COMEX-IE38

Reference Guide

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Table of Contents

1 INTRODUCTION 6
1.1 About This Document 6
1.2 COMEX-IE38 Part Number Legend 6
1.3 Related Documents 6

2 OVERVIEW 7
2.1 COMEX-IE38 Highlights 7
2.2 COMEX-IE38 Block Diagram 8
2.3 COMEX-IE38 Features 9

3 SYSTEM CORE 11
3.1 CPU 11
3.2 System Memory 11
3.3 On-board Storage 11
3.4 Graphics Core 12
3.5 Display Interfaces 12
3.5.1 eDP 12
3.5.2 LVDS 12

4 PERIPHERAL INTERFACES 13
4.1 PCI Express 13
4.1.1 Additional PCIe clocks 13
4.2 USB3.0 13
4.3 USB 2.0 13
4.4 SATA 14
4.5 Gigabit Ethernet 14
4.6 High Definition Audio (HDA) Interface 14
4.7 UART 14
4.8 SD 15
4.9 SPI 15
4.10 LPC 15
4.11 GPIO 15

5 SYSTEM LOGIC 16
5.1 Power Subsystem 16
5.1.1 Power Rails 16
5.1.2 Power-on Logic 16
5.1.3 Power Control 17
5.2 SPI Boot 17
5.3 RTC 17
5.4 System LEDs 17

6 CARRIER BOARD INTERFACE 18
6.1 Carrier Board Connectors Pin-out 18
6.2 Mating Connectors 22

7 MECHANICAL SPECIFICATIONS 23
7.1 Mechanical Drawings 23
7.2 Heat Spreader and Cooling Solutions 24

8 OPERATIONAL CHARACTERISTICS 25
8.1 Recommended Operating Conditions 25
8.2 Operating Temperature Ranges 25

Table 1 Document Revision Notes

Date	Description
Sep 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-IE38 Computer-on-Module.

1.2 COMEX-IE38 Part Number Legend

Please refer to the CompuLab website 'Ordering information' section to decode the COMEX-IE38 part number: http://www.compulab.co.il/products/com-express/comex-ie38/#ordering.

1.3 Related Documents

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

Table 2 Related Documents

Document	Location
COMEX-IE38 Developer Resources	http://www.compulab.com/

2 OVERVIEW

2.1 COMEX-IE38 Highlights

- COM Express Mini Type-10
- Intel BayTrail Atom E3800 and Celeron
- Up to 8GB DDR3L soldered on-board
- Up to 64GB on-board SSD
- 4x PCIe, USB3, 6x USB2, 2x SATA
- Dual mode display: LVDS, eDP, DVI, HDMI, DisplayPort
- Linux and MS Windows

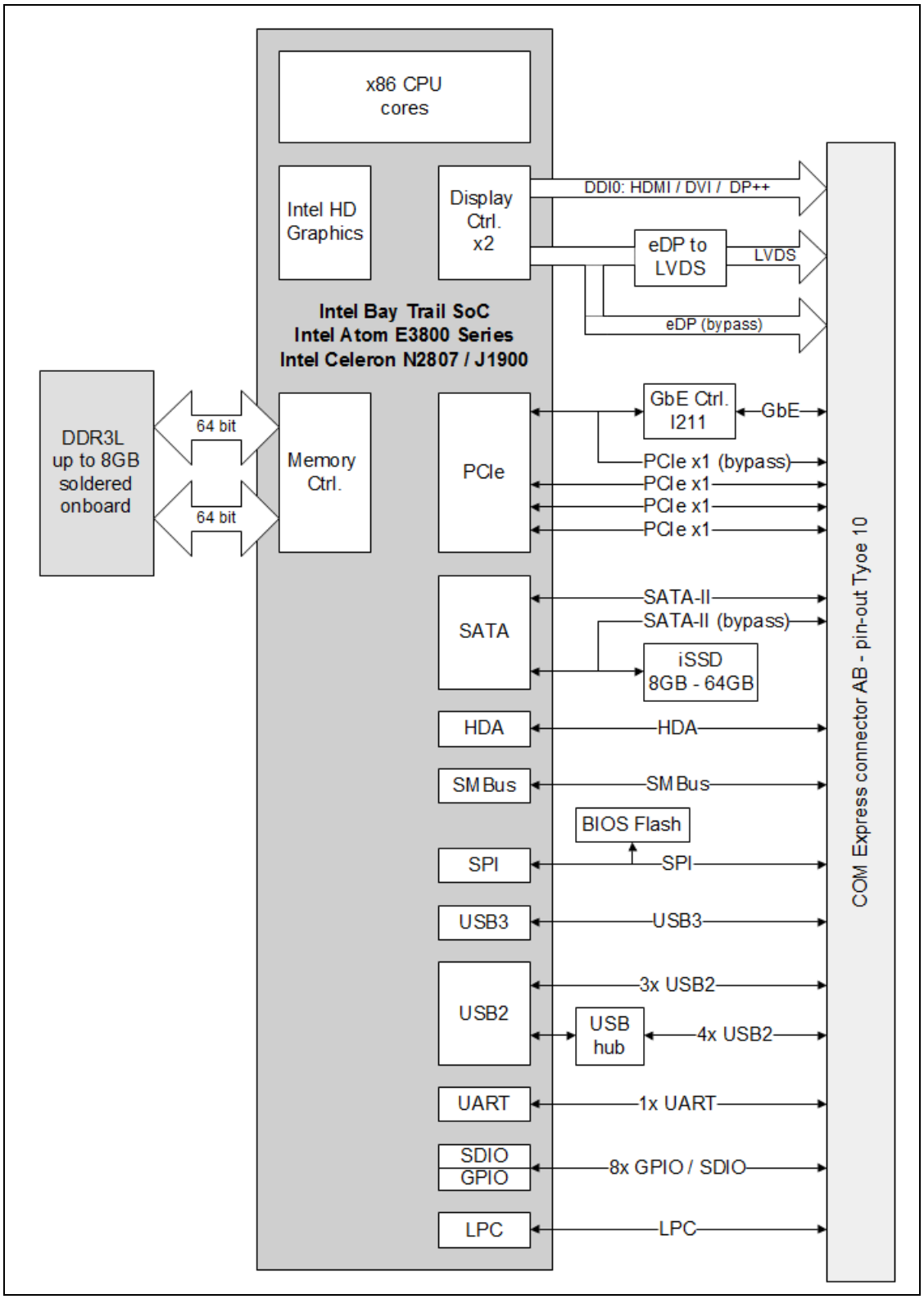
COMEX-IE38 is a credit-card sized Computer-on-Module packed in industry-standard COM Express Mini form factor. COMEX-IE38 is fully compliant with the COM Express standard and has been designed for seamless integration into COM Express system designs.

COMEX-IE38 is built around the Intel Atom E3800 and Celeron (Bay Trail) processor family featuring a highly scalable single/dual/quad CPU core coupled with the powerful Intel Gen 7 graphics engine. The SoC is supplemented with up-to 8GB DDR3 and 64GB of high-speed on-board SSD storage. In addition, COMEX-IE38 features a wide range of industry standard interfaces – Gigabit Ethernet, PCIe, SATA, USB3 and UARTs.

Small size and low power consumption of the COMEX-IE38 allow integration into portable and space-constrained designs, while its low price makes it an ideal selection for cost-sensitive systems.

2.2 COMEX-IE38 Block Diagram

Figure 1 COMEX-IE38 Block Diagram



2.3 COMEX-IE38 Features

The "Option" column specifies the COMEX-IE38 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 Atom Bay Trail E3815 64-bit single-core 1.46GHz, 5W TDP	CE3815
	Intel Celeron Bay Trail N2807 64-bit dual-core 1.58GHz, 4.3W TDP	CN2807
	Intel Celeron Bay Trail J1900 64-bit quad-core 2GHz, 10W TDP	CJ1900
	Intel Atom Bay Trail E3845 64-bit quad-core 1.91GHz, 10W TDP	CE3845
Chipset	Integrated in SoC	+
Memory and Storage		
RAM	Up to 8GB DDR3L-1333 (soldered onboard)	D
Storage	Up-to 2x SATA 3Gb/s	+
	On-board SSD, 8GB - 64GB, MLC, via SATA interface * precludes one of the SATA ports	NS
Display		
Graphics Controller	Intel® HD Graphics Gen 7 Dual display mode supported	+
DDI	DDI0: HDMI / DVI / DP / DP++, up-to 2560 x 1600	+
eDP	eDP v1.3 up to 2560 x 1600	not L
LVDS	Single-channel LVDS * precludes eDP port	L
Network		
Ethernet	1000Base-T Ethernet port implemented with Intel I211 GbE controller * precludes one PCIe port	E
Audio		
Digital Audio	HD Audio Interface	+
	Dual HDMI audio output	+
I/O		
PCI Express	Up-to 4 x PCI Express x1 ports	+
USB	1x USB3.0 (incl. USB2.0)	+
	6x USB2.0	+
Serial	1x UART	+
General Interfaces	LPC Bus SMBus Watch Dog Timer FAN control	+
GPIO	8 GPIO signals	+
System Logic		
RTC	Real time clock, powered from the carrier board	+
Power Management	ACPI 5 .0 compliant, Smart Battery Management	+

Table 4 Electrical, Mechanical and Environmental Specifications

Electrical Specifications	
Supply Voltage	4.7V – 20V
Digital I/O voltage	3.3V
Mechanical Specifications	
Form-factor	COM Express Mini, pin-out Type 10
Dimensions	84 x 55 mm
Weight	35 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-IE38 supports Intel Atom and Celeron Bay Trail CPUs.

Intel Bay Trail SoC supports the following key features:

- Advanced 22-nm process technology
- Up to four IA-compatible low power Intel x86 processor cores
- One thread per core
- Up to 2MB L2 cache
- INTEL 64 architecture
- Advanced Branch Prediction
- Out-of-Order Instruction Execution
- 64-bit floating-point unit
- SSE4.1,SSE4.2, AES,AES-NI,AVX
- Intel Carry-Less Multiplication Instruction (PCLMULQDQ)
- Digital Random Number Generator (DRNG)
- Intel Virtualization technology (Intel VT-x)

3.2 System Memory

COMEX-IE38 features up to 8GB of dual-channel non-ECC DDR3L-1333 soldered on-board memory. The table below summarizes supported CPU and DDR combination:

Table 5 Supported Memory Configurations

CPU configuration	Channels Supported	Max. Speed	Max. Memory Size
CE3815	1	DDR3L-1067	2GB
CN2807	2	DDR3L-1333	4GB
CE3845	2	DDR3L-1333	8GB
CJ1900	2	DDR3L-1333	8GB

3.3 On-board Storage

COMEX-IE38 features up to 64GB of on-board MLC SSD storage with build-in hardware ECC achieving up to 300MB/s sequential read and 160MB/s sequential write. The on-board SSD resides on the SATA0 interface.

NOTE: When on-board SSD is populated, SATA0 interface is not available on the COM Express connector.

3.4 Graphics Core

Intel Bay Trail SoC integrated GPU supports the following key features:

- Intel's 7th generation (Gen7) graphics and media encode/decode engine
- VED video decoder in addition to Gen 7 Media decoder
- DirectX 11
- OpenCL 1.2
- OpenGL 3.0
- OpenGLES 2.0
- GPU shader up to 8 gigaflops
- 4x anti-aliasing
- Full HW acceleration for decode H.264,JPEG,MJPEG,MPEG2,VC-1,WMV9
- Full HW acceleration for encode H.264
- Polyphase 8 tap scaling
- HD HQV

3.5 Display Interfaces

COMEX-IE38 supports two simultaneous display interfaces – one as DDI port and second available in 2 configurations: eDP or LVDS (option "L").

Table 6 Display Interfaces Maximum Resolution

Interface	Max. Resolution
HDMI / DVI	1920x1200@60Hz
eDP	2560x1600@60Hz
LVDS	1400x1050@60Hz

3.5.1 eDP

COMEX-IE38 supports eDP1.3 with resolutions of up to 3840x2160 @ 60Hz.

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

3.5.2 LVDS

The optional LVDS interface is implemented with an eDP to LVDS bridge. COMEX-IE38 supports single channel LVDS which can be configured for 18 or 24 bpp operation.

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

4 PERIPHERAL INTERFACES

4.1 PCI Express

COMEX-IE38 incorporates up to 4 PCIe x1 Gen2 ports [0..3].

NOTE: PCIe port #3 is available only without the 'E' configuration option.

4.1.1 Additional PCIe clocks

COMEX-IE38 provides two additional PCIe clocks for external PCIe devices saving additional clock buffers on the customer's carrier-board:

Table 7 Additional PCIe Clock Signals

Pin Name	Pin #	PU/PD/Plane
CLK_PCIE_P1	B55	PCIE CLOCK 2
CLK_PCIE_N1	B56	
CLK_PCIE_P2	B52	PCIE CLOCK 3
CLK_PCIE_N2	B53	

4.2 USB3.0

COMEX-IE38 features one USB3.0 interface which supports SuperSpeed, High-speed and Full-speed/Low-speed connections. USB3.0 port should be paired with the USB2.0 SoC port#0.

4.3 USB 2.0

The COMEX-IE38 features seven USB2.0 interfaces on the COM Express connectors:

- Three interfaces are routed directly from the SoC to the COM Express connector
- Four USB2.0 interfaces are implemented with a USB hub

The table below summarizes USB2.0 mappings:

Table 8 USB2.0 Port Mappings

COMEX-IE38 port number	USB port source
port #0	SoC port0
port #1	SoC port1
port #2	USB hub port1
port #3	USB hub port2
port #4	USB hub port3
port #5	USB hub port4
port #6	SoC port2

4.4 SATA

COMEX-IE38 supports up to two SATA interfaces via the SATA host controller integrated in the Intel Bay Trail SoC. The controller supports independent DMA operation and data transfer rates of 1.5 Gb/s and 3.0 Gb/s. It also supports two modes of operation - a legacy mode and AHCI mode. Software that uses legacy mode will not have AHCI capabilities.

NOTE: When on-board SSD is populated, SATA0 interface is not available on the COM Express connector.

4.5 Gigabit Ethernet

COMEX-IE38 Gigabit Ethernet interface is implemented with the I211 Intel Gigabit Ethernet controller. The controller is connected to the PCIe port #3.

The COMEX-IE38 Gigabit Ethernet port support the following key features:

- PCIe v2.1 (2.5GT/s) x1
- Jumbo frames
- 802.1q Double VLAN support
- IEEE 1588
- Crossover Detection and Auto-Correction
- Wake-on-LAN and remote wake-up support
- Auto-negotiation
- Activity and speed indicator LED controls

NOTE: PCIe port #3 is available only without the 'E' configuration option.

4.6 High Definition Audio (HDA) Interface

COMEX-IE38 features Intel HD Audio signals with support up to two CODECs.

4.7 UART

COMEX-IE38 supports one UART interface implemented with the internal Bay Trail SoC UART controller.

4.8 SD

COMEX-IE38 supports one SD card interface implemented with the internal Bay Trail SoC SD controller. The SD interface support the following key features:

- SD card 3.0 Bus interface
- Up to 400 Mbits per second
- Support for UHS-I modes: HS, DDR50 and SD12/25
- Support for CRC7 for command and CRC16 for data integrity
- IEEE 1588

COMEX-IE38 supports boot from SD card in DOS, Linux and MS Windows 8.x.

4.9 SPI

COMEX-IE38 SPI interface can used for booting from external SPI flash. For additional details please refer to section 5.2.

4.10 LPC

COMEX-IE38 supports LPC (Low Pin Count) bus. The LPC bus can be used for implementing I/O extensions such as additional Super I/O or TPM devices on an application specific carrier board. LPC bus operates at 33MHz with Atom SoCs and at 25MHz with Celeron SoCs.

4.11 GPIO

COMEX-IE38 provides eight GPIO signals multiplexed with the SD interface.

GPIO signals can be configured as input or output (GPI or GPO). All of the GPIO signals are SoC GPIO pins.

Table 9 GPIO Signals Details

Pin Name	Pin #	Default Function	PU/PD/Plane
GPI0	A54	SD_DATA0	PU 20k (S0)
GPI1	A63	SD_DATA1	PU 20k (S0)
GPI2	A67	SD_DATA2	PU 20k (S0)
GPI3	A85	SD_DATA3	PU 20k (S0)
GPO0	A93	SD_CLK	20k PD
GPO1	B54	SD_CMD	PU 20k (S0)
GPO2	B57	SD_WP	PU 10k (S5)
GPO3	B63	SD_CD#	PU 10k (S5)

5 SYSTEM LOGIC

5.1 Power Subsystem

5.1.1 Power Rails

COMEX-IE38 has multiple power supply options:

- +5VSBY is always available and +VCC is supplied through S3. All working states provided by COMEX-IE38 are supported with this configuration (S0/S3/S5).
- Single + VCC is always available. All working states provided by COMEX-IE38 are supported with this configuration (S0/S3/S5).
- Single + VCC is supplied through S0. In this case only S0 state is supported.

Table 10 Power Rails Requirements

Power Rail	Voltage Range (Volt)	Nominal Voltage (Volt)	Max Input Ripple (mV)
+VCC	4.75-20	12	100
+5VSBY	4.75 – 5.25	5	50

5.1.2 Power-on Logic

COMEX-IE38 is designed to support standard PC power-on logic. The COMEX-IE38 BIOS can be configured (using the “State after G3” menu) for the following power-on behavior:

- S5 - Stay off
- S3 - Turn on automatically

5.1.3 Power Control

The power control signals of the COMEX-IE38, available for the carrier board, include:

- **PWRBTN# / SLEEP#** (Module Input): The power button signal is an ACPI standard. It has a 16 milliseconds de-bounce circuit at the PCH, 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 PCH. 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 PCH, 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#** (Module Input): The wake signals are indicates the PCH that a PCIe Device generated a wake event. Upon a falling edge, the system should wake up to S0 operation mode.

5.2 SPI Boot

The COMEX-IE38 SPI bus can used in order to boot from an external SPI flash device.

When BIOS_DIS1# pin is pulled to GND, external SPI Flash device is selected as boot source. When BIOS_DIS1# is pulled-up or left unconnected, COMEX-IE38 will boot from the onboard SPI flash.

5.3 RTC

COMEX-IE38 features an RTC with internal CMOS memory backed up by an external battery via the +VRTC pin on the COM Express connector:

Table 11 RTC Power Rail

Power Rail	Voltage Range (Volt)	Nominal Voltage (Volt)
+VRTC	2.0-3.2	3.0

COMEX-IE38 may operate in RTC-less mode (without battery back-up), saving all main parameters in the BIOS SPI flash. Date and time information is not saved in this mode.

5.4 System LEDs

COMEX-IE38 features two on-board LED indicators with the following behavior:

- Green- The system is in the ON state
- Red - SATA activity LED

6 CARRIER BOARD INTERFACE

6.1 Carrier Board Connectors Pin-out

The COMEX-IE38 connects to a carrier board with 2x110 pin connector. The pin numbering is divided to two groups: A, B, where each pin number starts with the letter of the row it's in.

The pin-out of the connectors is compatible to type 10 COM Express specifications.

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.**

- **"I"** – Digital Input
- **"O"** – Digital Output
- **"IO"** – Digital Input/Output
- "**PU33SPI**" – Always pulled up to 3.3V SPI power rail.
- "**PU33**" – Always pulled up to 3.3V on-board COMEX-IE38
- "**PD**" - Always pulled down on-board COMEX-IE38
- "**NC**" – Connector Pin is Not Connected
- "**PI**" – Power input pin (to COMEX-IE38)
- "**PO**" – Power output pin (from COMEX-IE38)
- **"G"** – Ground pint

Table 12 COMEX-IE38 Carrier Board Connectors Signals

Pin	Signal Name	Type	Description / Standard	Comments / Availability
A1	GND	G	GND (FIXED)	
A2	LAN_MDIN3	IO	GBE0_MDI3-	
A3	LAN_MDIP3	IO	GBE0_MDI3+	
A4	LINK_100_LAN	O	GBE0_LINK100#	
A5	LINK_1000_LAN	O	GBE0_LINK1000#	
A6	LAN_MDIN2	IO	GBE0_MDI2-	
A7	LAN_MDIP2	IO	GBE0_MDI2+	
A8	LINK_ACT_LAN	O	GBE0_LINK#	
A9	LAN_MDIN1	IO	GBE0_MDI1-	
A10	LAN_MDIP1	IO	GBE0_MDI1+	
A11	GND	G	GND (FIXED)	
A12	LAN_MDIN0	IO	GBE0_MDI0-	
A13	LAN_MDIP0	IO	GBE0_MDI0+	
A14	NC		GBE0_CTREF	
A15	SLP_S3#	O	SUS_S3#	10k PU (S5) PU33
A16	SATA_TXP0	O	SATA0_TX+	AC coupled on module
A17	SATA_TXN0	O	SATA0_TX-	AC coupled on module
A18	SLP_S4#	O	SUS_S4#	Suspend to disk, 10k PU (S5) PU33
A19	SATA_RXP0	I	SATA0_RX+	AC coupled on module
A20	SATA_RXN0	I	SATA0_RX-	AC coupled on module
A21	GND	G	GND (FIXED)	
A22	USB3_RXN0	O	USB_SSRX0-	AC coupled off module
A23	USB3_RXP0	O	USB_SSRX0+	AC coupled off module
A24	SLP_S5#	O	SUS_S5#	Tied together with SLP_S4# (A18)
A25	NC		USB_SSRX1-	
A26	NC		USB_SSRX1+	
A27	NC		BATLOW#	

Pin	Signal Name	Type	Description / Standard	Comments / Availability
A28	SATA_LED#	O	ATA_ACT#	10k PU (S0) PU33
A29	HDA_SYNC	O	AC_SYNC	20k PD (SOC)
A30	HDA_RST#	O	AC_RST#	20k PD (SOC)
A31	GND	G	GND (FIXED)	
A32	HDA_BITCLK	O	AC_BITCLK	20k PD (SOC)
A33	HDA_SDO	O	AC_SDOUT	20k PD (SOC)
A34	BIOS_DIS0#	I	BIOS_DIS0#	10k PU (S5) PU33SPI
A35	NC		THRMTRIP#	
A36	USB_PN2	IO	USB6-	SOC USB port #2
A37	USB_PP2	IO	USB6+	
A38	USB1_OC#	I	USB_6_7_OC#	OC for USB port #2 and #3, 10K PU (S5) PU33
A39	USBH_PN3	IO	USB4-	SOC USB2 port #3
A40	USBH_PP3	IO	USB4+	
A41	GND	G	GND (FIXED)	
A42	USBH_PN1	IO	USB2-	USB hub port #1
A43	USBH_PP1	IO	USB2+	
A44	OC#1_2_HB	I	USB_2_3_OC#	OC for USB hub port #1 and #2
A45	USB_PN0	IO	USB0-	SOC USB port 0
A46	USB_PP0	IO	USB0+	
A47	+VRTC	PI	VCC_RTC	External RTC power rail
A48	NC		EXCD0_PERST#	
A49	NC		EXCD0_CPPE#	
A50	LPC_SERIRQ#	I	LPC_SERIRQ	10k PU (S5)
A51	GND	G	GND (FIXED)	
A52	NC		RSRVD	
A53	NC		RSRVD	
A54	SDIO_D0/GPIO	IO	GPI0/SD_D0	20k PU (S0)
A55	NC		RSRVD	
A56	NC		RSRVD	
A57	GND	G	GND	
A58	PCIE_TXP3	O	PCIE_TX3+	AC coupled on module
A59	PCIE_TXN3	O	PCIE_TX3-	AC coupled on module
A60	GND	G	GND (FIXED)	
A61	PCIE_TXP2	O	PCIE_TX2+	AC coupled on module
A62	PCIE_TXN2	O	PCIE_TX2-	AC coupled on module
A63	SDIO_D1	IO	GPI1/SD_D1	20k PU (S0)
A64	PCIE_TXP1	O	PCIE_TX1+	AC coupled on module
A65	PCIE_TXN1	O	PCIE_TX1-	AC coupled on module
A66	GND	G	GND	
A67	SDIO_D2	IO	GPI2/SD_D2	20k PU (S0)
A68	PCIE_TXP0	O	PCIE_TX0+	AC coupled on module
A69	PCIE_TXN0	O	PCIE_TX0-	AC coupled on module
A70	GND	G	GND (FIXED)	
A71	EDP_P2_A0+	O	LVDS_A0+	eDP_P2/LVDS_A0+
A72	EDP_N2_A0-	O	LVDS_A0-	eDP_N2/LVDS_A0-
A73	EDP_P1_A1+	O	LVDS_A1+	eDP_P1/LVDS_A1+
A74	EDP_N1_A1-	O	LVDS_A1-	eDP_N1/LVDS_A1-
A75	EDP_P0_A2+	O	LVDS_A2+	eDP_P0/LVDS_A2+
A76	EDP_N0_A2-	O	LVDS_A2-	eDP_N0/LVDS_A2-
A77	EDP_LVDS_VDDEN	O	LVDS_VDD_EN	
A78	LVDS_A3+	O	LVDS_A3+	
A79	LVDS_A3-	O	LVDS_A3-	
A80	GND	G	GND (FIXED)	
A81	EDP_P3_CK+	O	LVDS_A_CK+	eDP_P3/LVDS_CK+
A82	EDP_N3_CK-	O	LVDS_A_CK-	eDP_N3/LVDS_CK-
A83	EDP_AUXP_I2C_CK	O	LVDS_I2C_CK	2.2k PU (S0) (LVDS)
A84	EDP_AUXN_I2C_DAT	IO	LVDS_I2C_DAT	2.2k PU (S0) (LVDS)
A85	SDIO_D3	IO	GPI3/SD_D3	20k PU (S0)
A86	DEBUG#	I	RSRVD	Do not connect
A87	EDP_HPD	I	eDP_HPD	100k PD
A88	CLK_PCIE_P0	O	PCIE0_CK_REF+	
A89	CLK_PCIE_N0	O	PCIE0_CK_REF-	
A90	GND	G	GND (FIXED)	
A91	+V3.3A_SPI	PO	SPI_POWER	
A92	SPI_MISO	I	SPI_MISO	
A93	SDIO_CLK	IO	GPO0/SD_CLK	20k PD(S0)

Pin	Signal Name	Type	Description / Standard	Comments / Availability
A94	SPI_CLK	O	SPI_CLK	
A95	SPI_MOSI	O	SPI_MOSI	
A96	NC		TPM_PP	
A97	TYPE10	IO	TYPE10#	49.9k PD
A98	COM0_TX	O	SER0_TX	12V tolerant, 10k PD
A99	COM0_RX	I	SER0_RX	12V tolerant
A100	GND	G	GND (FIXED)	
A101	NC		SER1_TX	
A102	NC		SER1_RX	
A103	NC		LID#	
A104	+VCC	PI	VCC_12V	4.75-20V Typical
A105	+VCC	PI	VCC_12V	4.75-20V Typical
A106	+VCC	PI	VCC_12V	4.75-20V Typical
A107	+VCC	PI	VCC_12V	4.75-20V Typical
A108	+VCC	PI	VCC_12V	4.75-20V Typical
A109	+VCC	PI	VCC_12V	4.75-20V Typical
A110	GND	G	GND (FIXED)	
B1	GND	G	GND (FIXED)	
B2	LINK_ACT#	O	GBE0_ACT#	Connected to GBE0_LINK#
B3	LPC_FRAME#	IO	LPC_FRAME#	20k PU (S0)
B4	LPC_AD0	IO	LPC_AD0	20k PU (S0)
B5	LPC_AD1	IO	LPC_AD1	20k PU (S0)
B6	LPC_AD2	IO	LPC_AD2	20k PU (S0)
B7	LPC_AD3	IO	LPC_AD3	20k PU (S0)
B8	NC		LPC_DRQ0#	
B9	NC		LPC_DRQ1#	
B10	LPC_CLK	O	LPC_CLK	33MHz clock, 20k PD (S0)
B11	GND	G	GND (FIXED)	
B12	PWRBTN#	I	PWRBTN#	10k PU (S5)
B13	SMB_CLK	O	SMB_CK	10k PU (S5)
B14	SMB_DATA	IO	SMB_DAT	10k PU (S5)
B15	SMB_ALRT#	I	SMB_ALERT#	10k PU (S5)
B16	SATA_TXP1	O	SATA1_TX+	AC coupled on module
B17	SATA_TXN1	O	SATA1_TX-	AC coupled on module
B18	LPCPD#	O	SUS_STAT#	10k PU (S5)
B19	SATA_RXP1	I	SATA1_RX+	AC coupled on module
B20	SATA_RXN1	I	SATA1_RX-	AC coupled on module
B21	GND	G	GND (FIXED)	
B22	USB3_TXN0	O	USB_SSTX0-	AC coupled on module
B23	USB3_TXP0	O	USB_SSTX0+	AC coupled on module
B24	PWR_OK_IN	I	PWR_OK	10-30k PU (S5)
B25	NC		USB_SSTX1-	
B26	NC		USB_SSTX1+	
B27	WDO	O	WDT	TBD
B28	NC		AC_SDIN2	
B29	HDA_SDIN1	I	AC_SDIN1	20k PD (SOC)
B30	HDA_SDIN0	I	AC_SDIN0	20k PD (SOC)
B31	GND	G	GND (FIXED)	
B32	HDA_SPKR	O	SPKR	10k PU (S0)
B33	I2C0_SCL_3.3V	IO	I2C_CK	2.2k PU (S5)
B34	I2C0_SDA_3.3V	IO	I2C_DAT	2.2k PU (S5)
B35	NC		THRM#	
B36	NC		USB7-	
B37	NC		USB7+	
B38	OC#3_4_HB	I	USB_4_5_OC#	OC for USB hub port #3 and #4
B39	USBH_PN4	IO	USB5-	USB hub port #4
B40	USBH_PP4	IO	USB5+	
B41	GND	G	GND (FIXED)	
B42	USBH_PN2	IO	USB3-	USB hub port #2
B43	USBH_PP2	IO	USB3+	
B44	USB0_OC#	I	USB_0_1_OC#	OC for USB ports #0 and #1, 10k PU (S5)
B45	USB_PN1	IO	USB1-	SOC USB2 port #1
B46	USB_PP1	IO	USB1+	
B47	NC		EXCD1_PERST#	
B48	NC		EXCD1_CPPE#	
B49	SYS_RESET#	I	SYS_RESET#	10k PU (S5)

Pin	Signal Name	Type	Description / Standard	Comments / Availability
B50	PLT_RST#	O	CB_RESET#	10k PU (S0)
B51	GND	G	GND (FIXED)	
B52	CLK_PCIE_P2	O	RSRVD	Additional PCIe clock
B53	CLK_PCIE_N2	O	RSRVD	
B54	SDIO_CMD	IO	GPO1/SD_CMD	20k PU (S0)
B55	CLK_PCIE_P1	O	RSRVD	Additional PCIe clock
B56	CLK_PCIE_N1	O	RSRVD	
B57	SDIO_WP	IO	GPO2/SD_WP	10k PU (S5)
B58	PCIE_RXP3_OUT	I	PCIE_RX3+	
B59	PCIE_RXN3_OUT	I	PCIE_RX3-	
B60	GND	G	GND (FIXED)	
B61	PCIE_RXP2	I	PCIE_RX2+	
B62	PCIE_RXN2	I	PCIE_RX2-	
B63	SDIO_CD#	IO	GPO3/SD_CD	10k PU (S5)
B64	PCIE_RXP1	I	PCIE_RX1+	
B65	PCIE_RXN1	I	PCIE_RX1-	
B66	PCIE_WAKE#	I	WAKE0#	10k PU (S5)
B67	NC		WAKE1#	
B68	PCIE_RXP0	I	PCIE_RX0+	
B69	PCIE_RXN0	I	PCIE_RX0-	
B70	GND	G	GND (FIXED)	
B71	DDI0_LANE0_P	O	DDI0_PAIR0+	DDI0 differential pairs [2:0]
B72	DDI0_LANE0_N	O	DDI0_PAIR0-	
B73	DDI0_LANE1_P	O	DDI0_PAIR1+	
B74	DDI0_LANE1_N	O	DDI0_PAIR1-	
B75	DDI0_LANE2_P	O	DDI0_PAIR2+	
B76	DDI0_LANE2_N	O	DDI0_PAIR2-	
B77	NC		DDI0_PAIR4+	
B78	NC		DDI0_PAIR4-	
B79	EDP_LVDS_BKEN	O	LVDS_BKLT_EN	eDP/LVDS Backlight enable
B80	GND	G	GND (FIXED)	
B81	DDI0_LANE3_P	O	DDI0_PAIR3+	DDI0 differential pair 3
B82	DDI0_LANE3_N	O	DDI0_PAIR3-	
B83	EDP_LVDS_BKCTL	O	LVDS_BKLT_CTRL	eDP/LVDS Backlight control
B84	+V5SBY	PI	VCC_5V_SBY	
B85	+V5SBY	PI	VCC_5V_SBY	
B86	+V5SBY	PI	VCC_5V_SBY	
B87	+V5SBY	PI	VCC_5V_SBY	
B88	BIOS_DIS1#	I	BIOS_DIS1#	10k PU (S5) PU33SPI
B89	DDIO_HPDET	I	DDI0_HPD	100k PD
B90	GND	G	GND (FIXED)	
B91	NC		DDI0_PAIR5+	
B92	NC		DDI0_PAIR5-	
B93	NC		DDI0_PAIR6+	
B94	NC		DDI0_PAIR6-	
B95	DDI0_DDC_AUX_SEL	IO	DDI0_DDC_AUX_SEL	1M PD
B96	NC		USB_HOST_PRSNT	
B97	SPI_CS0#	O	SPI_CS#	
B98	DDI0_CLK_AUXP	IO	DDI0_CTRLCLK_AUX+	100k PD
B99	DDI0_DAT_AUXM	IO	DDI0_CTRLDAT_AUX-	100k PU (S0)
B100	GND	G	GND (FIXED)	
B101	FAN_PWM_CONN	O	FAN_PWMOUT	12V tolerant, 10k PD
B102	FAN_TACH_IN	I	FAN_TACHIN	12V tolerant
B103	NC		SLEEP#	
B104	+VCC	PI	VCC_12V	4.75-20V range
B105	+VCC	PI	VCC_12V	4.75-20V range
B106	+VCC	PI	VCC_12V	4.75-20V range
B107	+VCC	PI	VCC_12V	4.75-20V range
B108	+VCC	PI	VCC_12V	4.75-20V range
B109	+VCC	PI	VCC_12V	4.75-20V range
B110	GND	G	GND (FIXED)	

6.2 Mating Connectors

COMEX-IE38 should be connected to a carrier board using one 110x2 pins, 0.5mm pitch connector. The connector on the carrier board should be Foxconn QT002206-2141-3H for 5mm stack, Foxconn QT002206-4131-3H for 8mm stack, or other compatible connectors.

7 MECHANICAL SPECIFICATIONS

7.1 Mechanical Drawings

Figure 2 COMEX-IE38 Top Side

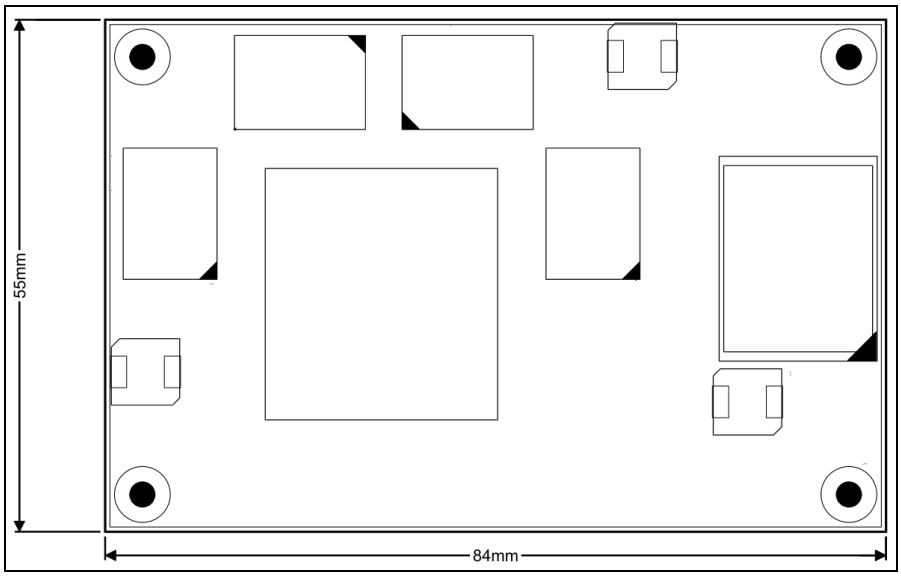
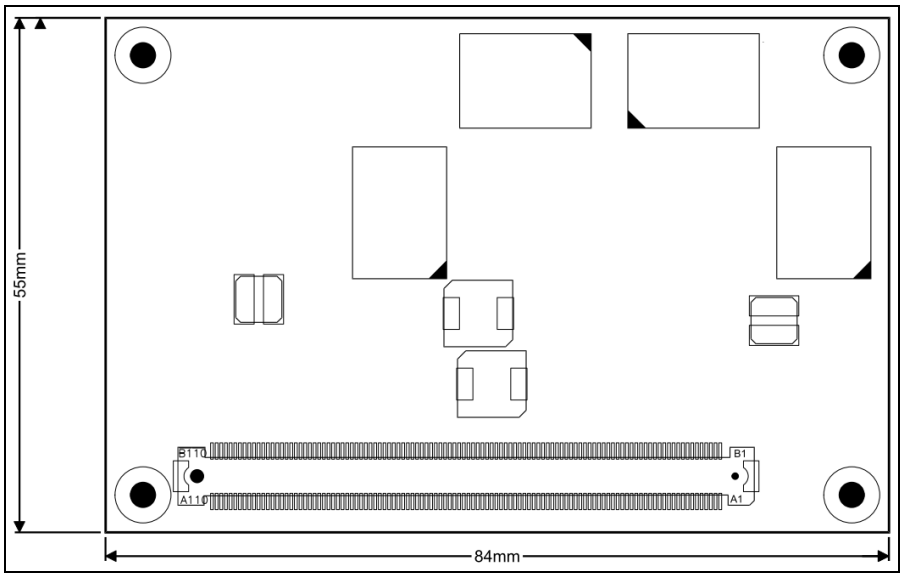


Figure 3 COMEX-IE38 Bottom Side



All dimensions are in millimeters. The tolerances are ± 0.1mm.

Board thickness is 1.6mm. The drawing is intended for reference uses only.

3D models and detailed mechanical drawings are available at

http://www.compulab.co.il/products/com-express/comex-ie38/#devres

7.2 Heat Spreader and Cooling Solutions

CompuLab provides COMEX-IE38 with a dedicated heat-spreader assembly. The COMEX-IE38 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-IE38 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-IE38 heat-spreader and cooling solutions are provided at http://www.compulab.co.il/products/com-express/comex-ie38/#devres.

8 OPERATIONAL CHARACTERISTICS

8.1 Recommended Operating Conditions

Table 13 Recommended Operating Conditions

Power Rail	Min.	Typ.	Max.	Unit
+VCC	4.75	12	20.0	V
+5VSBY	4.75	5.0	5.25	V
+VRTC	2.0	3.0	3.3	V

8.2 Operating Temperature Ranges

Table 14 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.