GammaRay USB Module







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GammaRay-64 USB Module



Figure 1 - GammaRay-64

GammaRay-256 USB Module



Figure 2 - GammaRay-256

Main Features

Easy installation

The GammaRay devices are Low Speed USB HID compliant using default USB HID drivers and powered by the USB Bus.

Digital Inputs

GammaRay-64 device support up to 64 individual inputs. GammaRay-256 device support up to 256 individual inputs.

Keyboard Emulation

Keyboard emulation using Keyboard Studio.

Introduction

The GammaRay USB module has been developed for applications requiring hardware input such as switches or digital circuitry such as ADCs. When used with switches, the multiplexed inputs prevent phantom signals or "ghosting" and do not require individual diodes such as scan matrix designs.

Being a Low Speed USB HID compliant device, GammaRay utilizes default drivers included with operating systems.

GammaRay-64 Pin-Out

JP1 – JP2 Pin-Out

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COMMON GND 34	17 INPUT	1	COMMON GNE	34	17	INPUT 33
INPUT 2 33	16 INPUT	3	INPUT 3	1 33	16	INPUT 35
INPUT 4 32	15 INPUT	5	INPUT 3	3 32	15	INPUT 37
INPUT 6 31	14 INPUT	7	INPUT 3	3 31	14	INPUT 39
INPUT 8 30	13 INPUT	9	INPUT 4	30	13	INPUT 41
INPUT 10 29	12 INPUT	11	INPUT 4	2 29	12	INPUT 43
INPUT 12 28	11 INPUT	13	INPUT 4	1 28	11	INPUT 45
INPUT 14 27	10 INPUT	15	INPUT 4	3 27	10	INPUT 47
INPUT 16 26	9 INPUT	17	INPUT 4	3 26	9	INPUT 49
INPUT 18 25	8 INPUT	19	INPUT 5	25	8	INPUT 51
INPUT 20 24	7 INPUT	21	INPUT 5	2 24	7	INPUT 53
INPUT 22 23	6 INPUT	23	INPUT 5	23	6	INPUT 55
INPUT 24 22	5 INPUT	25	INPUT 5	3 22	5	INPUT 57
INPUT 26 21	4 INPUT	27	INPUT 5	3 21	4	INPUT 59
INPUT 28 20	3 INPUT	29	INPUT 6	20	3	INPUT 61
INPUT 30 19	2 INPUT	31	INPUT 6	2 19	2	INPUT 63
INPUT 32 18		ON GND	INPUT 6	18	1	COMMON GND
					The second se	
			4	L		
	0			œ		
			10			

GammaRay-256 Pin-Out

INPUT 26 21 4 INPUT 27 INPUT 28 20 3 INPUT 29

INPUT 30 19 2 INPUT 31

18

路

INPUT 32 18 1 COMMON GND



INPUT 58

4

8

21 4 INPUT 59 INPUT 60 20 3 INPUT 61

8-

INPUT 62 19 2 INPUT 63

18

INPUT 64 18 1 COMMON GND

JP1 – JP2 Pin-Out

JP3 – JP4 Pin-Out

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COM	MON GND	34	17	INPUT 65	COMMON GND	34	17	INPUT 97
	INPUT 66	33	16	INPUT 67	INPUT 98	33	16	INPUT 99
	INPUT 68	32	15	INPUT 69	INPUT 100	32	15	INPUT 101
2	INPUT 70	31	14	INPUT 71	INPUT 102	31	14	INPUT 103
	INPUT 72	30	13	INPUT 73	INPUT 104	30	13	INPUT 105
10	INPUT 74	29	12	INPUT 75	INPUT 106	29	12	INPUT 107
4	INPUT 76	28	11	INPUT 77	INPUT 108	28	11	INPUT 109
	INPUT 78	27	10	INPUT 79	INPUT 110	27	10	INPUT 111
	INPUT 80	26	9	INPUT 81	INPUT 112	26	9	INPUT 113
	INPUT 82	25	8	INPUT 83	INPUT 114	25	8	INPUT 115
	INPUT 84	24	7	INPUT 85	INPUT 116	24	7	INPUT 117
ω	INPUT 86	23	6	INPUT 87	INPUT 118	23	6	INPUT 119
	INPUT 88	22	5	INPUT 89	INPUT 120	22	5	INPUT 121
12	INPUT 90	21	4	INPUT 91	INPUT 122	21	4	INPUT 123
0	INPUT 92	20	3	INPUT 93	INPUT 124	20	3	INPUT 125
	INPUT 94	19	2	INPUT 95	INPUT 126	19	2	INPUT 127
	INPUT 96	18	1	COMMON GND	INPUT 128	18	1	COMMON GND
4		ī	-			16	-	·

Itions	34	JP5		C10	34	JP6	JP7
COMMON GND	34	17	INPUT 129	COMMON GND	34	17	INPUT 161
INPUT 130	33	16	INPUT 131	INPUT 162	33	16	INPUT 163
INPUT 132	32	15	INPUT 133	INPUT 164	32	15	INPUT 165
INPUT 134	31	14	INPUT 135	INPUT 166	31	14	INPUT 167
INPUT 136	30	13	INPUT 137	INPUT 168	30	13	INPUT 169
INPUT 138	29	12	INPUT 139	INPUT 170	29	12	INPUT 171
INPUT 140	28	11	INPUT 141	INPUT 172	28	11	INPUT 173
INPUT 142	27	10	INPUT 143	INPUT 174	27	10	INPUT 175
INPUT 144	26	9	INPUT 145	INPUT 176	26	9	INPUT 177
INPUT 146	25	8	INPUT 147	INPUT 178	25	8	INPUT 179
INPUT 148	24	7	INPUT 149	INPUT 180	24	7	INPUT 181
INPUT 150	23	6	INPUT 151	INPUT 182	23	6	INPUT 183
INPUT 152	22	5	INPUT 153	INPUT 184	22	5	INPUT 185
INPUT 154	21	4	INPUT 155	INPUT 186	21	4	INPUT 187
INPUT 156	20	3	INPUT 157	INPUT 188	20	3	INPUT 189
INPUT 158	19	2	INPUT 159	INPUT 190	19	2	INPUT 191
INPUT 160	18	1	COMMON GND	INPUT 192	18	1	COMMON GND
	18	-		U12	18	1	<u> </u>

JP5 – JP6 Pin-Out

JP7 – JP8 Pin-Out

JP6 34	34 177		2	3 4	JP8	
COMMON GND	34 17	INPUT 193	COMMON GND	34	17	INPUT 225
INPUT 194	33 16	INPUT 195	INPUT 226	33	16	INPUT 227
INPUT 196	32 15	INPUT 197	INPUT 228	32	15	INPUT 229
INPUT 198	31 14	INPUT 199	INPUT 230	31	14	INPUT 231
INPUT 200	30 13	INPUT 201	INPUT 232	30	13	INPUT 233
INPUT 202	29 12	INPUT 203	INPUT 234	29	12	INPUT 235
NPUT 204	28 11	INPUT 205	INPUT 236	28	11	INPUT 237
INPUT 206	27 10	INPUT 207	INPUT 238	27	10	INPUT 239
INPUT 208	26 9	INPUT 209	INPUT 240	26	9	INPUT 241
INPUT 210	25 8	INPUT 211	INPUT 242	25	8	INPUT 243
_INPUT 212	24 7	INPUT 213	INPUT 244	24	7	INPUT 245
HNPUT 214	23 6	INPUT 215	INPUT 246	23	6	INPUT 247
CINPUT 216	22 5	INPUT 217	INPUT 248	22	5	INPUT 249
INPUT 218	21 4	INPUT 219	INPUT 250	21	4	INPUT 251
INPUT 220	20 3	INPUT 221	INPUT 252	20	3	INPUT 253
INPUT 222	19 2	INPUT 223	INPUT 254	19	2	INPUT 255
INPUT 224	18 1	COMMON GND	INPUT 256	18	1	COMMON GND
U12 C10	18 -		}	18	-	

Connecting Various Switches

The Plasma module does not use a scan matrix type of input layout. As such diodes are not required since it does not suffer from phantom signals when activating several switch inputs at the same time.



Push Button Switches



Knitter Rotary Switches

These are special rotary type switches that do not require a decoder circuit in order to be used with the Plasma button inputs. Typical rotary encoders require a decoder circuit in order to convert the output signals into a form usable by this USB module.



Mechanical / Optical Rotary Encoders

These types of rotary encoders require a decoder circuit in order to convert the output signals into a form usable by this USB module. Rotary output signals can be 2-bit gray code or 2-bit quadrature code.



Hardware Specifications

The GammaRay-64 firmware runs at 10 ms iteration rate whereas the GammaRay-256 firmware runs at 40 ms iteration rate. As such, any custom interface software should poll this device at least every 10 ms to prevent missing any input. All inputs are active low, which means you must ground an input in order to register a high "on" signal at the output.

Windows will detect and load the appropriate HID driver for your the device and does not require that a custom device driver be installed.

Maximum power consumption is 750mW (150mA) and is USB bus powered. You do not need to use an external power supply for this device, even when connecting (and powering) several rotary decoder modules to the onboard power pins specifically added for this purpose.



Mechanical Specifications: GammaRay-64

Figure 3 - GammaRay-64

Bill Of Materials: GammaRay-64

- C1 0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
- C2 0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
- C3 0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
- C4 0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
- C5 0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
- C6 0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
- C7 0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
- D1 1N914 Diode
- J1 USB Type 'B' Connector (Digi-Key Part No. 787780-1-ND)
- JP1 Header, 17-Pin, Dual row
- JP2 Header, 17-Pin, Dual row
- JP3 Header, 2-Pin, Right Angle
- R1 10K, 10%, 1/4W
- R2 1.5K, 1%, 1/4W
- U1 HCF4067BEY Analog Multiplexer/Demultiplexer
- U2 HCF4067BEY Analog Multiplexer/Demultiplexer
- U3 HCF4067BEY Analog Multiplexer/Demultiplexer
- U4 HCF4067BEY Analog Multiplexer/Demultiplexer
- U5 PIC16C765-I/P EPROM-Based 8-Bit CMOS Microcontroller with A/D Converter 40 pin DIP socket for the PIC Micro
- Y1 6MHz Ceramic Resonator (Digi-Key Part no. X904-ND)



Mechanical Specifications: GammaRay-256

Figure 4 - GammaRay-256

Bill Of Materials: GammaRay-256

C1	0.1μF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C2	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C3	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C4	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C5	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no, BC1127CT-ND)
C6	0 1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C7	0.1µF, 20%, 50V/DC Ceramic (Digi-Key Part no. BC1127CT-ND)
C8	0.1μ , 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C10	0.1μ , 20%, 50VDC Ceramic (Digi-Key Part no. DC1127CT-ND)
C10	0.1μ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C12	0.1μ F, 20%, 50VDC Ceramic (Digi-Key Part no. DC1127CT-ND) 0.1 μ F, 20%, 50VDC Ceramic (Digi-Key Part no. DC1127CT-ND)
012	0.1μ F, 20%, 50VDC Ceramic (Digi-Key Part no. DC1127CT-ND)
	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
014	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C15	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C16	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C17	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127C1-ND)
C18	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C19	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
D1	1N914 Diode
J1	USB Type 'B' Connector (Digi-Key Part No. 787780-1-ND)
JP1	Header, 17-Pin, Dual row
JP2	Header, 17-Pin, Dual row
JP3	Header, 17-Pin, Dual row
JP4	Header, 17-Pin, Dual row
JP5	Header, 17-Pin, Dual row
JP6	Header, 17-Pin, Dual row
JP7	Header, 17-Pin, Dual row
JP8	Header, 17-Pin, Dual row
JP9	Header, 2-Pin, Right Angle
R1	1.5K. 1%. 1/4W
R2	10K, 10%, 1/4W
U1	HCF4067BEY Analog Multiplexer/Demultiplexer
U2	HCF4067BEY Analog Multiplexer/Demultiplexer
U3	HCE4067BEY Analog Multiplexer/Demultiplexer
114	HCE4067BEY Analog Multiplexer/Demultiplexer
U5	HCE4067BEY Analog Multiplexer/Demultiplexer
116	HCE4067BEY Analog Multiplexer/Demultiplexer
117	HCE4067BEY Analog Multiplexer/Demultiplexer
118	HCE4067BEY Analog Multiplexer/Demultiplexer
10	HCE4067BEV Appleg Multiplexer/Demultiplexer
09	HCE4067BET Analog Multiplexer/Demultiplexer
	HCF4067DET Analog Multiplexer/Demultiplexer
012	HCF4067BEY Analog Multiplexer/Demultiplexer
013	
014	
U15	
U16	HCF406/BEY Analog Multiplexer/Demultiplexer
U17	PIC16C/65-I/P EPROM-Based 8-Bit CMOS Microcontroller with A/D Converter
	40 pin DIP socket for the PIC Micro
V1	6MHz Ceramic Resonator (Digi-Key Part no. X904-ND)

Y1 6MHz Ceramic Resonator (Digi-Key Part no. X904-ND) IMPORTATNT: You can substitute the analog multiplexer IC's (HCF4067BEY) with practically any other kind without any degradation in performance. Feel free to buy the least expensive types available from your local supplier of electronic components.

Please verify the specs of the ceramic resonator before substituting with any other kind. If you have a hard time finding these ceramic resonators, you can order them from Digi-Key.

Installing the headers and the USB 'B' connector is up to you. You can connect all the buttons and USB wires directly to the PCB board but I do not recommend doing this.

Visit www.betainnovations.com for the availability of preprogrammed Microchip micros.