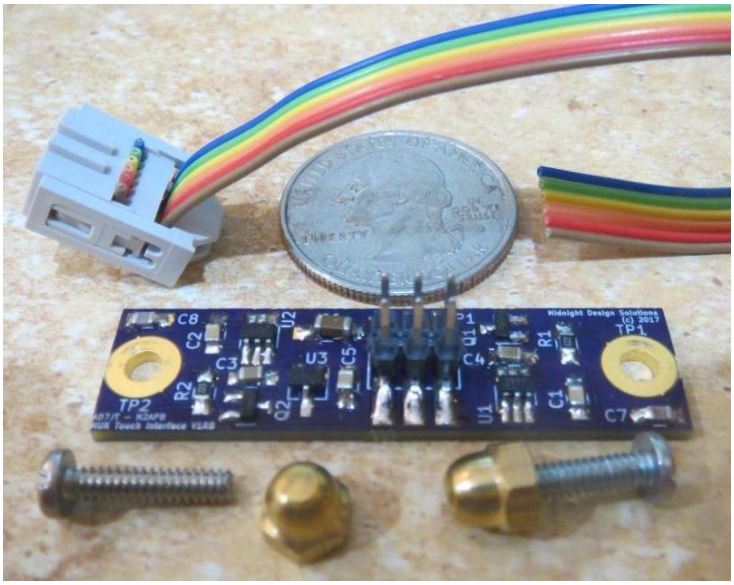
MUK TOUCH KEY (MTK) ASSEMBLY

2023-07-14

ASSEMBLY INSTRUCTIONS



The Midnight Ultimate Keyer (MUK) Touch Key (MTK) is designed for use with the MUK but will work with most any modern keyer. The MTK consists of two assemblies

- ***PCBA*** containing the active components.
- ***Interface Cable*** to connect to the connectors on the MUK's rear panel assembly.

Plus the mounting hardware which also serves as the input electrodes (touch paddles).

This document provides step-by-step instructions for assembling, installing, and using the MTK. The MTK PCBA mounts to the top of the MUK enclosure with the dome nuts exposed. The MTK is used by touching the dome nuts to activate the paddle inputs A bill of materials (BOM) and a schematic are included at the end of this document.

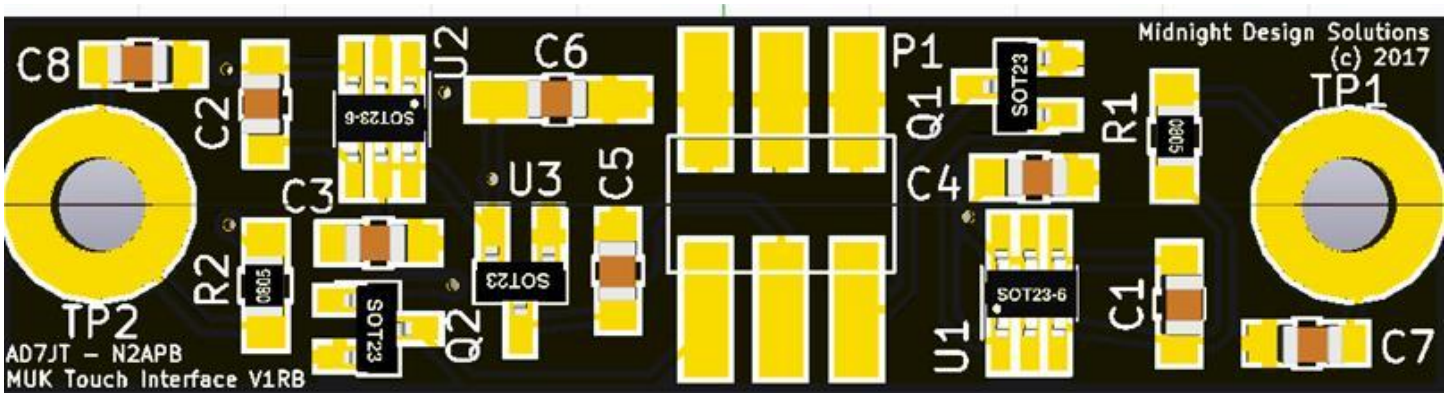
MUK TOUCH KEY (MTK) ASSEMBLY

The assembly, test, and installation of the MTK involves the following steps:

1. Assemble the PCBA
2. Assemble the interface cable
3. Connect the interface cable to the Paddle and Power connectors on the MUK rear panel
4. Test the MTK operation.
5. Mount the PCBA in the top section of the MUK enclosure.
6. Familiarize yourself with touch keying.

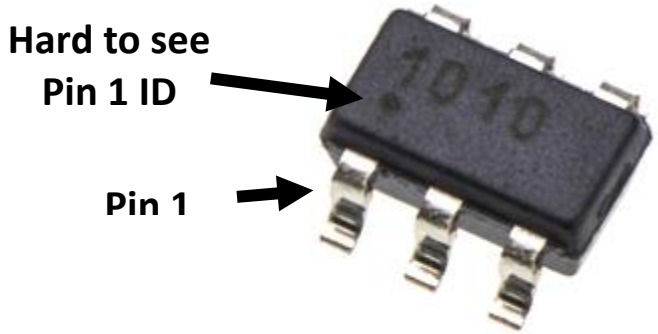
1. MTK PCBA ASSEMBLY

Here is a rendering of the component side of the MTK PCB for your reference. (Note, P1 is not yet installed.)



The PCB layout is fairly dense so take your time. I recommend you install the components in the order listed in the BOM. For soldering hits, see the MUK Front and Rear panel assembly instructions.

Be extra careful with U1 and U2, the touch sensors. They are very small and the marking for pin one is very hard to see. It may be helpful to shine a flashlight on the device at an angle to better reveal the dot location.



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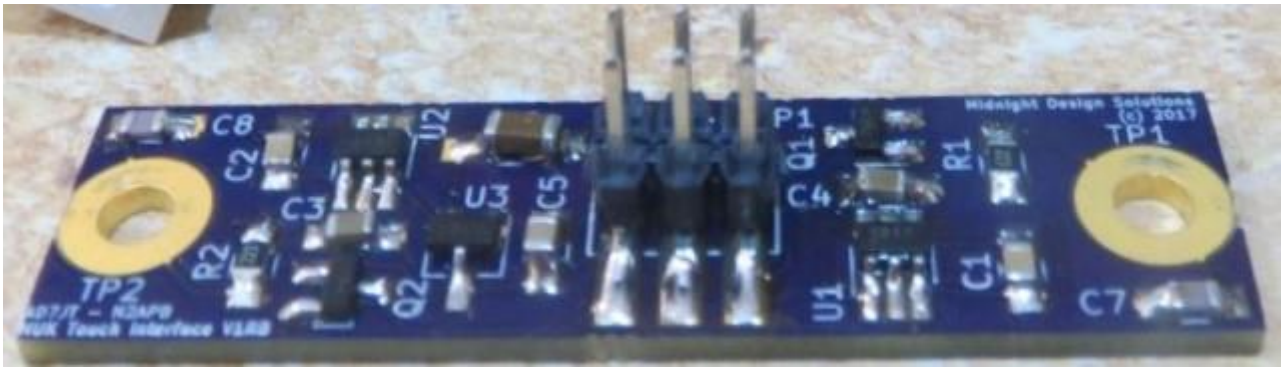
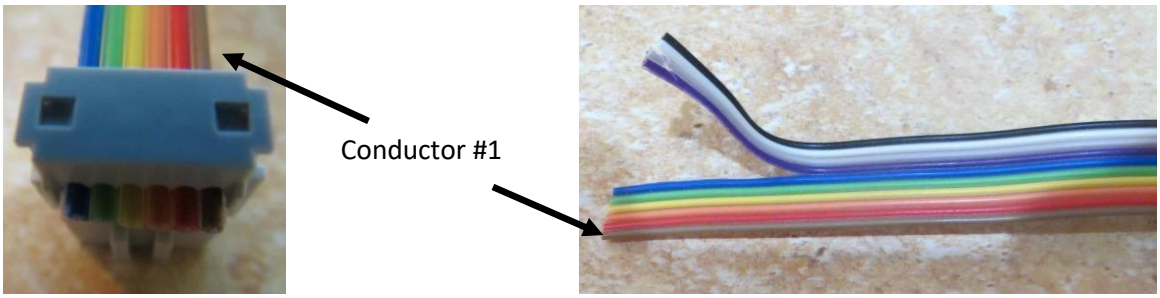
Your finished MTK PCBA should look something like this:



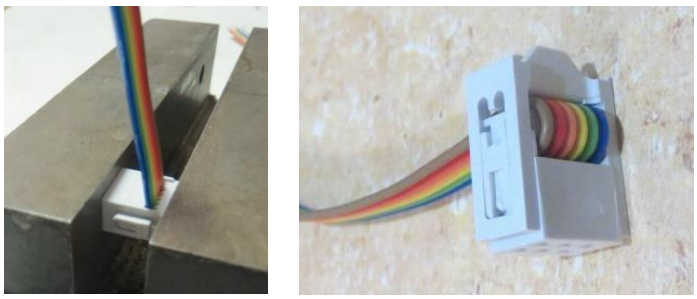
2. MTK INTERFACE CABLE ASSEMBLY

Count the number of conductors in the ribbon cable (BOM item 20). If there are more than six, unzip off the excess conductors. (Ribbon cable stock generally comes in multiples of ten conductors.) Note it will be easier to unzip the cable if you first cut the conductors apart for about 1/2 inch from the end of the cable. Retain the number one conductor which is normally colored brown.



Insert the ribbon cable in the connector such that when the connector is pointing down and the cable is entering the connector towards you, the number one conductor is on your right as shown above.

Squeeze the connector in a vice to push the top piece down on the cable and force it into the IDC pins. Fold the cable over the top of the connector and press the strain-relief clip down over the cable until the two ends snap into the holes at ends of the connector housing.



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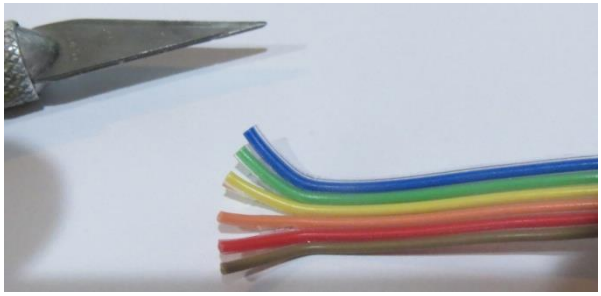
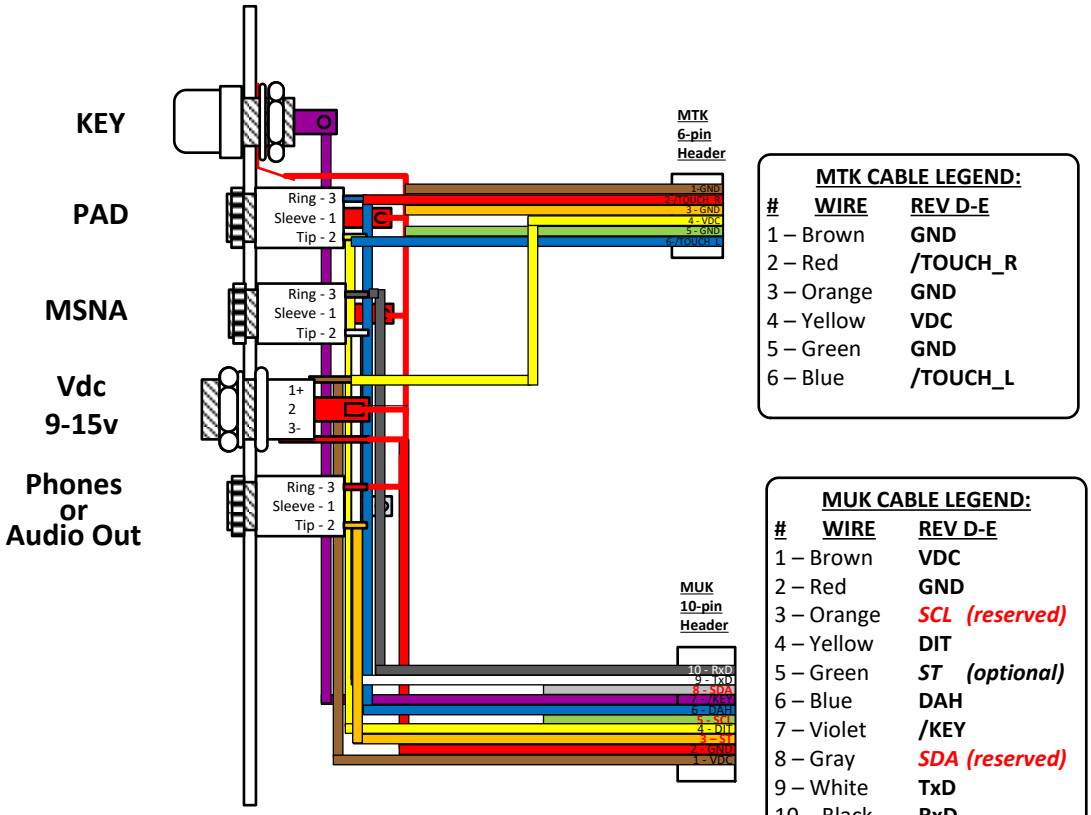
3. CONNECT CABLE TO REAR PANEL JACKS

Use a side cutter or X-ACTO knife to separate the end of each conductor from its neighbor. Unzip each conductor back about one inch. Strip about 1/4" insulation off of wires 2, 4, and 6 and tin the leads. Wires 1, 3, and 5 will be cut to length later.





MTK CABLE LEGEND:

#	WIRE	REV D-E
1	Brown	GND
2	Red	/TOUCH_R
3	Orange	GND
4	Yellow	VDC
5	Green	GND
6	Blue	/TOUCH_L

MUK CABLE LEGEND:

#	WIRE	REV D-E
1	Brown	VDC
2	Red	GND
3	Orange	*SCL (reserved)*
4	Yellow	DIT
5	Green	*ST (optional)*
6	Blue	DAH
7	Violet	/KEY
8	Gray	*SDA (reserved)*
9	White	TxD
10	Black	RxD

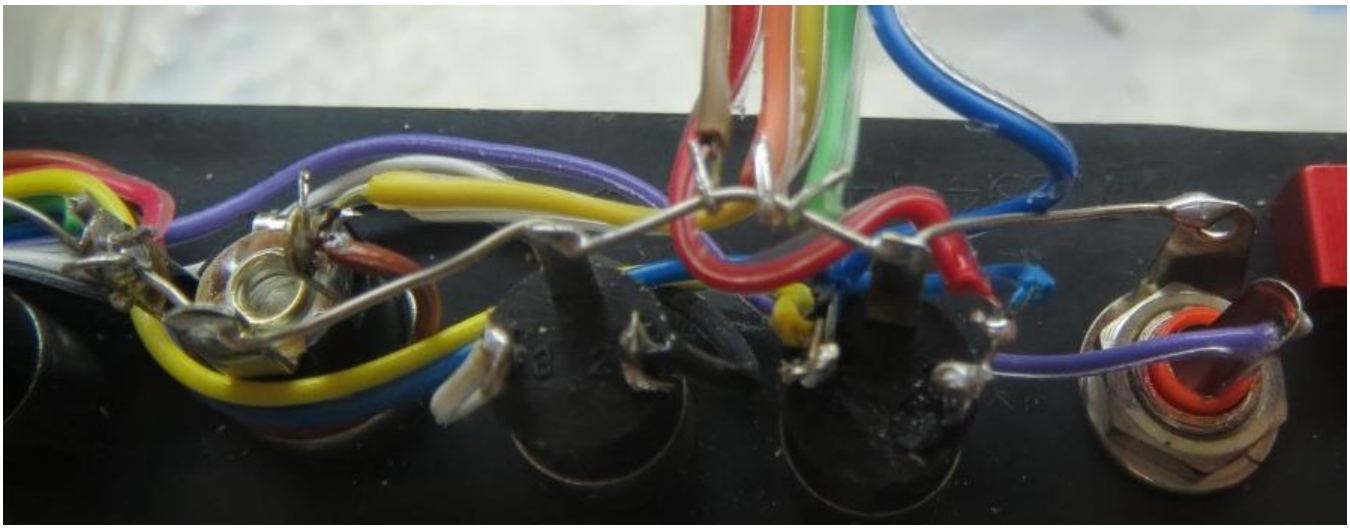
Referencing the wiring diagram above, solder the leads to the rear panel connectors in the following order:

1. Conductor 4 to VDC connector pin 1.
2. Conductor 6 to Paddle connector pin 2 (tip).
3. Conductor 2 to Paddle connector pin 1 (ring).

At this point, trim wires 1, 3, and 5 so the will be short enough to carry all the strain and strip and tin the ends.

4. Conductors 1, 3, and 5 to the ground bus.

MUK TOUCH KEY (MTK) ASSEMBLY

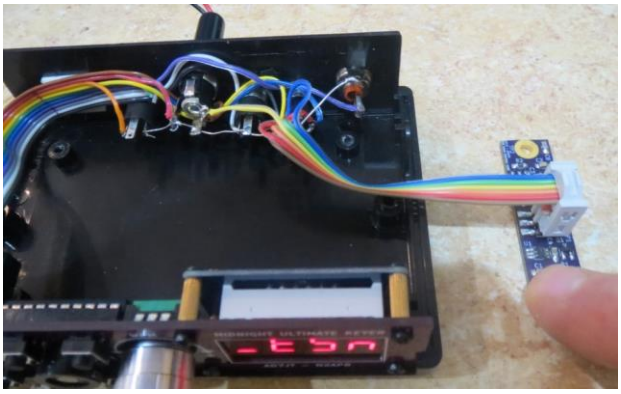


CAUTION

Be very careful when soldering to the Paddle connector. Some connectors are rather fragile and do not fare well when the terminals are overheated. Note in the picture above, there is melted plastic just below one of the terminals we were adding a wire to. I must have held the soldering iron on it too long. When I went to test the unit, I could not push the jack in that connector, it was destroyed and I had to replace it.

4. SMOKE TEST

At this point the MTK should be operational. Install the rear panel with the attached MTK cable in the MUK enclosure and plug the MTK cable connector onto P1 on the PCBA. Pin one of P1 is the pin closest to the reference "P1" on the silk screen. Position the PCB so that the pads around the mounting holes are accessible and not contacting anything. Power on the MUK. After the MUK initializes, you should be able to generate DITs and DAHs simply by touching the pads with your fingers.



With the exception of the voltage regulator, the left and right circuits are identical and independent of each other. If neither work, check the voltage regulator output. If one works and not the other, trouble the non-working circuit using

the working one as a reference. The circuit is quite simple and the most common source of problems is poor solder connections followed close by solder bridges between IC pins.

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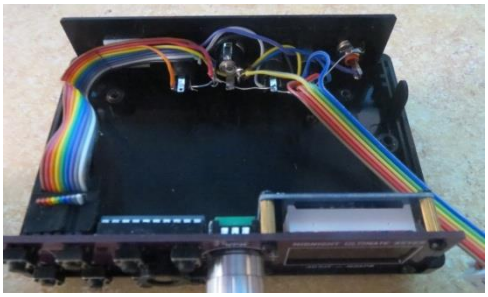
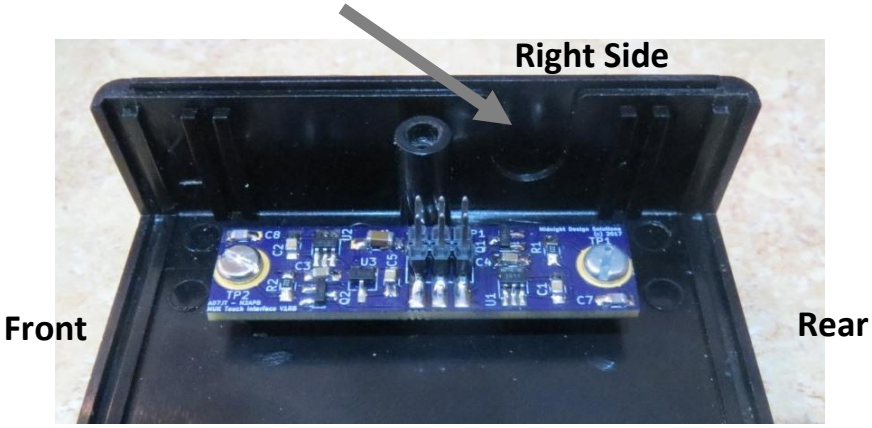
5. MOUNT MTK IN MUK ENCLOSURE

The MTK mounts in the MUK enclosure top on the right side. The two bosses for mounting a PCBA in the cover are used as guides to drill through the top. But first, note that the enclosure is not symmetrical, there are left and right sides. Looking at the base (the short half) note one side has a tab with a ROUNDED end extending up about 1/2 inch. The top (the tall half) has a tab with a square or LEVEL end that only extends down about 1/8 inch. These tabs mate with correspondingly shaped indentations in the mating pieces. The enclosure will only go together if the tabs and indentations are properly aligned. We have arbitrarily defined the side with the **R**ounded tab to be the **R**ight side and the side with the **L**evel tab to be the **L**eft side. Mount the MKT on the right side using the bosses closest to the indentation with the rounded top as drill guides.



Using a 1/8" drill bit, drill two holes in the top using the bosses on the right side (closest to the rounded indentation) as drill guides.



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Mount the MTK PCBA in the enclosure top using the two 4-4 x 1/2" machine screws and the two brass cap nuts (BOM items 30 and 31). Orient the PCBA as shown in the above picture. TP2 on the left, towards the front of the right side of the enclosure.

With the cover upside down, slide the MUK front panel (also upside down) in place making sure it does not interfere with the display assembly. If it does, you can file that end of the MTK PCB to make clearance.

Install the MUK front and rear panels in the base making sure the rounded tab on the base is on the right when facing the front of the MUK. Plug the MTK interface cable into P1 of the MTK PCBA. Pin one of P1 is the pin closest to the reference "P1" on the silk screen.

Fit the top assembly with the base and install the two self-tapping screws to hold the top in place.

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6. MTK OPERATION

The sensitivity of the capacitive touch controllers is determined by the capacitors in the MTK circuit (see schematic at end of this document). The capacitor values in the MTK circuit are set for **touch sensing** (as opposed to **proximity sensing**). The electrodes (the brass cap nuts) must be physically touched to be sensed and fully "untouched" to not be sensed. You should be able to move your fingers as close as possible without actually touching the electrode and not be sensed. As you move a finger tip towards an electrode you should be able to just feel the electrode before your finger is sensed. This may take some getting used to if you normally keep a light touch on the paddle(s) of your current paddles or bug.

The electrodes can be operated with any two fingers (or any two body parts, for that matter), your choice. Using a thumb and forefinger touching the sides of the cap nuts will make operation most like conventional paddles. Using this mode, however, will require a very light touch or something to anchor the MUK to keep it from sliding as you key. rotating y our hand slightly so you touch only the tops of the cap nuts will eliminate the sliding problem but will feel a little different and may take some getting used to.

Left-handed keyers can place their left hand on top of the MUK.

Another option is to use your index and middle fingers and tap down on the cap nuts. Since all the force is down, there is no worry about the MUK sliding. This approach is quite different and will probably require some practice.

There are many other possibilities too such as the following:

1..One finger from each hand.
2. One finger tapping one electrode with the tip and the other with the main body of the finger.
3. Index and little finger known as the ever popular "Hook 'em Horns" technique.

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MUK TOUCH KEY (MTK) PCBA V1RB

#	Id	Qty	Description	Value/Device No.	Footprint	Supplier	Part/Item No.
1	PCB	1	Printed Circuit Board, 2 layer		2.61x1.11 inch	MDS	MTK_01_0B
2	U1, U2	2	Cap. Touch Controller	AT42QT1011-TSHR	SOT-23-6	Microchip	AT42QT1011-TSHR
3	C1, C2	2	Cap. Ceramic	0.01 uF, 16 VDC	C_0805_HandSoldering	Mouser	710-885012207011
4	C3, C4	2	Cap. Ceramic	0.1uF, 50 VDC, X7R	C_0805_HandSoldering	Mouser	710-885012207011
5	C7,C8	2	Cap. Ceramic	20 pF, 50 VDC, X7R	C_0805_HandSoldering	Mouser	603-CC805JRNPO9BN200
6	U3	1	LDO Voltage Regulator	3.3V, 250 ma	SOT-23_Handsoldering	Mouser	79-MCP1703T-3302ECB
7	C5	1	Cap., Ceramic	1uF, 16 VDC	C_0805_HandSoldering	Mouser	581-0805YG105ZAT4A
8	Q1, Q2	2	MOSFET 60V 115mA N-Chan.	2N7002	SOT-23	Mouser	863-2N7002LT1G
9	C6	1	Cap., Ceramic	10uF, 6.3 VDC	C_0805_HandSoldering	Mouser	81-GRM21C80J106KE19L
10	R1, R2	2	Thick Film Resistor, 5%	22K, 1/8 W	R_0805_HandSoldering	Mouser	667-ERJ-6GEYJ223V
11	P1	1	2x3 male, 0.1" SMD	CONN_02X03	CONN_02x03-SMD	Mouser	538-15-91-0060

MTK CABLE ASSEMBLY

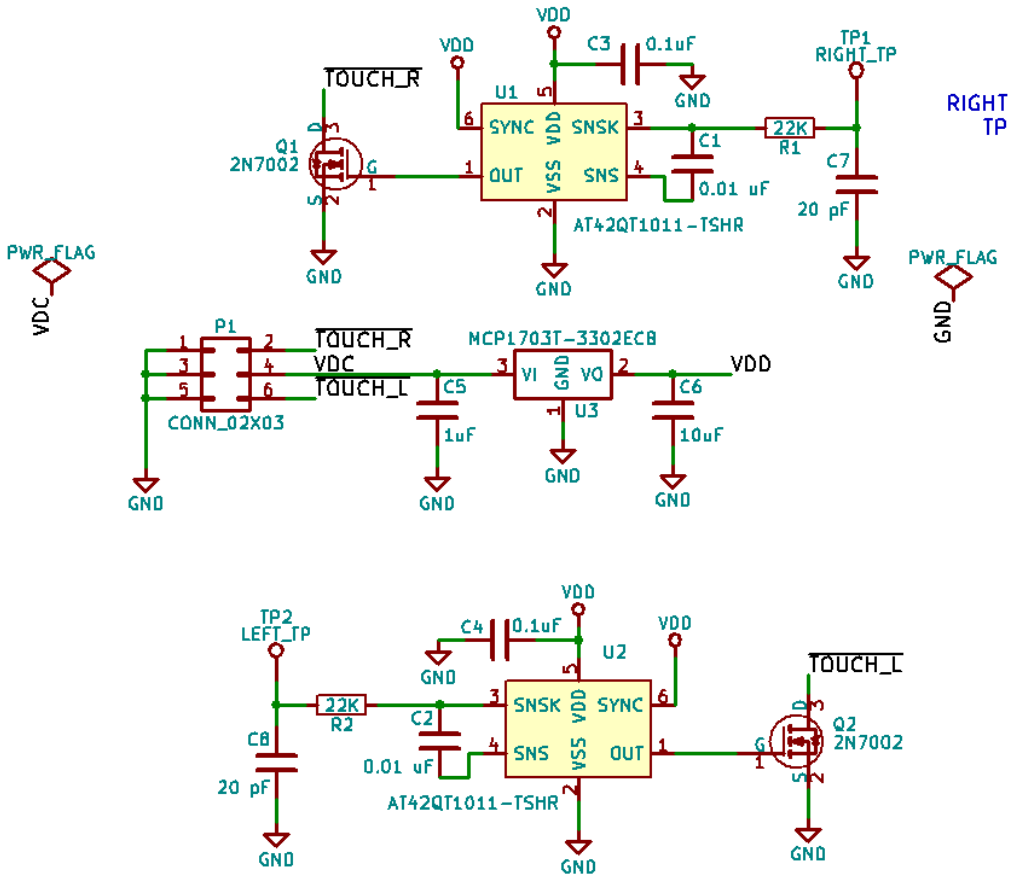
#	Id	Qty	Description	Value/Device No.	Footprint	Supplier	Part/Item No.
1	J1	1	2x3 female, 0.1" IDC	Receptical	0.48" x 0.25"	Mouser	649-71600-006LF
2		1	Ribbon cable, .050" pitch	10-condctor	0.3" x 6"	Digi-Key	AE09M-5-ND

MTK MOUNTING HARDWARE

#	Id	Qty	Description	Value/Device No.	Footprint	Supplier	Part/Item No.
1		2	Screw, Pan Head, ss	4-40 x 1/2"		boltdepot.com	3712
2		2	Cap nut, Brass	4-40		boltdepot.com	11792

NOTE: The part suppliers and numbers listed here may differ from the parts in your kit due to parts availability at the time your MUK is kitted.

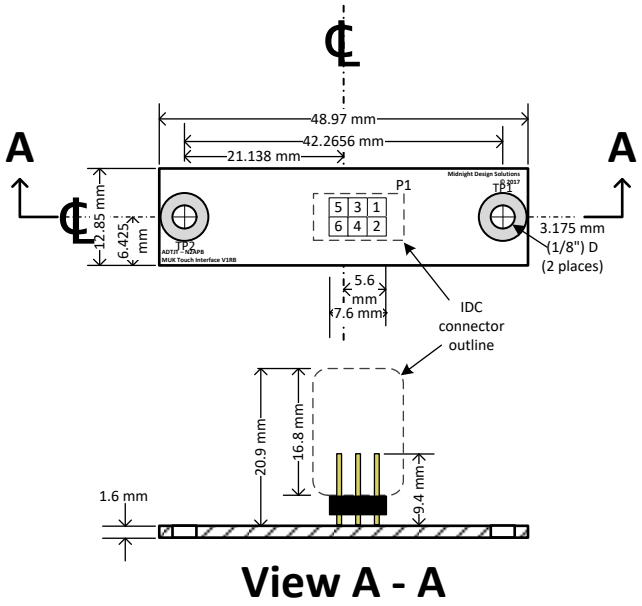
MTK SCHEMATIC (V1RB)



MUK TOUCH KEY (MTK) ASSEMBLY

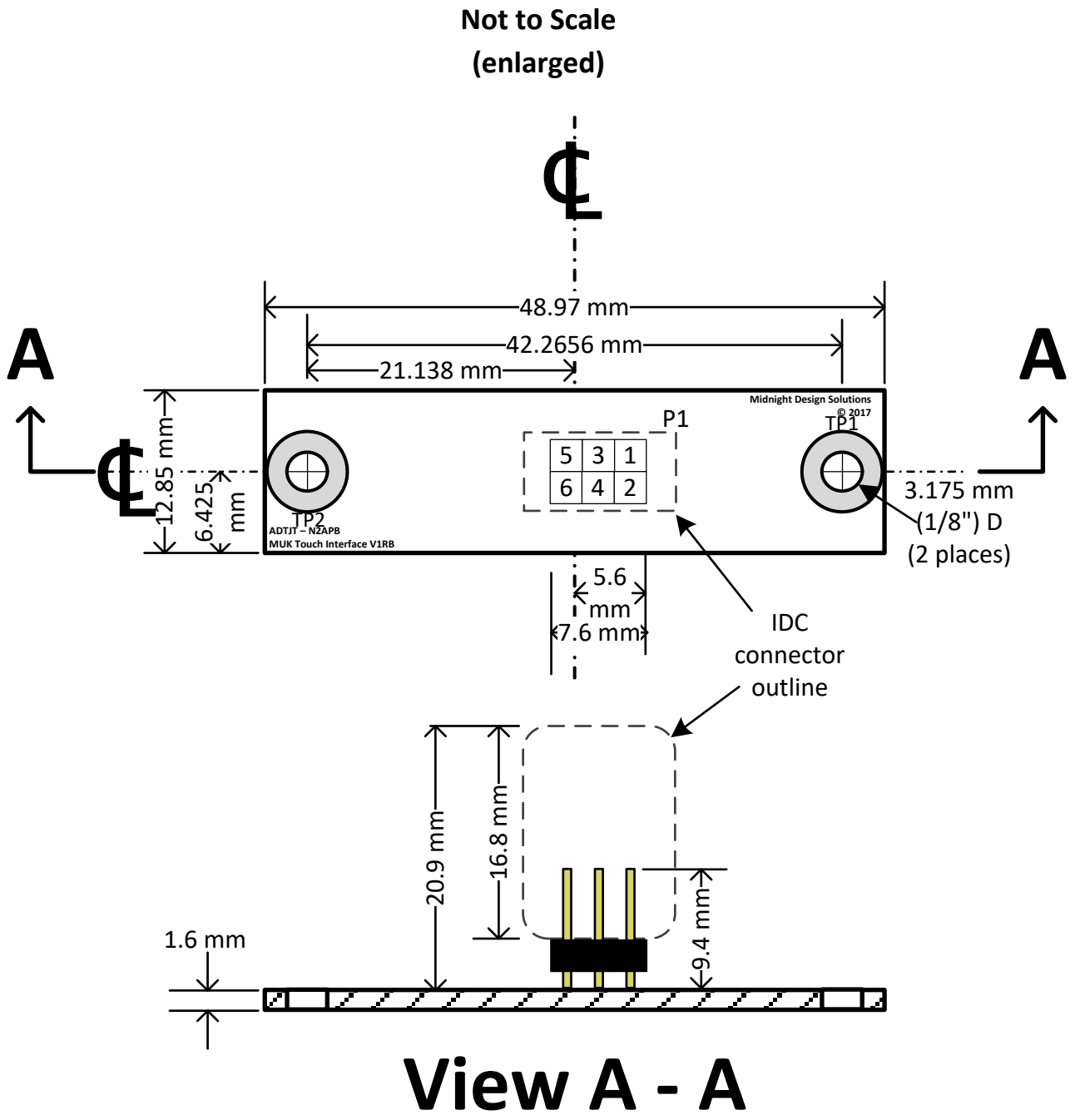
MTK PCBA DIMENSIONS

Scale 1:1



View A - A

MTK PCBA DIMENSIONS (cont.)



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