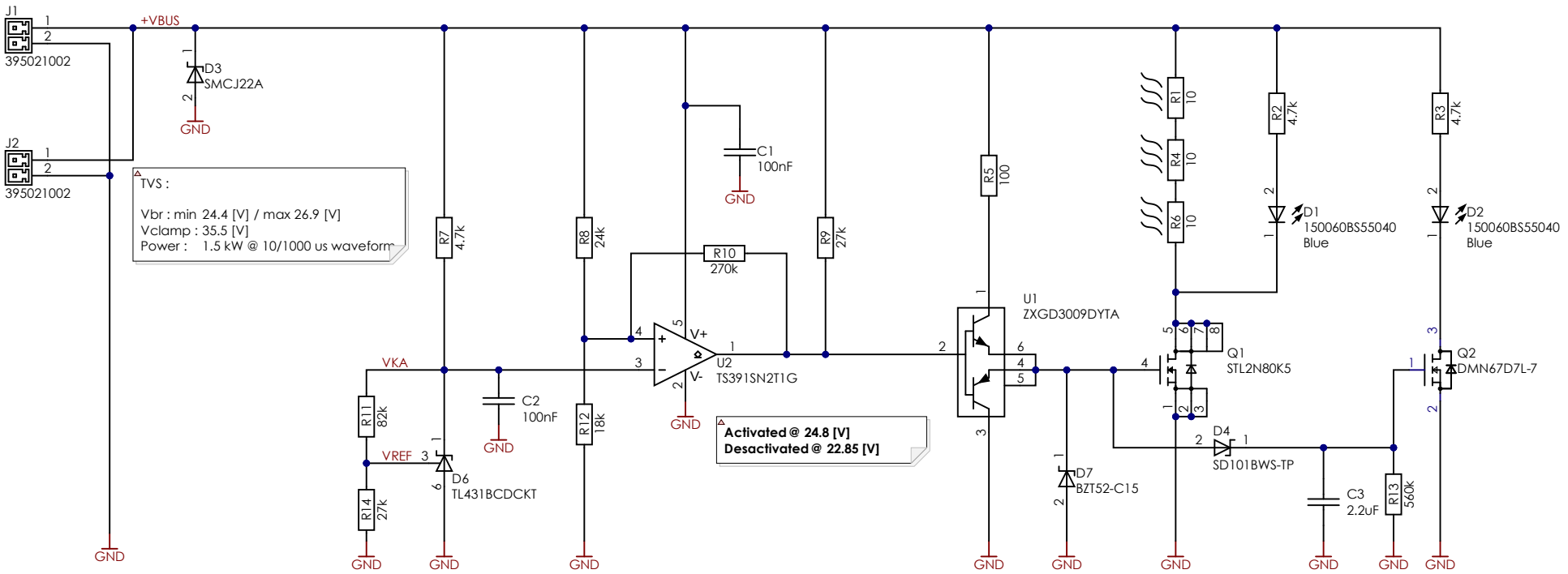
VBUS Voltage :
Battery = Vmax = 17.6 [V] / Vtyp = 15.4 [V] / Vmin = 14.85 [V]
PowerSupply = Vmax = 25 [V] / Vtyp = 22 [V]



VKA :

VREF = 2495 [mV]
Iref = 2 [uA]

VKA = Vref * (1 + R1/R2) + Iref * R1
VKA_typ = 2.495 * (1 + 82k/27k) + 2u * 82k = 10.23 [V]

IKA_max = (VBUSmax - VKA_typ)/R9 = (35.5-10.23)/4.7k = 5.38 [mA] < 100 [mA]
IKA_min = (VBUS_min - VKA_typ)R9 = (15 - 10.23)/4.7k = 1.01 [mA] > 1 [mA]

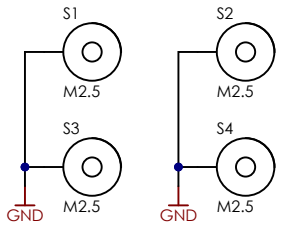
Non inverting hysteresis :

Vref = VKA = 10.23 [V]
Vth = (VBUS / (R8 + (R12//R10)))*(R12//R10)
VKA = (VBUS / (24k + (18k//270k)))*(18k//270k) => 10.23 = 0.4128*VBUS => 10.23/0.4128 = VBUS = 24.8 [V]

Vtl = (VBUS / (27k + 270k + (24k // 18k)))* (24k // 18k) + (VBUS / (((18k//(270k+27k))) + 24k) * (18k//(270k+27k))
VKA = 0.3347 VBUS + 0.4142 VBUS = 0.4477 VBUS
10.23 = 0.4477 VBUS => VBUS = 10.23 / 0.4477 = 22.85 [V]

U2 :

VGS(TH) = 4[V]
Rds(on) = 3 - 4 [Ohm] @ VGS = 10 [V]



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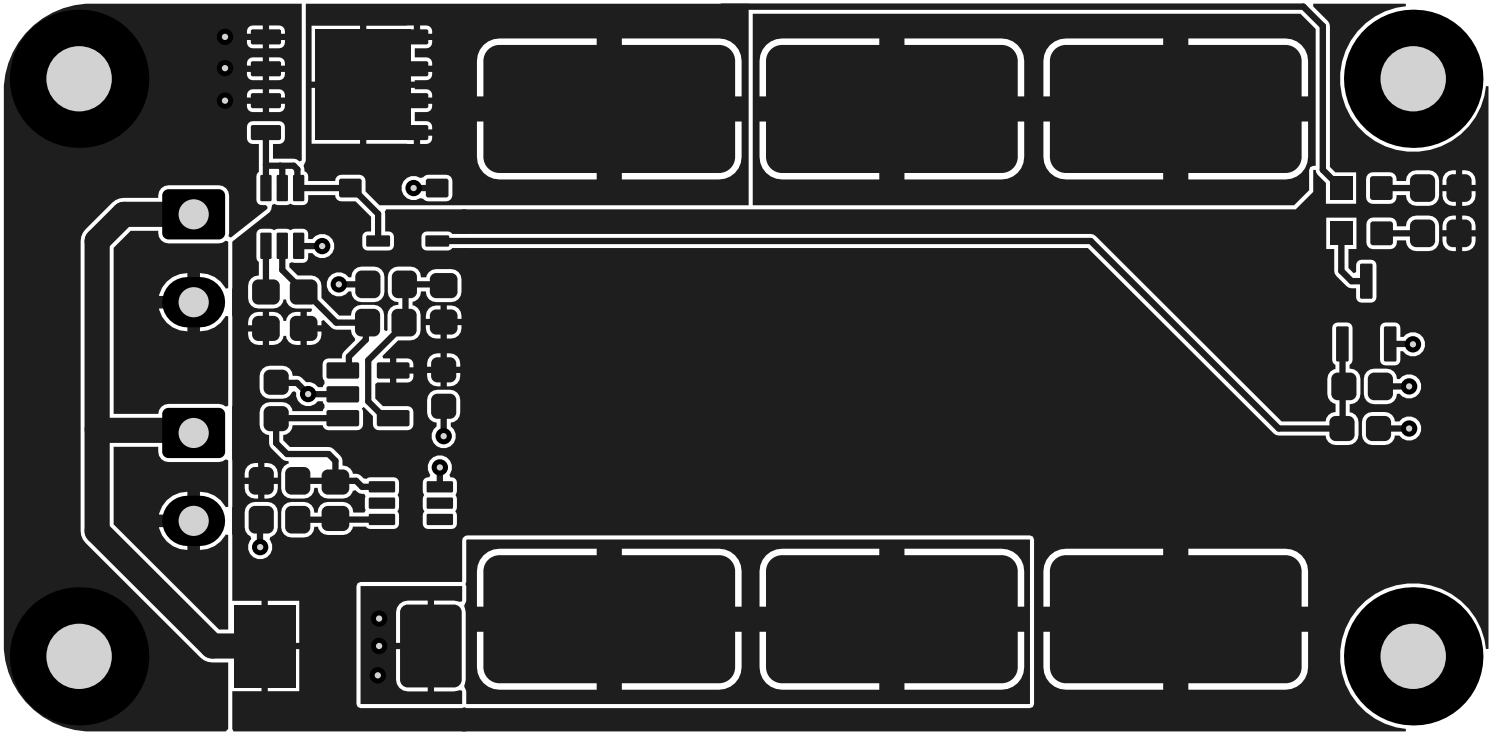
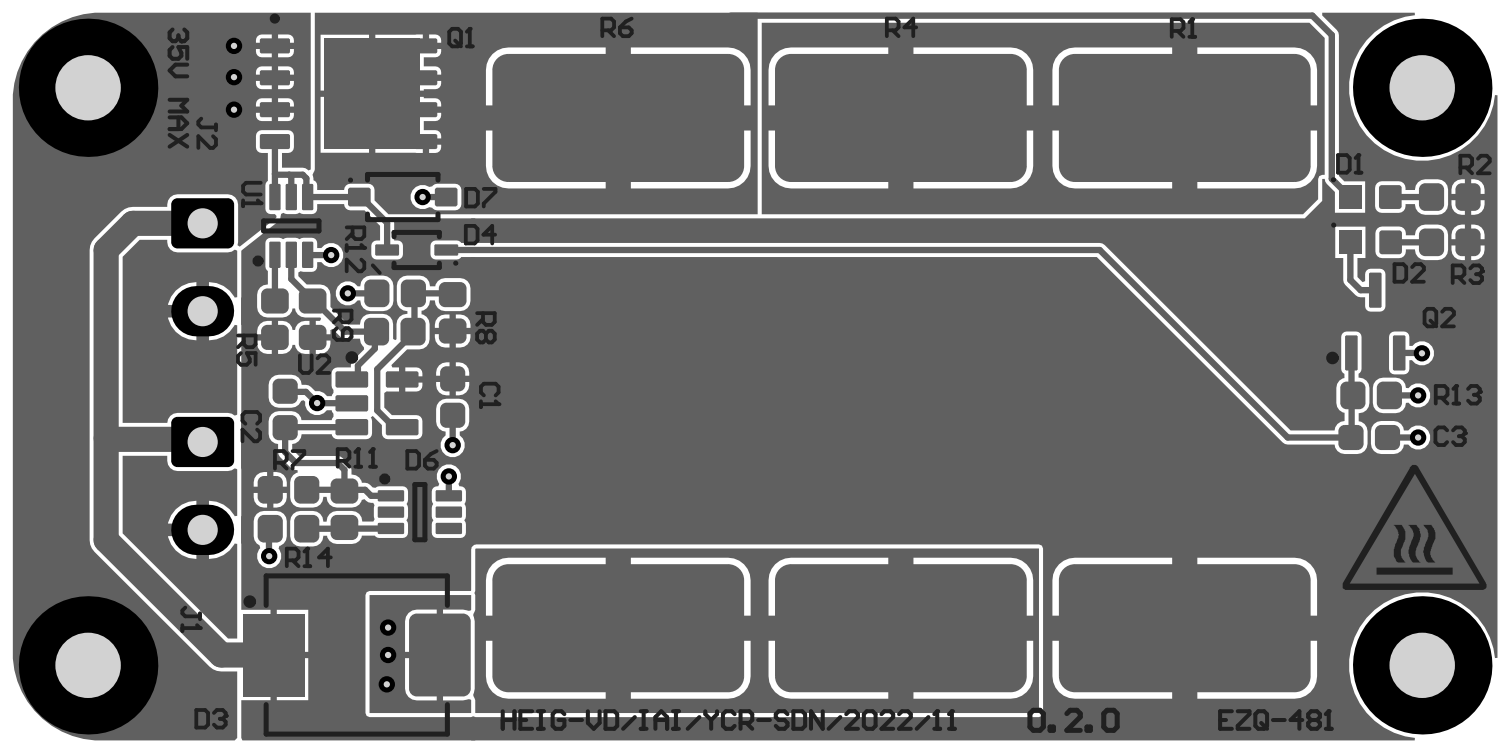
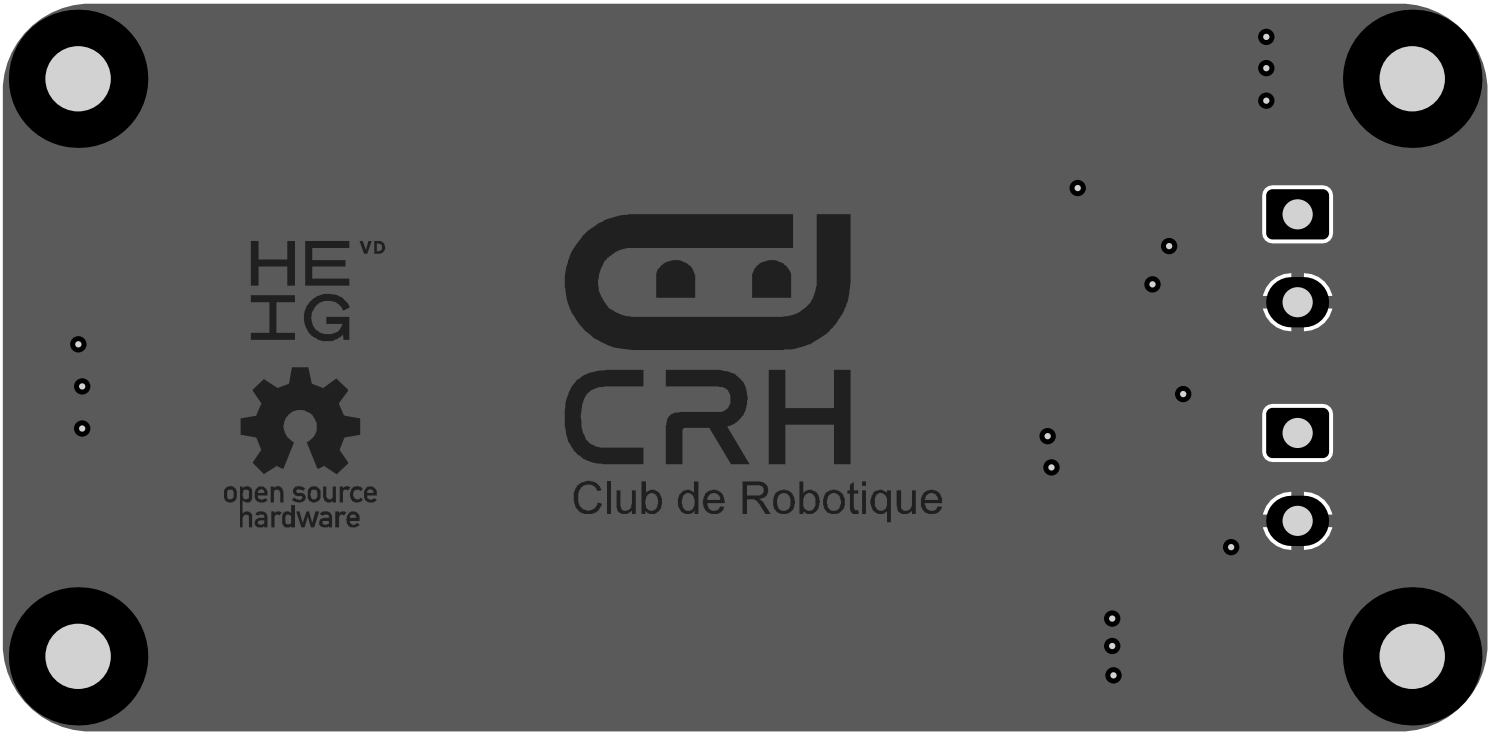
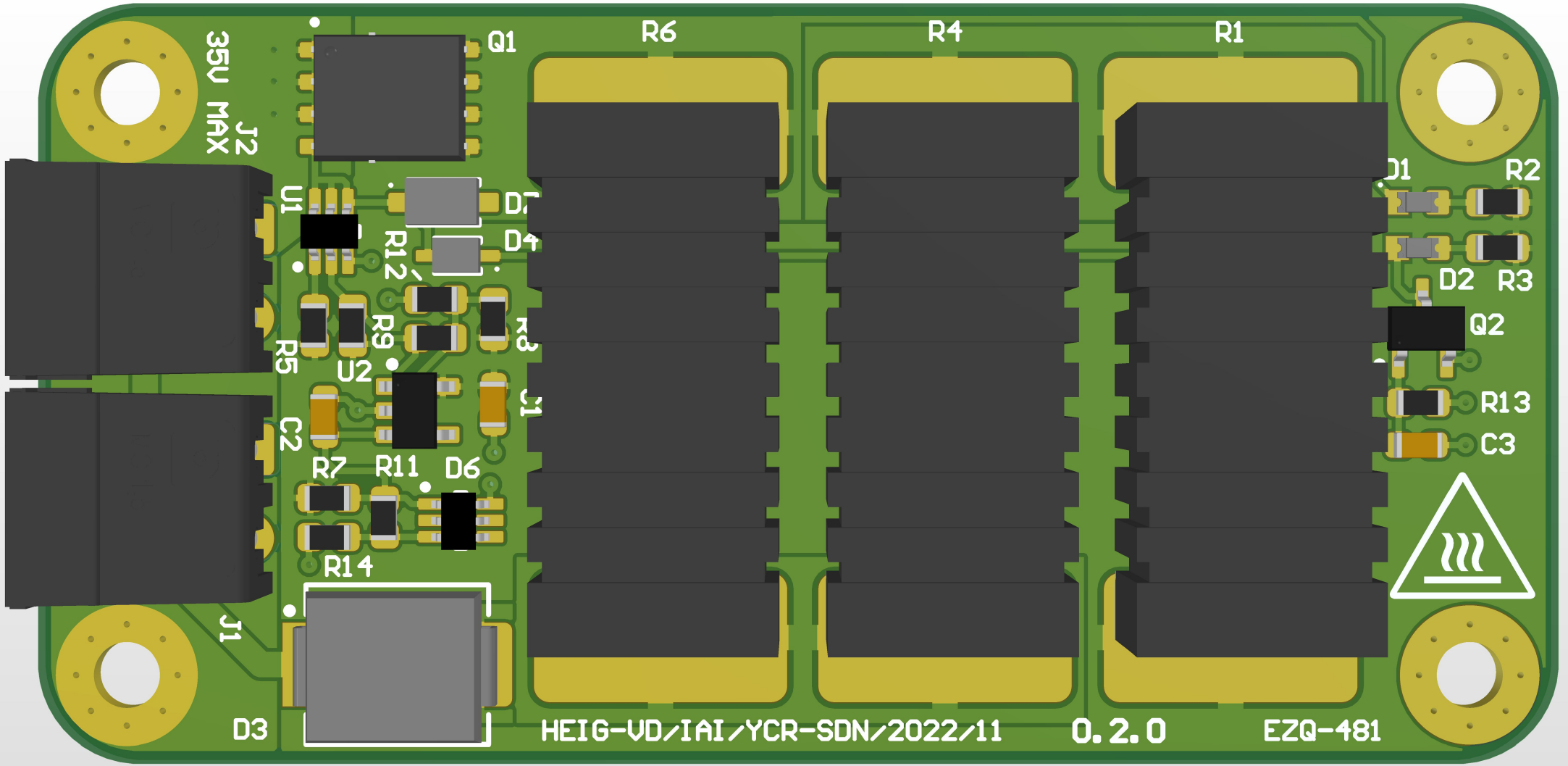
Title	**Dynamic Breaking Resistor**			
Format: A4	Project Name: Toaster	Project ID: EZQ-481	VCS: GitHub	Revision: 0.2.0
Date: 23/11/2022	Author: YCR / SDN			Page: 1/ 1
File: toaster.SchDoc				




35V MAX
J2
Q1
R6
R4
R1
D1
R2
D2
R3
Q2
R13
C3
U1
D7
D4
R12
R5
R8
R6
U2
C1
C2
R7
R11
D6
R14
J1
D3
HEIG-VD/IAI/YCR-SDN/2022/11
0.2.0
EZQ-481


HE VD
IG
open source
hardware
CRH
Club de Robotique


35V MAX
J2
Q1
R6
R4
R1
U1
D7
D4
R12
R9
R8
R5
U2
J1
C2
R7
R11
D6
R14
J1
D3
D1
R2
D2
R3
Q2
R13
C3
HEIG-VD/IAI/YCR-SDN/2022/11
0.2.0
EZQ-481


HE VD
IG
open source
hardware
CRH
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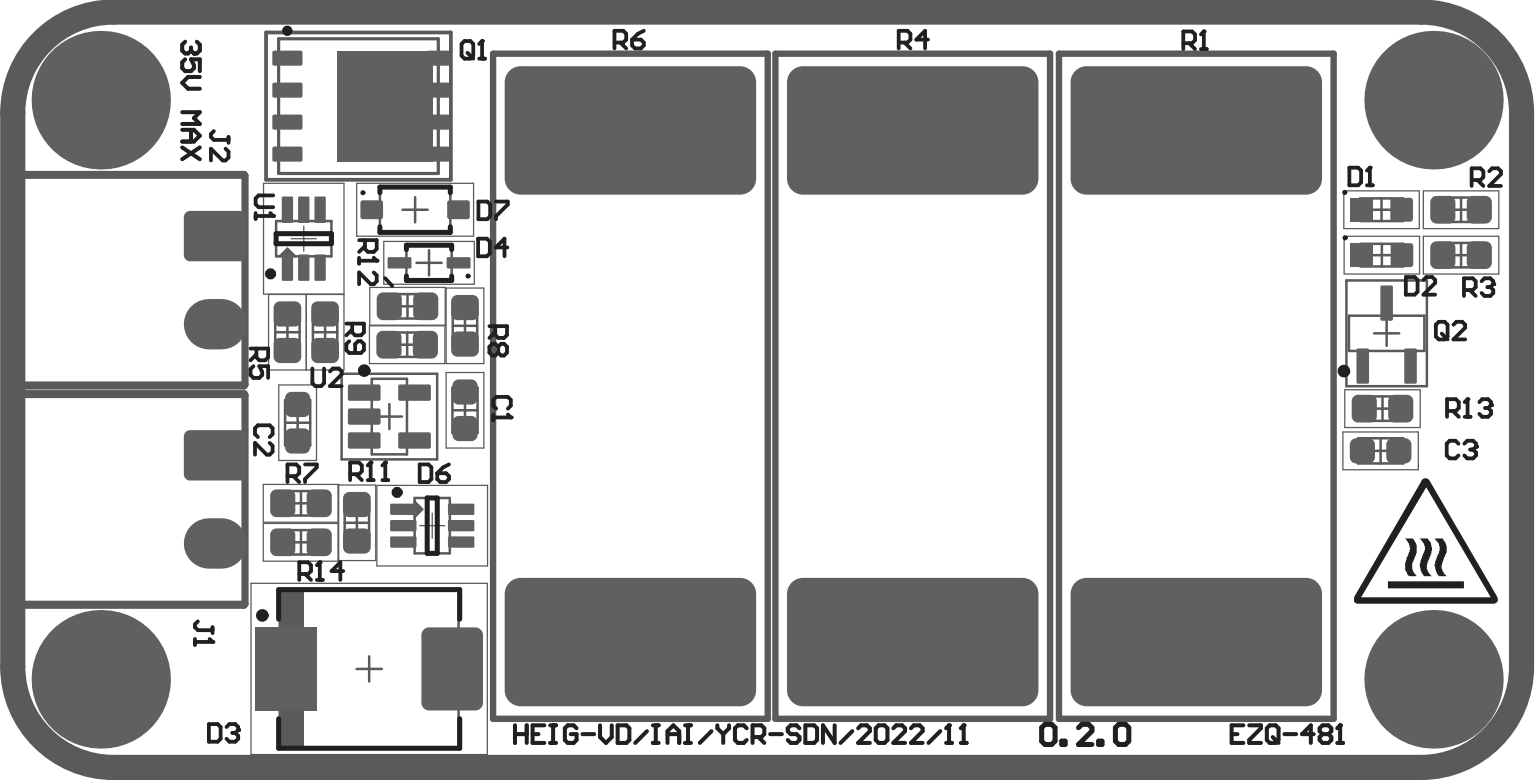
35V MAX
J2
J1
Q1
U1
U2
D7
D4
D6
D3
R12
R9
R8
R5
R7
R11
R14
C2
C1
R6
R4
R1
D1
R2
D2
R3
Q2
R13
C3
HEIG-VD/IAI/YCR-SDN/2022/11
0.2.0
EZQ-481

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vb
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hardware

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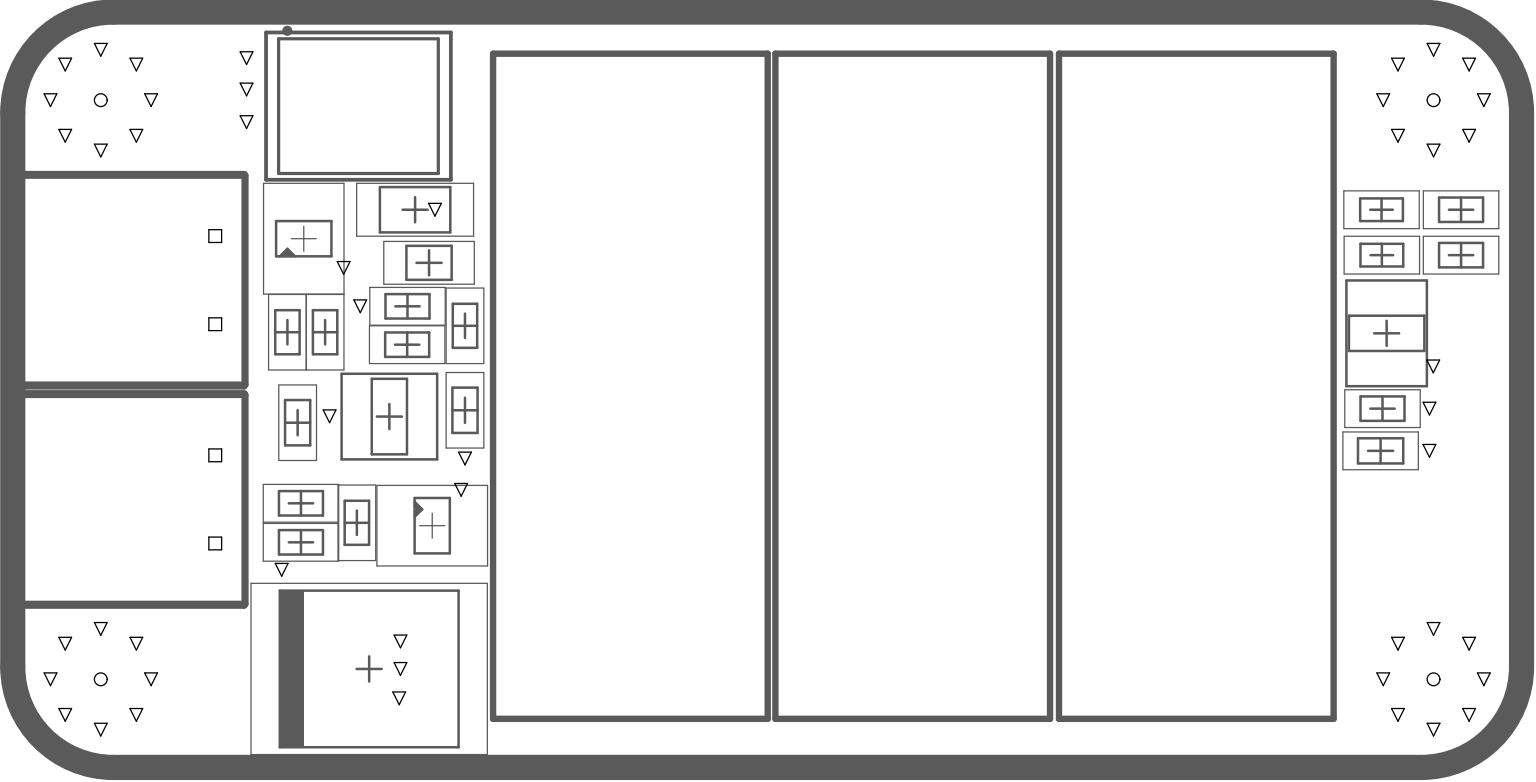

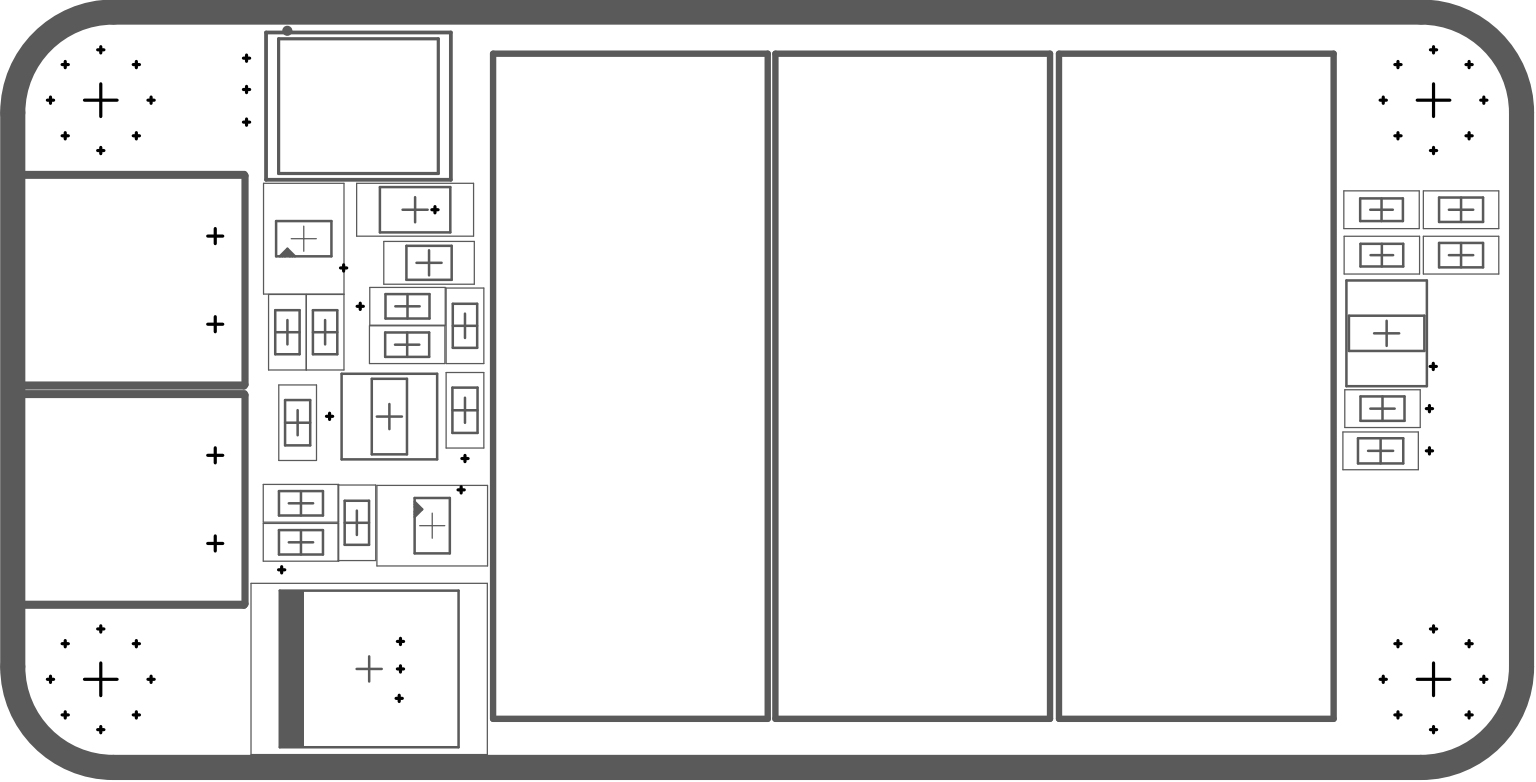

Line #	Designator	Value	Quantity	Manufacturer 1	Manufacturer Part Number 1	Supplier 1	Supplier Part Number 1	Supplier Unit Price 1
	C1	100nF	1	Wurth Electronics	885382206004	Digi-Key	732-13187-1-ND	0.09623
	C2	100nF	1	Wurth Electronics	885382206004	Digi-Key	732-13187-1-ND	0.09623
	C3	2.2uF	1	Murata	GRT188R61H225KE13D	Digi-Key	490-12332-1-ND	0.2887
	D1	150060BS55040	1	Wurth Electronics	150060BS55040	Digi-Key	732-12013-1-ND	0.18284
	D2	150060BS55040	1	Wurth Electronics	150060BS55040	Digi-Key	732-12013-1-ND	0.18284
	D3	SMCJ22A	1	Littelfuse	SMCJ22A	Digi-Key	SMCJ22ALFCT-ND	0.54853
	D4	SD101BWS-TP	1	MCC	SD101BWS-TP	Digi-Key	SD101BWSTPMSCT-ND	0.33682
	D6	TL431BCDCKT	1	Texas Instruments	TL431BCDCKT	Digi-Key	296-TL431BCDCKTCT-ND	1.1
	D7	BZT52-C15	1	Pan Jit	BZT52C15_R1_00001	Digi-Key	3757-BZT52-C15_R1_00001CT-ND	0.15397
	J1		1	Molex	0395021002	Digi-Key	WM7770-ND	0.65439
	J2		1	Molex	0395021002	Digi-Key	WM7770-ND	0.65439
	Q1	STL2N80K5	1	STMicroelectronics	STL2N80K5	Digi-Key	497-14539-1-ND	1.64
	Q2	DMN67D7L-7	1	Diodes	DMN67D7L-7	Digi-Key	DMN67D7L-7DICT-ND	0.26945
	R1	10	1	Ohmite	RW5S0FA10R0JE	Digi-Key	RW5S0FA10R0JE-ND	1.56
	R2	4.7k	1	Yageo	AC0603FR-074K7L	Digi-Key	YAG3613CT-ND	0.09623
	R3	4.7k	1	Yageo	AC0603FR-074K7L	Digi-Key	YAG3613CT-ND	0.09623
	R4	10	1	Ohmite	RW5S0FA10R0JE	Digi-Key	RW5S0FA10R0JE-ND	1.56
	R5	100	1	Yageo	AC0603FR-07100RL	Digi-Key	YAG3561CT-ND	0.09623
	R6	10	1	Ohmite	RW5S0FA10R0JE	Digi-Key	RW5S0FA10R0JE-ND	1.56
	R7	4.7k	1	Yageo	AC0603FR-074K7L	Digi-Key	YAG3613CT-ND	0.09623
	R8	24k	1	Yageo	AC0603FR-0724KL	Digi-Key	YAG3583CT-ND	0.09623
	R9	27k	1	Yageo	AC0603FR-0727KL	Digi-Key	YAG3585CT-ND	0.09623
	R10	270k	1	Yageo	AC0603FR-07270KL	Digi-Key	YAG3584CT-ND	0.09623
	R11	82k	1	Yageo	AC0603FR-0782KL	Digi-Key	YAG3633CT-ND	0.09623
	R12	18k	1	Yageo	AC0603FR-0718KL	Digi-Key	YAG3570CT-ND	0.09623
	R13	560k	1	Yageo	AC0603FR-07560KL	Digi-Key	311-560KLDCT-ND	0.09623
	R14	27k	1	Yageo	AC0603FR-0727KL	Digi-Key	YAG3585CT-ND	0.09623
	U1	ZXGD3009DYTA	1	Diodes	ZXGD3009DYTA	Digi-Key	ZXGD3009DYTADICT-ND	0.4138
	U2	TS391SN2T1G	1	ON Semiconductor	TS391SN2T1G	Digi-Key	TS391SN2T1GOSCT-ND	0.59665

Design Rules Verification Report

Filename : C:\Users\simon.demontmo\Desktop\CRH\hw-toaster\toaster.PcbDoc

Warnings 0
Rule Violations 2

Warnings	
Total	0

Rule Violations	
Clearance Constraint (Gap=0.15mm) (All),(All)	0
Short-Circuit Constraint (Allowed=No) (All),(All)	0
Un-Routed Net Constraint ((All))	0
Modified Polygon (Allow modified: No), (Allow shelved: No)	0
Width Constraint (Min=0.15mm) (Max=1mm) (Preferred=0.25mm) (All)	0
Power Plane Connect Rule(Relief Connect)(Expansion=0.508mm) (Conductor Width=0.254mm) (Air Gap=0.254mm)	0
Hole Size Constraint (Min=0.25mm) (Max=5.08mm) (All)	0
Hole To Hole Clearance (Gap=0.15mm) (All),(All)	0
Minimum Solder Mask Sliver (Gap=0.1mm) (All),(All)	0
Silk To Solder Mask (Clearance=0.15mm) (IsPad),(All)	2
Silk to Silk (Clearance=0.1mm) (All),(All)	0
Net Antennae (Tolerance=0mm) (All)	0
Board Clearance Constraint (Gap=0mm) ((InComponent('J1') OR InComponent('J2')))	0
Board Clearance Constraint (Gap=0mm) (All)	0
Height Constraint (Min=0mm) (Max=25.4mm) (Prefered=12.7mm) (All)	0
Total	2

Silk To Solder Mask (Clearance=0.15mm) (IsPad),(All)
Silk To Solder Mask Clearance Constraint: (0.143mm < 0.15mm) Between Pad R5-2(10.922mm,16.559mm) on Top Layer And Text "R5"
Silk To Solder Mask Clearance Constraint: (0.14mm < 0.15mm) Between Pad R9-2(12.421mm,16.559mm) on Top Layer And Text "U2"

Electrical Rules Check Report

Class	Document	Message
		Successful Compile for toaster.PrjPcb