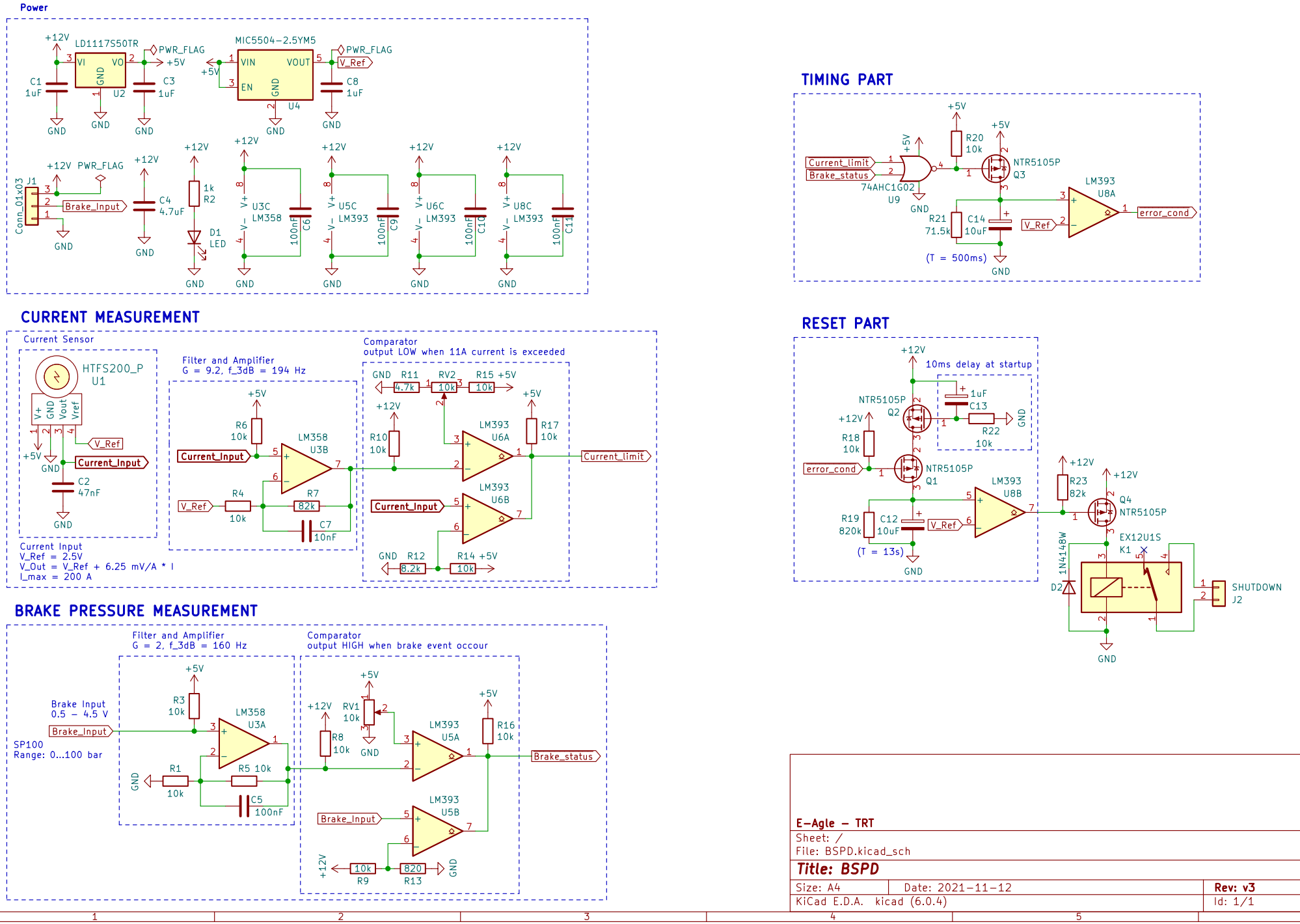
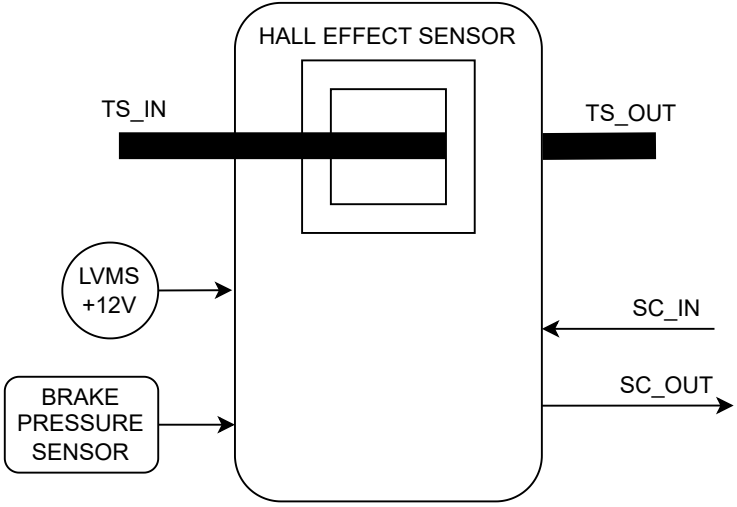
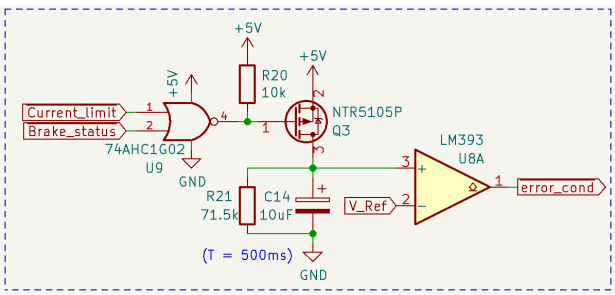

Power
LD1117S50TR
MIC5504-2.5YM5
PWR_FLAG
+12V
+5V
GND
C1 1uF
C3 1uF
C8 1uF
U2
U4
V_Ref
J1
Conn_01x03
Brake_Input
C4 4.7uF
R2 1k
D1 LED
U3C LM358
U5C LM393
U6C LM393
U8C LM393
C6 100nF
C9 100nF
C10 100nF
C11 100nF
TIMING PART
Current_limit
Brake_status
74AHC1G02
U9
R20 10k
NTR5105P
Q3
LM393
U8A
error_cond
R21 71.5k
C14 10uF
(T = 500ms)
CURRENT MEASUREMENT
Current Sensor
HTFS200_P
U1
V+ GND Vout Vref
Current_Input
C2 47nF
Current Input
V_Ref = 2.5V
V_Out = V_Ref + 6.25 mV/A * I
I_max = 200 A
Filter and Amplifier
G = 9.2, f_3dB = 194 Hz
R6 10k
LM358
U3B
R4 10k
R7 82k
C7 10nF
Comparator
output LOW when 11A current is exceeded
R11 4.7k
RV2 10k
R15 10k
R10 10k
LM393
U6A
R17 10k
U6B
R12 8.2k
R14 10k
RESET PART
10ms delay at startup
NTR5105P
Q2
Q1
R18 10k
C13 1uF
R22 10k
R19 820k
C12 10uF
(T = 13s)
LM393
U8B
R23 82k
Q4
EX12U1S
K1
1N4148W
D2
SHUTDOWN
J2
BRAKE PRESSURE MEASUREMENT
Brake Input
0.5 – 4.5 V
SP100
Range: 0...100 bar
Filter and Amplifier
G = 2, f_3dB = 160 Hz
R3 10k
LM358
U3A
R1 10k
R5 10k
C5 100nF
Comparator
output HIGH when brake event occour
RV1 10k
R8 10k
LM393
U5A
R16 10k
U5B
R9 10k
R13 820
E-Agle – TRT
Sheet: /
File: BSPD.kicad_sch
Title: BSPD
Size: A4
Date: 2021-11-12
Rev: v3
KiCad E.D.A. kicad (6.0.4)
Id: 1/1



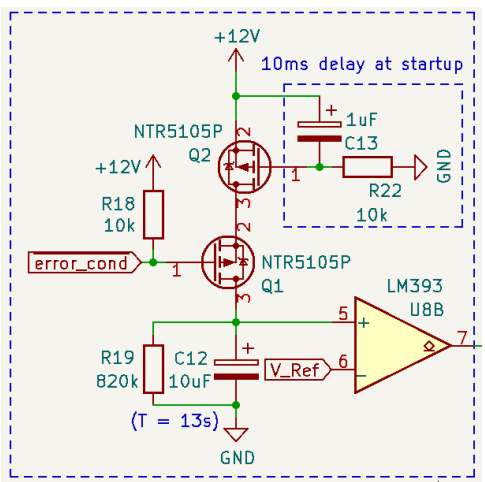
Test procedure:
1. Apply test current
2. Brake hard

Test current calculation:
I_{test} = 5kW/U_{max} = 5kW/454V = 11A



Delay between NOR port output rising and comparator output falling is given by the time required by voltage on C14 to go from 5V to V_{REF} = 2.5V, it is given by:

$$t = RC \cdot log\left(\frac{V_I}{V_F}\right) = 71.5k\Omega \cdot 10\mu F \log\left(\frac{5}{2.5}\right) = 0.495s$$

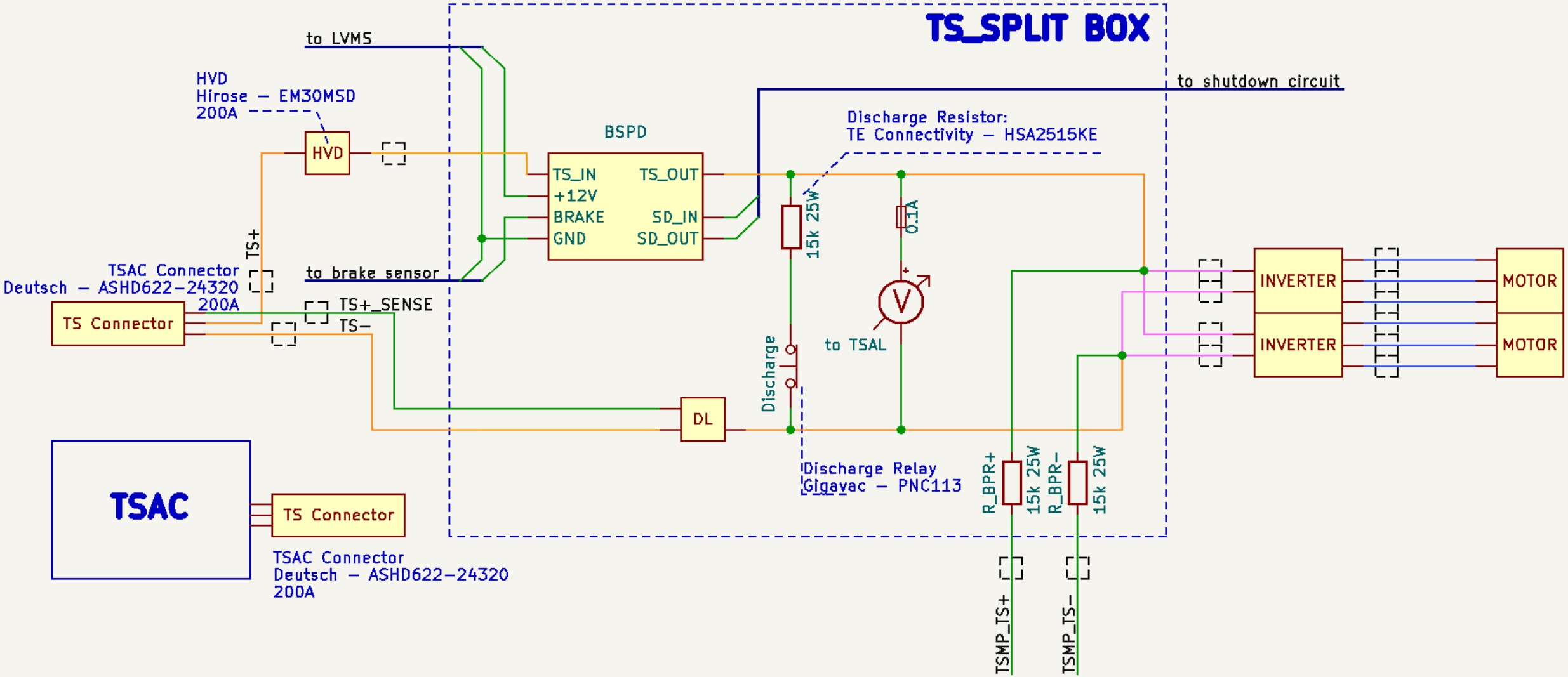


Delay between error_cond input rising and comparator output falling is given by the time required by voltage on C12 to go from 12V to V_{REF} = 2.5V, it is given by:

$$t = RC \cdot log\left(\frac{V_I}{V_F}\right) = 820k\Omega \cdot 10\mu F \left(\frac{12}{2.5}\right) = 12.9s$$

Delay for Reset on powerup is given by considering RC time:

$$\tau = RC = 10k\Omega \cdot 1\mu C = 10ms$$


TS_SPLIT BOX
to LVMS
HVD
Hirose – EM30MSD
200A
HVD
BSPD
TS_IN
+12V
BRAKE
GND
TS_OUT
SD_IN
SD_OUT
to shutdown circuit
Discharge Resistor:
TE Connectivity – HSA2515KE
15k 25W
0.1A
TS+
TSAC Connector
Deutsch – ASHD622-24320
200A
to brake sensor
TS Connector
TS+_SENSE
TS–
to TSAL
Discharge
DL
INVERTER
INVERTER
MOTOR
MOTOR
Discharge Relay
Gigavac – PNC113
R_BPR+
15k 25W
R_BPR–
15k 25W
TSAC
TS Connector
TSAC Connector
Deutsch – ASHD622-24320
200A
TSMP_TS+
TSMP_TS–