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System Application	POTS/ISDN Filter for ADSL	
Product Type	POTS/ISDN Splitter	
Product Name	CPF120IGG	RoHS Product
Date	Sep. 07 th , 2006	
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Revision History

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1. Introduction:

The CPF120IGG is a splitter module that has been specifically designed to implement the functionality of low pass filter in ISDN-BA with 2B1Q or 4B3T baseband linecodes over ADSL application. The CPF120IGG integrates low pass filters that block the high frequency energy from reaching the ISDN-BA device and provide isolation from impedance effects of the ISDN-BA device on ADSL. Because the ISDN splitter connects directly to the subscriber loop media, it must also provide some protection for externally induced line hits or faults which could damage any attached equipment or endanger humans interacting with the installed equipment. The circuit protection will be provided mostly by standard central office line protection means and additional protection measures built into splitter to protect against line overstress which could damage the splitter itself. The electrical and transmission specification is based on both [ETSI TS 101 952-1-3 V1.1.1](#) and [ETSI TR 101 728 V1.2.1](#) for ISDN-BA requirements and POTS requirements, respectively.

2. References:

- Ref. 1: **ETS 300 019**
Environmental conditions and environmental tests for Telecommunications equipment
- Ref. 2: **ETSI TS 101 388 V1.2.1**
Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Asymmetric Digital Subscriber Line (ADSL)–European specific requirements [ITU-T G.992.1 modified]
- Ref. 3: **ETSI TS 101 952-1-3 V1.1.1**
Specification of ADSL / ISDN splitters
- Ref. 4: **ETSI TS 102 080 V1.3.2**
Transmission and Multiplexing (TM); Integrated Services Digital Network (ISDN) basic rate access; Digital transmission system on metallic local lines
- Ref. 5: **ETSI TR 101 728 V1.2.1**
Study for the specification of low pass filter section of POTS / ADSL splitters
- Ref. 6: **ITU-T Recommendation G.961**
Digital transmission system on metallic local lines for ISDN basic rate access
- Ref. 7: **ITU-T Recommendation K.21**
Resistibility of telecommunication equipment installed in a telecommunication centre to overvoltages and overcurrents

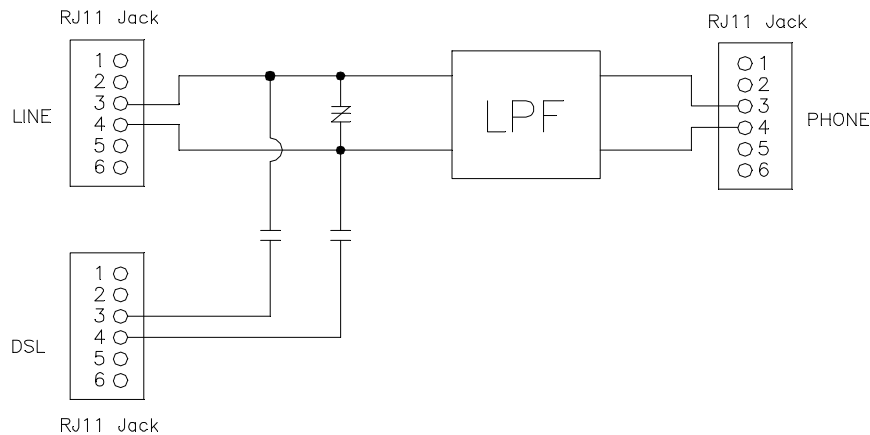
3. Abbreviations:

ADSL	Asymmetric Digital Subscriber Line
ISDN-BA	Integrated Services Digital Network–Basic Access
2B1Q	Baseband linecode for ISDN-BA (4-PAM)
4B3T	(or MMS43) Alternative ISDN-BA baseband linecode with higher frequency spectrum than 2B1Q
CO	Central Office
CPE	Customer Premise Equipment
LT	Line Termination
NT	Network Termination
LCL	Longitudinal Conversion Loss
LPF	Low Pass Filter
POTS	Plain Old Telephone Service

4. Technical requirements:

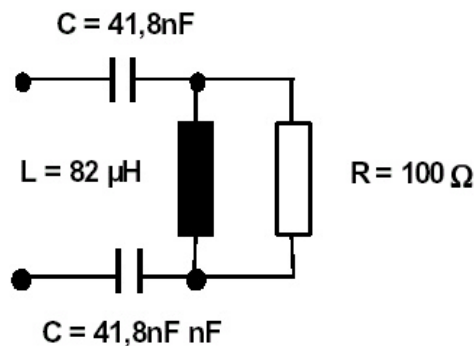
4.1. Schematic:

A block diagram of this product is graphically illustrated as below.



4.2. Z_{ADSL-I} definition:

In many of the tests with ISDN-BA frequencies, the ADSL port of the splitter is terminated with an impedance called Z_{ADSL-I} . This impedance model as shown in figure 1, represents the input impedance of the ADSL transceiver as seen from the ADSL port of the splitter, and does not include the blocking capacitors. The model is intended for splitter specification in the context of the present document. The purpose of this model impedance is for splitter specification, it is not a requirement on the input impedance of the ADSL transceiver.



Note: $Z_{ADSSL-I}$ does not include the blocking capacitors $C_B = 27$ nF

Figure 1. Schematic diagram of the impedance $Z_{ADSSL-I}$ for verifying requirements of the low pass filter

4.3. Electrical specification:

4.3.1. ISDN requirements:

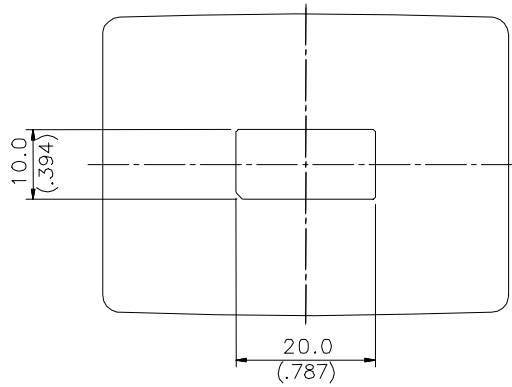
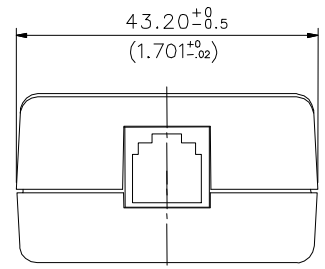
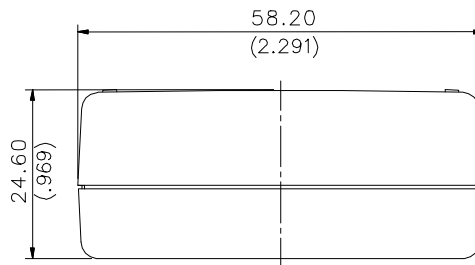
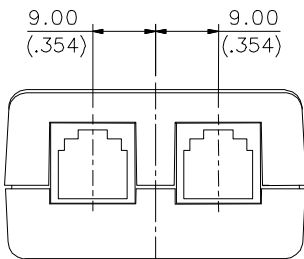
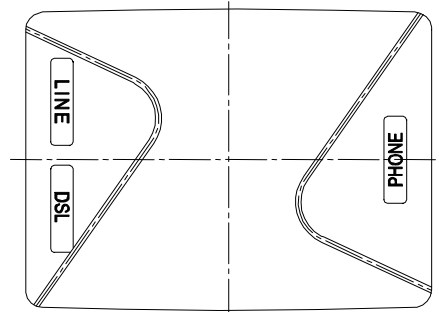
Splitter parameters		Electrical requirements	
		Range	Values
ISDN band (3 dB bandwidth)			DC to 94 kHz
Nominal impedance			
Line impedance Z_{LT}			135 ohms / 150 ohms
CO impedance Z_{Tc}			135 ohms / 150 ohms
RT impedance Z_{Tr}			135 ohms / 150 ohms
Modem impedance			100 ohms
DC requirements			
DC feeding current			< 60 mA
DC series resistance			< 12.5 ohms
Isolation resistance between A-wire and B-wire		120 V	> 5 M ohms
DC resistance to earth		120 V	> 20 M ohms
ISDN related requirements			
Insertion loss	2B1Q (135 ohms)	1 kHz to 40 kHz	< 0.8 dB
		40 kHz to 80 kHz	< 2.0 dB
	4B3T (150 ohms)	1 kHz to 60 kHz	< 1.2 dB
		60 kHz to 80 kHz	< 2.0 dB
Return loss	2B1Q (135 ohms)	1 kHz to 40 kHz	> 16 dB
		40 kHz to 80 kHz	> 14 dB
	4B3T (150 ohms)	1 kHz to 60 kHz	> 16 dB
		60 kHz to 80 kHz	> 14 dB
Unbalance about earth		300 Hz to 30 kHz	> 40 dB
		30 kHz to 1104 kHz	> 46 dB
		1104 kHz to 5 MHz	> 40 dB
Delay distortion		100 Hz to 80 kHz	< 20 usec.
Isolation requirements		150 kHz to 1104 kHz	> 65 dB
Noise		138 kHz to 1104 kHz	< -125 dBm / Hz
ADSL related requirements			
ADSL insertion loss		120 kHz to 170 kHz	< 3 dB
		170 kHz to 1104 kHz	< 1 dB

4.3.2. POTS requirements:

Splitter parameters	Electrical requirements	
	Range	Values
Nominal voice band		300 Hz to 3.4 kHz
Nominal impedance		
Line Impedance Z_L	200 Hz to 4 kHz	270 ohms+(750 ohms//150 nF)
CO impedance Z_{Tc}	200 Hz to 4 kHz	270 ohms+(750 ohms//150 nF)
RT impedance Z_{Tr}	200 Hz to 4 kHz	270 ohms+(750 ohms//150 nF)
Modem impedance	160 kHz to 1104 kHz	100 ohms
POTS operating voltage		
Nominal signal		21 mVp-p to 5.4 Vp-p
Pulse metering		10 Vp-p to 30.2 Vp-p
Ringing signal		< 100 Vrms
Ringing frequency		25 / 50 Hz
DC voltage		< 78 V
Max. AC voltage		100 Vrms with 78 VDC offset
Max. differential		220 V
DC requirements		
DC resistance to earth	100 V	> 20 Mohms
DC resistance between A-wire and B-wire	100 V	> 5 Mohms
DC series resistance		< 50 ohms
DC feeding current		< 80 mA
POTS related requirements		
Insertion loss	@ 1 kHz	< 1 dB
Insertion loss distortion	200 Hz to 4 kHz	< ± 1 dB
Return loss	300 Hz to 3.4 kHz	> 12 dB
	3.4 kHz to 4 kHz	> 8 dB
Unbalance about earth	50 Hz to 600 Hz	> 40 dB
	600 Hz to 3.4 kHz	> 46 dB
	3.4 kHz to 4 kHz	> 40 dB
Group delay distortion	200 Hz to 600 Hz	< 250 usec.
	600 Hz to 3.2 kHz	< 200 usec.
	3.2 kHz to 4 kHz	< 250 usec.
Pulse metering	12/16 kHz ± 1% in 200 ohms	< 3 dB

7. Mechanical conditions:

7.1. Dimensions:



Notes :

1. Unit : mm
2. Tolerance : $\frac{\pm 0.25\text{mm}}{(\pm .010\text{inch})}$