Single IC that converts serial and PS/2 data to USB

Preliminary
Geni™ usb ICs product specifications

Description

USAR's GeniDo™ UR3HCGN6-LGD-002 is a single IC that converts serial and PS/2 data to USB. USAR's UR3HCGN6-LGD-002 achieves in one, easy-to-implement IC what would otherwise require cumbersome, real-estate greedy and expensive chipsets.

A license for a high-functionality serial driver is available for each IC.

The UR3HCGN6-LGD-002 emulates a standard 16550 and thus supports a full range of serial devices, including serial mice and modems.

USAR's GeniDo™ also offers two hot-pluggable and hot-swappable PS/2 ports; either port can accept a mouse or a keyboard. In addition, the USAR GeniDo™ auto-detects and transparently supports mice with MouseWheel functionality. Internal and external mouse and keyboard data are streamed and appear to the system as if coming from a single source.

Customized versions are also available.

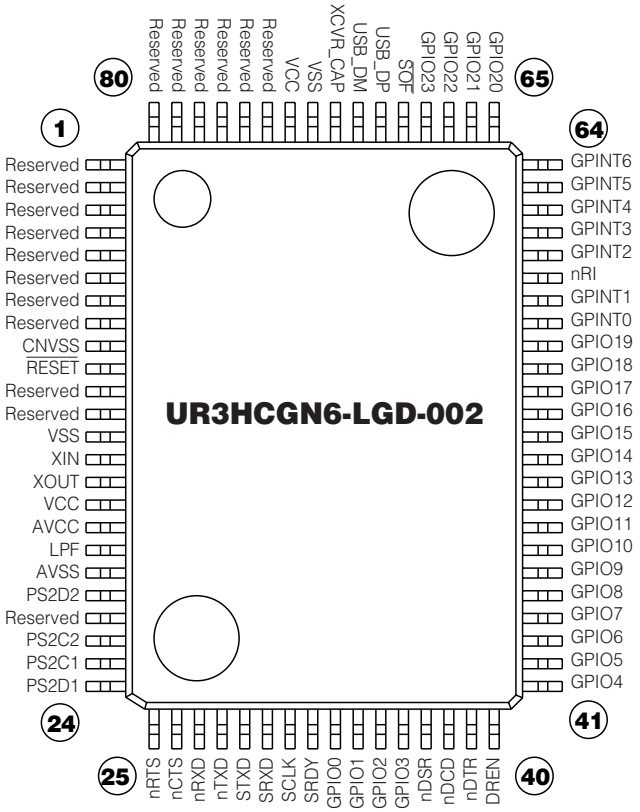
Features

- Interfaces serial and PS/2 devices to USB
- Devices are hot-pluggable
- Serial port emulates 16550
- Supports a full range of serial devices, from mice to modems
- High-functionality serial software driver available
- Provides two PS/2 ports
- PS/2 ports are hot-swappable – either the mouse or keyboard can be used in either port
- PS/2 ports support MouseWheel functionality
- Single chip can be used to achieve what previously required cumbersome, multi-chip chipsets, easing design and mitigating costs
- Few external components required
- Easy to implement
- Custom versions available upon request

Applications

- System legacy support

Pin Assignments

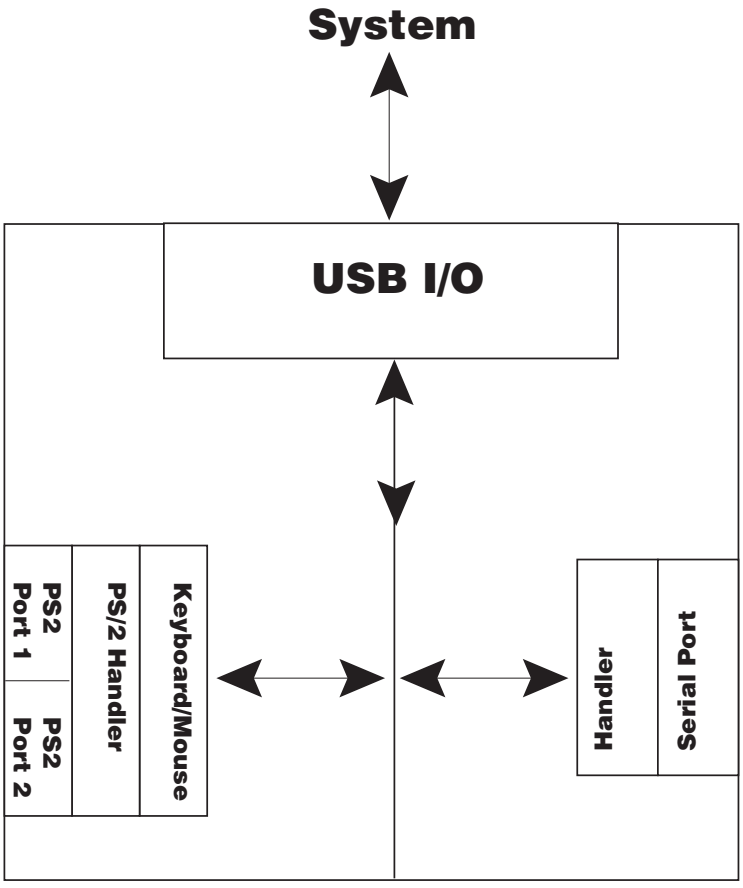


Ordering Code

Package options	Pitch in mm's	TA = 0°C to +75°C
80-pin, PQFP	0.8	UR3HCGN6-LGD-002-XX

XX = Optional for customization

Block Diagram



Pin Definitions

Mnemonic	Pin Numbers QFP	Type	Name and Function
Power Supply			
VCC	16, 74	PWR	**Positive supply voltage**
AVCC	17	PWR	Positive analog reference voltage
AVSS	19	PWR	**Ground:** analog signal
VSS	13, 73	PWR	**Ground:** negative supply voltage
VSS1	9	PWR	Connect to ground
XCVRCAP	72	PWR	Bypass line
Reset			
_RESET	10	I	**Controller hardware reset pin:** Active-low reset line
Oscillator pins			
XIN	14	I	**Oscillator input:** input signal from oscillator
XOUT	15	O	**Oscillator output:** output signal to oscillator
LPF	18	O	**Loop filter** for frequency synthesizer
USB			
_SOF	69	O	**USB _SOF signal**
DP	70	I/O	**USB D+ line**
DM	71	I/O	**USB D- line**
Serial			
nRTS	25	O	**Request-to-send:** RS232 control line
nCTS	26	I	**Clear-to-send:** RS232 control line
nRXD	27	I	**Receive Data:** RS232 input data line
nTXD	28	O	**Transmit Data:** RS232 output data line
nDSR	37	I	**DCE-ready:** RS232 control line
nDCD	38	I	**Carrier Detect:** RS232 control line
nDTR	39	O	**DTE-ready:** RS232 control line
DREN	40	O	RS232 module enable line
nRI	59	I	**Ring Indicator:** RS232 control line
Reserved			
	1-8, 11, 12, 21, 75-80		Reserved
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
Serial I/O			
STXD	29	O	Serial I/O output data line
SRXD	30	I	Serial I/O input data line
SCLK	31	O	Serial I/O clock line
SRDY	32	O	Serial I/O ready pulse
GPIO			
GPIO 0-23	33-36, 41-56, 65-68	I/O	General purpose input/output pins
GPINT 0-6	57-58, 60-64	I/O	General purpose interrupt lines

Note 1: An underscore in front of the pin mnemonic denotes an active low signal.

USB Functionality

The USAR GeniDo™ is a full-speed composite USB device. It includes two interfaces: serial and PS/2.

The serial interface uses one bidirectional bulk endpoint, as well as one interrupt endpoint.

The PS/2 interface supports legacy Human Input Devices (HID)-class specifiation. This interface uses one interrupt endpoint, which is shared among all of the PS/2 devices. The different forms of data are distinguished by different report IDs.

The serial interface presents a standard serial COM port to the Windows OS. This allows the user access to the port. The user can directly communicate through the port using a terminal application and can also connect various serial devices, which function in the same manner as when connected to a legacy hardware RS232 port. Devices that can use the GeniDo™ include serial mice and modems, as well as any device that communicates along a standard RS232 line.

The PS/2 interface conforms to the HID specification. Data can come from either of the PS/2 ports, or from on-board input devices (keypad, touch screen) if the USAR GeniDo™ is designed into a system in this manner. The USAR GeniDo™ handles the merging of all this data, and sends the data to the system. Different types of data are distinguished by unique HID report IDs, as described in the HID specification.

Serial Port

The legacy serial port allows any device communicating with the RS232 standard to seamlessly connect to the host system.

The serial port supports baud rates ranging from 300 to 115200 bps.

All necessary software drivers are available and present the virtual serial port to the system just as any COM port would appear.

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, can be hot-plugged at either of the PS/2 ports and imediately begin communicating with the host.

USB Descriptors

Offset	Field	Size	Value	Description
Device Descriptor				
0	bLength	1	12	Device Descriptor length
1	bDescriptorType	1	01	Device Descriptor
2	bcdUSB	2	0100bcd	USB Spec Revision
4	bDeviceClass	1	00	Specified in interfaces
5	bDeviceSubClass	1	00	Specified in interfaces
6	bDeviceProtocol	1	00	Specified in interfaces
7	bMaxPacketSize0	1	08	Maximum packet size (bytes) for endpoint 0
8	idVendor	2	047a	USAR USB Vendor ID
10	idProduct	2	0102	USAR GeniDo™ Product ID
12	bcdDevice	2	0100	firmware revision 1.0
14	iManufacturer	1	04	Index for manufacturer string descriptor
15	iProduct	1	1e	Index for product string descriptor
16	iSerialNumber	1	4e	Index for serial number string descriptor
17	bNumConfigurations	1	01	Number of configuration
Configuration Descriptor				
0	bLength	1	09	Configuration Descriptor length
1	bDescriptorType	1	02	Configuration Descriptor
2	bTotalLength	2	0067	Total length of descriptors returned with this one
4	bNumInterfaces	1	03	Number of interfaces: HID, serial port, and parallel port
5	bConfigurationValue	1	01	Value associated with this configuration
6	iConfiguration	1	00	Index for configuration string descriptor – none
7	bmAttributes	1	a0	Bus powered, remote wakeup
8	MaxPower	1	32	100 mA
Serial Port Interface Descriptor				
0	bLength	1	09	Interface Descriptor length
1	bDescriptorType	1	04	Interface Descriptor
2	bInterfaceNumber	1	00	Index for Serial Port interface
3	bAlternateSetting	1	00	Alternate Setting index
4	bNumEndpoints	1	03	Number of endpoints in this interface. This includes two bulk endpoints and one interrupt endpoint
5	bInterfaceClass	1	00	Unspecified interface class
6	bInterfaceSubClass	1	00	Unspecified interface subclass
7	bInterfaceProtocol	1	00	Unspecified interface protocol
8	iInterface	1	00	Index for interface string descriptor – none

USB Descriptors, Continued

Offset	Field	Size	Value	Description
Endpoint Descriptor – Endpoint 1, Bulk IN endpoint				
0	bLength	1	07	Endpoint Descriptor length
1	bDescriptorType	1	05	Endpoint Descriptor
2	bEndpointAddress	1	81	Address: Endpoint 1, IN
3	bmAttributes	1	02	Endpoint attributes: bulk
4	wMaxPacketSize	2	0040	Maximum packet size: 64 bytes
6	bInterval	1	00	Packet interval, set to 0 for bulk endpoint
Endpoint Descriptor – Endpoint 1, Bulk OUT endpoint				
0	bLength	1	07	Endpoint Descriptor length
1	bDescriptorType	1	05	Endpoint Descriptor
2	bEndpointAddress	1	01	Address: Endpoint 1, OUT
3	bmAttributes	1	02	Endpoint attributes: bulk
4	wMaxPacketSize	2	0040	Maximum packet size : 64 bytes
6	bInterval	1	00	Packet interval, set to 0 for bulk endpoint
Endpoint Descriptor – Endpoint 4, Interrupt status endpoint				
0	bLength	1	07	Endpoint Descriptor length
1	bDescriptorType	1	05	Endpoint Descriptor
2	bEndpointAddress	1	84	Address: Endpoint 4, IN
3	bmAttributes	1	03	Endpoint attributes: interrupt
4	wMaxPacketSize	2	0008	Maximum packet size: 8 bytes
6	bInterval	1	08	8 ms interval for packets
Parallel Interface Descriptor – Unidirectional setting (alternate setting 0)				
0	bLength	1	09	Interface Descriptor length
1	bDescriptorType	1	04	Interface Descriptor
2	bInterfaceNumber	1	01	Index for Parallel Port interface
3	bAlternateSetting	1	00	Alternate Setting index
4	bNumEndpoints	1	01	Number of endpoints in this interface. This includes two bulk endpoints
5	bInterfaceClass	1	07	USB printer class
6	bInterfaceSubClass	1	01	Printer subclass
7	bInterfaceProtocol	1	02	Bidirectional protocol
8	iInterface	1	00	Index for interface string descriptor – none
Parallel Port Interface Descriptor – Bidirectional setting (alternate setting 1)				
0	bLength	1	09	Interface Descriptor length
1	bDescriptorType	1	04	Interface Descriptor
2	bInterfaceNumber	1	01	Index for Parallel Port interfac
3	bAlternateSetting	1	01	Alternate Setting index
4	bNumEndpoints	1	02	Number of endpoints in this interface. This includes two bulk endpoints
5	bInterfaceClass	1	07	USB printer class
6	bInterfaceSubClass	1	01	Printer subclass
7	bInterfaceProtocol	1	02	Bidirectional protocol
8	iInterface	1	00	Index for interface string descriptor – none

USB Descriptors, Continued

Offset	Field	Size	Value	Description
Endpoint Descriptor – Endpoint 2, Bulk OUT endpoint				
0	bLength	1	07	Endpoint Descriptor length
1	bDescriptorType	1	05	Endpoint Descriptor
2	bEndpointAddress	1	02	Address: Endpoint 2, OUT
3	bmAttributes	1	02	Endpoint attributes: bulk
4	wMaxPacketSize	2	0020	Maximum packet size: 32 bytes
6	bInterval	1	00	Packet interval, set to 0 for bulk endpoint
Endpoint Descriptor – Endpoint 2, Bulk IN endpoint				
0	bLength	1	07	Endpoint Descriptor length
1	bDescriptorType	1	05	Endpoint Descriptor
2	bEndpointAddress	1	82	Address: Endpoint 2, IN
3	bmAttributes	1	02	Endpoint attributes: bulk
4	wMaxPacketSize	2	0020	Maximum packet size: 32 bytes
6	bInterval	1	00	Packet interval, set to 0 for bulk endpoint
HID Interface Descriptor				
0	bLength	1	09	Interface Descriptor length
1	bDescriptorType	1	04	Interface Descriptor
2	bInterfaceNumber	1	02	Index for HID interface
3	bAlternateSetting	1	00	Alternate Setting index
4	bNumEndpoints	1	01	Number of endpoints in this interface. This includes one interrupt endpoint
5	bInterfaceClass	1	03	USB HID class
6	bInterfaceSubClass	1	01	Keyboard subclass
7	bInterfaceProtocol	1	00	Boot protocol
8	iInterface	1	00	Index for interface string descriptor – none
HID Class Descriptor				
0	bLength	1	09	HID Descriptor length
1	bDescriptorType	1	21	HID Descriptor
2	bcdHID	2	0100	HID Specification Release (1.0)
4	bCountryCode	1	00	Country Code (not supported)
5	bNumDescriptors	1	01	Number of class descriptors. The one descriptor is the report descriptor
6	bDescriptorType	1	22	Report Descriptor
7	wDescriptorLength	2	00ec	Length of Report Descriptor

USB Descriptors: Report Descriptors

Byte #	Data	Mnemonic	Value
0	0501	Usage Page	Generic Desktop
2	0906	Usage	Keyboard
4	a101	Collection	Application
6	8501	Report ID	1
8	0507	Usage Page	Keyboard
10	19e0	Usage Minimum	Keyboard Left Control
12	29e7	Usage Maximum	Keyboard Right GUI
14	1500	Logical Minimum	0
16	2501	Logical Maximum	1
18	7501	Report Size	1
20	9508	Report Count	8
22	8102	Input	Variable
24	9505	Report Count	5
26	7501	Report Size	1
28	0508	Usage Page	LEDs
30	1901	Usage Minimum	NumLock
32	2905	Usage Maximum	Kana
34	9102	Output	Variable
36	9501	Report Count	1
38	7503	Report Size	3
40	9103	OutputConstant	Variable
42	9506	Report Count	6
44	7508	Report Size	8
46	1500	Logical Minimum	0
48	2567	Logical Maximum	67h
50	0507	Usage Page	Keyboard
52	1900	Usage Minimum	0 (no event)
54	2965	Usage Maximum	65h (Keyboard application key)
56	8100	Input	
58	c0	End Collection	
59	0501	Usage Page	Generic Desktop
61	0902	Usage	Mouse
63	a101	Collection	Application
65	8502	Report ID	2
67	0901	Usage	Pointer
69	a100	Collection	Linked
71	0509	Usage Page	Button
73	1901	Usage Minimum	Button 1
75	2903	Usage Maximum	Button 3
77	1500	Logical Minimum	0
79	2501	Logical Maximum	1
81	9503	Report Count	3
83	7501	Report Size	1
85	8102	Input	Variable
87	9501	Report Count	1
89	7505	Report Size	5
91	8103	Input	Constant, Variable
93	0501	Usage Page	Generic Desktop
95	0930	Usage	X
97	0931	Usage	Y
99	0938	Usage	Wheel
101	1581	Logical Minimum	81h (-127)
103	257f	Logical Maximum	7fh (127)
105	7508	Report Size	8
107	9503	Report Count	3

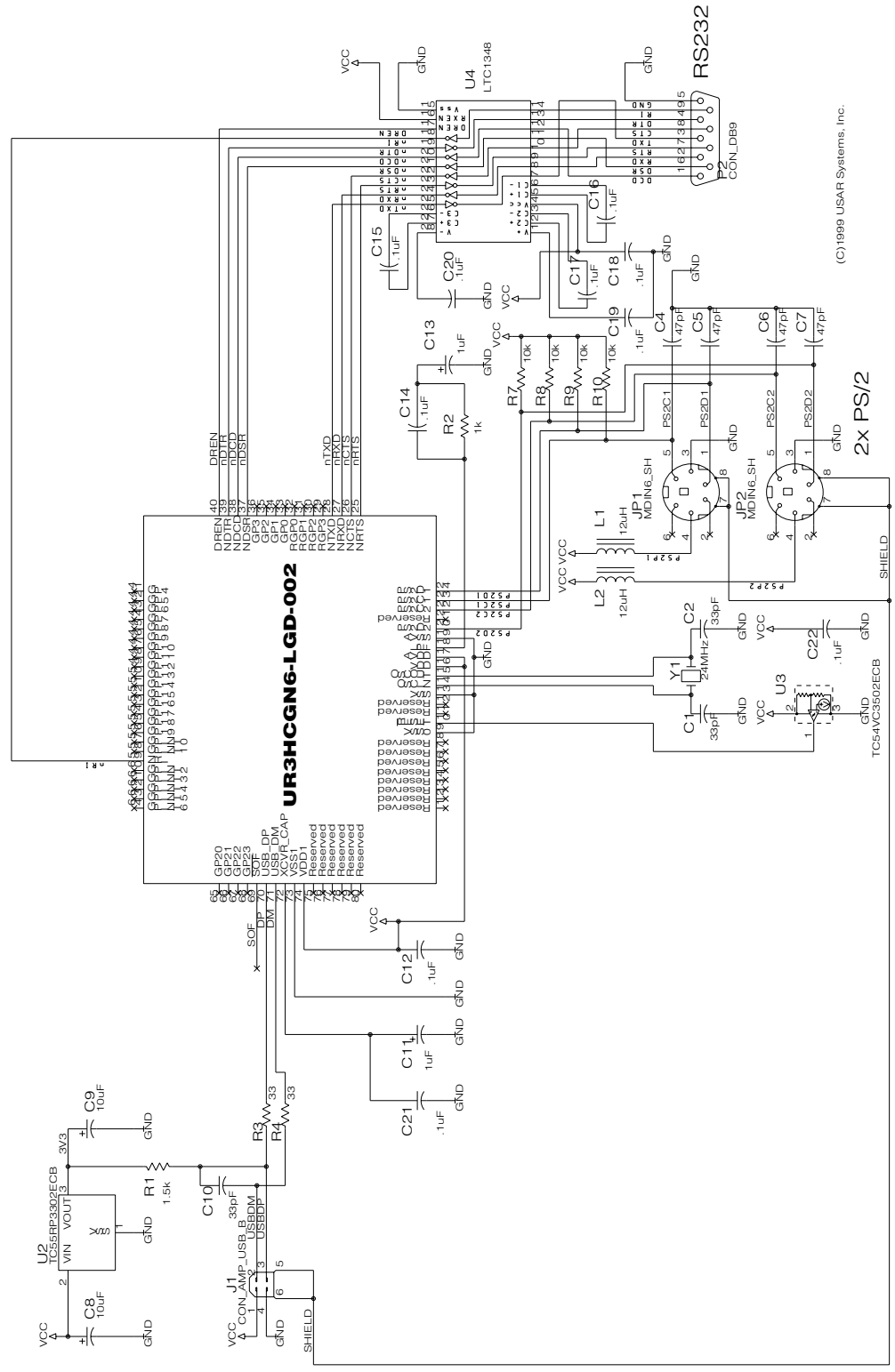
USB Descriptors: Report Descriptors, Continued

Byte #	Data	Mnemonic	Value
111	c0	End Collection	
112	c0	End Collection	
113	0901	Usage	Pointer
115	a101	Collection	Application
117	8503	Report	ID 3
119	0901	Usage	Pointer
121	a100	Collection	Linked
123	0509	Usage Page	Button
125	1901	Usage Minimum	Button 1
127	2901	Usage Maximum	Button 1
129	1500	Logical Minimum	0
131	2501	Logical Maximum	1
133	9501	Report Count	1
135	7501	Report Size	1
137	8102	Input	Variable
139	9501	Report Count	1
141	7507	Report Size	7
143	8103	Input	Constant, Variable
145	0501	Usage Page	Generic Desktop
147	0930	Usage	X
149	1564	Logical Minimum	64h (100)
151	268403	Logical Maximum	384h (900)
154	3500	Physical Minimum	0
156	46e803	Physical Maximum	3e8h (1000)
159	9501	Report Count	1
161	7510	Report Size	16
163	8102	Input	Variable
165	0931	Usage	Y
167	1564	Logical Minimum	64h (100)
169	268403	Logical Maximum	384h (900)
172	3500	Physical Minimum	0
174	46e803	Physical Maximum	3e8h (1000)
177	9501	Report Count	1
179	7510	Report Size	16
181	8102	Input	Variable
183	c0	End Collection	
184	c0	End Collection	
185	0501	Usage Page	Generic Desktop
187	0980	Usage	System Control
189	a101	Collection	Application
191	8504	Report ID	4
193	0981	Usage	System Power Down
195	1500	Logical Minimum	0
197	2501	Logical Maximum	1
199	7501	Report Size	1
201	9501	Report Count	1
203	8106	Input	Variable, Relative
205	0982	Usage	System Sleep
207	1500	Logical Minimum	0
209	2501	Logical Maximum	1
211	7501	Report Size	1
213	9501	Report Count	1
215	8106	Input	Variable, Relative
217	0983	Usage	System Wake Up
219	1500	Logical Minimum	0

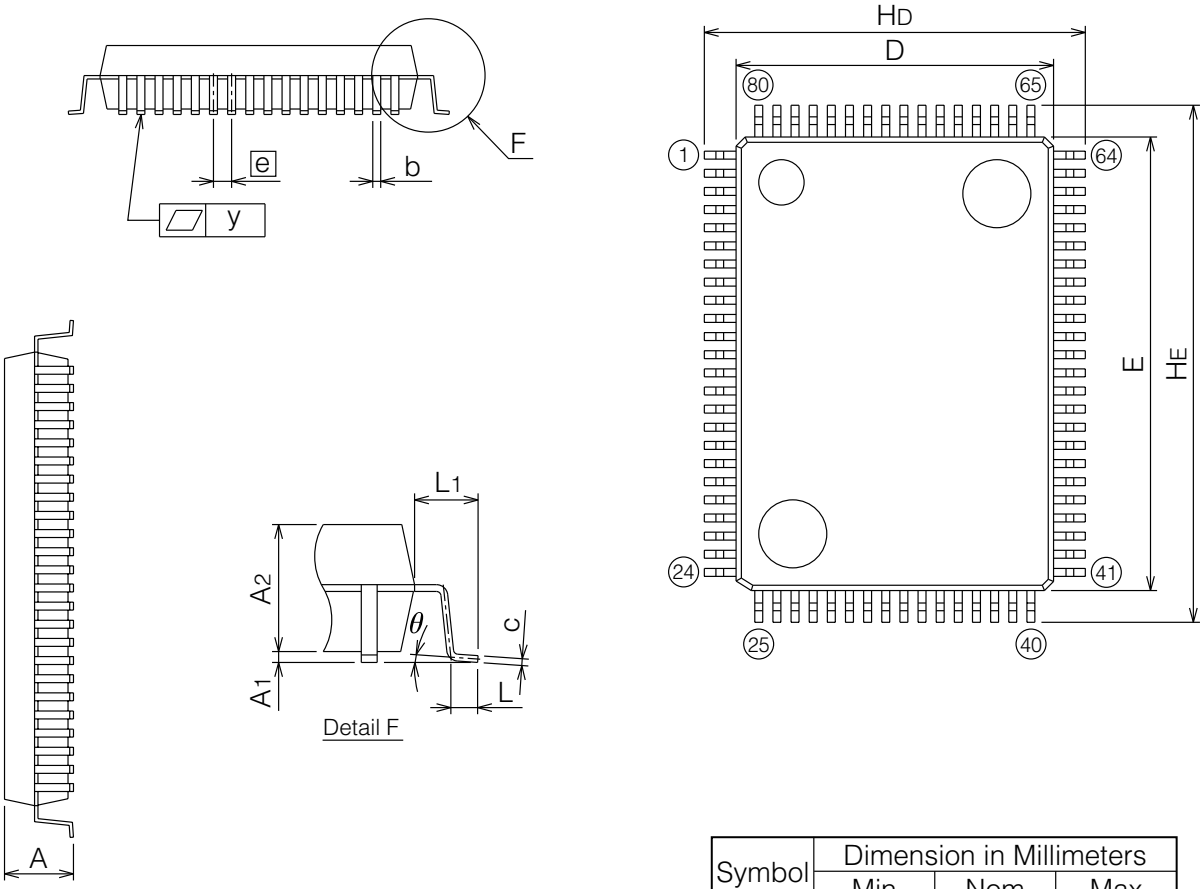
USB Descriptors: Report Descriptors, Continued

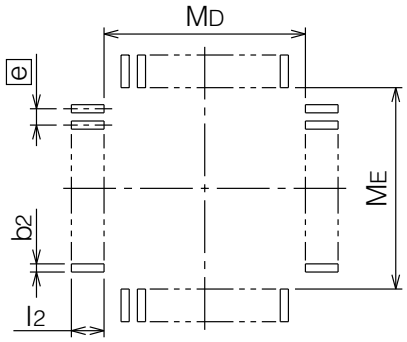
Byte #	Data	Mnemonic	Value
221	2501	Logical Maximum	1
223	7501	Report Size	1
225	9501	Report Count	1
227	8106	Input	Variable, Relative
229	7505	Report Size	1
231	9501	Report Count	5
233	8103	Input	Constant, Variable
235	c0		

Suggested interfacing for the USAR UR3HCGN6-LGD-002-XX



Mechanicals for the USAR UR3HCGN6-LGD-002





Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	–	–	3.05
A_1	0	0.1	0.2
A_2	–	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	–
H_D	16.5	16.8	17.1
H_E	22.5	22.8	23.1
L	0.4	0.6	0.8
L_1	–	1.4	–
y	–	–	0.1
θ	0_j	–	10_j
b_2	–	0.5	–
l_2	1.3	–	–
M_D	–	14.6	–
M_E	–	20.6	–

For sales information and product literature, contact:

USAR Systems, Inc.
568 Broadway
New York, NY 10012
info@usar.com
http://www.usar.com
Telephone 212 226 2042
Telefax 212 226 3215