KL5KUSB116

USB to Serial

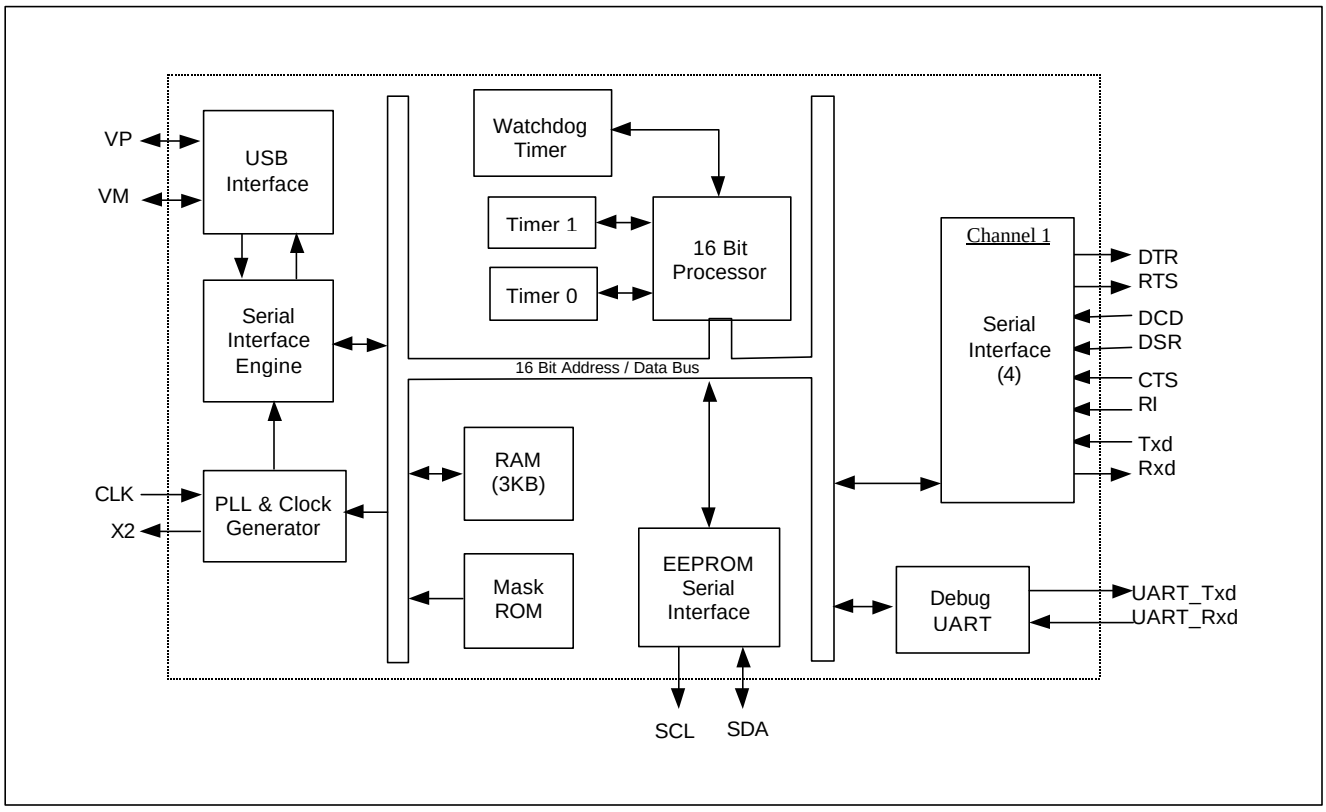
Description

The Kawasaki USB to Serial enables your system to have the capability to communicate between the USB (Universal Serial Bus) port and serial port peripherals. This device meets the USB 1.0/1.1 and standard serial port specifications. All the advantages of USB are available to peripherals with serial port interface such as plug and play capabilities. With the USB Standard of high-speed data transfers, this device is ideal for connections to high-speed modems or ISDN terminal adapters. Kawasaki's device and software enable the USB interface to be transparent to the peripheral and requires no firmware changes. This makes it possible for peripherals with serial interfaces to easily interface with USB with minimum modifications. This feature is ideal for Legacy applications.

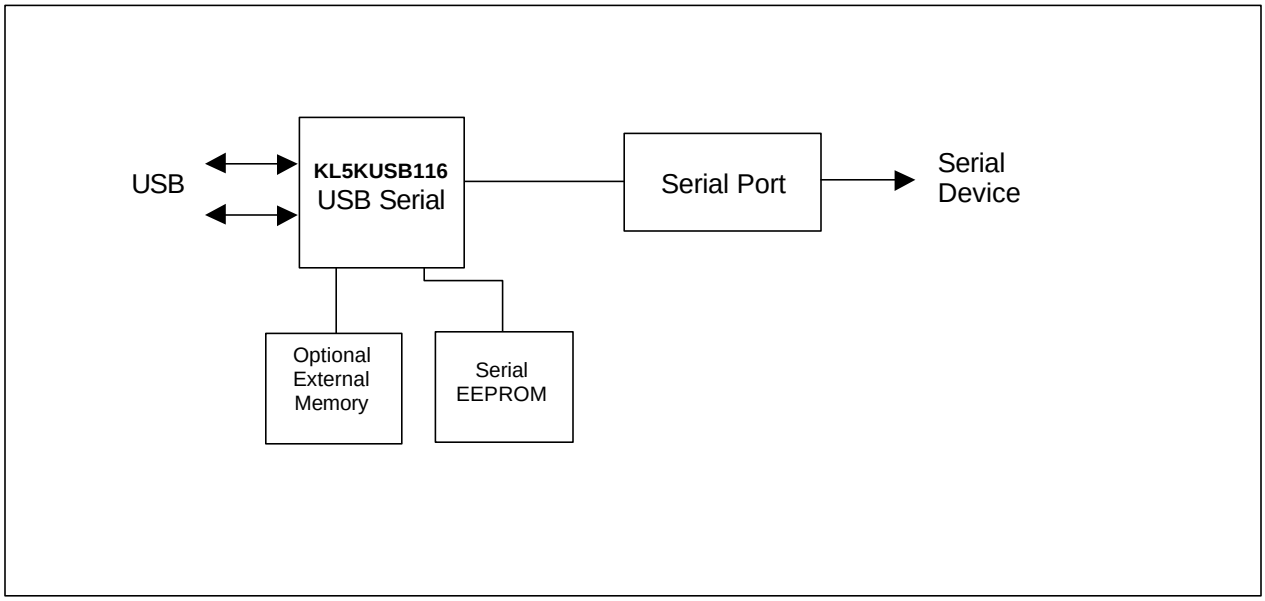
Features

- Advanced 16 Bit processor for USB transaction processing and control data processing
- Compliant with the USB 1.0/1.1 (Universal Serial Bus)
- Serial Port
- 230kbps
- 128 byte FIFO
- Plug and Play compatible
- I^2C interface
- Utilizes low cost external crystal circuitry
- 1.5K x 16 internal RAM buffer for fast communications
- Debug UART for debug and code development
- USB host device drivers available
- Single-chip solution in a 44 pin QFP

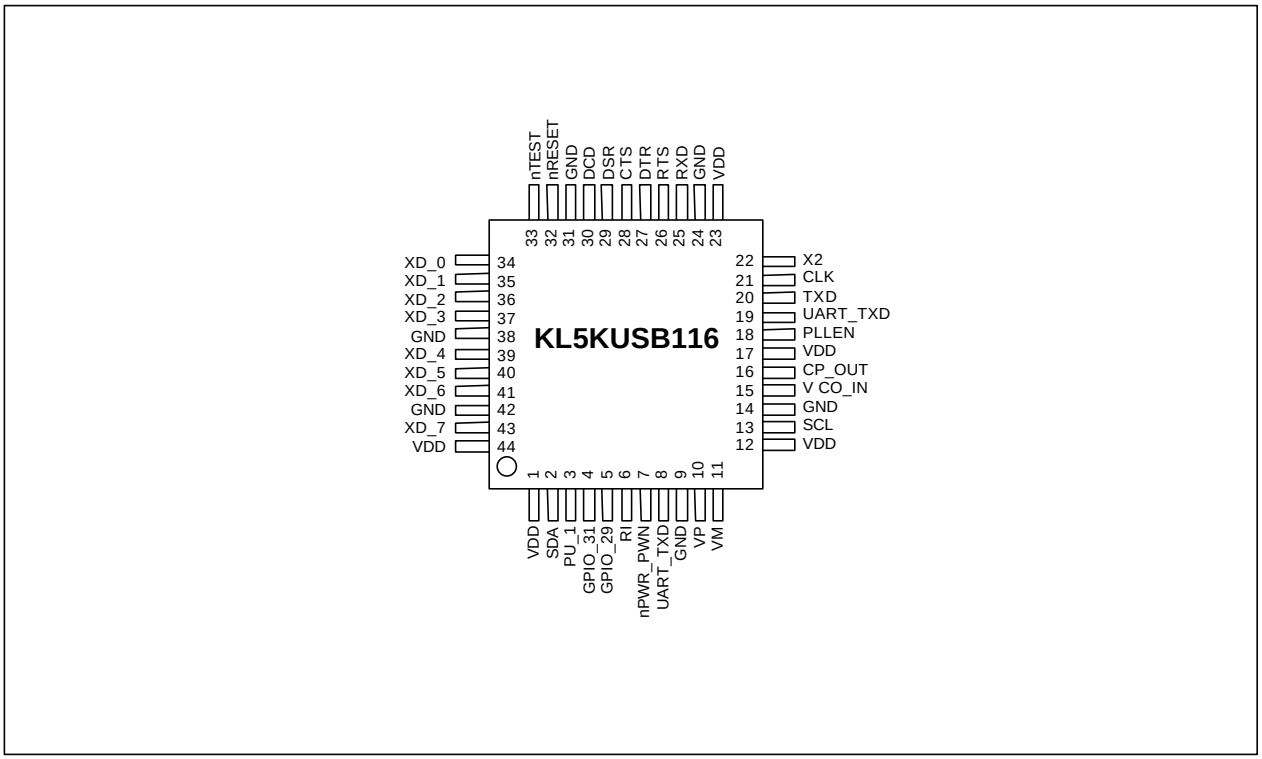
Block Diagram



KL5KUSB116 Application Block Diagram



Pin Diagram 44QFP



Pin Description

Pin # LQFP	I/O	Pin Name	Description
1		VDD	VDD
2	IN/OUT	SDA	Serial EEPROM serial data. Connect to EEPROM/SDA
3	IN	PU_1	Pull-up to USB +Pin for High Speed
4	IN/OUT	GPIO_31	GPIO_31
5	IN/OUT	GPIO_29	GPIO_29
6	IN	RI	Ring Indicate
7	OUT	nPWR_DWN	Active low Powerdown mode signal
8	IN	UART_TXD	Debug UART Txd
9		GND	Ground
10	IN/OUT	VP	USB +Pin
11	IN/OUT	VM	USB -Pin
12		VDD	VDD
13	IN/OUT	SCL	Serial EEPROM clock. Connect to EEPROM/SCL
14		GND	Ground
15	IN	VCO_IN	PLL VCO In
16	OUT	CP_OUT	PLL VDO Out
17		VDD	VDD
18	IN	PLLEN	PLL Enable
19	IN	UART_RXD	Debug UART Rxd
20	OUT	TXD	Transmit Data
21	IN	CLK	12MHz Clock/Crystal Input
22	OUT	X2	12MHz Crystal Output
23		VDD	VDD
24		GND	Ground
25	IN	RXD	Receive Data
26	OUT	RTS	Request To Send
27	OUT	DTR	Data Terminal Ready
28	IN	CTS	Clear To Send
29	IN	DSR	Data Set Ready
30	IN	DCD	Data Carrier Detect
31		GND	Ground
32	IN	nRESET	Reset Pin
33	IN	nTEST	Test Pin. Disconnect for normal operation.
34	IN/OUT	XD_0*	External Data Pins
35	IN/OUT	XD_1*	External Data Pins
36	IN/OUT	XD_2*	External Data Pins
37	IN/OUT	XD_3*	External Data Pins
38		GND	Ground
39	IN/OUT	XD_4*	External Data Pins
40	IN/OUT	XD_5*	External Data Pins
41	IN/OUT	XD_6*	External Data Pins
42		GND	Ground
43	IN/OUT	XD_7*	External Data Pins
44		VDD	VDD

*Pins are 5V tolerant

Function Description

16 Bit Processor

The integrated 16 bit processor serves as a micro controller for USB peripherals. The processor can execute approximately five million instructions per second. With this processing power it allows the design of intelligent peripherals that can process data prior to passing it on to the host PC, thus improving overall performance of the system. The masked ROM in the this device or external memory contains a specialized instruction set that has been designed for highly efficient coding of processing algorithms and USB transaction processing.

The 16-bit processor is designed for efficient data execution by having direct access to the RAM Buffer, external memory, I/O interfaces, and all the control and status registers

The processor supports prioritized vectored hardware interrupts and has as many as 240 software interrupt vectors.

The processor provides six addressing modes, supporting memory-to-memory, memory-to-register, register-to-register, immediate-to-register or immediate-to-memory operations. Register, direct, immediate, indirect, and indirect indexed addressing modes are supported. In addition, there is an auto-increment mode in which a register, used as an address pointer is automatically incremented after each use, making repetitive operations more efficient both from a programming and a performance standpoint.

The processor features a full set of program control, logical, and integer arithmetic instructions. All instructions are sixteen bits wide, although some instructions require operands, which may occupy another one or two words. Several special " short immediate" instructions are available, so that certain frequently used operations with small constant operand will fit into a 16-bit instruction.

The Processor – Divide/Multiply function

The processor's divide/multiply function contains all the instructions of the base processor that additionally includes integer divide and multiply instructions. A signed multiply instructions takes two 16-bit operands and returns a 32-bit result. A signed divide instruction divides a 32-bit operand by a 16-bit operand.

RAM Buffer

The USB controller contains internal buffer memory. The memory is used to buffer data and USB packets and accessed by the 16 Bit processor and the SIE. USB transactions are automatically routed to the memory buffer. The 16-bit processor has the ability to set up pointers and block sizes in buffer memory for USB transactions. Data is read from the interface and is processed and packetized by the 16-bit I/O processor.

PLL Clock Generator

The PLL circuitry is provided to generate the internal 48MHz clock. This circuitry is designed to allow use of a low cost 12 MHz external crystal which is connected to CLK and X2. If an external 12 MHz clock is available in the application, it may be used in lieu of the crystal circuit and connected directly to the CLK input pin.

USB Interface

The USB controller meets the Universal Serial Bus (USB) specification ver 1.0/1.1. The transceiver is capable of transmitting and receiving serial data at the USB's full speed, 12 Mbits/sec data rate. The driver portion of the transceiver is differential, while the receive section is comprised of a differential receiver and two single ended receivers. Internally, the transceiver interfaces to the SIE logic. Externally, the transceiver connects to the physical layer of the USB.

UART Serial Interface

One UART serial port is provided. The port can be configured for a wide selection of baud rates, 300 to 230.4 K baud, and support a set of control signals. The UART provides a means for external serial devices to access the USB.

Debug UART

An independent UART serial port is provided for debug and code development. The port can be configured for a wide selection of baud rates, 7200 to 115.2K baud. The port provides transmit and receive data support only.

Serial EEPROM Support

The USB Controller serial interface is used to provide access to external EEPROM's. The interface can support a variety of serial EEPROM formats.

Electrical Characteristics

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD}	-0.3 to 4.0	V
Input Voltage	V_{IN} (Normal)	-0.3 to V_{DD}+0.3	V
	V_{IN} (5V Tolerant)	-0.3 to 6.0	V
Storage Temperature	TSTG	-55 to 125	°C

DC Characteristics and conditions (V_{DD} @ 3.3V±.3V)

Symbol	Parameter	Condition	Value			Unit
			Min	Typ	Max	
V_{DD}	Supply Voltage		3.0	3.3	3.6	V
V_{IH}	Input high voltage		2.0	-	-	V
V_{IL}	Input low voltage		-	-	0.8	V
V+ *	Input high voltage	Schmitt	-	1.8	2.3	V
V- *	Input low voltage	Schmitt	0.5	0.9	-	V
V_H*	Hysteresis voltage	Schmitt	0.4	-	-	V
I_{IH}	Input high current	$V_{IN} = V_{DD}$	-10	-	10	µA
I_{IL}	Input low current	$V_{IN} = V_{ss}$	-10	-	10	µA
V_{OH}	Output high voltage		2.4	-	-	V
V_{OL}	Output low voltage		-	-	0.4	V
I_{OZ}	3-state leakage current	$V_{OH}=V_{SS}$	-10	-	10	µA
		$V_{OL}=V_{DD}$	-10	-	-10	µA

*For reset pin (nNRESET, pin 66)