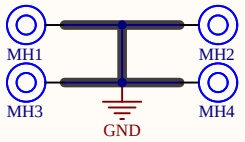
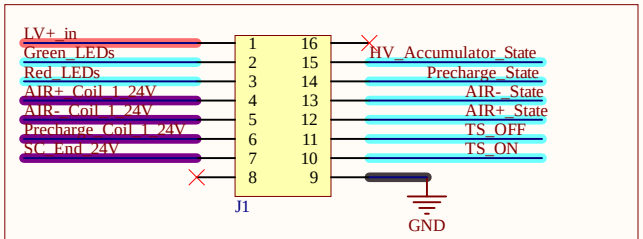
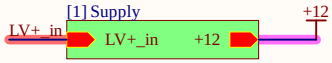
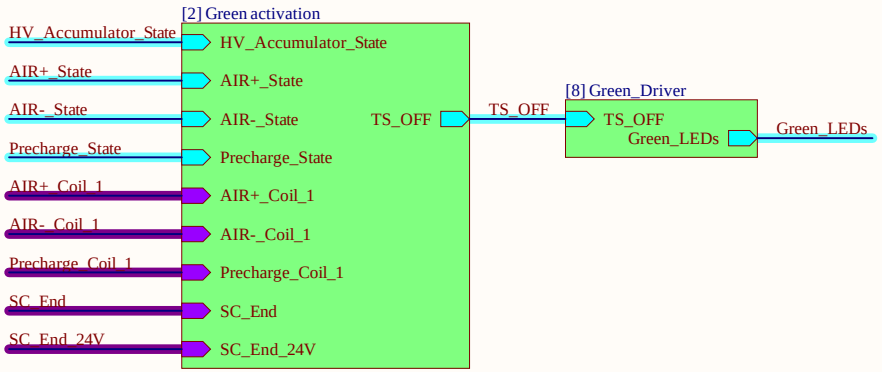
This PCB is installed in the power distribution box (HV Box) and is capable of controlling TSAL_Light according to 2023 FSG rules. It needs signals from AMS_Master (or TSAL_Dummy) and TSAL_Inverters. TS Voltage detection schematic [9] is DNP for 2023 but used in 2024 due to merging of inverter housings.

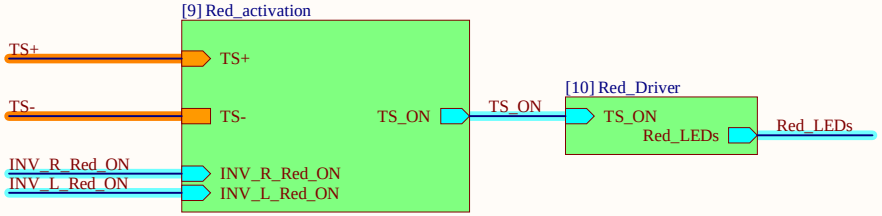


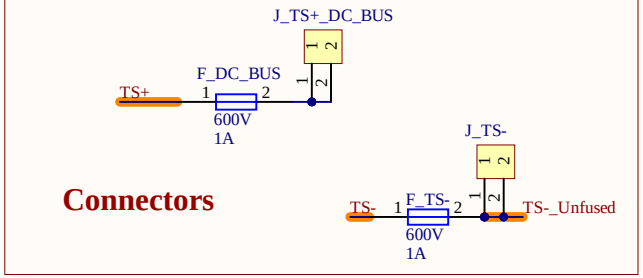


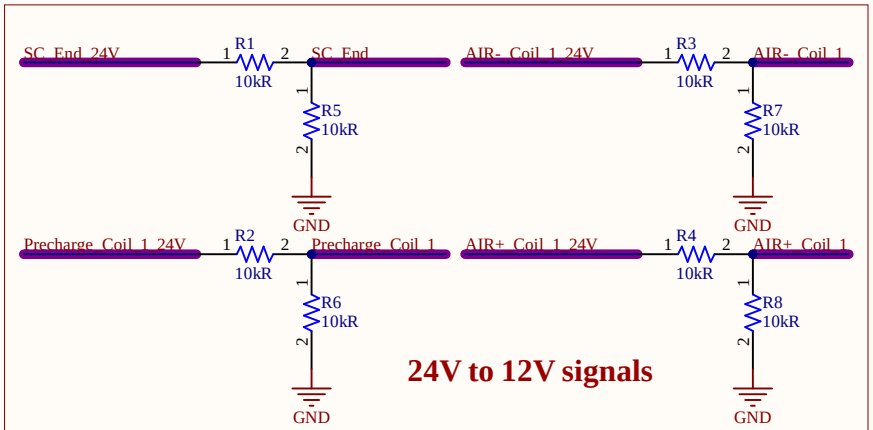


Signal	12V	1V	0V
Relay_AUX	relay is open	relay is closed	broken wire
HV_Accumulator_State	no voltage in accumulator	more than 60VDC in accumulator	broken wire
Relay_Coil_1	relay is open	N/A	relay is closed
INV_X_Red_ON	no voltage in inverters' box	more than 60VDC in inverters' box	broken wire



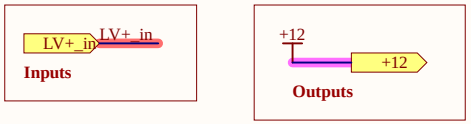


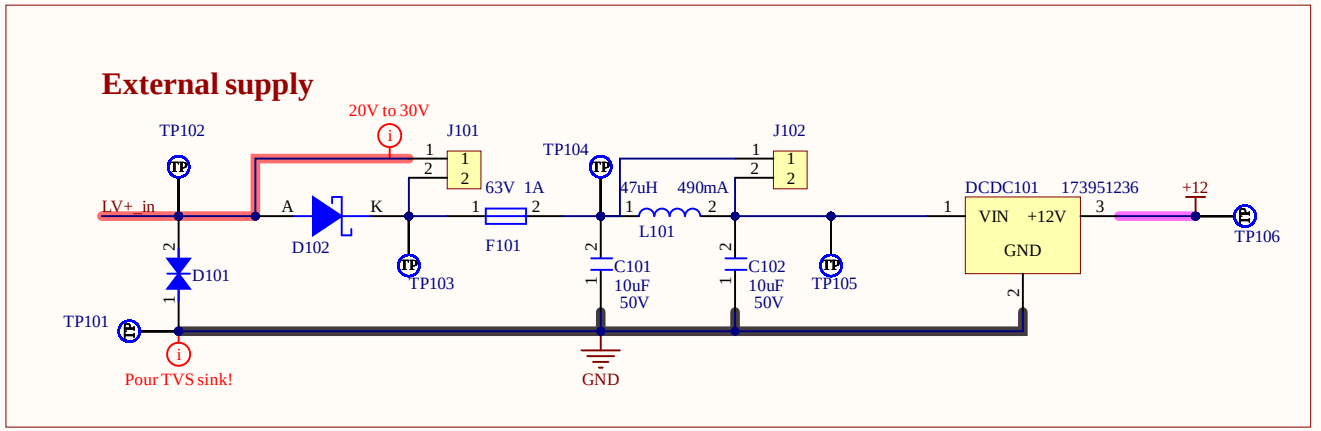


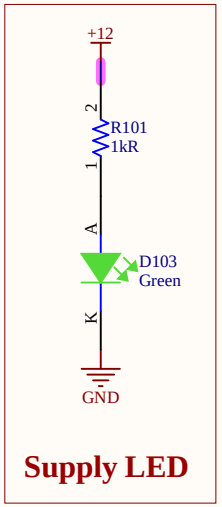


Cyan: External signal
Orange: High Voltage
Red: Untreated supply
Pink: Treated supply
Purple: Shutdown chain

Company: e-Tech Racing	e-techracing.es	
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: TSAL_Control.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 1 of 11
Checked by:		Date: 17/11/2023







Company: e-Tech Racing	e-techracing.es	
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: [1] Supply.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 2 of 11
Checked by:		Date: 17/11/2023

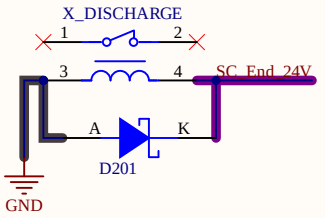
HV_Accumulator_State
AIR+_State
AIR-_State
Precharge_State
AIR+_Coil_1
AIR-_Coil_1
Precharge_Coil_1
SC_End_24V
SC_End

Inputs

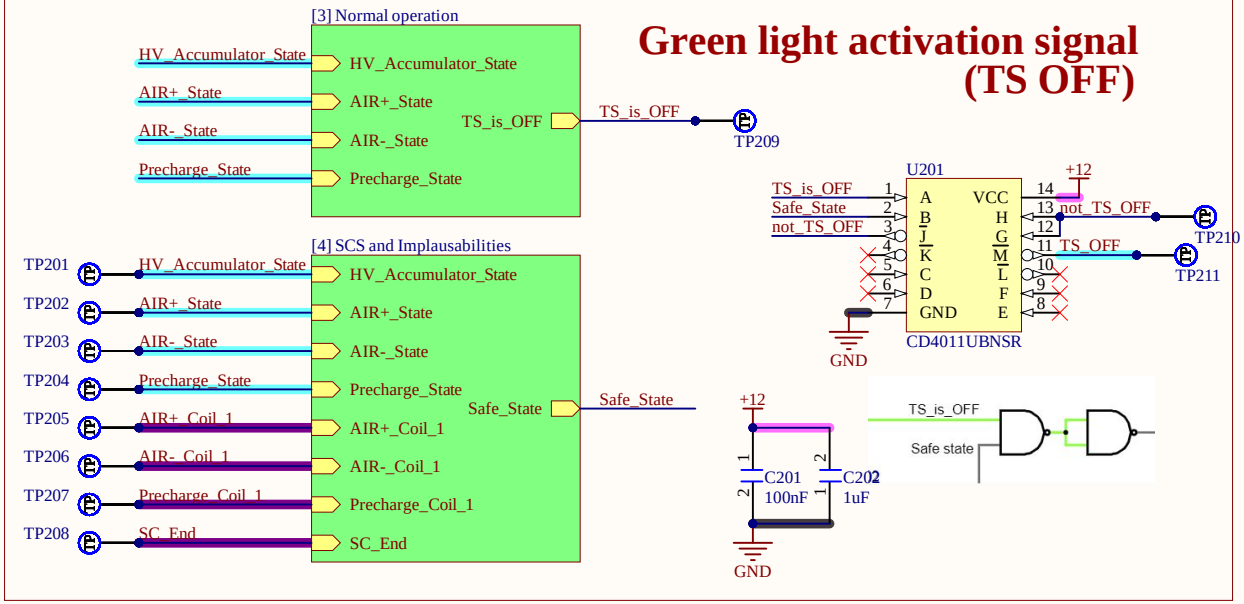
TS_OFF

Outputs

Discharge Relay Inverter



Green light activation signal (TS OFF)



Company: e-Tech Racing	e-techracing.es	
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: [2] Green activation.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 3 of 11
Checked by:		Date: 17/11/2023

HV_Accumulator_State → HV_Accumulator_State

AIR+_State → AIR+_State

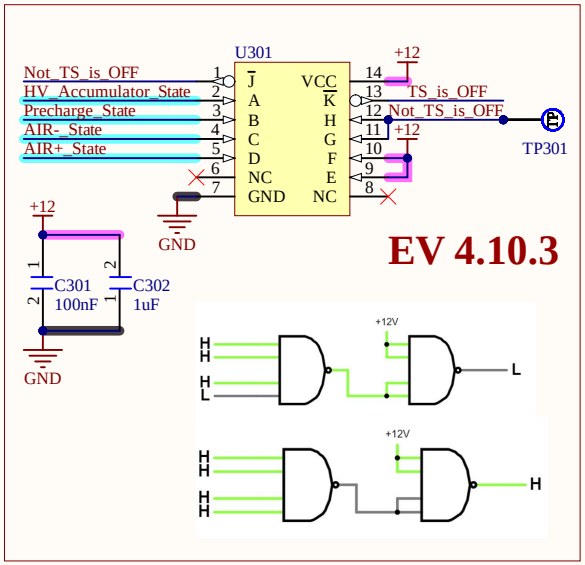
AIR-_State → AIR-_State

Precharge_State → Precharge_State

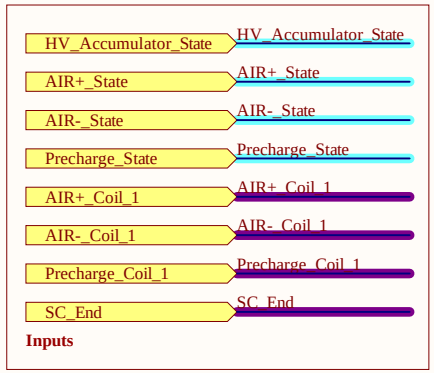
Inputs

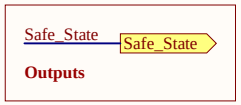
TS_is_OFF → TS_is_OFF

Outputs

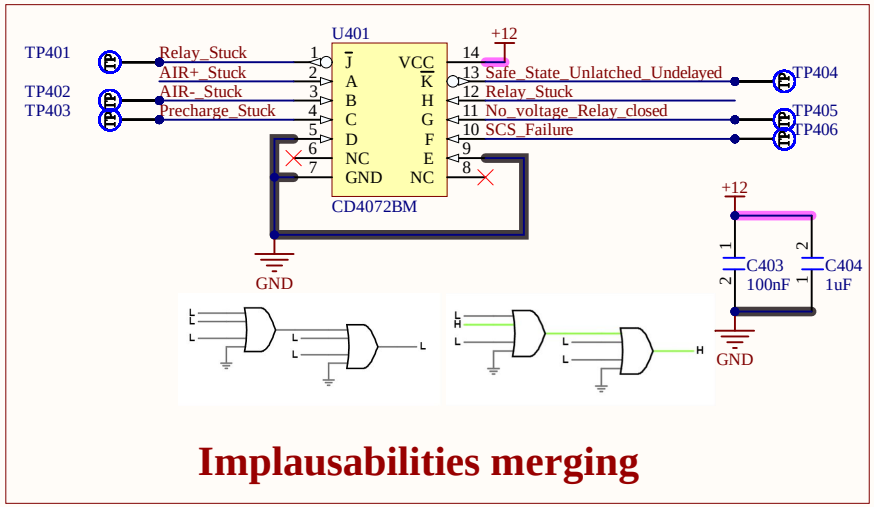


Company: e-Tech Racing	e-techracing.es	
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: [3] Normal operation.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 4 of 11
Checked by:		Date: 17/11/2023

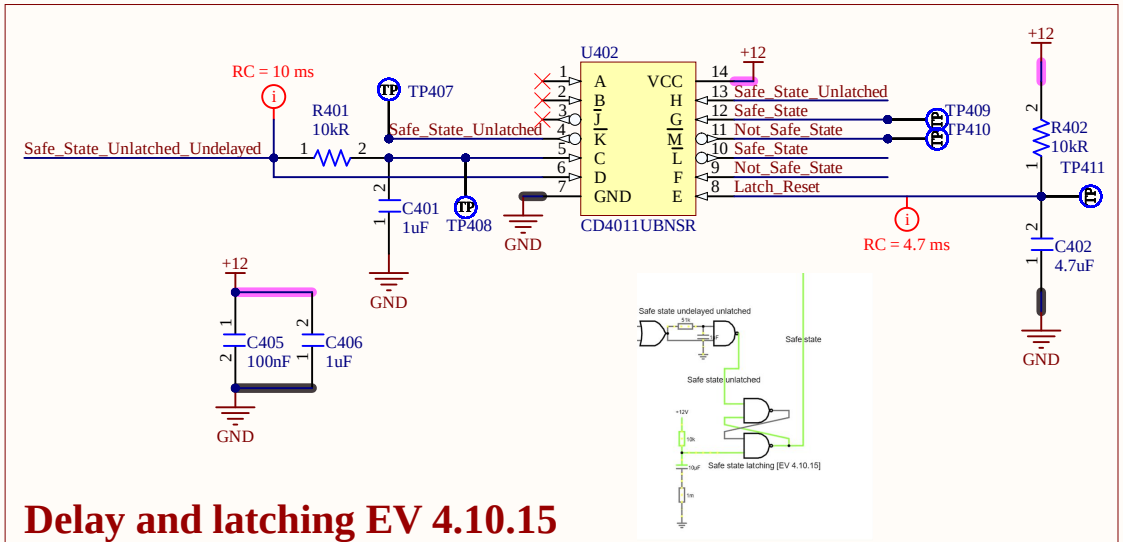




SCS and Implausabilities

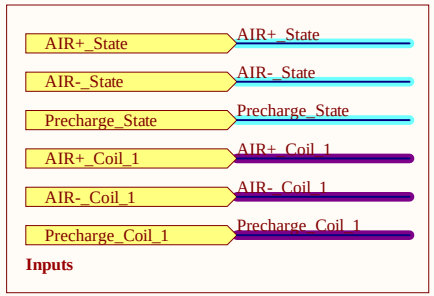


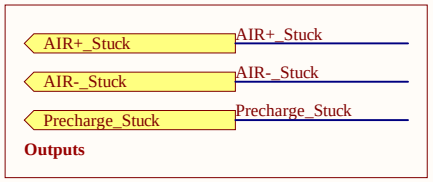
Implausabilities merging

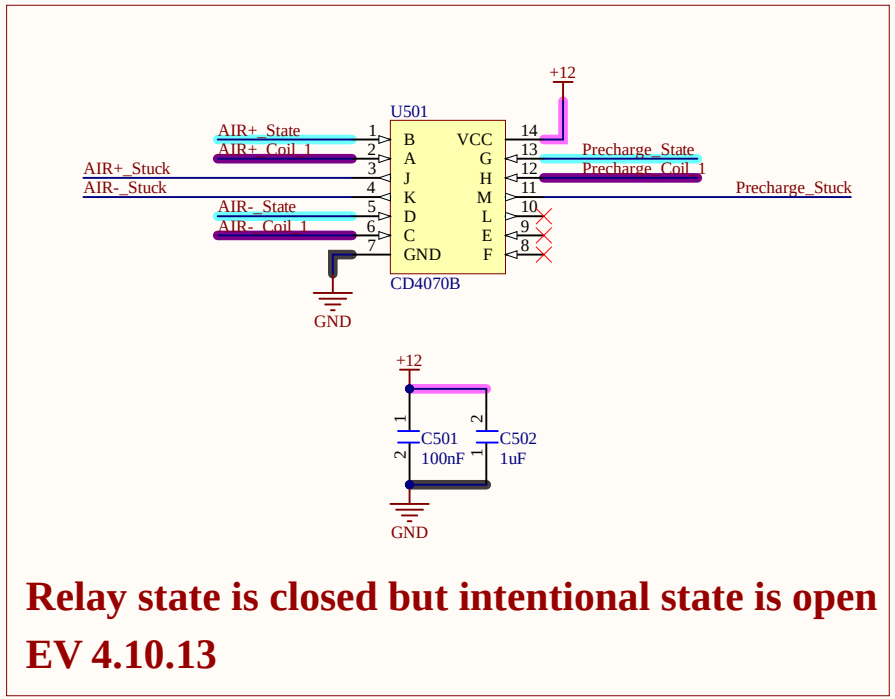


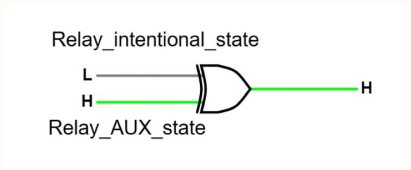
Delay and latching EV 4.10.15

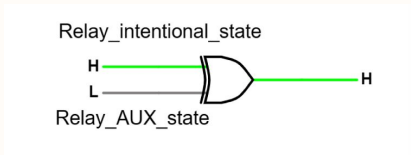
Company: e-Tech Racing	e-techracing.es		
Project: TSAL_Control	Variant: [No Variations]		
Size: -	Page Contents: [4] SCS and Implausabilities.SchDoc	Version: 6.0	
		Department: Hardware	
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 5 of 11	
Checked by:		Date: 17/11/2023	



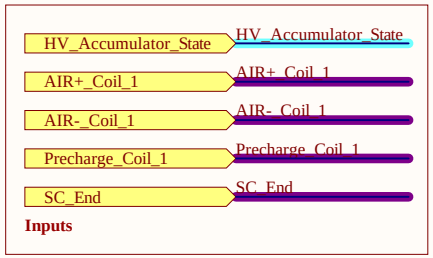


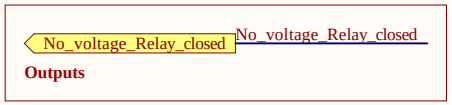


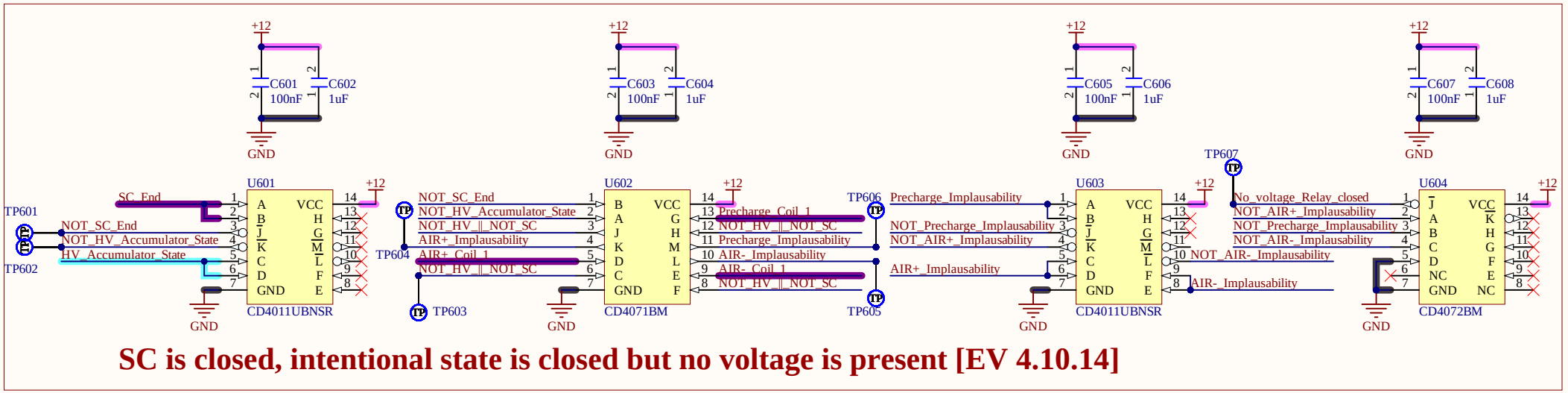


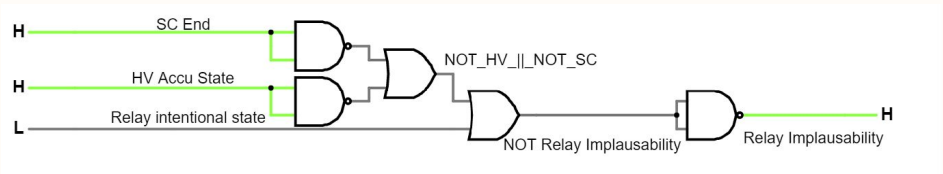


Company: e-Tech Racing e-techracing.es		
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: [5] EV 4.10.13.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero guillemroper@gmail.com		Sheet 6 of 11
Checked by:		Date: 17/11/2023







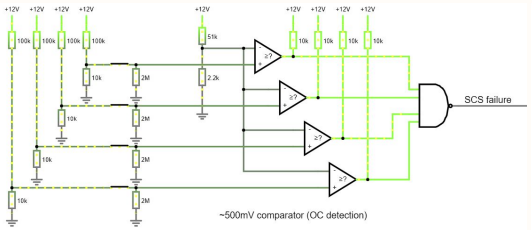


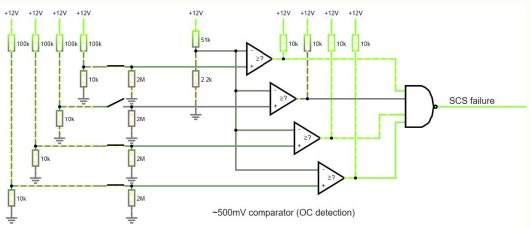
NOT_HV_||_NOT_SC is common for the three relays

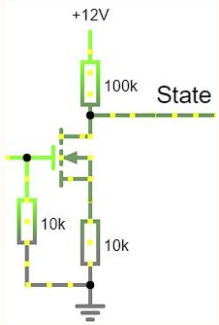
Company: e-Tech Racing	e-techracing.es		
Project: TSAL_Control	Variant: [No Variations]		
Size: -	Page Contents: [6] EV 4.10.14.SchDoc	Version: 6.0	
		Department: Hardware	
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 7 of 11	
Checked by:		Date: 17/11/2023	

HV_Accumulator_State
AIR+_State
AIR-_State
Precharge_State
Inputs

SCS_Failure
Outputs

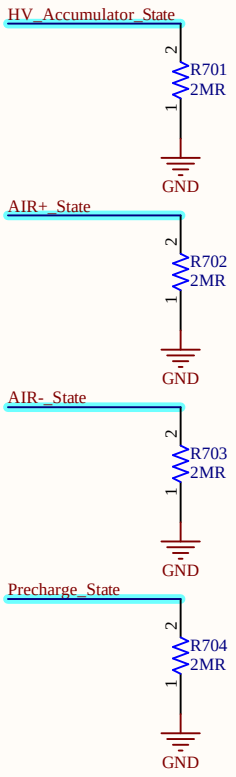


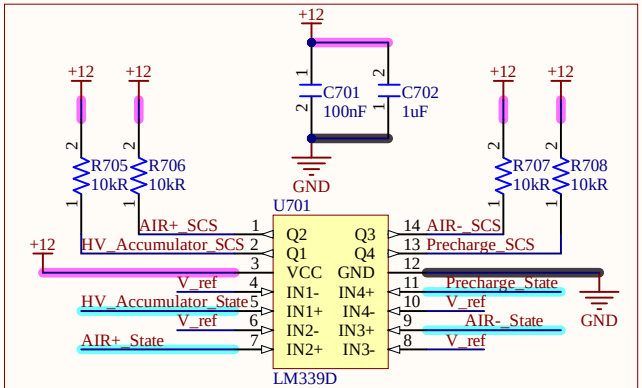




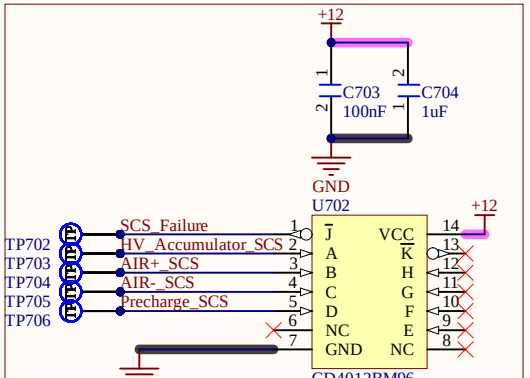
Expected input configuration

Inputs pull down

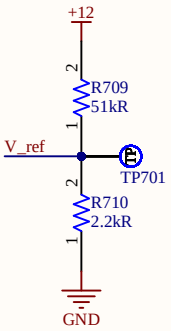




Comparators



Output merging

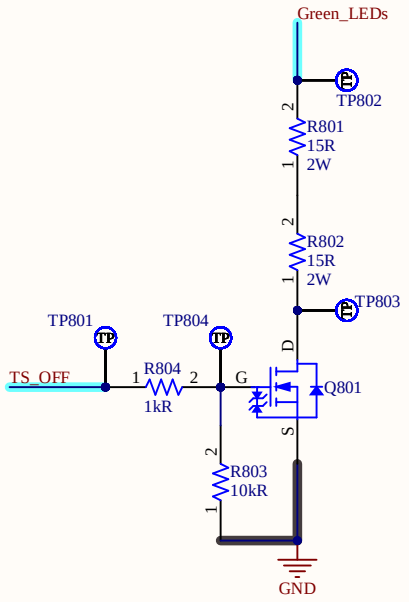


Voltage reference

Company: e-Tech Racing	e-techracing.es		
Project: TSAL_Control	Variant: [No Variations]		
Size: -	Page Contents: [7] SCS [T 11.9.2 (a)].SchDoc	Version: 6.0	
		Department: Hardware	
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 8 of 11	
Checked by:		Date: 17/11/2023	

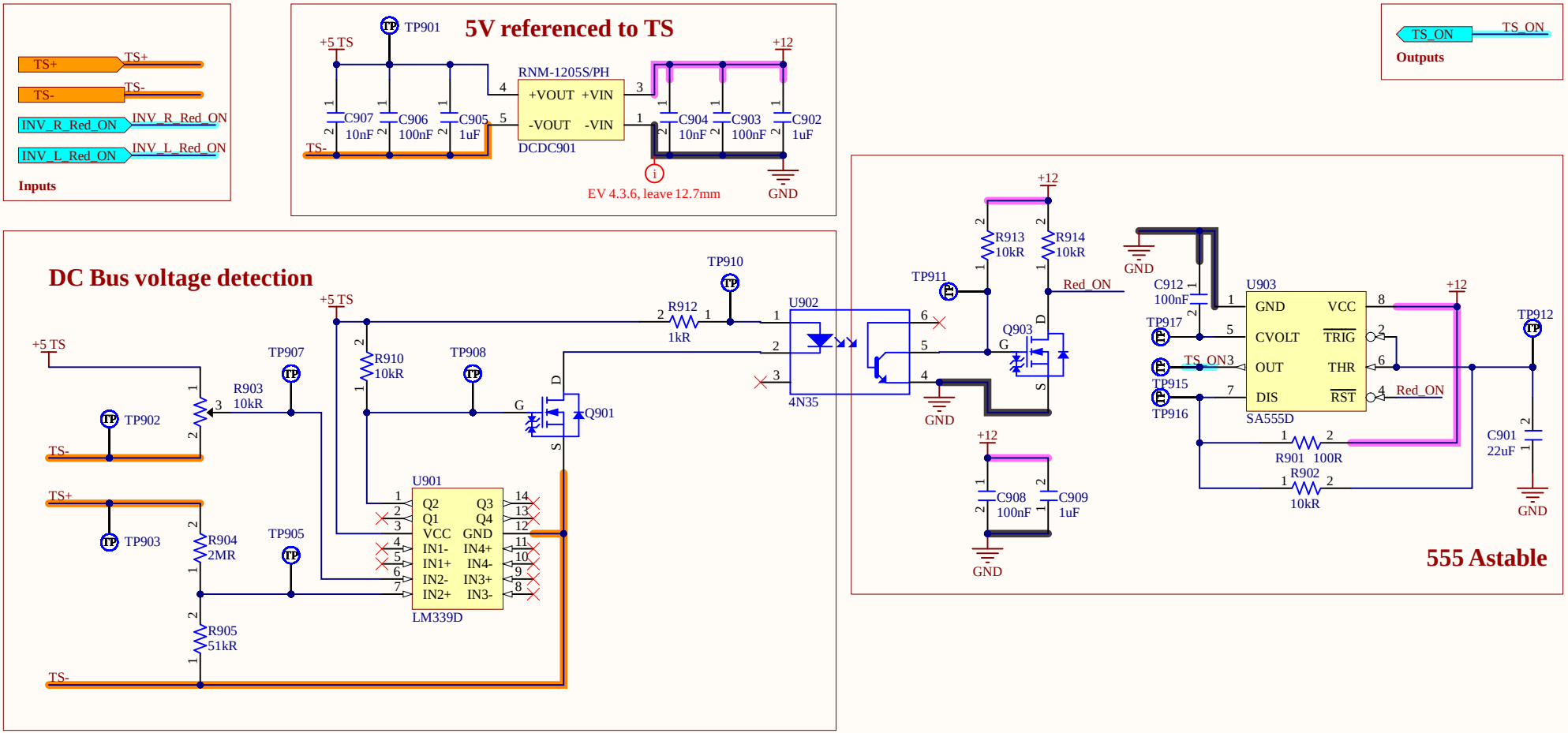
TS_OFF
TS_OFF
Inputs

Green_LEDs
Green_LEDs
Outputs



NMOS driver

Company: e-Tech Racing e-techracing.es		
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: [8] Green_Driver.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero guillemroper@gmail.com		Sheet 9 of 11
Checked by:		Date: 17/11/2023



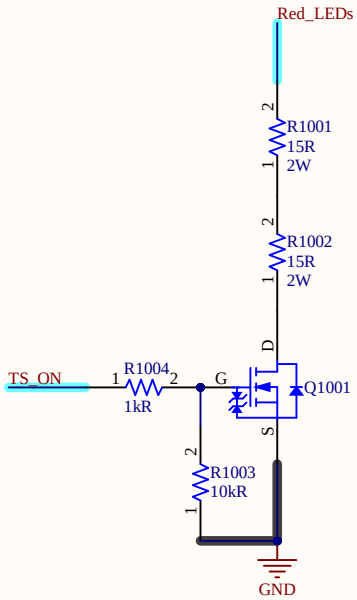
Company: e-Tech Racing	e-techracing.es	
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: [9] Red_activation.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero	guillemroper@gmail.com	Sheet 10 of 11
Checked by:		Date: 17/11/2023

TS_ON — TS_ON

Inputs

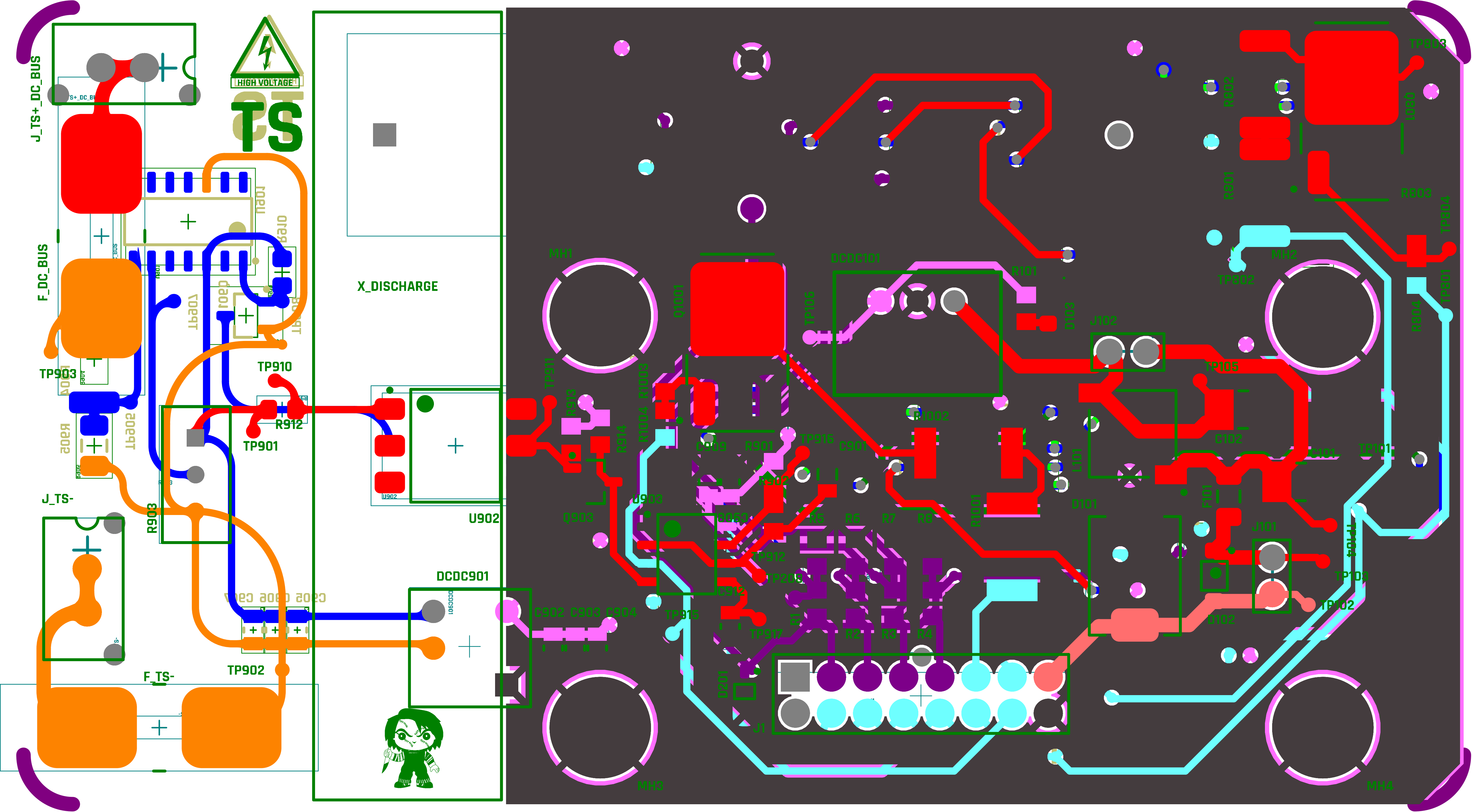
Red_LEDs — Red_LEDs

Outputs

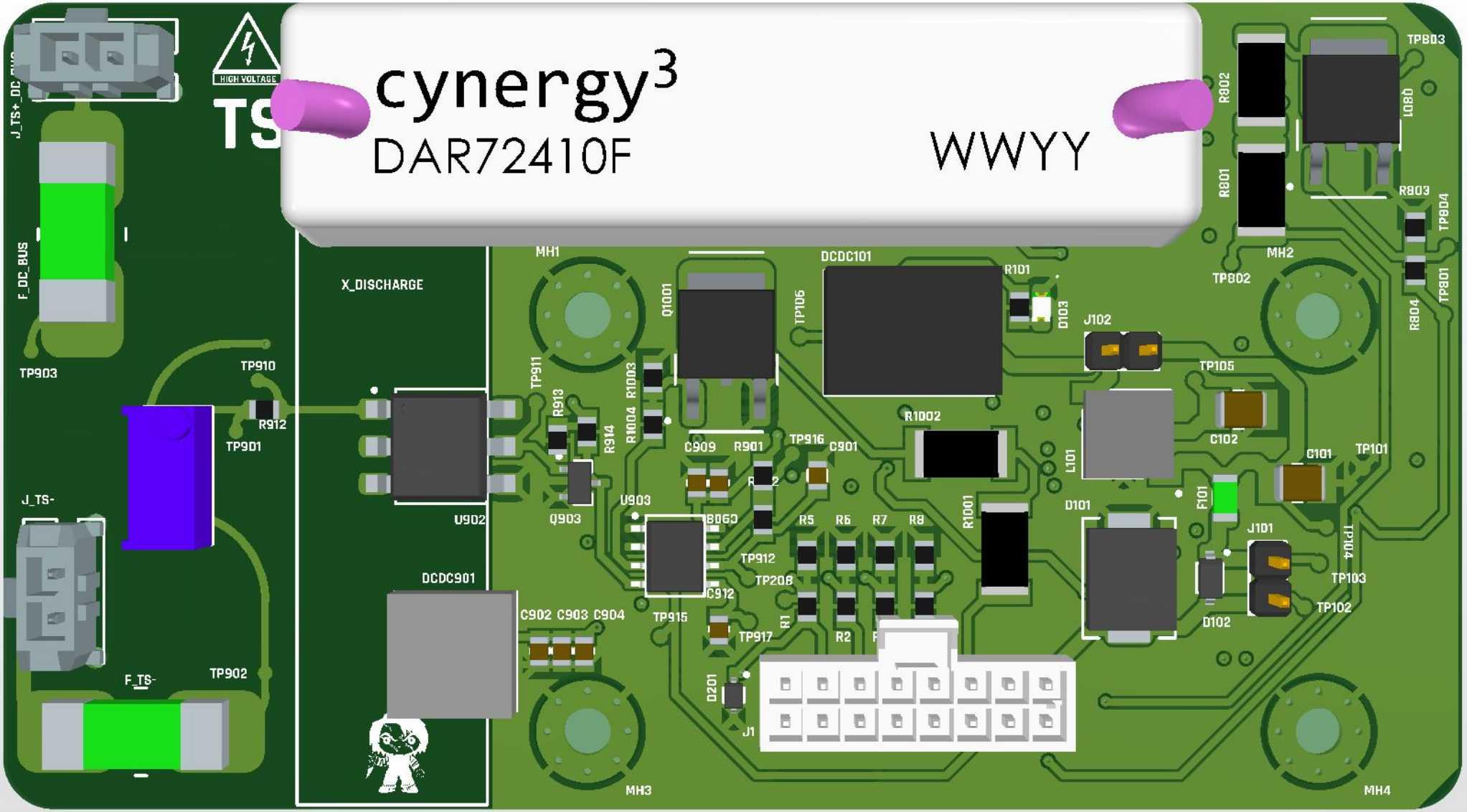


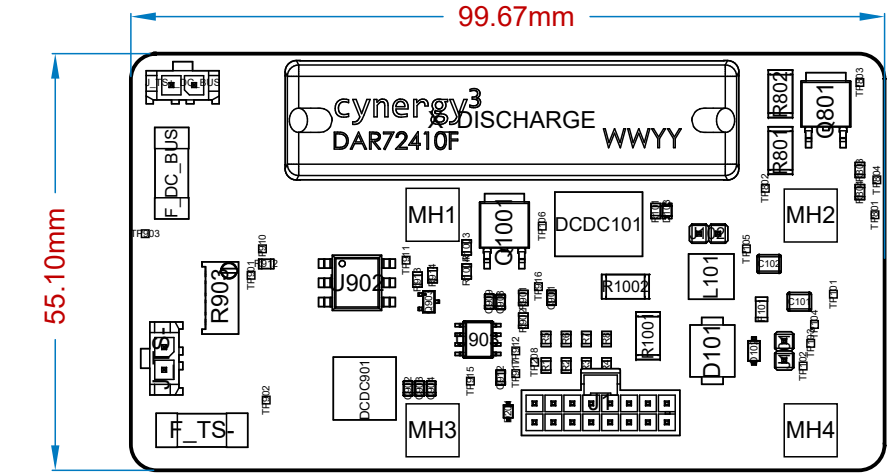
NMOS driver

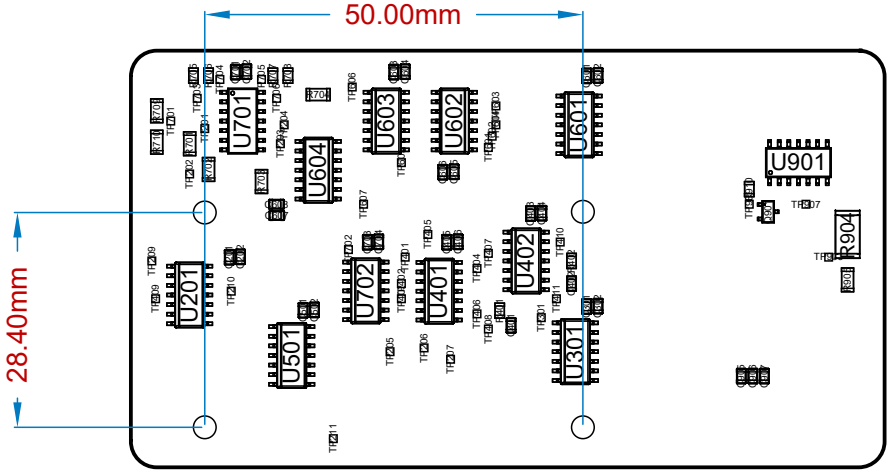
Company: e-Tech Racing e-techracing.es		
Project: TSAL_Control	Variant: [No Variations]	
Size: -	Page Contents: [10] Red_Driver.SchDoc	Version: 6.0
		Department: Hardware
Author: Guillem Ropero guillemroper@gmail.com		Sheet 11 of 11
Checked by:		Date: 17/11/2023

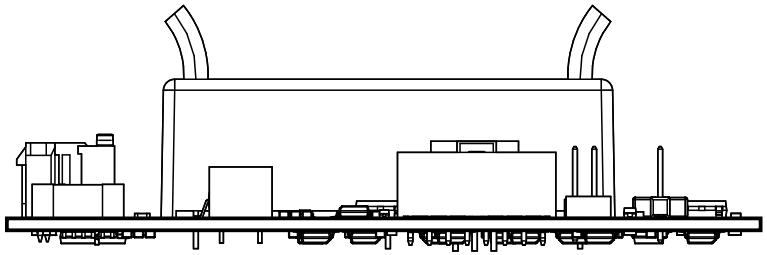


J_TS+_DC_BUS
HIGH VOLTAGE
TS
F_DC_BUS
TP903
TP910
R912
TP901
J_TS-
R903
TP902
F_TS-
X_DISCHARGE
U902
DCDC901
MH1
MH2
MH3
MH4
DCDC101
R101
D103
J102
TP105
TP106
Q1001
R1002
C102
C101
TP101
L101
D101
F101
J101
TP103
TP102
D102
TP802
TP801
TP803
R802
R801
R803
R804
TP804
TP911
R913
R914
R1003
R1004
C909
R901
TP916
C901
U903
Q903
TP912
TP200
C912
TP915
TP917
C902
C903
C904
R1
R2
R3
R4
R5
R6
R7
R8
R1001
D201
J1


cynergy3
DAR72410F
WWYY
HIGH VOLTAGE
X_DISCHARGE
F_DC_BUS
J_TS-
F_TS-
TP903
TP910
R912
TP901
TP902
U902
DCDC901
C902 C903 C904
MH1
MH2
MH3
MH4
Q1001
TP906
DCDC101
R101
D103
J102
TP802
TP803
R802
Q801
R801
R803
TP804
R804
TP801
TP911
R913
R914
R1003
R1004
C909
R901
TP916
C901
R1002
TP105
C102
C101
TP101
L101
F101
J101
TP104
TP103
TP102
D102
U903
Q903
B060
TP912
TP208
C912
TP915
TP917
R5
R6
R7
R8
R1001
D101
D201
J1

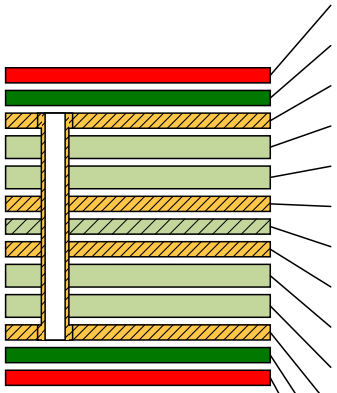






TSAL Control

Designator	Name	Quantity
C101, C102	GRJ32ER71H106KE11L	2
C201, C301, C403, C405, C501, C601, C603, C605, C607, C701, C703, C903, C906, C908, C912	885012207098	15
C202, C302, C401, C404, C406, C502, C602, C604, C606, C608, C702, C704, C902, C905, C909	885012207103	15
C402	GRM219R61A475KE34D	1
C901	885012107011	1
C904, C907	885012207092	2
D101	824551301	1
D102	MBR0530	1
D103	150080VS75000	1
D201	CMDSH05-4 TR PBFREE	1
DCDC101	173951236	1
DCDC901	RNM-1205S/PH	1
F101	0437001.WRA	1
F_DC_BUS, F_TS-	485001	2
J1	1053101116	1
J101, J102	61300211121	2
J_TS-, J_TS+_DC_BUS	436500215	2
L101	CDC5D23BNP-470KC	1
MH1, MH2, MH3, MH4	Mounting_Hole_M3	4
Q801, Q1001	IRFR3410PbF	2
Q901, Q903	SQ2318BES-T1_GE3	2
R1, R2, R3, R4, R5, R6, R7, R8, R401, R402, R705, R706, R707, R708, R803, R902, R910, R913, R914, R1003	CR0805-JW-103ELF	20
R101, R804, R912, R1004	CR0805-JW-102ELF	4
R701, R702, R703, R704	HVC1206-2M0FT3	4
R709, R905	CRCW120610K0FKEA	2
R710	CR1206-FX-2201ELF	1
R801, R802, R1001, R1002	352115RFT	4
R901	CR0805-FX-1000ELF	1
R903	3296W-1-103LF	1
R904	R2M-2512FTK	1
U201, U402, U601, U603	CD4011UBSNR	4
U301, U702	CD4012BM96	2
U401, U604	CD4072BM	2
U501	Arrayy_4x2_XOR	1
U602	CD4071BM	1
U701	LM339D	1
U901	LM339D	1
U902	4N35	1
U903	SA555	1
X_DISCHARGE	DBR72410FU	1



Material	Layer	Thickness
	Top Overlay	
Surface Material	Top Solder	0.01mm
Copper	**Top Layer**	**0.04mm**
Prepreg		*0.10mm*
Prepreg		*0.10mm*
CF-001	**GND**	**0.02mm**
		1.05mm
CF-001	**PWR**	**0.02mm**
Prepreg		*0.10mm*
Prepreg		*0.10mm*
Copper	**Bottom Layer**	**0.04mm**
Surface Material	Bottom Solder	0.01mm
	Bottom Overlay	

Total thickness: 1.57mm