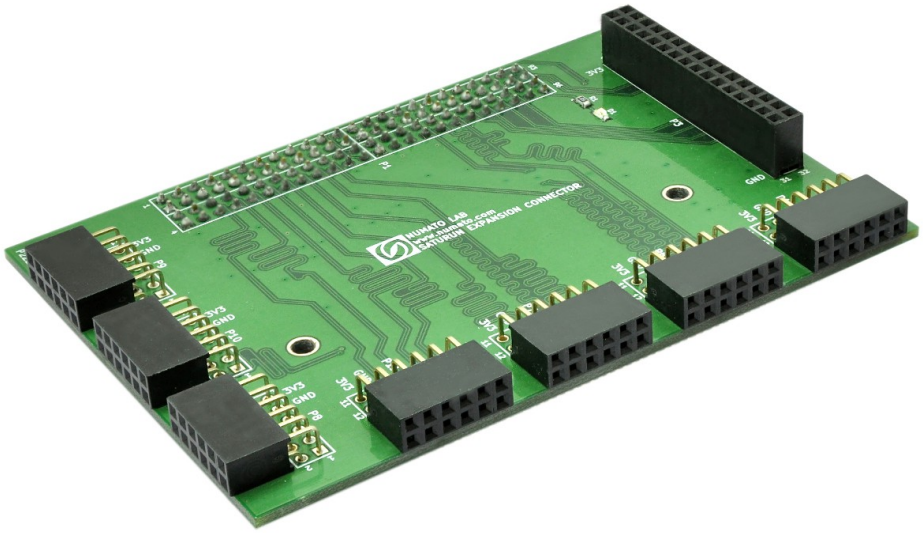

IO Breakout Module for Saturn
User Guide

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Rev 9

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Introduction

This board is an IO breakout solution for Saturn - Spartan6 FPGA Development Board. This product allows Saturn's IOs to be broken out in to smaller 2x6 headers that would facilitate easy attachment of other peripheral expansion modules. The board features seven 2×6 expansion connector.

Board features

- Seven 2x6 pin expansion connectors
- Can be attached to either side of Saturn
- Dimension: 70.6mm X 99.8mm

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How to use the module

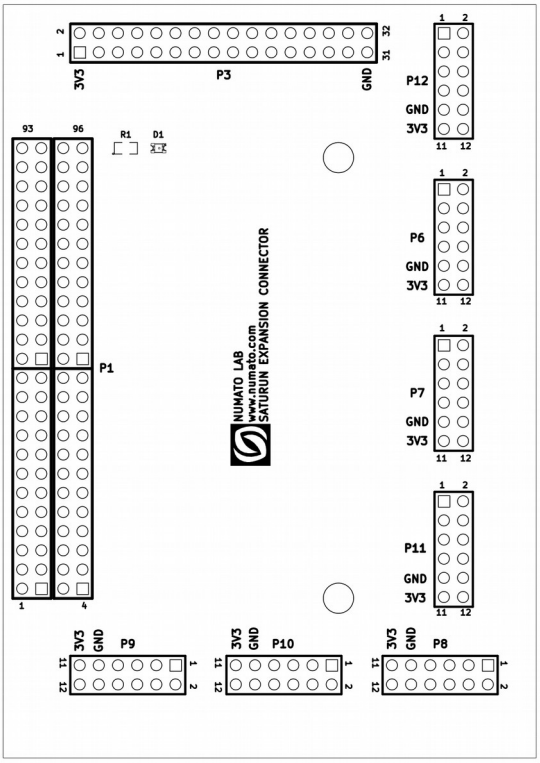
The following section describes how to use this module.

Components/Tools required

Along with the module, you may need the items in the list below for easy and fast installation.

1. Saturn - Spartan6 FPGA Development Board.

Connection Diagram



This diagram should be used as a reference only. For detailed information, see the schematics at the end of this document. Details of individual connectors are as below.

This breakout module can be placed on either side of Saturn. Depending on the placement, the IOs that are available on each header on the breakout will vary. To make identification easier, there is an LED on the breakout module that will turn ON when placed on the side where header P3 are found on Saturn. When the breakout module is placed on Saturn headers P2 the LED will NOT turn ON.

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Connection Details

When the On Board LED on Saturn Expansion Connector is ON (Breakout module is placed on Saturn headers P3)

Breakout Header P3

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	VCC3V3	NA	NA
2	VCC3V3	NA	NA
3	H12	IO_L32P_A17_M1A8_1	6
4	J13	IO_L39P_M1A3_1	8
5	VCC3V3	NA	NA
6	VCC3V3	NA	NA
7	GND	NA	NA
8	GND	NA	NA
9	B2	IO_L2P_0	88
10	A2	IO_L2N_0	87
11	B4	IO_L5P_0	84
12	A4	IO_L5N_0	83
13	GND	NA	NA
14	GND	NA	NA
15	B3	IO_L4P_0	86
16	A3	IO_L4N_0	85
17	C5	IO_L6P_0	82
18	A5	IO_L6N_0	81
19	B6	IO_L8P_0	78
20	A6	IO_L8N_VREF_0	77
21	F7	IO_L7P_0	74
22	E6	IO_L7N_0	73
23	C6	IO_L3N_0	79
24	D6	IO_L3P_0	80

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25	A7	IO_L10N_0	75
26	C7	IO_L10P_0	76
27	D11	IO_L36P_GCLK15_0	48
28	C11	IO_L36N_GCLK14_0	47
29	E11	IO_L42N_0	45
30	F11	IO_L42P_0	46
31	GND	NA	NA
32	GND	NA	NA

Breakout Header P6

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	D8	IO_L11P_0	70
2	C8	IO_L11N_0	69
3	G8	IO_L32P_0	66
4	F8	IO_L32N_0	65
5	E7	IO_L9P_0	68
6	E8	IO_L9N_0	67
7	C13	IO_L50P_0	38
8	A13	IO_L50N_0	37
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P7

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	C10	IO_L37P_GCLK13_0	58
2	A10	IO_L37N_GCLK12_0	57
3	B14	IO_L62P_0	34

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4	A14	IO_L62N_VREF_0	33
5	C15	IO_L64P_SCP5_0	30
6	A15	IO_L64N_SCP4_0	29
7	C17	IO_L29P_A23_M1A13_1	26
8	C18	IO_L29N_A22_M1A14_1	25
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P8

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	G11	IO_L40P_0	54
2	F10	IO_L40N_0	53
3	B11	IO_L39P_0	56
4	A11	IO_L39N_0	55
5	D12	IO_L47P_0	42
6	C12	IO_L47N_0	41
7	C13	IO_L50P_0	38
8	A13	IO_L50N_0	37
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P9

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	D17	IO_L31P_A19_M1CKE_1	24
2	D18	IO_L31N_A18_M1A12_1	23

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3	F17	IO_L35P_A11_M1A7_1	20
4	F18	IO_L35N_A10_M1A2_1	19
5	G16	IO_L38P_A5_M1CLK_1	16
6	G18	IO_L38N_A4_M1CLKN_1	15
7	H13	IO_L36P_A9_M1BA0_1	12
8	H14	IO_L36N_A8_M1BA1_1	11
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P10

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	B12	IO_L41P_0	44
2	A12	IO_L41N_0	43
3	F13	IO_L63P_SCP7_0	36
4	E13	IO_L63N_SCP6_0	35
5	D14	IO_L65P_SCP3_0	32
6	C14	IO_L65N_SCP2_0	31
7	B16	IO_L66P_SCP1_0	28
8	A16	IO_L66N_SCP0_0	27
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P11

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	E18	IO_L33N_A14_M1A4_1	21

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2	E16	IO_L33P_A15_M1A10_1	22
3	F16	IO_L1N_A24_VREF_1	17
4	F15	IO_L1P_A25_1	18
5	G14	IO_L30N_A20_M1A11_1	13
6	F14	IO_L30P_A21_M1RESET_1	14
7	H16	IO_L37N_A6_M1A1_1	9
8	H15	IO_L37P_A7_M1A0_1	10
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P12

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P3 Pin No.
1	B8	IO_L33P_0	71
2	A8	IO_L33N_0	70
3	D9	IO_L34P_GCLK19_0	62
4	C9	IO_L34N_GCLK18_0	61
5	B9	IO_L35P_GCLK17_0	64
6	A9	IO_L35N_GCLK16_0	63
7	G9	IO_L38P_0	60
8	F9	IO_L38N_VREF_0	59
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

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When the On Board LED on Saturn Expansion Connector is OFF (Breakout module is placed on Saturn headers P2)

Breakout Header P3

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	VCC3V3	NA	NA
2	VCC3V3	NA	NA
3	V2	PROGRAM_B_2	91
4	U3	IO_L65P_INIT_B_2	89
5	FTDI-26	AC0	1
6	FTDI-27	AC1	2
7	FTDI-28	AC2	5
8	FTDI-29	AC3	6
9	FTDI-30	AC4	9
10	FTDI-32	AC5	10
11	FTDI-33	AC6	13
12	FTDI-34	AC7	14
13	K12	IO_L34P_A13_M1WE_1	7
14	K13	IO_L34N_A12_M1BA2_1	8
15	L14	IO_L61P_1	11
16	M13	IO_L61N_1	12
17	M14	IO_L53P_1	15
18	N14	IO_L53N_VREF_1	16
19	L15	IO_L42P_GCLK7_M1UDM_1	19
20	L16	IO_L42N_GCLK6_TRDY1_M1LDM_1	20
21	N15	IO_L50P_M1UDQS_1	23
22	N16	IO_L50N_M1UDQSN_1	24
23	L13	IO_L40N_GCLK10_M1A6_1	18
24	L12	IO_L40P_GCLK11_M1A5_1	17

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25	K16	IO_L41N_GCLK8_M1CASN_1	22
26	K15	IO_L41P_GCLK9_IRDY1_M1RASN_1	21
27	GND	NA	NA
28	GND	NA	NA
29	GND	NA	NA
30	GND	NA	NA
31	GND	NA	NA
32	GND	NA	NA

Breakout Header P6

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	P15	IO_L74P_AWAKE_1	27
2	P16	IO_L74N_DOUT_BUSY_1	28
3	U17	IO_L52P_M1DQ14_1	31
4	U18	IO_L52N_M1DQ15_1	32
5	U16	IO_L2P_CMPCLK_2	29
6	V16	IO_L2N_CMPMOSI_2	30
7	M10	IO_L22P_2	59
8	N9	IO_L22N_2	60
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P7

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	U13	IO_L14P_D11_2	39
2	V13	IO_L14N_D12_2	40
3	R8	IO_L31P_GCLK31_D14_2	63

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4	T8	IO_L31N_GCLK30_D15_2	64
5	M8	IO_L40P_2	67
6	N8	IO_L40N_2	68
7	U8	IO_L41P_2	71
8	V8	IO_L41N_VREF_2	72
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P8

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	M11	IO_L15P_2	43
2	N11	IO_L15N_2	44
3	R11	IO_L16P_2	41
4	T11	IO_L16N_VREF_2	42
5	U11	IO_L23P_2	55
6	V11	IO_L23N_2	56
7	R10	IO_L29P_GCLK3_2	57
8	T10	IO_L29N_GCLK2_2	58
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P9

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	R7	IO_L46P_2	73
2	T7	IO_L46N_2	74

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3	N5	IO_L64P_D8_2	77
4	P6	IO_L64N_D9_2	78
5	R5	IO_L48P_D7_2	81
6	T5	IO_L48N_RDWR_B_VREF_2	82
7	R3	IO_L62P_D5_2	85
8	T3	IO_L62N_D6_2	86
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P10

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	N10	IO_L20P_2	53
2	P11	IO_L20N_2	54
3	T9	IO_L32P_GCLK29_2	61
4	V9	IO_L32N_GCLK28_2	62
5	N7	IO_L44P_2	65
6	P8	IO_L44N_2	66
7	U7	IO_L43P_2	69
8	V7	IO_L43N_2	70
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P11

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	P7	IO_L47N_2	76

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2	N6	IO_L47P_2	75
3	V6	IO_L45N_2	80
4	T6	IO_L45P_2	79
5	V5	IO_L49N_D4_2	84
6	U5	IO_L49P_D3_2	83
7	V4	IO_L63N_2	88
8	T4	IO_L63P_2	87
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

Breakout Header P12

Expansion Connector Pin No.	Spartan6 (CSG324) Pin No.	Pin Description	Saturn Header P2 Pin No.
1	T17	IO_L51P_M1DQ12_1	25
2	T18	IO_L51N_M1DQ13_1	26
3	U15	IO_L5P_2	35
4	V15	IO_L5N_2	36
5	T14	IO_L12P_D1_MISO2_2	33
6	V14	IO_L12N_D2_MISO3_2	34
7	T12	IO_L19P_2	37
8	V12	IO_L19N_2	38
9	GND	NA	NA
10	GND	NA	NA
11	VCC3V3	NA	NA
12	VCC3V3	NA	NA

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Saturn Expansion Connector Length Details

		Expansion Connector on Header P2 (on Saturn)		Expansion Connector on Header P3 (on Saturn)	
Pin No.	Trace Length (EXP Connector)(mm	Trace Length (Saturn) (mm)	Total Length (mm)	Trace Length (Saturn) (mm)	Total Length (mm)
Expansion Connector Header P12					
1	85.073	23.961	109.034	17.352	102.425
2	77.454	31.539	108.993	17.42	94.874
3	79.827	29.221	109.048	21.829	101.656
4	78.279	30.811	109.09	21.725	100.004
5	85.321	23.628	108.949	16.651	101.972
6	85.476	23.585	109.061	16.567	102.043
7	87.373	21.617	108.99	19.381	106.754
8	86.847	22.128	108.975	19.412	106.259
Expansion Connector Header P6					
1	78.559	30.508	109.067	24.471	103.003
2	74.568	34.419	108.987	24.349	98.917
3	81.459	27.526	108.985	23.767	105.226
4	79.401	29.58	108.981	25.727	105.128
5	81.78	27.213	108.993	16.527	98.307
6	80.002	29.032	109.034	19.485	99.487
7	82.599	26.367	108.966	24.388	106.987
8	80.597	28.443	109.04	24.565	105.162
Expansion Connector Header P7					
1	81.765	27.225	108.99	22.921	104.686
2	80.322	28.68	109.002	22.989	103.311
3	81.626	27.336	108.962	29.43	111.056
4	81.665	27.324	108.989	29.443	111.108
5	81.143	27.786	108.929	30.061	111.204

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6	78.433	30.53	108.963	30.477	108.91
7	82.292	26.745	109.037	34.87	117.162
8	82.2	26.852	109.052	34.939	117.139
Expansion Connector Header P11					
1	75.128	33.849	108.977	37.624	112.752
2	78.545	30.459	109.004	37.599	116.144
3	80.267	28.701	108.968	41.457	121.724
4	80.165	28.797	108.962	41.438	121.603
5	75.756	33.189	108.945	43.715	119.471
6	77.357	31.584	108.941	40.421	117.778
7	75.695	33.288	108.983	43.957	119.652
8	75.839	33.195	109.034	44.076	119.915
Expansion Connector Header P8					
1	79.634	29.372	109.006	25.181	104.815
2	78.978	29.973	108.951	25.011	103.989
3	85.712	23.27	108.982	14.023	99.735
4	84.254	24.717	108.971	14.108	98.362
5	86.326	22.642	108.968	25.112	111.438
6	85.78	23.16	108.94	25.041	110.821
7	87.717	21.375	109.092	24.565	112.282
8	87.744	21.222	108.966	24.388	112.132
Expansion Connector Header P10					
1	90.169	18.827	108.996	19.88	110.049
2	86.942	22.068	109.01	19.874	106.816
3	90.66	18.318	108.978	22.67	113.33
4	90.842	18.207	109.049	24.899	115.741
5	88.555	20.413	108.968	27.08	115.635
6	86.544	22.503	109.047	27.23	113.774
7	87.011	21.943	108.954	26.719	113.73
8	87.197	21.886	109.083	26.775	113.972

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Expansion Connector Header P9					
1	84.905	24.108	109.013	28.466	113.371
2	84.955	24.096	109.051	28.588	113.543
3	79.576	28.482	108.058	33.8	113.376
4	80.065	28.141	108.206	33.849	113.914
5	81.504	27.461	108.965	34.737	116.241
6	81.537	27.463	109	35.005	116.542
7	79.555	29.457	109.012	40.812	120.367
8	79.528	29.551	109.079	46.095	125.623

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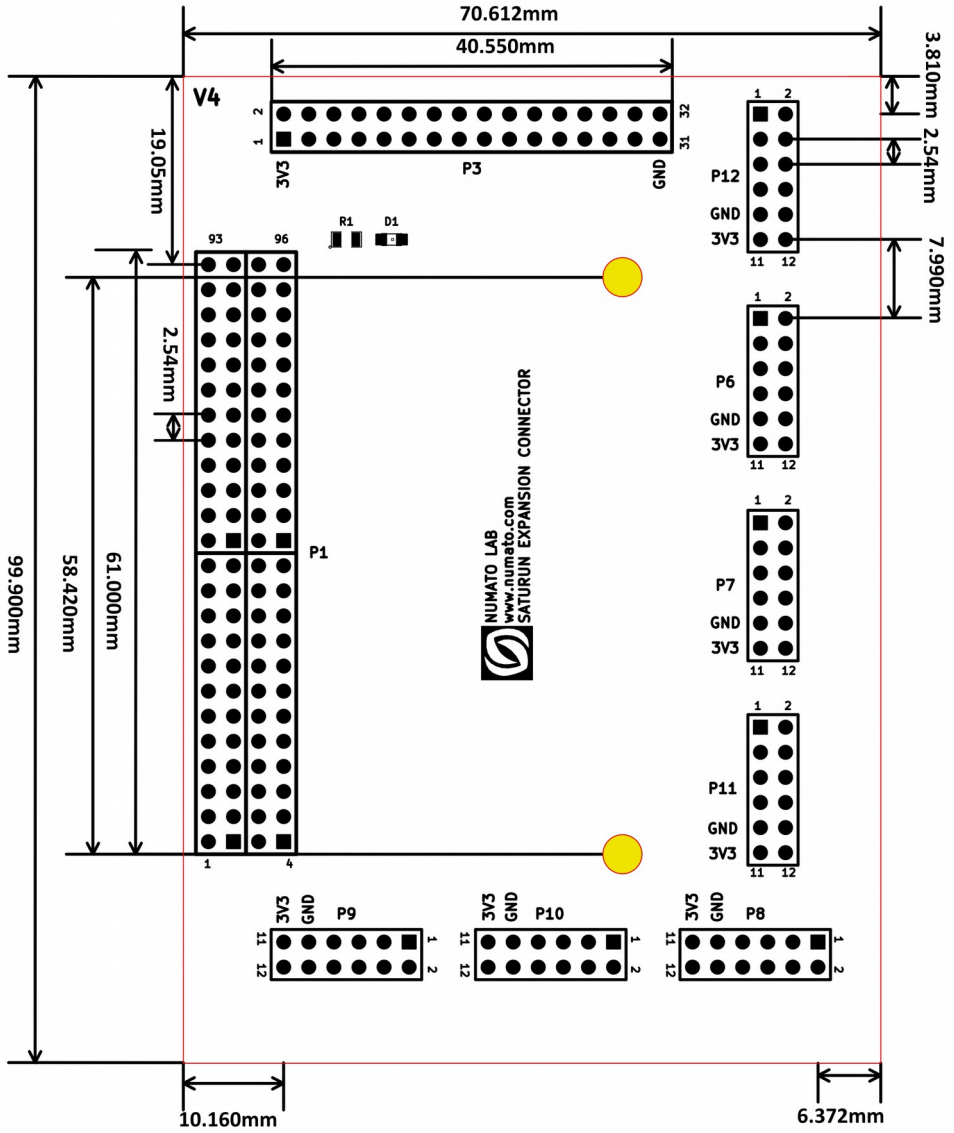
Physical Dimensions



L x W x H : 99.900 mm x 70.612 mm x 19 mm
Mechanical Hole Diameter : 3.0 mm

Schematics

See next page.

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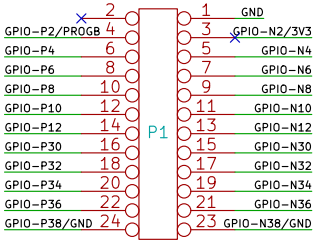
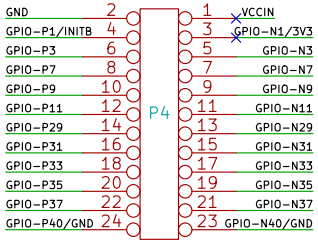
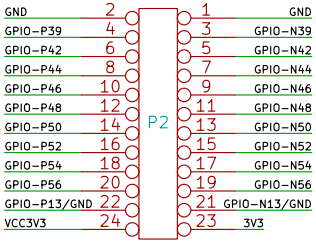
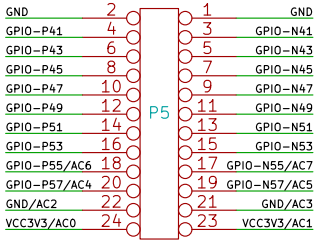
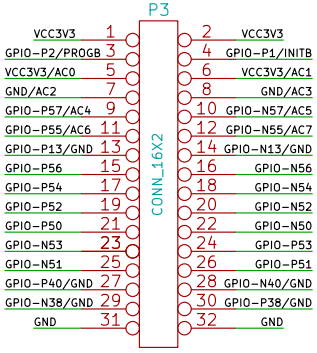
EXPANSION CONNECTORS

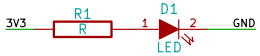


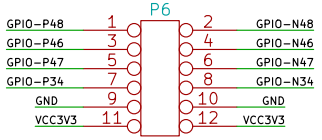


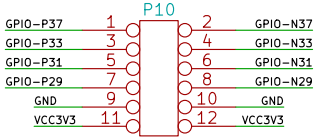


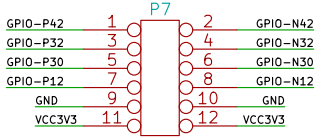


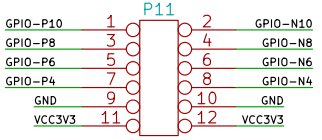


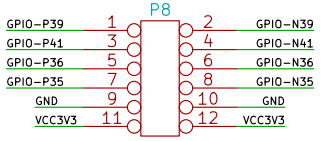


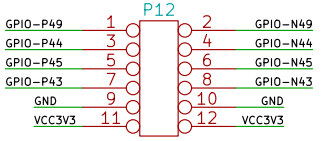


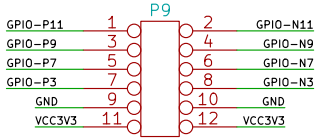












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