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# CM1K-PGA69 Module

## Hardware Specification

Product Code 901-2000



Version 2.5.2

Revised  
08/16/2013

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# Technical Manual

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## Introduction

The CM1K-PGA69 module is intended to assist customers in prototyping their hardware based pattern recognition systems with the CM1K. It comes complete with a CM1K TQFP device mounted on a 4-layer PCB with a 69 pin grid array header with .1" spacing. This can be used for connection on a prototyping mother board for easy addition and/or removal of CM1K's from the system. The module requires a standard 3.3v power supply (300ma) and includes the on-board circuitry for generating 1.2V for the CM1K core voltage.

## Reference Documentation

- CM1K Hardware User's Manual under product:

[http://www.cognimem.com/docs/Technical-Manuals/TM\\_CM1K\\_Hardware\\_Manual.pdf](http://www.cognimem.com/docs/Technical-Manuals/TM_CM1K_Hardware_Manual.pdf)

[http://www.cognimem.com/docs/Datasheet/DS\\_CM1K.pdf](http://www.cognimem.com/docs/Datasheet/DS_CM1K.pdf)

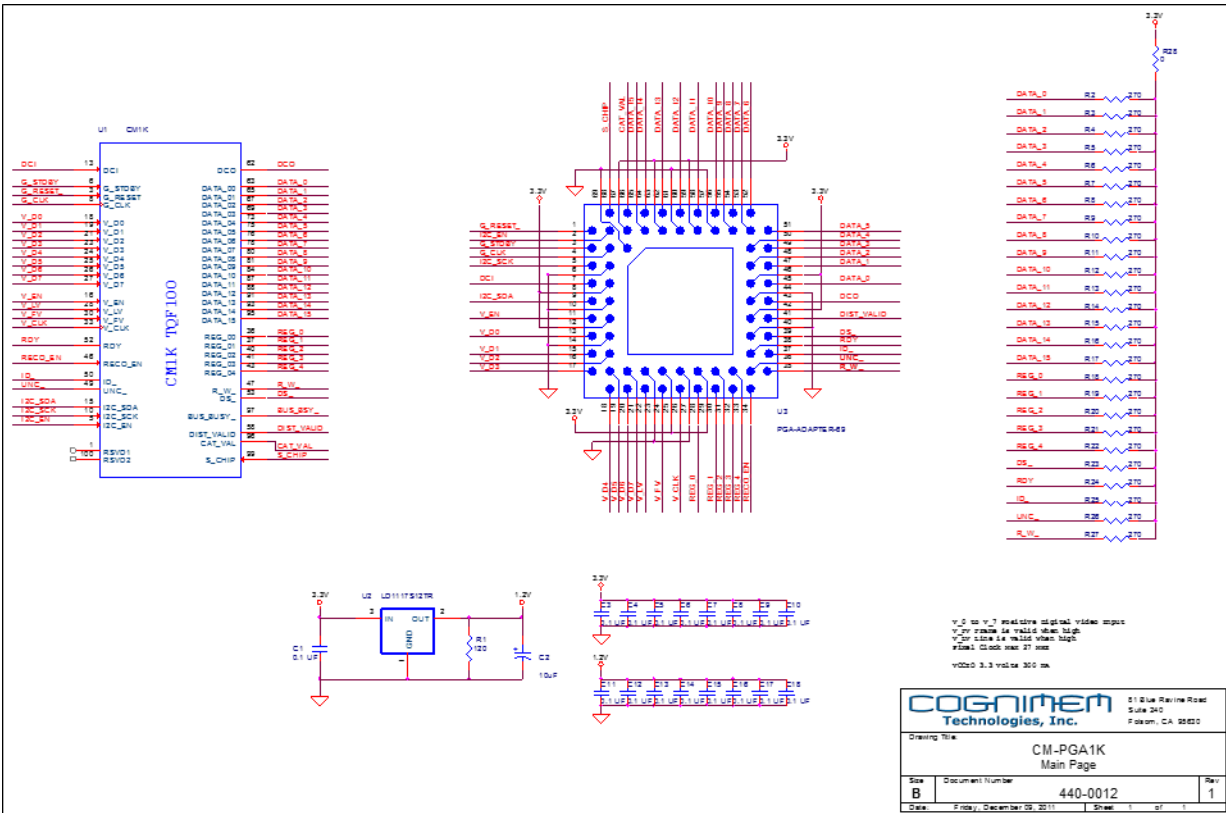
# CM1K-PGA69 Module

## Architecture Overview

The CM1K-PGA69 provides the necessary hardware to allow a customer to get started quickly on prototyping their CM1K hardware based pattern recognition system. The CM1K implements 1024 neurons configured as a 3-layer network, each connected to the input through 256 1 byte connections (256K bytes total per neuron). The output layer of the CM1K component implements a hardware search and sort to rapidly identify the neuron(s) providing the closest match.

The CM1K can learn in system real time or off-line as required by the application. Once taught, the knowledge can be replicated to any number of CM1Ks. The machine learning algorithm that is natively implemented is RCE- Restricted Coulomb Energy. During recognition and vector (data) matching, the CM1K optionally uses RBF- Radial Basis Functions, and kNN- k Nearest Neighbor non-linear classifiers for generality. The component also supports 1D or 2D data inputs as well as expandability to N number of neurons with constant latency of data matching (exact or fuzzy) performance.

## Schematic Diagram



## Specifications

- 1024 silicon neurons working in parallel with automatic model generator
- Classify vectors of up to 256 bytes, Up to 16382 categories
- Radial Basis Function (Restricted Coulomb Energy machine learning) or K-Nearest Neighbor non-linear classifiers
- CM1K-PGA69 supports both Parallel and VDATA buses

## Power Supply

A 1.2V voltage regulator is supplied onboard to supply 1.2V to the CM1K. The only supply voltage needed is 3.3V

## Pin Header Signal Mapping

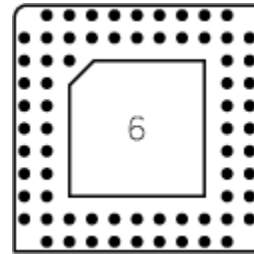
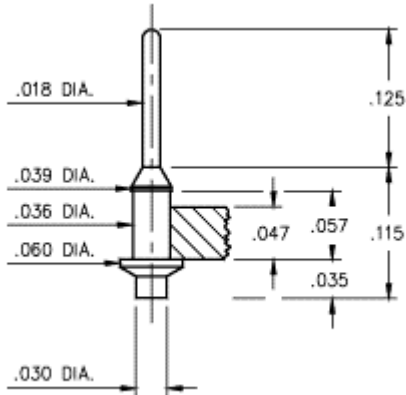
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	G_RESET_	24	V_FV	47	DATA_1
2	I2C_EN	25	3.3V	48	DATA_2
3	G_STDBY	26	V_CLK	49	DATA_3
4	G_CLK	27	GND	50	DATA_4
5	I2C_SCK	28	REG_0	51	DATA_5
6	GND	29	3.3V	52	DATA_6
7	DCI	30	REG_1	53	DATA_7
8	3.3V	31	REG_2	54	DATA_8
9	I2C_SDA	32	REG_3	55	DATA_9
10	GND	33	REG_4	56	DATA_10
11	V_EN	34	RECO_EN	57	GND
12	3.3V	35	R_W_	58	DATA_11
13	V_D0	36	UNC_	59	3.3V
14	GND	37	ID_	60	DATA_12
15	V_D1	38	RDY	61	GND
16	V_D2	39	DS_	62	DATA_13
17	V_D3	40	GND	63	3.3V
18	V_D4	41	DIST_VALID	64	DATA_14
19	V_D5	42	3.3V	65	DATA_15
20	V_D6	43	DCO	66	CAT_VAL
21	V_D7	44	GND	67	3.3V
22	V_LV	45	DATA_0	68	S_CHIP
23	GND	46	3.3V	69	GND

For signal descriptions refer to the CM1K Hardware Manual.

## Mechanical Definition

The CM1K-PGA Module is 1.1" x1.1".

Pin Header diagram:



Lead spacing:  
X= 0.100"  
Y= 0.100"

## Bill of Materials

Item	Quantity	Part Description
1	17	CAP CER .1UF 6.3V Y5V SMD 0402
2	1	CAP TANT 10UF 6.3V SMD 0603
3	1	RES 120 OHM 1/10W 5% 0402 SMD
4	26	RES 270 OHM 1/10W 5% 0402 SMD
5	1	RES 0.0 OHM 1/8W 0805 SMD
6	1	IC CTI ASIC CM1K
7	1	IC REG LDO 1.2V 950MA SOT-223
8	1	Header, PGA, .100", 69-Pin, SMD
	1	PCB, Bare Board