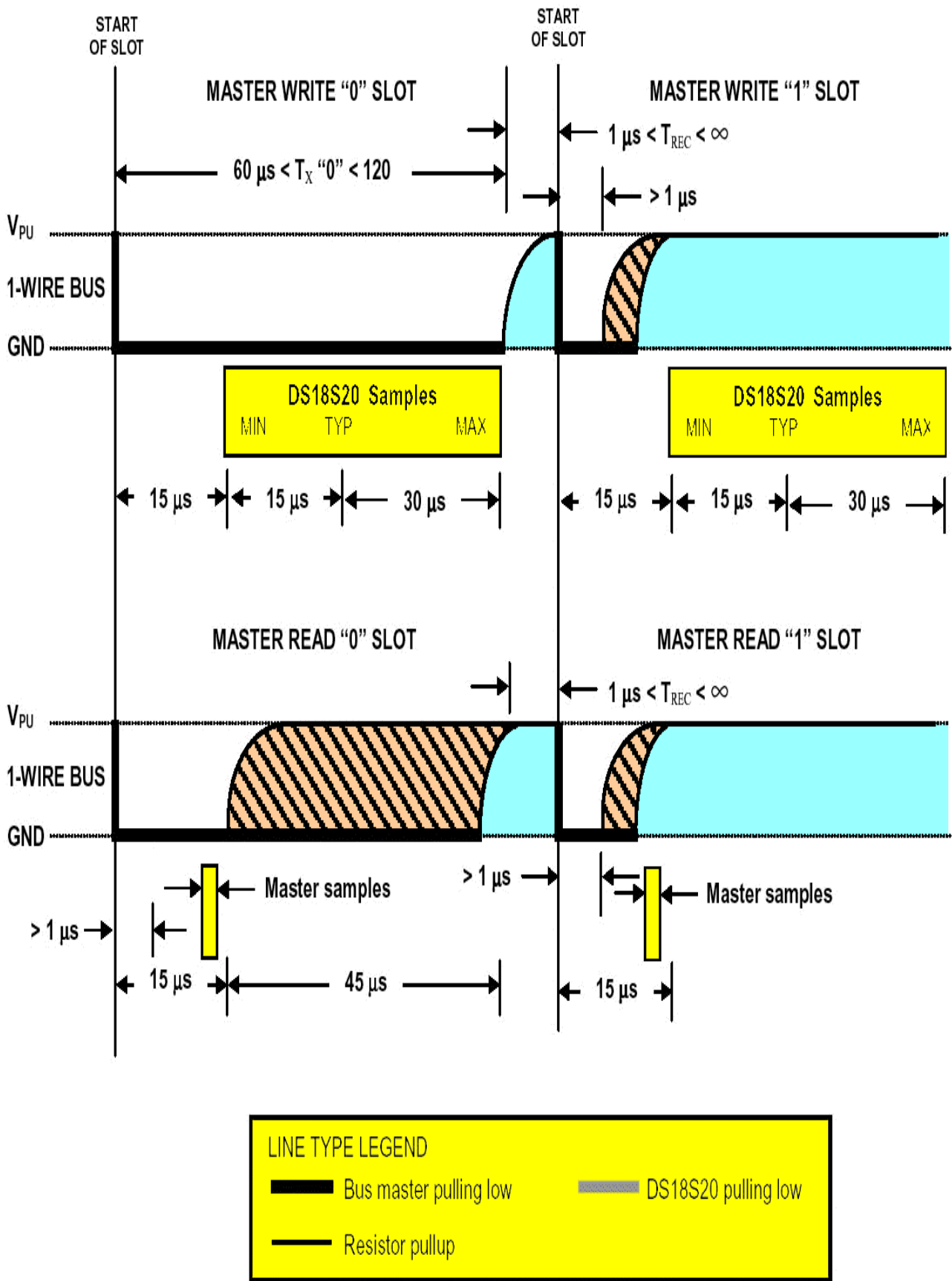
Through this line it can be supplied the commands implemented in the numerous **1-Wire®** devices. It is possible to interact with all the components available on **1-Wire® BUS** and, to exchange the necessary information with all them. The data exchange is performed through a status sequence, with proper predefined timings, as described in the diagrams listed in the following pages.



***"Master Read 1 Timing" diagram.***



***Recommended "Master Read 1 Timing".***



*Read/Write timings diagram.*

By mixing the fundamental operations, before described, in predefined sequences it can be supplied the commands defined in **1-WIRE®** standard, below listed:

Reset **1-WIRE® BUS**

Write one bit on **1-WIRE® BUS**

Read one bit from **1-WIRE® BUS**

Write one byte on **1-WIRE® BUS**

Read one byte from **1-WIRE® BUS**

Search **ROM Code** on **1-WIRE® BUS**

Read **ROM Code** from **1-WIRE® BUS**

Compare **ROM Code** on **1-WIRE® BUS**

Search alarms on **1-WIRE® BUS**

The **BASCOM** provides a set of instructions specialized in order to efficiently use the **1-WIRE® BUS**.

Trough these instructions the user can easily communicate with large parts of devices without any complications as **Timings** and **Directions** of data line, **CRC**, conflicts, etc.

It is sufficient to simply transmit and receive the proper data.

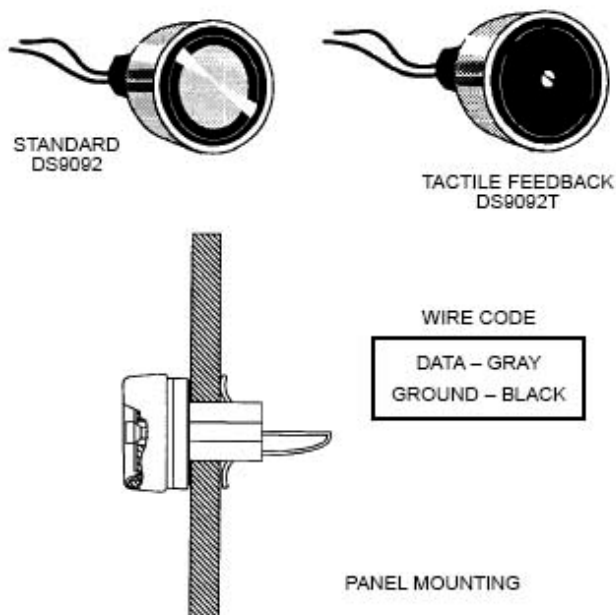
Some instructions realize complete functions of **1-WIRE®** communication as the recognition of how many and which devices are connected; the management of commands associated with **ROM Code**; the errors check and so on.

## iButton® devices

The **iButton®** devices deserve a specific description. These very interesting products have the appearance of a button, with a 6 millimeters depth, a 17 mm diameter and they have a sturdy cover of stainless steel. About format, these devices remind a little button battery and they include a chip with one of the following features.

### **iButton types**

- Electronic keys
- NV RAM type memories
- EPROM type memories
- EEPROM type memories
- Real Time Clock
- Multikeys
- Protected password memories
- Temperature sensors
- Temperature data logger
- Humidity data logger
- etc.



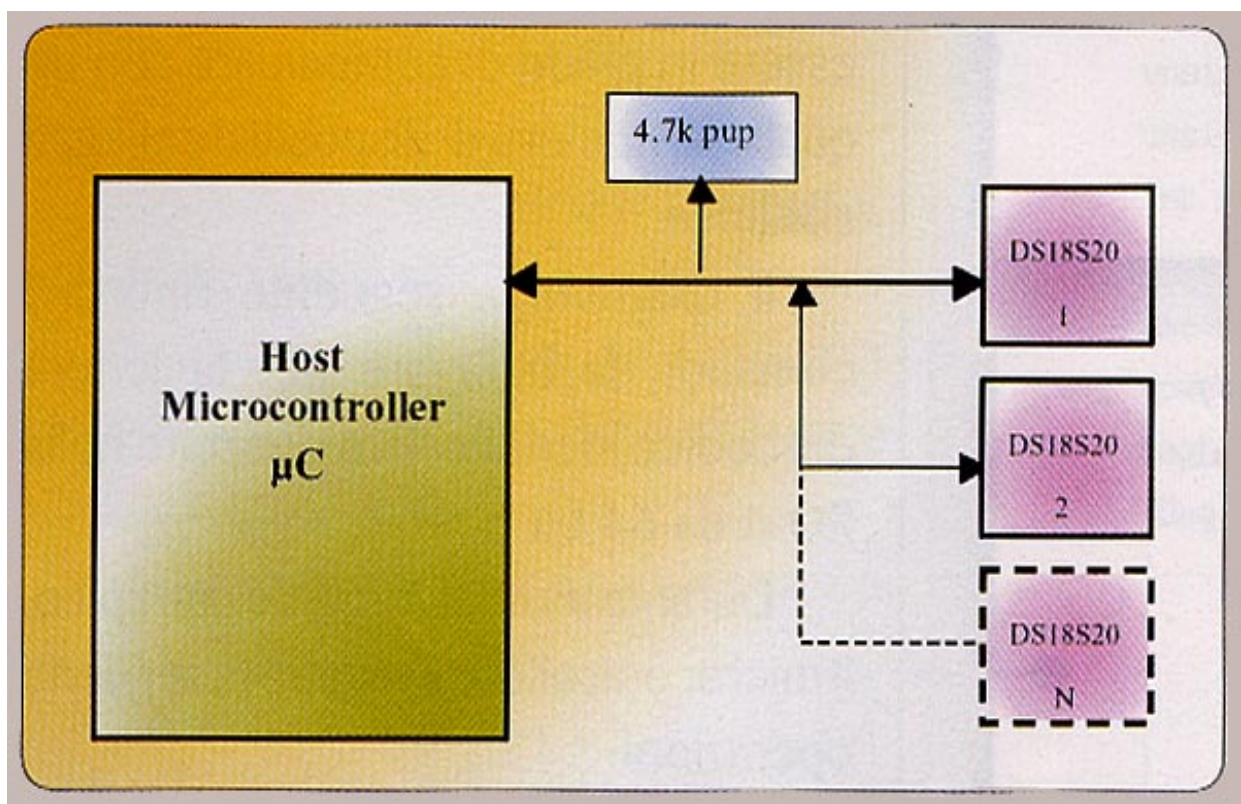
**Typical use of iButton® with 1-Wire®.**



One of the most interesting feature of these devices is that they don't require a power supply source in order to work.

The iron buttons can be mounted everywhere, in fact the container is strong and it tolerates even harsh environments, either closed or in open air.

This container is so small that it allows the accomodation into keyrings, watches or many other personal objects; so it can be used everyday for building accesses checking, personal computer blocking, heritage management and the logging of different data types.



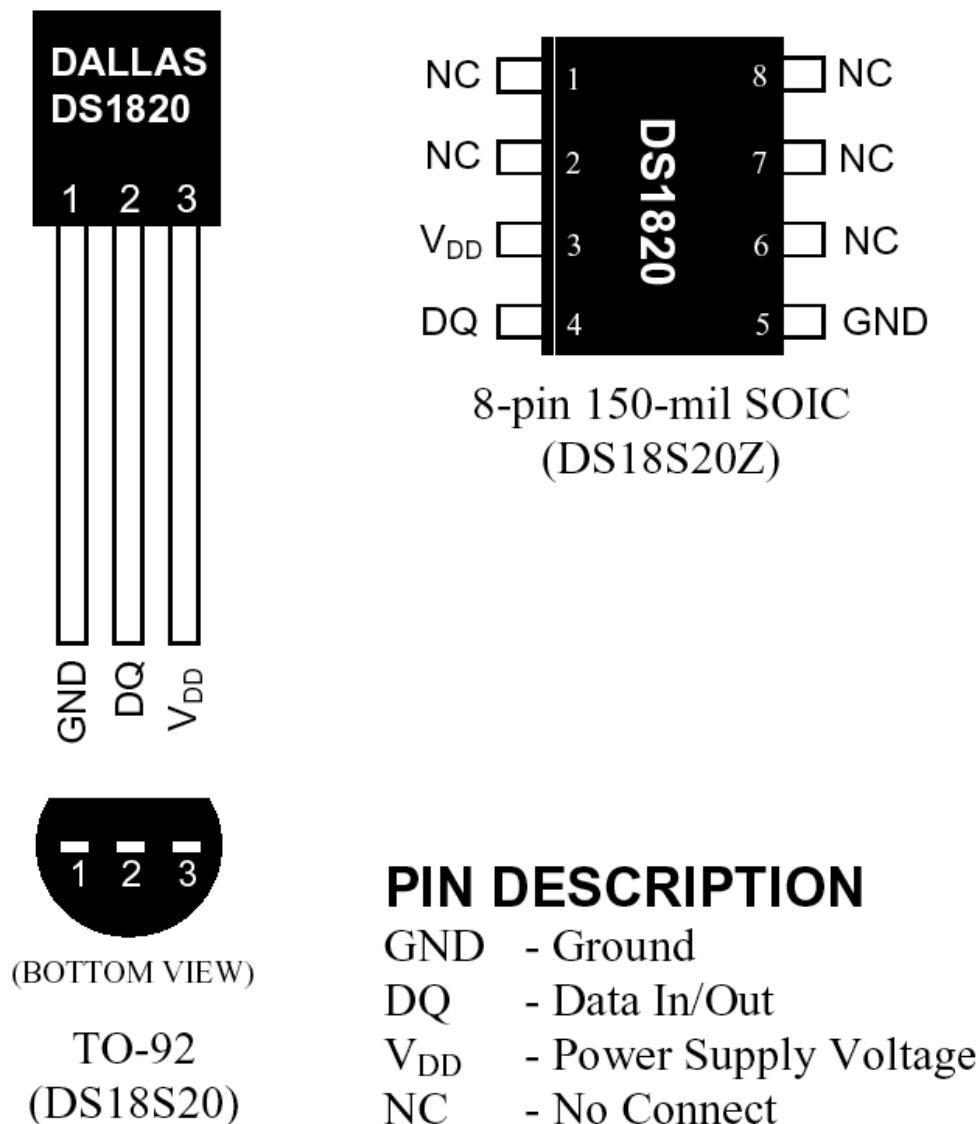
*Possible connection network through 1 Wire® BUS.*

By studying the documentation on **1-Wire®** protocol you can profitably get the required knowledge in order to correctly use it. For this purpose, from physical point of view, it is sufficient that the used device has at least one bidirectional digital **I/O** line.

The **BASCOM AVR** includes a group of dedicated instructions, that are specialized for **1-Wire®** efficient management.

## Temperature Sensor DS18S20

The **DS18S20** component is a complete Temperature sensor, capable to work in the range **-55..+125 °C**, with **0,5 °C** resolution, provided of **1-WIRE®** interface. Moreover the sensor checks if the measured temperature falls into a predefined range, it recognizes possible alarms when it is out of range and it even driver an alarm output signal. The border values of the alarm range can be set through dedicated **1-Wire®** commando, either in a temporaneous or permanent mode.



### Pin-Out of 1 Wire® Temperature sensor, type DS18S20.

The typical application of **DS18S20** are the multi points temperature control with distributed sensors or simple centralized thermostat controls. Further information about the component are described by the following figures and in proper data sheet.



By taking advantage of dedicated commands, the user can easily communicate with large parts of devices without any complications as **Timings** and **Directions** of data line, **CRC**, conflicts, etc. It is sufficient to simply transmit and receive the proper data.

The supported commands are:

Reset **1-WIRE® BUS**

Write one bit on **1-WIRE® BUS**

Read one bit from **1-WIRE® BUS**

Write one byte on **1-WIRE® BUS**

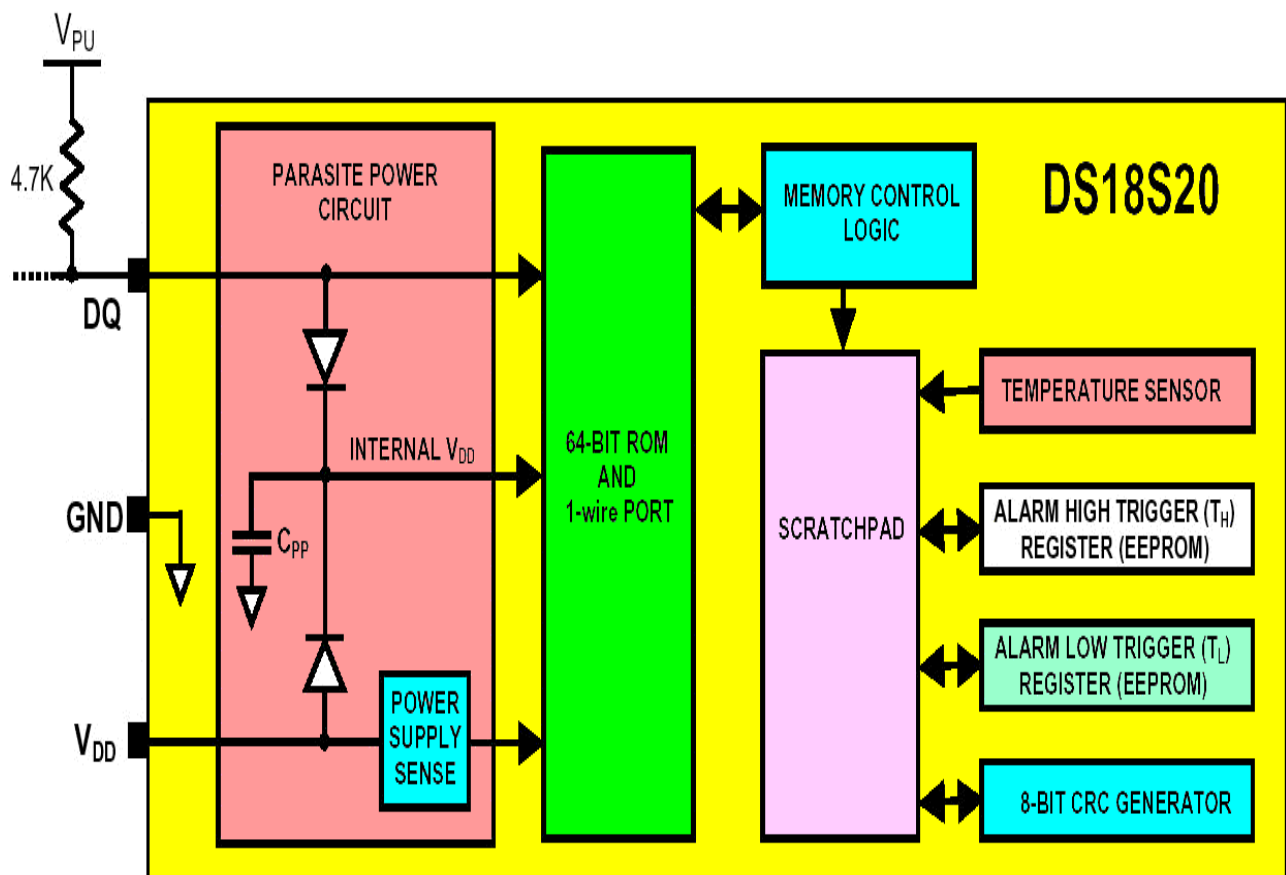
Read one byte from **1-WIRE® BUS**

Read **ROM Code** from **1-WIRE® BUS**

Compare **ROM Code** on **1-WIRE® BUS**

Bypass **ROM Code** on **1-WIRE® BUS**

Search alarms on **1-WIRE® BUS**



*Block diagram of 1-Wire® temperature sensor, type DS18S20.*

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
LS Byte	$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$	$2^{-1}$
	bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
MS Byte	S	S	S	S	S	S	S	S

***Temperature registers format.***

TEMPERATURE	DIGITAL OUTPUT (Binary)	DIGITAL OUTPUT (Hex)
+85.0°C*	0000 0000 1010 1010	00AAh
+25.0°C	0000 0000 0011 0010	0032h
+0.5°C	0000 0000 0000 0001	0001h
0°C	0000 0000 0000 0000	0000h
-0.5°C	1111 1111 1111 1111	FFFFh
-25.0°C	1111 1111 1100 1110	FFCEh
-55.0°C	1111 1111 1001 0010	FF92h

\*The power-on reset value of the temperature register is +85°C

***Table with relationship between Temperature and returned value.***

## Example.056. Management and driving of iButton® devices and one line with 1-WIRE® BUS.

### Added Definitions:

None

### Added Declarations:

None

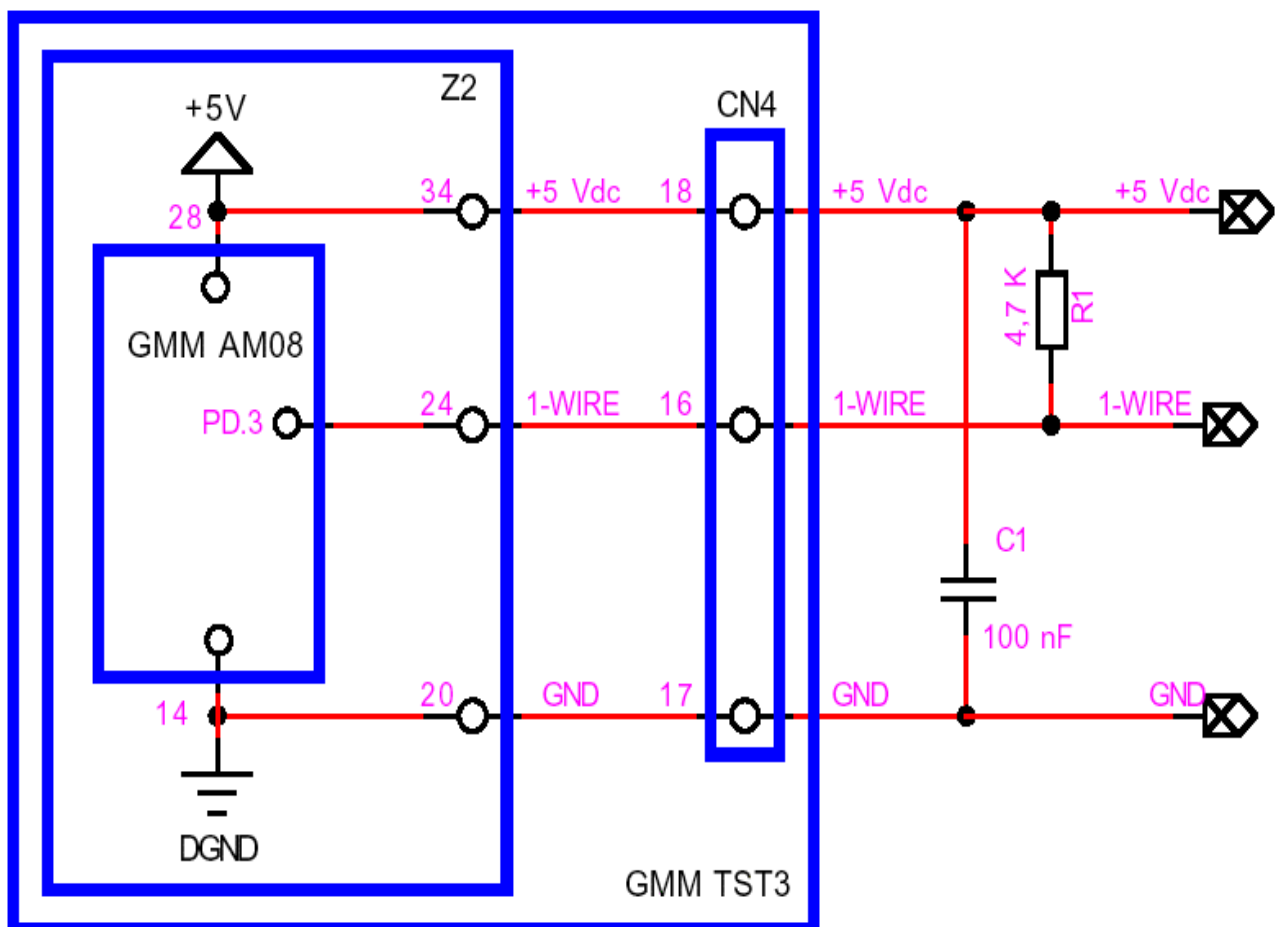
### Added Instructions:

CONFIG 1WIRE ; 1WRESET ; 1WIRECOUNT ; 1WSEARCHFIRST ; 1WSEARCHNEXT.

### Added Operators:

None

Example program **056** of **BASCOM AVR** course.



*1-Wire interfacement circuit.*

Program for **1-WIRE BUS** management, that identify and shows the information about the connected devices, **iButton®** type included, too.  
The program uses a **1-WIRE** interface with three wires, one (**DQ**) for the data and two (**GND**, **Vdd**) for the power supply, but it can operate even with devices provided of only two wires.

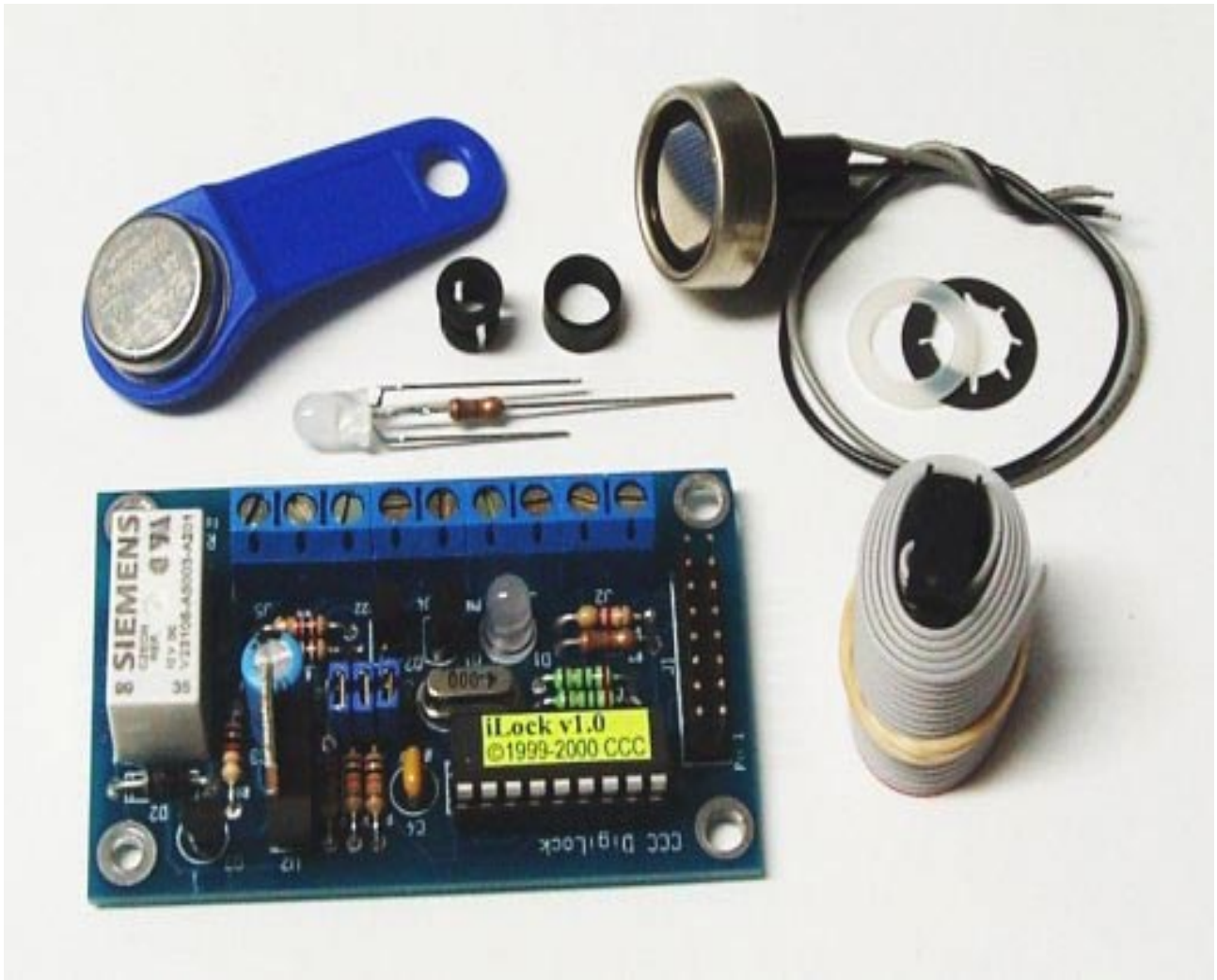
From electric point of view, this signals have been freely selected as listed in following definitions and they can be easily re-assigned, as described in **BASCOM** on line help.



*Typical iButton® plugged in a keys holder.*

The program count the possible devices connected to **1- WIRE® BUS**. For each one of the identified device, it shows the information that feature and describe it or, in other words, its **ROM code**.

This work is performed only by using the **ROM Commands**, always available on each device with **1-WIRE®** protocol. Further information about **ROM Commando**, and **ROM Code**, can be found into **data sheet** of the used devices, or on the **1-WIRE®** documents, released by **DALLAS (MAXIM)**.



*Application little card and Key for iButton® in 1-Wire®.*

The program describes its functionalities and uses a serial console provided of monitor and keyboard with a fixed physical protocol at **19.200 Baud, 8 Bits x chr, 1 Stop bit, No parity.**

This console can be another system capable to support a serial **RS 232** communication. In order to simplify the use it can be used a **PC** provided of one **COMx** line, that execute a terminal emulation program as **HYPERTERMINAL** or the homonym modality provided by **BASCOM AVR** (see **IDE Configuration**).

The program works only when the **GMM AM08** is mounted on **Z2** socket of **GMM TST3!!**



## Example.057. Temperature acquirement and management of DS1820 device with 1-WIRE®.

### Added Definitions:

None

### Added Declarations:

None

### Added Instructions:

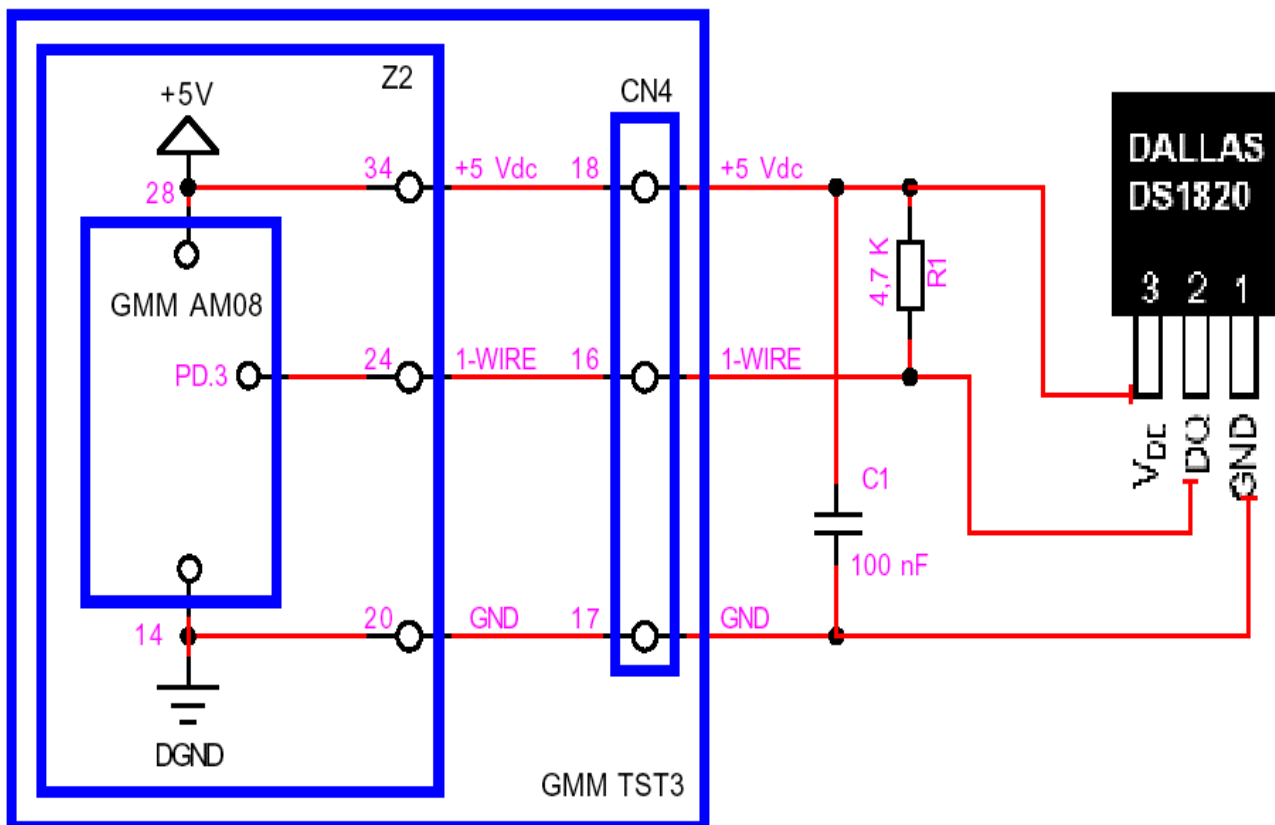
1WVERIFY ; 1WWRITE ; 1WREAD ; CRC8.

### Added Operators:

None

**Example** program **057** of **BASCOM AVR** course.

Temperature acquisition from **DS18S20** sensor through **1-WIRE®** BUS.



*Application circuit diagram for the DS18S20 sensor with 1-Wire®.*

Each second the program acquires and shows the temperature from sensor, by using a three wires (**DQ**, **GND**, **Vdd**) **1-WIRE®** interface.

The temperature is displayed on console with the half degree resolution, in the range from  
**-55 to +125 °C**, typical of the sensor.

When on **1-WIRE® BUS** there are several devices, the program searches for and manages only the first **DS18S20** sensor, with no intervenes on the other ones.

The program describes its functionalities and uses a serial console provided of monitor and keyboard with a fixed physical protocol at **19.200 Baud, 8 Bits x chr, 1 Stop bit, No parity**.

This console can be another system capable to support a serial **RS 232** communication. In order to simplify the use it can be used a **PC** provided of one **COMx** line, that execute a terminal emulation program as **HYPERTERMINAL** or the homonym modality provided by **BASCOM AVR** (see **IDE Configuration**).

The program works only when the **GMM AM08** is mounted on **Z2** socket of **GMM TST3!!**

## Example.058. Temperature control with management of a control band and hysteresys.

### Added Definitions:

None

### Added Declarations:

None

### Added Instructions:

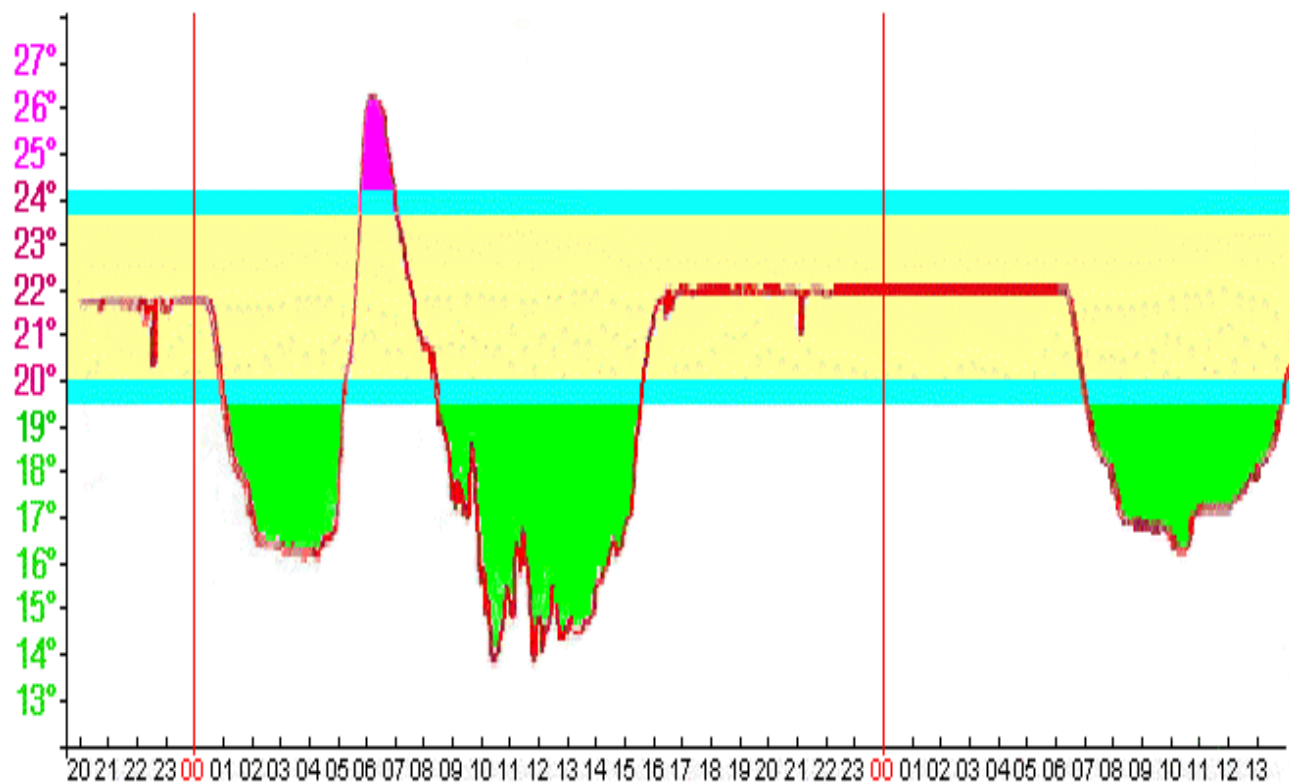
None

### Added Operators:

None

**Example** program **058** of **BASCOM AVR** course.

Temperature acquisition from **DS18S20** sensor through **1-WIRE® BUS**, with control band or hysteresys.



*Temperature control profile on a time base.*

Each second the program acquires the temperature from sensor and then it performs an heating thermostat function.

In other words, it checks if the temperature with a presettable limit (**set point**) and **hysteresys**.

The temperature is acquired by using a three wires (**DQ, GND, Vdd**) **1-WIRE®** interface, with **1** celsius degree resolution, and it is displayed on console, together with the other thermostat parameters. Moreover through the console it is possible to set the current value for **Set Point** and **Hysteresys**.

When on **1-WIRE® BUS** there are several devices, the program searches for and manages only the first **DS18S20** sensor, with no intervenes on the other ones.

The program describes its functionalities and uses a serial console provided of monitor and keyboard with a fixed physical protocol at **19.200 Baud, 8 Bits x chr, 1 Stop bit, No parity**.

This console can be another system capable to support a serial **RS 232** communication. In order to simplify the use it can be used a **PC** provided of one **COMx** line, that execute a terminal emulation program as **HYPERTERMINAL** or the homonym modality provided by **BASCOM AVR** (see **IDE Configuration**).

The program works only when the **GMM AM08** is mounted on **Z2** socket of **GMM TST3!!**