Title of the Experiment: Reverse Engineering Attack

Group Members' Names: Sujan Kumar Saha, Pankaj Bhowmik

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Abstract

This experiment is about reverse engineering attacks. A Printed Circuit Board (PCB) can be pirated by copying its components and interconnect. In this experiment, it has been explored that how this reverse engineering can be done on a circuit board. In the first step, a bill of material has been listed by finding all the components (e.g. chipsets, diode, resistor, capacitor etc.) and their manufacturer and part names. In the second step, we draw a schematic diagram of the full PCB design of the HaHa board. By doing so, we are able to know how those components are connected and we got a better understanding of the board in detail.

Experiment Details

Goals: The goal of this experiment is to reverse engineer the HaHa board.

Experimental Setup: We used Hardware Hacking (HaHa) board, digital multimeter, and EasyEDA software on a computer.

Experiment Steps:

1. We made the Bill of Material (BOM) of the HaHa board by listing all the components, their manufacturer, part name and quantity.
2. We created a schematic circuit diagram of the board using EasyEDA software.

Part 1 Result:

Bill of Material (BOM):

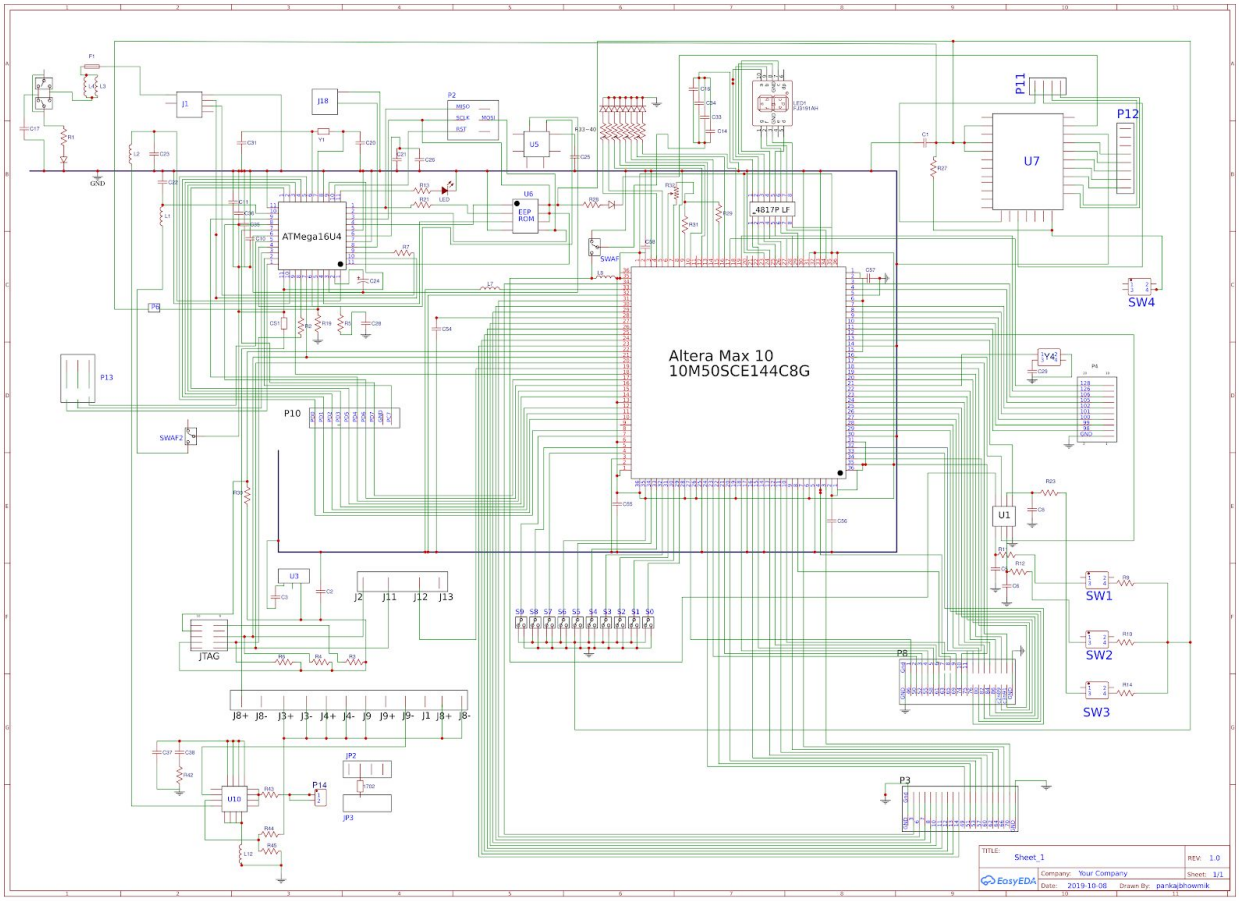
Reference	Manufacturer	Part No.	Description	Quantity
U1				1
U2	Atmel	ATmega16U4-AU	8-bit Micro-controller	1
U3			Voltage Fixer to 5V	1
U4	Microchip	MCP2200	USB to UART protocol converter	1
U5			Accelerometer Chip	1

U6	Microchip	25LC1024	EEPROM	1
U7	Microchip	RN4870	Bluetooth Module	1
U8	Altera	10M50SAE144C8G	MAX10 FPGA	1
U9	Analog Device	ADM3202A	Low Power Line Driver/Receiver	1
U10				1
C1,C2,C3,C4,C5, C6,C7,C8,C9, C10,C11,C12, C13,C14,C15, C16,C17,C18, C19,C20,C21, C22,C23,C24, C25,C26,C27, C28,C29,C30, C31,C32,C33, C34,C35,C36, C37,C38,C39, C53,C54,C55, C56,C57,C58			Capacitors	45
R1,R2,R3,R4,R5, R6,R7,R8R9,R10 ,R11,R12,R13, R14,R15,R16, R17,R18,R19, R21,R22,R23, R24,R25,R26, R27,R28,R29, R30,R31,R32, R33,R34,R35, R36,R37,R36, R37,R38,R39, R40,R41,R42, R43,R44,R45			Resistors	44
R20		4816P	ResistorBank for 7-segment display	1
L1,L2,L3,L4,L5, L7,L8,L9,L10,L11 ,L12			Inductor	11

L6			LED	1
SW1, SW2, SW3, SW4			Push button switches	4
SWup, SWDown			Push button switches for voltage adjustment	2
SWAF, SWAF2			SPDT switch	2
S0,S1,S2,S3,S4, S5,S6,S7,S8,S9, S10,S11			SPST switches	12
RST			Reset Switch	1
D1,D2,D3,D4, D5,D6,D7,D8,D9, D11,D12,D13, D14			Diodes	13
D10	On Semiconductor	FTF44 FSV8100V	8A 100V Schotty Rectifier	1
DS1			7-segment display	1
J1			USB Power	1
J2,J3,J4,J5,J6,J7, J8,J9,J11,J12, J13,J14,J15,J16, J17,J3+,J3-,J4+,J 4-,J8+,J8-,J9+, J9-,			Pin Connectors	23
J10			Serial Male Connector Port	1
J18			USB connector at Bluetooth module	1
JTAG			5x2 JTAG port	1
P1			10x1 Pin Connector	1
P2			3x2 Pin Connector	1
P3			20x2 Pin Connector	1

P4			10x2 Pin Connector	1
P6			Connector	1
P8			20x2 Pin Connector	1
P9			3x2 Pin Connector	1
P10			10x1 Pin Connector	1
P11			4x2 ???	1
P12			8x1 Pin Connector	1
P13			3x2 Pin Connector	1
P14			2x1 Pin Connector	1
JP1			2x1 Pin Connector	1
JP2			4x1 Pin Connector	1
JP3			4x1 Pin Connector	1
JP4			2x1 Pin Connector	1
Y1	Fox Electronics	FS8.000P	8MHz Surface mount Crystal	1
Y2				
Y4		50.00 A1 J4F		1
CS1		R010		
F1	Bel Fuse	0697H	Fuse	1

Schematic Diagram



Summary and discussion:

From this experiment, we learned how to use reverse engineering concept to copy a PCB. Here, we made the bill of materials and schematic diagram of the HaHa board. To stop piracy, multi-layered PCB is suggested to hide the connection from hackers.