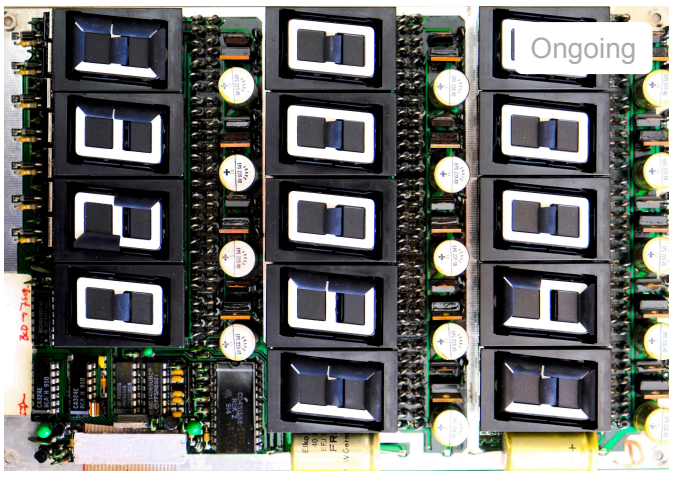
The Wayback Machine - https://web.archive.org/web/20241109105134/https://oshwlab.com/Andish/tankstellen-anzeige



STD

Tankstellen-Anzeige mit Flip-Dots 7-Segment-Display

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938 0 0 0

Update time 2020-10-29 23:39:30
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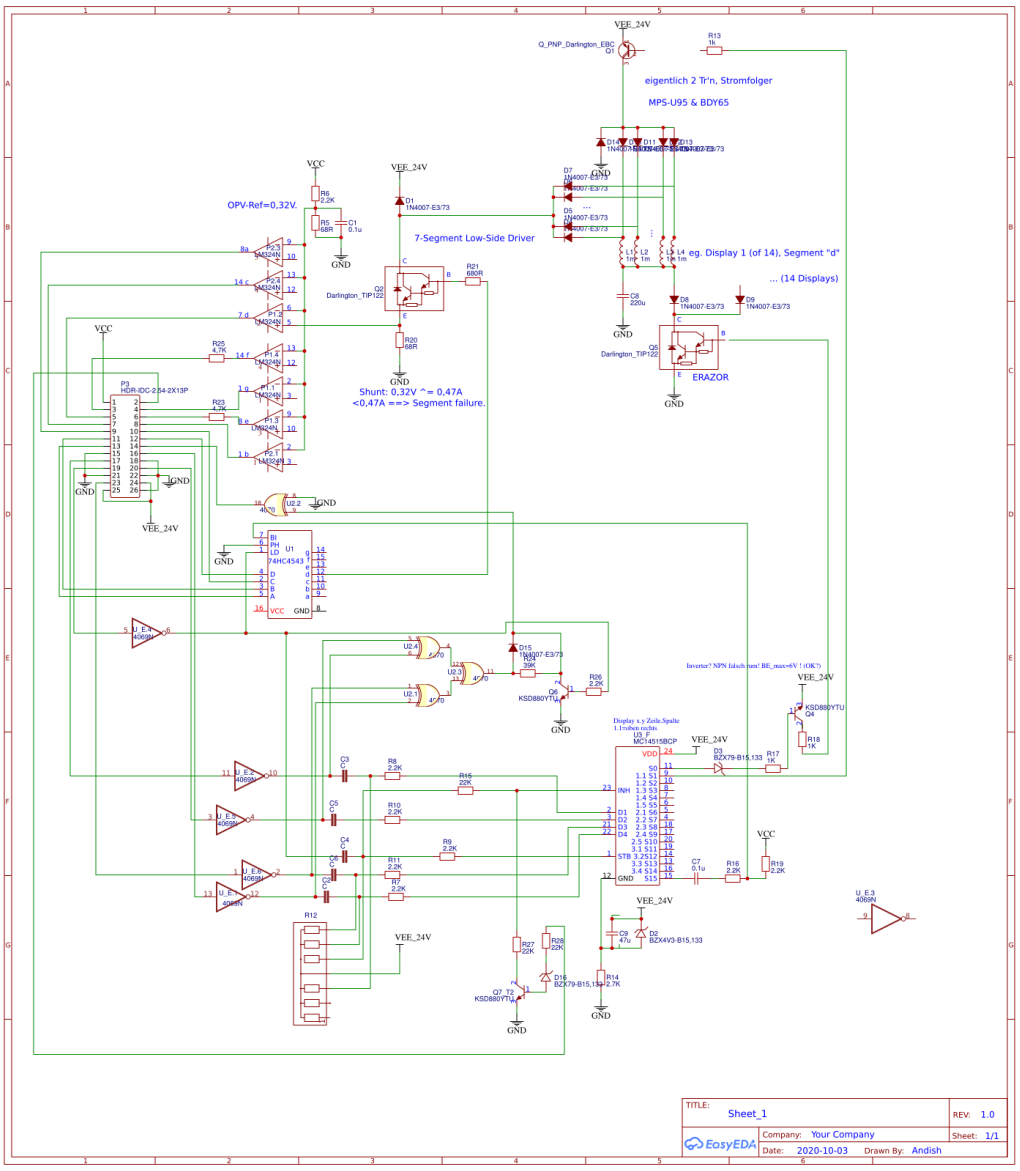
Description

Flip-Segment Electro-Mechanical 7-Segment Display Unit
Mannesmann-Kienzle / Deutsche Gerätebau, 1990
Versuch der Backannotation zum Ansteuern mit einem Mikrocontroller.
Dem 1-aus-16 Decoder kommt da eine Schlüsselrolle zu, da S0 (Discharge C's) und S15 (Un-Blank 1,2ms) Sonderfunktionen haben.
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This is a Display from an old Gasoline Meter from a gas station.
Every Segment in each Display is driven by a small coil that is bi-stable. No additional springs are inside, the flip-back movement when pushed gently with a finger is caused only by magnetic repulsive force.
I.e. with a pulse, the core of the coil is magnetized and remains so, and a small magnet in the black flip cover either is repulsed or attracted to the core of the coil.
You need at least 0,6A DC current to set or reset the segment when you test this with a lab DC source with current limiting and slowly tuning up the current. When you tickle the pins of the display, you observe smaller values, but this is due to higher voltage buffered with a (small) capacitor at the output of your DC supply.
Since the resistance of the coil is quite low, 4.5 Ohms, you need to pulse the thing to avoid heating up. This is done with capacitors, as charge sink and source, and C's along logical signals in the original display circuitry. Not very nice to measure the timing by this "analog digital" approach for pulse shaping and timing critical parts of the cycle.
Resetting (to black) is done in the first step by charging 220µF capacitor per Display through all 7 coils in parallel (0,5ms to 90%, takes 1.2ms in original timing of gas station display microcontroller. It is done by just selcting a Display Number S1..S14.
Directly (some protective ms later) aferwards, the setting of selected segments (to white) is done by discharging "the" 220µF capacitor through the coils, a diode, and down to ground by the low-side segment NPN Darlington drivers. The 7-segment-driver is unblanked by line S15 of the Display Select 1:16 decoder, via some capacitor, and by this for approx. max. 1,2ms.
Afterwards there is time to discharge the capacitor.
The original sequence leaves 50ms or so between every write cycle.
The discharging imho is only necessary when no segment was set, i.e., a display was left blank.
Because when a display sets at least two segments, for the "1" digit, the capacitor is discharged in about 1ms down to 5% or so. One should test which value suffices to avoid spurious setting or rattling of displays that should not be altered by consequitive writes to other displays.
But if no segment was set, i.e. the selected Display shall be left blank=black, the capacitor remains charged, AND must be discharged (S0 active) before any other display wants to set segments to white, in order to avoid setting multiple displays in parallel. (Which could be a feature to speed things up. ;)
But perhaps there are limits how much current the NPN Darlingtons for low side Segment a-g can sink. When you are thinking the discharge is to slow, think about modfying the Dischare current limiting resitors to smaller Values, perhaps increase the case size, using 1/4 or 1/2 W verions, or just solder some more 82 Ohms in parallel for each of the 3 occurances/lines of Displays.
One could also think of charging all capacitors in rapid succession and then discharging them with a longer pause (3-4 * R*C with S0 active. Here we must calculate the energy burnt in the 82 Ohms resistors, which is for 5 Displays in a row.*
$E = CU^2/2 = 5 220\mu F (24V)^2/2 = 0{,}38J$
Over time the resitor(s) should not get more Energy than they can dissipate (1/8W per second), so leave 3 sec. before blanking a row again. Or just let the controller do some maths about the temperature of the resistors, limiting it.
Another easy speed-up is to blank one display in each row, then discharge the 3 together for 50ms. Here the Time Constant is 18ms and the energy per resitor burnt is 0,063J per event.
Good luck !
Please see the original fotos of the PCB and discussion of it on
https://www.mikrocontroller.net/topic/347231
See you

Andi

Design Drawing

schematic diagram



Sheet_1 Open in Editor

BOM

BOM download Purchase Parts

ID	Name	Designator	Quantity
1	0.1u	C1,C7	2
2	220u	C8	1
3	47u	C9	1
4	KSD880YTU	Q4,Q6,Q7_T2	3
5	BZX4V3-B15,133	D2	1

Unfold

Project Attachments

Empty

Project Members

Andish