☆MAS

Soft Touch Relay Bypass

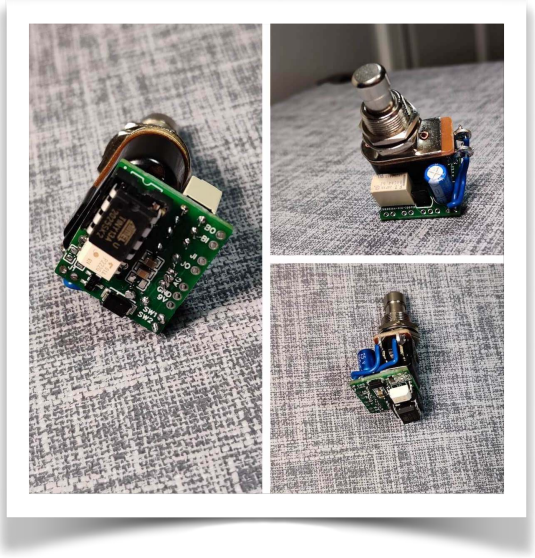
version 1.49

mas-effects.com/relay-bypass/

Documentation for earlier versions: **v1.3**, **v1.2**

Introduction

Typical 3PDT latching mechanical switches are noisy, hard to press, and prone to mechanical failure after repeated use. A controller board with a relay is a great alternative, and provides some other really great options you couldn't otherwise do.



This tiny and featureful relay bypass board can do a LOT.

- Soft touch, momentary switches can toggle your DIY guitar pedal, using a relay to provide true bypass.
- Quick tap to switch between engaged and bypass, or hold the foot switch to temporarily toggle until you release it
- Fits easily in a tiny 1590A enclosure
- Optional optocoupler muting can be enabled with a switch or jumper to mute any popping your circuit might exhibit while switching
- Hold when powering on to toggle auto-on/auto-off
- Passes signal when powered off

Usage Instructions

Engage / Bypass: When bypassed, the sound signal will go directly from your input to your output jacks. Tap the foot switch to engage the effect and route the signal to your audio PCB. When engaged, tap the foot switch again to switch to bypass.

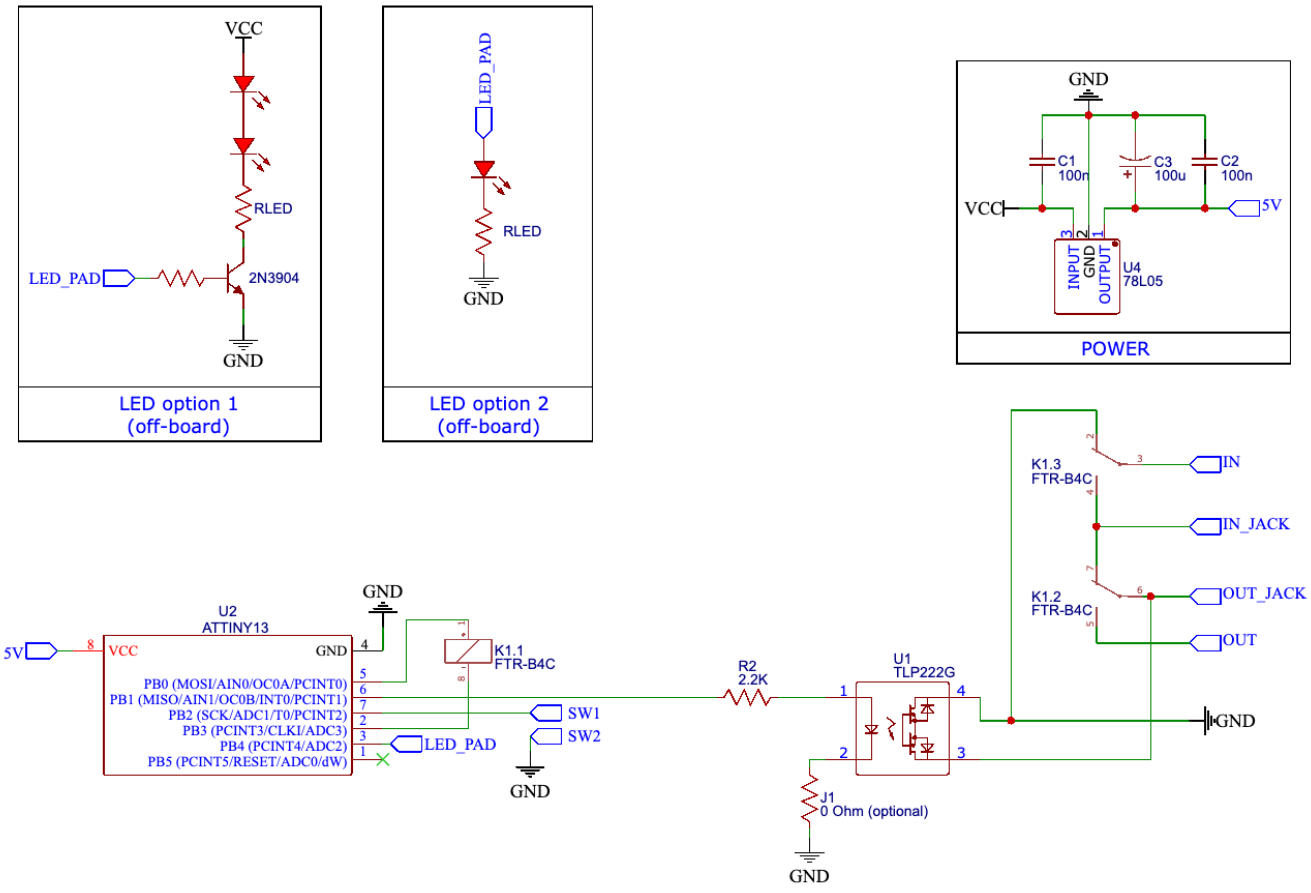
Temporary Bypass/Engage: Holding the foot switch while the effect is engaged will temporarily bypass it, and it will re-engage when you lift your foot. Similarly, holding the foot switch while bypassed will temporarily engage it.

Memory: v1.49 and greater will, by default, remember whether the effect is engaged or bypassed and recall this setting on power on. If instead you want the effect always on, or always off when powered on, hold the switch while powering on to toggle its behavior. The LED will blink to indicate the change. 3 blinks for auto-on, 4 blinks for auto-off, and 5 blinks for memory.

Bill of Materials

Quantity	Name	Designator	Note
1	FTR-B4C	K1	FTR-B4CB4.5Z (latching)
1	TLP222G	U1	Optional
1	ATTINY13	U2	Requires programming. Pre-programmed if purchased
1	78L05	U4	
1	100u	C3	Electrolytic
2	100n	C2,C1	Pre-soldered, SMD
1	2.2K	R2	Pre-soldered, SMD
		J1	Connect J1 pads to enable pop-suppressing mute
1	Switch	SW	SPST normally open momentary switch

Schematic



Build Notes

Assembly should be straightforward, but contact me if you have any questions <mark@mas-effects.com>.

Hookup

- ***BO*** *(Board Output)*: Connect this to the "Output" of your audio PCB
- ***BI*** *(Board Input)*: Connect this to the "Input" of your PCB
- ***JO*** *(Jack Output)*: Connect this to the tip of your Output jack
- ***JI*** *(Jack Input)*: Connect this to the tip of your Input jack
- ***LED***: Supplies 5V when effect is engaged. See "Adding an LED" below.
- ***J1***: These two pads can be connected to enable Optocoupler Muting
- ***AG***: See "Audio Ground / Digital Ground" below
- ***GND***: Connect this with all the other ground points of your pedal
- ***SW1, SW2***: Connect these to the two lugs of a SPST, normally open, momentary foot switch
- ***9V*****:** Connect to your 9V power supply

Optocoupler Muting

By default, no muting is done.

However, you may find you have a noisy audio circuit that tends to pop when engaged or disengaged. When this occurs you can add the optional U1 optocoupler and connect the J1 jumper pads to temporary mute (~35ms) when engaging and bypassing.

You can either directly connect them with a wire or solder, or use a switch.

This behavior needs to be enabled in the firmware, and may be disabled if you bought a kit from MAS Effects that didn't include an optocoupler. When ordering, you may ask for either version.

Adding an LED

The LED solder pad *(or pin 3 of v1 - see below)* supplies 5V when the effect is engaged. You can use this to control or directly power your LED.

Look at the schematic above to see 2 options for hooking up an LED.

For a single, low-to-moderate current LED you can simply connect an LED in series with a resistor to this pad, and run the other side to GND. This is illustrated in "Option 2" of the schematic.

Because the power from this is supplied by the 78L05 voltage regulator, it is not suitable if you need more than a small amount of current or if you want higher than 5V. In this scenario you can use a transistor to switch one or more LEDs as shown in "Option 1" in the schematic.

Audio Ground / Digital Ground

The *AG* and *GND* pads on the PCB are connected, and are all part of the ground. You can simply use the *AG* as an additional *GND* pad if you'd like.

If, however, you want to separate your audio and digital grounds, e.g. because you're joining them elsewhere in your pedal, then carefully cut the trace between the *AG* and *GND* pads. There is a small line drawn in the silk layer showing where to cut. Then solder wires between these pads and your other grounding points.

Versions:

1.**49** uses the 1.4 PCB and same hardware setup, but adds memory to the bypass state. By default it will remember whether the effect is engaged or bypassed (and uses wear leveling to store this). Holding the switch down at startup will toggle the behavior.

1.4 is the latest version in the root of this repository. It uses a latching relay for slightly reduced power consumption.

1.3 also uses a latching relay, but is not as DIY-friendly if you scratch-build (from a kit, however, it's exactly the same as V4). It requires you to write a fuse to disable the RESET pin and turn it into a GPIO pin. After doing this you can't re-program the ATtiny without special equipment. i.e. if you're not careful you may waste some microcontrollers.

1.2 has all the same features as later versions, but uses a non-latching relay instead.