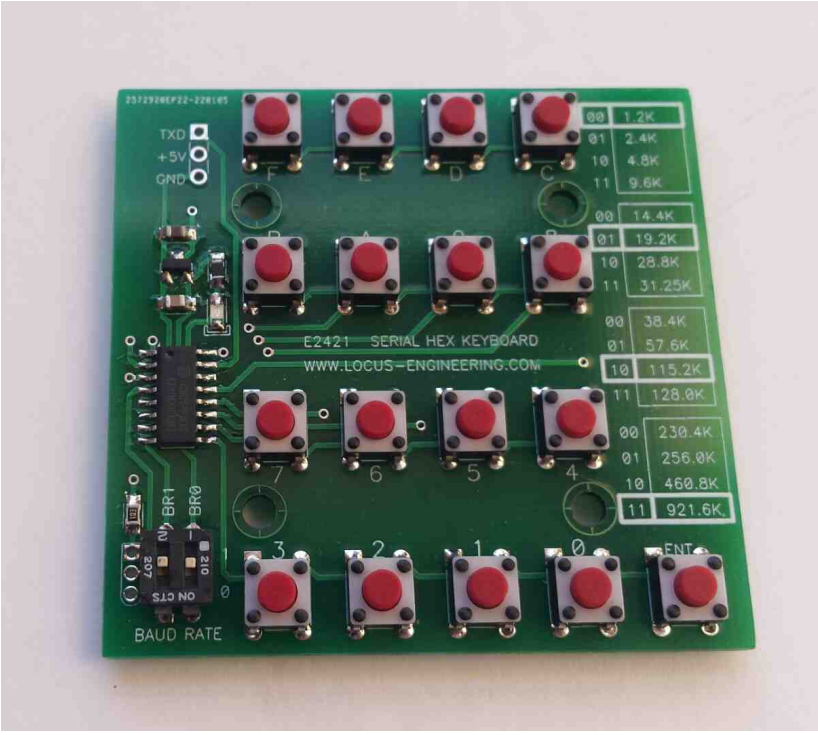
Locus Engineering Inc. E2421

Serial Hex Keyboard



FEATURES

- 0-9, A-F shifted hex entry into byte
- byte is sent at selected baud rate on <Enter> key closure
- 20msec debounced keys
- 16 commonly used baud rates from 1.2K to 921.6K
- TTL/3.3V logic compatible outputs
- +3.3V to +5.5V operation
- 5.5mA supply current
- 2.6”W x 2.3”H size
- #4 mounting holes on 1.25”H by 1.25”V

DESCRIPTION

The E2421 Serial Hex Keyboard provides an easy to use debounced hex entry into a byte which is sent at the selected baud rate on closure of the <Enter> key. This keyboard is useful for single stepping serial data without a PC. There are 16 baud rates between 1.2K to 921.6K organized into four baud groups of four specific baud rates. On power up the baud group is set, and following this the specific baud rate can set using the switch settings. The keys are on a 0.375”H by 0.625”V grid and the keyboard is easily mounted with #4 hardware or standoffs. Power input is +3.3V to +5.5V and the outputs are TTL or 3.3V logic compatible.

APPLICATIONS

- custom keyboards
- industrial controls
- engineering development

Table 1. Absolute Maximum Ratings

Parameter	Rating
Input Voltage to GND	-0.3 to +5.5V
Operating temperature range	-40 to +85°C
Storage temperature range	-65 to +150°C
Maximum output current through port pin	100mA
Maximum total current through Vdd or GND	300mA

Table 2. Electrical Characteristics

Test Conditions: Supply Voltage V_{dd} = +5.0V, $T_{ambient}$ = 25° C, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{dd}	Supply voltage	3.3	5.0	5.5	V
I_{dd}	Supply current		5.5		mA
V_{OH}	Digital high output voltage	2.5V @Iout -10mA	2.6V @Iout -3mA	3.2V @Iout -10µA	V
V_{OL}	Digital low output voltage	0.1V @Iout 10µA	0.6V @Iout 10mA	1.0V @Iout 25mA	V
$T_{debounce}$	Debounce time		20		msec
F_{baud}	Baud Rate	1.2K		921.6K	baud

General Precautions

Charged devices and circuit boards can discharge without warning. Proper ESD precautions should be followed to avoid failure.

This device is not authorized for use in any product where the failure or malfunction of the product can reasonably be expected to cause failure in a life support system or to significantly affect its operation.

Locus Engineering Inc. reserves the right to make changes at any time without notice to improve product features or reliability.

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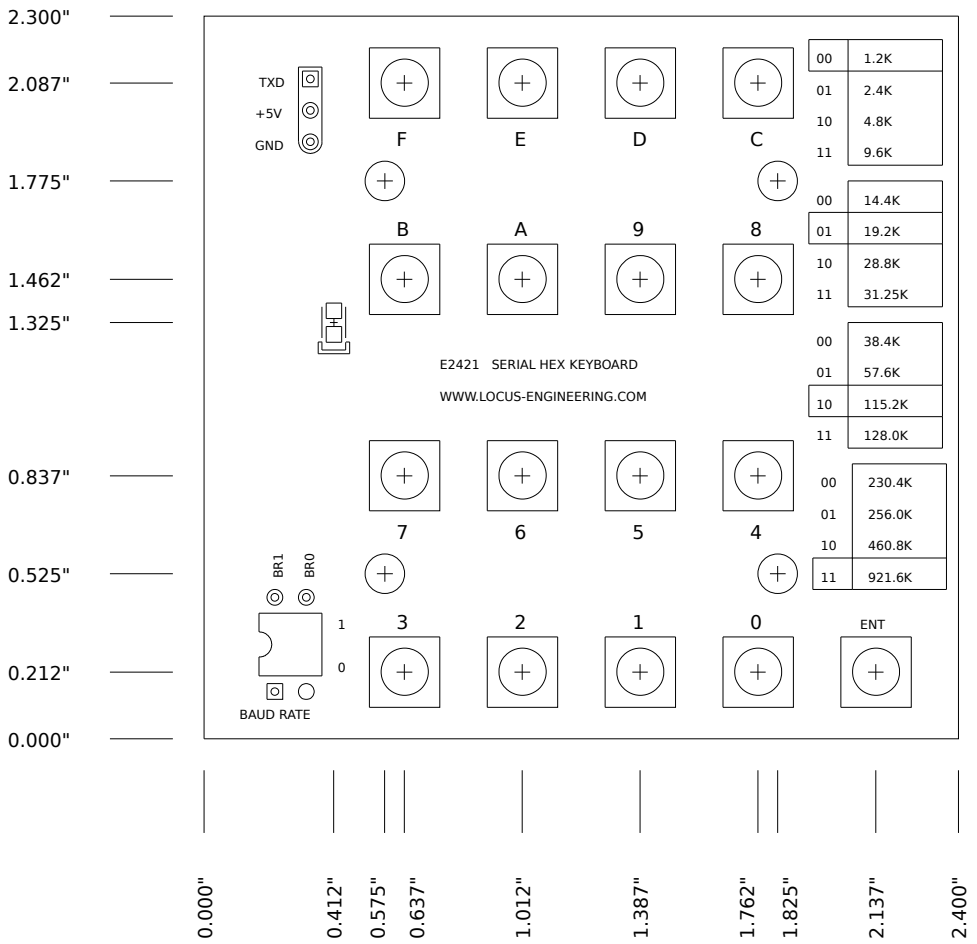

Figure 1. Mechanical Dimensions

Table 3. Pin Descriptions

Pin#	Name	Function
1	TXD	Serial output, 0-3.3V, 1.2Kbaud to 921.6Kbaud
2	+5V	+3.3V to +5.5V
3	GND	Ground

Power Supply

The E2421 keyboard will operate from voltages between +3.3V to +5.5V, and uses approximately 5.5mA of current. An onboard low dropout (~40mVf @ 10mA) regulator supplies ~3.3V to the microcontroller. For supply voltages lower than ~3.3V, the microcontroller will continue operating to ~2V however the output voltage will be reduced accordingly, therefore compatibility with the receiving circuit needs to be assured.

Serial Output

The TXD digital output pin is push-pull with a 0 to +3.3V voltage swing and is compatible with 5V TTL or LVC inputs or 3.3V logic. The serial output can drive +/-10mA while still meeting TTL logic thresholds. To send data to a PC, the output needs to be converted to RS-232 levels using a MAX232™ or equivalent. The serial byte is sent as 8N1, i.e. eight bits, no parity, and one stop bit. Thus each byte sent uses 10 bits. The period for each byte is roughly 10/baud rate. Thus a byte at 1.2Kbaud takes ~10/1,200 = 8.333msec, and a byte at 921.6Kbaud takes ~10/921,600 = 10.85 μsec. The byte is sent as one start bit (always low) + eight bits + stop bit (always high), and are sent least significant bit first.

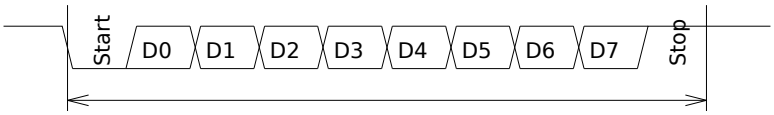

Figure 2. Serial Bit Order

The baud rate will affect the maximum distance for reliable data transmission. Lower baud rates allow longer distances. Cable length is typically halved for every doubling of the baud rate. Cable lengths for the highest baud rates should be limited to under 25cm or 10".

Reset

The power-on reset circuitry is self-contained within the module. Ensure the power supply ramp is faster than 1msec. On reset, the baud rate group and actual baud rate are initialize.

Keyswitches

The keyboard is supplied with 17 keys soldered in place, however the board is also available without keys to allow the use of switches with different button heights. User supplied keyswitches should have bounce times of <10msec.

Switches are standard types with 4.5mm x 6.5mm pin spacings. The switches are spaced 0.375" horizontally and 0.625" vertically. The switches supplied have a button height of 1.6mm or 0.062” however other switches in the same series have longer button heights to accommodate different packaging requirements. Contact Locus Engineering Inc. for custom orders.

Operation

On power up, the E2421 reads the baud rate group according to the baud rate dipswitch setting. The baud rate is set to the highlighted value within the group. After power up, the baud rate can be changed to one of four values within the baud rate group. For example, for BR1 BR0 = 10, the baud rate becomes 115.2Kbaud on power up. Changing the BR1 BR0 dipswitch now allows the baud rate to be set to 38.4K, 57.6K, 115.2K, or 128.0K for 00, 01, 10, 11 settings.

00	1.2K	00	14.4K	00	38.4K	00	230.4K
01	2.4K	01	19.2K	01	57.6K	01	256.0K
10	4.8K	10	28.8K	10	115.2K	10	460.8K
11	9.6K	11	31.25K	11	128.0K	11	921.6K

Figure 3. Baud Rate Settings

The E2421 debounces each of the keyswitches to provide immunity from EMI and also a fast response to a valid switch closure. Keys are debounced when they are solidly low for ~20msec. Valid key closures for 0-9 and A to F have their nibble values shifted into a byte register. Pressing the Enter key sends the byte out the serial port at the selected baud rate. The LED flashes after the byte has been sent. Pressing the Enter key again sends the same byte unless new hex values have been entered.