

ML69240-C49

- Preliminary -

Intelligent Microcontroller Driven Dual Smartcard Reader IC

**Designed and developed by Applied Card Technologies Ltd
in association with Taiko Electronics**

General Description

The ML69240-C49 can control two sockets for ISO7816-3 IC-cards. It is based on an 80C51-type microcontroller-core. Multiple asynchronous and synchronous protocols are supported. In addition, other peripheral modules like keypad and LC-Display can be connected and controlled by ML69240-C49. Interfacing with the host is done via simple commands that are transferred over a RS232 serial port. Due to the simple structure of the command set and the full support of the peripheral components, the software and hardware design for a card reader system based on ML69240-C49 is easy to realise.

Features

Operating range	
Supply voltage	+4.5~5.5 V
Frequency	14.7456 MHz
Temperature	-40~+85°C
Smartcard sockets	2 Jumper selectable 'normally open', 'normally closed' or 'not present' card detect switch Socket parameters dependent on type of socket used
Smartcard supported	
Asynchronous	T=0, T=1
Synchronous	7816-Sync., Eurochip, GPM 416/896, I ² C
Serial Port	RS232
Speed	9600, 19200, 38400 (software selectable)
Flow Control	CTS controlled by reader
Hardware Reset	RTS controlled by host
LCD Interface	Intelligent LCD module 8x1, 8x2, 16x1, 16x2, etc. e.g. RS 294-8774
Keypad	4x4 matrix scanning built in Can use standard 4x4 passive matrix numeric keypad e.g. RS 331-304
Digital I/O	4 software selectable TTL I/O ports
Package	44-pin TQFP (TQFP44-P-1010-0.80-K): ML69240-C49TB

Software Support

Windows 32bit DLL. Driver source code available (for other platforms)
Sample host source code
Trainer application (Windows based)

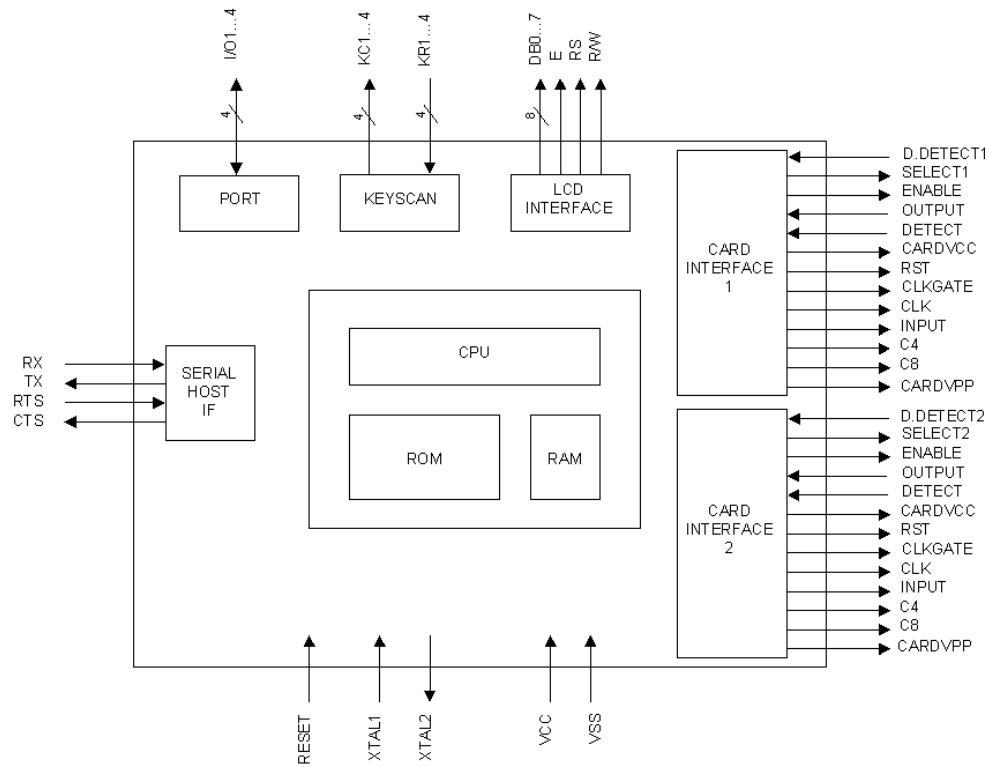
(Note: Software developed by Applied Card Technologies Ltd)

Notice:

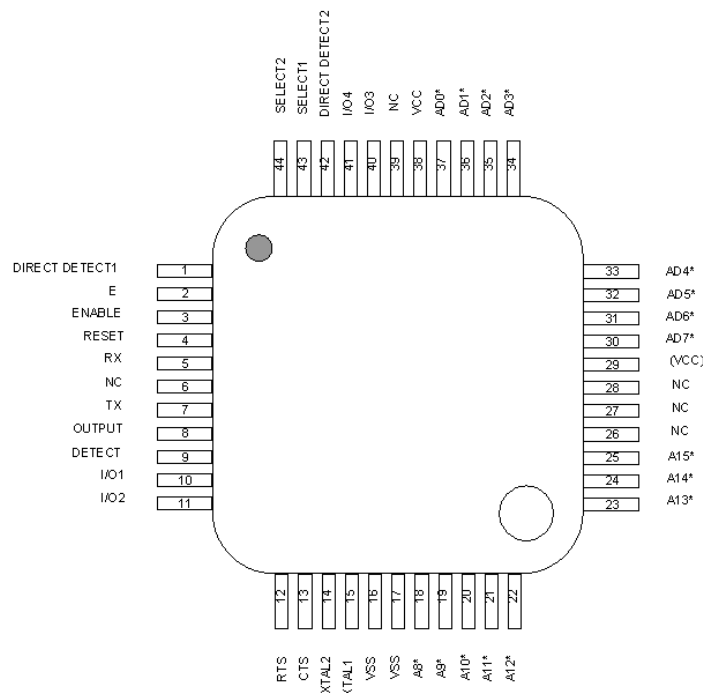
The ML69240-C49 was designed to conform to ISO/IEC 7816-3 second edition 1997 with the following limitations:

- 1) The ML69240-C49 operates under Class A (5V) only, hence the class indicator in the ATR is received but not examined.
- 2) The asynchronous clock provided is fixed at 3.5795 MHz and Clock stop is not supported.
- 3) The supported ICC data rate is fixed at 9600 baud. It is recommended that the host to IFD communication speed be kept at 19200 baud and above to avoid under or overruns.
- 4) The Vpp line is kept in the Pause state once the card is powered up under asynchronous conditions, but does not supply any programming power.
- 5) The ML69240-C49 uses the host to buffer the data, hence it supports the maximum block size, but requires the host to participate in error recovery and retransmission of T=1 blocks as well as the reception of blocks with the chaining flag set.
- 6) The NAD is fixed at 0.

As OKI cannot guarantee proper operation with any type of IC-card, we strongly recommend to evaluate the functional and electrical characteristics in combination with the possible IC-cards before design-in.



Block Diagram



*) pin has multiple functions, refer to pin description

44-pin plastic TQFP

PIN FUNCTIONS

Function							
No	Name	LCD	Keyscan	Smartcard 1	Smartcard 2	Serial Host IF	I/O
1	P1.5			D.DETECT1			
2	P1.6	E					
3	P1.7			ENABLE	ENABLE		
4	RESET						
5	RXD					RX	
6	nc*						
7	TXD					TX	
8	P3.2			OUTPUT	OUTPUT		
9	P3.3			DETECT	DETECT		
10	P3.4						I/O1
11	P3.5						I/O2
12	P3.6					RTS	
13	P3.7					CTS	
14	XTAL2						
15	XTAL1						
16	VSS						
17	VSS						
18	A8		KC1	CARDVCC	CARDVCC		
19	A9		KC2	RST	RST		
20	A10		KC3	CLKGATE	CLKGATE		
21	A11		KC4	CLK	CLK		
22	A12	RS		INPUT	INPUT		
23	A13	R/W		C4	C4		
24	A14			C8	C8		
25	A15			CARDVPP	CARDVPP		
26	PSEN*						
27	ALE*						
28	nc*						
29	EA						
30	AD7	DB7					
31	AD6	DB6					
32	AD5	DB5					
33	AD4	DB4					
34	AD3	DB3	KR4				
35	AD2	DB2	KR3				
36	AD1	DB1	KR2				
37	AD0	DB0	KR1				
38	VCC						
39	nc*						
40	P1.0						I/O3
41	P1.1						I/O4
42	P1.2				D.DETECT2		
43	P1.3			SELECT1			
44	P1.4				SELECT2		

*) leave open

PIN DESCRIPTIONS

General

No	Name	Description
4	RESET	Reset input. If "H" signal is applied for at least one machine cycle (0.81μs @ 14.7456 MHz) ML69240-C49 is reset. Power-on-reset function is achieved by connecting a capacitor between this pin and Vcc.
14, 15	XTAL2 XTAL1	Clock oscillator input/output. Connect 14.7456 MHz crystal.
16, 17	VSS	Power supply GND pin. Connect to 0V.
18 to 25	A8 to A15	I/O ports and higher 8 bits of external address bus.
29	EA/(VCC)	Connect to VCC (+5V).
30 to 37	AD7 to AD0	I/O ports and lower 8 bits of external address bus and 8 bit data bus.
2, 3, 5, 7~13, 40, 41, 43, 44	Px.x	Control pins for connecting peripheral modules and general purpose I/O pins.
38	VCC	Power supply pin. Connect to +5V
1, 6, 26, 27, 28, 39, 42	nc, PSEN, ALE	Do not connect, leave open.

LCD

No	Name	Description
2	E	Enable output.
22	RS	Register Select output.
23	R/W	Register/Write select output.
30 to 37	DB7 to DB0	Display data output/input.

Keyscan

No	Name	Description
18 to 21	KC1 to KC4	Column output for 4x4 keypad.
34 to 37	KR4 to KR1	Row input for 4x4 keypad.

Smartcard1/2

No	Name	Description
1	D.DETECT1	Direct card detect input (without card slot selection)
3	ENABLE	Enable output.
8	OUTPUT	Serial data from smartcard.
9	DETECT	Card detect input. "0" = card present, "1" = no card inserted
18	CARDVCC	Enable signal output for smartcard power supply.
19	RST	Reset signal output for smartcard.
20	CLKGATE	Clock control output for smartcard.
21	CLK	Clock control output for smartcard.
22	INPUT	Serial data output to smartcard.
23	C4	(Contact 4.)
24	C8	(Contact 8.)
25	CARDVPP	(Programming voltage.)
42	D.DETECT2	Direct card detect input (without card slot selection)
43	SELECT1	Select output for card slot 1.
44	SELECT2	Select output for card slot 2.

Serial Interface

No	Name	Description
5	RX	Serial data input from host MCU.
7	TX	Serial data output to host MCU.
12	RTS	Reset request input.
13	CTS	Flow control output.

I/O Ports

No	Name	Description
10, 11, 40, 41	I/O1 to I/O4	General purpose TTL input/output ports.

ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rating	Unit
Supply Voltage	V_{CC}	$T_a = 25^{\circ}\text{C}$	-0.5 to 7	V
Input Voltage	V_I	$T_a = 25^{\circ}\text{C}$	-0.5 to $V_{CC}+0.5$	V
Storage Temperature	T_{STG}	-	-55 to +150	$^{\circ}\text{C}$

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Condition	Rating	Unit
Supply Voltage	V_{CC}		4.5 to 5.5	V
Oscillation Frequency	f_{OSC}		14.7456	MHz
Ambient Temperature	T_a		-40 to +85	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

(V_{CC}=4.5 to 5.5V, V_{SS}=0V, Clock = 14.7456MHz, T_a=-40 to +85°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input Low Voltage	V _{IL}	-	-0.5	-	0.2V _{CC} -0.1	V
Input High Voltage	V _{IH}	Except XTAL1 and RESET	0.2V _{CC} +0.9	-	V _{CC} +0.5	V
Input High Voltage	V _{IH1}	XTAL1 and RESET	0.7 V _{CC}	-	V _{CC} +0.5	V
Output Low Voltage ^{*1}	V _{OL}	I _{OL} =1.6mA	-	-	0.45	V
Output Low Voltage ^{*2}	V _{OL1}	I _{OL} =3.2mA	-	-	0.45	V
Output High Voltage ^{*1}	V _{OH}	I _{OH} =-60μA	2.4	-	-	V
		I _{OH} =-30μA	0.75V _{CC}	-	-	V
		I _{OH} =-10μA	0.9V _{CC}	-	-	V
Output High Voltage ^{*2}	V _{OH1}	I _{OH} =-400μA V _{CC} =5V±10%	-2.4	-	-	V
		I _{OH} =-150μA	0.75V _{CC}	-	-	V
		I _{OH} =-40μA	0.9V _{CC}	-	-	V
Logical 0 Input Current/ Logical 1 Output Current ^{*1}	I _{IL} /I _{OH}	V _I =0.45V / V _O =0.45V	-5	-20	-80	μA
Logical 1 to 0 Transistion Output Current ^{*1}	I _{TL}	V _I =2.0V	-	-190	-500	μA
Input Leakage Current (AD0~7 floating)	I _{LI}	V _{SS} < V _I < V _{CC}	-	-	±10	μA
RESET Pull-down Resistance	R _{RST}	-	20	40	125	kΩ
Pin Capacitance (except XTAL1)	C _{IO}	T _a =25°C, f=1MHz	-	-	10	pF
Power Supply Current	I _{CC}	f=14.7456MHz	-	-	25	mA
Power Down Current	I _{PD}	-	-	1	50	μA

*1) E, ENABLE, TX, CTS, OUTPUT, I/O1~4, A8~15, SELECT1/2

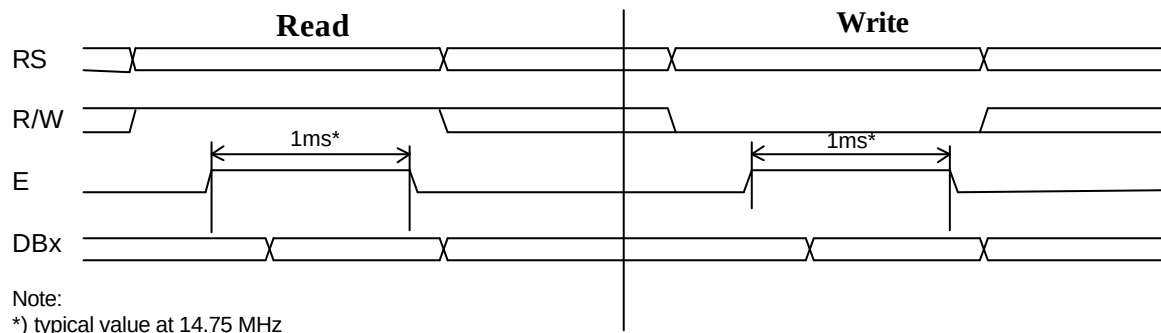
*2) AD0~7

FUNCTIONAL DESCRIPTION OF INTERFACE SIGNALS

LCD

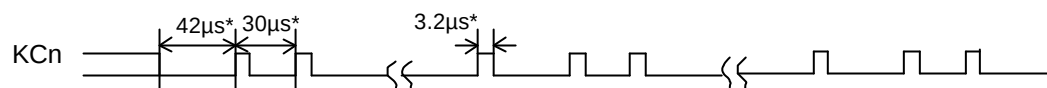
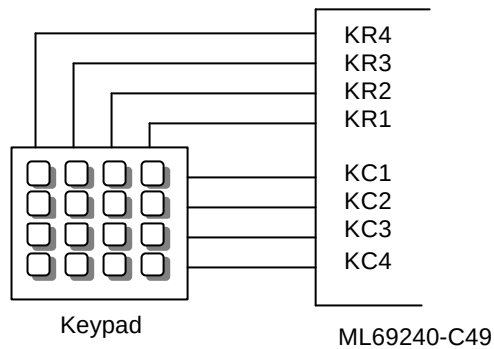
This interface can drive 8x1, 8x2, 16x1 or 16x2 (characters x lines) type LCD modules, e.g. RS294-8774.

E	RS	R/W	Function
0	X	X	disabled
1	0	0	instruction register write
1	0	1	instruction register read
1	1	0	data register write
1	1	1	data register read



KEYSCAN

This interface can drive a 4x4 standard passive matrix numeric keypad, e.g. RS331-304.



Notes:
n = 1, 2, 3, 4
*) typical values at 14.75 MHz

SERIAL I/O

This is a RS232 type serial interface for communication with the host MCU. Selectable speeds are 9.6, 19.2 and 38.4 kbps. For a detailed description, please refer to the document "OKI Dual Card Reader Interface Specification".

SMART CARD 1/2

This is the interface to the card slot modules 1 and 2 to provide the ISO7816-3 compliant function. For more details, please refer to the application note in the appendix and to the document "OKI Dual Card Reader Interface Specification".

I/O PORTS

These are 4 general-purpose I/O ports. For a detailed description, please refer to the document "OKI Dual Card Reader Interface Specification".

- Main Block -

The diagram illustrates the main block of the circuit, centered around the ML69240-C48TS-K microcontroller. The microcontroller is connected to various components as follows:

- Power Supply:** VCC and GND connections are shown at the top right.
- Crystal Oscillator:** A 14.745MHz crystal is connected to XTAL1 and XTAL2 pins, with 33pF capacitors and a 10uF capacitor.
- IO Pins:** I/O pins 1, 2, 3, and 4 are connected to a common I/O block.
- Smart Card 1 and 2:** Two SMART CARD modules are connected to the microcontroller's I/O pins. Each card has pins for OUTPUT, DETECT, DIRECT, and SELECT.
- Serial Port:** A SERIAL PORT is connected to the TX, RX, RTS, and CTS pins.
- Keyscan and LCD:** A KEYSKAN module is connected to the microcontroller's I/O pins. An LCD is connected to the microcontroller's I/O pins.
- Other Components:** A 74HC04 hex inverter is used to invert the output of the KEYSKAN module. A 74HC04 hex inverter is also used to invert the output of the SMART CARD 1 module.

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Circuit developed by Applied Card Technologies
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Note: This device is supported in Europe/Israel only.