



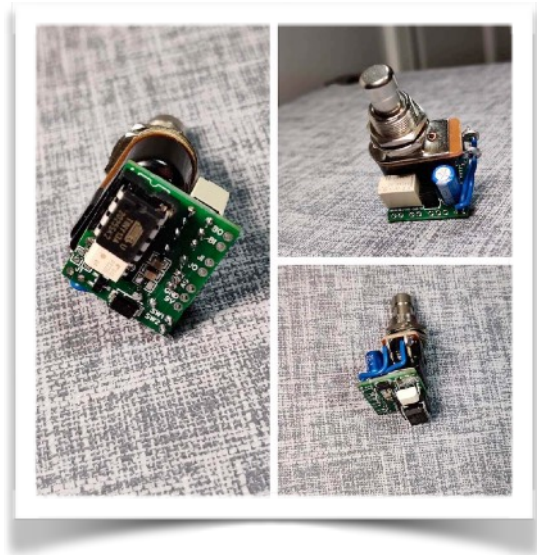
Soft Touch Relay Bypass

mas-effects.com/relay-bypass/

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.

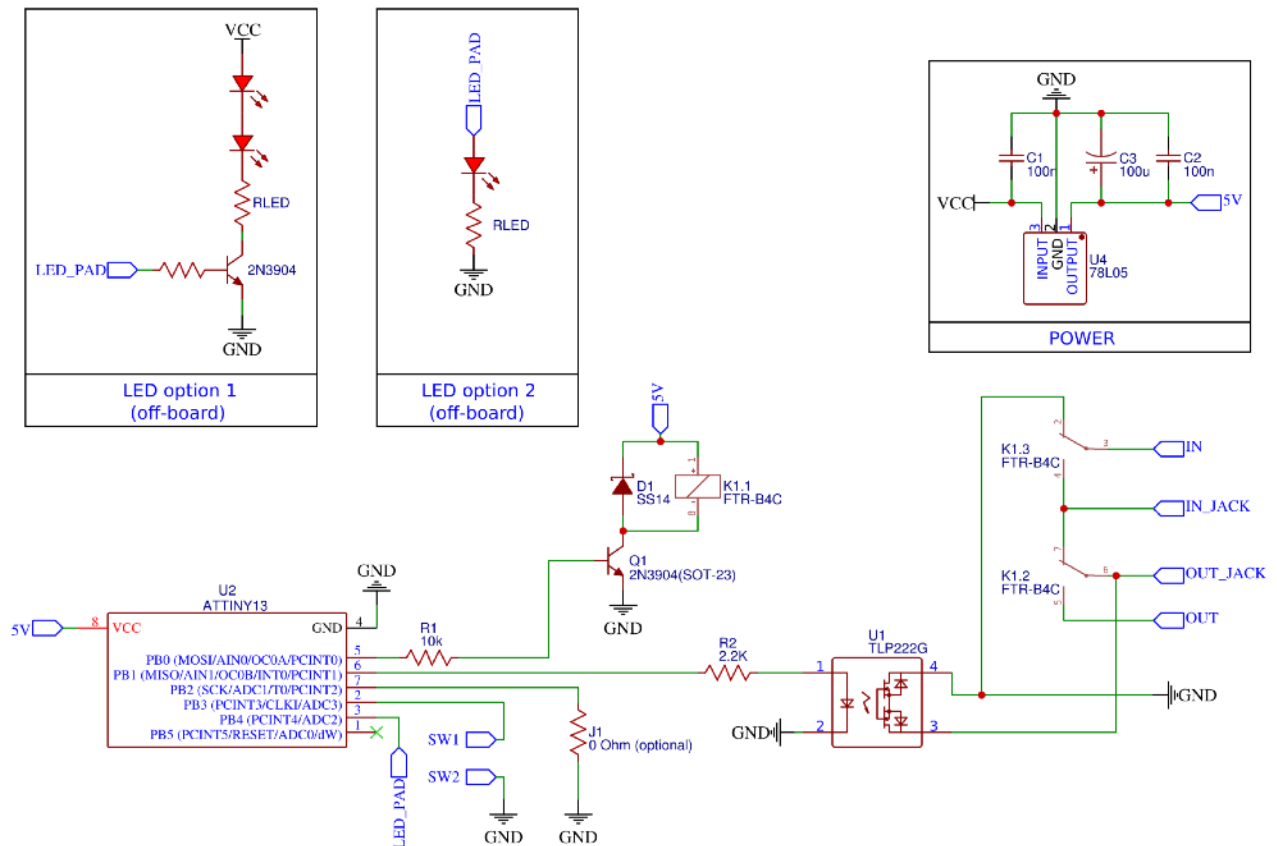
Temporary Bypass/Engage: Holding the foot switch while the effect is engaged will temporarily bypass it, and it will re-engage when you lift your foot. Similarly, holding the foot switch while bypassed will temporarily engage it.

Auto-on: When you supply power to your pedal, it will either engage or bypass. If you want to toggle which setting is enabled when powered up, hold the foot switch down while you plug in the power. The LED (if used) will blink to indicate the *auto-on* setting was changed. If you unplug then power up your pedal again, it should now start in your desired setting.

Bill of Materials

Quantity	Name	Designator	Note
1	FTR-B4C	K1	FTR-B4CA4.5Z (non-latching)
1	TLP222G	U1	
1	ATTINY13	U2	Requires programming. Pre-programmed if purchased
1	78L05	U4	
1	100u	C3	Electrolytic
1	MMBT3904	Q1	Pre-soldered, SMD
1	SS14	D1	Pre-soldered, SMD
2	100n	C2,C1	Pre-soldered, SMD
1	10k	R1	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'd like a detailed build doc <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 connect the J1 jumper pads to temporarily mute (~35ms) when engaging and bypassing.

You can either directly connect them with a wire or solder, or use a switch. If you use a switch please note that this setting is only checked when the board is first powered up.

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 common 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.

V1 vs V2

V1 (green PCB) and V2 (black PCB with "1.2") are equally capable and run the same program code.

The difference is that the V1 PCB is slightly less convenient to work with, and is also why it's being sold for a significant discount.

Here are the differences:

V1	V2
No LED pad. Solder a wire to pin 3 of the ATtiny IC or to pin 3 of its socket	Adds an LED pad
Fits into a 1590A, but when pushed between the screw holes at the bottom, it doesn't sit nicely on the switch	Can be easily centered between screw holes of the 1590A enclosure
SW1 and SW2 solder pads are offset from the switch	SW1 and SW2 sit directly below the lugs of most switches
Included R3 and C4 components that must be removed (already done if you purchase from MAS Effects)	Omitted R3 and C4

Customizing the Microcontroller Code

This relay module uses an ATtiny13 or ATtiny85 microcontroller. Its code is available on the github project page <<https://github.com/mstratman/relay-bypass>>.

You can then use an AVR programmer to experiment and update the program on it. I recommend the SparkFun Pocket Programmer, but there are plenty of other options.

Even if you're not extremely comfortable writing AVR code, you will find there are quite a few *define* directives that you can easily modify to changes its behavior.