

# PM1K Prototyping Module

## Introduction

The PM1K is a prototyping board featuring one CM1K chip ready to interface to a microcontroller via I2C and to a sensor via an 11-pin digital input bus. It has been designed to enable academic and research teams to get a quick perception of the CM1K chip's simplicity of deployment, speed and low-power consumption. The CM1K chip is the sole active on-board component. It can learn and recognize digital patterns in real-time. The output pins of the PM1K continually report the category recognized by the neurons and can be used to control LEDs, a seven segment display, or otherwise.

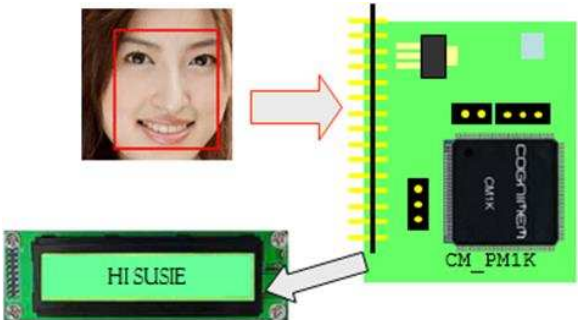
## Features

- I2C serial interface (100 and 400 Kbits)
- Simple RTL instructions (less than a dozen registers)
- 3 possible methods to feed a vector to the neurons:
  - Neuron bus (via I2C commands)
  - Digital input bus (8 data and 1 ctrl lines, 1 clock)
  - Video input bus (8 data and 2 ctrl lines)
- Match one vector among 1024 in 10 microseconds @ 27 MHz
- Recognition time independent from the number of neurons in use
- Output lines: 8 data and 2 strobe lines to report the recognized category



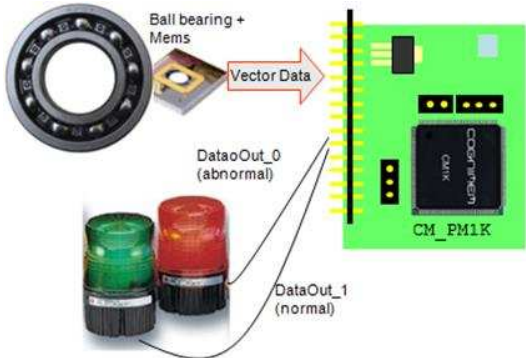
## Image Recognition

Face recognition, target tracking, video monitoring, kinematics, and more...

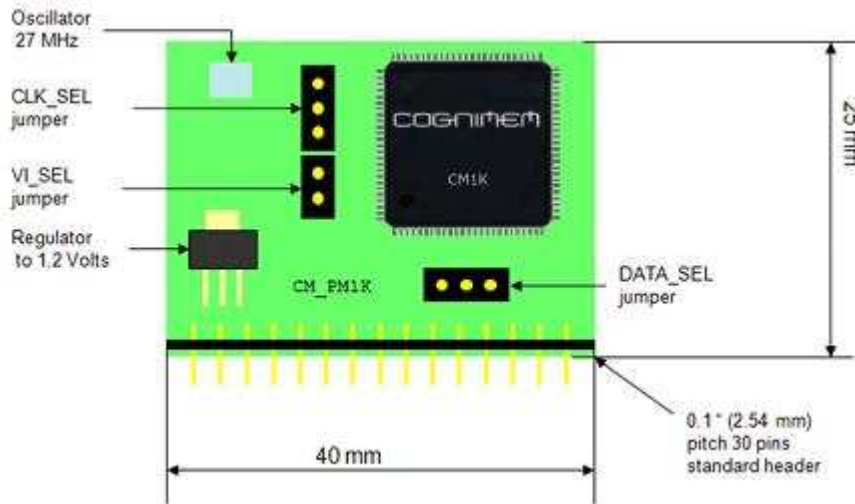


## Signal Recognition

Speech recognition, radar identification, EEG/EKG monitoring, vibration, sonar, and more...



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The CM1K chip is a parallel neural network with built-in model generator and a real-time recognition stage. When the recognition stage is enabled, the signal received on the CM1K digital input bus is automatically broadcasted to the neurons and the response of the neuron with the best match is available in less than 11µsecs after the last data feed.

## Header Pin Assignment

Pin	Signal	Pin	Signal
1	VCC (3.3V, 200 mA)	2	GROUND
3	Interrupt (cat ready)	4	Output data 7
5	Output data 6	6	Output data 5
7	Output data 4	8	Output data 3
9	Output data 2	10	Output data 1
11	Output data 0	12	Bus Busy
13	Identified status	14	Uncertain status line
15	Video/Vector clock	16	Video Frame/Vector valid
17	Video line valid	18	Video/vector data 7
19	Video/vector data 6	20	Video/vector data 5
21	Video/vector data 4	22	Video/vector data 3
23	Video/vector data 2	24	Video/vector data 1
25	Video/vector data 0	26	I2C SDA
27	I2C SCK	28	Standby (low power)
29	Reset (low)	30	External clock (5 to 27 MHz)

## CM1K Neural Network

- Vector data: up to 256 bytes
- Categories: up to 32768 values
- Classification status: IDentified (pin 13), UNCertain (pin 14) or UNKknown
- Distance Norms: L1 or MAX
- Up to 127 contexts or sub-networks
- RBF classifier, trained by example
- K-Nearest Neighbor

## Recognition Stage

- V\_clock up to 27 MHz (pin 15)
- 8-bit data (pins 18-25)
- 1 sync. line for vector input (pin 16)
- 2 sync. lines for video input (pins 16-17)
- 1 output strobe signal (pin 3) after each recognition
- Digital output bus (pins 4-10)

## Connectivity

- Serial bus I2C (100 kbit and 400 kbit)

## Electrical / Mechanical

- 300 mW @ 27 MHz
- 3.3 V power supply
- Dimensions 40 x 32 x 10 mm