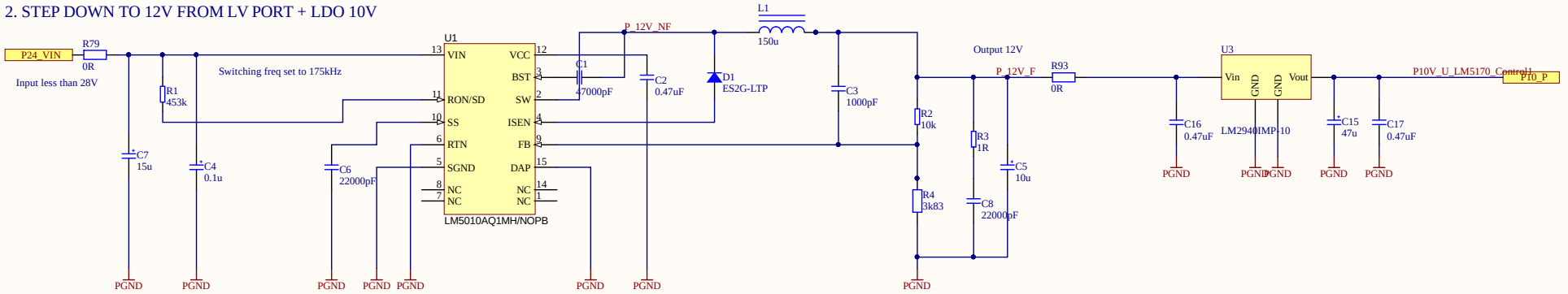
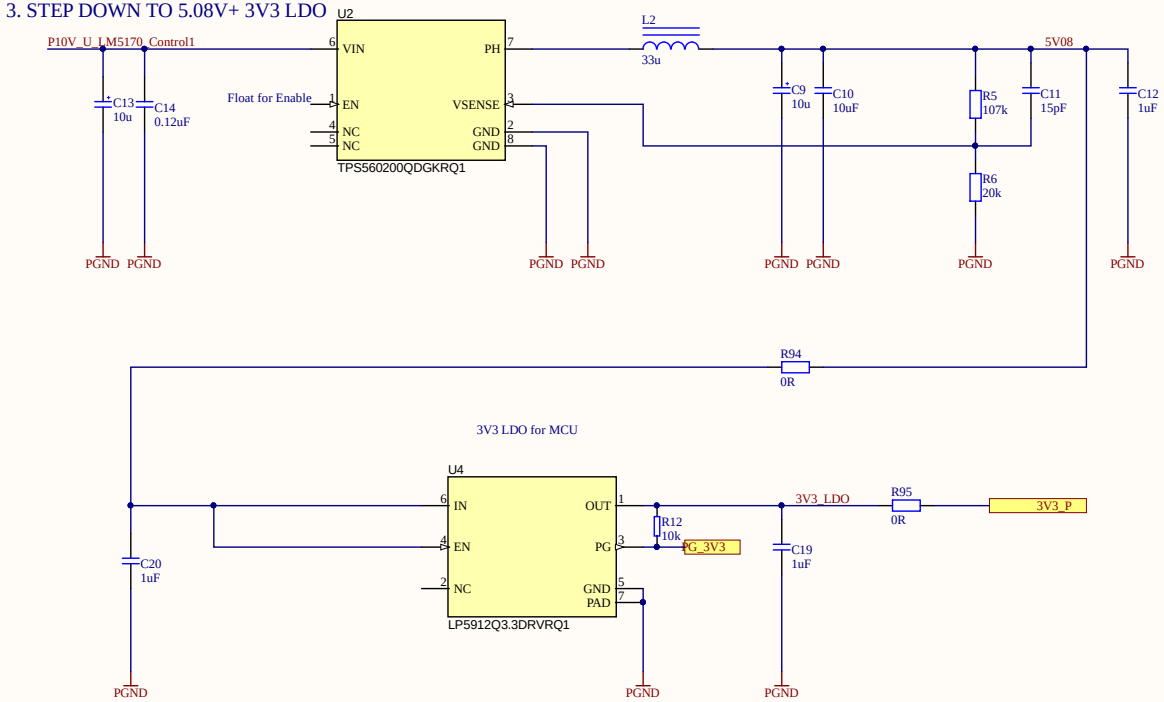
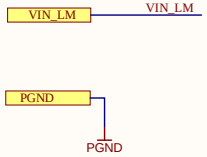
2. STEP DOWN TO 12V FROM LV PORT + LDO 10V



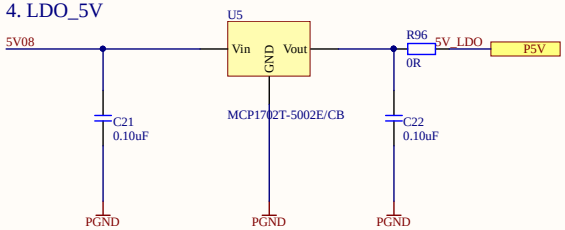
3. STEP DOWN TO 5.08V+ 3V3 LDO



1. VIN MANAGMENT



4. LDO_5V



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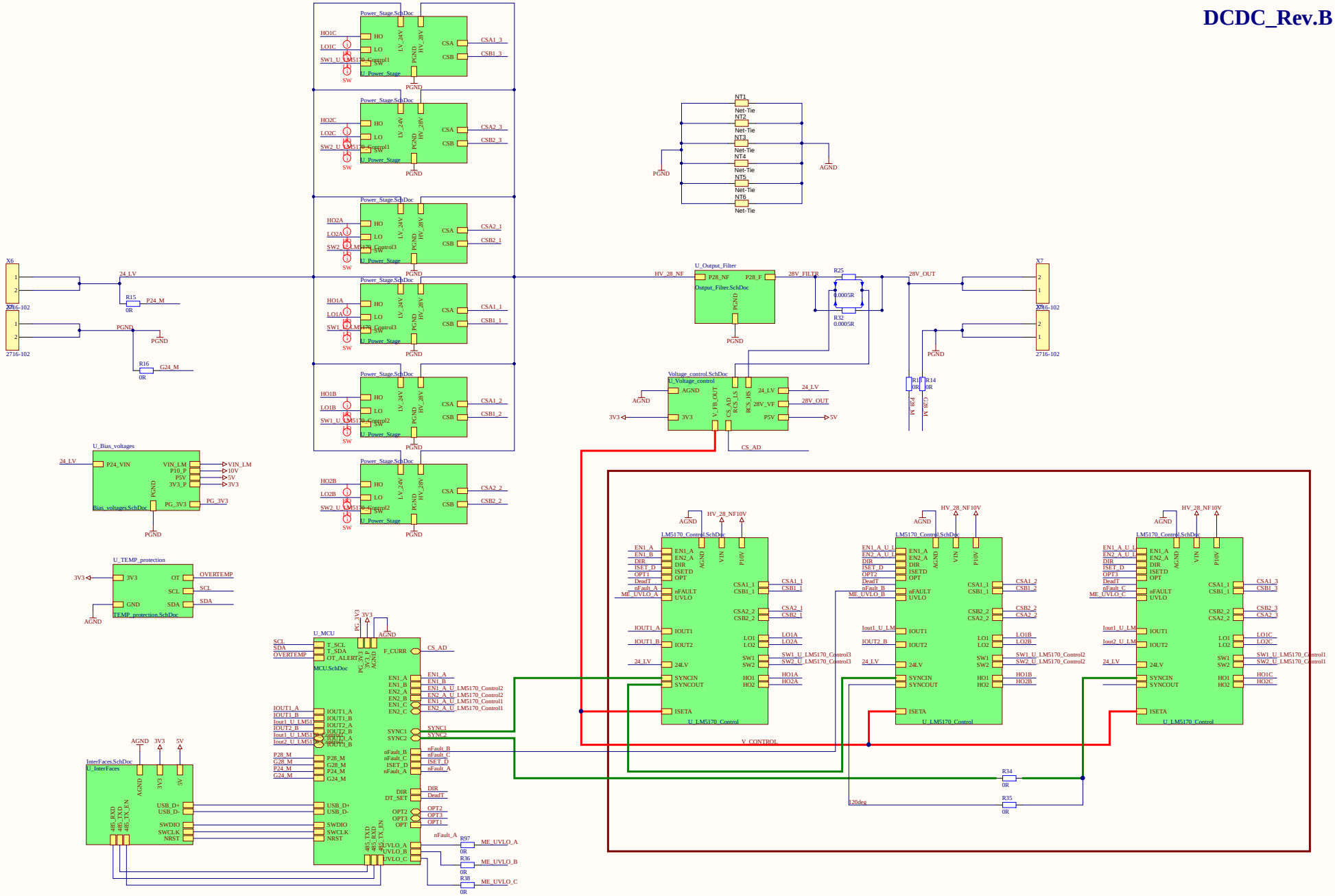
DCDC_Rev.B



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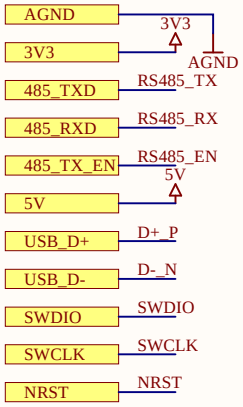
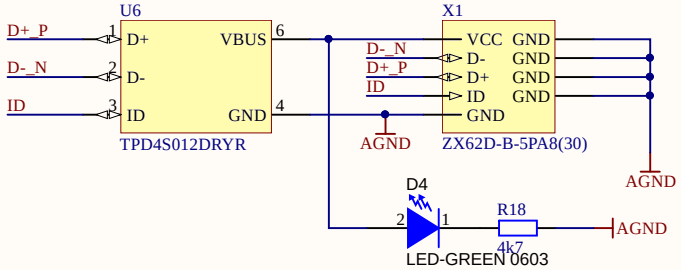
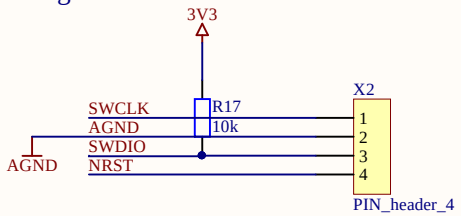
PORTS



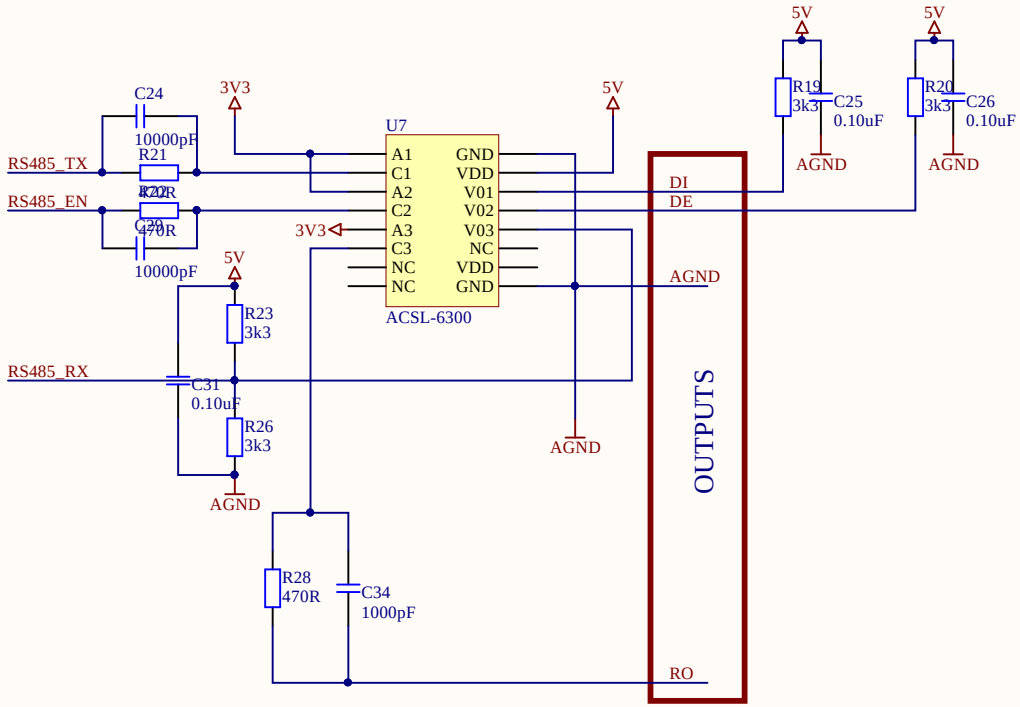
MICRO_USB_ESD



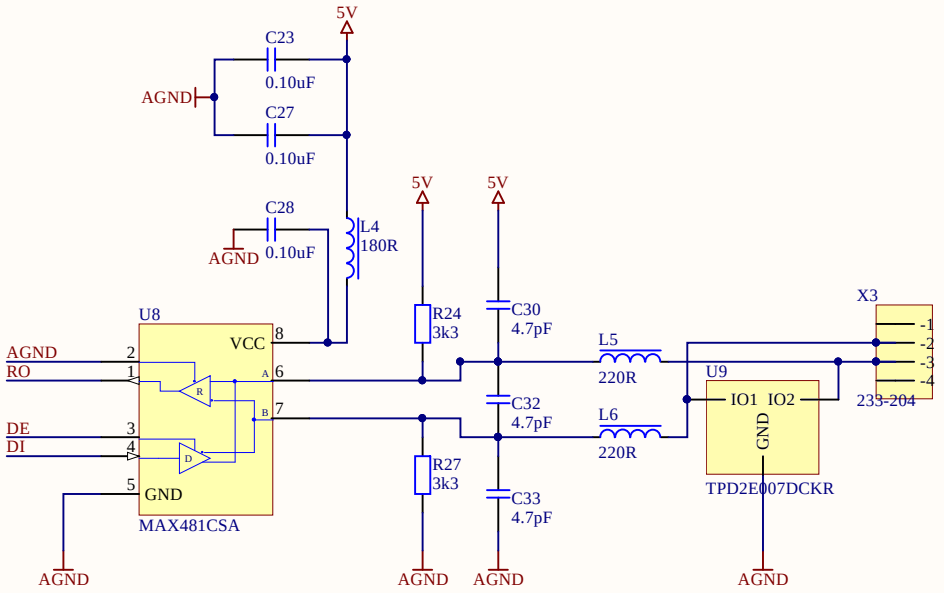
Programming Pins



OPTOCOUPLERS



RS422/485 TRS WITH ESD PROTECTION



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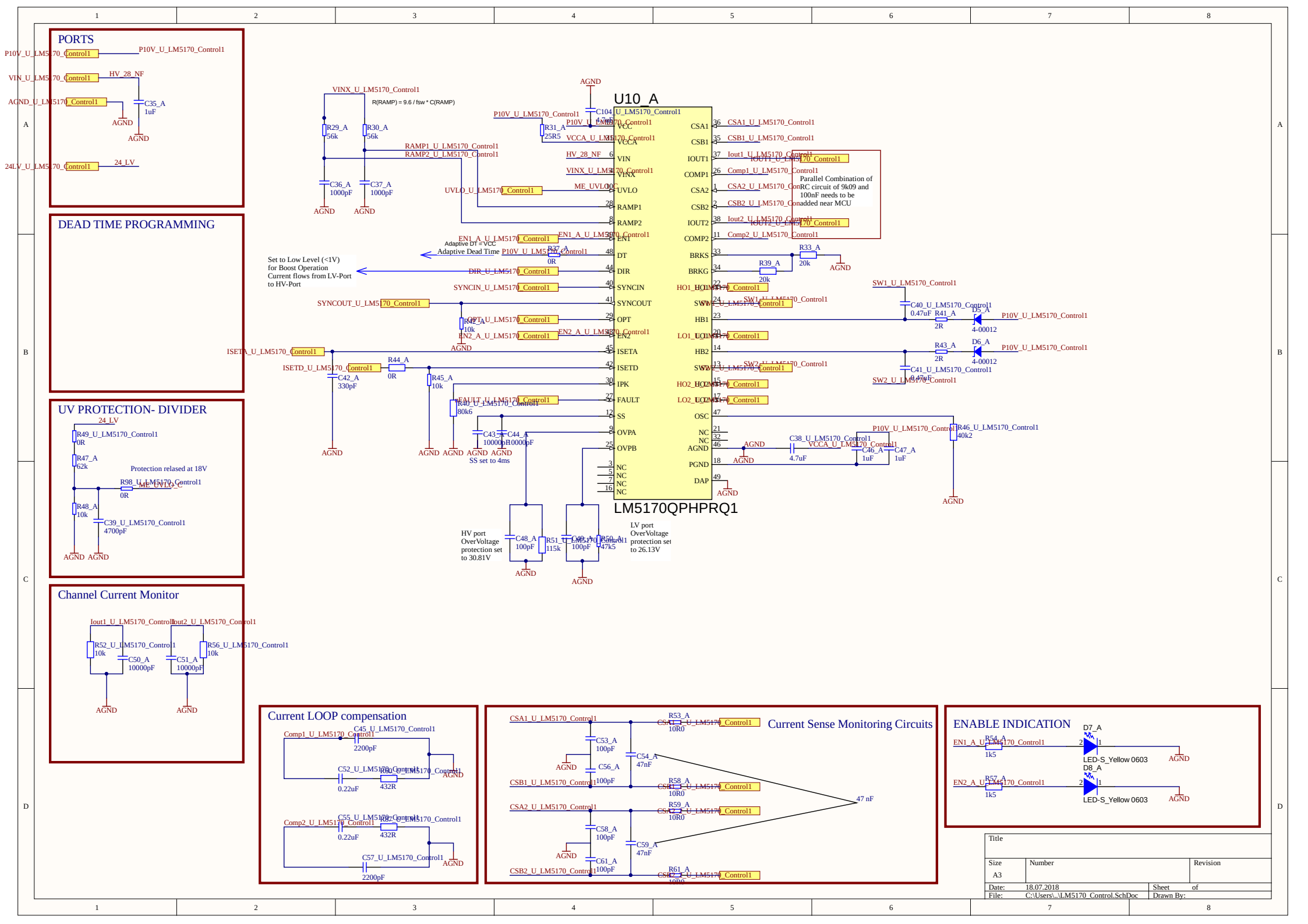
PORTS
P10V_U_LM5170_Control1
VIN_U_LM5170_Control1
AGND_U_LM5170_Control1
24LV_U_LM5170_Control1
HV_28_NF
24_LV
C35_A
1uF
AGND
DEAD TIME PROGRAMMING
UV PROTECTION- DIVIDER
24_LV
R49_U_LM5170_Control1
0R
R47_A
62k
Protection relased at 18V
R98_U_LM5170_Control1
ME_UVLO_C
0R
R48_A
10k
C39_U_LM5170_Control1
4700pF
Channel Current Monitor
Iout1_U_LM5170_Control1
Iout2_U_LM5170_Control1
R52_U_LM5170_Control1
10k
C50_A
10000pF
R56_U_LM5170_Control1
10k
C51_A
10000pF
U10_A
LM5170QPHPRQ1
VINX_U_LM5170_Control1
R(RAMP) = 9.6 / fsw * C(RAMP)
R29_A
56k
R30_A
56k
C36_A
1000pF
C37_A
1000pF
RAMP1_U_LM5170_Control1
RAMP2_U_LM5170_Control1
UVLO_U_LM5170_Control1
ME_UVLO_C
P10V_U_LM5170_Control1
C104_U_LM5170_Control1
4.7uF
R31_A
25R5
VCCA_U_LM5170_Control1
HV_28_NF
VIN
VINX_U_LM5170_Control1
VINX
UVLO
RAMP1
RAMP2
EN1_A_U_LM5170_Control1
EN1
Adaptive DT = VCC
Adaptive Dead Time
DT
R37_A
0R
Set to Low Level (<1V)
for Boost Operation
Current flows from LV-Port
to HV-Port
DIR_U_LM5170_Control1
DIR
SYNCIN_U_LM5170_Control1
SYNCIN
SYNCOUT_U_LM5170_Control1
SYNCOUT
OPT_U_LM5170_Control1
R42_A
10k
EN2_A_U_LM5170_Control1
EN2
ISETA_U_LM5170_Control1
ISETA
ISETD_U_LM5170_Control1
R44_A
0R
ISETD
C42_A
330pF
R45_A
10k
IPK
FAULT_U_LM5170_Control1
R40_U_LM5170_Control1
80k6
FAULT
SS
C43_A
C44_A
10000pH10000pF
SS set to 4ms
OVPA
OVPB
NC
NC
NC
NC
CSA1
CSB1
IOUT1
COMP1
CSA2
CSB2
IOUT2
COMP2
BRKS
BRKG
HO1_HO1
SW1
HB1
LO1_LO1
HB2
SW2
HO2_HO2
LO2_LO2
OSC
NC
NC
AGND
PGND
DAP
CSA1_U_LM5170_Control1
CSB1_U_LM5170_Control1
Iout1_U_LM5170_Control1
Comp1_U_LM5170_Control1
CSA2_U_LM5170_Control1
CSB2_U_LM5170_Control1
Iout2_U_LM5170_Control1
Comp2_U_LM5170_Control1
Parallel Combination of
RC circuit of 9k09 and
100nF needs to be
added near MCU
R33_A
20k
R39_A
20k
SW1_U_LM5170_Control1
SW2_U_LM5170_Control1
C40_U_LM5170_Control1
0.47uF
R41_A
2R
D5_A
4-00012
R43_A
2R
D6_A
4-00012
C41_U_LM5170_Control1
0.47uF
C38_U_LM5170_Control1
4.7uF
VCCA_U_LM5170_Control1
C46_A
1uF
C47_A
1uF
R46_U_LM5170_Control1
40k2
HV port
OverVoltage
protection set
to 30.81V
C48_A
100pF
R51_U_LM5170_Control1
115k
C49_A
100pF
R50_A
47k5
LV port
OverVoltage
protection set
to 26.13V
Current LOOP compensation
Comp1_U_LM5170_Control1
C45_U_LM5170_Control1
2200pF
C52_U_LM5170_Control1
0.22uF
R60_U_LM5170_Control1
432R
Comp2_U_LM5170_Control1
C55_U_LM5170_Control1
0.22uF
R62_U_LM5170_Control1
432R
C57_U_LM5170_Control1
2200pF
Current Sense Monitoring Circuits
CSA1_U_LM5170_Control1
R53_A
10R0
C53_A
100pF
C54_A
47nF
C56_A
100pF
CSB1_U_LM5170_Control1
R58_A
10R0
47 nF
CSA2_U_LM5170_Control1
R59_A
10R0
C58_A
100pF
C59_A
47nF
C61_A
100pF
CSB2_U_LM5170_Control1
R61_A
10R0
ENABLE INDICATION
EN1_A_U_LM5170_Control1
R54_A
1k5
D7_A
LED-S_Yellow 0603
EN2_A_U_LM5170_Control1
R57_A
1k5
D8_A
LED-S_Yellow 0603
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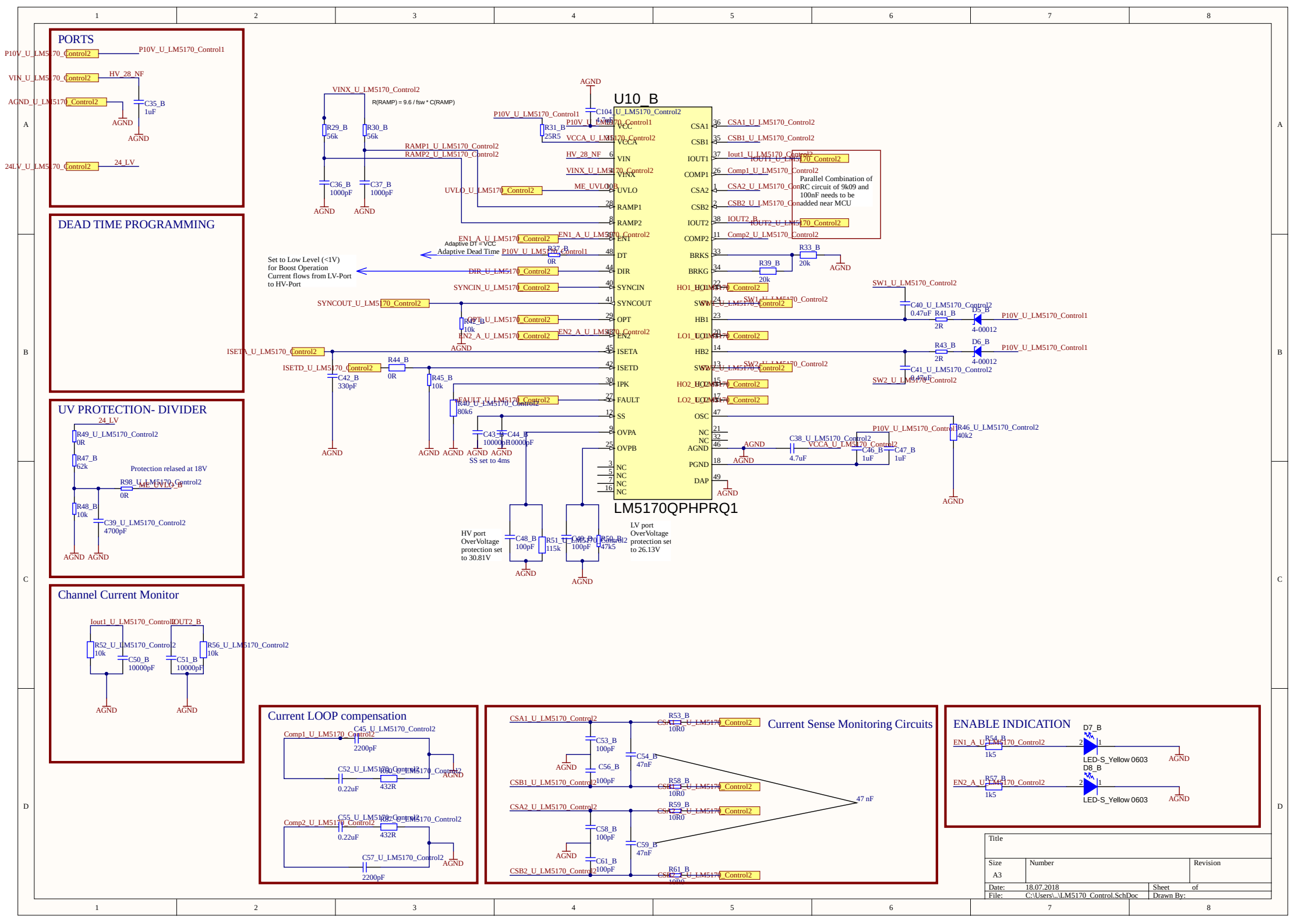
PORTS
P10V_U_LM5170_Control2
P10V_U_LM5170_Control1
VIN_U_LM5170_Control2
HV_28_NF
C35_B
1uF
AGND
AGND_U_LM5170_Control2
24LV_U_LM5170_Control2
24_LV
DEAD TIME PROGRAMMING
UV PROTECTION- DIVIDER
24_LV
R49_U_LM5170_Control2
0R
R47_B
62k
Protection relased at 18V
R98_U_LM5170_Control2
ME_UVLO_B
0R
R48_B
10k
C39_U_LM5170_Control2
4700pF
Channel Current Monitor
Iout1_U_LM5170_Control2
IOUT2_B
R52_U_LM5170_Control2
10k
C50_B
10000pF
C51_B
10000pF
R56_U_LM5170_Control2
10k
VINX_U_LM5170_Control2
R(RAMP) = 9.6 / fsw * C(RAMP)
R29_B
56k
R30_B
56k
RAMP1_U_LM5170_Control2
RAMP2_U_LM5170_Control2
C36_B
1000pF
C37_B
1000pF
UVLO_U_LM5170_Control2
ME_UVLO_B
U10_B
C104_U_LM5170_Control2
4.7uF
P10V_U_LM5170_Control1
R31_B
25R5
VCCA_U_LM5170_Control2
HV_28_NF
VINX_U_LM5170_Control2
VCC
VCCA
VIN
VINX
UVLO
RAMP1
RAMP2
EN1
DT
DIR
SYNCIN
SYNCOUT
OPT
EN2
ISETA
ISETD
IPK
FAULT
SS
OVPA
OVPB
NC
NC
NC
NC
CSA1
CSB1
IOUT1
COMP1
CSA2
CSB2
IOUT2
COMP2
BRKS
BRKG
HO1_HO1
SW1_U_LM5170_Control2
HB1
LO1_LO1
HB2
SW2_U_LM5170_Control2
HO2_HO2
LO2_LO2
OSC
NC
NC
AGND
PGND
DAP
LM5170QPHPRQ1
CSA1_U_LM5170_Control2
CSB1_U_LM5170_Control2
Iout1_U_LM5170_Control2
Comp1_U_LM5170_Control2
CSA2_U_LM5170_Control2
CSB2_U_LM5170_Control2
IOUT2_B
Comp2_U_LM5170_Control2
Parallel Combination of
RC circuit of 9k09 and
100nF needs to be
added near MCU
EN1_A_U_LM5170_Control2
Adaptive DT = VCC
Adaptive Dead Time
R37_B
0R
Set to Low Level (<1V)
for Boost Operation
Current flows from LV-Port
to HV-Port
DIR_U_LM5170_Control2
SYNCIN_U_LM5170_Control2
SYNCOUT_U_LM5170_Control2
OPT_U_LM5170_Control2
R42_B
10k
EN2_A_U_LM5170_Control2
ISETA_U_LM5170_Control2
ISETD_U_LM5170_Control2
R44_B
0R
C42_B
330pF
R45_B
10k
FAULT_U_LM5170_Control2
R40_U_LM5170_Control2
80k6
C43_B
10000pF
C44_B
10000pF
SS set to 4ms
R33_B
20k
R39_B
20k
SW1_U_LM5170_Control2
C40_U_LM5170_Control2
0.47uF
R41_B
2R
D5_B
4-00012
P10V_U_LM5170_Control1
R43_B
2R
D6_B
4-00012
C41_U_LM5170_Control2
0.47uF
SW2_U_LM5170_Control2
C38_U_LM5170_Control2
4.7uF
VCCA_U_LM5170_Control2
C46_B
1uF
C47_B
1uF
R46_U_LM5170_Control2
40k2
HV port
OverVoltage
protection set
to 30.81V
C48_B
100pF
R51_U_LM5170_Control2
115k
C49_B
100pF
R50_B
47k5
LV port
OverVoltage
protection set
to 26.13V
Current LOOP compensation
Comp1_U_LM5170_Control2
C45_U_LM5170_Control2
2200pF
C52_U_LM5170_Control2
0.22uF
R60_U_LM5170_Control2
432R
Comp2_U_LM5170_Control2
C55_U_LM5170_Control2
0.22uF
R62_U_LM5170_Control2
432R
C57_U_LM5170_Control2
2200pF
Current Sense Monitoring Circuits
CSA1_U_LM5170_Control2
R53_B
10R0
C53_B
100pF
C54_B
47nF
CSB1_U_LM5170_Control2
C56_B
100pF
R58_B
10R0
CSA2_U_LM5170_Control2
R59_B
10R0
C58_B
100pF
C59_B
47nF
CSB2_U_LM5170_Control2
C61_B
100pF
R61_B
10R0
47 nF
ENABLE INDICATION
EN1_A_U_LM5170_Control2
R54_B
1k5
D7_B
LED-S_Yellow 0603
EN2_A_U_LM5170_Control2
R57_B
1k5
D8_B
LED-S_Yellow 0603
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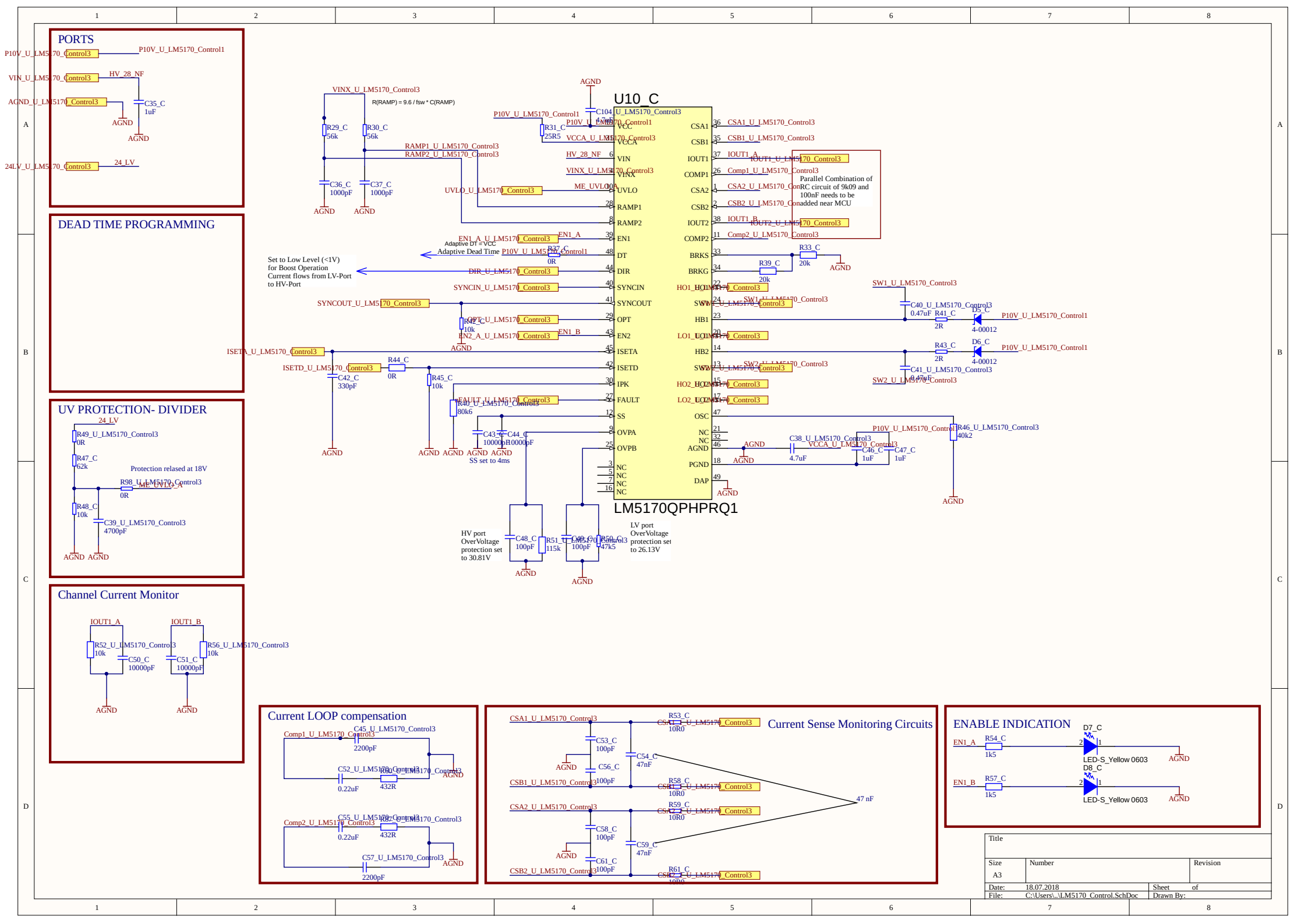
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P10V_U_LM5170_Control3
P10V_U_LM5170_Control1
VIN_U_LM5170_Control3
HV_28_NF
C35_C
1uF
AGND_U_LM5170_Control3
AGND
24LV_U_LM5170_Control3
24_LV
DEAD TIME PROGRAMMING
UV PROTECTION- DIVIDER
24_LV
R49_U_LM5170_Control3
0R
R47_C
62k
Protection relased at 18V
R98_U_LM5170_Control3
ME_UVLO_A
0R
R48_C
10k
C39_U_LM5170_Control3
4700pF
Channel Current Monitor
IOUT1_A
IOUT1_B
R52_U_LM5170_Control3
10k
C50_C
10000pF
C51_C
R56_U_LM5170_Control3
U10_C
LM5170QPHPRQ1
VINX_U_LM5170_Control3
R(RAMP) = 9.6 / fsw * C(RAMP)
R29_C
56k
R30_C
RAMP1_U_LM5170_Control3
RAMP2_U_LM5170_Control3
C36_C
1000pF
C37_C
UVLO_U_LM5170_Control3
ME_UVLO_A
EN1_A_U_LM5170_Control3
EN1_A
Adaptive DT = VCC
Adaptive Dead Time
R37_C
0R
Set to Low Level (<1V)
for Boost Operation
Current flows from LV-Port
to HV-Port
DIR_U_LM5170_Control3
SYNCIN_U_LM5170_Control3
SYNCOUT_U_LM5170_Control3
OPT_U_LM5170_Control3
R42_C
10k
EN2_A_U_LM5170_Control3
EN1_B
ISETA_U_LM5170_Control3
ISETD_U_LM5170_Control3
R44_C
0R
C42_C
330pF
R45_C
10k
FAULT_U_LM5170_Control3
R40_U_LM5170_Control3
80k6
SS set to 4ms
C43_C
C44_C
10000pF
P10V_U_LM5170_Control1
C104_U_LM5170_Control3
4.7uF
R31_C
25R5
VCCA_U_LM5170_Control3
HV_28_NF
VINX_U_LM5170_Control3
ME_UVLO_A
EN1_A
EN1
DT
DIR
SYNCIN
SYNCOUT
OPT
EN2
ISETA
ISETD
IPK
FAULT
SS
OVPA
OVPB
NC
NC
NC
NC
VCC
VCCA
VIN
VINX
UVLO
RAMP1
RAMP2
CSA1
CSB1
IOUT1
COMP1
CSA2
CSB2
IOUT2
COMP2
BRKS
BRKG
HO1_HO1
SW1_U_LM5170_Control3
HB1
LO1_LO1
HB2
SW2_U_LM5170_Control3
HO2_HO2
LO2_LO2
OSC
NC
NC
AGND
PGND
DAP
CSA1_U_LM5170_Control3
CSB1_U_LM5170_Control3
IOUT1_A
IOUT1_U_LM5170_Control3
Comp1_U_LM5170_Control3
CSA2_U_LM5170_Con
CSB2_U_LM5170_Con
IOUT1_B
IOUT2_U_LM5170_Control3
Comp2_U_LM5170_Control3
Parallel Combination of
RC circuit of 9k09 and
100nF needs to be
added near MCU
R33_C
20k
R39_C
20k
HO1_U_LM5170_Control3
LO1_U_LM5170_Control3
HO2_U_LM5170_Control3
LO2_U_LM5170_Control3
SW1_U_LM5170_Control3
SW2_U_LM5170_Control3
C40_U_LM5170_Control3
0.47uF
R41_C
2R
D5_C
4-00012
P10V_U_LM5170_Control1
R43_C
2R
D6_C
4-00012
C41_U_LM5170_Control3
0.47uF
C38_U_LM5170_Control3
4.7uF
VCCA_U_LM5170_Control3
C46_C
1uF
C47_C
1uF
R46_U_LM5170_Control3
40k2
HV port
OverVoltage
protection set
to 30.81V
C48_C
100pF
R51_U_LM5170_Control3
115k
C49_C
100pF
R50_C
47k5
LV port
OverVoltage
protection set
to 26.13V
Current LOOP compensation
Comp1_U_LM5170_Control3
C45_U_LM5170_Control3
2200pF
C52_U_LM5170_Control3
0.22uF
R60_U_LM5170_Control3
432R
Comp2_U_LM5170_Control3
C55_U_LM5170_Control3
R62_U_LM5170_Control3
C57_U_LM5170_Control3
Current Sense Monitoring Circuits
CSA1_U_LM5170_Control3
R53_C
10R0
C53_C
100pF
C54_C
47nF
CSB1_U_LM5170_Control3
R58_C
10R0
C56_C
100pF
CSA2_U_LM5170_Control3
R59_C
10R0
C58_C
100pF
C59_C
47nF
CSB2_U_LM5170_Control3
R61_C
10R0
C61_C
100pF
47 nF
ENABLE INDICATION
EN1_A
R54_C
1k5
D7_C
LED-S_Yellow 0603
EN1_B
R57_C
1k5
D8_C
LED-S_Yellow 0603
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PORTS

T_SCL — SCL
T_SDA — SDA
OT_ALERT — OVERTEMP
UVLO_A — UVLO_A
UVLO_B — UVLO_B
UVLO_C — UVLO_C

nFault_A — nFault_A
nFault_C — nFault_C
nFault_B — nFault_B
DIR — DIR

AGND
OPT — OPT1_AGND
OPT2 — OPT2
OPT3 — OPT3
EN1_A — EN1_A
EN2_A — EN1_A_U_LM5170_Control2
EN1_B — EN1_B
EN2_B — EN2_A_U_LM5170_Control2
EN1_C — EN1_A_U_LM5170_Control1
EN2_C — EN2_A_U_LM5170_Control1
IOUT1_A — IOUT1_A
IOUT1_B — IOUT1_B
IOUT2_A — Iout1_U_LM5170_Control2
IOUT2_B — IOUT2_B
IOUT3_A — Iout1_U_LM5170_Control1
IOUT3_B — Iout2_U_LM5170_Control1
DT_SET — DeadT
P28_M — P28_M
G28_M — G28_M
P24_M — P24_M
G24_M — G24_M
485_TXD — RS485_TX
485_RXD — RS485_RX
485_TX_EN — RS485_EN
USB_D+ — D+_P
USB_D- — D-_N
PG_3V3 — PG_3V3
3V3_P — 3V3
ISET_D — ISET_D
SWCLK — SWCLK
SWDIO — SWDIO
NRST — NRST
SYNC1 — SYNC1
SYNC2 — SYNC2
F_CURR — CS_AD

DIRECTION AND FAULT INDICATION

SN74LVC2G17QDCKRQ1 U12A
DIR
3V3
AGND
C18 0.10uF
R62 1k5
R64 1k5
D9 LED-GREEN 0603

SN74LVC2G17QDCKRQ1 U12B
nFault_A
Fault_A
D11 LED-S_RED 0603

SN74LVC2G17QDCKRQ1 U20A
nFault_B
Fault_B
C63 0.10uF
R8 1k5
R55 1k5
D13 LED-S_RED 0603

U20B SN74LVC2G17QDCKRQ1
nFault_C
Fault_C
D14 LED-S_RED 0603

UVLO_A AND RST INDICATION

SN74LVC2G17QDCKRQ1 U13A
UVLO_A
C62 0.10uF
D10 LED-S_RED 0603
R63 1k5

SN74LVC2G17QDCKRQ1 U13B
NRST
D12 LED-S_RED 0603
R65 1k5

MCU POWER

U11B
VBAT
VDD_1 VDD_2 VDD_3 VDD_4
VSS_1 VSS_2 VSS_3 VSS_4
VDDA VSSA
STM32F103R8T6TR
C64 1uF
C65 0.10uF

8x100nF Ceramic X7R Capacitor 0402
C66 C67 C68 C69 C70 C71 C72 C73 0.10uF

OUTPUT VOLTAGE MEASURMENT

C74 330pF
C75 0.10uF
R68 1k
R69
R70 11k7
U14A TLV2252AQD
V_OUT_M
D2 4-00101
R71 1k
C76 330pF

MAX Output Voltage =>2.79V, for 30V

ISET_D — R7 0R — ISET_Dx

MCU

U11A STM32F103R8T6TR
CS_AD
RS485_TX RS485_RX RS485_EN
EN1_B
Iout2_U_LM5170_Control1
Iout1_U_LM5170_Control1
UVLO_A EN1_A
D- D+ SWDIO SWCLK ISET_Dx
IOUT1_A IOUT1_B Iout1_U_LM5170_Control2 IOUT2_B V_OUT_M V_IN_M Fault_B PG_3V3 Fault_C
DIR
OVERTEMP
EN2_A_U_LM5170_Control2
EN1_A_U_LM5170_Control2
PD0-OSC_IN PD1-OSC_OUT
SYNC1 SYNC2 OPT2 OPT1 SCL SDA UVLO_C Fault_A EN1_A_U_LM5170_Control1 EN2_A_U_LM5170_Control1 UVLO_B OPT3 NRST
BOOT0
PC13-TAMPER-RTC
PC14-OSC32_IN
PC15-OSC32_OUT

R67 10k
R76 10k
R9 5k1
R10 5k1
D3 4-00101
D19 4-00101
R92 10k
R66 10k
Y1
C110 5.6pF
C111 5.6pF
Crystal_SMD_ECS
R91 0R

INPUT VOLTAGE MEASURMENT

C77 330pF
C78 0.10uF
R72 1k
G24_M
P24_M
R73
R74 9k53
U14B TLV2252AQD
V_IN_M
D15 4-00101
R75 1k
C79 330pF

MAX Output Voltage =>2.38V, for 24V

UVLO_B AND UVLO_C Indication

SN74LVC2G17QDCKRQ1 U22A
UVLO_B
C103 0.10uF
D17 LED-S_RED 0603
R109 1k5

SN74LVC2G17QDCKRQ1 U22B
UVLO_C
D18 LED-S_RED 0603
R110 1k5

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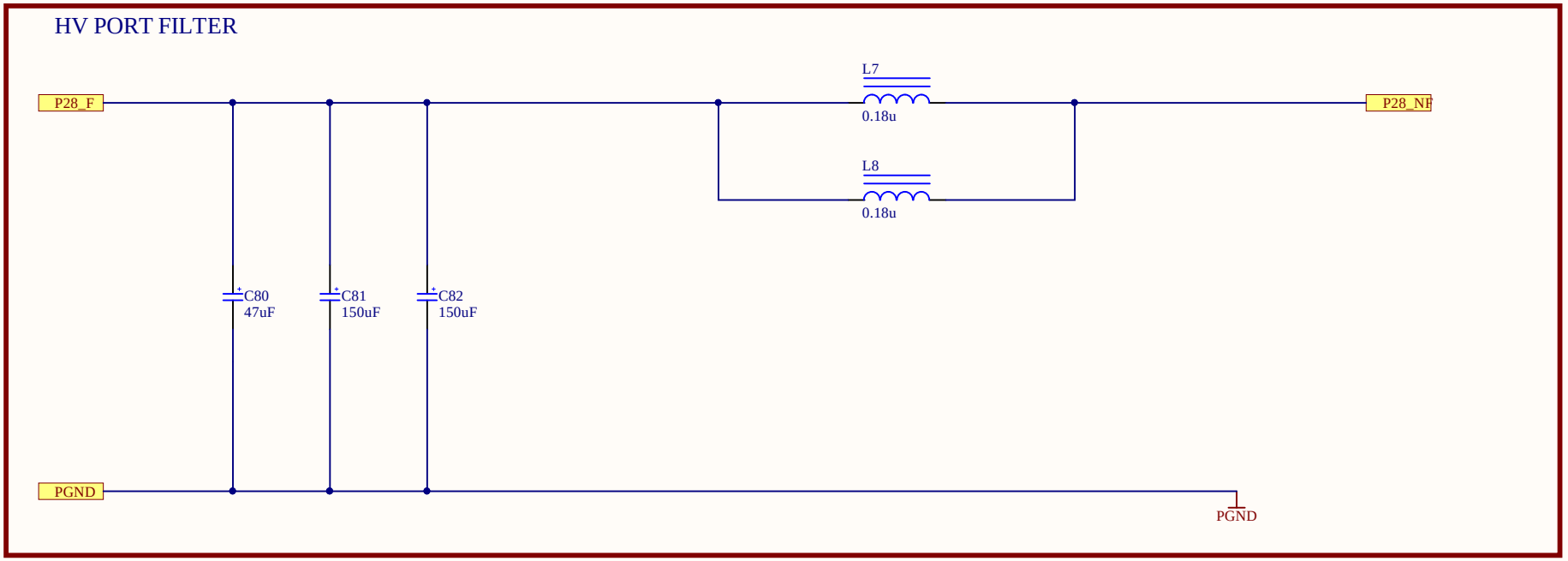

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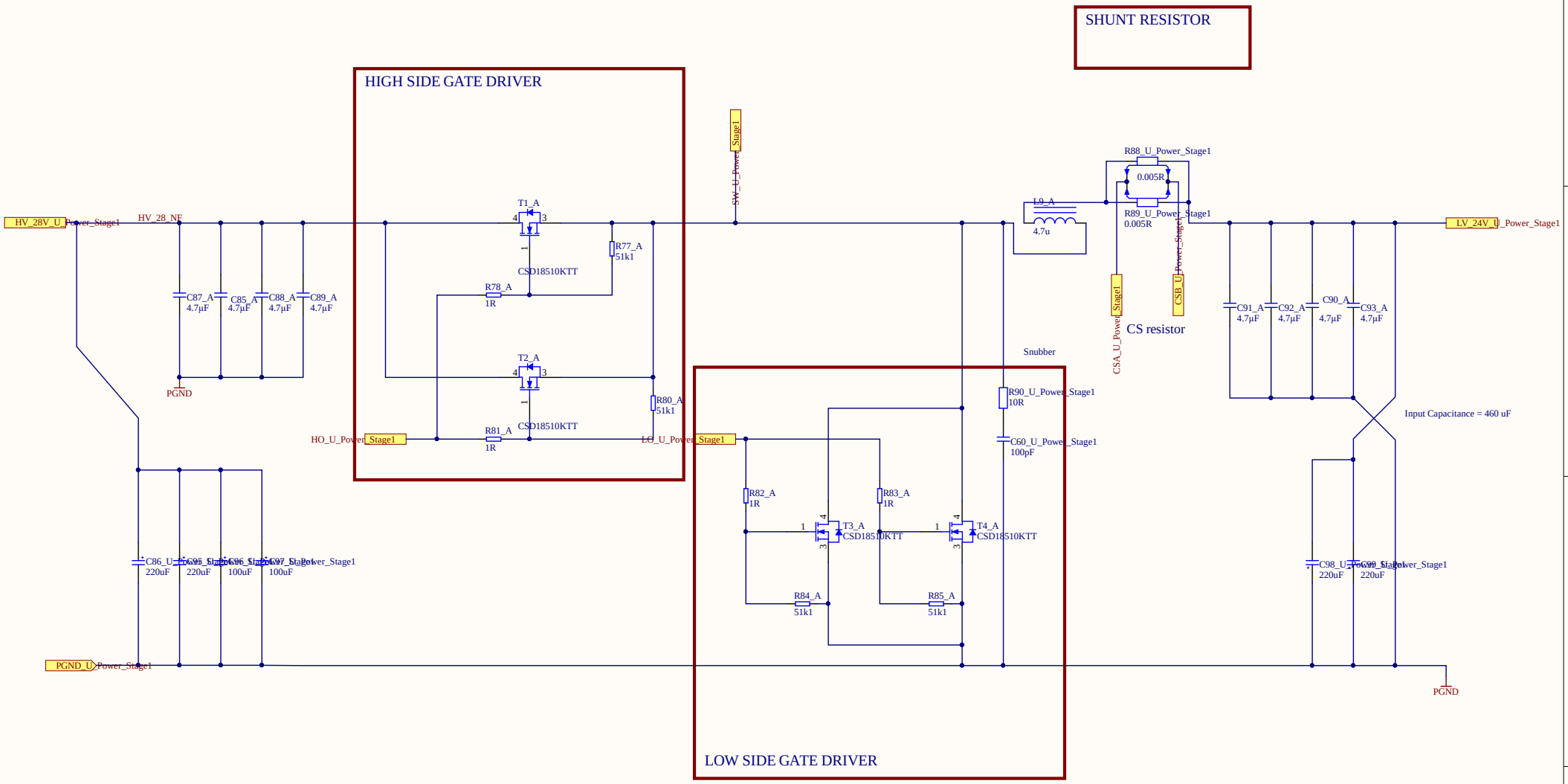
Power Stage



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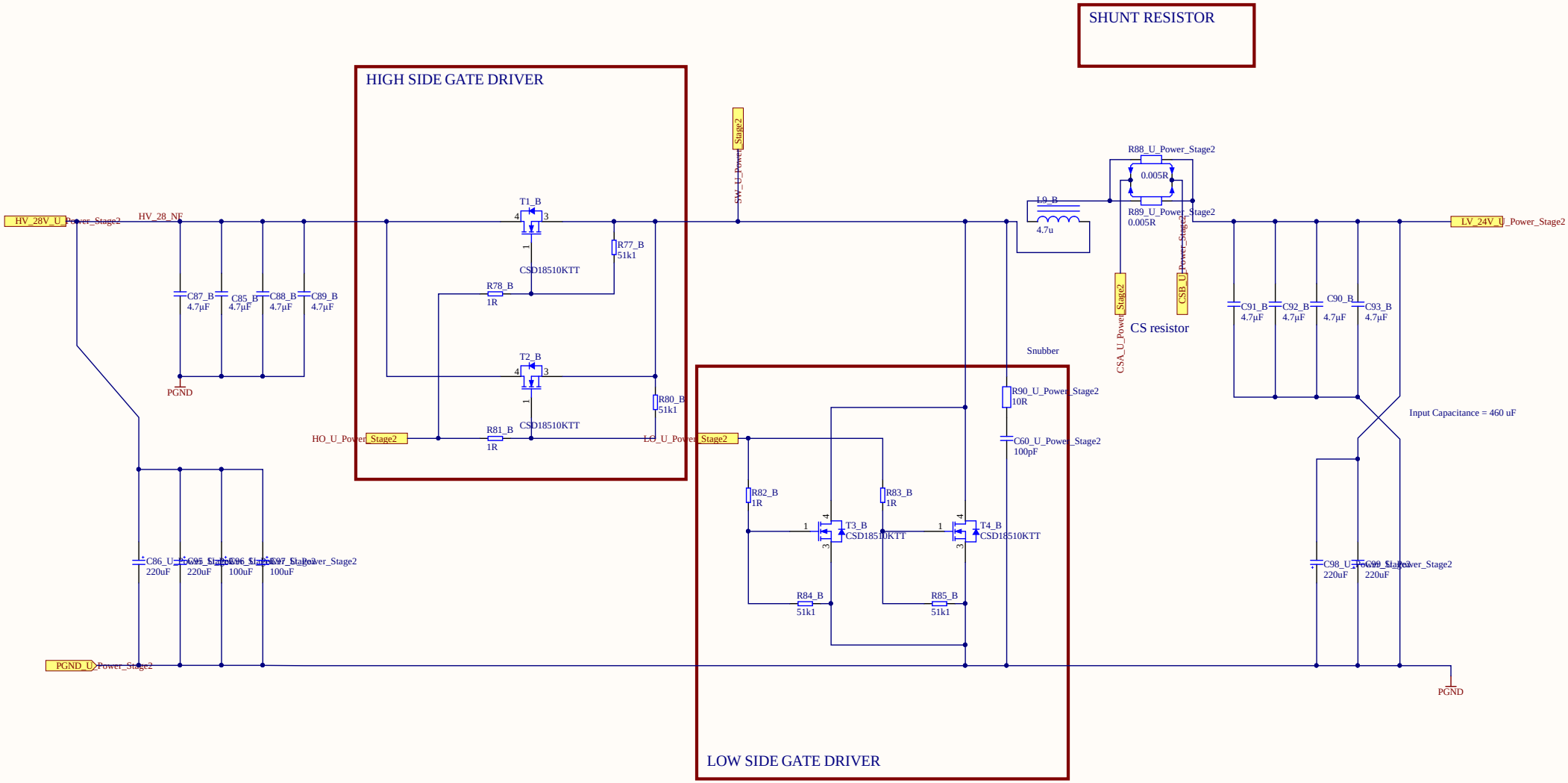

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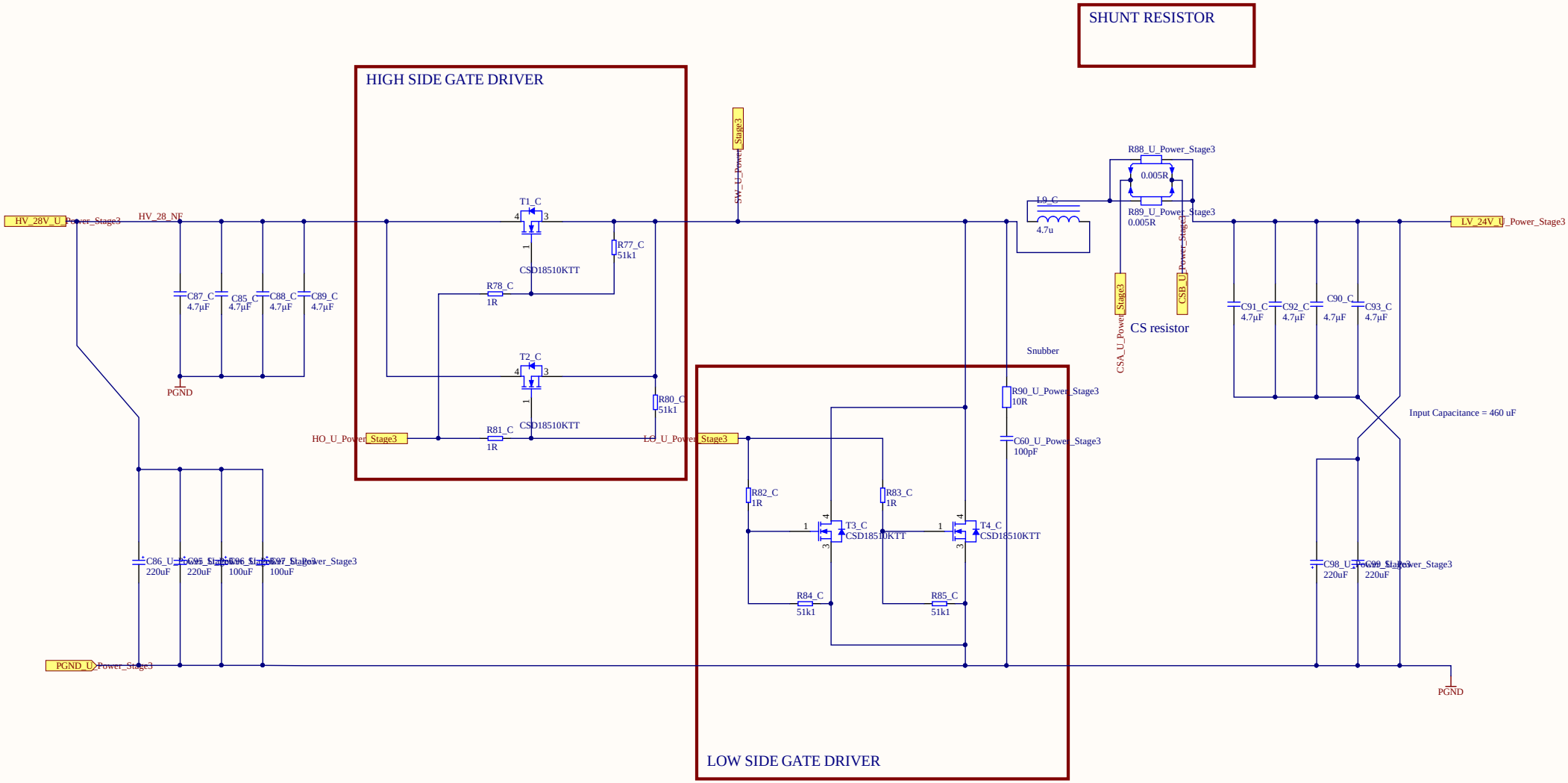

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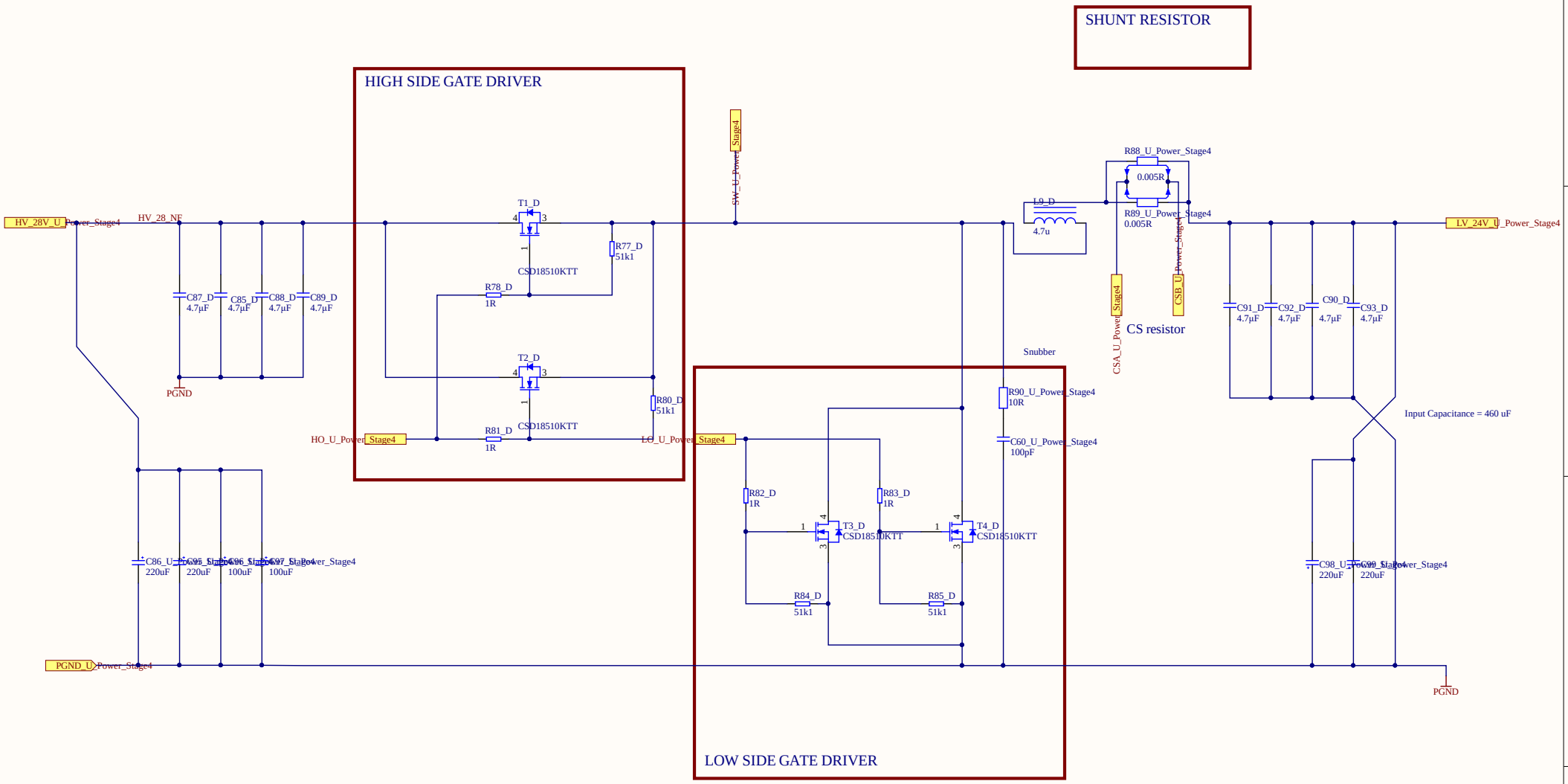

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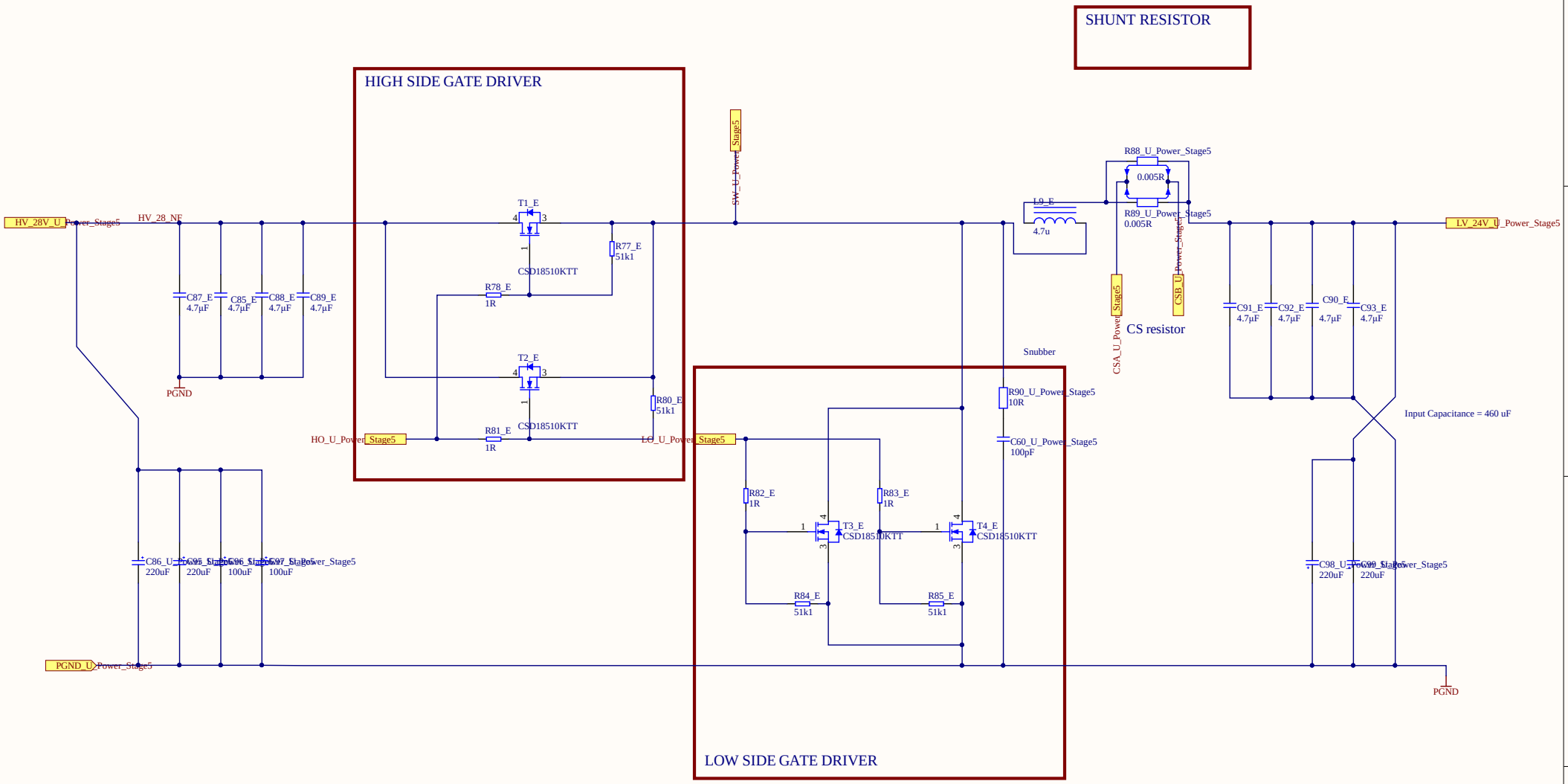

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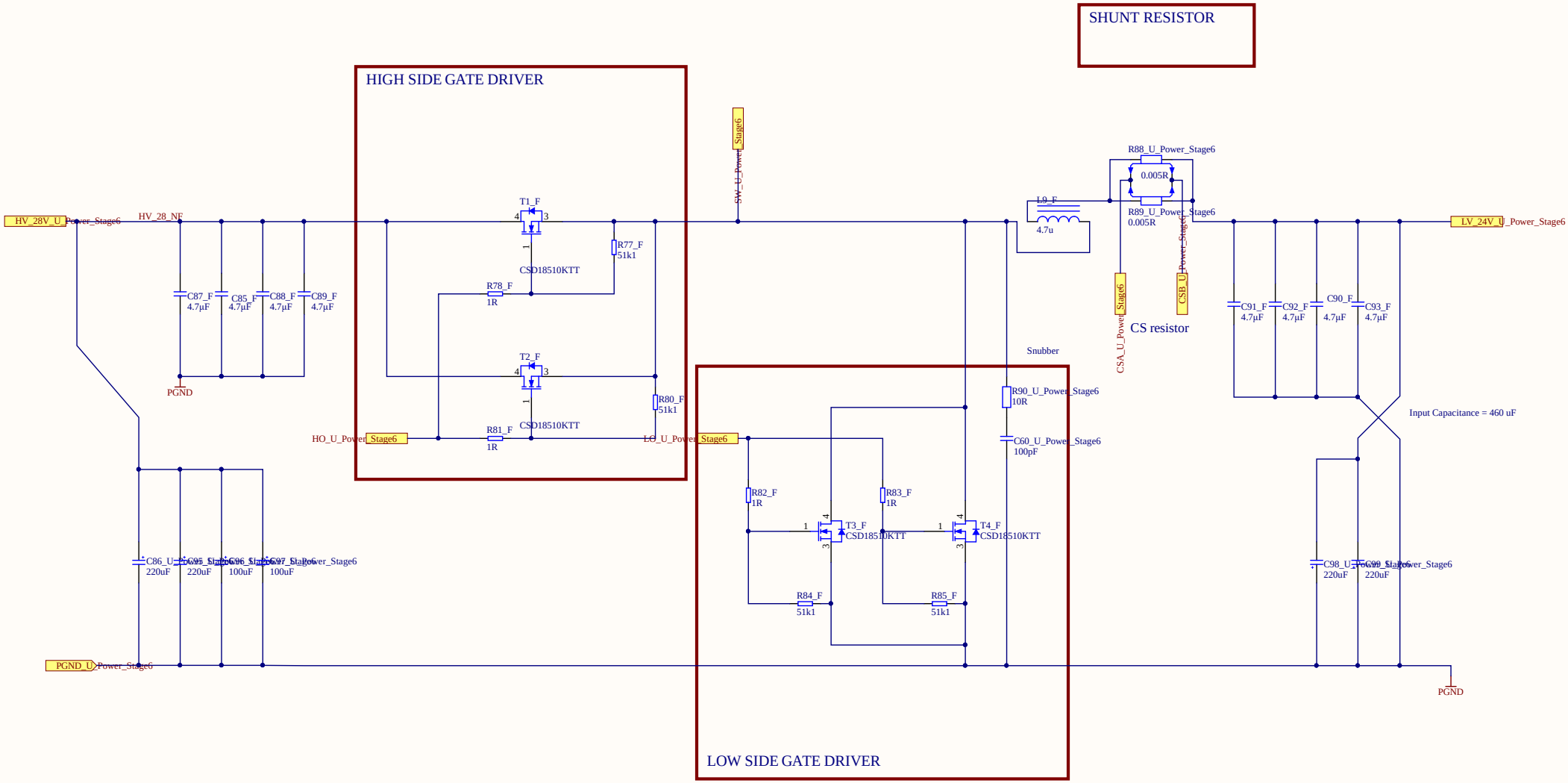

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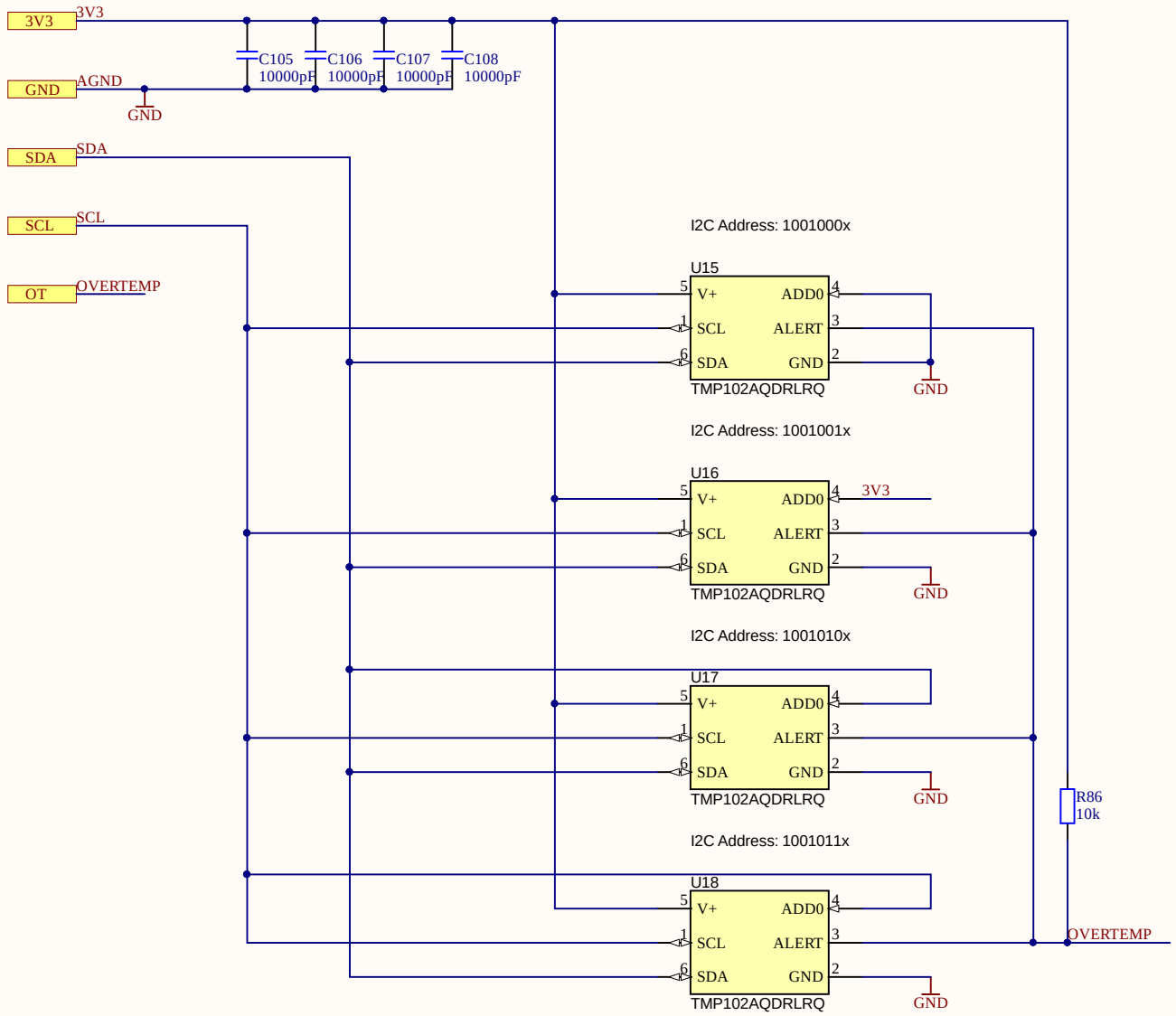

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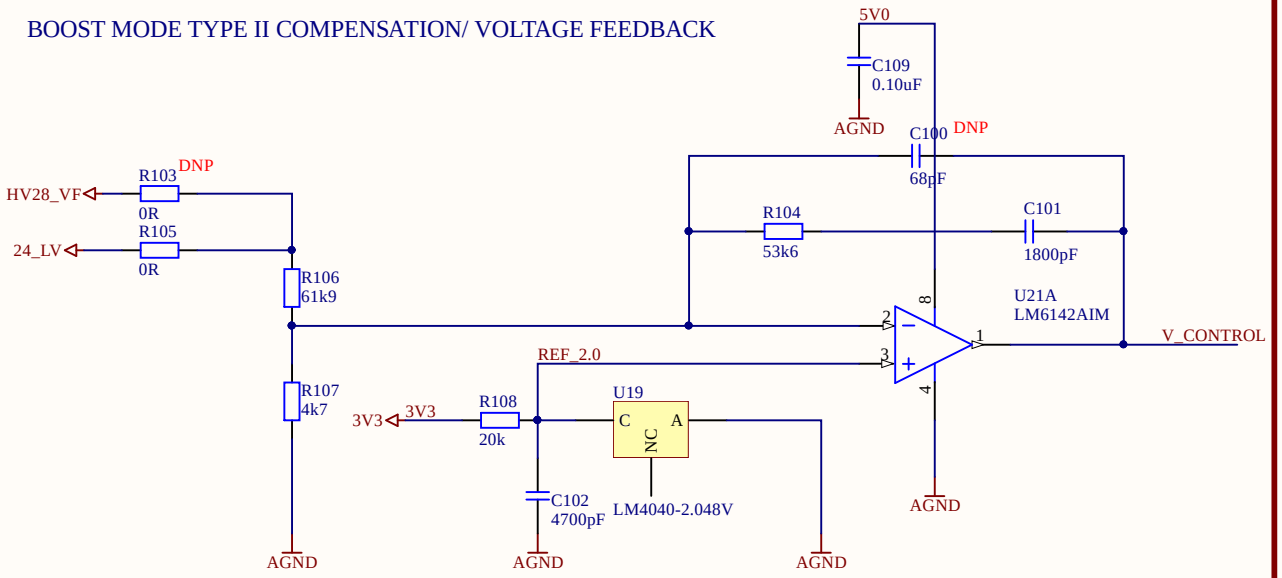
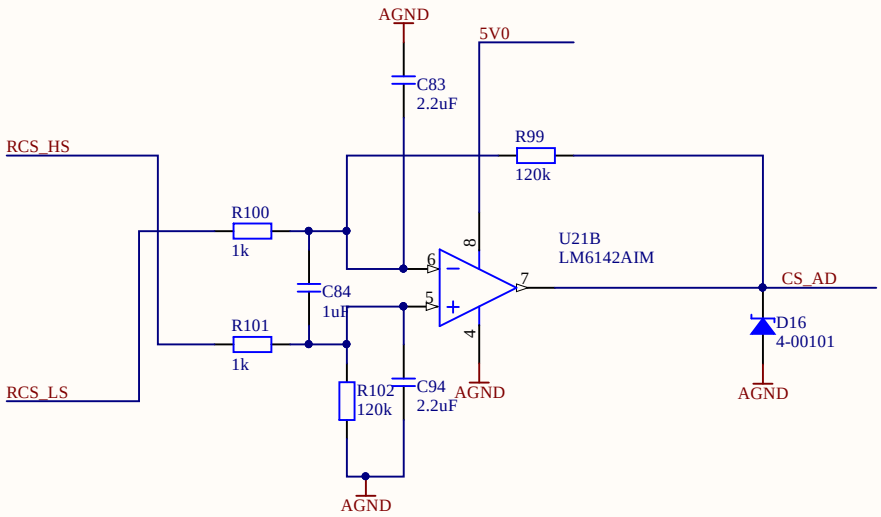
PORTS

3V3 3V3 3V3
28V_VF 28V_OUT HV28_VF
V_FB_OUT V_CONTROL
P5V 5V0
AGND
CS_AD CS_AD
RCS_LS RCS_LS
RCS_HS RCS_HS
24_LV 24_LV 24_LV

BOOST MODE TYPE II COMPENSATION/ VOLTAGE FEEDBACK





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