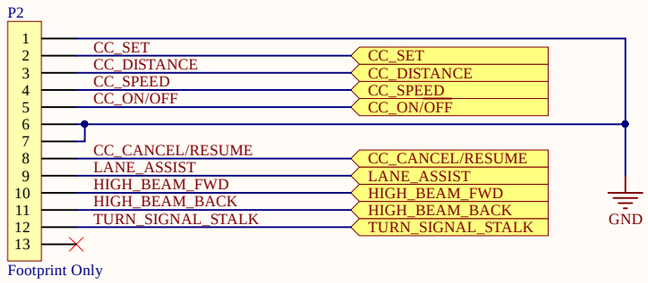
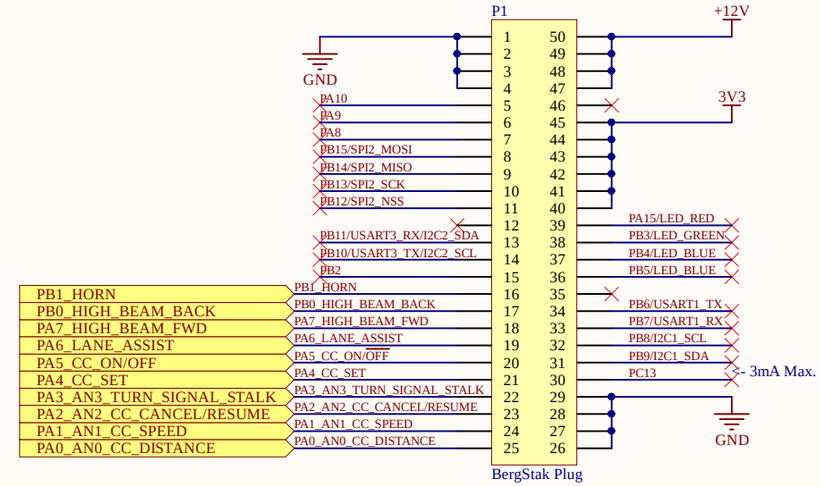
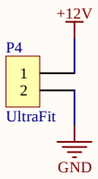
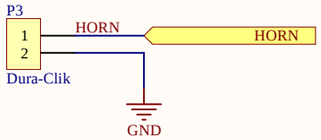
Steering Stalk Connector









PROJECT	MSXII_SteeringWheelInterfaceBoard.PrjPcb		
DOCUMENT	Steering Wheel Interface - Mezzanine		
PART NUMBER	MS-ELE0008	VARIANT	[No Variations]
DRAWN BY	Jenny Xia	REVISION	3.1
LAST MODIFIED	2019-05-24	SHEET	1 OF 3

MIDNIGHT SUN

Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com

RC Low Pass Filter

fc = 116.17[Hz]

fc = 159154.94[Hz]

+12V
R1
4.7k
1/10W
LED1
Green
2V
GND

TURN_SIGNAL_STALK
TURN_SIGNAL_STALK
3V3
R2
1k
0.1%
1/10W
R3
15k
1%
1/10W
C1
10000pF
50V
U2J
C2
0.1µF
50V
X7R
U1A
R4
100
1/10W
C3
10000pF
50V
U2J
PA3_AN3_TURN_SIGNAL_STALK
PA3_AN3_TURN_SIGNAL_STALK
GND

+12V
8
U1C
4
GND
+12V
C4
0.1µF
50V
X7R
GND

CC_CANCEL/RESUME
CC_CANCEL/RESUME
3V3
R5
1k
0.1%
1/10W
R6
15k
1%
1/10W
C5
10000pF
50V
U2J
C6
0.1µF
50V
X7R
U1B
R7
100
1/10W
C7
10000pF
50V
U2J
PA2_AN2_CC_CANCEL/RESUME
PA2_AN2_CC_CANCEL/RESUME
GND

+12V
C8
4.7µF
25V
X5R
GND

CC_SPEED
CC_SPEED
3V3
R8
1k
0.1%
1/10W
R9
15k
1%
1/10W
C9
10000pF
50V
U2J
C10
0.1µF
50V
X7R
U2A
R10
100
1/10W
C11
10000pF
50V
U2J
PA1_AN1_CC_SPEED
PA1_AN1_CC_SPEED
GND

+12V
8
U2C
4
GND
+12V
C12
0.1µF
50V
X7R
GND

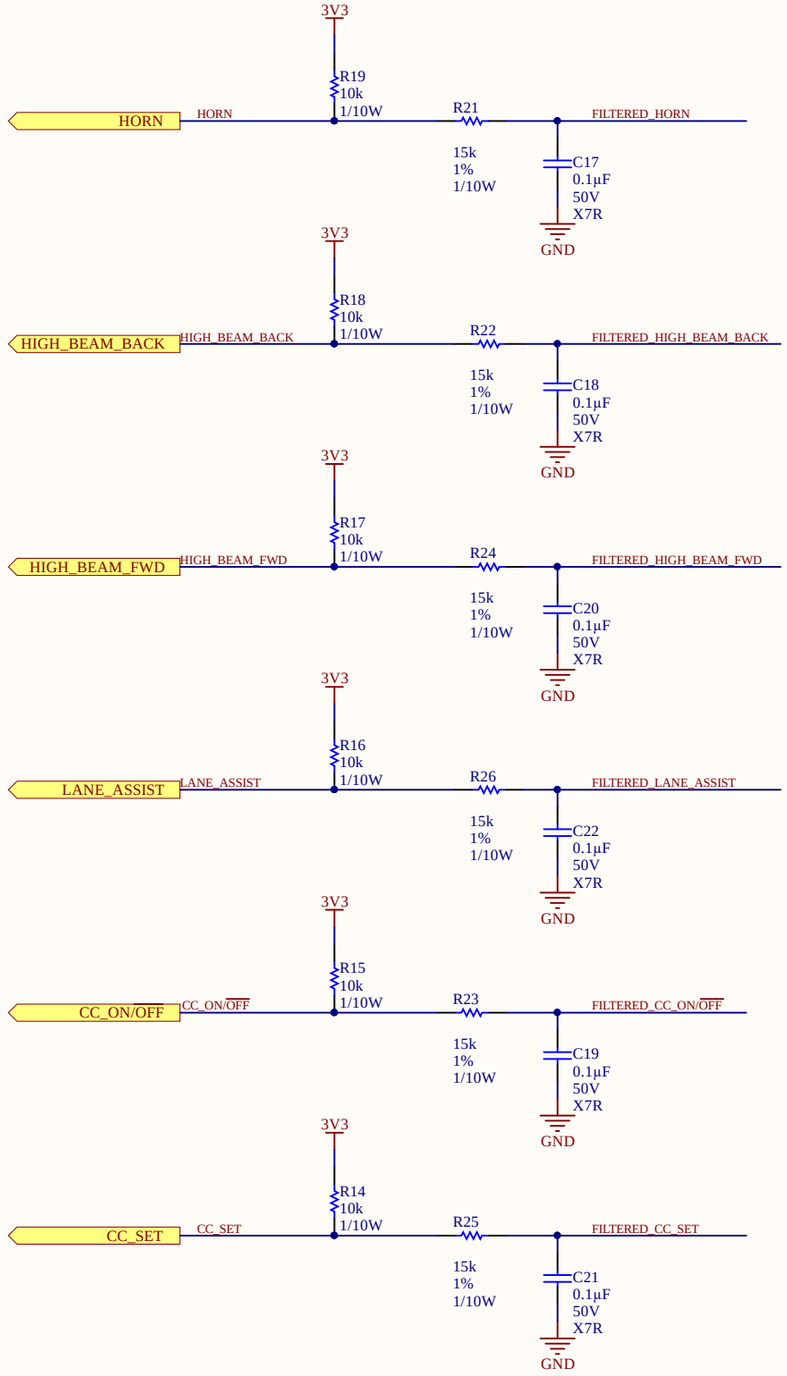
TP1
TP
Test Point
GND

CC_DISTANCE
CC_DISTANCE
3V3
R11
1k
0.1%
1/10W
R12
15k
1%
1/10W
C13
10000pF
50V
U2J
C14
0.1µF
50V
X7R
U2B
R13
100
1/10W
C15
10000pF
50V
U2J
PA0_AN0_CC_DISTANCE
PA0_AN0_CC_DISTANCE
GND

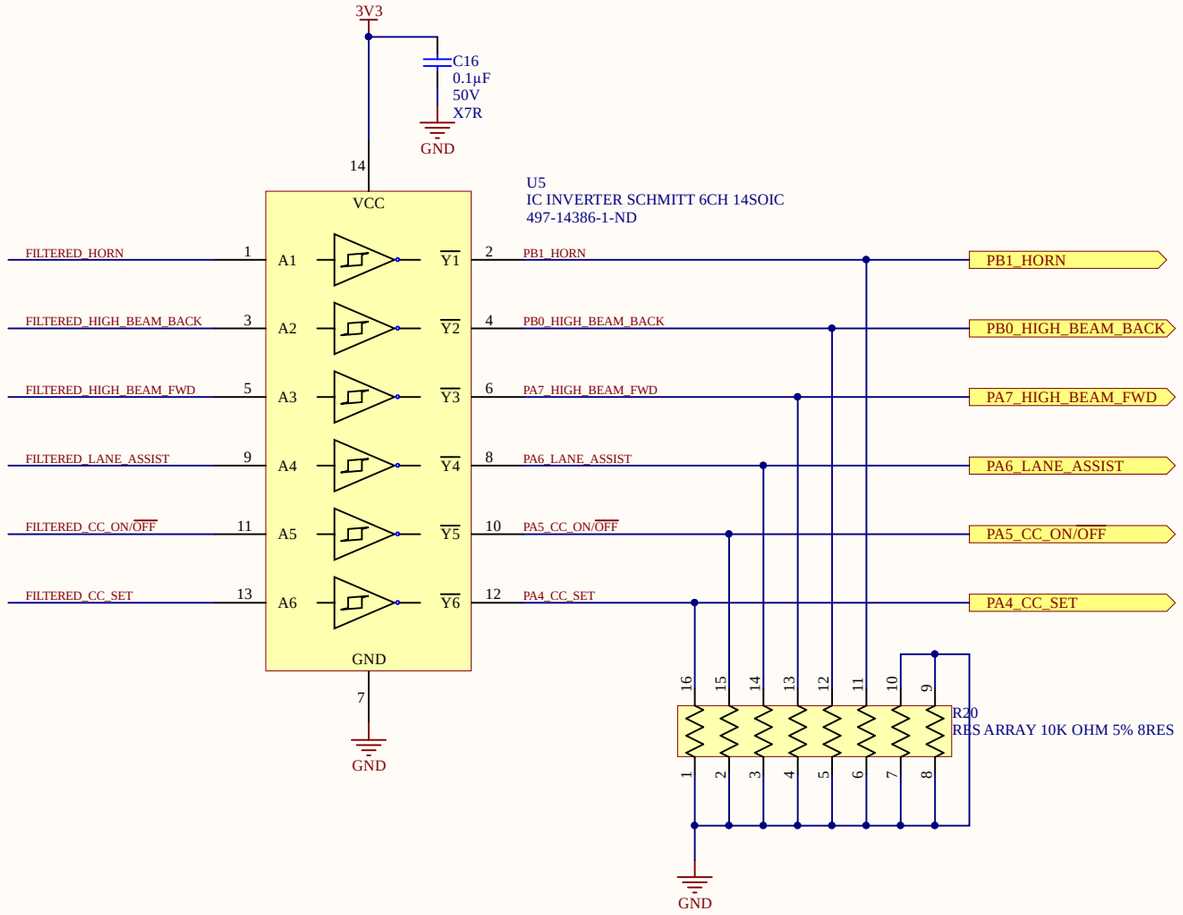
PROJECT	MSXII_SteeringWheelInterfaceBoard.PrjPcb		
DOCUMENT	Steering Wheel Interface - Analog Inputs		
PART NUMBER	MS-ELE0008	VARIANT	[No Variations]
DRAWN BY	Jenny Xia	REVISION	3.1
LAST MODIFIED	2019-05-24	SHEET	2 OF 3

MIDNIGHT SUN

Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com



fc = 116.17[Hz]



PROJECT	MSXII_SteeringWheelInterfaceBoard.PrjPcb		
DOCUMENT	Steering Wheel Interface - Digital Inputs		
PART NUMBER	MS-ELE0008	VARIANT	[No Variations]
DRAWN BY	Jenny Xia	REVISION	3.1
LAST MODIFIED	2019-05-24	SHEET	3 OF 3

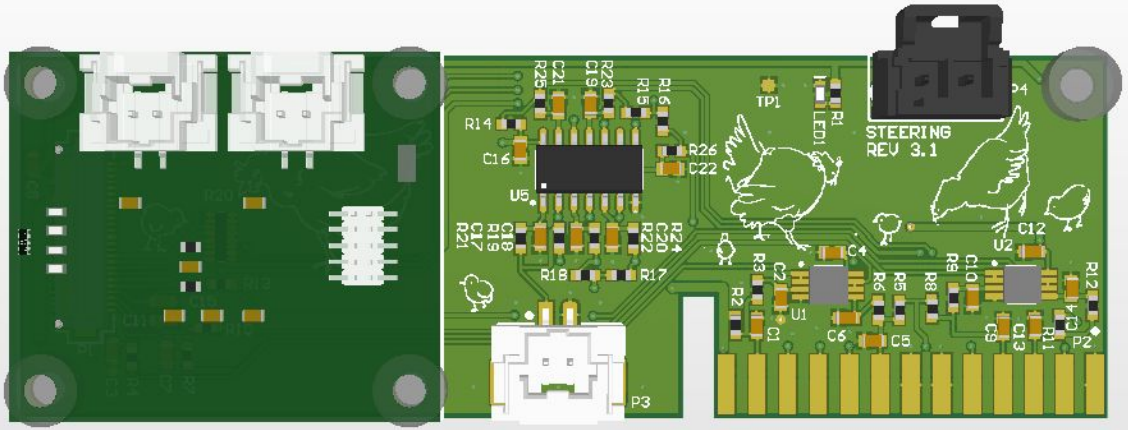
MIDNIGHT SUN

Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com

Bill of Materials

Project:	SXII_SteeringWheelInterfaceBoard.PrjPcb
Revision:	3.1
Project Lead:	Jenny Xia
Generated On:	2019-05-24 23:02
Production Quantity:	1
Currency	CAD
Total Parts Count:	55

LibRef	Designator	Manufacturer 1	Manufacturer Part Number 1	Supplier 1	Supplier Part Number 1	Supplier Unit Price 1	Quantity	Supplier Subtotal 1
CAP CER 10nF 50V 5% X7R 0603	C1, C3, C5, C7, C9, C11, C13, C15	KEMET	C0603C103J5JACTU	Digi-Key	399-13384-1-ND	0.48478	8	$ 3.88
CAP CER 0.1UF 50V 10% X7R 0603	C6, C10, C12, C14, C16, C17, C18, C19, C20, C	Kyocera AVX	06035C-104KAT2A	Digi-Key	478-5052-1-ND	0.15486	13	$ 2.01
CAP CER 4.7UF 25V 10% X5R 0603	C8	Murata	GRM188R61E475KE11D	Digi-Key	490-7203-1-ND	0.49825	1	$ 0.50
LED GREEN CLEAR 2V 0603	LED1	Wurth Electronics	150060VS75000	Digi-Key	732-4980-1-ND	0.18853	1	$ 0.19
CONN 50POS Bergstak Plug 0.02"	P1	Amphenol FCI	10132797-055100LF	Digi-Key	609-5226-1-ND	1.89	1	$ 1.89
CONN 2POS DURA-CLIK 0.079" VERT	P3	Molex	560020-0220	Digi-Key	WM10862CT-ND	1.05	1	$ 1.05
CONN 2POS ULTRA-FIT 0.138"	P4	Molex	1722861302	Digi-Key	WM11673-ND	1.97	1	$ 1.97
RES 4.7K OHM 1% 1/10W 0603	R1	Yageo	RC0603FR-074K7L	Digi-Key	311-4.70KHRCT-ND	0.13466	1	$ 0.13
RES SMD 1K OHM 0.1% 1/10W 0603	R2, R5, R8, R11	Panasonic	ERA3AEB102V	Digi-Key	P1.0KDBCT-ND	0.47132	4	$ 1.89
RES SMD 15K OHM 1% 1/10W 0603	R3, R6, R9, R12, R21, R22, R23, R24, R25, R26	Yageo	RC0603FR-0715KL	Digi-Key	311-15.0KHRCT-ND	0.03232	10	$ 0.32
RES 100 OHM 1% 1/10W 0603	R4, R7, R10, R13	Yageo	RC0603FR-07100RL	Digi-Key	311-100HRCT-ND	0.13466	4	$ 0.54
RES 10K OHM 1% 1/10W 0603	R14, R15, R16, R17, R18, R19	Yageo Phycomp	RC0603FR-0710KL	Digi-Key	311-10.0KHRCT-ND	0.13466	6	$ 0.81
RES ARRAY 10K OHM 5% 8RES EXB-2HV103JV	R20	Panasonic	EXB2HV103JV	Digi-Key	Y1103CT-ND	0.39052	1	$ 0.39
IC OP AMP DUAL GP RR 10MHZ 8-VSSOP	U1, U2	Texas Instruments	OPA2197IDGKR	Digi-Key	296-47349-1-ND	3.25	2	$ 6.49
IC INVERTER SCHMITT 6CH 14TSSOP	U5	STMicroelectronics	M74HC14YRM13TR	Digi-Key	497-14386-1-ND	0.64638	1	$ 0.65
							Total:	$ 22.71


STEERING
REV 3.1
TP1
LED1
P1
P2
P3
P4
U1
U2
U5
C1
C2
C4
C5
C6
C9
C10
C12
C13
C16
C17
C19
C21
R1
R2
R3
R5
R6
R8
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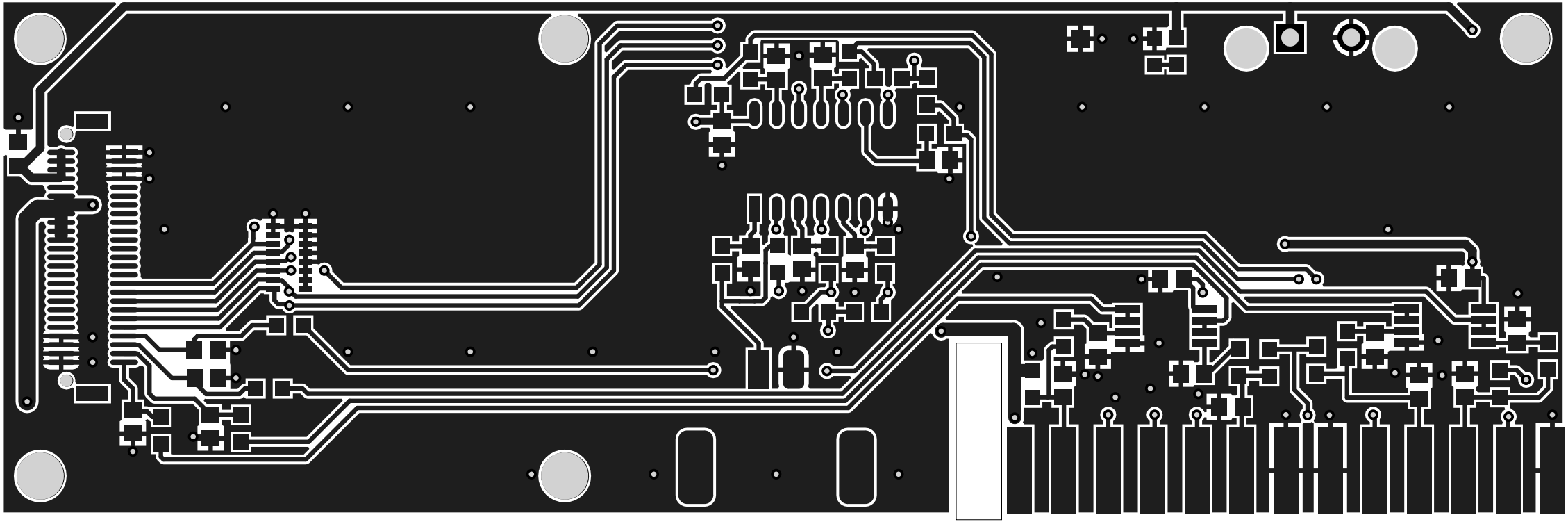
R21
R22
R23
R24
R25
R26
C22



MS-ELE0008

Design Rules Verification Report

Filename : C:\Users\jieni\Documents\Github\hardware\MSXII_SteeringWheelInterfaceBoard\

Warnings 0
Rule Violations 43

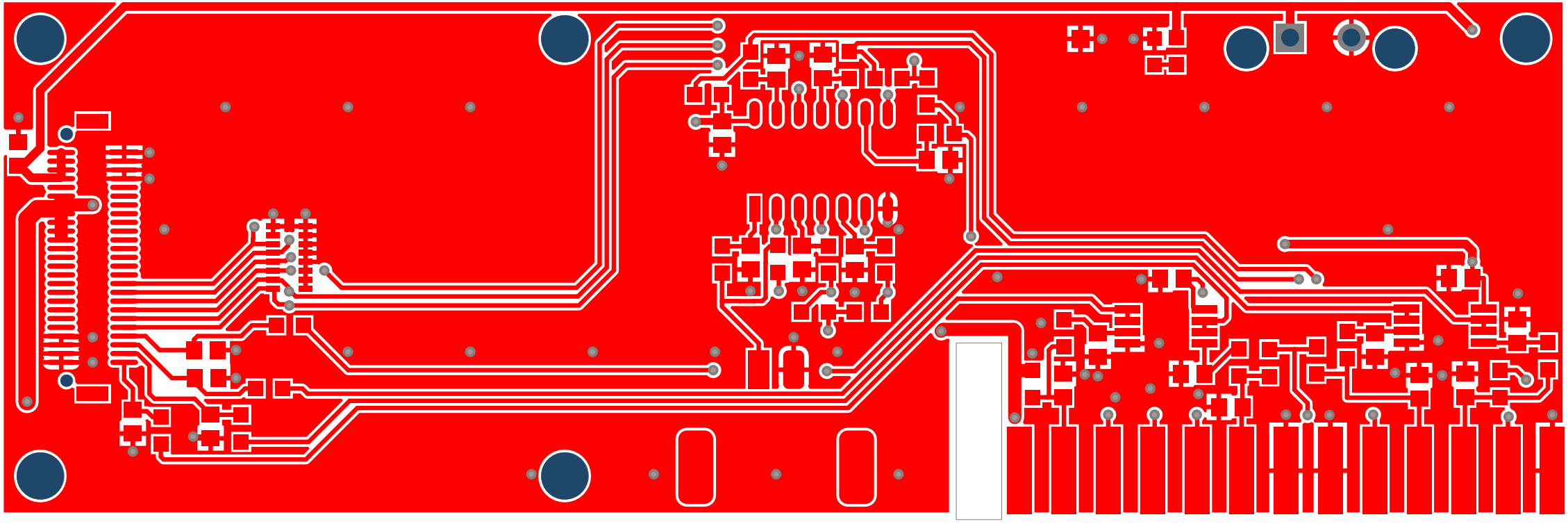
Warnings	
Total	0

Rule Violations	
Clearance Constraint (Gap=0.152mm) (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=0.152mm) (Max=2.54mm) (Preferred=0.254mm) (All)	0
Power Plane Connect Rule(Relief Connect)(Expansion=0.508mm) (Conductor Width=0.254mm) (Air Gap=0.254mm)	0
Minimum Annular Ring (Minimum=0.06mm) (All)	0
Hole Size Constraint (Min=0.3mm) (Max=6.3mm) (All)	0
Hole To Hole Clearance (Gap=0.254mm) (All),(All)	0
Minimum Solder Mask Sliver (Gap=0mm) (All),(All)	0
Silk To Solder Mask (Clearance=0.178mm) (IsPad),(All)	8
Silk to Silk (Clearance=0.254mm) (All),(All)	5
Net Antennae (Tolerance=0mm) (All)	0
Board Clearance Constraint (Gap=0mm) (All)	30
Height Constraint (Min=0mm) (Max=25.4mm) (Prefered=12.7mm) (All)	0
Total	43

Silk To Solder Mask (Clearance=0.178mm) (IsPad),(All)
Silk To Solder Mask Clearance Constraint: (0.175mm < 0.178mm) Between Pad C13-1(84mm,7mm) on Top Layer And Text "R11" (84.75mm,7.5mm) on
Silk To Solder Mask Clearance Constraint: (0.005mm < 0.178mm) Between Pad C9-1(81.38mm,6.915mm) on Top Layer And Text "C9" (80mm,7.75mm) on
Silk To Solder Mask Clearance Constraint: (0.122mm < 0.178mm) Between Pad C9-2(81.38mm,8.265mm) on Top Layer And Text "C9" (80mm,7.75mm) on
Silk To Solder Mask Clearance Constraint: (0.163mm < 0.178mm) Between Pad P3-3(40mm,3mm) on Top Layer And Track
Silk To Solder Mask Clearance Constraint: (0.16mm < 0.178mm) Between Pad R11-1(86mm,8.55mm) on Top Layer And Text "C14" (87.46mm,7.4mm) on
Silk To Solder Mask Clearance Constraint: (Collision < 0.178mm) Between Pad R11-2(86mm,7mm) on Top Layer And Text "R11" (84.75mm,7.5mm) on
Silk To Solder Mask Clearance Constraint: (0.105mm < 0.178mm) Between Pad R23-2(48.763mm,26.762mm) on Top Layer And Text "R23"
Silk To Solder Mask Clearance Constraint: (0.138mm < 0.178mm) Between Pad R25-2(43.125mm,26.73mm) on Top Layer And Text "R25"

Silk to Silk (Clearance=0.254mm) (All),(All)
Silk To Silk Clearance Constraint: (0.235mm < 0.254mm) Between Arc (42.513mm,17.775mm) on Top Overlay And Text "U5" (40.75mm,18mm) on Top
Silk To Silk Clearance Constraint: (0.15mm < 0.254mm) Between Region (2 hole(s)) Top Overlay And Text "U2" (80.75mm,14mm) on Top Overlay Silk Text
Silk To Silk Clearance Constraint: (0.25mm < 0.254mm) Between Text "C18" (40mm,16mm) on Top Overlay And Text "R19" (38.8mm,15.934mm) on Top
Silk To Silk Clearance Constraint: (0.227mm < 0.254mm) Between Text "C20" (52.75mm,16mm) on Top Overlay And Text "R22" (51.573mm,16mm) on Top
Silk To Silk Clearance Constraint: (0.048mm < 0.254mm) Between Text "P1" (5mm,5.25mm) on Top Overlay And Track (4.1mm,6.3mm)(6.9mm,6.3mm) on

Board Clearance Constraint (Gap=0mm) (All)
Board Outline Clearance(Cutout Edge): (0.32mm < 0.406mm) Between Board Cutout (Multi-Layer)Region (0 hole(s)) Multi-Layer And Pad
Board Outline Clearance(Cutout Edge): (0.375mm < 0.406mm) Between Board Cutout (Multi-Layer)Region (0 hole(s)) Multi-Layer And Track
Board Outline Clearance(Cutout Edge): (0.375mm < 0.406mm) Between Board Cutout (Multi-Layer)Region (0 hole(s)) Multi-Layer And Track
Board Outline Clearance(Cutout Edge): (0.375mm < 0.406mm) Between Board Cutout (Multi-Layer)Region (0 hole(s)) Multi-Layer And Track
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-1(89mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-10(66.14mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-11(63.6mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-12(61.06mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-13(58.52mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-2(86.46mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-3(83.92mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-4(81.38mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-5(78.84mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-6(76.3mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-7(73.76mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-8(71.22mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.3mm < 0.406mm) Between Board Edge And Pad P2-9(68.68mm,2.8mm) on Top Layer
Board Outline Clearance(Outline Edge): (0.35mm < 0.406mm) Between Board Edge And Text "C19" (47mm,29.5mm) on Top Overlay
Board Outline Clearance(Outline Edge): (0.35mm < 0.406mm) Between Board Edge And Text "C21" (44.25mm,29.5mm) on Top Overlay
Board Outline Clearance(Outline Edge): (0.35mm < 0.406mm) Between Board Edge And Text "R23" (48.25mm,29.5mm) on Top Overlay
Board Outline Clearance(Outline Edge): (0.35mm < 0.406mm) Between Board Edge And Text "R25" (42.773mm,29.5mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (0mm,0mm)(0mm,30mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (0mm,0mm)(35mm,0mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (0mm,30mm)(35mm,30mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (35mm,0mm)(35mm,30mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (39.325mm,-0.02mm)(49.875mm,-0.02mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (70.255mm,24.64mm)(70.255mm,29.94mm) on Top
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (70.255mm,29.94mm)(78.5mm,29.94mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (77.5mm,29.94mm)(81.33mm,29.94mm) on Top Overlay
Board Outline Clearance(Outline Edge): (Collision < 0.406mm) Between Board Edge And Track (81.33mm,24.64mm)(81.33mm,29.94mm) on Top Overlay



M2-ELE0008