

# Cooli

## Cold Box Control Serial Interface

Version 1.01 Draft

12.03.02

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III.Physikalisches Institut B  
RWTH Aachen

## Controller Serial I/O:

Settings: 19200 8 1 N

## Dallas one wire Interface:

Commands:

A; set sensor address  
M; measure temperature with actual sensor, returns measurement  
G; get sensor address  
This is only possible if only one sensor is connected to the Single wire bus.

## Slave Serial I/O:

Serial interface for XANTREX power supply remote control receives and echos character from the serial controller I/O interface and forwards them to the slave serial I/O port until a CR is received.

Settings: 9600 8 1 N

## Analog Input:

Channels: 8  
Resolution: 10 bit  
Range: 0 – 5V  
Impedance: 20K

Command: V; Data: D3 .. D0 channel No. < 0 ...7 >  
Return: D15 <0>; D14 .. D12 <channel No.>; D11 <0>; D10 .. D0 < result >

D15	D14 .. D12	D11 .. D10	D9 ...D0
0	x x x	0 0	x....x
always	Channel No.	always	Result data

## Analog Output:

Channels: 4  
Resolution: 12 bit  
Range: two channels 0 .. 5V  
two channels 0 .. 10V

Command: D;  
Data: D15 ..D14 channel No. %< 00...11>; D13 ..D12 %< 11>; D11 .. D0 < data >;

D15	D14	D13	D12	D11 ... D0
x	x	1	1	
Channel No.		always		Value

## Polarity Switch:

Relay switch 30A, 50V

Command: C;  
Data: <H> enables relay 1 heating  
<C> enables relay 2 cooling  
<O> both relays off

Overheat Protection Input:

To prevent the peltier elements from overheating most of them have a temperature switch. This switch should be connected in series with the power relays, J5 pin 6,7. In case the switch is not used J5 pin 6,7 have to be shorted.

## Watchdog Timer:

When the watchdog times out, it will switch off the peltier elements and the controller interface goes into idle mode. The watchdog is reset by every excess to the serial controller port. The time-out delay is adjusted to ~ 1.5 minutes.

## Connectors:

**J1:** Controller serial I/O front panel 9 pin sub D Female

Pin	Signal Name	
2	TXD	
3	RXD	
5	GND	

**J2:** slave serial I/O rear panel 9 pin sub D Male

Pin	Signal Name	
2	RXD	
3	TXD	
5	GND	

**J4:** Analog I/O rear panel 20 pin flat cable connector

Pin	Signal Name	Description
1	VCC	+5V
2	VCC	+5V
3	GND	0V
4	GND	0V
5	OUTA	Analog Out ch 0 0...5V
6		
7	OUTB	Analog Out ch 1 0...5V
8		
9	OUTC	Analog Out ch 2 0...10V
10		
11	OUTD	Analog Out ch 3 0...10V
12		
13	GND	
14	GND	
15	AIN_2	Analog Input ch 2 0...5V
16	AIN_3	Analog Input ch 3 0...5V
17	AIN_4	Analog Input ch 4 0...5V
18	AIN_5	Analog Input ch 5 0...5V
19	AIN_6	Analog Input ch 6 0...5V
20	AIN_7	Analog Input ch 7 0...5V

**J5:** sensor rear panel 9 pin sub D Male

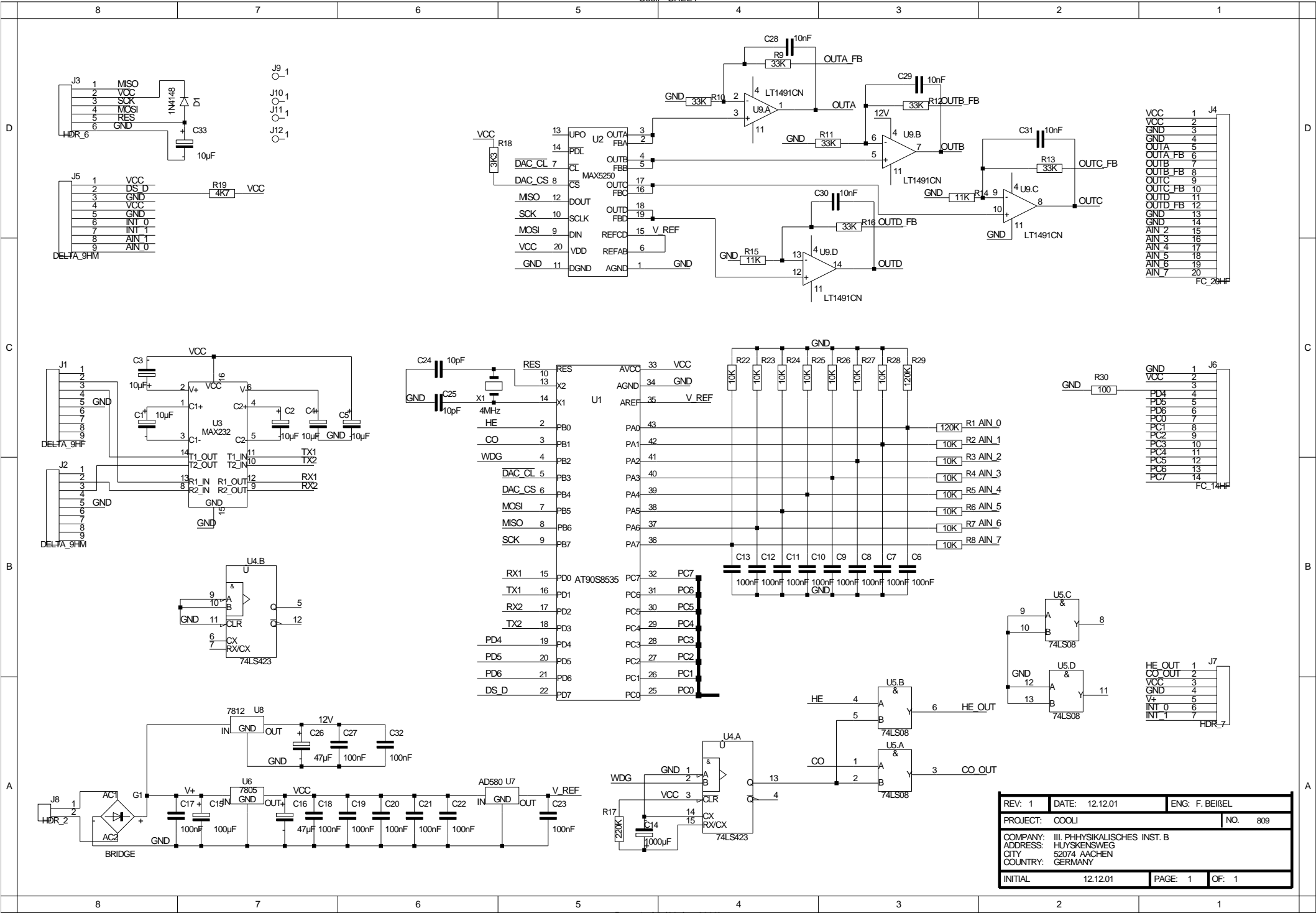
Pin	Name	Description
1	VCC	+5V DS1820 pin 3
2	DS_D	Dallas Single Wire Bus DS1820 pin 2
3	GND	GND DS1820 pin 1
4	VCC	+5V
5	GND	GND
6	INT_0	Temperature switch
7	INT_1	Temperature switch
8	AIN_1	Analog Input Channel 1
9	AIN_0	Analog Input Channel 0 Humidity sensor

**8 Pin Tuchel Male** Power supply Input

Pin		
A/3,4 B/3,4	Power supply +	
A/1,2 B/1,2	Power supply -	

**8 Pin Tuchel Female** Peltier element output

Pin		
A/3,4 B/3,4	Peltier + Cooling	
A/1,2 B/1,2	Peltier - Cooling	



MAX5250 Pinout:

13	UPO	U2	OUTA	3
14	PDL	CL	FBA	2
7	DAC_CL	CL	OUTB	4
8	DAC_CS	CS	FBB	5
12	MISO	DOUT	OUTC	7
10	SCK	SCLK	FBC	16
9	MOSI	DIN	FBD	18
20	VDD	REFCD	OUTD	19
11	GND	REFAB	FBD	15
		AGND	1	GND

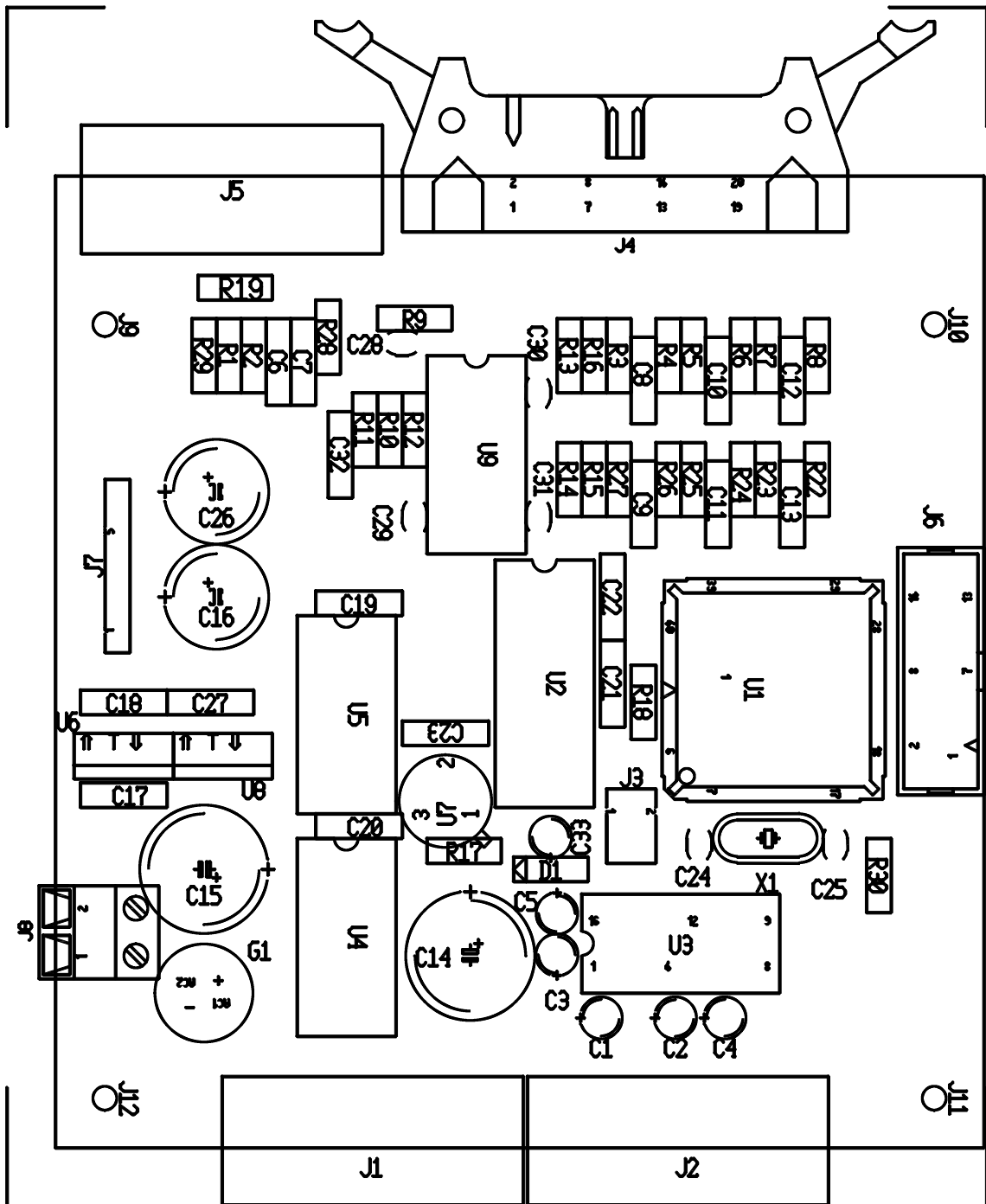
AT90S8535 Pinout:

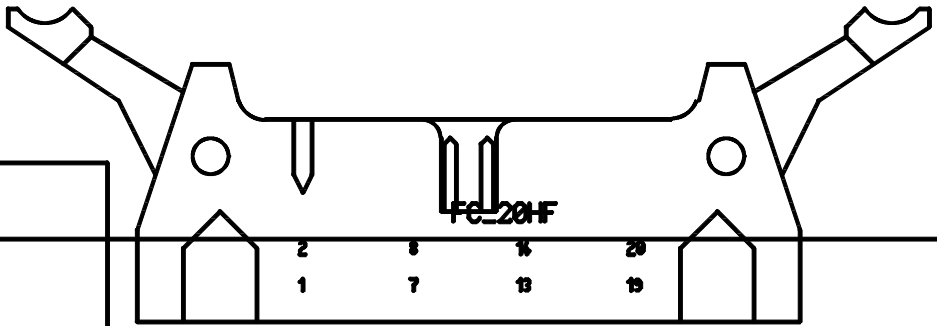
33	VCC	AVCC
34	GND	AGND
35	V_REF	AREF
43	PA0	PC7
42	PA1	PC6
41	PA2	PC5
40	PA3	PC4
39	PA4	PC3
38	PA5	PC2
37	PA6	PC1
36	PA7	PC0
15	PD0	PC7
16	TX1	PC6
17	RX2	PC5
18	TX2	PC4
19	PD4	PC3
20	PD5	PC2
21	PD6	PC1
22	DS_D	PC0

REV: 1	DATE: 12.12.01	ENG: F. BEISEL
PROJECT: COOLJ	NO. 809	
COMPANY: III. PHYSIKALISCHES INST. B		
ADDRESS: HUYSKENSWEG		
CITY: 52074 AACHEN		
COUNTRY: GERMANY		
INITIAL	12.12.01	PAGE: 1 OF: 1



ULTIboard  
PCB Design





DELTA\_9HM

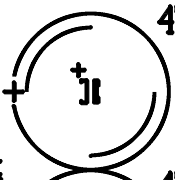
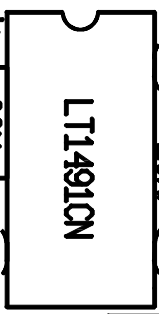
HDR\_1

HDR\_1

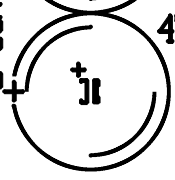
4K7

33K

COOL I



47µF



47µF

HDR\_7

100NF  
33K  
33K  
33K  
100NF

10K  
100T  
10K  
10K  
10K  
100NF  
10K  
10K  
10K  
33K  
33K  
33K  
100NF

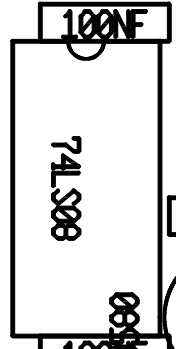
10K  
100NF  
10K  
10K  
10K  
100NF  
10K  
10K  
10K  
11K  
11K  
11K  
100NF

100NF 100NF



7812

100NF



74LS08



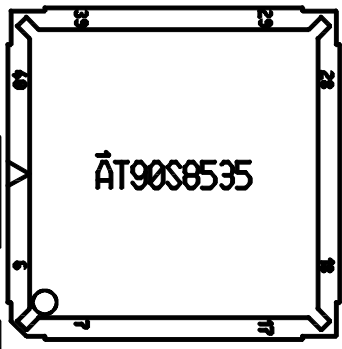
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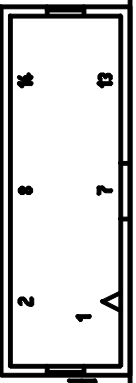
MAX5250

10µF

100NF 100NF  
3K3  
HDR\_5

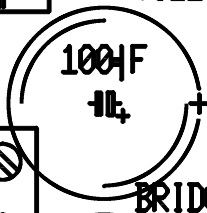


AT90S8535



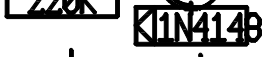
FC14F

7805

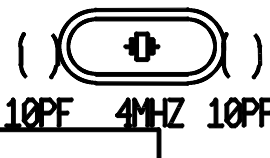


100µF

BRIDGE

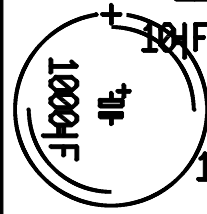


1N4148

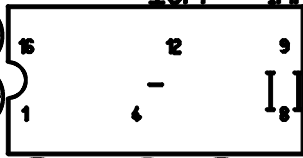


10PF 4MHZ 10PF

100



1000µF



74LS423

10µF

10µF

10µF

10µF

10µF

10µF

I. I. PHYSIK B  
RWTH  
AACHEN

HDR\_2

HDR\_1

HDR\_1

DELTA\_9FF

DELTA\_9HM

BILL OF MATERIALS				
H:\ULTI_PRJ\COOL\COOLI.UTSCH				
date: 14:46:41 10-Jan-2002				
#	UT_DEVICE	UT_VALUE	UT_PKGTYPE	Refdes
1	74LS08	74LS08	DIP14	U5
1	74LS423	74LS423	DIP16	U4
1	7805	7805	78XXV	U6
1	7812	7812	78XXV	U8
1	AD580	AD580	TO39	U7
1	AT90S8535	AT90S8535	SOC_PLCC44	U1
1	LT1491CN	LT1491CN	DIP14	U9
1	MAX232	-	DIP16A	U3
1	MAX5250	MAX5250	DIP20	U2
1	XTAL	4MHz	QUARZ_HC49	X1
1	BRIDGE	BRIDGE	2WXXXM	G1
1	DIODE	1N4148	DIOD1	D1
1	RES10	100	RES10	R30
1	RES10	220K	RES10	R17
1	RES10	3K3	RES10	R18
2	RES10	120K	RES10	R1
				R29
14	RES10	10K	RES10	R25
				R26
				R27
				R2
				R28
				R3
				R4
				R5
				R6
				R7
				R8
				R22
				R23
				R24
6	RES10	33K	RES10	R16
				R9
				R10
				R11
				R12
				R13
2	RES10	11K	RES10	R14
				R15
1	RES10	4K7	RES10	R19
17	CAPACITOR	100nF	CRM5A	C23



					C12
					C13
					C27
					C6
					C17
					C7
					C18
					C8
					C19
					C9
					C20
					C32
					C21
					C10
					C22
					C11
2	CAPACITOR	10pF	KERKO4X3R2_5		C24
					C25
4	CAPACITOR	10nF	KERKO4X3R2_5		C28
					C29
					C30
					C31
1	ELCO	1000µF	ELKO13R5		C14
1	ELCO	100µF	ELKO13R5		C15
2	ELCO	47µF	ELKO10R2_5		C26
					C16
6	ELCO	10µF	ELKO4R1_5		C2
					C3
					C4
					C5
					C33
					C1
1	DELTA_9HF	DELTA_9HF	D9HF		J1
1	FC_14HF	FC_14HF	FKV14SN		J6
1	FC_20HF	FC_20HF	FKV20HR		J4
1	HDR_2	HDR_2	SMK2R5MM_A		J8
1	HDR_6	HDR_6	HDR2X3		J3
1	HDR_7	HDR_7	HDR1X7		J7
2	DELTA_9HM	DELTA_9HM	D9HM		J2
processed Variant : DEFAULT					