TK500 Teslacoildriver

Features

- Input voltage 230VAC
- 160VDC output
- Optical input (Toslink connector)
- Power Limiter

Description

The tesla coil driver is a box with optical input, and output for driving an dual resonant tesla coil rig. The driver has an internal series load capacitor.

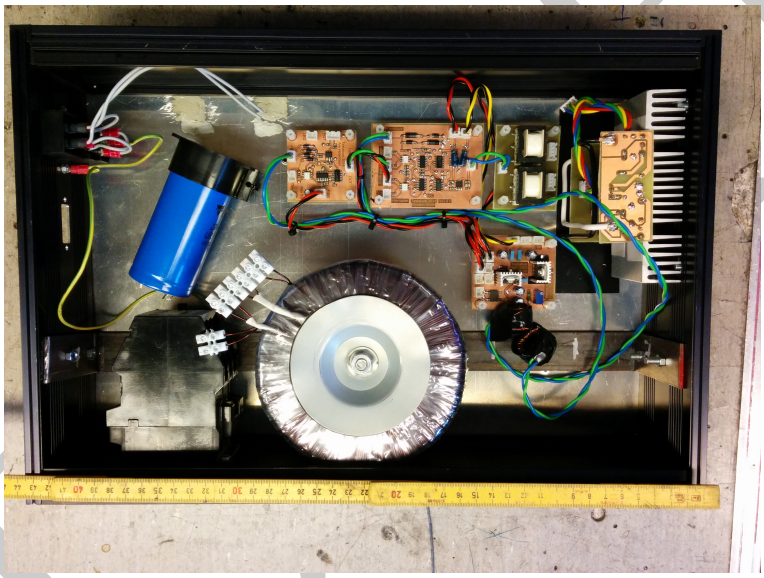


Figure 1: Product image

Contents

1 Connections

Table 1 contains an overview of the available connections on the controller card.

Designator	Connector name	Description
J500XX	AC in	Connector for 230V in.
J500XX	Tesla out 2	Connector for connecting coil rig.
J500XX	Optical	Connector for input control signal.

Table 1: Connections on controller card

1.1 Optical interface

The tesla coil driver has a optical connector (TOSLINK) for the input control signal. The input control signal should be pulse width modulated (PWM) with a 2MHz carrier wave. The signal should have an maximal pulse width (high) of $680\mu S$. The tesla coil fires as long as the control signal is active. To adjust the length of the spark the pulse width can be adjusted. Shorter pulse width equals shorter spark. See fig. 2 for a graphical representation. In the figure 'CW' is the clock signal, 'Control Signal' is the control signal, and 'PWM' is the signal on the optical cable. Note that the aspects and pulse widths are not exact. A pulse widht of 80% for active and 10% for inactive should be sufficent.

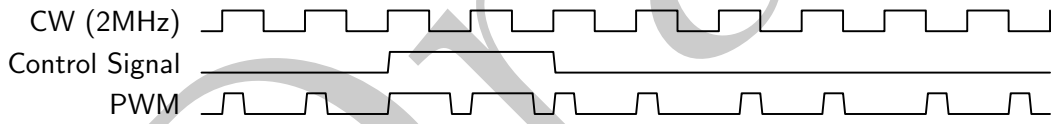


Figure 2: Control signal timing diagram

1.2 Tesla out

The tesla out connector connects to the coil rig. The coil rig schematic is shown in fig. 3. C1 is physically small and contained inside the driver enclosure. L1 is physically large and encloses L2 with a large air gap in between. L2 is physically large and contains significantly more windings than L1 (typ. 1000 times more). C2 is a capacitor consisting of the top load, and the enviroment around the top load. One plate can i.e. be a steel sphere, and the other plate can be the walls, roof, and floor of the room. Or something closer like a chain mail glove. The relationships between C1, L1, L2, C2 is given by eq. (1) and eq. (1). f_0 should be around $120kHz$.

$$f_0 = \frac{1}{\sqrt{L_1 \cdot C_1}} \tag{1}$$

$$f_0 = \frac{1}{\sqrt{L_2 \cdot C_2}} \tag{2}$$

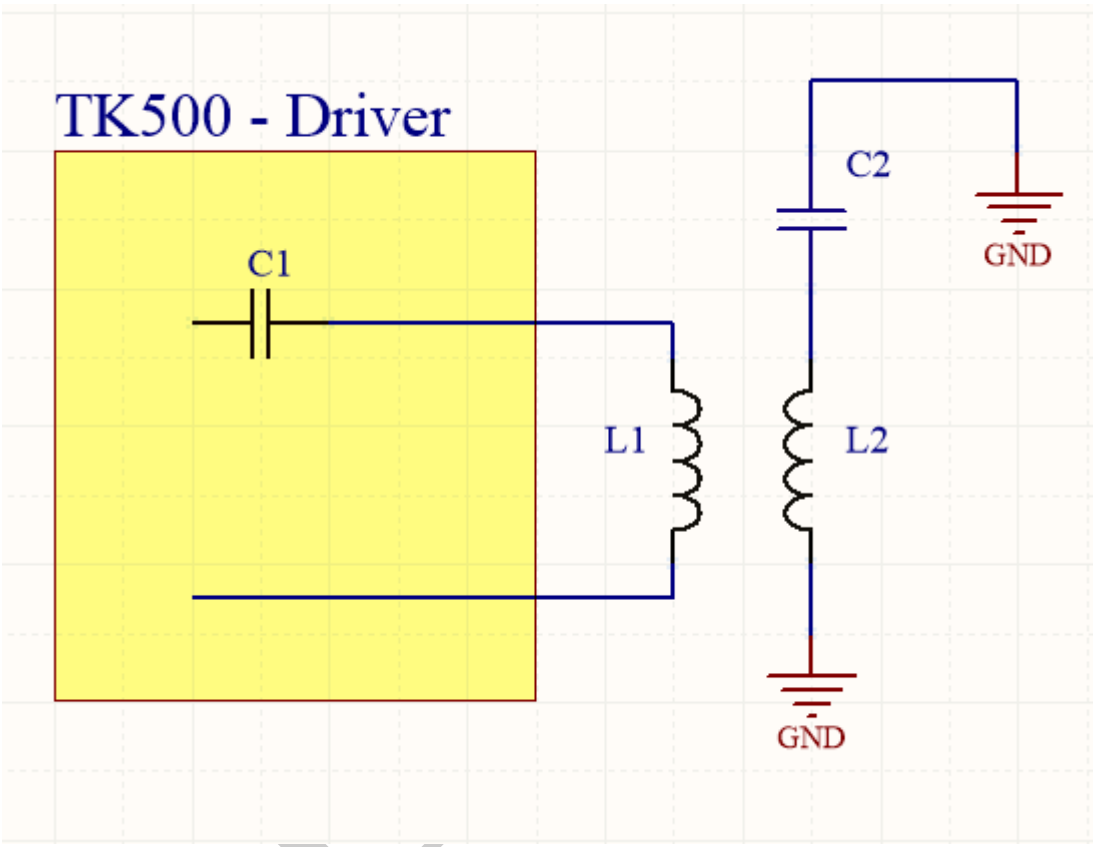


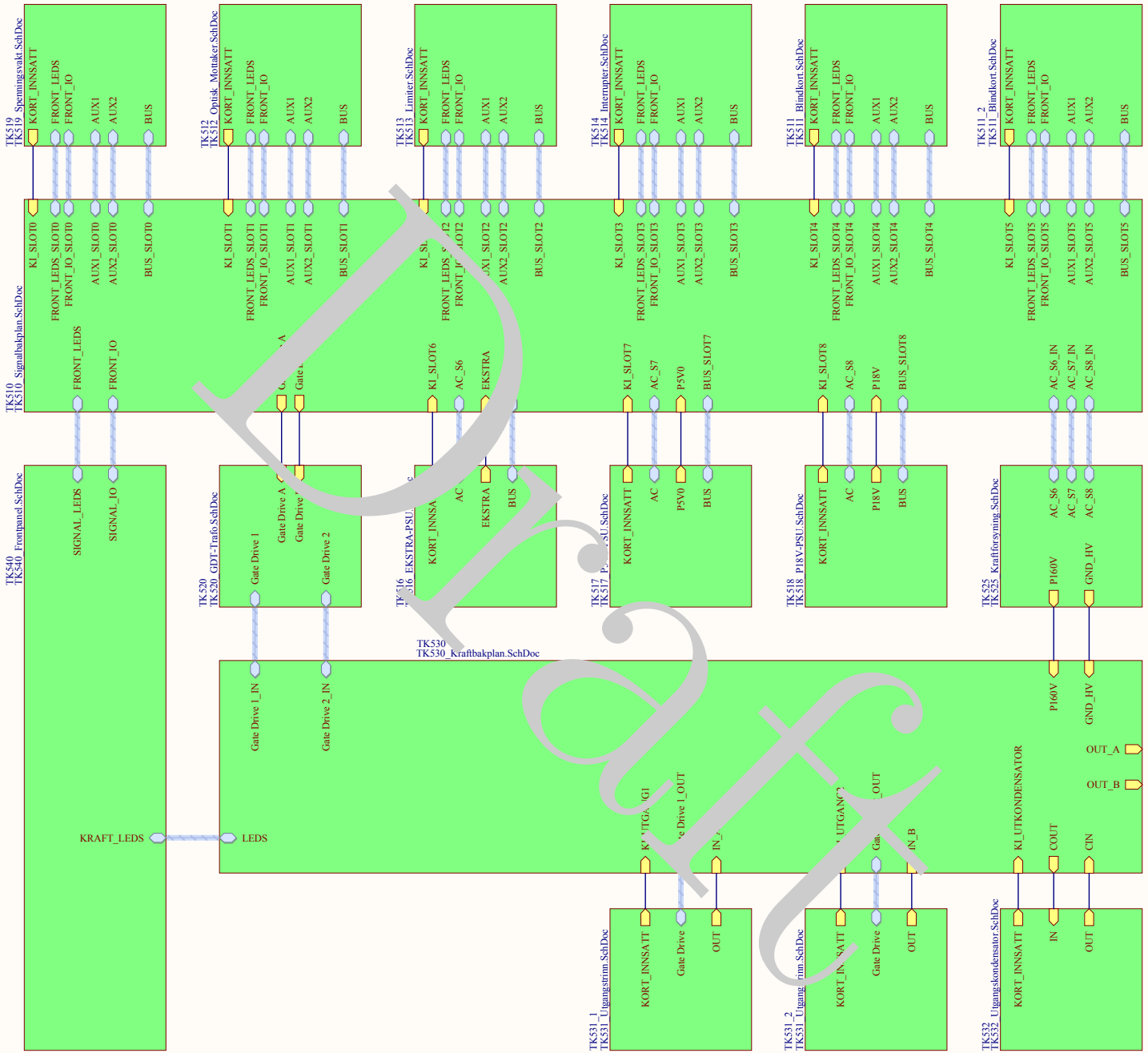
Figure 3: Coil rig schematic

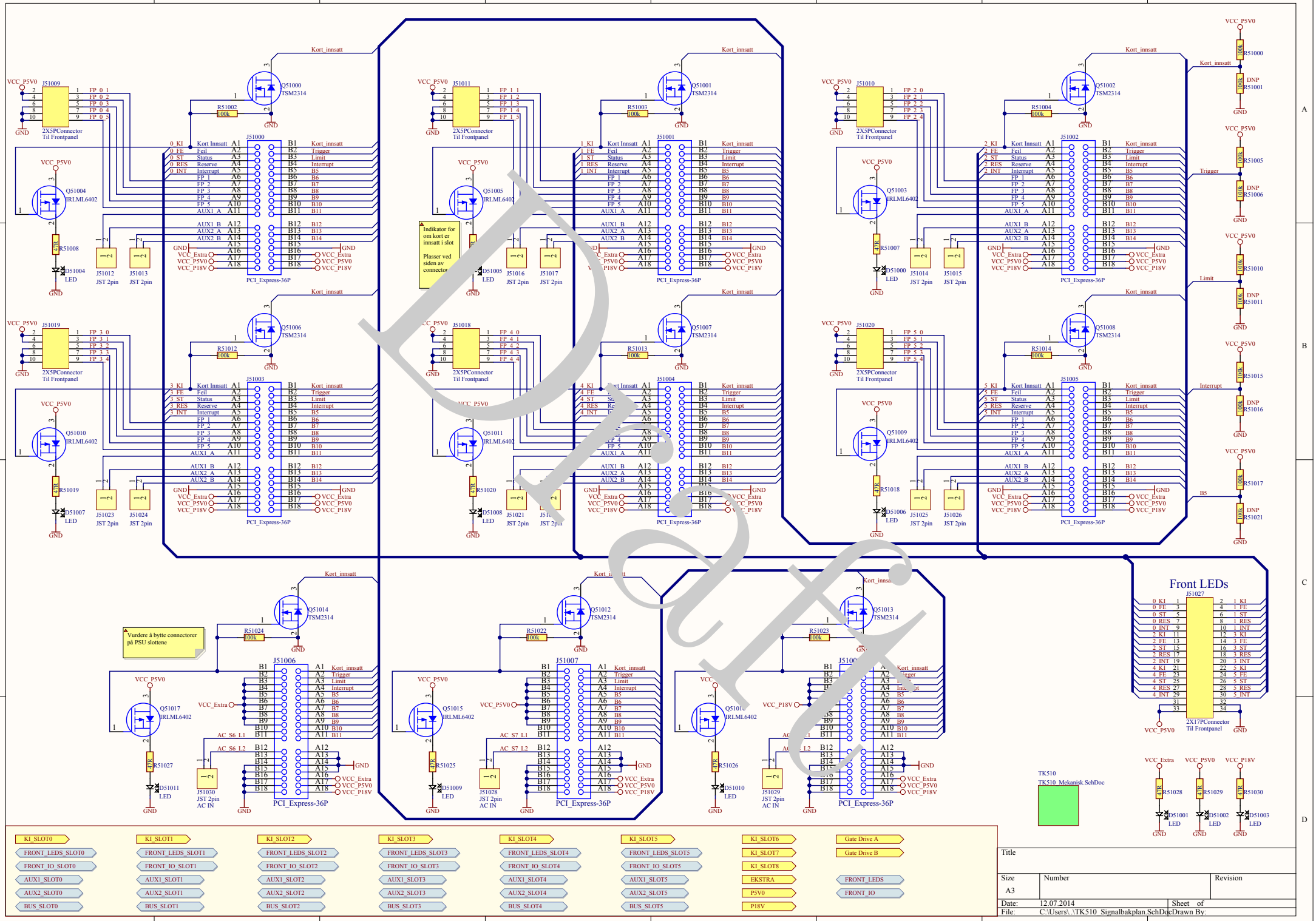
2 Powersupplies

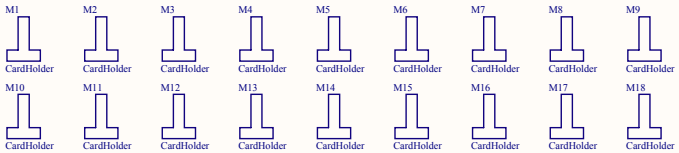
2.1 5V

3 Schematics

This page is intentionally left (almost) blank.


TK519 Spenningsvakt.SchDoc
KORT_INNSATT
FRONT_LEDS
FRONT_IO
AUX1
AUX2
BUS
TK512 Optisk_Mottaker.SchDoc
TK513 Limiter.SchDoc
TK514 Interrupter.SchDoc
TK511 Blindkort.SchDoc
TK511_2 Blindkort.SchDoc
TK510 Signalbakplan.SchDoc
KL_SLOT0
FRONT_LEDS_SLOT0
FRONT_IO_SLOT0
AUX1_SLOT0
AUX2_SLOT0
BUS_SLOT0
KL_SLOT1
FRONT_LEDS_SLOT1
FRONT_IO_SLOT1
AUX1_SLOT1
AUX2_SLOT1
BUS_SLOT1
KL_SLOT2
AUX1_SLOT2
AUX2_SLOT2
BUS_SLOT2
KL_SLOT3
FRONT_LEDS_SLOT3
FRONT_IO_SLOT3
AUX1_SLOT3
AUX2_SLOT3
BUS_SLOT3
KL_SLOT4
FRONT_LEDS_SLOT4
FRONT_IO_SLOT4
AUX1_SLOT4
AUX2_SLOT4
BUS_SLOT4
KL_SLOT5
FRONT_LEDS_SLOT5
FRONT_IO_SLOT5
AUX1_SLOT5
AUX2_SLOT5
BUS_SLOT5
KL_SLOT6
AC_S6
EKSTRA
KL_SLOT7
AC_S7
P5V0
BUS_SLOT7
KL_SLOT8
AC_S8
P18V
BUS_SLOT8
AC_S6_IN
AC_S7_IN
AC_S8_IN
TK540 Frontpanel.SchDoc
SIGNAL_LEDS
SIGNAL_IO
KRAFT_LEDS
TK520 GDT-Trafo.SchDoc
Gate Drive 1
Gate Drive 2
TK516 EKSTRA-PSU.SchDoc
KORT_INNSATT
AC
EKSTRA
BUS
TK517 P5V-PSU.SchDoc
P5V0
TK518 P18V-PSU.SchDoc
P18V
TK525 Kraftforsyning.SchDoc
P160V
GND_HV
TK530
TK530_Kraftbakplan.SchDoc
Gate Drive 1_IN
Gate Drive 2_IN
LEDS
OUT_A
OUT_B
KL_UTKONDENSATOR
COUT
CIN
TK531_1 TK531_Utgangstrinn.SchDoc
Gate Drive
OUT
TK531_2 TK531_Utgangstrinn.SchDoc
TK532 Utgangskondensator.SchDoc
IN
Title
Size
A3
Number
Revision
Date:
12.07.2014
Sheet of
File:
C:\Users\..\TK500_Driver.SchDoc
Drawn By:

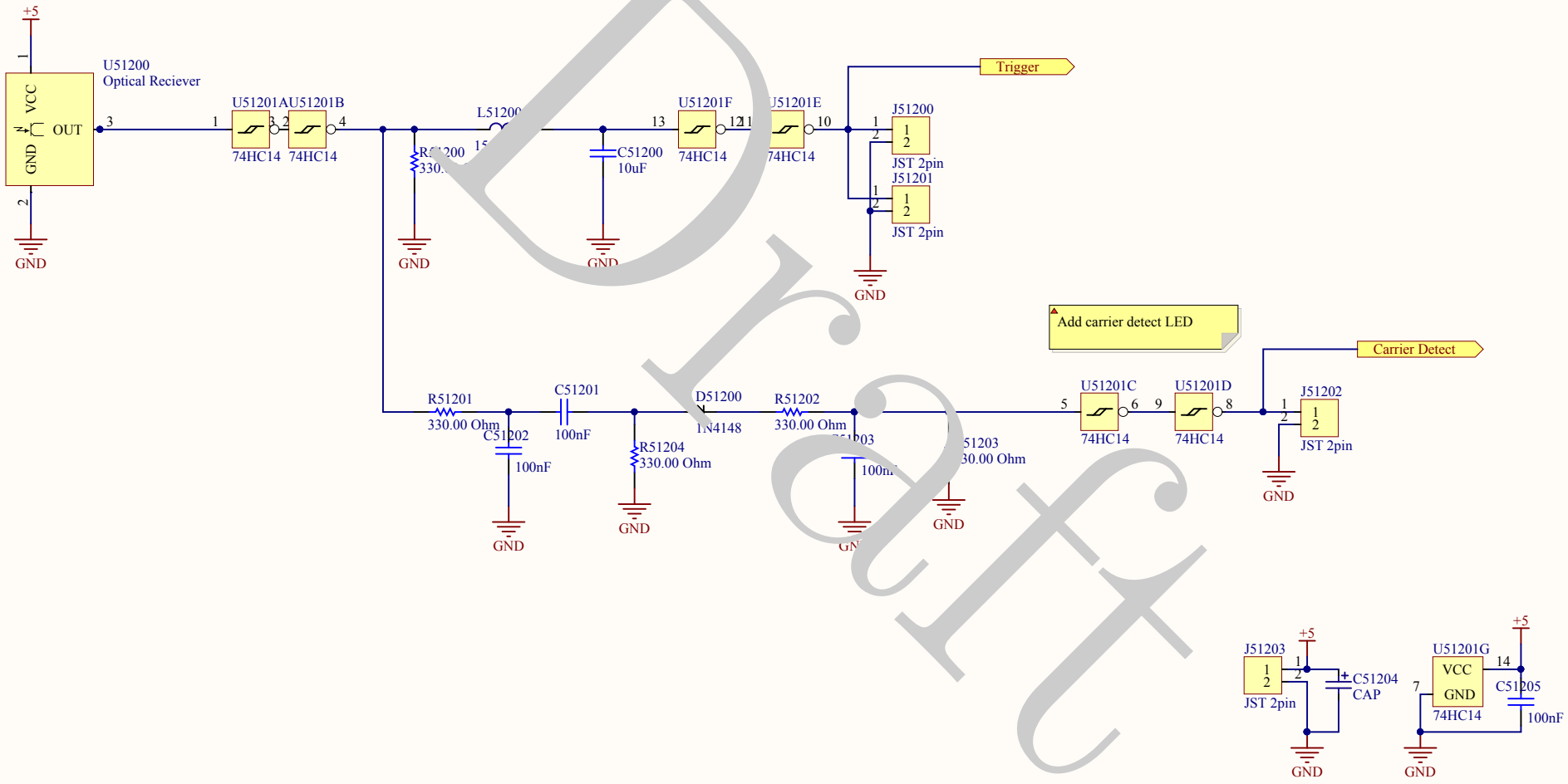

Kort_innsatt
Indikator for om kort er innsatt i slot
Plasser ved siden av connector
Vurdere å bytte connectorer på PSU slottene
Front LEDs
TK510
TK510_Mekanisk.SchDoc
KI_SLOT0
KI_SLOT1
KI_SLOT2
KI_SLOT3
KI_SLOT4
KI_SLOT5
KI_SLOT6
KI_SLOT7
KI_SLOT8
Gate Drive A
Gate Drive B
FRONT_LEDS_SLOT0
FRONT_LEDS_SLOT1
FRONT_LEDS_SLOT2
FRONT_LEDS_SLOT3
FRONT_LEDS_SLOT4
FRONT_LEDS_SLOT5
FRONT_IO_SLOT0
FRONT_IO_SLOT1
FRONT_IO_SLOT2
FRONT_IO_SLOT3
FRONT_IO_SLOT4
FRONT_IO_SLOT5
AUX1_SLOT0
AUX1_SLOT1
AUX1_SLOT2
AUX1_SLOT3
AUX1_SLOT4
AUX1_SLOT5
EKSTRA
FRONT_LEDS
AUX2_SLOT0
AUX2_SLOT1
AUX2_SLOT2
AUX2_SLOT3
AUX2_SLOT4
AUX2_SLOT5
P5V0
FRONT_IO
BUS_SLOT0
BUS_SLOT1
BUS_SLOT2
BUS_SLOT3
BUS_SLOT4
BUS_SLOT5
P18V
Title
Size
A3
Number
Revision
Date: 12.07.2014
Sheet of
File: C:\Users\..\TK510_Signalbakplan.SchDoc
Drawn By:



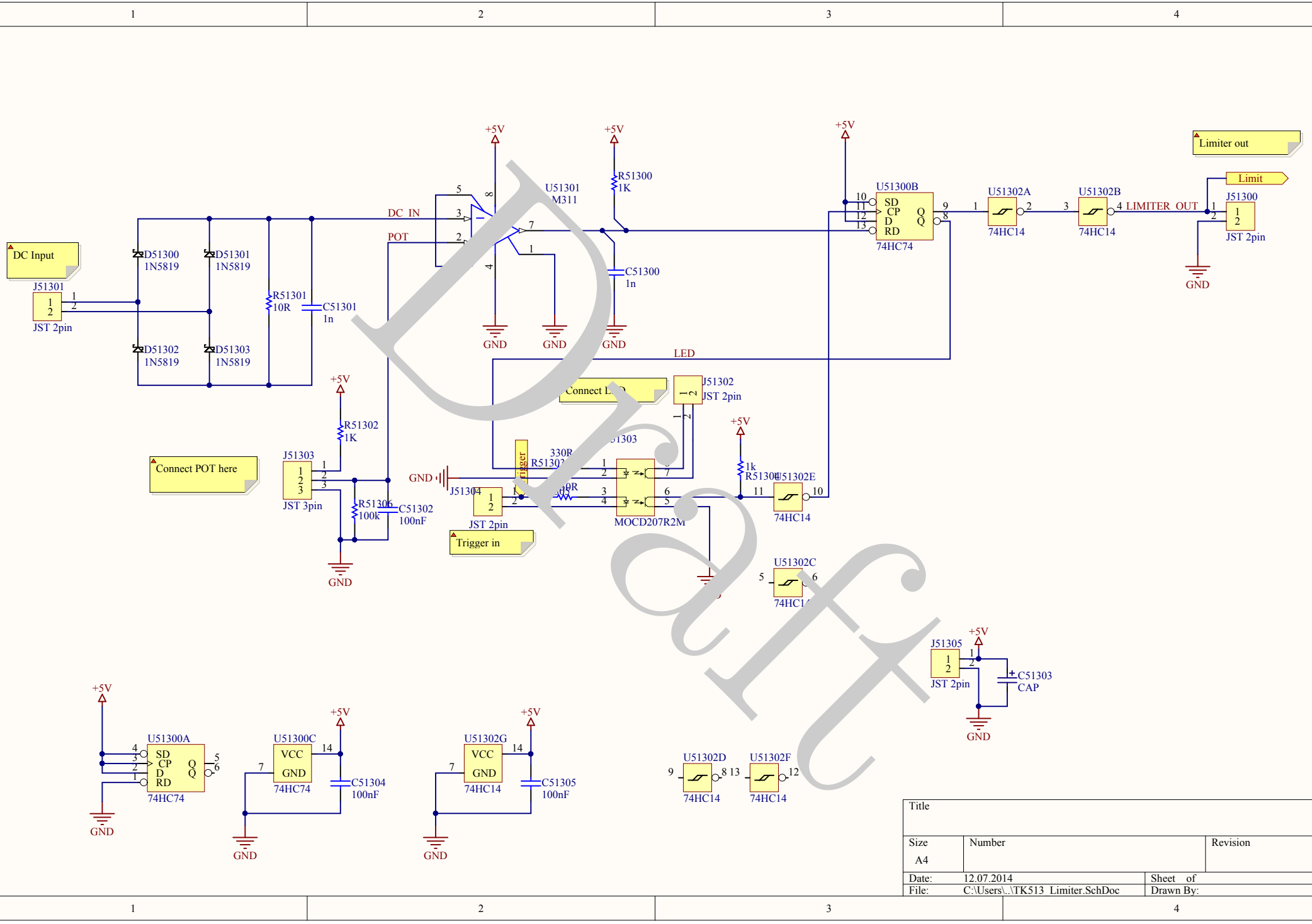
Title		
Size A3	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK510_Mekanisk.SchDoc		Drawn By:

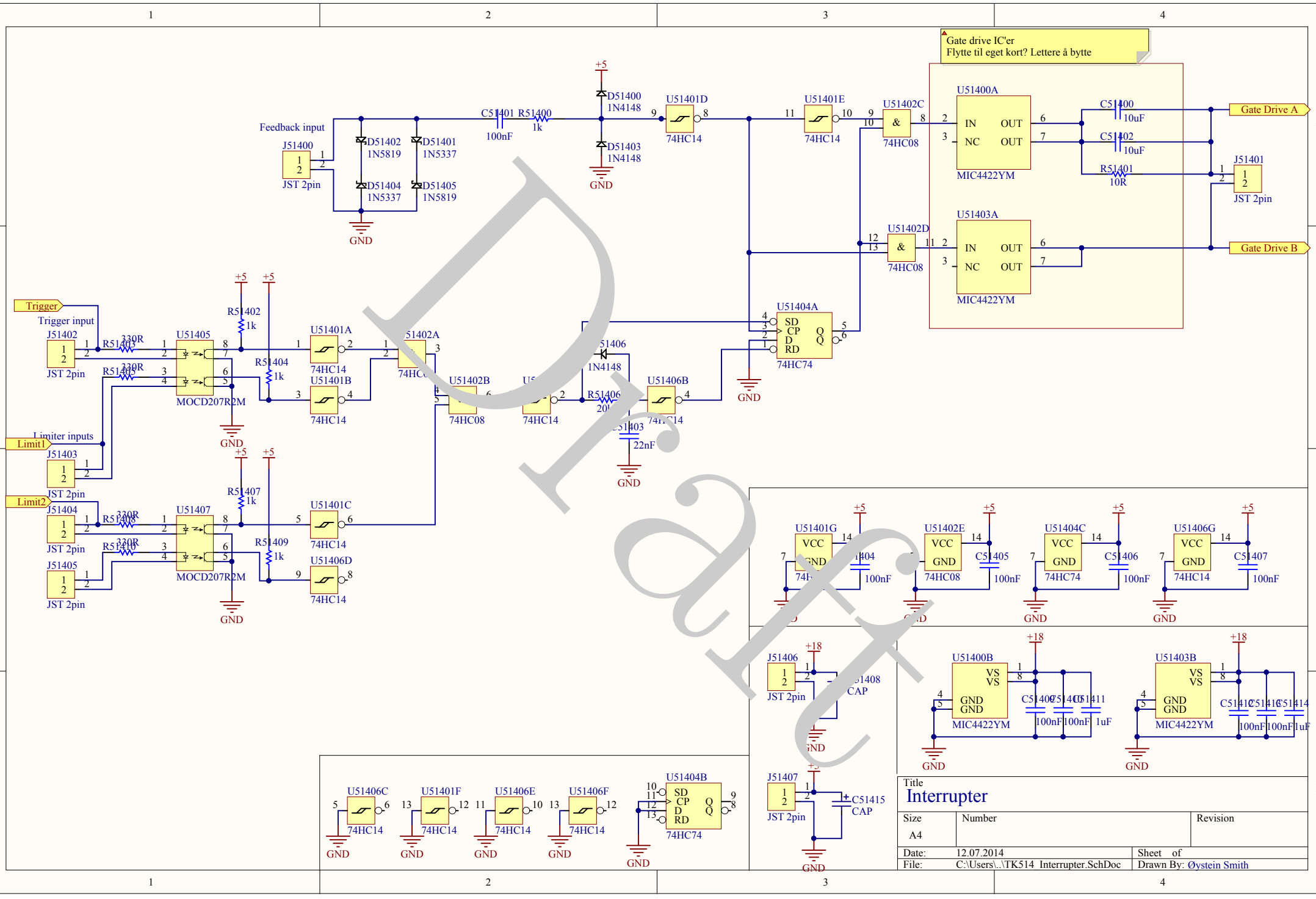
A8
A3
Limit
Interrupt
A5
A2
B10
A9
Trigger
B11
ReserveLED
Status
B6
B14
B4
A1
B5
A7
Feil
A4
B3
A6
B8
Kort innsatt
B9
B7
B13
B12

Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK511_Blindkort.SchDoc		Drawn By:



Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK512_Optisk_Mottaker.SchDoc		Drawn By:


DC Input
J51301
JST 2pin
D51300
1N5819
D51301
1N5819
D51302
1N5819
D51303
1N5819
R51301
10R
C51301
1n
DC_IN
POT
U51301
M311
+5V
GND
R51300
1K
C51300
1n
LED
U51300B
74HC74
U51302A
74HC14
U51302B
74HC14
LIMITER_OUT
Limiter out
Limit
J51300
JST 2pin
Connect POT here
J51303
JST 3pin
R51302
1K
R51306
100k
C51302
100nF
Connect LED
J51302
JST 2pin
J51304
JST 2pin
Trigger in
330R
MOCD207R2M
1k
U51302E
74HC14
U51302C
74HC14
U51300A
74HC74
U51300C
74HC74
C51304
100nF
U51302G
74HC14
C51305
100nF
U51302D
74HC14
U51302F
74HC14
J51305
JST 2pin
C51303
CAP
Draft
Title
Size
A4
Number
Revision
Date: 12.07.2014
Sheet of
File: C:\Users\..\TK513 Limiter.SchDoc
Drawn By:

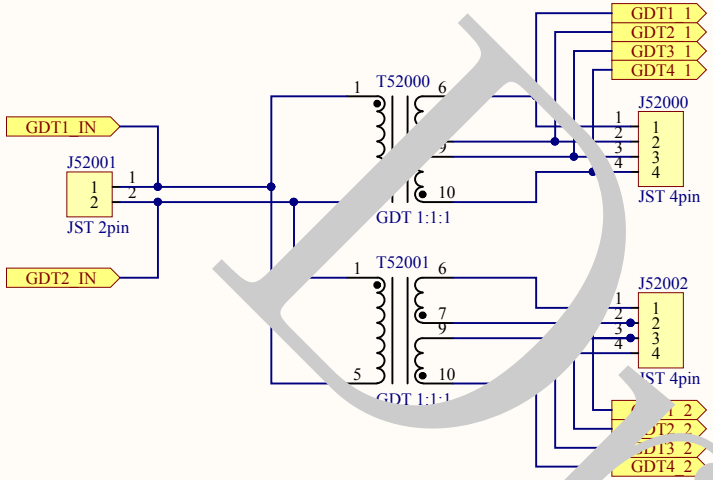

Gate drive IC'er
Flytte til eget kort? Lettere å bytte
Feedback input
J51400
JST 2pin
D51402 1N5819
D51401 1N5337
D51404 1N5337
D51405 1N5819
C51401 100nF
R51400 1k
D51400 1N4148
D51403 1N4148
GND
U51401D
74HC14
U51401E
74HC14
U51402C
74HC08
U51402D
74HC08
U51400A
MIC4422YM
U51403A
MIC4422YM
C51400 10uF
C51402 10uF
R51401 10R
J51401
JST 2pin
Gate Drive A
Gate Drive B
Trigger
Trigger input
J51402
JST 2pin
R51403 330R
R51405 330R
U51405
MOCD207R2M
R51402 1k
R51404 1k
U51401A
74HC14
U51401B
74HC14
U51402A
74HC08
U51402B
74HC08
U51404A
74HC74
D51406 1N4148
R51406 20
C51403 22nF
U51406B
74HC14
Limiter inputs
Limit1
J51403
JST 2pin
Limit2
J51404
JST 2pin
J51405
JST 2pin
R51408 330R
R51410 330R
U51407
MOCD207R2M
R51407 1k
R51409 1k
U51401C
74HC14
U51406D
74HC14
+5
GND
U51401G
74HC14
U51402E
74HC08
U51404C
74HC74
U51406G
74HC14
C51404 100nF
C51405 100nF
C51406 100nF
C51407 100nF
J51406
JST 2pin
C51408 CAP
J51407
JST 2pin
C51415 CAP
+18
U51400B
MIC4422YM
U51403B
MIC4422YM
C51409 100nF
C51410 100nF
C51411 1uF
C51412 100nF
C51413 100nF
C51414 1uF
U51406C
74HC14
U51401F
74HC14
U51406E
74HC14
U51406F
74HC14
U51404B
74HC74
Title
Interrupter
Size
A4
Number
Revision
Date: 12.07.2014
File: C:\Users\...\TK514 Interrupter.SchDoc
Sheet of
Drawn By: Øystein Smith

Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK516_EKSTRA-PSU.SchDoc		Drawn By:

Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK517_P5V0-PSU.SchDoc		Drawn By:

Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK518_P18V-PSU.SchDoc		Drawn By:

Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK519_Spenningsvakt.SchDoc		Drawn By:



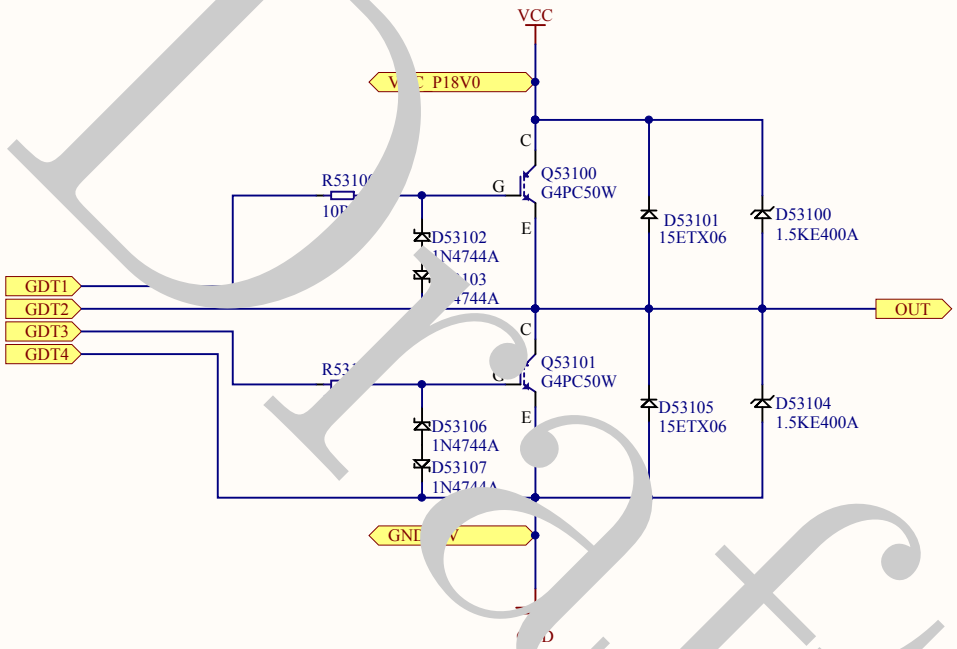
Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK520_GDT-Trafo.SchDoc		Drawn By:

Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK525_Kraftforsyning.SchDoc		Drawn By:

GDT4_2
GDT3_2
GDT1_2
GDT1_1
GDT2_2
GDT4_1
GDT2_1
GDT3_1

GND_HV
VCC_P18V0

Title		
Size: A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK530_Kraftbakplan.SchDoc		Drawn By:



Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK531_Utgangstrinn.SchDoc		Drawn By:

Title		
Size A4	Number	Revision
Date: 12.07.2014		Sheet of
File: C:\Users\..\TK532_Utgangskondensator.SchDoc		Drawn By:

ATMEL Norway	*			
Vestre Rosten 79	*			
N-7075 TILLER	*			
NORWAY				
Date:	12.07.2014	23:24:03	PAGE: 17 of 17	
Document number:	17		Revision:	A
TITLE: *				
TK540_Frontpanel.SchDoc				

Designator	Quantity	Value	Description
C51200, C51400, C51402	3	10uF	CAP10uF 25V ±10% 1206(3216Metric Thickness 1.9mm SMD
C51201, C51202, C51203, C51203, C51404, C51405, C51406, C51407, C51409, C51410, C51412, C51413	12	100nF	CAP100nF 25V ±5% 0805(2012Metric Thickness 1.45mm SMD
C51204, C51303, C51408, C51415	4		
C51300, C51301	2	100nF	CAP100nF 50V ±5% 0805(2012Metric Thickness 1mm SMD
C51302, C51304, C51305	3	100nF	CAP100nF 50V ±5% 0805(2012Metric Thickness 1mm SMD
C51401	1	100nF	CAP100nF 25V ±10% 0805(2012Metric Thickness 1.45mm SMD
C51403	1	22nF	CAP22nF 25V ±5% 0805(2012Metric Thickness 1.45mm SMD
C51411, C51414	2	1uF	CAP1uF 25V ±5% 0805(2012Metric Thickness 1.45mm SMD
D51000, D51001, D51002, D51003, D51004, D51005, D51006, D51007, D51008, D51009, D51010, D51011	12		
D51200, D51400, D51403, D51406	4		
D51300, D51301, D51302, D51[illegible] D51402, D51405	6		
D51401, D51404	2		
D53100_TK531_1, D53100_TK531_2, D53104_TK531_1, D53104_TK531_2	4		
D53101_TK531_1, D53101_TK531_2, D53105_TK531_1, D53105_TK531_2	4		
D53102_TK531_1, D53102_TK531_2, D53103_TK531_1, D53103_TK531_2, D53106_TK531_1, D53106_TK531_2, D53107_TK531_1, D53107_TK531_2	8		
J51000, J51001, J51002, J51003, J5100 J51005, J51006, J51007, J51008	9		Board-to-Board Connector, PTH, Verti Pitch 1.00mm, 36-Position
J51009, J51010, J51011, J51018, J5101 J51020	6		
J51012, J51013, J51014, J51015, J5101 J51017, J51021, J51022, J51023, J5102 J51025, J51026	12		
J51027	1		
J51028, J51029, J51030	3		
J51200, J51201, J51202, J51203, J5130 J51301, J51302, J51304, J51305, J5[illegible] J514[illegible], J51402, J51403, J51[illegible] J51406, J5[illegible]	18		
J51303	1		
J52000, J52002	2		
L51200	1		
M1, M2, M3, M4, M5, M6, M7, M8, M9 M10, M11, M12, M13, M14, M15, M16 M17, M18	18		
Q51000, Q51001, Q51002, Q510[illegible] Q51007, Q51008, Q51012, Q5101[illegible] Q51014	9		
Q51003, Q51004, Q51005, Q51009, Q51010, Q51011, Q51015, Q51016, Q51017	9		
Q53100_TK531_1, Q53100_TK531_2, Q53101_TK531_1, Q53101_TK531_2	4		
R51000, R51001, R51005, R51006, R51010, R51011, R51015, R51016, R51017, R51021	10		
R51002, R51003, R51004, R51012, R51013, R51014, R51022, R51023, R51	9		
R51007, R51008, R51009, R51018, R51019, R51020, R51025, R51026, R51027, R51028, R51029, R51030	12		
R51200, R51201, R51202, R51203, R51204	5	330.00 [illegible]	[illegible] 0.125W 5% 0805 (2012 Metric) SMD
R51300, R51302	2	1K	330R 0.125W 5% 0805 (2012 Metric SMD
R51301	1	10R	330R 0.125W 5% 0805 (2012 [illegible] SMD
R51303, R51305, R51405, R51408, R51410	5	330R	330R 0.125W 5% 0805 [illegible] Metric) SMD
R51304, R51402, R51404, R51407, R51409	5	1k	1K 0.125W 5[illegible] (2012 Metric) SM
R51306	1	100k	330R 0.125[illegible] 0805 (2012 Metric) SMD
R51400	1	1k	1K 0.125[illegible] 1% 0805 (2012 Met[illegible]) SM
R51401	1	10R	10R 0.125W [illegible]% 0805 (20[illegible] Metric) S
R51403	1	330R	330R 0.125W [illegible] (2012 Metric) SMD
R51406	1	20k	20K 0.125W 1% 0805 (2012 Metric) S
R53100_TK531_1, R53100_TK531_2, R53101_TK531_1, R53101_TK531_2	4	10R	
T52000, T52001	2		
U51200	1		
U51201, U51302, U51401, U51406	4		
U51300, U51404	2		
U51301	1		
U51303, U51405, U51407	3		
U51400, U51403	2		
U51402	1		

References