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HEB_MATRIX : HIGHER EDUCATIONAL BOARD, MATRIX MODULE			
PAGE NO	PAGE NAME	DESCRIPTION	MOST IMPORTANT COMPONENTS
1	COVER	THIS PAGE	NO COMPONENT
2	VERSION	MODIFICATION SHEET WITH VERSION CONTROL	NO COMPONENT
3	INTERFACE	HEB POINT TO POINT INTERFACE	HEB POINT TO POINT CONNECTOR
4	LED	MATRIX LED CONNECTION	2x 5x7 DOT LED MATRIX
5	DRIVER	P AND N MOS FOR DRIVING COLUMN AND ROW CURRENT	10x PMOS AND 7x NMOS

HEB (Higher Educational Board) heb_matrix: COVER	DES	01 SEPT 03 Laurent Gauch
	REV	v1.0
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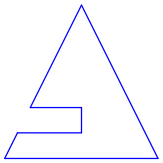

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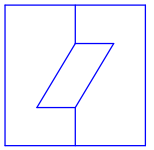

VERSION MANAGEMENT

DATE	VERSION	DESCRIPTION	AUTHOR
01 SEPT 2003	1.0	FIRST VERSION	GAUCH LAURENT

HEB (Higher Educational Board)
heb_matrix: VERSION

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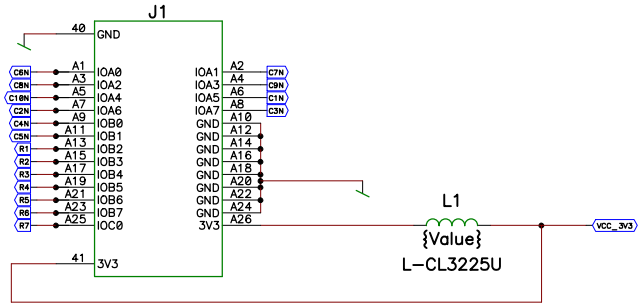

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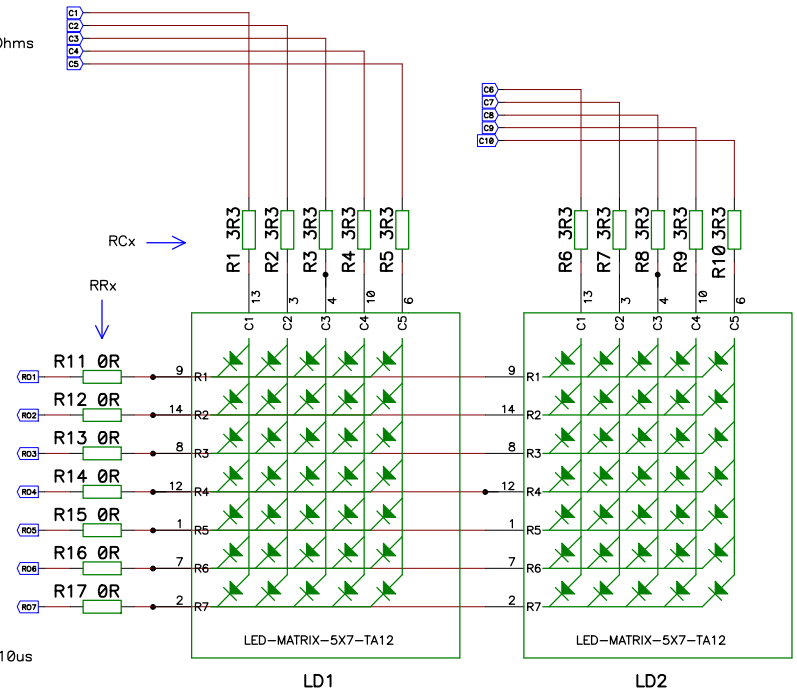

STATIC USE :
Imax = 30mA –> Vf = 2.1V
RCx = (3.3V – 2.1V) – 30mA x (1.5 + 0.6) / 30mA = 37.4 Ohm

DYNAMIC USE :
Imax = 150mA for max T = 10us –> Vf = 2.5V
RCx = (3.3V – 2.5V) – 150mA x (1.5 + 0.6) / 150mA = 3.23 Ohm

1. RRx
————
RRx are the current limiter by Row and for the FDV303N.
The FDV303N can drive IDS max 500 mA.
This current is corresponding with the max current on a Row.
RRx = 3.3V – 2.35V – (1.5 Ohm x 50mA) – (0.6 Ohm x 500mA) / 500mA = 1.15 Ohm
WE TAKE 1R5 FOR RRx

1. RCx
————
RCx are the current limiter by Column and for the FDV304P.
The FDV304P can drive IDS max 500 mA.
But the maximum dynamic current on one led can be 150 mA by LED, for a 10us pulse
RCx = 3.3V – 2.5V – ((1.5 + 0.6 + 1.5) x 150mA) / 150mA = 1.75 Ohm
WE TAKE 1R5 FOR RCx

1. Static Current limiter option
————
Rp = 3.3V – 2.35 – ((1.5 + 1.5 + 1.5 + 0.6) / 50 mA) / 50 mA =13.9 Ohm
WE TAKE 15R FOR Rp

On one LED :
————————
Peak Forward Current = 150mA for t < 10us
At 150mA –> Vf = 3.5V
As we are working on 3.3V power source,
we cannot drive the maximum current.

FOR a 10mA by LED
max current by ROW = 10 x 0.01A = 0.1A
max current by COLUMN = 7 x 0.01A = 0.07A
max current of the matrix = 10 x 7 x 0.01A = 0.7A
At 10mA VF= 2.05V (Forward Voltage of one LED)
RCx = (3.3V – (0.01A x 7 x 1.5) – (0.01A x 10 x 0.6) – 2.05V) / 0.07A
RCx = 1.53V / 0.07A = 21.85 ohms
RCx real = 22R
IF one LED on one COLUMN is driven:
LEDcurrent will be 3.3V – 2.2V/ (1.5 + 22 + 0.6) = 0.62mA

FOR a 20mA by LED
max current by ROW = 10 x 0.02A = 0.2A
max current by COLUMN = 7 x 0.02A = 0.14A
max current of the matrix = 10 x 7 x 0.02A = 1.4A
At 20mA VF= 2.15V (Forward Voltage of one LED)
RCx = (3.3V – (0.02A x 7 x 1.5) – (0.02A x 10 x 0.6) – 2.15V) / 0.14A
RCx = 0.82V / 0.14A = 5.86 ohms
RCx real = 5R6

NOTE : The serial resistor is highly depending on the FET–P and FET–N Type.
RRx with RCx = 0 Ohm
RRx = (3.3V – (0.02A x 7 x 1.5) – (0.02A x 10 x 0.6) – 2.5V) / 0.2 = 2.35 ohms
RCx with RRx = 0 Ohm
RCx = (3.3V – (0.02A x 7 x 1.5) – (0.02A x 10 x 0.6) – 2.5V) / 0.14 = 3.35 ohms
We take 3.3 Ohms for RCx and 0 Ohm for RRx

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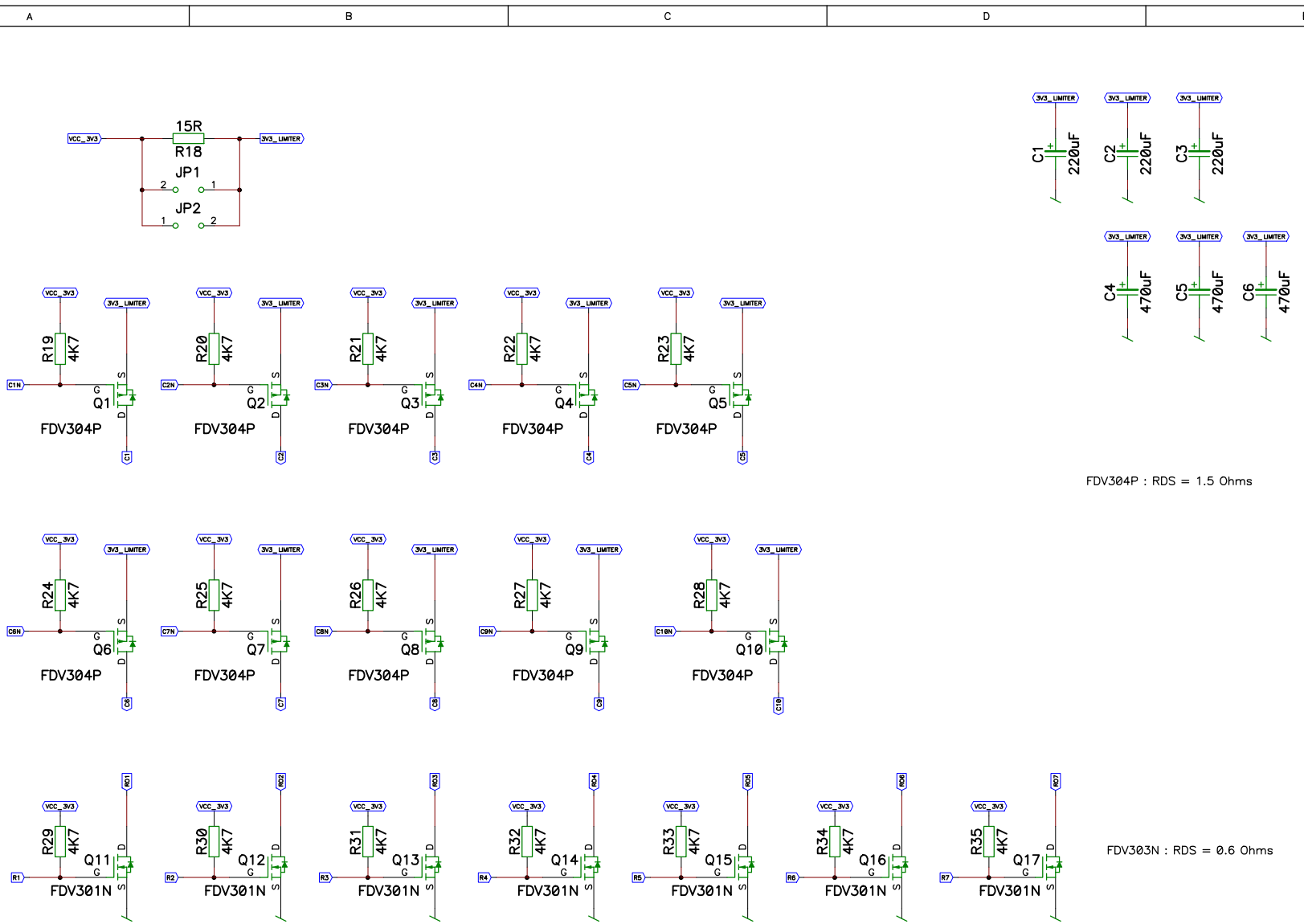

FDV304P : RDS = 1.5 Ohms

FDV303N : RDS = 0.6 Ohms

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