COMEX-IC40L

Reference Guide

CompuLab

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Table of Contents

1 INTRODUCTION 6
1.1 About This Document 6
1.2 COMEX-IC40L Part Number Legend 6
1.3 Related Documents 6

2 OVERVIEW 7
2.1 COMEX-IC40L Highlights 7
2.2 COMEX-IC40L Block Diagram 8
2.3 COMEX-IC40L Features 9

3 SYSTEM CORE 11
3.1 CPU 11
3.2 Chipset 11
3.3 Memory 11
3.4 Graphics Core 11
3.5 Display Interfaces 12
3.5.1 DDI 12
3.5.2 eDP 12
3.5.3 LVDS 12
3.5.4 VGA 13

4 PERIPHERAL INTERFACES 14
4.1 PCI Express 14
4.2 USB 2.0/3.0 14
4.3 SATA 15
4.4 Ethernet 15
4.5 Audio 15
4.6 SPI 15
4.7 SMBus 15
4.8 I2C 16
4.9 LPC 16
4.10 GPIO 16

5 SYSTEM LOGIC 17
5.1 Power Supply 17
5.1.1 Power Rails 17
5.1.2 Single Supply Mode 17
5.2 Power management 17
5.3 Power Control 18
5.4 SPI Boot 18

6 SYSTEM RESOURCES 19

6.1 Interrupt Request (IRQ) Lines 19
6.2 PCI Devices 19
6.3 I2C 20
6.4 System Management SMBus 20

7 CARRIER BOARD INTERFACE 21
7.1 Carrier Board Connectors Pinout 21
7.2 Mating Connectors 28

8 MECHANICAL SPECIFICATIONS 29
8.1 Mechanical Drawings 29
8.2 On-Board Connectors 30
8.3 Heat spreader and Cooling Solutions 31

9 OPERATIONAL CHARACTERISTICS 32
9.1 Absolute Maximum Ratings 32
9.2 Recommended Operating Conditions 32
9.3 DC Electrical Characteristics 32
9.4 Operating Temperature Ranges 32

Table 1 Document Revision Notes

Date	Description
June 2015	First release

Please check for a newer revision of this document at the CompuLab web site http://www.compulab.co.il/.

1 INTRODUCTION

1.1 About This Document

This document is part of a set of reference documents providing information necessary to operate and program the CompuLab COMEX-IC40L Computer-on-Module.

1.2 COMEX-IC40L Part Number Legend

Please refer to the CompuLab website 'Ordering information' section to decode the COMEX-IC40L part number: http://www.compulab.co.il/products/com-express/COMEX-IC40L/#ordering.

1.3 Related Documents

For additional information, refer to the documents listed in Table 2.

Table 2 Related Documents

Document	Location
COMEX-IC40L Developer Resources	http://www.compulab.com/

2 OVERVIEW

2.1 COMEX-IC40L Highlights

- COM Express Compact Type-6
- Up-to 16GB dual-channel DDR3L
- Intel HD Graphics 6000
- 6x PCIe, 8x USB2, up-to 4x USB3 and 4x SATA
- Triple mode display: LVDS, eDP, HDMI, DisplayPort
- Linux and MS Windows

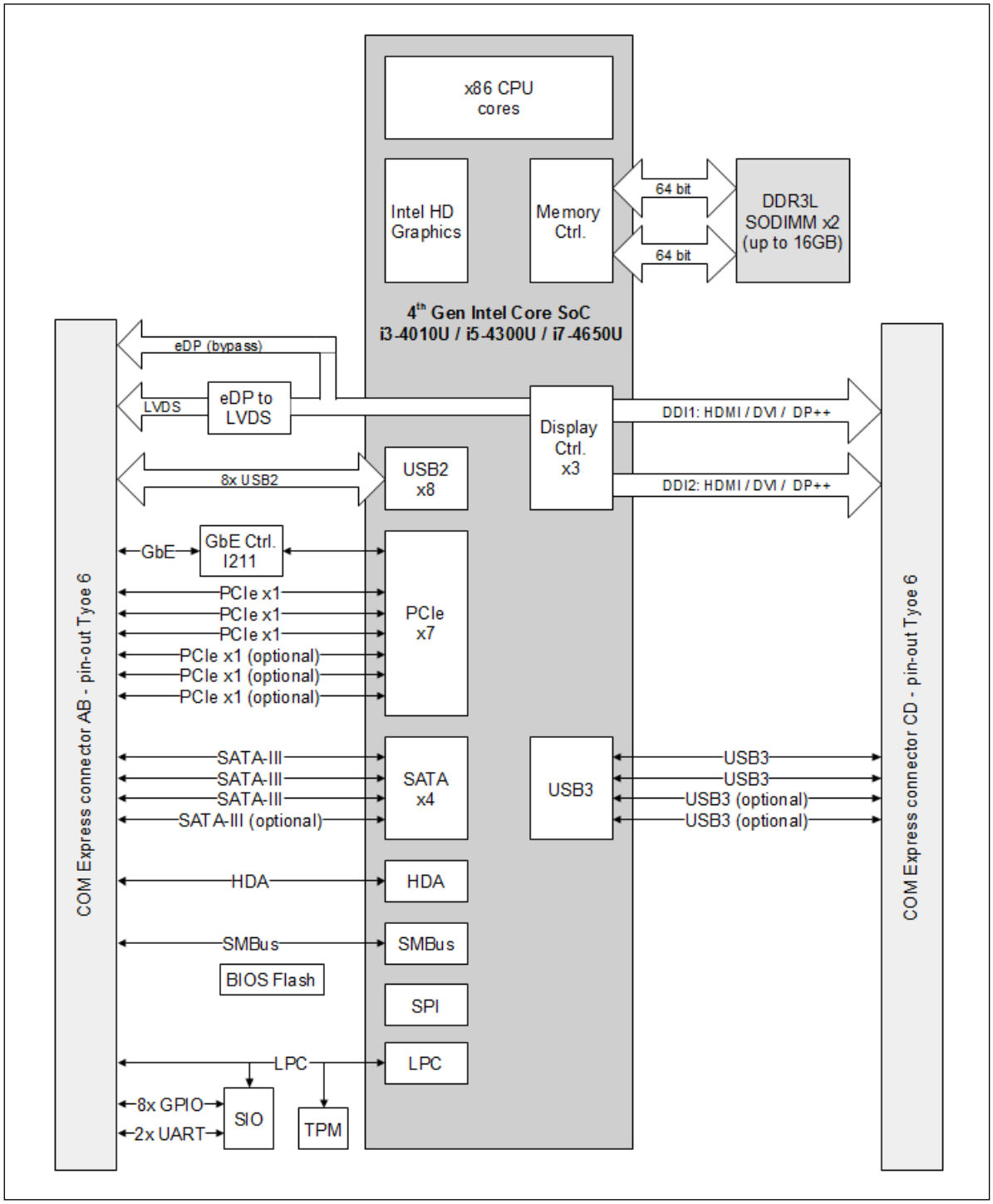
COMEX-IC40L is a Computer-on-Module packed in the industry-standard COM Express Compact form factor. COMEX-IC40L is fully compliant with the COM Express standard and has been designed for seamless integration into COM Express system designs.

COMEX-IC40L is built around the Intel 4th Generation Core (Haswell) ULT processor family, featuring a highly scalable and power efficient CPU coupled with the powerful Intel HD Graphics engine. Delivering high performance in a miniature form-factor and low-power envelope, COMEX-IC40L is an ideal choice for power demanding yet space-constrained systems.

Featuring a wide range of industry standard interfaces, COMEX-IC40L is an excellent platform for networking, industrial automation, communications and IoT applications. High-performance Intel HD Graphics GPU and support for triple display operation make COMEX-IC40L a powerful solution for multimedia applications such as digital signage, point of sale and surveillance.

2.2 COMEX-IC40L Block Diagram

Figure 1 COMEX-IC40L Block Diagram



2.3 COMEX-IC40L Features

The "Option" column specifies the COMEX-IC40L configuration option required for a particular feature to be populated. When a configuration option is prefixed by “not”, the particular feature is only available when the option is not populated.

"+" means that the feature is always available.

Table 3 Features and Configuration options

Feature	Description	Option
CPU Core		
CPU	Intel Core i3-4010U 64-bit dual-core 1.7GHz, 15W TDP	C4010
	Intel Core i5-4300U 64-bit dual-core 1.9GHz, 15W TDP	C4300
	Intel Core i7-4650U 64-bit dual-core 1.7GHz, 15W TDP	C4650
Chipset	Integrated in SoC	+
Memory and Storage		
RAM	Up to 16GB (2x 8GB) DDR3L-1600 (1.35V only) 2x SO-DIMM 204-pin	D
Storage	3x SATA 6Gb/s	+
	Additional (4th) SATA port * precludes 1x PCIe port	S4
Display		
Graphics Controller	Intel HD Graphics 5500 / 6000 Triple display mode supported	+
DDI	DDI1: HDMI / DVI / DP / DP++, up-to 3200 x 2000	+
	DDI2: HDMI / DVI / DP / DP++, up-to 3200 x 2000	not V
eDP	eDP v1.3 up to 3200 x 2000	not L
LVDS	Dual-channel LVDS, up-to 1920 x 1200 * precludes ePD port	L
VGA	Up-to 1920 x 1200 * precludes DDI2 port	V
Network		
Ethernet	1000Base-T Ethernet port implemented with Intel I218 GbE PHY Supports remote management with Intel AMT Technology	+
Audio		
Digital Audio	HD Audio Interface	+
	HDMI audio output	+
I/O		
PCI Express	3x PCI Express x1 ports	+
	Additional 2x PCIe port	U2
	Additional 1x PCIe port	S3
USB	2x USB3.0	+
	Additional (3rd and 4th) USB3 ports * each additional USB3 port precludes one PCIe port	Ux
	8x USB2.0	+
Serial	2 x UART	+
General Interfaces	LPC Bus I2C Bus SMBus Watch Dog Timer FAN control	+
GPIO	Up-to 8 GPIOs	+
System Logic		
RTC	Real time clock, powered by external lithium battery	+
Security	TPM - Trusted Platform Module device	TPM
Power Management	ACPI 5 .0 compliant, Smart Battery Management	+

Table 4 Electrical, Mechanical and Environmental Specifications

Electrical Specifications	
Supply Voltage	Single 12V DC
Digital I/O voltage	3.3V
Mechanical Specifications	
Form-factor	COM Express compact, pin-out Type 6
Dimensions	95 x 95 mm
Weight	74 gram
Environmental and Reliability	
MTTF	> 100,000 hours
Operation temperature (case)	Commercial: 0° to 70° C
	Extended: -20° to 70° C
	Industrial: -40° to 85° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation)
	05% to 95% (storage)
Shock	50G / 20 ms
Vibration	20G / 0 - 600 Hz

3 SYSTEM CORE

3.1 CPU

COMEX-IC40L module features the Intel® 4th Generation 'Haswell' Core processor family.

3.2 Chipset

The COMEX-IC40L chipset is integrated in the processor SoC.

The chipset includes 14 high speed I/O ports. Some of these ports can be configured according to the module hardware and BIOS configurations. The high-speed I/O ports and the configurations are described in the following table.

Table 5 HSIO configuration

HSIO Port	GbE	USB 3.0	PCIe	SATA
1		USB SS Port 1		
2		USB SS Port 2		
3		USB SS Port 3	PCIe Port 1	
4		USB SS Port 4	PCIe Port 2	
5			PCIe Port 3	
6			PCIe Port 4	
7			PCIe Port 5 lane0	
8				
9	GbE (Integrated LAN)			
10				
11			PCIe Port 6	SATA Port 3
12				SATA Port 2
13				SATA Port 1
14				SATA Port 0

3.3 Memory

COMEX-IC40L includes two SO-DIMM sockets. Each socket interfaces with the CPU by a separate DDR3 channel.

COMEX-IC40L supports SO-DIMM modules up to 8GB each, 1333/1600 MT/s, unbuffered, non-ECC.

3.4 Graphics Core

The graphics cores are integrated in the processor SoC.

3.5 Display Interfaces

COMEX-IC40L supports the following display interfaces:

- Two Digital Display Interfaces (DDI)
- Optional embedded Display Port (eDP)
- Optional dual-channel LVDS
- Optional VGA

Table 6 Display Interfaces Maximum Resolution

Interface	Max. Resolution
HDMI	4096x2304 @ 24Hz
DVI	1920x1200 @ 60Hz
VGA	1920x1200,@60 Hz,
eDP/DP	3200x2000 @60 Hz
LVDS	1920x1200 @ 60Hz

The maximum resolution of the eDP and DP depends on the link data rate and the number of lanes used:

Table 7 eDP and DP maximum resolutions

Link Data Rate	1 Lane	2 Lanes	4 Lanes
RBR	1064x600	1400x1050	2240x1400
HBR	1280x960	1920x1200	2880x1800
HBR2	1920x1200	2880x1800	3200x3200

3.5.1 DDI

DDI1 and DDI2 interfaces support dual-mode and can be natively used as HDMI of DisplayPort, according to the state of AUX_SEL pins that should be connected to the DisplayPort connector on the carrier board.

3.5.2 eDP

The Embedded DisplayPort* (eDP*) channel is used to transport digital display data from the processor to an embedded DisplayPort Panel. Embedded DisplayPort (eDP) utilizes differential signaling to achieve a high bandwidth bus interface that supports embedded chip-to-chip connections from the processor. Potential embedded chip-to-chip applications include usage within a laptop PC for driving a panel. The Embedded DisplayPort utilizes DisplayPort 2.7 GT/s and 5.4 GT/s differential signaling with up to 3200x2000 @60 Hz resolution.

NOTE: eDP is only available without the 'L' configuration option.

3.5.3 LVDS

The LVDS interface is implemented with an eDP to LVDS bridge. COMEX-IC40L can support single or dual LVDS, 18 or 24 bits per pixel, with up to 1920x1200@60Hz resolution. The data format can be VESA or JEIDA.

NOTE: LVDS is only available with the 'L' configuration option.

NOTE: LVDS port precludes eDP port.

3.5.4 VGA

The VGA interface is implemented with an optional DDI to VGA bridge.

NOTE: VGA is only available with the 'V' configuration option.

NOTE: VGA port precludes DDI2 port.

4 PERIPHERAL INTERFACES

4.1 PCI Express

COMEX-IC40L incorporates up to 6 PCI Express Gen. 2 ports. PCIe ports 0, 1 and 5 are derived from multifunctional HSIO chipset ports and are mutually exclusive with other functions.

Table 8 PCIe Gen. 2 ports

CoM Express port number	Processor port number	Availability
0	1	Mutually exclusive with USB3 port 2 Available only without 'U3' option
1	2	Mutually exclusive with USB3 port 3 Available only without 'U4' option
2	3	
3	4	
4	5	Mutually exclusive with SATA port 3 Available only without 'S4' option
5	6	

Table 9 PCIe Ports 0 – 3 Configurations

Port 0	Port 1	Port 2	Port 3
PCIe x4			
PCIe x2		PCIe x2	
PCIe x2		PCIe x1	PCIe x1
PCIe x1	PCIe x1	PCIe x1	PCIe x1

Table 10 PCIe Ports 4 – 5 Configurations

Port 4	Port 5
PCIe x1	PCIe x1

4.2 USB 2.0/3.0

COMEX-IC40L supports up to 4 USB 3.0 ports, and 8 USB 2.0 ports.

The USB 2.0 ports can be connected to low-speed, full-speed and high speed devices. In order for the USB 3.0 ports to be back-compatible with USB 2.0, each USB 3.0 can be paired with any USB 2.0 port.

USB 3.0 ports 2 and 3 are derived from multifunctional HSIO chipset ports and are mutually exclusive with PCIe ports 0 and 1.

NOTE: USB3.0 ports 2 and 3 are available only with 'U3' and 'U4' configuration options.

4.3 SATA

COMEX-IC40L incorporates up to four SATA 6Gb/s (gen. 3) ports.

COMEX-IC40L supports Intel's Rapid Storage Technology (RST) that allows the SATA controller to be configured as a RAID controller, supporting RAID 0/1/5/10.

SATA port 3 is derived from a multifunctional HSIO chipset port and is mutually exclusive with PCIe ports 5.

NOTE: SATA ports 3 is available only with 'S4' configuration option.

4.4 Ethernet

COMEX-IC40L features an onboard Gigabit Ethernet interface.

The CPU SoC integrated GbE controller is interfaced with Intel I218 GbE PHY through the PCIe port 5 lane 2 (HSIO 9) and SMBus.

4.5 Audio

COMEX-IC40L supports Intel HD Audio interface. The HDA signals include one SDO output, two SDIN inputs and control signals.

COMEX-IC40L also supports up to two HD audio streams, integrated in HDMI or Display Port video streams.

4.6 SPI

COMEX-IC40L SPI interface can only be used for booting from external SPI flash. For additional details please refer to section 5.4.

4.7 SMBus

There are three System Management (SM) compatible busses on the COMEX-IC40L:

- SML0: Internal only, communication between the CPU and the i218 GbE PHY.
- SML1: Internal only, communication between the CPU and the embedded controller.
- Thermal SMB: Internal and external, communication to the DIMM area thermal sensor and external connector.

The COMEX-IC40L SMBus design separates the bus into two portions: SMBus for devices running in standby, and SMBus for devises not running in standby. The SMB available for the carrier can be used also in standby mode.

The onboard SMBus devices are described in the following table:

Table 11 SMBus Addresses

Address	Function Description
0xA0	LPC Controller
0x30	SATA Controller
0xA4	SMBus Controller
0x34	Thermal Subsystem
0xC8	Gigabit Ethernet controller

4.8 I2C

The COMEX-IC40L I2C bus allows access to the COMEX-IC40L onboard EEPROM device at write address 0xA0 as well as external carrier-board devices.

4.9 LPC

The COMEX-IC40L LPC interface is used to communicate with several onboard devices:

- Embedded Controller
- Supper IO (SIO)
- Trusted Platform Module (TPM) if available
- Embedded controller

In addition, the LPC interface is available on the carrier board interface connectors.

4.10 GPIO

There are eight General Purpose I/O (GPIO) signals available from the COMEX-IC40L.

Each of the GPIO signals can be configured as input or output (GPI or GPO). The GPIO signals are derived CPU GPIO pins.

Table 12 GPIO Signals Details

Pin Name	CPU Name	Default Function	Power Plane
GPI0*	GPIO66	GPIO	Core
GPI1	GPIO67	GPIO	Core
GPI2	GPIO68	GPIO	Core
GPI3	GPIO69	GPIO	Suspend
GPO0	GPIO64	GPIO	Core
GPO1	GPIO65	GPIO	Core
GPO2	GPIO33	GPIO	Core
GPO3	GPIO34	GPIO	Core

NOTE: GPIO0 must be pulled to GND or Hi-Z during system reset and power-on.

5 SYSTEM LOGIC

5.1 Power Supply

5.1.1 Power Rails

COMEX-IC40L requires the following power rails:

Table 13 Power Rails

Power Rail	Maximum Current (Ampere)	Voltage Range (Volt)	Nominal Voltage (Volt)	Max Input Ripple (mV)
VCC_12V	See below	11.4 – 12.6	12	100
VCC_5V_SBY	2	4.75 – 5.25	5	50
VCC_RTC	<0.001	2.0 – 3.3	3	20

5.1.2 Single Supply Mode

COMEX-IC40L supports single-supply operation. It this operation mode, VCC_5V_SBY and the VCC_RTC rails are not supported, and the matching power pins must be left unconnected on the carrier board.

Single supply mode does not allow the system to be at stand-by, i.e. suspend-to-RAM or suspend-to-disk. Absence of VCC_RTC prevents the RTC circuit to keep time and date, and to store system data in the RTC SRAM when the system is not powered.

5.2 Power management

COMEX-IC40L supports the power states listed below:

G0 – Work

S0 – System powered on

C0 – Active

C1 – Auto halt

C1E – Auto halt, low frequency, low voltage

C3 – L1/L2 cache flush + clocks off

C6 – Save core states, before shutdown

C7 – Save core states, before shutdown + L3 flush

G1 – Sleep

S3 – Sleep, Suspend to RAM

S4 – Hibernate, Suspend to disk

G2 – Power Off

S5 – Soft off, no power

G3 – Mechanical Off

The C states availability depends on the CPU configuration.

COMEX-IC40L supports the wake events listed below:

- PWRBTN# of SLEEP# signals falling edge
- RTC Alarm, if enabled
- Wake On LAN
- SMB_ALERT# falling edge
- Intel ME non-maskable wake (on supporting CPU)
- EHCI/xHCI USB controller

5.3 Power Control

The COMEX-IC40L power control signals available on the carrier board interface include:

- **PWRBTN# / SLEEP#** (Module Input): The power button signal is an ACPI standard. It has a 16 milliseconds de-bounce circuit at the CPU, and may initiate a power event, depending on the software. At any power state, if PWRBTN# is held low for at least four seconds, the system should be immediately powered off (G2/S5 state).
- **SYS_RESET#** (Module Input): The system reset signal has a 16 milliseconds de-bounce circuit at the CPU. At falling edge of SYS_RESET#, after de-bouncing, the system should wait up to 25 milliseconds for the SMBus to go idle, and then initiate a system reset.
- **CB_RESET#** (Module Output): The Carrier Board reset signal originates from the CPU, and generates a reset for all the subsystems on the module. It is asserted at PWR_OK low input, at a watchdog timeout, after a SYS_RESET# event, or by the software.
- **PWR_OK** (Module Input): The power OK signal indicates to the module that the main power supply is within specification. It can be held low by the carrier board in order to delay the startup of the module. After pulled up by the carrier, PWR_OK must be left up as long as the main power supply is within specification.
- **SUS_STAT#** (Module Output): The suspend status signals indicates peripheral devices that the system should switch into a sleep mode, at least 210 microseconds later.
- **WAKE0# / WAKE1#** (Module Input): The wake signals are indicates the CPU that a PCIe or other device generated a wake event. Upon a falling edge, the system should wake up to S0 operation mode.

5.4 SPI Boot

The SPI is used in COMEX-IC40L in order to boot from SPI flash devices.

The COMEX-IC40L CPU requires two separate SPI Flash boot devices – one for BIOS and one for CPU firmware. In order to support external boot from two SPI Flash devices, the firmware SPI Flash chip select is routed to pin A86 on the carrier-board connector.

When the BIOS_DIS1# signal is pulled to GND external SPI Flash devices are selected as boot source. When BIOS_DIS1# is pulled-up or unconnected, COMEX-IC40L will boot from the onboard SPI flash.

The BIOS_DIS0# signal is not used.

6 SYSTEM RESOURCES

6.1 Interrupt Request (IRQ) Lines

COMEX-IC40L includes an interrupt controller that can function as two 8259 standard ISA-compatible Programmable Interrupt Controllers (PIC) for legacy or PCI based interrupts. In addition, an Advanced Programmable Interrupt Controller (APIC) is available in the CPU.

The APIC supports 24 interrupts, as listed in the table below:

Table 14 APIC Interrupt Mapping

IRQ #	Using SERIRQ#	Using PCI Message	Comments
0	No	No	Cascade from 8259 #1
1	Yes	Yes	
2	No	No	8254 Counter 0, HPET #0
3	Yes	Yes	
4	Yes	Yes	
5	Yes	Yes	GSPI, UART, I2C, SDIO
6	Yes	Yes	GSPI, UART, I2C, SDIO
7	Yes	Yes	GSPI, UART, I2C, SDIO
8	No	No	RTC, HPET #1
9	Yes	Yes	Option for SCI, TCO
10	Yes	Yes	Option for SCI, TCO
11	Yes	Yes	HPET #2, Option for SCI, TCO
12	Yes	Yes	HPET #3
13	No	No	GSPI, UART, I2C, SDIO
14	Yes	Yes	GPIO
15	Yes	Yes	GPIO
16	PIRQA#	Yes	Internal devices are routable.
17	PIRQB#	Yes	
18	PIRQC#	Yes	
19	PIRQD#	Yes	
20	N/A	Yes	
21	N/A	Yes	
22	N/A	Yes	
23	N/A	Yes	

6.2 PCI Devices

Table 15 PCI Devices and Functions

Bus	Device	Function	Function Description
0	31	0	LPC Controller
0	31	2	SATA Controller
0	31	3	SMBus Controller
0	31	6	Thermal Subsystem
0	29	0	USB EHCI Controller
0	28	0	PCIe Port 1
0	28	1	PCIe Port 2
0	28	2	PCIe Port 3
0	28	3	PCIe Port 4
0	28	4	PCIe Port 5
0	28	5	PCIe Port 6
0	27	0	Intel HDA Controller
0	25	0	GbE Controller
0	22	0	Intel ME Interface 1
0	22	1	Intel ME Interface 2
0	22	2	IDE-R
0	22	3	KT

0	20	0	xHCI Controller
0	23	0	SDIO Controller
0	21	0	Intel® Serial I/O DMA
0	21	1	Intel® Serial I/O I2C Controller #0
0	21	2	Intel® Serial I/O I2C Controller #1
0	21	3	Intel® Serial I/O GSPI Controller #0
0	21	4	Intel® Serial I/O GSPI Controller #1
0	21	5	Intel® Serial I/O UART Controller #0
0	21	6	Intel® Serial I/O UART Controller #1
0	19	0	Intel® Smart Sound Technology Controller

6.3 I2C

To be added in a later revision of this document.

6.4 System Management SMBus

Table 16 SMBUS address

Address	Function Description
0xA0	LPC Controller
0x30	SATA Controller
0xA4	SMBus Controller
0x34	Thermal Subsystem
0xC8	Gigabit Ethernet controller

7 CARRIER BOARD INTERFACE

7.1 Carrier Board Connectors Pinout

COMEX-IC40L is interfaced to a carrier board with two connectors. Each connector incorporates two 110-pin rows. The pin numbering is divided to four groups: A, B C and D.

Connector pinout is fully compatible with type 6 COM Express specifications.

The following notes apply to interfaces available through the COM Express connectors interface:

- Some interfaces/signals are available only with/without certain configuration options of the COMEX-IC40L. The availability restrictions of each signal are described in the "Signals description" table for each interface.
- All of the COMEX-IC40L digital interfaces operate at 3.3V levels, unless otherwise noted.

The signals for each interface are described in the "Signal description" table for the interface in question. The following notes provide information on the "Signal description" tables:

- **"Signal name"** – The name of each signal with regards to the discussed interface. The signal name corresponds to the signal name as appears in the COM Express Module Base Specification.
- **"Pin#" –** The carrier board interface pin number, including the connector's dedicated letter (A/B/C/D).
- **"Type" –** Signal type, see the definition of different signal types below
- **"Description" –** Signal description with regards to the interface in question.
- **"Availability" –** Depending on COMEX-IC40L configuration options, certain carrier board interface pins are physically disconnected (floating) on-board COMEX-IC40L. The "Availability" column summarizes configuration requirements for each signal. All the listed requirements must be met (logical AND) for a signal to be "available" unless otherwise noted.

Each described signal can be one of the following types. Signal type is noted in the "Signal description" tables. **Multifunctional pin direction, pull resistor and open drain functionality may be software controlled. The "Type" column header for multifunctional pins refers to the recommended pin configuration with regards to the discussed signal.**

- **"AI"** – Analog Input
- **"AO"** – Analog Output
- **"AIO"** – Analog Input/Output
- **"AP"** – Analog Power Output
- **"I"** – Digital Input
- **"O"** – Digital Output
- **"IO"** – Digital Input/Output
- **"OD"** – Open Drain Signal (not pulled up on-board COMEX-IC40L)
- **"P"** – Power
- "**SPU" –** Software controlled pull up to 3.3V
- "**SPD" –** Software controlled pull down to GND
- "**PU105**" – Always pulled up to 1.05V on-board COMEX-IC40L, (typ. 5KΩ-15KΩ).

- **"PU33"** – Always pulled up to 3.3V on-board COMEX-IC40L, (typ. 5KΩ-15KΩ).
- **"PU5"** – Always pulled up to 5.0V on-board COMEX-IC40L, (typ. 5KΩ-15KΩ).
- **"PD" -** Always pulled down on-board COMEX-IC40L, (typ. 5KΩ-15KΩ).
- **"NC" –** Connector Pin is Not Connected

Table 17 COMEX-IC40L Carrier Board Connectors Signals

Pin	Signal Name	Type	Description	Comments / Availability
A1	GND	P	Ground	
A2	GBE0_MDI3-	IO	GbE MDI 3 -	
A3	GBE0_MDI3+	IO	GbE MDI 3 +	
A4	GBE0_LINK100#	O	Ethernet 100 Mbit Indicator	Configurable function
A5	GBE0_LINK1000#	O	Ethernet 1000 Mbit Indicator	Configurable function
A6	GBE0_MDI2-	IO	GbE MDI 2 -	
A7	GBE0_MDI2+	IO	GbE MDI 2 +	
A8	GBE0_LINK#	O	Ethernet Link Indicator	Configurable function
A9	GBE0_MDI1-	IO	GbE MDI 1 -	
A10	GBE0_MDI1+	IO	GbE MDI 1 +	
A11	GND	P	Ground	
A12	GBE0_MDI0-	IO	GbE MDI 0 -	
A13	GBE0_MDI0+	IO	GbE MDI 0 +	
A14	GBE0_CTREF	AP	GbE Center Tap Reference	100nF capacitor on module
A15	SUS_S3#	O	Suspend S3	100K PU (S5)
A16	SATA0_TX+	O	SATA 0 TX +	AC coupled on module
A17	SATA0_TX-	O	SATA 0 TX -	AC coupled on module
A18	SUS_S4#	O	Suspend S4	
A19	SATA0_RX+	I	SATA 0 RX +	AC coupled on module
A20	SATA0_RX-	I	SATA 0 RX -	AC coupled on module
A21	GND	P	Ground	
A22	SATA2_TX+	O	SATA 2 TX +	AC coupled on module
A23	SATA2_TX-	O	SATA 2 TX -	AC coupled on module
A24	SUS_S5#	O	Soft Off	
A25	SATA2_RX+	I	SATA 2 RX +	AC coupled on module
A26	SATA2_RX-	I	SATA 2 RX -	AC coupled on module
A27	BATLOW#	I	Battery Low	
A28	(S)ATA_ACT#	O	SATA Activity	10K PU (S0)
A29	AC/HDA_SYNC	O	HDA Sync	
A30	AC/HDA_RST#	O	HDA RST	
A31	GND	P	Ground	
A32	AC/HDA_BITCLK	O	HDA Bit Clock (BCLK)	
A33	AC/HDA_SDOUT	O	HDA SD Out (SDO)	
A34	BIOS_DIS0#	NC	SPI routing selection	no function on module
A35	THRMTRIP#	O	CPU Thermal Trip Indicator	1K PU (S0) to 1.05V
A36	USB6-	IO	USB 2.0 Port 6 -	14.25K - 24.8K PD in CPU
A37	USB6+	IO	USB 2.0 Port 6 +	14.25K - 24.8K PD in CPU
A38	USB_6_7_OC#	I	USB Overcurrent #3	10K PU (S5)
A39	USB4-	IO	USB 2.0 Port 4 -	14.25K - 24.8K PD in CPU
A40	USB4+	IO	USB 2.0 Port 4 +	14.25K - 24.8K PD in CPU
A41	GND	P	Ground	
A42	USB2-	IO	USB 2.0 Port 2 -	14.25K - 24.8K PD in CPU
A43	USB2+	IO	USB 2.0 Port 2 +	14.25K - 24.8K PD in CPU
A44	USB_2_3_OC#	I	USB Overcurrent #1	10K PU (S5)
A45	USB0-	IO	USB 2.0 Port 0 -	14.25K - 24.8K PD in CPU
A46	USB0+	IO	USB 2.0 Port 0 +	14.25K - 24.8K PD in CPU
A47	VCC_RTC	P	RTC Power	
A48	EXCD0_PERST#			
A49	EXCD0_CPPE#			
A50	LPC_SERIRQ	I	Serial IRQ	10K PU (S0)
A51	GND	P	Ground	
A52	PCIE_TX5+	O	PCIe Lane 6 TX +	Only without "S4" option
A53	PCIE_TX5-	O	PCIe Lane 6 TX -	Only without "S4" option
A54	GPI0	IO	GPIO 0	Hi-Z OR PD AT BOOT
A55	PCIE_TX4+	O	PCIe Lane 5 TX +	AC coupled on module
A56	PCIE_TX4-	O	PCIe Lane 5 TX -	AC coupled on module
A57	GND	P	Ground	
A58	PCIE_TX3+	O	PCIe Lane 4 TX +	AC coupled on module

Pin	Signal Name	Type	Description	Comments / Availability
A59	PCIE_TX3-	O	PCIe Lane 4 TX -	AC coupled on module
A60	GND	P	Ground	
A61	PCIE_TX2+	O	PCIe Lane 3 TX +	AC coupled on module
A62	PCIE_TX2-	O	PCIe Lane 3 TX -	AC coupled on module
A63	GPI1	IO	GPIO 1	10K PU (S0)
A64	PCIE_TX1+	O	PCIe Lane 2 TX +	Available only without "U4" option
A65	PCIE_TX1-	O	PCIe Lane 2 TX -	Available only without "U4" option
A66	GND	P	Ground	
A67	GPI2	IO	GPIO 2	10K PU (S0)
A68	PCIE_TX0+	O	PCIe Lane 1 TX +	Available only without "U3" option
A69	PCIE_TX0-	O	PCIe Lane 1 TX -	Available only without "U3" option
A70	GND	P	Ground	
A71	LVDS_A0+	O	LVDS Ch. A 0 + / eDP 2 +	Available only with "L" option
A72	LVDS_A0-	O	LVDS Ch. A 0 - / eDP 2 -	Available only with "L" option
A73	LVDS_A1+	O	LVDS Ch. A 1 + / eDP 1 +	Available only with "L" option
A74	LVDS_A1-	O	LVDS Ch. A 1 - / eDP 1 -	Available only with "L" option
A75	LVDS_A2+	O	LVDS Ch. A 2 + / eDP 0 +	Available only with "L" option
A76	LVDS_A2-	O	LVDS Ch. A 2 - / eDP 0 -	Available only with "L" option
A77	LVDS_VDD_EN	O	LCD Power Enable	
A78	LVDS_A3+	O	LVDS Ch. A 3 +	Available only with "L" option
A79	LVDS_A3-	O	LVDS Ch. A 3 -	Available only with "L" option
A80	GND	P	Ground	
A81	LVDS_A_CK+	O	LVDS Ch. A CLK + / eDP 3 +	Available only with "L" option
A82	LVDS_A_CK-	O	LVDS Ch. A CLK - / eDP 3 -	Available only with "L" option
A83	LVDS_I2C_CK	O	LVDS I2C Clock / eDP AUX +	2.2K PU (S0) (LVDS) / 100K PD
A84	LVDS_I2C_DAT	IO	LVDS I2C Data / eDP AUX -	2.2K PU (S0) (LVDS) / 100K PU (S0)
A85	GPI3	IO	GPIO 3	10K PU (S5)
A86	SPI_CS#1_EXTC	O	Chip select for FW external SPI	
A87	eDP_HPD	I	eDP HPD	100K PD
A88	PCIE_CLK_REF+	O	PCIe Reference Clock +	
A89	PCIE_CLK_REF-	O	PCIe Reference Clock -	
A90	GND	P	Ground	
A91	SPI_POWER	P	SPI Power output	3.3V Typical
A92	SPI_MISO	I	SPI MISO	
A93	GPO0	IO	GPO 0	
A94	SPI_CLK	O	SPI Clock	
A95	SPI_MOSI	O	SPI MOSI	
A96	TPM_PP	PD/NC	TPM Physical Presence	10K PD if TPM is assembled
A97	TYPE10#	NC	Not Connected	
A98	SER0_TX	O	Serial Port 0 TX	12V tolerant
A99	SER0_RX	I	Serial Port 0 RX	12V tolerant
A100	GND	P	Ground	
A101	SER1_TX	O	Serial Port 1 TX	12V tolerant
A102	SER1_RX	I	Serial Port 1 RX	12V tolerant
A103	LID#	PU33	LID Switch	12V tolerant, 10K PU (S5), no function
A104	VCC_12V	P	Main VCC Input	12V typical
A105	VCC_12V	P	Main VCC Input	12V typical
A106	VCC_12V	P	Main VCC Input	12V typical
A107	VCC_12V	P	Main VCC Input	12V typical
A108	VCC_12V	P	Main VCC Input	12V typical
A109	VCC_12V	P	Main VCC Input	12V typical
A110	GND	P	Ground	
B1	GND	P	Ground	
B2	GBE0_ACT	NC		
B3	LPC_FRAME#	IO	LPC FRAME#	
B4	LPC_AD0	IO	LPC AD0	15K - 40K PU in CPU (S0)
B5	LPC_AD1	IO	LPC AD1	15K - 40K PU in CPU (S0)
B6	LPC_AD2	IO	LPC AD2	15K - 40K PU in CPU (S0)
B7	LPC_AD3	IO	LPC AD3	15K - 40K PU in CPU (S0)
B8	LPC_DRQ0#	NC		
B9	LPC_DRQ1#	NC		
B10	LPC_CLK	O	LPC Clock	33MHz Clock
B11	GND	P	Ground	
B12	PWRBTN#	OD	Power Button	8K - 40K PU in CPU (S5)
B13	SMB_CK	O	SMBus Clock	2.2K PU (S5)
B14	SMB_DAT	IO	SMBus Data	2.2K PU (S5)
B15	SMB_ALERT#	I	SMBus Alert	10K PU (S5)

Pin	Signal Name	Type	Description	Comments / Availability
B16	SATA1_TX+	O	SATA 1 TX +	AC coupled on module
B17	SATA1_TX-	O	SATA 1 TX -	AC coupled on module
B18	SUS_STAT#	O	Suspend Status	
B19	SATA1_RX+	I	SATA 1 RX +	AC coupled on module
B20	SATA1_RX-	I	SATA 1 RX -	AC coupled on module
B21	GND	P	Ground	
B22	SATA3_TX+	O	SATA 3 TX +	Only with "S4" option
B23	SATA3_TX-	O	SATA 3 TX -	Only with "S4" option
B24	PWR_OK	I	Power OK	10K PU (S5)
B25	SATA3_RX+	I	SATA 3 RX +	Only with "S4" option
B26	SATA3_RX-	I	SATA 3 RX -	Only with "S4" option
B27	WDT	NC		
B28	AC/HDA_SDIN2	NC		
B29	AC/HDA_SDIN1	I	HDA IN 1	9K - 50K PD in CPU
B30	AC/HDA_SDIN0	I	HDA IN 0	9K - 50K PD in CPU
B31	GND	P	Ground	
B32	SPKR	O	Speaker	100R PD. Boot strap. Do not PU at reset.
B33	I2C_CK	IO	I2C Clock	2.2K PU (S5), I2C to EeeP EEPROM TBD
B34	I2C_DAT	IO	I2C Data	2.2K PU (S5), I2C to EeeP EEPROM TBD
B35	THRM#	I	Over Temperature Input	10K PU (S0)
B36	USB7-	IO	USB 2.0 Port 7 -	14.25K - 24.8K PD in CPU
B37	USB7+	IO	USB 2.0 Port 7 +	14.25K - 24.8K PD in CPU
B38	USB_4_5_OC#	I	USB Overcurrent #2	10K PU (S5)
B39	USB5-	IO	USB 2.0 Port 5 -	14.25K - 24.8K PD in CPU
B40	USB5+	IO	USB 2.0 Port5 +	14.25K - 24.8K PD in CPU
B41	GND	P	Ground	
B42	USB3-	IO	USB 2.0 Port 3 -	14.25K - 24.8K PD in CPU
B43	USB3+	IO	USB 2.0 Port 3 +	14.25K - 24.8K PD in CPU
B44	USB_0_1_OC#	I	USB Overcurrent #0	10K PU (S5)
B45	USB1-	IO	USB 2.0 Port 1 -	14.25K - 24.8K PD in CPU
B46	USB1+	IO	USB 2.0 Port 1 +	14.25K - 24.8K PD in CPU
B47	EXCD1_PERST#	NC		
B48	EXCD1_CPPE#	NC		
B49	SYS_RESET#	I	Reset Request Input	10K PU (S0)
B50	CB_RESET#	O	Reset Output	
B51	GND	P	Ground	
B52	PCIE_RX5+	I	PCIe Lane 6 RX +	Available only without "S4" option
B53	PCIE_RX5-	I	PCIe Lane 6 RX -	Available only without "S4" option
B54	GPO1	IO	GPIO 1	
B55	PCIE_RX4+	I	PCIe Lane 5 RX +	
B56	PCIE_RX4-	I	PCIe Lane 5 RX -	
B57	GPO2	IO	GPIO 2	
B58	PCIE_RX3+	I	PCIe Lane 4 RX +	
B59	PCIE_RX3-	I	PCIe Lane 4 RX -	
B60	GND	P	Ground	
B61	PCIE_RX2+	I	PCIe Lane 3 RX +	
B62	PCIE_RX2-	I	PCIe Lane 3 RX -	
B63	GPO3	IO	GPIO 3	
B64	PCIE_RX1+	I	PCIe Lane 2 RX +	Available only without "U4" option
B65	PCIE_RX1-	I	PCIe Lane 2 RX -	Available only without "U4" option
B66	WAKE0#	I	PCIe Wake	10K PU (S5)
B67	WAKE1#	I	General Wake	10K PU (S5), PCIe Wake
B68	PCIE_RX0+	I	PCIe Lane 1 RX +	Only without "U3" option
B69	PCIE_RX0-	I	PCIe Lane 1 RX -	Only without "U3" option
B70	GND	P	Ground	
B71	LVDS_B0+	O	LVDS Ch. B 0 +	Only available with "L" option
B72	LVDS_B0-	O	LVDS Ch. B 0 -	Only available with "L" option
B73	LVDS_B1+	O	LVDS Ch. B 1 +	Only available with "L" option
B74	LVDS_B1-	O	LVDS Ch. B 1 -	Only available with "L" option
B75	LVDS_B2+	O	LVDS Ch. B 2 +	Only available with "L" option
B76	LVDS_B2-	O	LVDS Ch. B 2 -	Only available with "L" option
B77	LVDS_B3+	O	LVDS Ch. B 3 +	Only available with "L" option
B78	LVDS_B3-	O	LVDS Ch. B 3 -	Only available with "L" option
B79	LVDS_BKLT_EN	O	Backlight Enable	
B80	GND	P	Ground	
B81	LVDS_B_CK+	O	LVDS Ch. B Clock +	Only available with "L" option
B82	LVDS_B_CK-	O	LVDS Ch. B Clock -	Only available with "L" option

Pin	Signal Name	Type	Description	Comments / Availability
B83	LVDS_BKLT_CTRL	O	Backlight control	Only available with "L" option
B84	VCC_5V_SBY	P	Standby Power Input	
B85	VCC_5V_SBY	P	Standby Power Input	
B86	VCC_5V_SBY	P	Standby Power Input	
B87	VCC_5V_SBY	P	Standby Power Input	
B88	BIOS_DIS1#	I	SPI routing selection	10K PU (S5)
B89	VGA_RED	AO	Red Analog Video Output	Only available with "V" option
B90	GND	P	Ground	
B91	VGA_GRN	AO	Green Analog Video Output	Only available with "V" option
B92	VGA_BLU	AO	Blue Analog Video Output	Only available with "V" option
B93	VGA_HSYnc	AO	VGA H-Sync	Only available with "V" option
B94	VGA_VSYnc	AO	VGA V-Sync	Only available with "V" option
B95	VGA_I2C_CK	IO	VGA I2C Clock	2.2K PU (S0) Only with "V" option
B96	VGA_I2C_DAT	IO	VGA I2C Data	2.2K PU (S0) Only with "V" option
B97	SPI_CS#	O	SPI CS0#	For external SPI boot Flash
B98	RSVD	NC	Reserved	
B99	RSVD	NC	Reserved	
B100	GND	P	Ground	
B101	FAN_PWMOUT	O	Fan PWM Output	12V tolerant
B102	FAN_TACHIN	I	Fan Tachometer Input	12V tolerant, 10K PU (S0)
B103	SLEEP#	OD	Sleep Request Input	12V tolerant, 15K - 40K PU in CPU (S5)
B104	VCC_12V	P	Main VCC Input	12V typical
B105	VCC_12V	P	Main VCC Input	12V typical
B106	VCC_12V	P	Main VCC Input	12V typical
B107	VCC_12V	P	Main VCC Input	12V typical
B108	VCC_12V	P	Main VCC Input	12V typical
B109	VCC_12V	P	Main VCC Input	12V typical
B110	GND	P	Ground	
C1	GND	P	Ground	
C2	GND	P	Ground	
C3	USB_SSRX0-	I	USB 3.0 Port 1 RX -	
C4	USB_SSRX0+	I	USB 3.0 Port 1 RX +	
C5	GND	P	Ground	
C6	USB_SSRX1-	I	USB 3.0 Port 2 RX -	
C7	USB_SSRX1+	I	USB 3.0 Port 2 RX +	
C8	GND	P	Ground	
C9	USB_SSRX2-	I	USB 3.0 Port 3 RX -	Available only with "US3" option
C10	USB_SSRX2+	I	USB 3.0 Port 3 RX +	Available only with "US3" option
C11	GND	P	Ground	
C12	USB_SSRX3-	I	USB 3.0 Port 4 RX -	Available only with "US4" option
C13	USB_SSRX3+	I	USB 3.0 Port 4 RX +	Available only with "US4" option
C14	GND	P	Ground	
C15	DDI1_PAIR6+	NC	Not Connected	
C16	DDI1_PAIR6-	NC	Not Connected	
C17	Internal use	NC	Internal use	Should be left unconnected
C18	Internal use	NC	Internal use	Should be left unconnected
C19	PCIE_RX6+	NC	Not Connected	
C20	PCIE_RX6-	NC	Not Connected	
C21	GND	P	Ground	
C22	PCIE_RX7+	NC	Not Connected	
C23	PCIE_RX7-	NC	Not Connected	
C24	DDI1_HPD	I	DDI 1 HPD	100K PD
C25	DDI1_PAIR4+	NC	Not Connected	
C26	DDI1_PAIR4-	NC	Not Connected	
C27	RSVD	NC	Reserved	
C28	RSVD	NC	Reserved	
C29	DDI1_PAIR5+	NC	Not Connected	
C30	DDI1_PAIR5-	NC	Not Connected	
C31	GND	P	Ground	
C32	DDI2_CTRLCLK_AUX+	O	DDI 2 CTRL Clock / AUX +	100K PD / 2.2K PU (S0)
C33	DDI2_CTRLDATA_AUX-	O	DDI 2 CTRL Data / AUX -	100K PU / 2.2K PU (S0)
C34	DDI2_DDC_AUX_SEL	I	DDI2	1M PD. High for HDMI/DVI, Low for DP
C35	RSVD	NC	Reserved	
C36	DDI3_CTRLCLK_AUX+	NC	Not Connected	
C37	DDI3_CTRLDATA_AUX-	NC	Not Connected	
C38	DDI3_DDC_AUX_SEL	NC	Not Connected	
C39	DDI3_PAIR0+	NC	Not Connected	

Pin	Signal Name	Type	Description	Comments / Availability
C40	DDI3_PAIR0-	NC	Not Connected	
C41	GND	P	Ground	
C42	DDI3_PAIR1+	NC	Not Connected	
C43	DDI3_PAIR1-	NC	Not Connected	
C44	DDI3_HPD	NC	Not Connected	
C45	RSVD	NC	Reserved	
C46	DDI3_PAIR2+	NC	Not Connected	
C47	DDI3_PAIR2-	NC	Not Connected	
C48	RSVD	NC	Reserved	
C49	DDI3_PAIR3+	NC	Not Connected	
C50	DDI3_PAIR3-	NC	Not Connected	
C51	GND	P	Ground	
C52	PEG_RX0+	NC	Not Connected	
C53	PEG_RX0-	NC	Not Connected	
C54	TYPE0#	NC	Not Connected	
C55	PEG_RX1+	NC	Not Connected	
C56	PEG_RX1-	NC	Not Connected	
C57	TYPE1#	NC	Not Connected	
C58	PEG_RX2+	NC	Not Connected	
C59	PEG_RX2-	NC	Not Connected	
C60	GND	P	Ground	
C61	PEG_RX3+	NC	Not Connected	
C62	PEG_RX3-	NC	Not Connected	
C63	RSVD	NC	Not Connected	
C64	RSVD	NC	Not Connected	
C65	PEG_RX4+	NC	Not Connected	
C66	PEG_RX4-	NC	Not Connected	
C67	RSVD	NC	Not Connected	
C68	PEG_RX5+	NC	Not Connected	
C69	PEG_RX5-	NC	Not Connected	
C70	GND	P	Ground	
C71	PEG_RX6+	NC	Not Connected	
C72	PEG_RX6-	NC	Not Connected	
C73	GND	P	Ground	
C74	PEG_RX7+	NC	Not Connected	
C75	PEG_RX7-	NC	Not Connected	
C76	GND	P	Ground	
C77	RSVD	NC	Not Connected	
C78	PEG_RX8+	NC	Not Connected	
C79	PEG_RX8-	NC	Not Connected	
C80	GND	P	Ground	
C81	PEG_RX9+	NC	Not Connected	
C82	PEG_RX9-	NC	Not Connected	
C83	RSVD	NC	Not Connected	
C84	GND	P	Ground	
C85	PEG_RX10+	NC	Not Connected	
C86	PEG_RX10-	NC	Not Connected	
C87	GND	P	Ground	
C88	PEG_RX11+	NC	Not Connected	
C89	PEG_RX11-	NC	Not Connected	
C90	GND	P	Ground	
C91	PEG_RX12+	NC	Not Connected	
C92	PEG_RX12-	NC	Not Connected	
C93	GND	P	Ground	
C94	PEG_RX13+	NC	Not Connected	
C95	PEG_RX13-	NC	Not Connected	
C96	GND	P	Ground	
C97	RSVD	NC	Reserved	
C98	PEG_RX14+	NC	Not Connected	
C99	PEG_RX14-	NC	Not Connected	
C100	GND	P	Ground	
C101	PEG_RX15+	NC	Not Connected	
C102	PEG_RX15-	NC	Not Connected	
C103	GND	P	Ground	
C104	VCC_12V	P	Main VCC Input	12V Typical
C105	VCC_12V	P	Main VCC Input	12V Typical
C106	VCC_12V	P	Main VCC Input	12V Typical

Pin	Signal Name	Type	Description	Comments / Availability
C107	VCC_12V	P	Main VCC Input	12V Typical
C108	VCC_12V	P	Main VCC Input	12V Typical
C109	VCC_12V	P	Main VCC Input	12V Typical
C110	GND	P	Ground	
D1	GND	P	Ground	
D2	GND	P	Ground	
D3	USB_SSTX0-	O	USB 3.0 Port 1 TX -	AC coupled on module
D4	USB_SSTX0+	O	USB 3.0 Port 1 TX +	AC coupled on module
D5	GND	P	Ground	
D6	USB_SSTX1-	O	USB 3.0 Port 2 TX -	AC coupled on module
D7	USB_SSTX1+	O	USB 3.0 Port 2 TX +	AC coupled on module
D8	GND	P	Ground	
D9	USB_SSTX2-	O	USB 3.0 Port 3 TX -	Only with "US3" option
D10	USB_SSTX2+	O	USB 3.0 Port 3 TX +	Only with "US3" option
D11	GND	P	Ground	
D12	USB_SSTX3-	O	USB 3.0 Port 4 TX -	Only with "US4" option
D13	USB_SSTX3+	O	USB 3.0 Port 4 TX +	Only with "US4" option
D14	GND	P	Ground	
D15	DDI1_CTRLCLK_AUX+	O	DDI 1 CTRL Clock / AUX +	100K PD / 2.2K PU (S0)
D16	DDI1_CTRLDATA_AUX-	O	DDI 1 CTRL Data / AUX -	100K PU / 2.2K PU (S0)
D17	RSVD	NC	Not Connected	
D18	RSVD	NC	Not Connected	
D19	PCIE_TX6+	NC	Not Connected	
D20	PCIE_TX6-	NC	Not Connected	
D21	GND	P	Ground	
D22	PCIE_TX7+	NC	Not Connected	
D23	PCIE_TX7-	NC	Not Connected	
D24	RSVD	NC	Not Connected	
D25	RSVD	NC	Not Connected	
D26	DDI1_PAIR0+	O	DDI 1 Lane 0 +	
D27	DDI1_PAIR0-	O	DDI 1 Lane 0 -	
D28	RSVD	NC	Not Connected	
D29	DDI1_PAIR1+	O	DDI 1 Lane 1 +	
D30	DDI1_PAIR1-	O	DDI 1 Lane 1 -	
D31	GND	P	Ground	
D32	DDI1_PAIR2+	O	DDI 1 Lane 2 +	
D33	DDI1_PAIR2-	O	DDI 1 Lane 2 -	
D34	DDI1_DDC_AUX_SEL	I	DDI 1 Aux. select	1M PD. High for HDMI/DVI, Low for DP
D35	RSVD	NC	Not Connected	
D36	DDI1_PAIR3+	O	DDI 1 Lane 3 +	
D37	DDI1_PAIR3-	O	DDI 1 Lane 3 -	
D38	RSVD	NC	Not Connected	
D39	DDI2_PAIR0+	O	DDI 2 Lane 0 +	
D40	DDI2_PAIR0-	O	DDI 2 Lane 0 -	
D41	GND	P	Ground	
D42	DDI2_PAIR1+	O	DDI 2 Lane 1 +	
D43	DDI2_PAIR1-	O	DDI 2 Lane 1 -	
D44	DDI2_HPD	I	DDI 2 HPD	100K PD
D45	RSVD	NC	Not Connected	
D46	DDI2_PAIR2+	O	DDI 2 Lane 2 +	
D47	DDI2_PAIR2-	O	DDI 2 Lane 2 -	
D48	RSVD	NC	Not Connected	
D49	DDI2_PAIR3+	O	DDI 2 Lane 3 +	
D50	DDI2_PAIR3-	O	DDI 2 Lane 3 -	
D51	GND	P	Ground	
D52	PEG_TX0+	NC	Not Connected	
D53	PEG_TX0-	NC	Not Connected	
D54	PEG_LANE_RV#	NC	Not Connected	
D55	PEG_TX1+	NC	Not Connected	
D56	PEG_TX1-	NC	Not Connected	
D57	TYPE2#	O	GND	
D58	PEG_TX2+	NC	Not Connected	
D59	PEG_TX2-	NC	Not Connected	
D60	GND	P	Ground	
D61	PEG_TX3+	NC	Not Connected	
D62	PEG_TX3-	NC	Not Connected	
D63	RSVD	NC	Not Connected	

Pin	Signal Name	Type	Description	Comments / Availability
D64	RSVD	NC	Not Connected	
D65	PEG_TX4+	NC	Not Connected	
D66	PEG_TX4-	NC	Not Connected	
D67	GND	P	Ground	
D68	PEG_TX5+	NC	Not Connected	
D69	PEG_TX5-	NC	Not Connected	
D70	GND	P	Ground	
D71	PEG_TX6+	NC	Not Connected	
D72	PEG_TX6-	NC	Not Connected	
D73	GND	P	Ground	
D74	PEG_TX7+	NC	Not Connected	
D75	PEG_TX7-	NC	Not Connected	
D76	GND	P	Ground	
D77	RSVD	NC	Not Connected	
D78	PEG_TX8+	NC	Not Connected	
D79	PEG_TX8-	NC	Not Connected	
D80	GND	P	Ground	
D81	PEG_TX9+	NC	Not Connected	
D82	PEG_TX9-	NC	Not Connected	
D83	RSVD	NC	Not Connected	
D84	GND	P	Ground	
D85	PEG_TX10+	NC	Not Connected	
D86	PEG_TX10-	NC	Not Connected	
D87	GND	P	Ground	
D88	PEG_TX11+	NC	Not Connected	
D89	PEG_TX11-	NC	Not Connected	
D90	GND	P	Ground	
D91	PEG_TX12+	NC	Not Connected	
D92	PEG_TX12-	NC	Not Connected	
D93	GND	P	Ground	
D94	PEG_TX13+	NC	Not Connected	
D95	PEG_TX13-	NC	Not Connected	
D96	GND	P	Ground	
D97	RSVD	NC	Not Connected	
D98	PEG_TX14+	NC	Not Connected	
D99	PEG_TX14-	NC	Not Connected	
D100	GND	P	Ground	
D101	PEG_TX15+	NC	Not Connected	
D102	PEG_TX15-	NC	Not Connected	
D103	GND	P	Ground	
D104	VCC_12V	P	Main VCC Input	12V Typical
D105	VCC_12V	P	Main VCC Input	12V Typical
D106	VCC_12V	P	Main VCC Input	12V Typical
D107	VCC_12V	P	Main VCC Input	12V Typical
D108	VCC_12V	P	Main VCC Input	12V Typical
D109	VCC_12V	P	Main VCC Input	12V Typical
D110	GND	P	Ground	

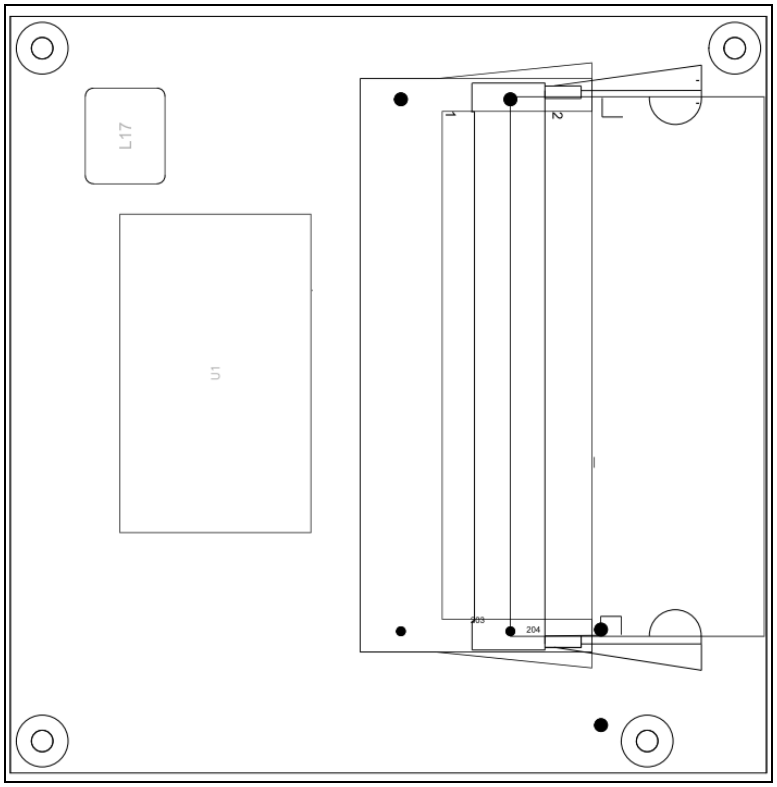
7.2 Mating Connectors

COMEX-IC40L is interfaced to the carrier board using two 110x2 pins, 0.5mm pitch connectors. Mating (carrier board) connectors should be Foxconn QT002206-2141-3H for 5mm stack, Foxconn QT002206-4131-3H for 8mm stack, or other compatible connectors.

8 MECHANICAL SPECIFICATIONS

8.1 Mechanical Drawings

Figure 2 COMEX-IC40L Top Side

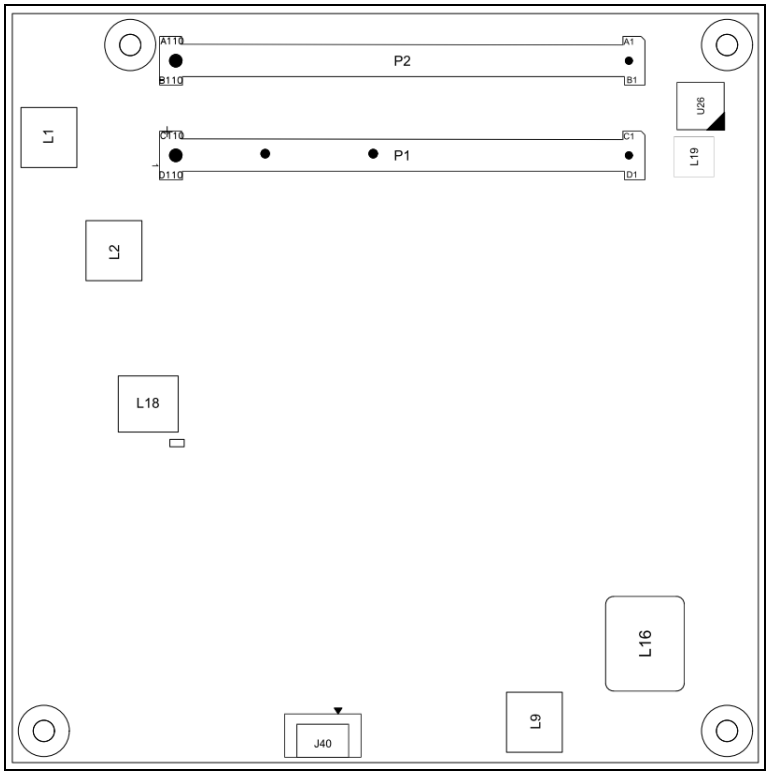


All dimensions are in millimeters.

The tolerances are ± 0.1mm.

The drawing is intended for reference uses only.

Figure 3 COMEX-IC40L Bottom Side



The drawing is intended for reference uses only.

3D model and detailed mechanical drawings are available at
http://www.compulab.co.il/products/com-express/comex-ic40l/#devres

8.2 On-Board Connectors

COMEX- IC50L features two 220-pin COM Express connectors (P1 and P2), two 204-pin SO-DIMM sockets (J1 and J2) and one 4-pin fan connector (J40).

The fan connector J40 is a 4-pin right angle 1.25mm pitch, Molex P/N: 53261-0471.

Table 18 Fan Connector Pinout

Pin #	Signal Name	Type	Description
1	FAN_PWMOUT	O	Fan PWM Output
2	FAN_TACH	I	Fan Tachometer Input
3	GND	P	Ground
4	FAN_PWR	P	5V Nominal Power Output

8.3 Heat spreader and Cooling Solutions

CompuLab provides COMEX-IC40L with a dedicated heat-spreader assembly. The COMEX_IC50L heat-spreader has been designed to act as a thermal interface and should be used in conjunction with a heat-sink or an external cooling solution.

External cooling must be provided to maintain the heat-spreader at proper operating temperatures. The cooling solution must ensure that under worst-case conditions the temperature on any spot of the heat-spreader surface is maintained according to the COMEX-IC40L temperature specifications.

Various thermal management solutions can be used with the heat-spreader, including active and passive approaches.

Reference cooling solutions are provided by CompuLab.

Documentation and CAD drawings for the COMEX-IC40L heat-spreader and cooling solutions are provided at http://www.compulab.co.il/products/com-express/comex-ic40l/#devres.

9 OPERATIONAL CHARACTERISTICS

9.1 Absolute Maximum Ratings

Table 18 Absolute Maximum Voltage

Power Rail	Min.	Typ.	Max.	Unit
VCC12V	-0.3	12	16	V
+V5_SBY	-0.3	5	16	V
+V3.3A_RTC	-0.3	3.3	3.7	V

NOTE: Exceeding the absolute maximum ratings may damage the device.

9.2 Recommended Operating Conditions

Table 19 Recommended Operating Conditions

Power Rail	Min.	Typ.	Max.	Unit
VCC12V	11.4	12	12.6	V
+V5_SBY	-0.3	5	16	V
+V3.3A_RTC	-0.3	3.3	3.7	V

9.3 DC Electrical Characteristics

Table 20 Recommended Operating Conditions

Parameter	Siganl	Min.	Typ.	Max.	Unit
V_{IH}	GPI\ GPO	1.98	3.3	3.7	V
V_{IL}		-0.3	0	1.32	V
V_{OH}		2.97	3.3		V
V_{OL}			0	0.33	V

9.4 Operating Temperature Ranges

Table 20 Operating Temperature Ranges

Range	Temp.	Description
Commercial	0 to 70 C	Sample boards from each batch are tested for the lower and upper temperature limits. Individual boards are not tested.
Extended	-20o to 70o C	Every board undergoes a short test for the lower limit (-20o C) qualification.
Industrial	-40 to 85 C	Every board is extensively tested for both lower and upper limits and at several midpoints.