



A Semtech Company

USAR GeniPS2™ - IC that converts PS/2 data to USB

*Preliminary
USAR Geni™ USB IC family
product specifications*

Description

The USAR GeniPS2™ UR3HCGNP-001 is a single IC that converts PS/2 keyboard and mouse data to USB.

The USAR GeniPS2™ is ideal for applications, such as system legacy support, where a seamless connection of standard PS/2 devices, such as mouse or keyboard to USB is needed.

The USAR GeniPS2™ supports boot mode of the USB 1.1 specification. The keyboard and mouse will therefore function at start-up, before the operating system loads.

The IC offers two hot-pluggable and hot-swappable PS/2 ports; either port can accept a mouse or a keyboard. In addition, the GeniPS2™ 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.

The USAR GeniPS2™ supports remote wake-up function via either mouse or keyboard, if the BIOS of the host machine is configured in this manner.

In addition, the USAR GeniPS2™ supports a multitude of languages, including Korean and Japanese.

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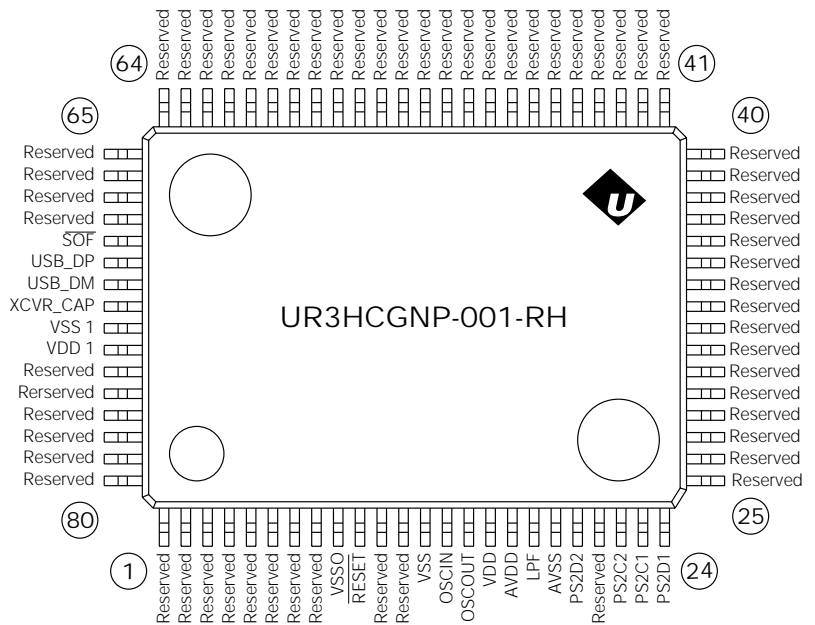
Features

- Interfaces PS/2 devices to USB
- Devices are hot-pluggable
- Supports boot-mode of USB 1.1 specification - both keyboard and mouse function at start-up
- Provides two PS/2 ports
- PS/2 ports support MouseWheel functionality
- PS/2 ports are auto-selectable and hot-swappable – the mouse or keyboard can be used in either port
- Works with standard Windows 98 keyboard and mouse drivers
- Easy to implement
- Few external components required

Applications

- System Legacy Support

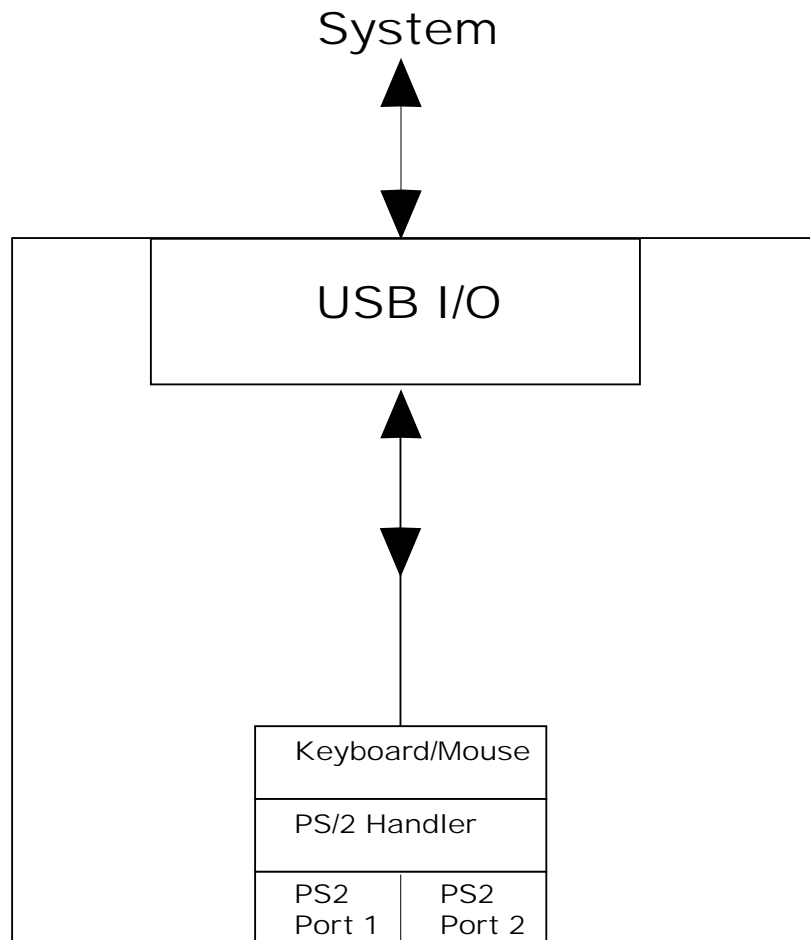
Pin Assignments



Ordering Code

Package options	Pitch in mm's	TA = 0°C to +75°C
80-pin, PQFP	0.8	UR3HCGNP-100-RH
Other Materials	Type	Order number
USAR GeniPS2™ Eval Kit	Evaluation Kit	EVK3-GNP-001-XXX

Block Diagram



USB Functionality

The USAR GeniPS2™ 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 USAR GeniPS2™ 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	QFP	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
XCVRCAP	72	PWR	Bypass line
Reset			
<u>_RESET</u>	10	I	Controller hardware reset pin: Active-low reset line
Oscillator pins			
OSCIN	14	I	Oscillator input: input signal from oscillator
OSCOU	15	O	Oscillator output: output signal to oscillator
LPF	18	O	Loop filter for frequency synthesizer
USB			
<u>_SOF</u>	69	O	USB <u>_SOF</u> 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 25-40 41-69 75-80	N/U	Not used; keep open; reserved for future functions

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

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	12	Descriptor length (18 bytes)
1	bDescriptorType	1	01	Descriptor type
2	bcdUSB	2	0101	USB release
4	bDeviceClass	1	00	Specified in interfaces
5	bDeviceSubClass	1	00	Specified in interfaces
6	bDeviceProtocol	1	00	No protocols on the device basis
7	bMaxPacketSize0	1	08	Maximum packet length (bytes) for endpoint 0 is 8
8	idVendor	2	047A	Vendor ID (USAR)
10	idProduct	2	0101	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	00	Index for serial number string descriptor
17	bNumConfigurations	1	01	Number of configurations
Configuration Descriptor				
0	bLength	1	09	Configuration Descriptor length
1	bDescriptorType	1	02	Configuration Descriptor
2	bTotalLength	2	003B	Total length of descriptors returned with this one
4	bNumInterfaces	1	02	Number of interfaces supported
5	bConfigurationValue	1	01	Value associated with this configuration
6	iConfiguration	1	00	Index for configuration string descriptor – none
7	bmAttributes	1	A0	Configuration Characteristics Bit 7: Reserved (set to one) 1 Bit 6: Self-powered 0 Bit 5: Remote wake-up 1
8	MaxPower	1	32	Maximum Power consumed is 100 mA
String Descriptor				
0	bLength	1	04	Length of language ID
1	bDescriptorType	1	03	Descriptor type (=String)
2	bString	2	0904	Array of Language ID code (=English)
4	bLength	1	1A	Length of Manufacture String
5	bDescriptorType	1	03	Descriptor Type (=String)
6	bString	24	USAR Systems	Manufacturer name
30	bLength	1	2A	Length of product string
31	bDescriptorType	1	03	Descriptor Type (=String)
32	bString	40	USAR Systems Geni PS2	Product Name

USB Descriptors, Cont.

Offset	Field	Size	Value	Description
HID Interface Descriptor (Keyboard)				
0	bLength	1	09	Interface Descriptor length
1	bDescriptorType	1	04	Interface Descriptor
2	bInterfaceNumber	1	00	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	01	Boot protocol
8	iInterface	1	00	Index for interface string descriptor – none
HID Class Descriptor (Keyboard)				
0	bLength	1	09	HID Descriptor length
1	bDescriptorType	1	21	HID Descriptor
2	bcdHID	2	0101	HID Specification Release (1.01)
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	0040	Length of Report Descriptor
EndPoint Descriptor (Keyboard)				
0	bLength	1	07	Endpoint Descriptor Length
1	bDescriptor type	1	05	Endpoint Descriptor
2	bEndpointAddress	1	83	Address:Endpoint3.IN
3	bmAttributes	1	03	Endpoint Attributes: interrupt
4	wMaxPacketSize	2	0008	Maximum Packet Size: 8 bytes
6	bInterval	1	04	Polling Interval

USB Descriptors: Report Descriptors (Keyboard)

Byte #	Data	Mnemonic	Value
0	Usage Page	05 01	Generic Desktop Control
2	Usage	09 06	Keyboard
4	Collection	A1 01	Application
6	Usage Page	05 07	Keyboard/Keypad Keys
8	Usage Minimum	19 E0	224
10	Usage Maximum	29 E7	231
12	Logical Minimum	15 00	0
14	Logical Maximum	25 01	1
16	Report Size	75 01	1
18	Report Count	95 08	8
20	Input	81 02	Data, Variable, Absolute
22	Report Size	75 01	1
24	Report Count	95 08	8
26	Input	81 03	Constant
28	Report Count	95 06	6
30	Report Size	75 01	1
32	Usage Page	05 08	LED
34	Usage Minimum	19 01	1
38	Usage Maximum	29 06	6
40	Output	91 02	Data, Variable, Absolute
42	Report Count	95 01	1
44	Report Size	75 02	2
46	Output	91 03	Constant
48	Report Count	95 06	6
50	Report Size	75 08	8
52	Logical Minimum	15 00	0
54	Logical Maximum	26 FF 00	255
56	Usage Page	05 07	Keyboard/Keypad Keys
58	Usage Minimum	19 00	0
60	Usage Maximum	29 FF	255
62	Input	81 00	Data, Array, Absolute
64	End Collection	C0	

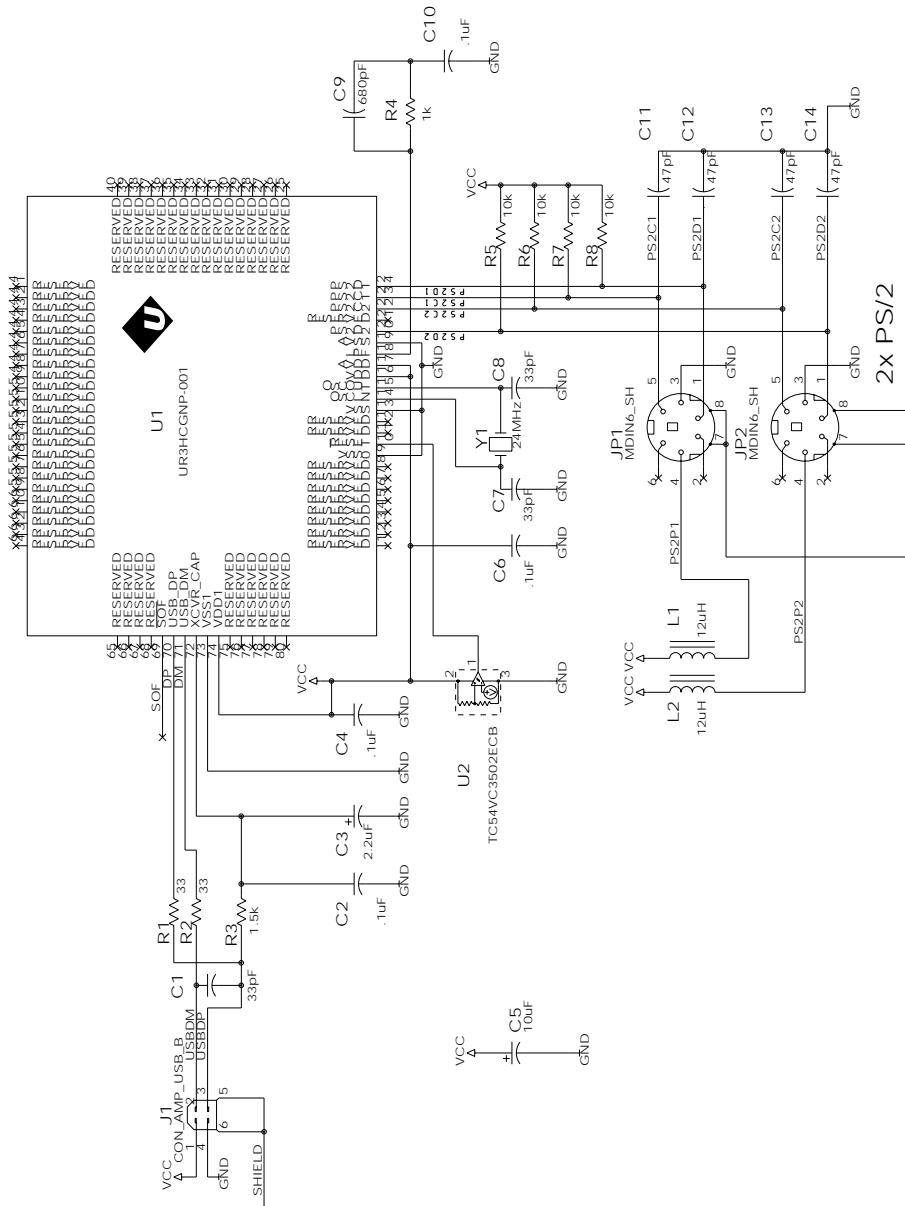
USB Descriptors, Cont.

Offset	Field	Size	Value	Description
HID Interface Descriptor (Mouse)				
0	bLength	1	09	Interface Descriptor length
1	bDescriptorType	1	04	Interface Descriptor
2	bInterfaceNumber	1	01	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	02	Boot protocol
8	iInterface	1	00	Index for interface string descriptor – none
HID Class Descriptor (Mouse)				
0	bLength	1	09	HID Descriptor length
1	bDescriptorType	1	21	HID Descriptor
2	bcdHID	2	0101	HID Specification Release (1.01)
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	0034	Length of Report Descriptor
EndPoint Descriptor (Mouse)				
0	bLength	1	07	Endpoint Descriptor Length
1	bDescriptor type	1	05	Endpoint Descriptor
2	bEndpointAddress	1	84	Address:Endpoint4.IN
3	bmAttributes	1	03	Endpoint Attributes: interrupt
4	wMaxPacketSize	2	0004	Maximum Packet Size: 8 bytes
6	bInterval	1	04	Polling Interval

USB Descriptors: Report Descriptors (Mouse)

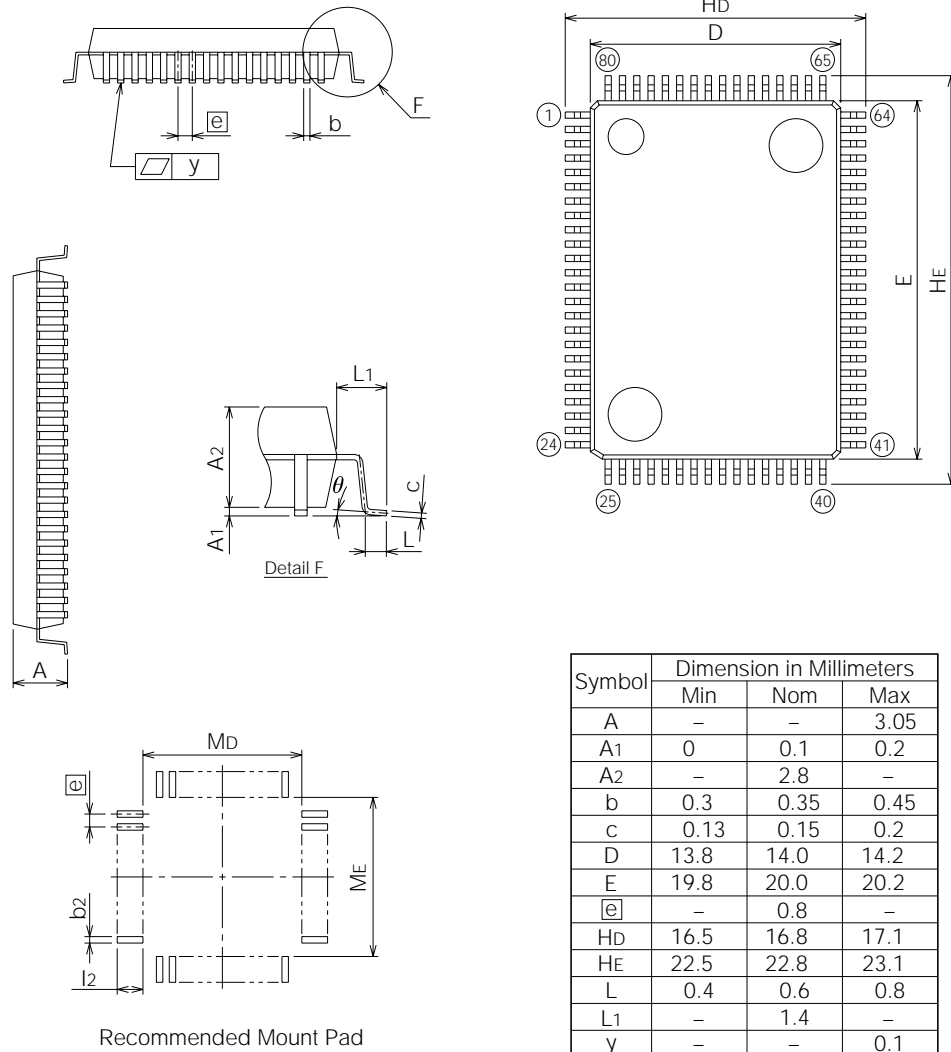
Byte #	Data	Mnemonic	Value
0	Usage Page	05 01	Generic Desktop Control
2	Usage	09 02	Mouse
4	Collection	A1 01	Application
6	Usage	09 01	Pointer
8	Collection	A1 00	Physical
10	Usage Page	05 09	Button
12	Usage Minimum	19 01	1
14	Usage Maximum	29 03	3
16	Logical Minimum	15 00	0
18	Logical Maximum	25 01	1
20	Report Count	95 03	3
22	Report Size	75 01	1
24	Input	81 02	Data, Variable, Absolute
26	Report Count	95 01	1
28	Report Size	75 05	5
30	Input	81 01	Constant
32	Usage Page	05 01	Generic Desktop Control
34	Logical Minimum	15 81	-127
36	Logical Maximum	25 7F	127
38	Report Size	75 08	8
40	Report Count	95 03	3
42	Usage	09 30	X
44	Usage	09 31	Y
46	Usage	09 38	Wheel
48	Input	81 06	Data, Variable, Relative
50	End Collection	C0	
52	End Collection	C0	

Suggested Interfacing for the USAR GeniPS2™ UR3HCGNP-001



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 UR3HCGNP-001 2xPS2-to-USB Interface #NPP001.SCH R 1.2

Mechanical Information for the USAR UR3GNP-001 Package



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	-

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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	° C
UR3HCGNP-001-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	fosc				MHz
■ Crystal Option			24.0		
■ External Clock Option			24.0		

*Preliminary**USAR Geni™ USB IC family
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UR3HCGNP-001-XX BOM

Description	Quantity	Manufacturer	Part#	Description
Capacitors:				
C1, C7, C8	3	Generic	Any	33pF, Ceramic, NPO/COG
C2,C4, C6, C10	4	Generic	Any	.1uF, Ceramic, X7R
C3	1	Generic	Any	2.2uF, Tantalum
C5	1	Generic	Any	10uF, Tantalum
C9	1	Generic	Any	680pF, Ceramic, NPO/COG
C11,C12,C13,C14	4	Generic	Any	47pF, Ceramic, NPO/COG
ICs:				
U1	1	USAR	UR3GNP-001	USAR GeniPS2™ Controller
U2	1	Generic	TC54VC3502ECB	
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	12uH
<hr/>				
Total # Comp	28			

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For sales information
and product literature,
contact:

USAR – A Semtech Company
568 Broadway
New York, NY 10012
info@usar.com
<http://www.usar.com>
212 226 2042 Telephone
212 226 3215 Telefax

In Japan:
Semtech Japan
Tel: 81-45-948-5925
Fax: 81-45-948-5930

In Taiwan:
Semtech Asia/Pacific Sales
Tel: 011-886-2-2748-3380
Fax: 011-886-2-2748-3390

Koryo Electronics Co., Ltd.
Telephone +886-2-2698-1143
E-mail alex.chen@koryo.com.tw

In Korea:
Semtech Korea
Tel: 011-82-2-527-4377
Fax: 011-82-2-527-4376

In Europe
Semtech Limited
Tel: +44-1592-630350
Fax: +44-1592-774781

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