

FEATURES

- reference design based on Randolph Telecom AN-5 for experimental purposes
- microcontroller compatible
- ring detect output with LED indication
- solid state on hook/off hook relay with LED indication
- analog transmit output and receive input
- RJ-11 jack
- transmit gain 0dB into 600 Ω
- receive gain 0dB
- isolation barrier between analog side and telephone side
- +5V operation
- 2.375"L 1.2"W 0.6"W

DESCRIPTION

The E2210 Telephone Line Interface is an easy to use module allowing the development of products that will be connected to the telephone network.

APPLICATIONS

- telephone line interface

Table 1. Electrical CharacteristicsTest Conditions: Supply Voltage $V_{dd} = +8.4V$, $T_{ambient} = 25^{\circ}C$, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{dd}	Supply voltage	3.3	5.0	5.5	V
I_{avg}	Average supply current		4.6		mA
	Analog output short circuit current		45		mA
	Isolation voltage		1875		V _{rms}
$T_{operate}$	Operating temperature	-40		+85	$^{\circ}C$

General Precautions

This module is a reference design for development purposes only. It is not approved for connection to the telephone network.

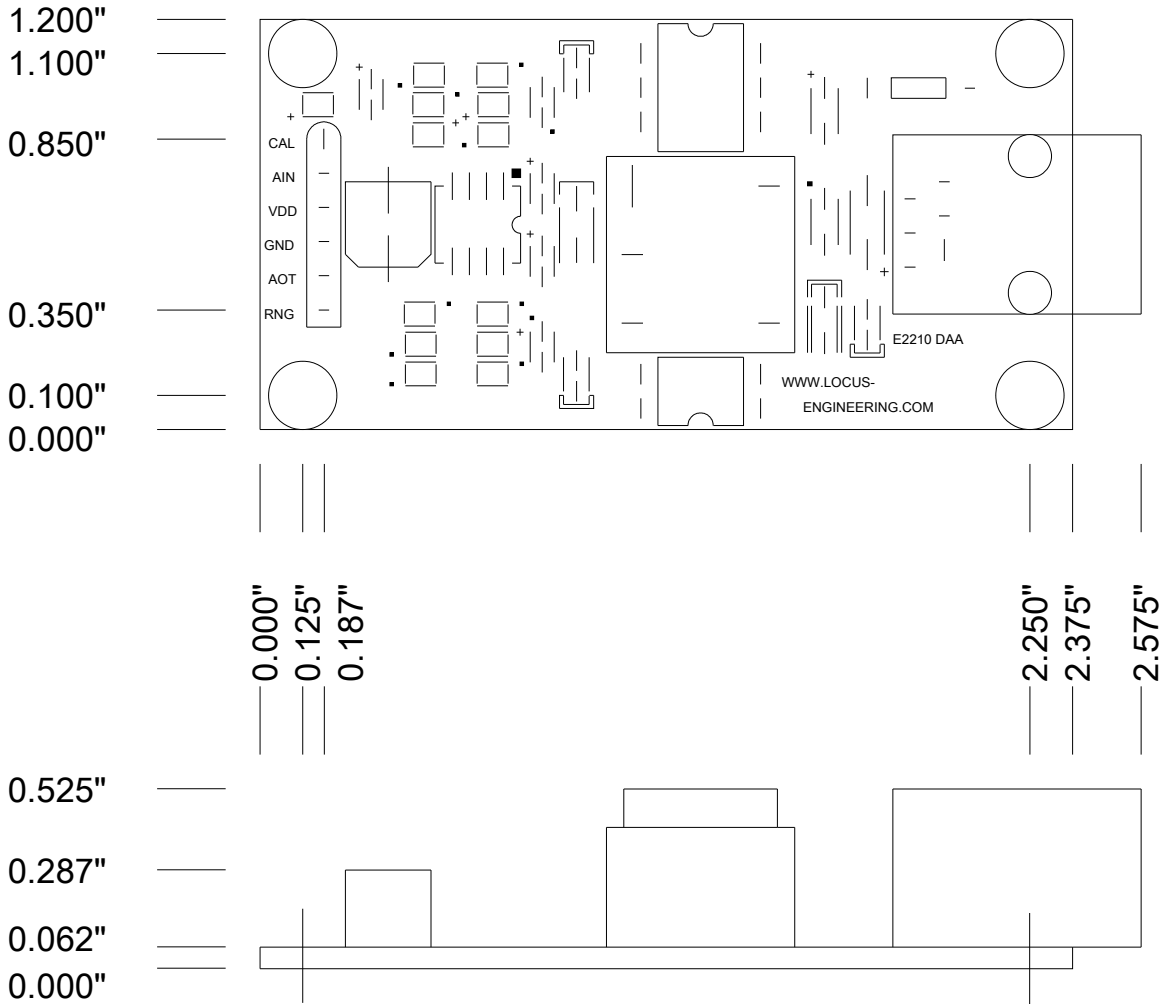
Charged devices and circuit boards can discharge without warning. Proper ESD precautions should be followed to avoid failure.

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.

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TOP VIEW



SIDE VIEW

Figure 1. Module Dimensions

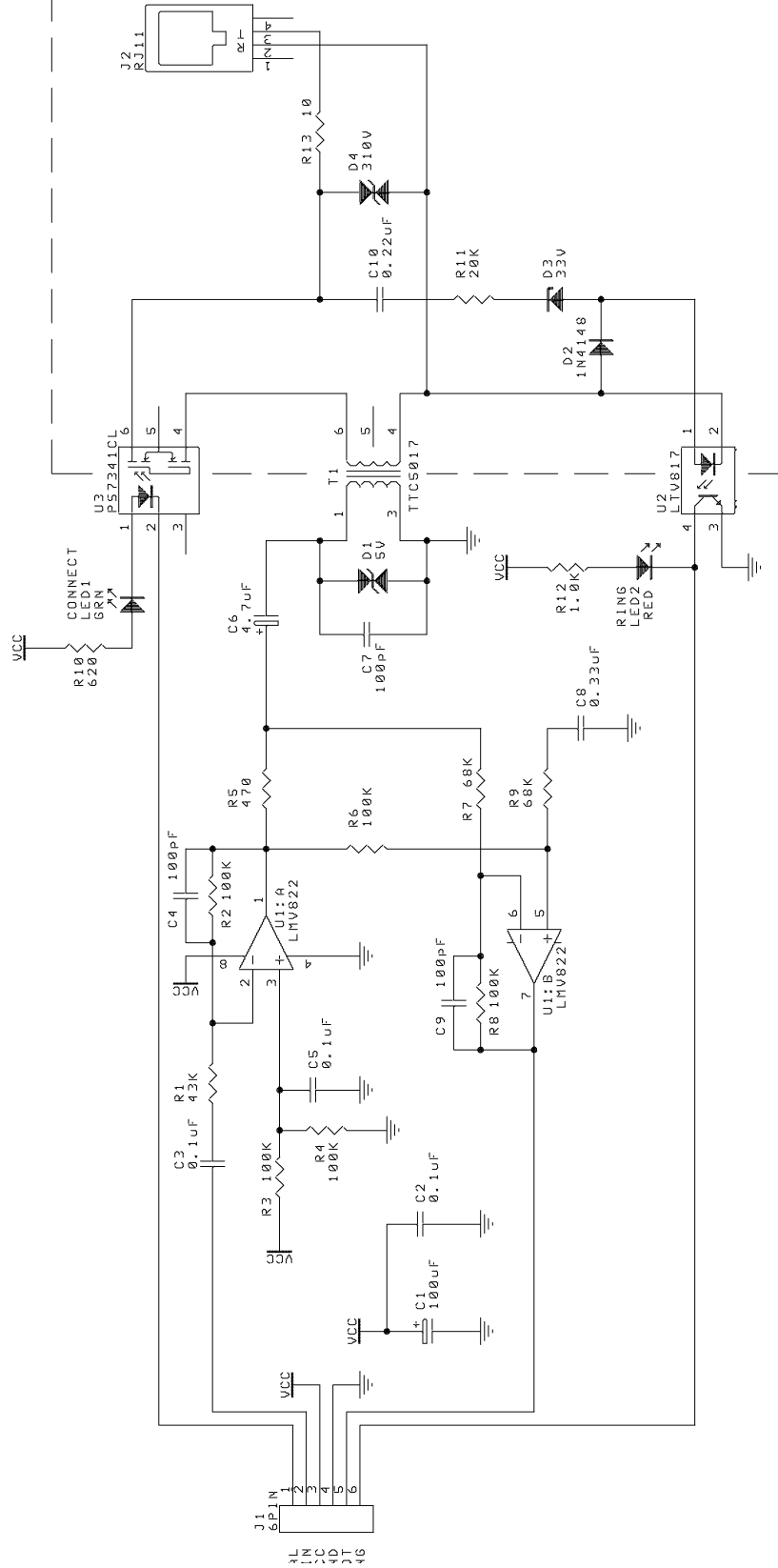


Figure 2. Schematic

Parts list

<u>Item</u>	<u>Ref.Des</u>	<u>Qty</u>	<u>Value</u>	<u>Part Number</u>	<u>Disti.</u>	<u>Distributor #</u>
1	C1	1	Capacitor, aluminum 100uF 16V 6.6mmX6.6mm	UCC EMVE160ADA101MF55G	Digikey	565-2204-1-ND
2	C2,C3,C5	3	Capacitor, ceramic 0.10uF 25V Y5V 0805	MRT GRM216F51E104ZA01D	Digikey	490-1726-1-ND
3	C4,C7,C9	3	Capacitor, ceramic 100pF 50V NPO 0805	SAM CL21C101JCANNNC	Digikey	1276-1261-1-ND
4	C6	1	Capacitor, ceramic 4.7uF 16V Y5V 0805	CC0805ZRY5V6BB475	Digikey	311-1371-1-ND
5	C8	1	Capacitor, ceramic 0.33uF 50V X7R 0805	SAM CL21B334KOCNNNC	Digikey	1276-1797-1-ND
6	C10	1	Capacitor, ceramic 0.22uF 250V X7R 1206	TDK C3216X7T2E224M160AA	Digikey	445-14828-1-ND
7	D1	1	Transzorb, 5V 400mW DO-214AC	VSH SMAJ5.0CA-E3/61	Digikey	SMAJ5.0CA-E3/61GICT-ND
8	D2	1	Diode, sw itching 100V 75mA SOD323	1N4148	Digikey	1N4148WSFSCT-ND
9	D3	1	Diode, zener 33V SOD123	BZT52C33-7-F	Digikey	BZT52C33-FDICT-ND
10	D4	1	Transzorb, 310V DO214AA	TISP4350H3	Digikey	TISP4350H3BJR-SCT-ND
11	J1	1	Connector, 6 pin 0.1"x6 pads	-	-	-
12	J2	1	Connector, RJ11 6P2C	A-2004-0-4-LP-N-R	Digikey	AE10382-ND
13	L1	1	LED, green, 0805	KNG APT2012CGCK	Digikey	754-1127-1-ND
14	L1	1	LED, red, 0805	KNG APT2012SRCPRV	Digikey	754-1132-1-ND
15	R1	1	Resistor, 43K 1/8W 5% 0805	RHM MCR10EZPJ433	Digikey	311-43KARCT-ND
16	R2,R3,R4,R6,R8	5	Resistor, 100K 1/8W 5% 0805	RHM MCR10EZPJ102	Digikey	311-100KARCT-ND
17	R5	1	Resistor, 470 ohm 1/8W 5% 0805	RHM MCR10EZPJ101	Digikey	311-470ARCT-ND
18	R7,R9	2	Resistor, 68K 1/8W 5% 0805	RHM MCR10EZPJ681	Digikey	311-68KARCT-ND
19	R10	1	Resistor, 620 ohm 1/8W 5% 0805	RHM MCR10EZPJ681	Digikey	311-620ARCT-ND
20	R11	1	Resistor, 20K 1/8W 5% 0805	RHM MCR10EZPJ681	Digikey	311-20KARCT-ND
21	R12	1	Resistor, 1.0K 1/8W 5% 0805	RHM MCR10EZPJ681	Digikey	311-1KARCT-ND
22	R13	1	Resistor, 10 ohm 1/8W 5% 0805	RHM MCR10EZPJ681	Digikey	311-10ARCT-ND
23	T1	1	Transformer, telecom 600:600	TTC5017	Digikey	MT7207-ND
24	U1	1	Op amp, general purpose rail to rail S08	LMV822IDT	Digikey	497-12416-1-ND
25	U2	1	Opto-isolator 5KV transistor output	LTV817S-TA	Digikey	160-2038-1-ND
26	U3	1	Solid state relay OCMOS FET 400V 150mA NO	PS7341L-1A-A	Digikey	PS7341L-1A-A-ND

Installation

The module can be mounted using #4 standoffs on a 2.125" by 1.000" pattern.

Power

Use a regulated +5V supply between the Vcc pin 3 and the Gnd pin 4 for optimum operation. Operation at lower voltages is possible such as +3.3V however the analog output swing will be reduced.

Analog Input & Output

The analog input at the AIN pin 2 requires line level audio between 300Hz and 3.3KHz which conforms to the telephone bandwidth.

The analog output at the AOT pin 5 can drive a 600 ohm load and is not AC coupled, however the output is centered at $V_{cc}/2$.

Ring Detect

On reception of a ringing voltage between the tip and ring, an active low pulsing output is produced at the RNG pin 6 by the ring detect opto-coupler, and the red ring detect LED flashes.

Off/On Hook

To answer or make a call, an active low signal is applied to the CAL pin 1; this energizes the solid state relay and illuminates the green On Hook LED.

Additional Notes

Bandwidth	300Hz to 3.3KHz for a 3KHz bandwidth
Average level	-9 dBm (275 mV) [0 dBm = 1 mW (0.775V) into 600 ohms]
Impedance	600 ohms
Tip to ring voltage	-48V \pm 6 V
Off hook voltage	3V to 6V
Ringing voltage	90 Vrms, 20 Hz (2 secs on, 4 secs off)

References

LOW COST TELEPHONE LINE INTERFACE (DAA, FXO), by Joe Randolph, Randolph Telecom, Inc. March 17, 2005

http://www.randolph-telecom.com/articles/AN-4,%20Low%20cost%20telephone%20line%20interface%20_DAA,%20FXO_.pdf