IT900

PIM-9A Reference Design

IT900-RD-002-R1.3

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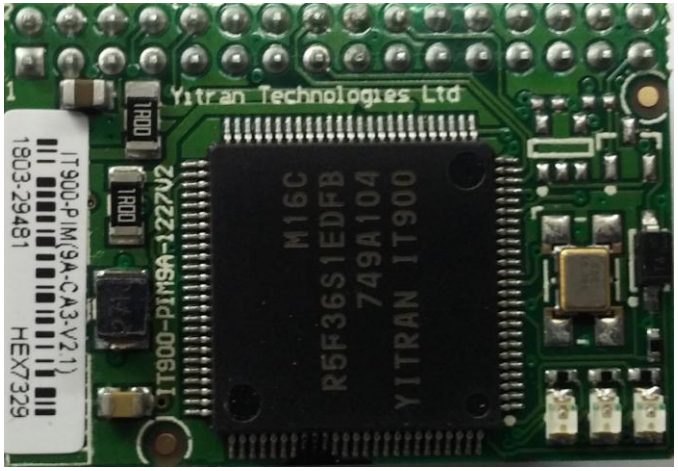
1. Abstract

This document details the schematic drawing and bill of materials (BOM) for the Yitran's IT900 PIM-9A (Plug In Module 9A series). There are 7 variations of PIM-9A modules for 4 different frequency bands defined by the following regulations:

1. US (FCC: 120-400 kHz)
2. Japan (ARIB, MPT: 120-400 kHz)
3. Europe Outdoor:
    a. CA: (CENELEC Band A: 20-80 kHz)
    b. CA2: (CENELEC Band A: 72-92 kHz)
    c. CA3: (CENELEC Band A: 65-95 kHz)
    d. CA4: (CENELEC Band A: 45-95 kHz)
4. Europe Indoor (CENELEC Band B: 95-125 kHz)



To facilitate the evaluation and development process, this PIM can be operated with Yitran's Starter Kit platform.

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2. PIM-9A Schematic Drawings

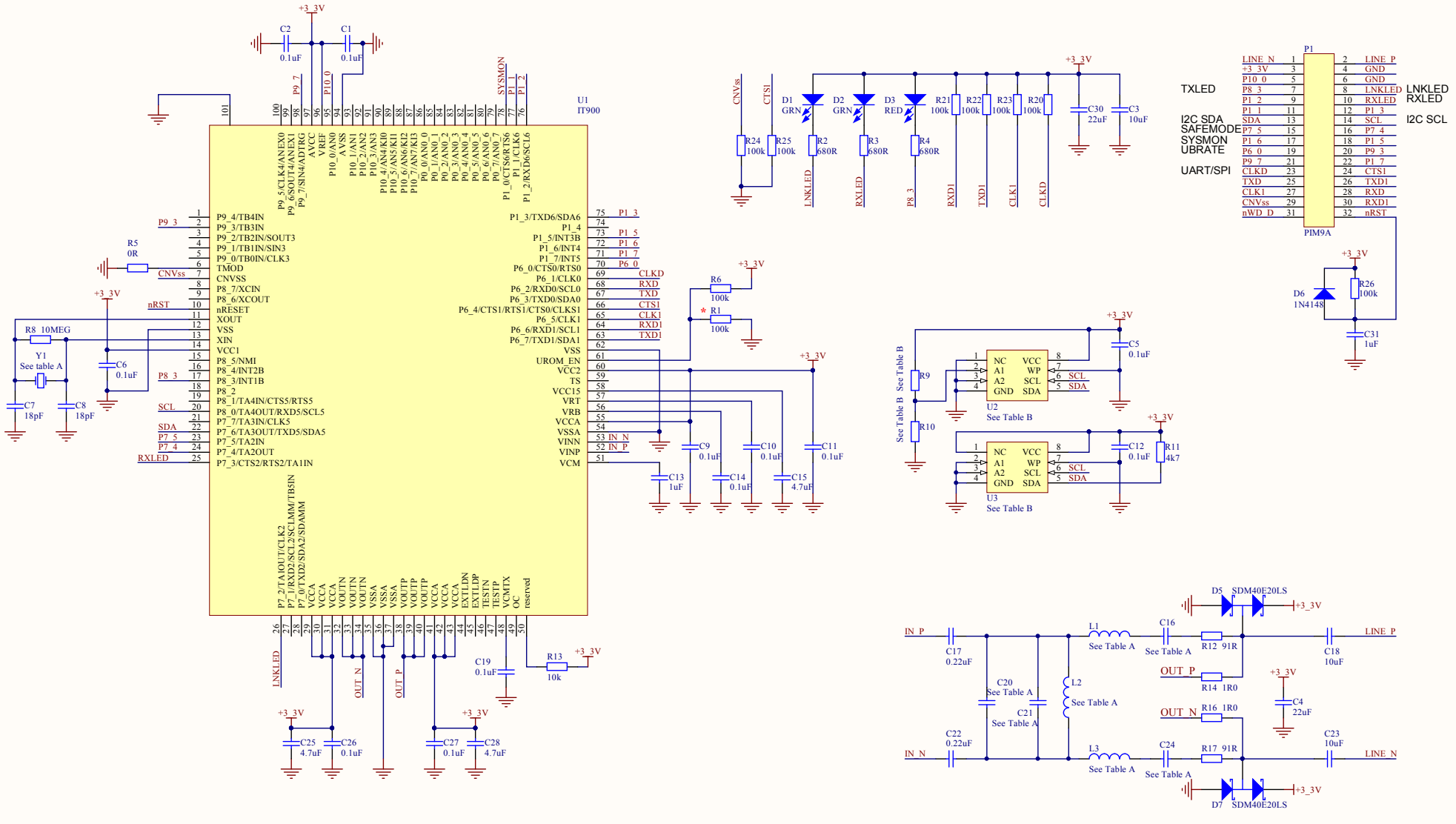

Table A

Input Filter and Clock Options						
Des.	FCC/SAE/ARIB	CA	CA2	CA3	CA4	CB
C16/C24	18nF	100nF	15nF	15nF	33nF	10nF
L1/L3	33uH	150uH	270uH	270uH	180uH	220uH
L2	150uH	1200uH	100uH	120uH	330uH	82uH
C20	3.9nF	16nF	39nF	33nF	10nF	27nF
C21	N.A.	N.A.	N.A.	1.5nF	10nF	N.A.
Y1	15.36 MHz	15.36 MHz	11.52 MHz	15.36 MHz	15.36 MHz	15.36 MHz

Table B

EEPROM Assembly Options	
Capacity	Assembled components
512Kbit	U2 M24512, R10 4.7k
1024Kbit	U2&U3 M24512, R10 4.7k Default
1024Kbit	U3 M24M01
1536Kbit	U2 M24512, U3 M24M01, R9 4.7k
2048Kbit	U2&U3 M24M01, R9 4.7k

* All starred components are not assembled

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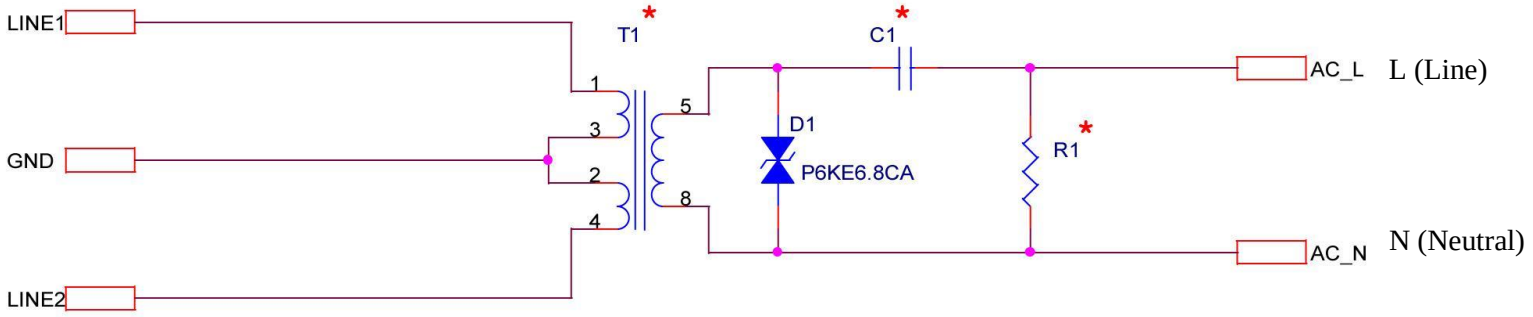
Title IT900-PIM9A-1227		Number 1227
Creation Date: 04-Jun-13	Size A3	Ver_Rev: 2_1
Last Modified: 04-Jun-13	CONFIDENTIAL	Sheet 1 Of 1

3. IT900 Power Line Coupler Schematic Drawings

The IT900 Line Coupler "connects" the PLC modem to the power line. The coupler provides the required insulation between high and low voltage sections and converts a balanced output of the modem to an unbalanced power line. The Line Coupler is not a part of the PIM module and should be designed as a separate unit or part of the power supply according to the schematic below.



* The Line Coupler's design supports two optional input voltage levels, either 90V-265V or 90V-440V. Please refer to the Document 001_IT900 Line Coupler with HITACHI Transformer (IT900-AN-001-R1.0) for the appropriate list of components required for each voltage level.

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4. Power Supply Requirements

Output Voltage, VDC	Max. Consumed Power, mAmp		Output Ripple, mVp-p
	RX mode	Tx Mode	
3.3 (±5%)	70	450	50

5. Application Recommendation

It is recommended to use two bypass capacitors (100 uF Tantalum and 0.1 uF ceramic) connected to the power rail (+3.3V and GND). These capacitors must be located close to the power pin of the PIM.

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6. BOM for PIM-9A

I	Qty One Ass.	Part Reference	Part Description	Part Number	Manufacture
1	11	C1, C2, C6, C9, C10, C11, C12, C14, C19, C26, C27	Cap.X7R, 0.1uF,0402,10%,10V, LF	L05B104K05NNNC	SAMSUNG
2	3	C3, C18, C23	Cap.X5R, 10uF,0805,10%,6.3V, LF	GRM21BR60J106KE19L	MURATA
3	2	C4, C30	Cap.X5R, 22uF,0805,10%,6.3V, LF	JMK212BJ226KG-T	Taiyo Yuden
4	2	C7, C8	Cap.COG, 18pF,0402,5%,50V, LF	CL05C180JB5NNNC	SAMSUNG
5	2	C13, C31	Cap.X7R 1uF,0603,10%,16V,LF	GRM188R71C105KE15D	MURATA
6	3	C15, C25, C28	Cap.X7R, 4.7uF,0603,10%,10V, LF	C1608X5R1A475K	TDK
7	2	C17, C22	Cap.X7R, 0.22uF,0603,10%,16V, LF	CL10B224K08NNNC	SAMSUNG
8	2	D1,D2	LED Green 0805 SMD, LF	17-21SYGC-S530-E3-TR8	EVERLIGHT
9	1	D3	LED Red 0805 SMD, LF	17-21SURC-S530-A3-TR8	EVERLIGHT
10	2	D5,D7	DIODE SCHOTTKY 20V 300MW SOT23-3	SDM40E20LS-7-F	Diodes
11	1	D6	Diode High Conductance,IF200mA,VRRM 200V,SOD323	1N4148W-7-W	Diodes
12	1	P1	Pin header 2.00mm straight type 16x2 pins, LF	PH2S15-216GB39/28-U	Amtek
13	3	R2, R3, R4	Res.680, 5%, 0.06W, 0402 (0.04W, 85°C), LF	RC0402JR-07680RL	YAGEO
14	1	R5	Res.0R,5%,0.062W,0402, LF	RC0402JR-070RL	YAGEO
15	8	R6, R20, R21, R22, R23, R24, R25, R26	Res.100K,5%,1/10W,0402 LF	RC0402JR-07100KL	YAGEO
16	1	R8	Res.10M, 5%, 0.1W, 0402, LF	RC0402JR-710ML	YAGEO
17	1	R11	Res.4K7, 5%, 0.06W, 0402 (0.04W, 85°C), LF	RC0402JR-074K7L	YAGEO
18	2	R12, R17	Res.91, 1%, 0.06W, 0402 (0.04W, 85°C), LF	RC0402FR-0791RL	YAGEO
19	1	R13	Res.10K,1%,0.06W,0402, LF	RC0402FR-0710KL	YAGEO
20	2	R14, R16	Res.1R,1%,0.25W,1206, LF	RC1206FR-071RL	YAGEO
	1	U1	IT900 Chip Renesas MCU TSQFP50P1600X1600X120_HS-100N	IT900YAINC	YITRAN
22	1	U3	EEPROM 1-Mbit I2C Prom 256kB SO8	M24M01-RMN6TP	STM
23	1	PCB	IT900-PIM9A-1227V2.1	1227V2.1	

Not install: C5,C29,R1,R9,R10,R18,R19,Q6,U2,U4

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FC

1	2	C16,C24	Cap. X7R, 18nF,0603 5%,50V	CL10B183JB8NNNC	SAMSUNG
2	1	C20	Cap.X7R 3.9nF,0603,50V,5%	0603B392J500NT	FENGHUA
3	2	L1,L3	Ind 33uH,1210,5%,Q-30,SRF-17MHz,Rdc-5.6, LF	NLV32T-330J-PF	TDK
4	1	L2	Ind.150uH,1812,5%,Q-45,SRF-5MHz,Rdc-9,LF	NL453232T-151J-PF	TDK
5	1	Y1	Crystal 15.36MHz,C load =20pF, 120PPM overall (-40 +85)C LF	SMD3225-15.360-20-30/30/E-LF	SHOULDER

Not install: C21

CA

1	2	C16,C24	Cap. X7R, 100nF,0603 5%,25V LF	CL10B104JB8NNNC	SAMSUNG
2	1	C20	Cap.X7R 15nF,0603,5%,50V,LF	CL10B153JB8NNNC	SAMSUNG
3	1	C21	Cap. X7R, 1nF,0603,5%,50V, LF	CL10B102JB8NNNC	SAMSUNG
4	2	L1,L3	Ind 150uH,1210,5%,Q-20(0.796MHz),SRF-8MHz,Rdc-15 LF	NLV32T-151J-PF/	TDK
5	1	L2	Ind 1.2mH,2220,5%,Q-30,SRF-1.5MHz,Rdc-17 LF	GS565050-122J	GANG SONG
6	1	Y1	Crystal 15.36MHz,C load =20pF, 120PPM overall (-40 +85)C LF	SMD3225-15.360-20-30/30/E-LF	SHOULDER

CA2

1	2	C16,C24	Cap.X7R 15nF,0603,5%,50V LF	CL10B153JB8NNNC	SAMSUNG
2	1	C20	Cap.X7R 39nF,0603,5%,50V LF	0603B393J500NT	FENGHUA
3	2	L1,L3	Ind 270uH,1210,5%,Q-20(0.796MHz),SRF-5MHz,Rdc-34 LF	NLV32T-271J-PF	TDK
4	1	L2	Ind 100uH,1812LS,5%,Q-40,SRF-8.5MHz,Rdc-8.0	NL453232T-101J-PF	TDK
5	1	Y1	Crystal 11.52MHz,C load =20pF, 120PPM overall (-40 +85)C LF	SMD0603-11.520-20-30/30/E-LF	SHOULDER

Not install: C21

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CA3

1	2	C16,C24	Cap.X7R 15nF,0603,5%,50V LF	CL10B153JB8NNNC	SAMSUNG
2	1	C20	Cap.X7R 33nF,0603,5%,50V LF	0603B333J500NT	HITANO
3	1	C21	Cap.X7R 1.5nF,0603,5%,50V,LF	CL10B152JB8NNNC	SAMSUNG
4	2	L1,L3	Ind 270uH,1210,5%,Q-20(0.796MHz),SRF-5MHz,Rdc-34 LF	NLV32T-271J-PF	TDK
5	1	L2	Ind 120uH,1812,5%,Q-40,SRF-6MHz,Rdc-8.0,LF	NL453232T-121J-PF	TDK
6	1	Y1	Crystal 15.36MHz,C load =20pF, 120PPM overall (-40 +85)C LF	SMD3225-15.360-20-30/30/E-LF	SHOULDER

CA4

1	2	C16,C24	Cap.X7R 33nF,0603,5%,50V LF	0603B333J500NT	HITANO
2	2	C20,C21	Cap. X7R,10nF, 0603 5%,50V LF	CL10B103JB8NNNC	SAMSUNG
3	2	L1,L3	Ind 180uH,1210,5%,Q-20(0.796MHz),SRF-7MHz,Rdc-17	NLV32T-181J-PF	TDK
4	1	L2	Ind 330uH,1210,5%,Q-20(0.796MHz),SRF-5MHz,Rdc-34	NLV32T-331J-PF	TDK
5	1	Y1	Crystal 15.36MHz,C load =20pF, 120PPM overall (-40 +85)C LF	SMD3225-15.360-20-30/30/E-LF	SHOULDER

CB

1	2	C16,C24	Cap. X7R,10nF, 0603 5%,50V LF	CL10B103JB8NNNC	SAMSUNG
2	1	C20	Cap. X7R, 27nF,0603,5%,50V LF	0603B273J500NT	HITANO
3	2	L1,L3	Ind 220uH,1210,5%,Q-20(0.796MHz),SRF-7MHz,Rdc-21 LF	NLV32T-221J-PF	TDK
4	1	L2	Ind 82uH,1812WI,5%,Q-50,SRF-8MHz,Rdc-7.0/NL453232T-820J-	NL453232T-820J-PF	TDK
5	1	Y1	Crystal 15.36MHz,C load =20pF, 120PPM overall (-40 +85)C LF	SMD3225-15.360-20-30/30/E-LF	SHOULDER

Not install: C21

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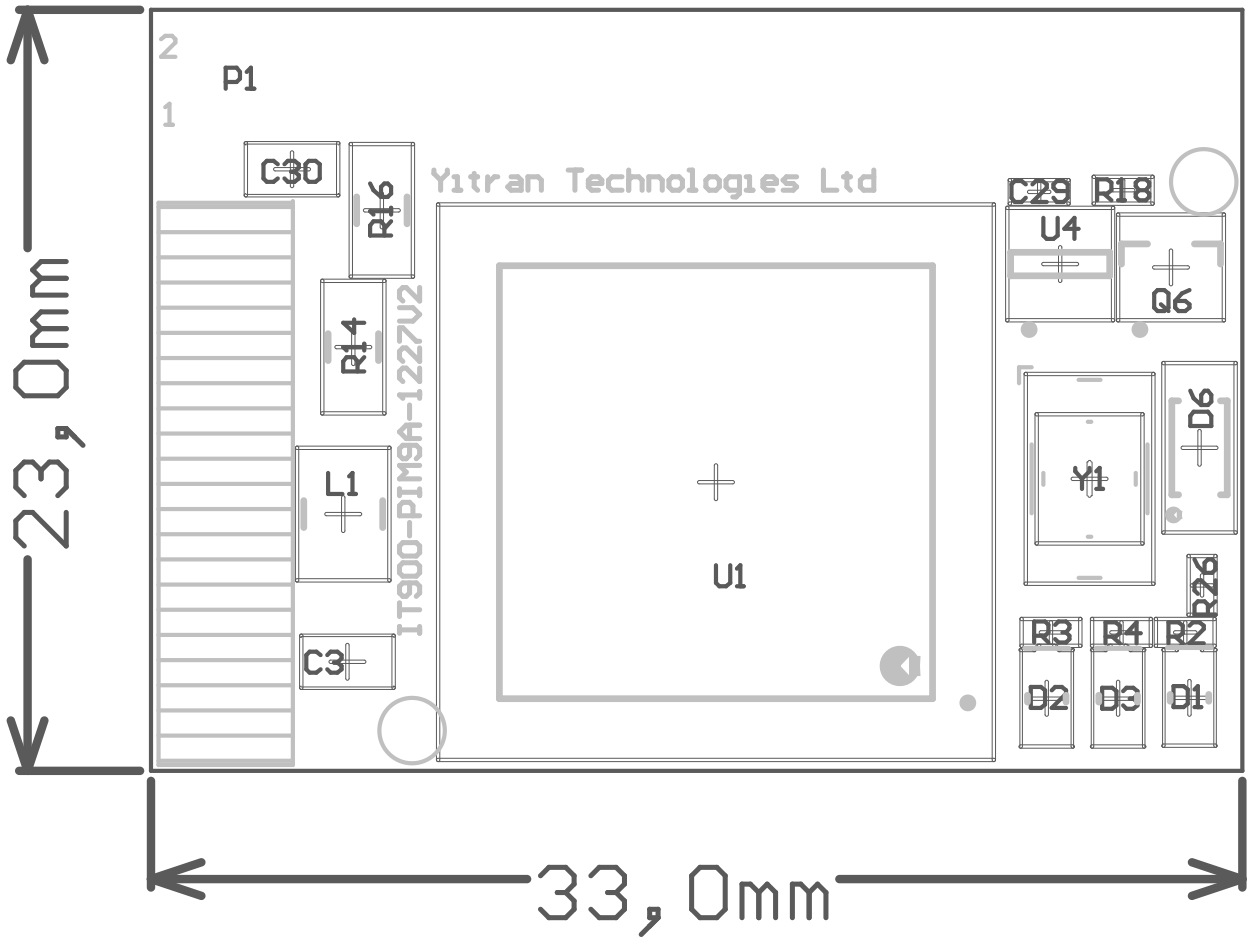
7. PIM-9A PCB Drawing



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8. PIM-9A Connector Dimensions

The IT900 PIM 9A connector consists of a single header with 2 rows of 16 pins (see Section 7).
The picture below details the dimensions of the Female Connector for the IT900 PIM 9A.

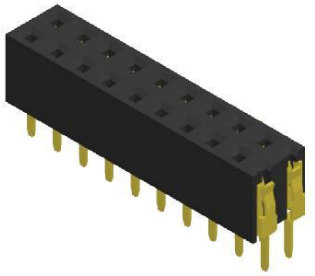
Female Header 2.0mm 2 Row H=4.0/4.3/4.6mm Straight Type

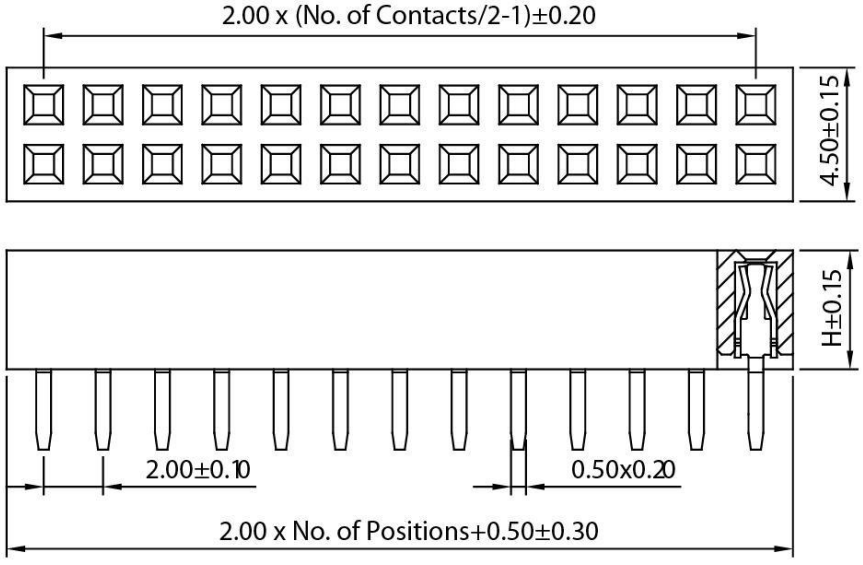
SPECIFICATION

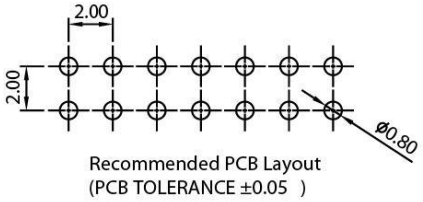
Current Rate:1.5 AMP
Insulation Resistance:1000MΩ Min.
Contact Resistance:20mΩ Max.
Dielectric Voltage:500V AC for one minute
Operation Temperature:-40°C to +105°C

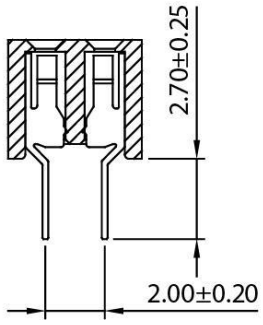
MATERIAL

Insulator:Polyester,UL 94V-0
Standard:PBT or Nylon 6T
Contact Pin:Copper Alloy
Contact Plating:Gold Flash all over









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