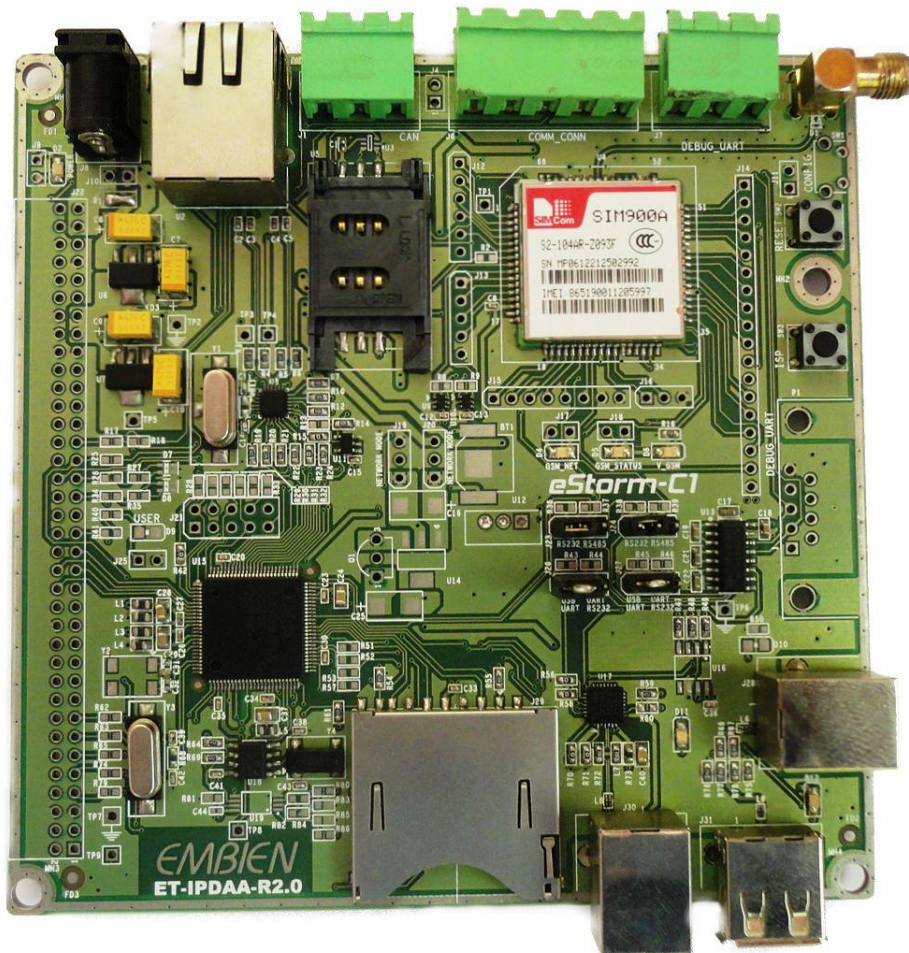


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# eStorm-C1

## Data Manual



**Revision History**

<b>Date</b>	<b>Revision</b>	<b>Authors</b>	<b>Remarks</b>
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## 1. Introduction

eStorm-C1 is the latest in the eStorm series of devices from Embien Technologies targeted for low cost high performance processing segment. Powered by the industry leading ARM Cortex-M3 core, this platform is ideal for application which needs excellent connectivity with low deployment cost.

Operating from single 5V DC power supply or a USB Device Port, the board has NXP's LPC1769 processor with 512KB Integrated Flash and 64KB SRAM at its heart. Memory support includes 2KB EEPROM along with SD card. Connectivity options include USB Host or Device interface, 10/100T Ethernet, RS-232/ RS485 serial communication ports and CAN port. GSM Connectivity is also available. A B2B connector is also provided for easy expansion of the available functionalities.

### 1.1 Scope

The primary scope of this document is to provide the developer/technical persons the background about the device and procedures for using the same. All the details of the hardware, components used etc are provided to aid the developer use the system effectively as well as expand its functionalities with custom daughter boards.

This document does not describe about programming this device and using them. For this information, kindly refer to the "User Manual" provided.

### 1.2 References

1. LPC1769 microcontroller user manual document: UM10360 from NXP.com.
2. LPC1769 product datasheet: LPC1769/68/67/66/65/64/63 from NXP.com.

## 2. System Features

This section describes various features of the eStorm-C1 platform in detail.

### 2.1 eStorm-C1 Board features

eStorm-C1 board supports the following features. Some of them are provided as standard while others are selectable by the customer.

Features	Description	Availability
Processor	ARM Cortex M3 - NXP LPC1769	Default
Processor Speed	120MHz	Default
SRAM	64KB	Default
Flash	512KB	Default
EEPROM	2KB over I2C	Optional
RTC	Over I2C	Optional
Standard 100mils expansion connector	SSP Ports, TTL level serial communication port, 12-bit ADC channels, PWM channels, I2C, I2S interface, 10-bit DAC channels, General purpose input/output.	Default
Input power	5V via Standard Power Jack or USB device port	Default
Form Factor	Nano-ITX - 120mm X 120mm	Default
10/100T Ethernet	Yes	Optional
UART Serial Interface	1 (RS232 or RS 485 )	Optional
USB	1 (USB Host or Device)	Optional
CAN	1	Optional
SD card	Standard SD Card Connector	Optional
Debug port	1 (RS-232 port or USB device )	Optional
GSM Connectivity	2G Modem	Optional

Table 1: eStorm-C1 Board features

Features marked in Green as default and in Tan color are selectable when ordering the board.

## 2.2 eStorm-C1 Block Diagram

The block diagram of the eStorm-C1 board is depicted here with the standard and optional features.

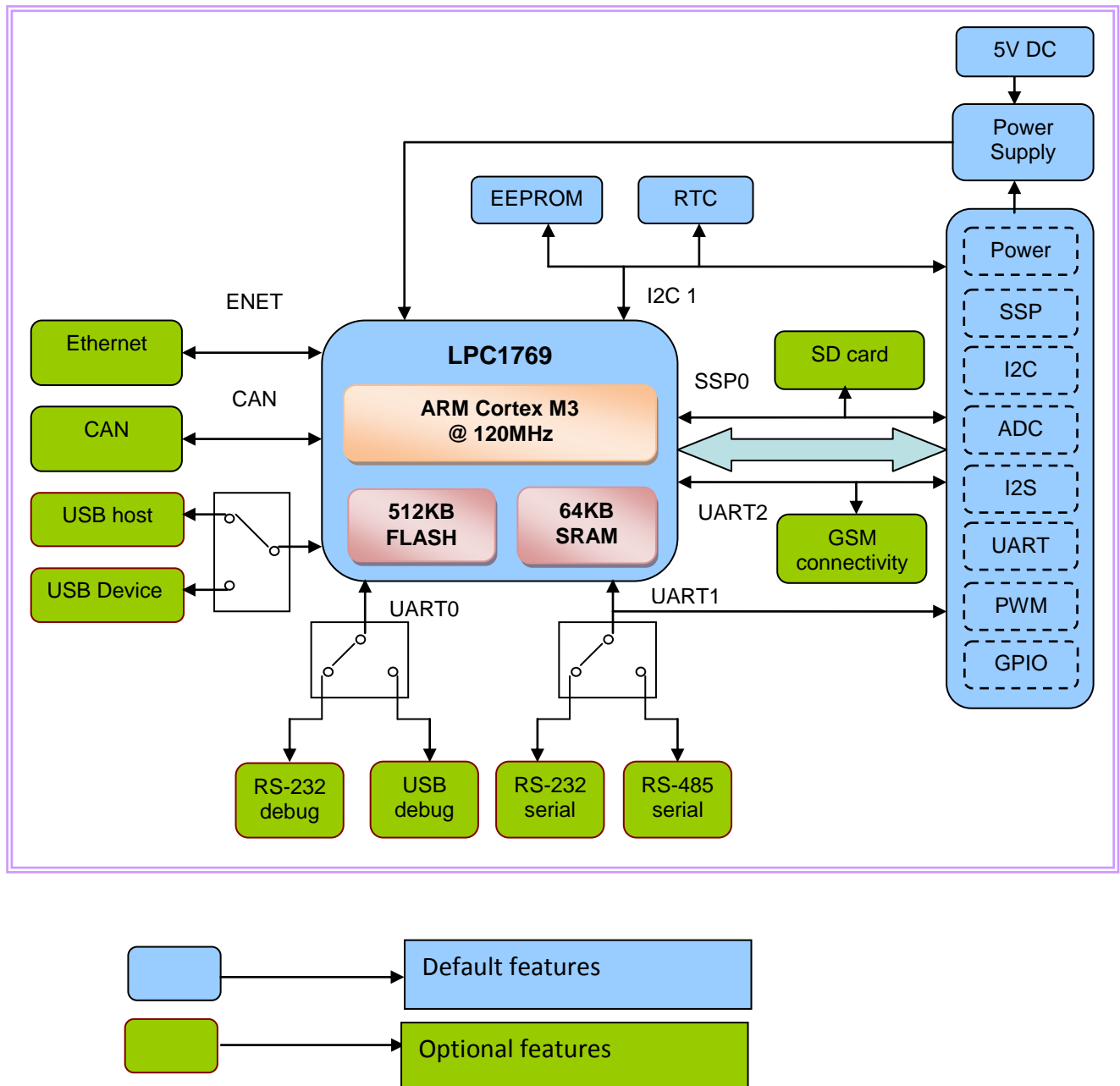


Figure 1: eStorm-C1 Block Diagram

## 2.3 eStorm-C1 Add-On Card development

While the eStorm-C1 platform by itself is feature rich and is suitable for direct use, the functionalities can be further enhanced by using low cost expansion cards. These daughter cards, being less complex designs, can be designed with low engineering effort. This approach reduces the overall development cost of the customer product.

In the software perspective, the firmware of eStorm-C1 is highly stable, thoroughly tested and is very modular. So the new functionalities can be simply supported in software by adding the necessary modules.

The expansion connector has the following functionalities that can be used to design the Add-On cards (daughter cards)

Feature	Quantity	Description and Usage
SSP Ports	2	Offers the standard 4 wire serial bus functionality. Can be used to interface external ADC IC's, Wi-Fi module, etc.
TTL Serial Port	2	Offers the standard 2-wire serial bus functionality. Can be used to integrate TTL Wi-Fi, Bluetooth, GSM modules etc.
RS232 Serial Port	1	Offers the standard 2-wire serial bus functionality. Can be used to integrate RS-232 level module interfaces.
12 Bit ADC	6	Offers 6 channels of 12-bit analog inputs. Can be used to interface analog output signal from SpO2 module, temperature sensor, etc.
8bit PWM	6	Offers 6 PWM signal output. Can be used in LED driving applications, etc.
10bit DAC	1	Offers single analog output. Can be used for analog dimming control of LED, etc.
GPIO	48	Offers 48 general purpose digital inputs or outputs. Can be used to drive a relay, ON/OFF control etc.
I2C Interface	3	Standard I2C compliant bus interfaces may be configured as Master, Slave, or Master/Slave. Can be used to integrate external I2C standard parts such as serial RAMs, LCDs, tone generators, other microcontrollers, etc.
I2S Interface	1	Provides a standard 3-wire communication interface for digital audio applications.

*Table 2 : Expansion connector functionalities*

The expansion connector pin outs have been discussed in detail in section **4.3**.



## 2.4 eStorm-C1 Ordering Info

eStorm-C1 can be ordered with only the features necessary for the target applications. The following table gives the detailed description of the ordering codes.

### **eStorm-C1\_ET\_CA\_DU\_RM\_RS\_U[D/H]\_SD\_GS\_EX**

<b>ET</b>	: Ethernet Support
<b>CA</b>	: CAN Transceiver and Connector
<b>DU</b>	: Debug Serial to USB Bridge (USB as debug port)
<b>RM</b>	: RS-485 serial communication support
<b>RS</b>	: RS-232 serial communication support
<b>UH</b>	: USB Host support
<b>UD</b>	: USB Device support
<b>SD</b>	: SD card support
<b>GS</b>	: GSM/GPRS connectivity
<b>EX</b>	: Expansion Connector

For example, to order a eStormC1 board with the following features:

1. Ethernet
2. RS-232 serial com port
3. SD card
4. GSM/GPRS connectivity.

Use the following ordering code

**Ordering code** : **eStorm-C1\_ET\_RS\_SD\_GS**

By default, operating system supported is **FreeRTOS**.

To order other related tools/software related to eStorm-C1 like RAPIDSEA – Rapid Deployment Suite for Embedded Application, Flint Graphical/Scripting Development Environment, kindly visit our website <http://www.embien.com/>

### 3. eStorm-C1 Hardware Components

The eStorm-C1 platform is designed using some of the most powerful and reliable components available. This section describes some of the major components used in the design.

#### 3.1 ARM Cortex-M3 Microcontroller

NXP's LPC1769 is an ARM Cortex-M3 based microcontroller that lies in the heart of the eStorm-C1 platform. It is specially selected for usage in embedded applications requiring a high level of integration and low power dissipation. The ARM Cortex-M3 is a next generation core that offers system enhancements such as modernized debug features and a higher level of support block integration.

The ARM Cortex-M3 CPU incorporates a 3-stage pipeline and uses Harvard architecture with separate local instruction and data buses as well as a third bus for peripherals. The ARM Cortex-M3 CPU also includes an internal prefetch unit that supports speculative branches.

The LPC1769 is a high speed version operating up to 120 MHz CPU frequency. The peripheral complement of the LPC1769 includes the following features

- 512KB of flash memory
- Up to 64 kB of data memory
- Ethernet MAC
- A USB interface that can be configured as Host or Device or OTG
- 8 channel general purpose DMA controller
- 4 UARTs, 2 CAN channels, 2 SSP controllers, and SPI interface
- 3 I2C interfaces, 2-input plus 2-output I2S interface
- 8 channel 12-bit ADC, 10-bit DAC
- Motor control PWM
- Quadrature Encoder interface
- 4 general purpose timers
- 6-output general purpose PWM
- Ultra-low power RTC with separate battery supply and
- Up to 70 general purpose I/O pins.

The following figure shows the simplified block diagram of the LPC1769 microcontroller.

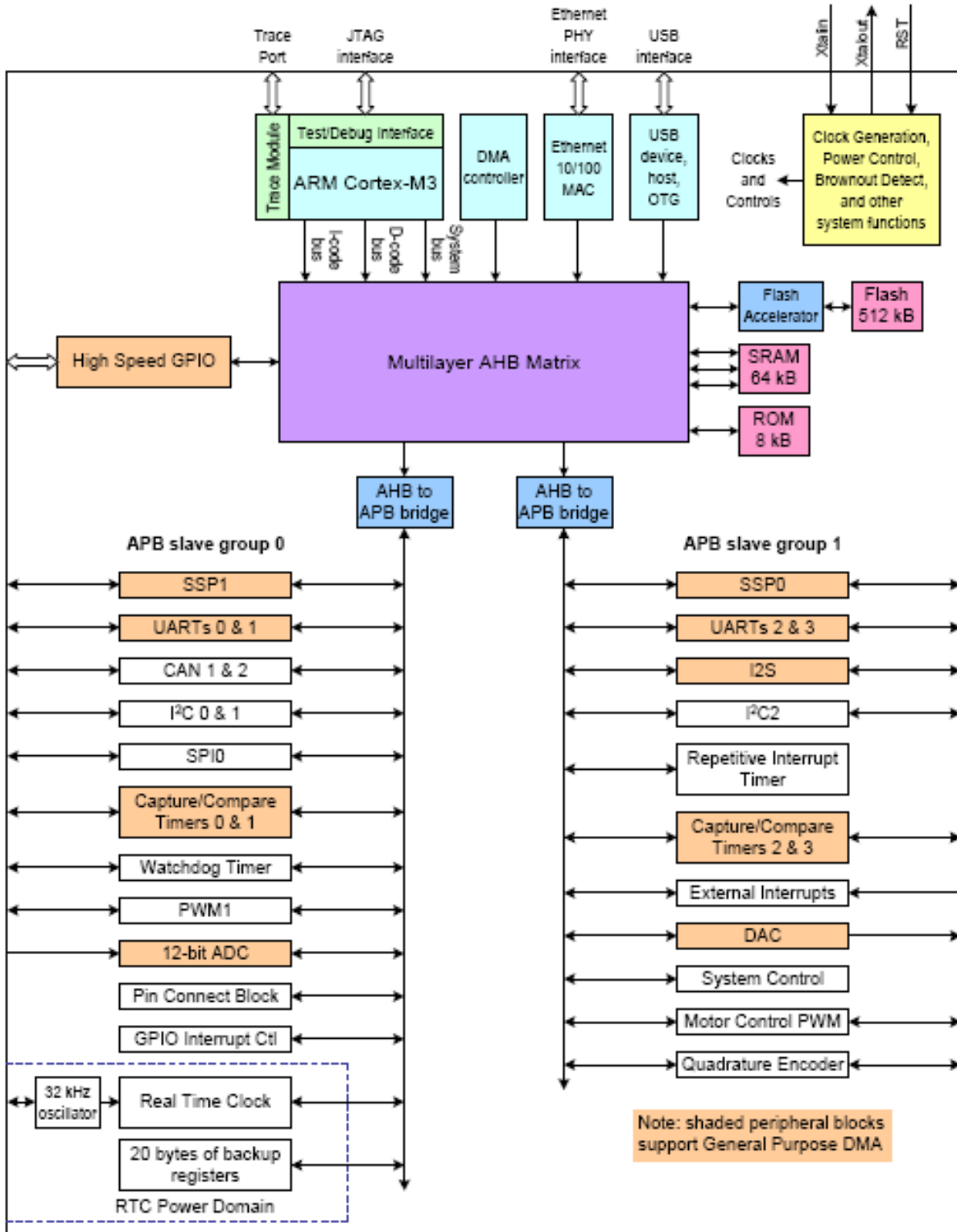


Figure 2: LPC1769 Block Diagram

### 3.2 Ethernet Transceiver

eStorm-C1 employs LAN8720A from SMSC as the physical layer (PHY) transceiver . It is a low-power 10BASE-T/100BASE-TX with variable I/O voltage, compliant with the IEEE 802.3-2005 standards. LAN8720A supports communication with the LPC1769 Ethernet MAC via the standard RMIi interface.

Apart from supporting full-duplex 10Mbps (10BASE-T) and 100Mbps (100BASE-TX) operations it also implements auto negotiation feature to automatically determine the best possible speed and duplex mode of operation.

The following figure shows the architectural overview of LAN8720 chip.

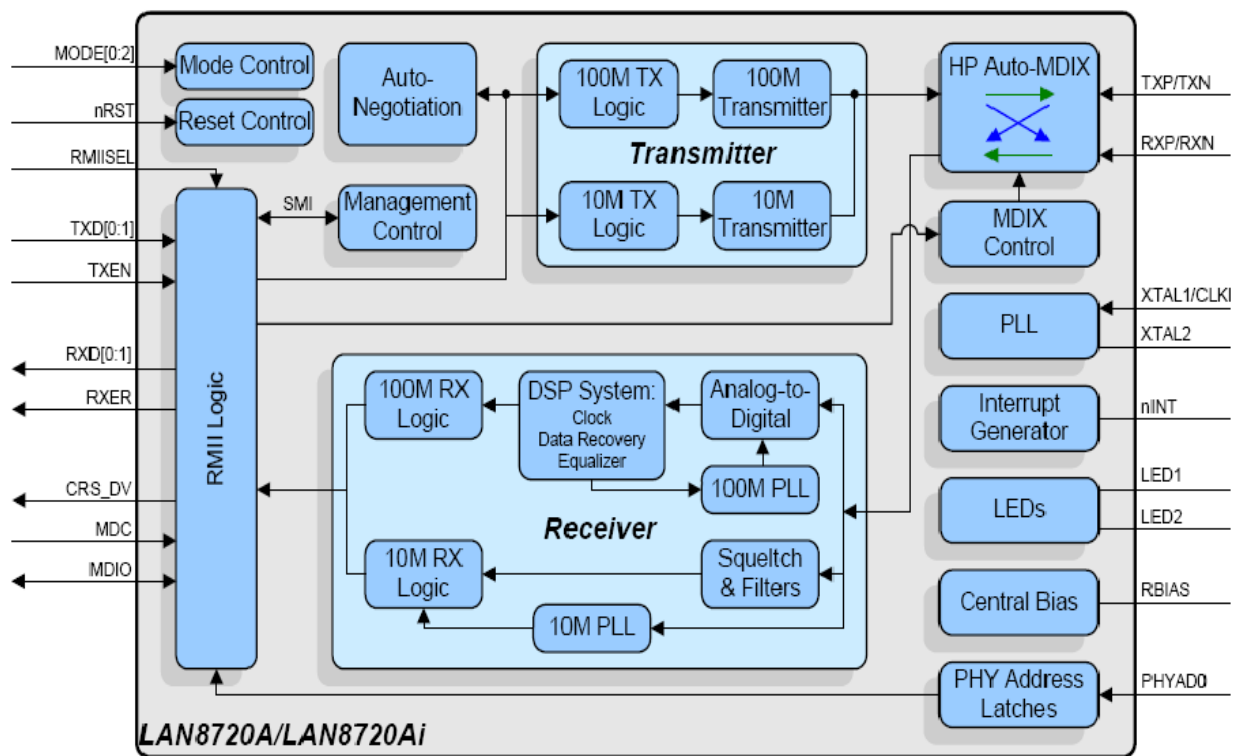


Figure 3: LAN8720 Block Diagram

### 3.3 CAN (Controlled Area Network) Transceiver

TJA1040 transceiver is used for the CAN Interface of the eStorm-C1 platform. It is primarily intended for high speed applications, up to 1 Mbaud, in automotive and industrial applications.

The following figure depicts the CAN transceiver block diagram.

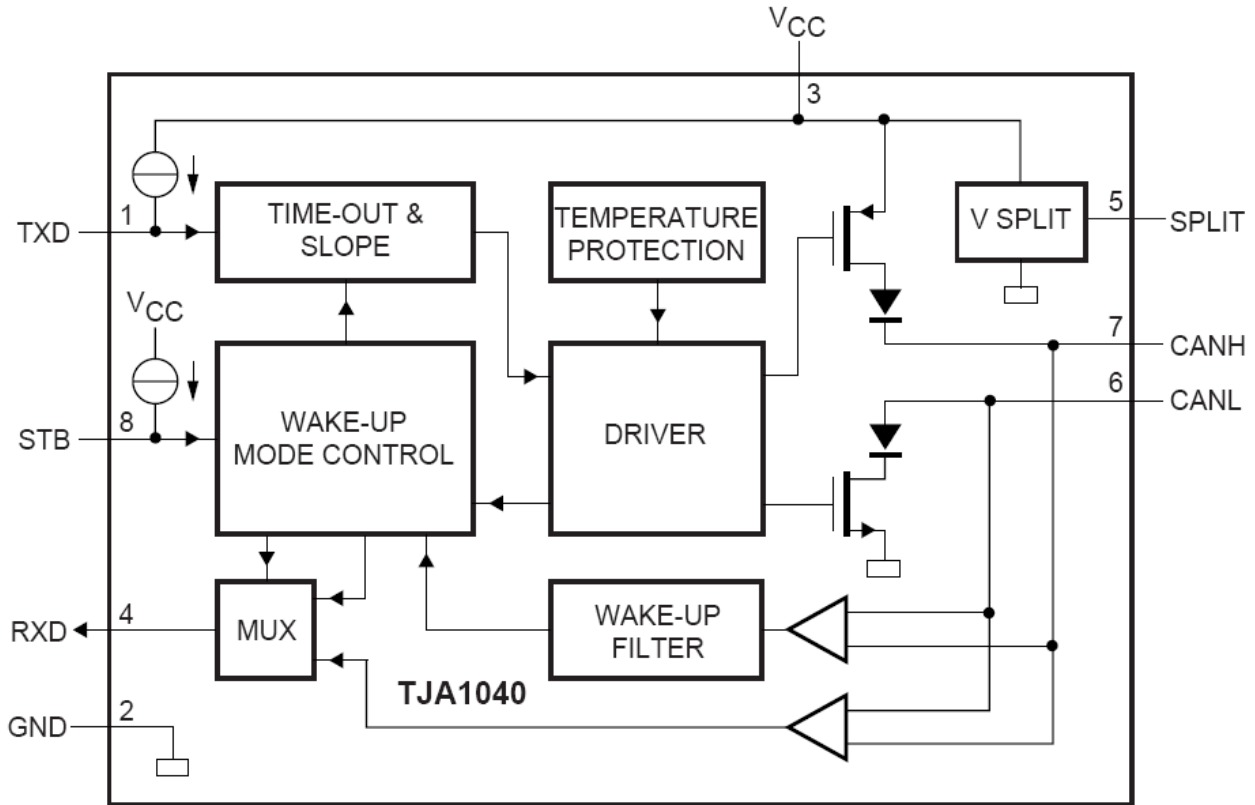


Figure 4: CAN Transceiver block Diagram

### 3.4 USB to UART Bridge

Since nowadays, RS232 ports in computers are no longer available, a UART to USB Bridge is provided for the debug port. This enables programming/debugging of the platform over the universally available USB port. For this purpose, CP2102 is used.

The CP2102 includes a USB 2.0 full-speed function controller, USB transceiver and oscillator. Royalty-free Virtual COM Port (VCP) device drivers provided by Silicon Laboratories allow a CP2102-based product to appear as a COM port to PC applications.

### 3.5 GSM Modem

SIM900A module from SIMCOM provides the GSM connectivity for the eStorm-C1 platform. It is a dual band GSM/GPRS engine working on frequencies EGSM 900MHz and DCS 1800MHz.

GSM module is interfaced with eStorm-C1 via serial UART2 interface. Sim900A supports standard AT commands and is integrated with the TCP/IP protocol accessible through extended TCP/IP AT commands especially for those data transfer applications.

The antenna interface is provided through right angled SMA connector. The SIM900A is interfaced with power saving technique there by powered on only when needed. The module supports both 1.8V, 3V SIM card. Necessary ESD protection is provided for both antenna and SIM card interface.

### 3.6 USB Interfaces

The USB OTG controller present in the LPC1769 is presented as separate USB Device and Host Interfaces for the end user. Only USB Host or Device can be used at a time and the Host/Device operation selection can be easily done by placing suitable resistor as discussed below in section **4.2**.

The USB Host Controller power section is managed by current limited dual USB port power switch (AP2146). USB over current indication via LED is provided as explained in section **4.5**.

### 3.7 Secure Digital Card

User data storage option is provided in eStorm-C1 using the SD card interface implemented over SPI protocol. The standard SD card connector allows easy interface of commercially available low cost cards. Write Protection and Card Detection logic is provided.

## 4. eStorm-C1 Pin Outs and Indications

This section describes pin outs and various indications of the eStorm-C1 platform.

### 4.1 Connector Placements

The following figure shows the top view of eStorm-C1 board and connector details.

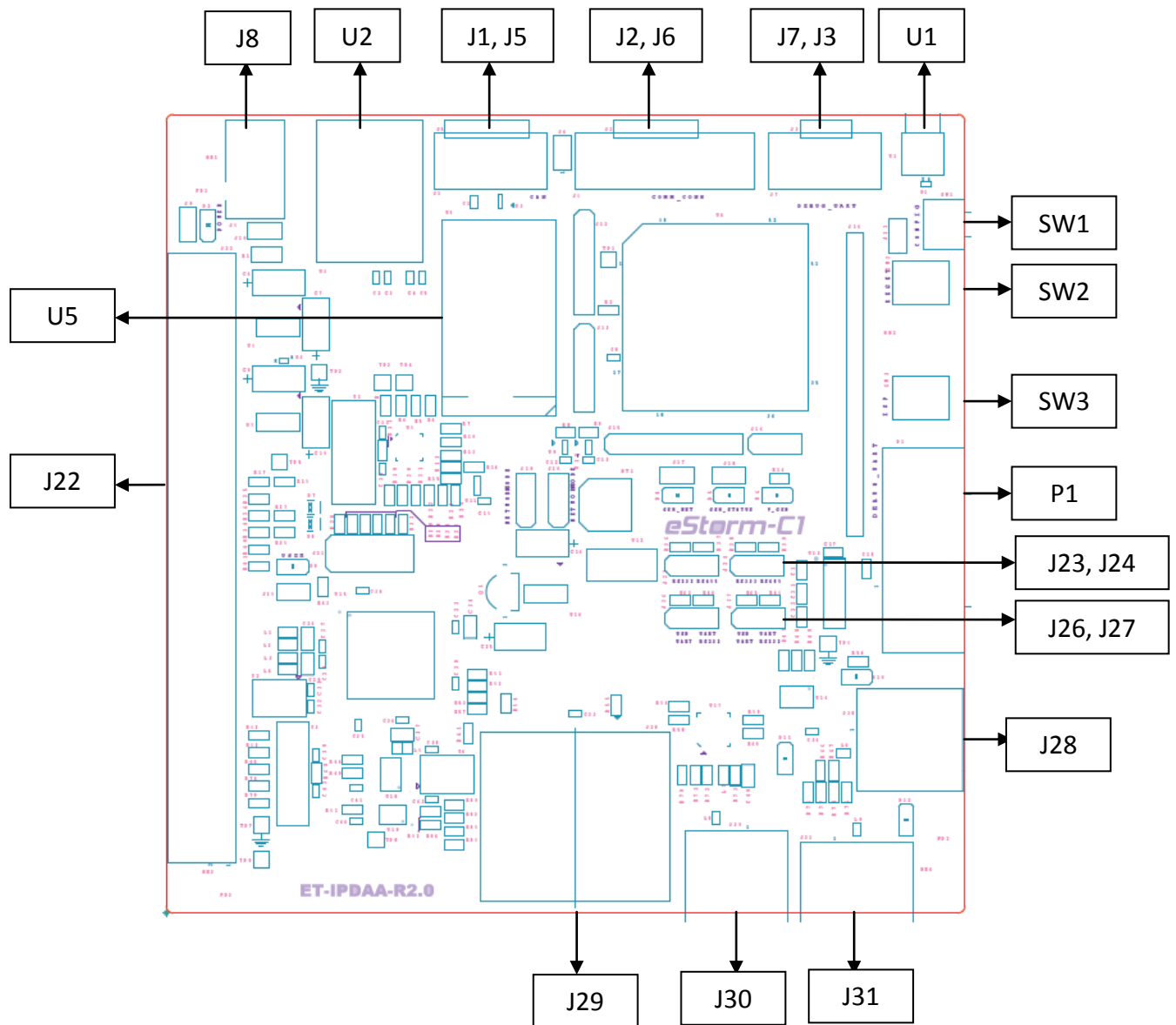


Figure 5: Connector Placement

## 4.2 Connector Pin Outs

Following table describes various connectors available in the board and their pin outs along with the description:

Connector / Header	Header / Connector details	Description			
J8	Power Jack	5V Single supply			
U2	Ethernet connector with integrated magnetics	Standard RJ45 Connector for 10/100T Ethernet connection			
J1 , J5	J1 - CAN 100mils 5-Pin male Header J5 - CAN 3-Pin male connector	<b>J1 Pins</b>		<b>J5 Pins</b>	
		1	Field Gnd	1	Field Gnd
		2	Low signal	2	Low signal
		3	Drain		
		4	High signal	3	High signal
5	CAN 24V				
J2 , J6	J2 - RS232 or RS485 serial interface 100mils 5-Pin male Header. J6 - RS232 or RS485 serial interface 5-Pin male connector RS232 or RS485 mode selection is done through J23 and J24 connector. Both modes of communication cannot be done simultaneously.	<b>J2 Pins</b>		<b>J6 Pins</b>	
		1	RS485 A	1	RS485 A
		2	RS485 B	2	RS485 B
		3	Gnd	3	Gnd
		4	RS232 Tx	4	RS232 Tx
J7 , J3	J3 - RS232 Debug UART 100mils 3-pin male header J7 - RS232 Debug UART 3-pin male connector	<b>J3 Pins</b>		<b>J7 Pins</b>	
		1	RS232 TX	1	RS232 TX
		2	RS232 RX	2	RS232 RX
		3	Gnd	3	Gnd
U1	Right angled RF Antenna connector	For connecting RF antenna to GSM circuit			
SW1	Right angled configuration switch	For Application specific usage			
SW2	Reset Switch	For system reset option			
SW3	ISP mode switch	For ISP mode selection. First Press SW3, then press SW2, then release SW2 and finally release SW3. System will enter into ISP mode for programming the system flash			



Connector / Header	Header / Connector details	Description	
P1	Debug UART DB-9 female connector	Either P1 DB-9 or J7 or J3 connectors can be used as debug port. Jumpers J26 and J27 must be configured suitably for this mode.	
J23 , J24	Communication mode selection jumper J23= RS232 or RS485 Rx signal selector. 3-Pin 100mils male header J24= RS232 or RS485 Tx signal selector. 3-Pin 100mils male header	<b>J23</b>	<b>J24</b>
		Between 1 & 2 RS232 Rx signal selection	Between 1 & 2 RS232 Tx signal selection
		Between 2 & 3 RS485 Rx signal selection	Between 2 & 3 RS485 Tx signal selection
J26 , J27	Debug mode selection jumper J26= RS232 UART or USB Debug mode Tx signal selector J27= RS232 UART or USB Debug mode Rx signal selector	<b>J26</b>	<b>J27</b>
		Between 1 & 2 USB Debug mode Tx signal selection	Between 1 & 2 USB Debug mode Rx signal selection
		Between 2 & 3 RS232 UART Debug mode Tx signal selection	Between 2 & 3 RS232 UART Debug mode Rx signal selection
J28	USB B connector	For USB device operation. Resistors R66 and R67 must be mounted for this option.  If USB Host option is enabled, this feature must not be used.	
J31	USB A connector	For USB Host operation. Resistors R77 and R78 must be mounted for this option.  If USB device option is enabled this feature must not be used.	
J30	USB B connector for Debug Port	For USB mode Debug option, the USB cable must be connected to this connector. Jumpers J26 and J27 must be configured suitably for this mode.	
J29	SD card connector	For SD card storage option.	
U5	SIM card connector	For connecting standard 6-pin SIM card	
J22	Expansion Connector	Please refer section <b>4.3</b> for details.	
J21	JTAG connector	Refer section <b>4.4</b>	

Table 3: eStorm-C1 connector details

### 4.3 Expansion Connector Pin Out

eStorm-C1 expansion connector J22 can be used to interface daughter card specific to application requirement. Below table gives the details of the expansion connector pin outs.

The Column heading descriptions are as follows:

**Pin No:** eStorm-C1 expansion connector (J22) pin numbers

**Connection name:** Reference name of the expansion connector pin

**uC Pin No:** The LPC1769 processor pin to which this pin is connected to. This is available only for the pins for which there is a direct or indirect connection with the processor pin. Please note that some resistors/components have to be mounted to realize this connection.

**Processor signal name:** If valid, lists the LPC1769 signal name corresponding to processor pin number.

**I/O:** Signal type for the pins.

I/O	: Input and/Or Output
O	: Output Only
I	: Input Only
P	: Power
G	: Ground

**Pin description:** Provides brief explanation of the pin functionality and usage. Please refer to NXP Semiconductors LPC1769 User manual (UM10360) for detailed description of Processor pins.

**Comment:** Comments on the pin usage and resistor information for alternate usage.

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
1	3V3			P	3.3V DC	
2	3V3			P	3.3V DC	
3	3V3			P	3.3V DC	
4	3V3			P	3.3V DC	
5	GND			G	Digital Ground	
6	GND			G	Digital Ground	
7	B2B_P1_19	33	P1.19	I/O	General purpose digital input/output pin.	Used by USB inside eStorm-C1. If USB option is used this pin is not available.  If USB not required place 0 ohm resistor on <b>R79</b> to use P1.19/ MCOA0/CAP1.1 on B2B pin 7.
			MCOA0	O	Motor control PWM channel 0, output A.	
			USB_PPWR	O	Port Power enable signal for USB port.	
			CAP1.1	I	Capture input for Timer 1, channel 1.	
8	B2B_P1_22	36	P1.22	I/O	General purpose digital input/output pin.	Used by USB inside eStorm-C1. If USB option is used this pin is not available.  If USB not required place 0 ohm resistor on <b>R157</b> to use P1.22/ MCOB0/MAT1.0 on B2B pin 8.
			MCOB0	O	Motor control PWM channel 0, output B.	
			USB_PWRD	I	Power Status for USB port (host power switch).	
			MAT1.0	O	Match output for Timer 1, channel 0.	
9	B2B_P3_25	27	P3.25	I/O	General purpose digital input/output pin.	Used by SD card inside eStorm-C1. If SD card option is used this pin is not available.  If SD card not required place 0 ohm resistor on <b>R74</b> to use P3.25/ MAT0.0 /PWM1.2 on B2B pin 9.
			MAT0.0	O	Match output for Timer 0, channel 0.	
			PWM1.2	O	Pulse Width Modulator 1, channel 2 output.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
10	B2B_P3_26	26	P3.26	I/O	General purpose digital input/output pin.	Used by SD card inside eStorm-C1. If SD card option is used this pin is not available.  If SD card not required place 0 ohm resistor on <b>R156</b> to use P3.26/ STCLK/ MAT0.1/ PWM1.3 on B2B pin 10.
			STCLK	I	System tick timer clock input.	
			MAT0.1	O	Match output for Timer 0, channel 1.	
			PWM1.3	O	Pulse Width Modulator 1, channel 3 output.	
11	B2B_P2_13	50	P2.13	I/O	General purpose digital input/output pin. 5 V tolerant pad with 5 ns glitch filter providing digital I/O functions with TTL levels and hysteresis.	Used by GSM module inside eStorm-C1.  If GSM connectivity is used this pin is not available,  If GSM connectivity not required place 0 ohm resistor on <b>R65</b> to use P2.13/ EINT3/ I2STX_SDA on B2B pin 11
			EINT3	I	External interrupt 3 input.	
			I2STX_SDA	I/O	Transmit data. It is driven by the transmitter and read by the receiver. Corresponds to the signal SD in the I2S bus specification.	
12	B2B_P0_10	48	P0.10	I/O	General purpose digital input/output pin.	Used by GSM module inside eStorm-C1. If GSM connectivity is used this pin is not available.  If GSM not required place 0 ohm resistor on <b>R155</b> to use P0.10/ TXD2/ SDA2/ MAT3.0 on B2B pin 12.
			TXD2	O	Transmitter output for UART2.	
			SDA2	I/O	I2C2 data input/output (this is not an open-drain pin).	
			MAT3.0	O	Match output for Timer 3, channel 0.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
13	B2B_P2_12	51	P2.12	I/O	General purpose digital input/output pin. 5 V tolerant pad with 5 ns glitch filter providing digital I/O functions with TTL levels and hysteresis.	Any processor signal can be used with right pin function selection.  If RTS signal from GSM module is required place 0 ohm resistor on R63.  While using GSM option, the pin 13 on B2B should not be used.
			EINT2	I	External interrupt 2 input.	
			I2STX_WS	I/O	Transmit Word Select. It is driven by the master and received by the slave. Corresponds to the signal WS in the I2S bus specification.	
14	B2B_P2_11	52	P2.11	I/O	General purpose digital input/output pin. 5 V tolerant pad with 5 ns glitch filter providing digital I/O functions with TTL levels and hysteresis.	Any processor signal can be used with right pin function selection
			EINT1	I	External interrupt 1 input.	
			I2STX_CLK	I/O	Transmit Clock. It is driven by the master and received by the slave. Corresponds to the signal SCK in the I2S bus specification.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
15	B2B_P1_28	44	P1.28	I/O	General purpose digital input/output pin.	Used by GSM module inside eStorm-C1.  If GSM connectivity is used this pin is not available.  If GSM connectivity not required place 0 ohm resistor on R62 to use P1.28/MCOA2/PCAP1.0/MAT0.0 on B2B pin 15
			MCOA2	O	Motor control PWM channel 2, output A.	
			PCAP1.0	I	Capture input for PWM1, channel 0.	
			MAT0.0	O	Match output for Timer 0, channel 0.	
16	B2B_P1_26	40	P1.26	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			MCOB1	O	Motor control PWM channel 1, output B.	
			PWM1.6	O	Pulse Width Modulator 1, channel 6 output.	
			CAP0.0	I	Capture input for Timer 0, channel 0.	
17	B2B_P1_24	38	P1.24	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			MCI2	I	Motor control PWM channel 2 input. Also Quadrature Encoder Interface INDEX input.	
			PWM1.5	O	Pulse Width Modulator 1, channel 5 output.	
			MOSIO	I/O	Master Out Slave In for SSP0.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
18	B2B_P1_21	35	P1.21	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			MCABORT	I	Motor control PWM, active low fast abort.	
			PWM1.3	O	Pulse Width Modulator 1, channel 3 output.	
			SSEL0	I/O	Slave Select for SSP0.	
19	B2B_P0_11	49	P0.11	I/O	General purpose digital input/output pin.	Used by GSM module inside eStorm-C1. If GSM connectivity is used this pin is not available.  If GSM connectivity not required place 0 ohm resistor on <b>R146</b> to use P0.11/ RXD2/ SCL2/ MAT3.1 on B2B pin 19.
			RXD2	I	Receiver input for UART2.	
			SCL2	I/O	I2C2 clock input/output (this is not an open-drain pin).	
			MAT3.1	O	Match output for Timer 3, channel 1.	
20	B2B_P1_29	45	P1.29	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			MCOB2	O	Motor control PWM channel 2, output B.	
			PCAP1.1	I	Capture input for PWM1, channel 1.	
			MAT0.1	O	Match output for Timer 0, channel 1.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
21	B2B_P1_25	39	P1.25	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			MCOA1	O	Motor control PWM channel 1, output A.	
			MAT1.1	O	Match output for Timer 1, channel 1.	
22	B2B_P1_23	37	P1.23	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			MCI1	I	Motor control PWM channel 1 input. Also Quadrature Encoder Interface PHB input.	
			PWM1.4	O	Pulse Width Modulator 1, channel 4 output.	
			MISO0	I/O	Master In Slave Out for SSP0.	
23	B2B_P1_20	34	P1.20	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			MCI0	I	Motor control PWM channel 0 input. Also Quadrature Encoder Interface PHA input.	
			PWM1.2	O	Pulse Width Modulator 1, channel 2 output.	
			SCK0	I/O	Serial clock for SSP0.	



Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
24	B2B_P1_18	32	P1.18	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			USB_UP_LED	O	USB Good link LED indicator. It is LOW when device is configured (non-control endpoints enabled). It is HIGH when the device is not configured or during global suspend.	
			PWM1.1	O	Pulse Width Modulator 1, channel 1 output.	
			CAP1.0	I	Capture input for Timer 1, channel 0.	
25	B2B_P0_28	24	P0.28	I/O	General purpose digital input/output pin. Open-drain 5 V tolerant digital I/O pad, compatible with I2C-bus specifications for 100 kHz standard mode, 400 kHz Fast Mode, and 1 MHz Fast Mode Plus. This pad requires an external pull-up to provide output functionality. When power is switched off, this pin connected to the I2C-bus is floating and does not disturb the I2C lines. Open-drain configuration applies to all functions on this pin.	Any processor signal can be used with right pin function selection
			SCL0	I/O	I2C0 clock input/output. Open-drain output (for I2C-bus compliance).	
			USB_SCL	I/O	USB port I2C serial clock (OTG transceiver).	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
26	GND			G	Digital Ground	
27	B2B_P1_30	21	P1.30	I/O	General purpose digital input/output pin. When configured as an ADC input, digital section of the pad is disabled.	Any processor signal can be used with right pin function selection
			VBUS	I	Monitors the presence of USB bus power. Note: This signal must be HIGH for USB reset to occur.	
			AD0.4	I	A/D converter 0, input 4.	
28	B2B_P1_31	20	P1.31	I/O	General purpose digital input/output pin. When configured as an ADC input, digital section of the pad is disabled.	Any processor signal can be used with right pin function selection
			SCK1	I/O	Serial Clock for SSP1.	
			AD0.5	I	A/D converter 0 input 5.	
29	B2B_P0_27	25	P0.27	I/O	General purpose digital input/output pin. Open-drain 5 V tolerant digital I/O pad, compatible with I2C-bus specifications for 100 kHz standard mode, 400 kHz Fast Mode, and 1 MHz Fast Mode Plus.	Any processor signal can be used with right pin function selection

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
					This pad requires an external pull-up to provide output functionality. When power is switched off, this pin connected to the I2C-bus is floating and does not disturb the I2C lines. Open-drain configuration applies to all functions on this pin.	
			SDA0	I/O	I2C0 data input/output. Open-drain output (for I2C-bus compliance).	
			USB_SDA	I/O	USB port I2C serial data (OTG transceiver).	
30	B2B_P0_23	9	P0.23	I/O	General purpose digital input/output pin. When configured as an ADC input, digital section of the pad is disabled.	Any processor signal can be used with right pin function selection
			AD0.0	I	A/D converter 0, input 0.	
			I2SRX_CLK	I/O	Receive Clock. It is driven by the master and received by the slave. Corresponds to the signal SCK in the I2S bus specification.	
			CAP3.0	I	Capture input for Timer 3, channel 0.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
31	B2B_P0_24	8	P0.24	I/O	General purpose digital input/output pin. When configured as an ADC input, digital section of the pad is disabled.	Any processor signal can be used with right pin function selection
			AD0.1	I	A/D converter 0, input 1.	
			I2SRX_WS	I/O	Receive Word Select. It is driven by the master and received by the slave. Corresponds to the signal WS in the I2S bus specification.	
			CAP3.1	I	Capture input for Timer 3, channel 1.	
32	B2B_P0_25	7	P0.25	I/O	General purpose digital input/output pin. When configured as an ADC input, digital section of the pad is disabled.	Any processor signal can be used with right pin function selection
			AD0.2	I	A/D converter 0, input 2.	
			I2SRX_SDA	I/O	Receive data. It is driven by the transmitter and read by the receiver. Corresponds to the signal SD in the I2S bus specification.	
			TXD3	O	Transmitter output for UART3.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
33	B2B_P0_26	6	P0.26	I/O	General purpose digital input/output pin. When configured as an ADC input or DAC output, the digital section of the pad is disabled.	Any processor signal can be used with right pin function selection
			AD0.3	I	A/D converter 0, input 3.	
			AOUT	O	D/A converter output.	
			RXD3	I	Receiver input for UART3.	
34	Nresetout			O	Reset signal out	
35	B2B_P4_28	82	P4.28	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection.
			RX_MCLK	O	I2S receive master clock.	To drive the LED D9 in the board please place 0 ohm resistor on <b>R41</b> .
			MAT2.0	O	Match output for Timer 2, channel 0.	If LED drive is required the pin 35 on B2B should not be used.
			TXD3	O	Transmitter output for UART3.	
36	GND			G	Digital Ground	
37	B2B_P0_4	81	I2SRX_CLK	I/O	Receive Clock. It is driven by the master and received by the slave. Corresponds to the signal SCK in the I2S bus specification.	Any processor signal can be used with right pin function selection
			RD2	I	CAN2 receiver input.	
			CAP2.0	I	Capture input for Timer 2, channel 0.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
38	B2B_P0_5	80	P0.5	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			I2SRX_WS	I/O	Receive Word Select. It is driven by the master and received by the slave. Corresponds to the signal WS in the I2S bus specification.	
			TD2	O	CAN2 transmitter output.	
			CAP2.1	I	Capture input for Timer 2, channel 1.	
39	B2B_P0_6	79	P0.6	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection.  To drive the Bicolor LED D8 in the board please place 0 ohm resistor on <b>R34</b> .  If LED drive is required the pin 39 on B2B should not be used.
			I2SRX_SDA	I/O	Receive data. It is driven by the transmitter and read by the receiver. Corresponds to the signal SD in the I2S bus specification.	
			SSEL1	I/O	Slave Select for SSP1.	
			MAT2.0	O	Match output for Timer 2, channel 0.	
40	B2B_P0_7	78	P0.7	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection.  To drive the Bicolor LED D8 in the board please place 0 ohm resistor on <b>R139</b> .  If LED drive is required the pin 40 on B2B should not be used.
			I2STX_CLK	I/O	Transmit Clock. It is driven by the master and received by the slave. Corresponds to the signal SCK in the I2S bus specification.	
			SCK1	I/O	Serial Clock for SSP1.	
			MAT2.1	O	Match output for Timer 2, channel 1.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
41	B2B_P0_8	77	P0.8	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection.  To drive the Bicolor LED D7 in the board please place 0 ohm resistor on <b>R26</b> .  If LED drive is required the pin 41 on B2B should not be used.
			I2STX_WS	I/O	Transmit Word Select. It is driven by the master and received by the slave. Corresponds to the signal WS in the I2S bus specification.	
			MISO1	I/O	Master In Slave Out for SSP1.	
			MAT2.2	O	Match output for Timer 2, channel 2.	
42	B2B_P0_9	76	P0.9	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection.  To drive the Bicolor LED D7 in the board please place 0 ohm resistor on <b>R135</b> .  If LED drive is required the pin 42 on B2B should not be used.
			I2STX_SDA	I/O	Transmit data. It is driven by the transmitter and read by the receiver. Corresponds to the signal SD in the I2S bus specification.	
			MOSI1	I/O	Master Out Slave In for SSP1.	
			MAT2.3	O	Match output for Timer 2, channel 3.	
43	B2B_P4_29	85	P4.29	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection.  To use the selection switch SW1 on the board, place 0 ohm resistor on <b>R25</b> .  If switch function is required the pin 43 on B2B should not be used.
			TX_MCLK	O	I2S transmit master clock.	
			MAT2.1	O	Match output for Timer 2, channel 1.	
			RXD3	I	Receiver input for UART3.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
44	B2B_P0_19	59	P0.19	I/O	General purpose digital input/output pin.	Used by SD card inside eStorm-C1. If SD card option is used this pin is not available.  If SD card not required place 0 ohm resistor on <b>R131</b> to use P0.19/ DSR1/ SDA1 on B2B pin 44.
			DSR1	I	Data Set Ready input for UART1.	
			SDA1	I/O	I2C1 data input/output (this pin is not fully compliant with the I2C-bus specification;	
45	B2B_P0_20	58	P0.20	I/O	General purpose digital input/output pin.	Used by CAN inside eStorm-C1. If CAN option is used this pin is not available.  Signal switched using R18 and R17. To use CAN, configuration is R18 (0 Ohms) and R17 (NC*). For P0.21/ RI1/ RD1 on B2B pin 45, use R18 (NC*) and R17 (0 Ohms).
			DTR1	O	Data Terminal Ready output for UART1. Can also be configured to be an RS-485/EIA-485 output enable signal.	
			SCL1	I/O	I2C1 clock input/output (this pin is not fully compliant with the I2C-bus specification	
46	B2B_P2_8	65	P2.8	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			TD2	O	CAN2 transmitter output.	
			TXD2	O	Transmitter output for UART2.	
			ENET_MDC	O	Ethernet MIIM clock.	



Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
47	B2B_P2_7	66	P2.7	I/O	General purpose digital input/output pin.	Used by UART RS485 inside eStorm-C1. If UART RS485 serial communication is used this pin is not available. If RS-485 UART not required Place 0 ohm resistor on <b>R122</b> to use P2.7/ RD2/ RTS1 on B2B pin 47.
			RD2	I	CAN2 receiver input.	
			RTS1	O	Request to Send output for UART1. Can also be configured to be an RS-485/EIA-485 output enable signal.	
48	B2B_P2_6	67	P2.6	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			PCAP1.0	I	Capture input for PWM1, channel 0.	
			RI1	I	Ring Indicator input for UART1.	
			TRACECLK	I	Trace Clock.	
49	B2B_P2_5	68	P2.5	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			PWM1.6	O	Pulse Width Modulator 1, channel 6 output.	
			DTR1	O	Data Terminal Ready output for UART1. Can also be configured to be an RS-485/EIA-485 output enable signal.	
			TRACEDATA0	O	Trace data, bit 0.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
50	B2B_P2_3	70	P2.3	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			PWM1.4	O	Pulse Width Modulator 1, channel 4 output.	
			DCD1	I	Data Carrier Detect input for UART1.	
			TRACEDATA2	O	Trace data, bit 2.	
51	B2B_P2_4	69	P2.4	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			PWM1.5	O	Pulse Width Modulator 1, channel 5 output.	
			DSR1	I	Data Set Ready input for UART1.	
			TRACEDATA1	O	Trace data, bit 1.	
52	B2B_P2_1	74	P2.1	I/O	General purpose digital input/output pin.	Used by serial UART communication inside eStorm-C1. If serial UART communication is used this pin is not available. If UART not required place 0 ohm resistor on R119 to use P2.1/ PWM1.2/ RXD1 on B2B pin 52.
			PWM1.2	O	Pulse Width Modulator 1, channel 2 output.	
			RXD1	I	Receiver input for UART1.	
53	B2B_P2_2	73	P2.2	I/O	General purpose digital input/output pin.	Any processor signal can be used with right pin function selection
			PWM1.3	O	Pulse Width Modulator 1, channel 3 output.	
			CTS1	I	Clear to Send input for UART1.	
			TRACEDATA3	O	Trace data, bit 3.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
54	B2B_P2_0	75	P2.0	I/O	General purpose digital input/output pin.	Used by serial UART communication inside eStorm-C1. If serial UART communication is used this pin is not available.  If UART not required place 0 ohm resistor on <b>R117</b> to use P2.0/ PWM1.1/ TXD1 on B2B pin 54
			PWM1.1	O	Pulse Width Modulator 1, channel 1 output.	
			TXD1	O	Transmitter output for UART1.	
55	GND			G	Digital Ground	
56	GND			G	Digital Ground	
57	VIN_5V			P	5V DC supply	
58	GND			G	Digital Ground	
59	VIN_5V			P	5V DC supply	
60	GND			G	Digital Ground	
61	B2B_P0_22	56	P0.22	I/O	General purpose digital input/output pin.	Used by CAN inside eStorm-C1. If CAN option is used this pin is not available.  Signal switched using R53 and R57. To use CAN, configuration is R53 (0 Ohms) and R57 (NC). For P0.22/ RTS1/ TD1 on B2B pin 61, use R53(NC) and R57 (0 Ohms)
			RTS1	O	Request to Send output for UART1. Can also be configured to be an RS-485/EIA-485 output enable signal.	
			TD1	O	CAN1 transmitter output.	

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
62	B2B_P2_9	64	P2.9	I/O	General purpose digital input/output pin.	<p>Used by USB inside eStorm-C1. If USB option is used this pin is not available.</p> <p>Place 0 ohm resistor on <b>R110</b> while using USB.</p> <p>Use the pin 62 on B2B directly for P2.9/ RXD2/ ENET_MDIO.</p>
			USB_CONNECT	O	Signal used to switch an external 1.5 kΩ resistor under software control. Used with the SoftConnect USB feature.	
			RXD2	I	Receiver input for UART2.	
			ENET_MDIO	I/O	Ethernet MIIM data input and output.	
63	B2B_P0_21	57	P0.21	I/O	General purpose digital input/output pin.	<p>Used by CAN inside eStorm-C1. If CAN option is used this pin is not available.</p> <p>Signal switched using R52 and R51. To use CAN, configuration is R52 (0 Ohms) and R51 (NC). For P0.21/ RI1/ RD1 on B2B pin 63, use R52(NC) and R51 (0 Ohms)</p>
			RI1	I	Ring Indicator input for UART1.	
			RD1	I	CAN1 receiver input.	
64	GND			G	Digital Ground	
65	GND			G	Digital Ground	
66	COMM_RS232_RX			I	UART1 RS232 serial communication Rx signal	Can be used for RS232 serial communication. Make sure UART 1 TTL Rx is not used.

Pin No	Connection Name	uC Pin No.	Processor Signal Name	I / O	Pin description	Comment
67	COMM_RS232_TX			O	UART1 RS232 serial communication Tx signal	Can be used for RS232 serial communication. Make sure UART 1 TTL Tx is not used.
68	GND			G	Digital Ground	
69	VIN_5V			P	5V DC supply	
70	V_GSM2			P	4V DC supply	
71	VIN_5V			P	5V DC supply	
72	V_GSM2			P	4V DC supply	

*Table 4: eStorm-C1 expansion connector signal list*

**Note:**

- 1. The options with blue color are the default configurations. User can configure the alternate options on microcontroller pins to B2B pins through configuration resistor as defined the comments column.*
- 2. \* NC implies NO CONNECT. This means the respective circuit should be left open.*

#### 4.4 JTAG Connector Pin Out

The following table describes the pin details of the JTAG connector (J21) along with the description,

Pin. No	Pin name	Description
1	3V3	3.3V DC
2	TMS	Test Mode Select
3	Gnd	Digital ground
4	TCK	Test Clock
5	Gnd	Digital ground
6	TDO	Test Data Out
7	RTCK	JTAG interface control signal
8	TDI	Test Data In
9	Gnd	Digital ground
10	nRESET	Test Reset

*Table 5: JTAG connector pin outs*

#### 4.5 LED Indications

eStorm-C1 platform has multiple LED's (Light Emitting Diode) for various indications and the description of the same is tabulated below.

S.No	LED	Indication
1	D11	USB over current
2	D10	USB Device
3	D12	USB Host
4	D9	Configurable Test LED
5	D7	Configurable Bi-colour LED 1
6	D8	Configurable Bi-colour LED 2
7	D2	3V3 DC input
8	D6	GSM input DC supply
9	D4	GSM Netlight
10	D5	GSM On/Off status

*Table 6: eStorm-C1 LED Indications*

## 5. Electrical and Environmental Specification

Parameter	Min	Typical	Max
Input power supply	4.8V DC	5V DC	5.5V DC
Operating temperature	-40 degree Celsius	+25 degree Celsius	+85 degree Celsius
Current rating		2A*	

Note:

1. \* - Current rating of all configurations working including GSM.

## 6. Legal Notice

### 6.1 Customer Support

Embien Technologies are excited to offer our customers an easy “out of box” experience by providing board support package, software demos, user manuals and other electro mechanical documentation to get our evaluation modules up and running.

Customer product development support is a part of standard support offer from Embien Technologies. If customers are interested, Embien Technologies can offer product development services around Embien’s eStorm-C1 platform. This includes application board (daughter board) development, Board Support package (BSP) development and application software development.

### 6.2 Usage Restriction

Embien Technologies products are excellent starting point for customer’s applications development. But, selection and usage of Embien Technologies products for a particular application is responsibility of customers. In order to minimize risks associated with customer applications, the customer must use adequate design and operating safeguards to minimize inherent or procedural hazards.

Embien Technologies products are not intended for use in life support systems and appliances, nuclear systems or systems where malfunction can reasonably be expected to result in personal injury, death or severe property or environmental damage. Any use of products by the customer for such purposes are at the customer’s own risk.