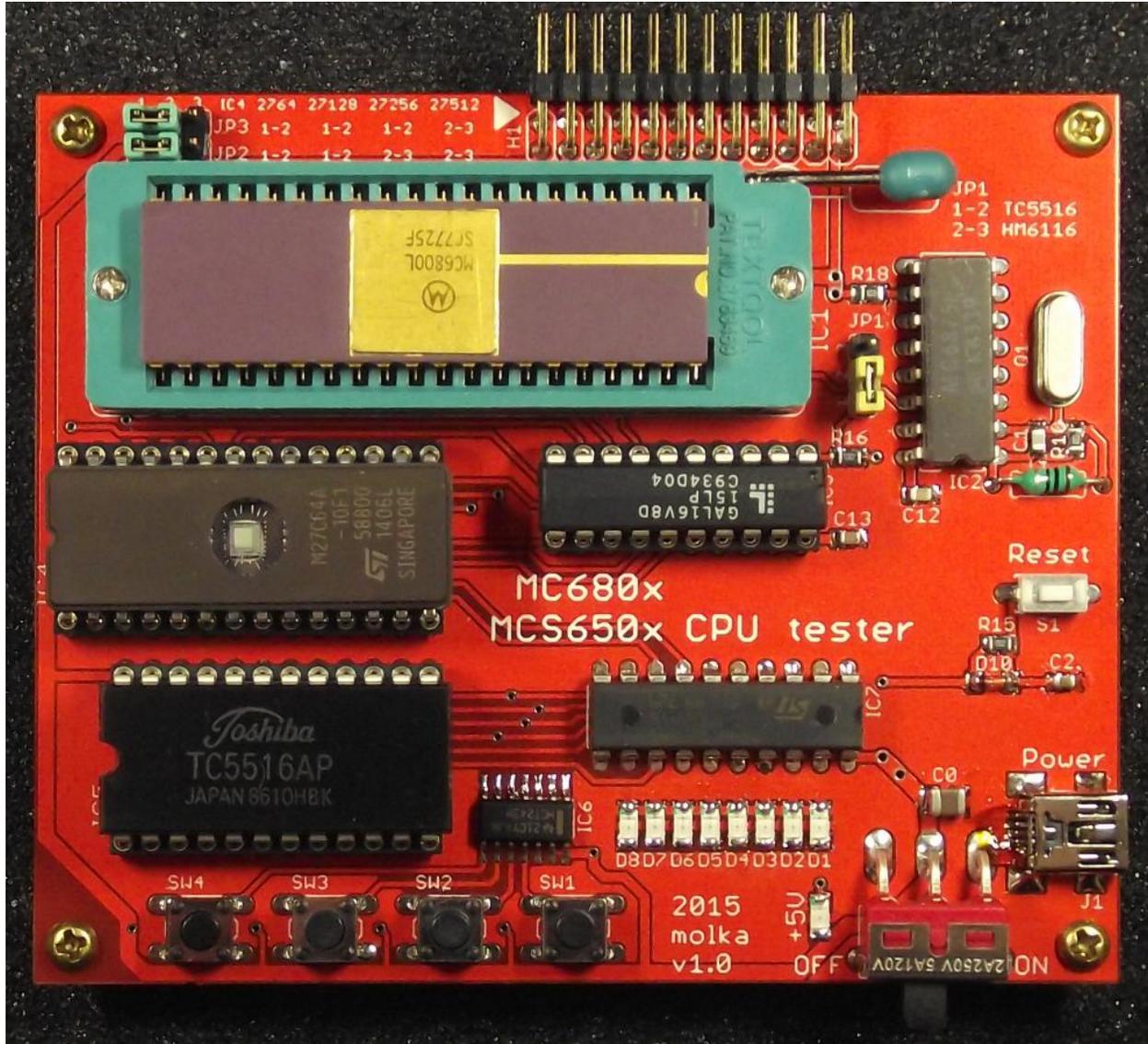


MC680x/MCS650x



MC680x/MCS650x CPU Test board User's Manual

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by molka

Overview

The MC680x/MCS650x test board is intended to test the working condition of CPUs/MCUs belonging to the Motorola 680x and MOS families.

The board consists of the base components of a MC680x/MCS650x system:

- 40-pin ZIF socket – for the tested CPU – provides easy replacement of the CPUs.
- Clock generator with 4MHz crystal oscillator for generating 1, 2 or 4MHz system clock of the CPU.
- 2K x 8bit (HM6116/TC5516) static RAM for variable and stack area.
- 8K x 8bit (D2764) EPROM holds the test programs. This program supports 4 push buttons as inputs, and 8 LEDs, as output devices. It also provides basic and special feature test routines.
- 24-pin header provides facility to configure the different function pins of different CPU/MCU types.

The board requires a single +5V power supply (200mA) provided through a mini-USB connector.

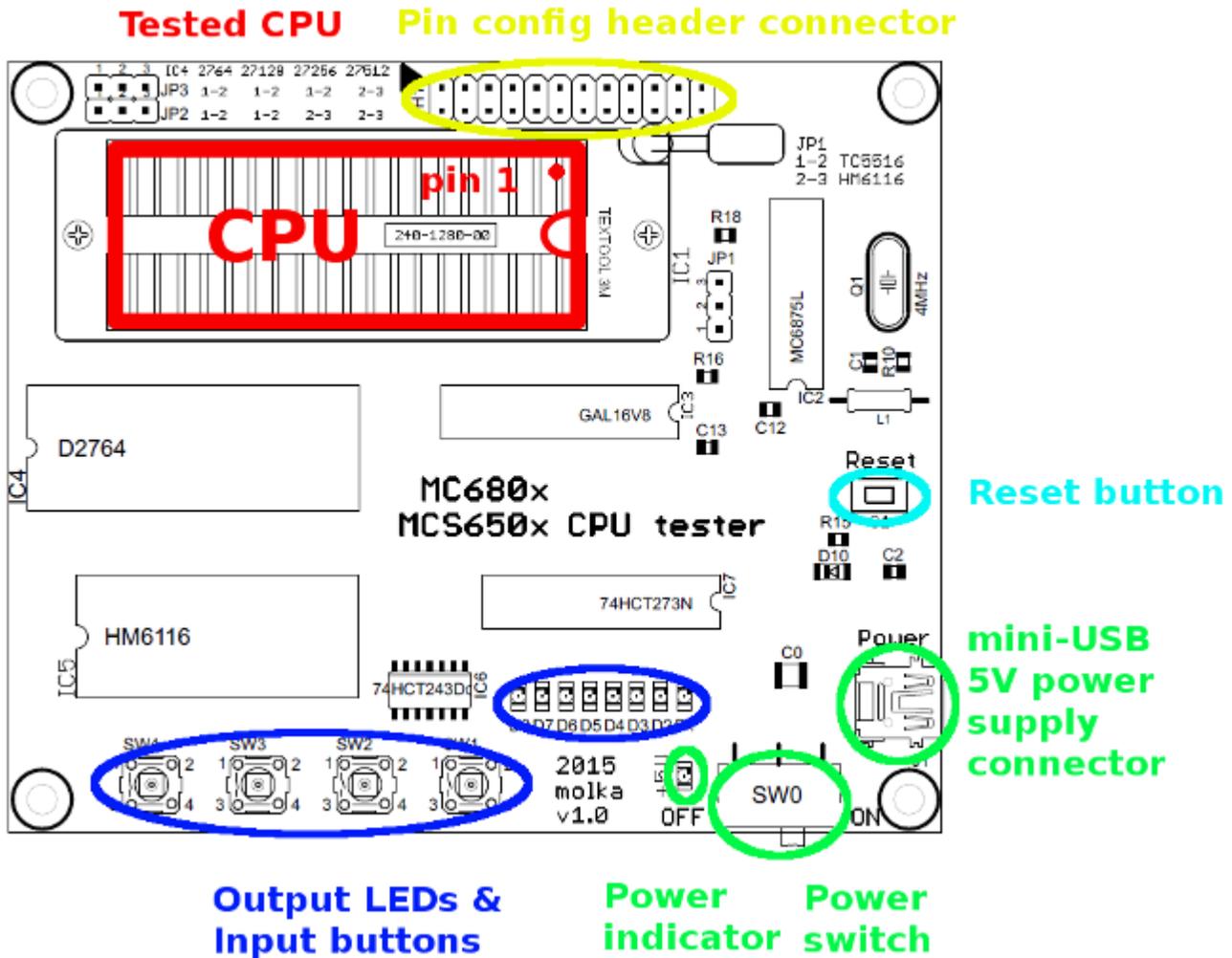
There is a power switch and power indicator LED in the upper left corner of the test board.

Many CPUs of the MC680x/MCS650x families can be inserted directly into the ZIF socket of the test-board, due to the **Pin-Configuration-Panels (PCP)** that resolve the differences of pin functions of different CPU types. The CPU specific PCP can be found in the CPU compatibility list.

Nevertheless some supported have significantly different pin layouts and functions that cannot be supported by a PCP. These CPUs may be connected to the test-board through a specific expansion tool that should be inserted to the ZIF socket of the test-board which also contains a ZIF socket for the CPU to be tested. The available expansion panels can be found in the CPU compatibility list.

With a complete set of PCPs and Expansions the board can test over 28 types of CPUs/MCUs and support for others may be provided in the future as needed.

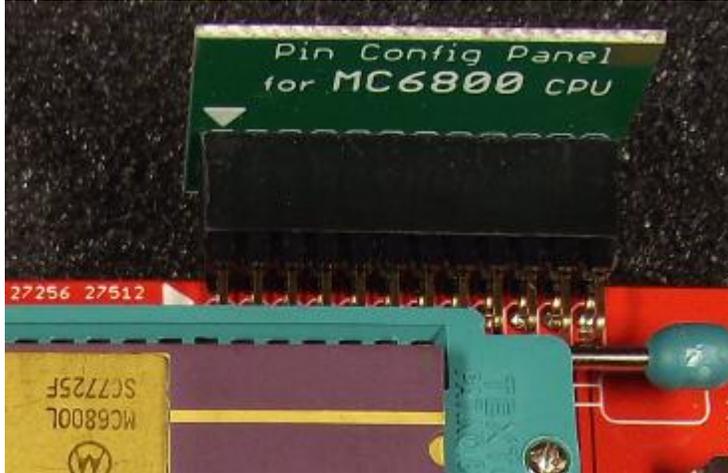
Board layout and parts



- **Mini-USB 5V power supply connector:** The board consumes around 200mA so a computer USB connector or cell phone charger that can provide at least 300mA may be used as power source.
- **Switch:** Power supply can be turned on and off by the sliding switch at the bottom right corner.
- **Green LED:** Indicates the power level of 5V (next to the power switch).
- **Reset Button:** The board contains a Power-Up reset circuit, but can be reset manually by pressing Reset button.
- **40-pin ZIF socket:** For the MC680x or MCS650x CPU/MCU being tested. **Ensure proper CPU orientation!!!** The pin-1 is at upper-right corner, next to the release lever of the socket.
- **H1:** Pin-configuration-Panel header. **Take extra care that to connect the Pin-Configuration-Panel (PCP) that suits for the CPU to be tested!!!** Always Check CPU compatibility list before use.
- **Eight output LEDs:** – Show simple animations, flashes – indicate that the CPU is working and indicate with features present (for 650x ICs only).
- **Four push buttons:** Used for testing inputs and changing animation sequences.

Usage

- Before changing the CPU in the ZIF socket, make sure the power is off. **The power indicator LED should be off!**
- Select the proper PCP from compatibility list according to the CPU to be tested. Connect proper PCP to the H1 header. See Picture 1.



Picture 1. How to connect PCP.

- Place the CPU into the socket (socket lever should be in the **UP** position). Ensure proper orientation to prevent damage to the test board and CPU! **Pin 1 must be at the upper-right corner**, next to the release lever of the ZIF socket. Then lock the socket by moving the lever down into the lock position.
- Connect the power through the USB connector and switch the power switch to ON.
- The green power indicator LED should be illuminated.
- If the CPU is in working condition the 8 output LEDs should be flashing (1s on/1s off pattern).
- **At this point the CPU can be considered WORKING. Congrats!**

Base function test

- When you press any of the four push buttons (SW1 – 4) the output LEDs copy the state of the buttons, duplicated in the low and high nibbles.
- Releasing the buttons causes one of the four different animation sequences to start, corresponding to the button released last.
- During the animations of SW2, SW3 the Q LED blinks periodically.

These test routines use the common instructions and features of MC680x/MOS650x CPU.

Special feature test (available for 6502 family CPUs)

To activate the special feature test SW1 and SW4 should be pressed together and held for 3 seconds.

- The program checks if the ROR bug is present.
- Then checks if jump error on page boundaries is present.
- Finally checks the technology of the inserted CPU.

The test result is displayed on LEDs D1-8

- D1 – ROR bug detected
- D2 – Jump page boundaries bug detected
- D3 – not used
- D4 – not used
- D5 – NMOS CPU detected
- D6 – CMOS CPU detected
- D7 – 65C802 or 65C816 CPU detected
- D8 – not used

Expansion tools usage

- Turn off the power of the MC680x/MCS650x test-board and unplug the power cord.
- Remove the last tested CPU and leave the release lever of the ZIF socket open.
- Insert the pins of the expansion tool carefully into the ZIF socket. Ensure they are aligned properly, and then lock the ZIF socket of the test-board.
- Insert the CPU to be tested into the expansion tool's ZIF socket. Ensure proper orientation to prevent damage to the test board and CPU! **Pin 1 must be at the upper-right corner**, next to the release lever of the ZIF socket. Then lock the socket by moving the lever down into the lock position.
- Plug in the power supply and switch on the power of the test-board.
- The same behavior of test-board should be discerned as testing a CPU directly inserted into the MC680x/MCS650x test-board.

Removing the expansion tool

- Turn off the power of the test-board and unplug the power cord.
- Remove the tested CPU from the expansion tool's ZIF socket.
- Unlock the release lever of the ZIF socket on test-board.
- Remove the expansion tool from the ZIF socket of test-board.

Troubleshooting

- After connecting the power supply the power indicator LED remains off. Turn off the power immediately!

This may be caused by:

- The power supply is unable to provide enough current. Check that it can provide at least 200mA. (300-400mA recommended)
 - Thin, poor quality USB cable can also cause this problem.
 - There is short-circuit (fault) in the CPU.
-
- The 8 output LEDs do not start flashing.
 - Press the Reset button. If the output LEDs continue to remain off then the CPU may be faulty.
 - Check the CPU pins, if they are dirty or dusty clean them, and try testing again.
 - It often helps to gently but firmly press down on the CPU while closing the locking lever

Available PCPs and Expansion Boards**

PCP	Expansion	Exp. Socket (pins)
PCP001 (6800)	6809/E	40
PCP002 (6802)	65xx 4K	28
PCP003 (6808)	65xx 8K	28
PCP004 (6809)	6508	40
PCP005 (6809E)	6509	40
PCP101 (6502)	6510/8500	40
PCP102 (65C02)	8501	40
PCP103 (6512)	8502	40
PCP104 (65C102)	2A03/07	40
PCP105 (65C112)		
PCP106 (65SC816)		
PCP107 (6508)		
PCP108 (6509)		
PCP109 (6503-6507)		
PCP110 (6513/6514)		
PCP111 (6515)		
PCP112 (6510/8500)		
PCP113 (MOS8501/02)		
PCP114 (NES2A03/07)		

** Some CPU/MCUs require a PCP AND a Expansion board.

Some PCPs and Expansion Boards work with more than one CPU/MCU

Check the **CPU Compatibility List** carefully

CPU Compatibility List					Special feature test available
CPU family	PCP	Expansion	Compatible CPUs	Tested CPUs	
MC6800	PCP001 for MC6800 CPU	None	Motorola MC6800, XC6800 6800/BQCJC, MC6800C, MC6800CL, MC6800CP, MC6800CS, MC6800L, MC6800L2, MC6800P, MC6800S, MC68A00CL, MC68A00CS, MC68A00CP, MC68A00L, MC68A00P, MC68A00S, MC68B00L, MC68B00P, MC68B00S, XC6800B	6800/BQCJC, MC6800L, MC6800LD, MC6800P, MC68A00P	NO
			AMI S6800 S6800, S6800D, S6800EP, S6800P, S68A00, S68A00D, S68A00P, S68B00, S68B00D, S68B00P	S6800, S6800P	
			Fairchild F6800 F6800CP, F6800CS, F6800DM, F6800P, F6800PC, F6800S, F68A00CP, F68A00CS, F68A00DM, F68A00P, F68A00S, F68B00CP, F68B00CS, F68B00DM, F68B00P, F68B00S, F6800L	F6800L	
			Hitachi HD6800, HD46800 HD68B00, HD68A00, HD6800, HD68B00P, HD68A00P, HD6800P, HD6800PJ, HD46800DP, HD468A00P, HD468B00P		
			Thomson EF6800 EF6800CM, EF6800P, EF68A00CLD	EF6800P	
			Bulgarian clone of MC6800 CM601, CM601P	CM601, CM601P	
MC6802	PCP002 for MC6802 CPU	None	Motorola MC6802 MC6802CL, MC6802CP, MC6802L, MC6802NSL, MC6802NSP, MC6802P, MC68A02CL, MC68A02CP, MC68A02L, MC68A02P, MC68B02L, MC68B02P,	MC68B02L, MC6802P	NO
			AMI S6802 S6802, S6802P, S68A02, S68A02P		
			Fairchild F6802 F6802CP, F6802CS, F6802P, F6802S, F68A02CP, F68A02CS, F68A02P, F68A02S, F6882P, F6882S, F68A82P, F68A82S	F6802P	
			Hitachi HD6802, HD46802 HD6802P, HD46802P		
			Thomson EF6802 EF6802P		

MC6808	PCP003 for MC6808 CPU	None	Motorola MC6808 MC6808L, MC6808P, MC68A08L, MC68A08P, MC68B08L, MC68B08P		NO
			Fairchild F6808 F6808CP, F6808CS, F6808P, F6808S, F68A08CP, F68A08CS, F68A08P, F68A08S		
			Thomson EF6808 EF6808P	EF6808P	
MC6809	PCP004 for MC6809 CPU	Expansion for MC6809 CPU	Motorola MC6809 MC6809CL, MC6809CP, MC6809CS, MC6809ECL, MC6809ECP, MC6809ECS, MC6809EL, MC6809EP, MC6809ES, MC6809L, MC6809P, MC6809S, MC68A09CL, MC68A09CP, MC68A09CS, MC68A09ECL, MC68A09ECP, MC68A09ECS, MC68A09EL, MC68A09EP, MC68A09ES, MC68A09L, MC68A09P / MC68A09PDS, MC68A09S, MC68B09CL, MC68B09CP, MC68B09CS, MC68B09ECL, MC68B09ECP, MC68B09ECS, MC68B09EL, MC68B09EP, MC68B09ES, MC68B09L / MC68B09LDS, MC68B09P / MC68B09PDS, MC68B09S	MC6809P	NO
			AMI S6809 S6809, S6809D, S6809P, S68A09, S68A09D, S68A09P, S68A09EP, S68B09, S68B09D, S68B09P		
			Fairchild F6809 F68B09P		
			Fujitsu MBL6809 MBL68B09, MBL68B09E		
			Hitachi HD6809, HD6309 HD6809, HD6809E, HD6809EP, HD6809EPJ, HD6809P, HD6809PJ, HD68A09, HD68A09E, HD68A09EP, HD68A09EPJ, HD68A09P, HD68A09PJ, HD68B09, HD68B09E, HD68B09EP, HD68B09EPJ, HD68B09P, HD68B09PJ, HD63B09P, HD63B09EP, HD63B09RP, HD63C09P, HD63C09EP, HD63C09RP	HD63B09P, HD63C09P	
			Thomson EF6809 EF6809C, EF6809CM, EF6809CV, EF6809J, EF6809JM, EF6809JV, EF6809JLD, EF6809P, EF6809PV, EF68A09C, EF68A09CM, EF68A09CV, EF68A09EP, EF68A09J, EF68A09JLD, EF68A09JM, EF68A09JV, EF68A09P, EF68A09PV, EF68B09CV, EF68B09J, EF68B09JV, EF68B09P	EF6809P	
SGS-Thomson EF6809 EF6809EP, EF6809P, EF68A09P, EF68B09J, EF68B09P					

MOS6502	PCP101 for MCS6502 CPU	None	MOS Technology MCS6502 MCS6502, MCS6502A, MPS6502 / 6502, MPS6502A / 6502A, 6502B	6502AD, 6502B, MPS6502, MPS6502A	YES
			CMD G65SC02 G65SC02P-1, G65SC02P-2, G65SC02P-3, G65SC02P-4, G65SC02PI-1, G65SC02PI-2, G65SC02PI-3, G65SC02PI-4	G65SC02P-3	
			CSG MCS6502 MCS6502, MPS6502, MCS6502A, MPS6502A, MCS6502B, MPS6502B, MCS6502C, MPS6502C 6502AD, 65CE02		
			GTE G65SC02 G65SC02P-1, G65SC02P-2, G65SC02P-3		
			NCR 65C02A 65C02A, 65C02B, 65C02C		
			NTE NTE6502 NTE6502		
			Rockwell R6502 370-6502, 338-6503 (65C02), R6502C, R6502CE, R6502P, R6502PE, R6502AC, R6502ACE, R6502AP, R6502APE, R6502BC, R6502BCE, R6502BP, R6502BPE, R65C02P1, R65C02P2, R65C02P3, R65C02P4	370-6502, R65C02P3, R6502PE, R6502APE, R6502F, R65NC02P2	
			Synertek SY6502 370-6502, 6502, 6502A, SY6502, SY6502A, SY6502B, SYE6502, SYE6502A, SYU6502, SYU6502A, SY65C02, SY65C02A, SY65C02B, SY65C02C	SY6502, SY6502A, SY6502B, SY6502C, SYU6502	
			UMC UM6502 UM6502, UM6502A, UM6502B, UM6502C, UM6502CE	UM6502	
W65C02S	PCP102 for W65C02S CPU	None	WDC W65C02S W65C02S8P-10	W65C02S8P-10	YES
			UMC W65C02S W65C02S8P-10	W65C02S8P-10	
MOS6503	PCP109 for 6503-6507 CPU	65xx 4K CPU expansion for 65x3, 65x5, 6506 CPU	MOS Technology MCS6503 MCS6503, MCS6503A, MPS6503, MPS6503A		YES
			CSG MCS6503 MCS6503, MPS6503, MCS6503A, MPS6503A, MCS6503B, MPS6503B, MCS6503C, MPS6503C		
			Rockwell R6503 R6503C, R6503CE, R6503P, R6503PE, R6503AC, R6503ACE, R6503AP, R6503APE, R6503BC, R6503BCE, R6503BP, R6503BPE	R6503P, R6503APE	
			Synertek SY6503 SY6503, SY6503A	SY6503	

MOS6504	PCP109 for 6503-6507 CPU	65xx 8K CPU expansion for 65x4, and 6507 CPU	MOS Technology MCS6504 MCS6504, MCS6504A, MPS6504 / 6504, MPS6504A, 6504B	MPS6504, 6504B	YES
			CMD G65SC04 G65SC04P-1	G65SC04P-1	
			CSG MCS6504 MCS6504, MPS6504, MCS6504A, MPS6504A, MCS6504B, MPS6504B, MCS6504C, MPS6504C		
			Rockwell R6504 R6504C, R6504CE, R6504P, R6504PE, R6504AC, R6504ACE, R6504AP, R6504APE, R6504BC, R6504BCE, R6504BP, R6504BPE		
			Synertek SY6504 6504, SY6504, SY6504A	6504, SY6504A	
MOS6505	PCP109 for 6503-6507 CPU	65xx 4K CPU expansion for 65x3, 65x5, 6506 CPU	MOS Technology MCS6505 MCS6505, MCS6505A, MPS6505, MPS6505A		YES
			CSG MCS6505 MCS6505, MPS6505, MCS6505A, MPS6505A, MCS6505B, MPS6505B, MCS6505C, MPS6505C		
			Rockwell R6505 R6505C, R6505CE, R6505P, R6505PE, R6505AC, R6505ACE, R6505AP, R6505APE, R6505BC, R6505BCE, R6505BP, R6505BPE	R6505P	
			Synertek SY6505 6505, SY6505, SY6505A		
MOS6506	PCP109 for 6503-6507 CPU	65xx 4K CPU expansion for 65x3, 65x5, 6506 CPU	MOS Technology MCS6506 MCS6506, MCS6506A, MPS6506, MPS6506A		YES
			CSG MCS6506 MCS6506, MPS6506, MCS6506A, MPS6506A, MCS6506B, MPS6506B, MCS6506C, MPS6506C		
			Rockwell R6506 R6506C, R6506CE, R6506P, R6506PE, R6506AC, R6506ACE, R6506AP, R6506APE, R6506BC, R6506BCE, R6506BP, R6506BPE		
			Synertek SY6506 SY6506, SY6506A		

MOS6507	PCP109 for 6503-6507 CPU	65xx 8K CPU expansion for 65x4, and 6507 CPU	CSG MCS6507 MCS6507, MPS6507, MCS6507A, MPS6507A, MCS6507B, MPS6507B, MCS6507C, MPS6507C		YES
			Rockwell R6507 R6507C, R6507CE, R6507P / CO10745, R6507PE, R6507AC, R6507ACE, R6507AP, R6507APE, R6507BC, R6507BCE, R6507BP, R6507BPE	CO10745 / R6507	
			Synertek SY6507 SY6507, SY6507A		
			UMC UM6507 UM6507	UM6507	
MOS6508	PCP107 for MOS6508 CPU	Expansion for 6508 CPU	MOS 6508 MPS6508		NO
MOS6509	PCP108 for MOS6509 CPU	Expansion for 6509 CPU	MOS 6509 MOS6509		NO
MOS6510	PCP112 for 6510/8500 CPU	Expansion for 6510 & 8500 CPU	MOS Technology 6510 6510CBM	6510CBM	NO
			CSG 6510 6510CBM		
MOS6512	PCP103 for MOS6512 CPU	None	MOS Technology MCS6512 MCS6512, MCS6512A, MPS6512, MPS6512A	MPS6512	YES
			CMD G65SC12 G65SC12P-1, G65SC12P-2, G65SC12P-3, G65SC12P-4, G65SC12PI-1, G65SC12PI-2, G65SC12PI-3, G65SC12PI-4	G65SC12P-2	
			CSG MCS6512 MCS6512, MPS6512, MCS6512A, MPS6512A, MCS6512B, MPS6512B, MCS6512C, MPS6512C		
			Rockwell R6512 R6512C, R6512CE, R6512P, R6512PE, R6512AC, R6512ACE, R6512AP, R6512APE, R6512BC, R6512BCE, R6512BP, R6512BPE	R6512AP	
			Synertek SY6502 SY6512, SY6512A		
			UMC UM6502 UM6512, UM6512A, UM6512B, UM6512C		

MOS6513	PCP110 for 6513/6514 CPU	65xx 4K CPU expansion for 65x3, 65x5, 6506 CPU	MOS Technology MCS6513 MCS6513, MCS6513A, MPS6513, MPS6513A		YES
			CSG MCS6513 MCS6513, MPS6513, MCS6513A, MPS6513A, MCS6513B, MPS6513B, MCS6513C, MPS6513C		
			Rockwell R6513 R6513C, R6513CE, R6513P, R6513PE, R6513AC, R6513ACE, R6513AP, R6513APE, R6513BC, R6513BCE, R6513BP, R6513BPE		
			Synertek SY6513 SY6513, SY6513A		
MOS6514	PCP110 for 6513/6514 CPU	65xx 8K CPU expansion for 65x4, and 6507 CPU	MOS Technology MCS6514 MCS6514, MCS6514A, MPS6514, MPS6514A	R6514P	YES
			CSG MCS6514 MCS6514, MPS6514, MCS6514A, MPS6514A, MCS6514B, MPS6514B, MCS6514C, MPS6514C		
			Rockwell R6514 R6514C, R6514CE, R6514P, R6514PE, R6514AC, R6514ACE, R6514AP, R6514APE, R6514BC, R6514BCE, R6514BP, R6514BPE		
			Synertek SY6514 SY6514, SY6514A		
MOS6515	PCP111 for 6515 CPU	65xx 4K CPU expansion for 65x3, 65x5, 6506 CPU	MOS Technology MCS6515 MCS6515, MCS6515A, MPS6515, MPS6515A		YES
			CSG MCS6515 MCS6515, MPS6515, MCS6515A, MPS6515A, MCS6515B, MPS6515B, MCS6515C, MPS6515C		
			Rockwell R6515 R6515C, R6515CE, R6515P, R6515PE, R6515AC, R6515ACE, R6515AP, R6515APE, R6515BC, R6515BCE, R6515BP, R6515BPE		
			Synertek SY6515 SY6515, SY6515A		
R65C102	PCP104 for R65C102 CPU	None	CMD G65SC102 G65SC102P-1, G65SC102P-2, G65SC102P-3, G65SC102P-4, G65SC102PI-1, G65SC102PI-2, G65SC102PI-3, G65SC102PI-4	G65SC102PI-3	YES
			Rockwell R65C102 R65C102P4		

R65C112	PCP105 for R65C112 CPU	None	GTE G65SC112 G65SC112P-1, G65SC112P-2, G65SC112P-3, G65SC112P-4, G65SC112PI-1, G65SC112PI-2, G65SC112PI-3, G65SC112PI-4	G65SC112PI-2	YES
			Rockwell R65C112 R65C112P2	R65C112P2	
G65SC802	PCP101 for MCS6502 CPU	None	CMD G65SC802 G65SC802P-4, G65SC802P-5, G65SC802PI-4, G65SC802PI-5		YES
			GTE G65SC802 G65SC802P-2, G65SC802P-4, G65SC802PI-2, G65SC802PI-4		
			WDC W65C802 W65C802P-4	W65C802P-4	
G65SC816	PCP106 for G65SC816 CPU	None	CMD G65SC816 G65SC816P-4, G65SC816P-5, G65SC816PI-4, G65SC816PI-5	G65SC816P-5	YES
			GTE G65SC816 G65SC816P-2, G65SC816P-4, G65SC816PI-2, G65SC816PI-4		
			VLSI VL65C816 VL65C816-04PC		
			WDC W65C816 W65C816S8P-14	W65C816S8P-14	
MOS8500	PCP112 for 6510/8500 CPU	Expansion for 6510 & 8500 CPU	MOS Technology 8500 8500		NO
			CSG 8500 8500	8500	
MOS7501/ MOS8501	PCP113 for MOS8501/02 CPU	Expansion for 8501 CPU	MOS Technology 7501 / 8501 7501, 7501R1, 8501, 8501R1, 8501R4		NO
MOS8502	PCP113 for MOS8501/02 CPU	Expansion for 8502 CPU	MOS Technology 8502 8502, 8502R0, 8502R2		NO
NES2A03/ 2A07	PCP114 for NES2A03/07 CPU	Expansion for NES 2A03 CPU	Ricoh 2A03 / 2A07 2A03, 2A07		NO

Thanks to CPUSHack for review and advises!

Feel free to write an e-mail to me at molnar.kalman@freemail.hu or send a PM to molka at CPU-World forum if you have any question.