

HID & SYSTEM MANAGEMENT PRODUCTS, PROTOCOL INTERPRETER FAMILY
DESCRIPTION

The USB-Adapt™ UR6HCUSB is a single IC that converts PS/2 keyboard and mouse data to USB.

The USB-Adapt™ is ideal for system legacy support, enabling seamless connection of standard PS/2 devices (mice or keyboards) to USB.

The IC offers two hot-pluggable and hot-swappable PS/2 ports; either port can accept a mouse or a keyboard. In addition, the USB-Adapt™ auto-detects and transparently supports mice with MouseWheel functionality.

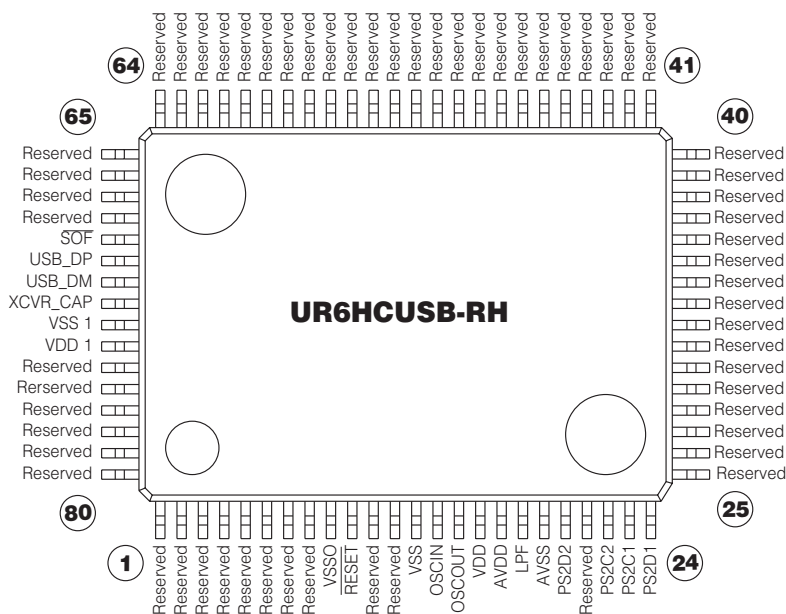
The USB-Adapt™ supports remote wake-up function via either mouse or keyboard, if the BIOS of the host machine is configured in this manner.

FEATURES

- Interfaces PS/2 devices to USB
- Devices are hot-pluggable
- Provides two PS/2 ports
- PS/2 ports support MouseWheel functionality
- Works with standard Windows keyboard and mouse drivers
- PS/2 ports are auto-selectable and hot-swappable – the mouse or keyboard can be used in either port
- Easy to implement
- Few external components required

APPLICATIONS

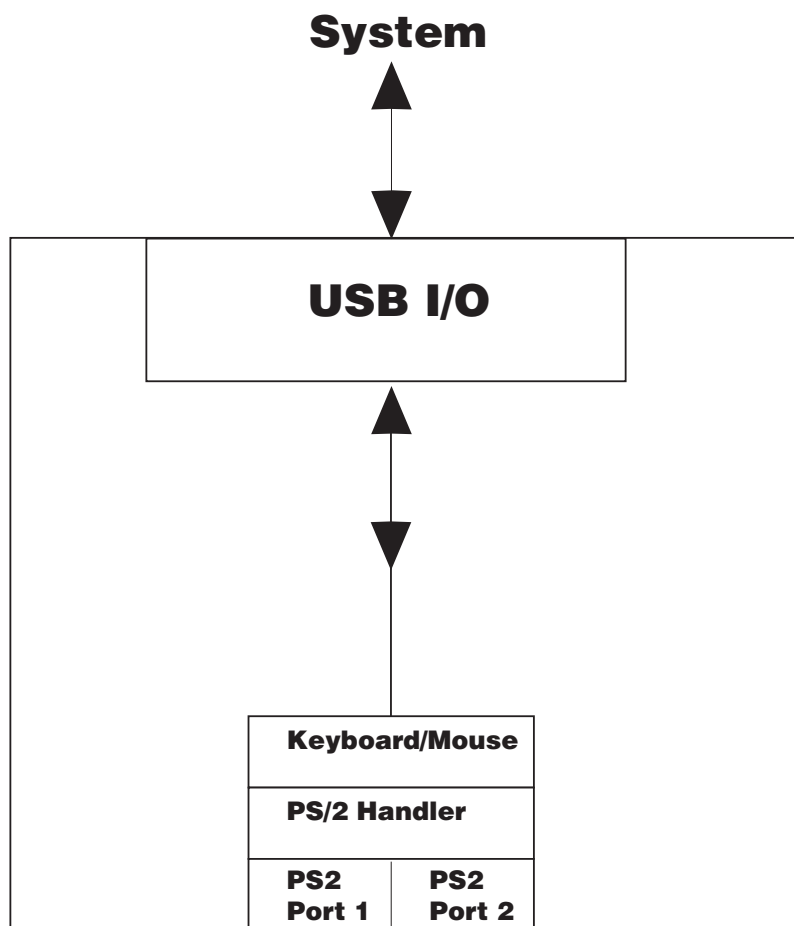
- System legacy support

PIN ASSIGNMENTS


ORDERING CODE

Package options	Pitch	TA = -20°C to +85°C
80-pin, PQFP	0.8 mm	UR6HCUSB-RH
Other Materials	Type	Order number
USB-Adapt™ eval. kit	Evaluation kit	EVK6-USB-XXX

BLOCK DIAGRAM





USB FUNCTIONALITY

The USB-Adapt™ is a full-speed composite USB device that interfaces PS/2.

The PS/2 interface supports legacy Human Input Devices (HID)-class specification and uses two interrupt endpoints for the PS/2 devices.

The USB-Adapt™ handles the merging of all this data, and sends the data to the system. Data can come from either of the two PS/2 ports. Internal and external mouse and keyboard data are streamed and appear to the system as if coming from a single source.

PIN DEFINITIONS

Mnemonic	PQFP	Type	Name and Function
Power Supply			
VDD	16	PWR	Positive supply voltage
VDD1	74	PWR	Positive supply voltage
AVDD	17	PWR	Positive analog reference voltage
AVSS	19	PWR	Ground: analog signal
VSS	13	PWR	Ground: negative supply voltage
VSS0	9	PWR	Ground: negative supply voltage
VSS1	73	PWR	Ground: negative supply voltage
XCVR_CAP	72	PWR	Bypass line
Reset			
_RESET	10	I	Controller hardware reset pin: Active-low reset line
Oscillator pins			
OSCIN	14	I	Oscillator input: input signal from oscillator
OSCOUT	15	O	Oscillator output: output signal to oscillator
LPF	18	O	Loop filter for frequency synthesizer
USB			
_SOF	69	O	USB _SOF signal
USB_DP	70	I/O	USB D+ line
USB_DM	71	I/O	USB D- line
PS/2			
PS2D2	20	I/O	Data line for PS/2 port 2
PS2C2	22	I/O	Clock line for PS/2 port 2
PS2C1	23	I/O	Clock line for PS/2 port 1
PS2D1	24	I/O	Data line for PS/2 port 1
Reserved			
Reserved	1-8, 11-12, 21, 25-68, 75-80	N/U	Not used; keep open; reserved for future functions

PS/2 PORTS

The two PS/2 ports allow the user to connect legacy PS/2 devices to the USB host system. Standard 104-key keyboards and PS/2 mice, with support for MouseWheel functionality, can be hot-plugged at either of the PS/2 ports and immediately begin communicating with the host.

USB DESCRIPTORS

Offset	Field	Size	Value	Description
Device Descriptor				
0	bLength	1	0x12	Descriptor length (18 bytes)
1	bDescriptorType	1	0x01	Descriptor type: device
2	bcdUSB	2	0x01 01	USB release
4	bDeviceClass	1	0x00	Specified in interfaces
5	bDeviceSubClass	1	0x00	Specified in interfaces
6	bDeviceProtocol	1	0x00	No protocols on the device basis
7	bMaxPacketSize0	1	0x08	Maximum packet length (bytes) for endpoint 0 is 8
8	idVendor	2	0x7A 04	Vendor ID (Semtech) = 0x47A = 1146
10	idProduct	2	0x01 01	Product ID
12	bcdDevice	2	0x01 00	Firmware revision 1.0
14	iManufacturer	1	0x04	Index for manufacturer string descriptor
15	iProduct	1	0x1E	Index for product string descriptor
16	iSerialNumber	1	0x00	Index for serial number string descriptor
17	bNumConfigurations	1	0x01	Number of configurations
Configuration Descriptor				
0	bLength	1	0x09	Descriptor length
1	bDescriptorType	1	0x02	Descriptor type: configuration
2	bTotalLength	2	0x3B 00	Total length of descriptors returned with this one
4	bNumInterfaces	1	0x02	Number of interfaces supported
5	bConfigurationValue	1	0x01	Value associated with this configuration
6	iConfiguration	1	0x00	Index for configuration string descriptor- none
7	bmAttributes	1	0xA0	Configuration characteristics Bit 7: Reserved (set to one) = 1 Bit 6: Self-powered = 0 Bit 5: Remote wake-up = 1
8	MaxPower	1	0x32	Maximum power consumed is 100 mA
String Descriptor				
0	bLength	1	0x04	Length of language ID
1	bDescriptorType	1	0x03	Descriptor type (=string)
2	bString	2	0x09 04	Array of language ID code (=English)
4	bLength	1	0x1A	Length of manufacturer string
5	bDescriptorType	1	0x03	Descriptor type (=string)
6	bString	24		Manufacturer name
30	bLength	1	0x1A	Length of product string
31	bDescriptorType	1	0x03	Descriptor type (=string)
32	bString	24		Product name

USB DESCRIPTORS (CONT'D)

Offset	Field	Size	Value	Description
Interface Descriptor (Keyboard)				
0	bLength	1	0x09	Descriptor length
1	bDescriptorType	1	0x04	Descriptor type: interface
2	bInterfaceNumber	1	0x00	Index for HID interface
3	bAlternateSetting	1	0x00	Alternate setting index
4	bNumEndpoints	1	0x01	Number of endpoints in this interface (including one interrupt endpoint)
5	bInterfaceClass	1	0x03	USB HID class
6	bInterfaceSubClass	1	0x01	Keyboard subclass
7	bInterfaceProtocol	1	0x01	Boot protocol
8	iInterface	1	0x00	Index for interface string descriptor – none
HID Descriptor (Keyboard)				
0	bLength	1	0x09	Descriptor length
1	bDescriptorType	1	0x21	Descriptor type: HID
2	bcdHID	2	0x01 01	HID specification release (1.01)
4	bCountryCode	1	0x00	Country code (not supported)
5	bNumDescriptors	1	0x01	Number of class descriptors (the one descriptor is the report descriptor)
6	bDescriptorType	1	0x22	Report descriptor
7	wDescriptorLength	2	0x40 00	Length of report descriptor
EndPoint Descriptor (Keyboard)				
0	bLength	1	0x07	Descriptor length
1	bDescriptor type	1	0x05	Descriptor type: endpoint
2	bEndpointAddress	1	0x83	Endpoint address: IN, endpoint 3
3	bmAttributes	1	0x03	Endpoint attributes: interrupt
4	wMaxPacketSize	2	0x08 00	Maximum packet size: 8 bytes
6	bInterval	1	0x04	Polling interval

USB DESCRIPTORS: REPORT DESCRIPTOR (KEYBOARD)

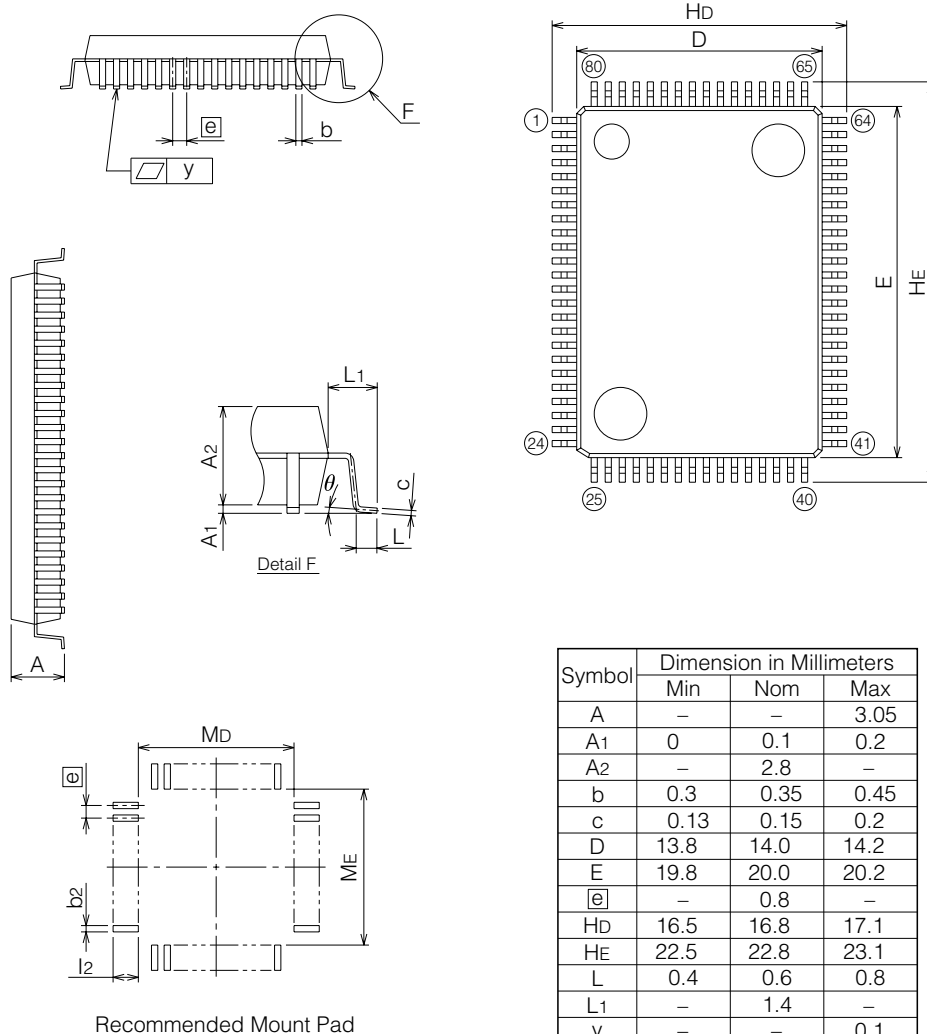
Offset	Data	Mnemonic	Value
0	Usage Page	0x05 01	Generic desktop control
2	Usage	0x09 06	Keyboard
4	Collection	0xA1 01	Application
6	Usage Page	0x05 07	Keyboard/keypad keys
8	Usage Minimum	0x19 E0	224
10	Usage Maximum	0x29 E7	231
12	Logical Minimum	0x15 00	0
14	Logical Maximum	0x25 01	1
16	Report Size	0x75 01	1
18	Report Count	0x95 08	8
20	Input	0x81 02	Data, variable, absolute
22	Report Size	0x75 01	1
24	Report Count	0x95 08	8
26	Input	0x81 03	Constant
28	Report Count	0x95 06	6
30	Report Size	0x75 01	1
32	Usage Page	0x05 08	LED
34	Usage Minimum	0x19 01	1
36	Usage Maximum	0x29 06	6
38	Output	0x91 02	Data, variable, absolute
40	Report Count	0x95 01	1
42	Report Size	0x75 02	2
44	Output	0x91 03	Constant
46	Report Count	0x95 06	6
48	Report Size	0x75 08	8
50	Logical Minimum	0x15 00	0
52	Logical Maximum	0x26 FF 00	255
55	Usage Page	0x05 07	Keyboard/keypad keys
57	Usage Minimum	0x19 00	0
59	Usage Maximum	0x29 FF	255
61	Input	0x81 00	Data, array, absolute
63	End Collection	0xC0	

USB DESCRIPTORS (CONT'D)

Offset	Field	Size	Value	Description
Interface Descriptor (Mouse)				
0	bLength	1	0x09	Descriptor length
1	bDescriptorType	1	0x04	Interface Descriptor
2	bInterfaceNumber	1	0x01	Index for HID interface
3	bAlternateSetting	1	0x00	Alternate setting index
4	bNumEndpoints	1	0x01	Number of endpoints in this interface (including one interrupt endpoint)
5	bInterfaceClass	1	0x03	USB HID class
6	bInterfaceSubClass	1	0x01	Keyboard subclass
7	bInterfaceProtocol	1	0x02	Boot protocol
8	iInterface	1	0x00	Index for interface string descriptor – none
HID Descriptor (Mouse)				
0	bLength	1	0x09	Descriptor length
1	bDescriptorType	1	0x21	Descriptor type: HID
2	bcdHID	2	0x01 01	HID specification release (1.01)
4	bCountryCode	1	0x00	Country code (not supported)
5	bNumDescriptors	1	0x01	Number of class descriptors (the one descriptor is the report descriptor)
6	bDescriptorType	1	0x22	Report descriptor
7	wDescriptorLength	2	0x34 00	Length of report descriptor
EndPoint Descriptor (Mouse)				
0	bLength	1	0x07	Descriptor length
1	bDescriptor type	1	0x05	Descriptor type: endpoint
2	bEndpointAddress	1	0x84	Endpoint address: .IN, endpoint 4
3	bmAttributes	1	0x03	Endpoint attributes: interrupt
4	wMaxPacketSize	2	0x08 00	Maximum packet size: 8 bytes
6	bInterval	1	0x04	Polling interval

USB DESCRIPTORS: REPORT DESCRIPTOR (MOUSE)

Offset	Data	Mnemonic	Value
0	Usage Page	0x05 01	Generic desktop control
2	Usage	0x09 02	Mouse
4	Collection	0xA1 01	Application
6	Usage	0x09 01	Pointer
8	Collection	0xA1 00	Physical
10	Usage Page	0x05 09	Button
12	Usage Minimum	0x19 01	1
14	Usage Maximum	0x29 03	3
16	Logical Minimum	0x15 00	0
18	Logical Maximum	0x25 01	1
20	Report Count	0x95 03	3
22	Report Size	0x75 01	1
24	Input	0x81 02	Data, variable, absolute
26	Report Count	0x95 01	1
28	Report Size	0x75 05	5
30	Input	0x81 01	Constant
32	Usage Page	0x05 01	Generic desktop control
34	Logical Minimum	0x15 81	-127
36	Logical Maximum	0x25 7F	127
38	Report Size	0x75 08	8
40	Report Count	0x95 03	3
42	Usage	0x09 30	X
44	Usage	0x09 31	Y
46	Usage	0x09 38	Wheel
48	Input	0x81 06	Data, variable, relative
50	End Collection	0xC0	
51	End Collection	0xC0	



Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	3.05
A1	0	0.1	0.2
A2	—	2.8	—
b	0.3	0.35	0.45
c	0.13	0.15	0.2
D	13.8	14.0	14.2
E	19.8	20.0	20.2
e	—	0.8	—
Hd	16.5	16.8	17.1
HE	22.5	22.8	23.1
L	0.4	0.6	0.8
L1	—	1.4	—
y	—	—	0.1
θ	0 _j	—	10 _j
b2	—	0.5	—
l2	1.3	—	—
MD	—	14.6	—
ME	—	20.6	—

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

Ratings	Symbol	Value	Unit
Supply Voltage	Vdd	-0.3 to 7.0	V
Input Voltage	Vin	Vss -0.3 to Vdd +0.3	V
Input Voltage USB D+, D-	Vin USB	-0.5 to +3.8	V
Operating Temperature	Ta	T low to T high	
UR6HCUSB-RH		-20 to +85	°C
Storage Temperature Range	Tstg	-40 to +125	°C

DC Electrical Characteristics, Temperature range=T low to T high unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Supply Voltage	Vdd	+4.15	+5	+5.25	V
Input High Voltage	Vih	0.8Vdd			V
Input Low Voltage	Vil			0.2Vdd	V
Peak Output Current	Io	-10		+10	mA
Average Output Current	Io (avg)	-5		+5	mA
Output Voltage (Ioh = -10mA)	Voh	Vdd-2.0			V
(Iol = 10 mA)	Vol			2.0	V
Input Current	Iin	-5		+5	μA
Supply Current (Vdd=5.0 Vdc+/-10%, Vss=0, USB operating)	Idd		70	90	mA
Supply Current (Vdd=5.0 Vdc+/-10%, Vss=0, USB suspended)	Idd		200	250	μA

Control Timing (Vdd=5.0 Vdc +/-10%, Vss=0 Vdc, Temperature range=T low to T high unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency of Operation					
■ Crystal Option	fosc		24.0		MHz
■ External Clock Option	fosc		24.0		MHz



USB-ADAPT™ BILL OF MATERIALS FOR PAGE 9 SCHEMATIC

UR6HCUSB-RH BOM

Description	Quantity	Manufacturer	Part#	Description
Capacitors:				
C1, C7, C8	3	Generic	Any	33pF, Ceramic, NPO/C0G
C2,C4, C6, C10	4	Generic	Any	0.1μF, Ceramic, X7R
C3	1	Generic	Any	2.2μF, Tantalum
C5	1	Generic	Any	10μF, Tantalum
C9	1	Generic	Any	680pF, Ceramic, NP0/C0G
C11,C12,C13,C14	4	Generic	Any	47pF, Ceramic, NP0/C0G
ICs:				
U1	1	Semtech	UR6HCUSB-RH	USB-Adapt™ IC
U2	1	Generic	TC54VC3502ECB	Reset voltage regulator
Resistors:				
R1,R2	2	Generic	Any	33, 5%, 1/16W
R3	1	Generic	Any	1.5k, 5%, 1/16W
R4	1	Generic	Any	1.0k, 5%, 1/16W
R5, R6, R7, R8	4	Generic	Any	10k, 5%, 1/16W
Resonator:				
Y1	1	Generic	Any	24MHz
Transistor:				
Q1	1	Zetex	BSS84ZXCT	MOSFET_P Transistor, SMT, SOT-23
Connector:				
J1	1	Generic	Any	Con_AMP_USB_B
Inductor:				
L1, L2	2	Generic	Any	12μH

This Page Left Intentionally Blank

**For sales information
and product literature,
contact:**

HID & System Mgmt Division
Semtech Corporation
652 Mitchell Road
Newbury Park, CA 91320
hidinfo@semtech.com
<http://www.semtech.com>
805 498 2111 Telephone
805 498 3804 Telefax

Semtech Western Regional Sales
805-498-2111 Telephone
805-498-3804 Telefax

Semtech Central Regional Sales
972-437-0380 Telephone
972-437-0381 Telefax

Semtech Eastern Regional Sales
203-964-1766 Telephone
203-964-1755 Telefax

Semtech Asia-Pacific Sales Office
+886-2-2748-3380 Telephone
+886-2-2748-3390 Telefax

Semtech Japan Sales Office
+81-45-948-5925 Telephone
+81-45-948-5930 Telefax

Semtech Korea Sales Sales
+82-2-527-4377 Telephone
+82-2-527-4376 Telefax

Northern European Sales Office
+44 (0)2380-769008 Telephone
+44 (0)2380-768612 Telefax

Southern European Sales Office
+33 (0)1 69-28-22-00 Telephone
+33 (0)1 69-28-12-98 Telefax

Central European Sales Office
+49 (0)8161 140 123 Telephone
+49 (0)8161 140 124 Telefax

Copyright ©1999-2001 Semtech Corporation. All rights reserved.
USB-Adapt is a trademark of Semtech Corporation. Semtech is a
registered trademark of Semtech Corporation. All other trademarks
belong to their respective companies.

INTELLECTUAL PROPERTY DISCLAIMER
This specification is provided 'as is' with no warranties whatsoever
including any warranty of merchantability, fitness for any particular
purpose, or any warranty otherwise arising out of any proposal,
specification or sample. A license is hereby granted to reproduce
and distribute this specification for internal use only. No other
license, expressed or implied to any other intellectual property
rights is granted or intended hereby. Authors of this specification
disclaim any liability, including liability for infringement of proprietary
rights, relating to the implementation of information in this
specification. Authors of this specification also do not warrant or
represent that such implementation(s) will not infringe such rights.