



## TECHNICAL DOCUMENTATION

COMMERCIAL CODE: HPS50

PRODUCT NAME:  
Personal Scope with USB connection

DATE: 20/05/09

REVISION: 02

**MANUFACTURED BY**

Velleman NV  
Legen Heirweg 33  
9890 Gavere  
Belgium

PREPARED BY	APPROVED BY
Stephan Santens	/
Date:20/05/09	Date:

## PRODUCT DESCRIPTION:

### **HPS50 Personal oscilloscope With USB connectivity**

Designed By electronics enthusiasts For electronics enthusiasts! Powerful, compact and USB connectivity, this sums up the features of this oscilloscope. The large keyboard and bright LCD makes this unit a breeze to use, combine this with great specifications and you wonder how you ever managed without it!

- 40 MHz sampling rate
- 12 MHz analog bandwidth
- 0.1 mV sensitivity
- 5mV to 20V/div in 12 steps
- 50ns to 1 hour/div time base in 34 steps
- ultra fast full auto set up option
- adjustable trigger level
- X and Y position signal shift
- DVM readout
- audio, power calculation (rms and peak)
- dBm, dBV, DC, rms ... measurements
- signal markers for voltage and time
- frequency readout (through markers)
- recorder function (roll mode)
- signal storage (2 memories)
- high-resolution LCD 192x112 pixels
- LCD backlight
- galvanically separated USB output for PC
- data or bitmap download to PC
- different screen modes
  - normal screen view
  - wide screen with DVM
  - normal screen with large DVM
  - wide screen with large DVM
- USB PC Connection real-time and screen capture
- included:
  - worldwide charging adaptor
  - insulated measurement probe x1 / x10: [PROBE60S](#)
  - USB cable

**PRODUCT PICTURE:**



## APPLICABLE NORMATIONS

### EMC

APP	STANDARDS	DESCRIPTION
x	EN55022	Radiated disturbance field, CISPR22 limits
	EN55014	Conducted disturbance at mains port, CISPR14 limits
	EN61000-4-2	Electrostatic discharge level (IEC801/2)
	EN61000-4-3	Radiated immunity level (IEC801/3)
	EN61000-4-4	Electrostatic fast transient / burst requirements (IEC801/4)
	EN61000-4-5	Surge immunity requirements (IEC801/5)
	ETS300683	EMC standard for short range device 9Khz -25GHz

### LOW VOLTAGE / SAFETY

APP	STANDARDS	DESCRIPTION
	IEC60669-2-1	Electronic switches and associated extension units for household and similar fixed electrical installations.
	IEC60065	Audio, Video and similar apparatus, safety requirements
x	IEC1010-1	Safety requirements for measurement, control and laboratory use

### SPECTRUM

APP	STANDARDS	DESCRIPTION
	ETS300-220	Electromagnetic compatibility and Radio spectrum matters

### REMARKS / OTHER STANDARDS:

See adaptor and battery addendum



## Declaration of Conformity

We, Manufacturer

**Velleman Components  
Legen Heirweg 33  
9890 Gavere  
Belgium**

declare that the product

**HPS50 Personal Scope**

if used according the instructions included with the unit meet the directives  
in accordance with 89/336/EEC-EMC Directive  
and

EN 55022 Limits and methods of measurement of radio interference  
characteristics of information technology equipment (CISPR22  
limits)

IEC 1010-1 Safety requirements for equipment for measurement, control  
and laboratory use (\*)

(\*) if equipment used with safety measurement probes

FCC Part 15 Part B Unintentional radiators

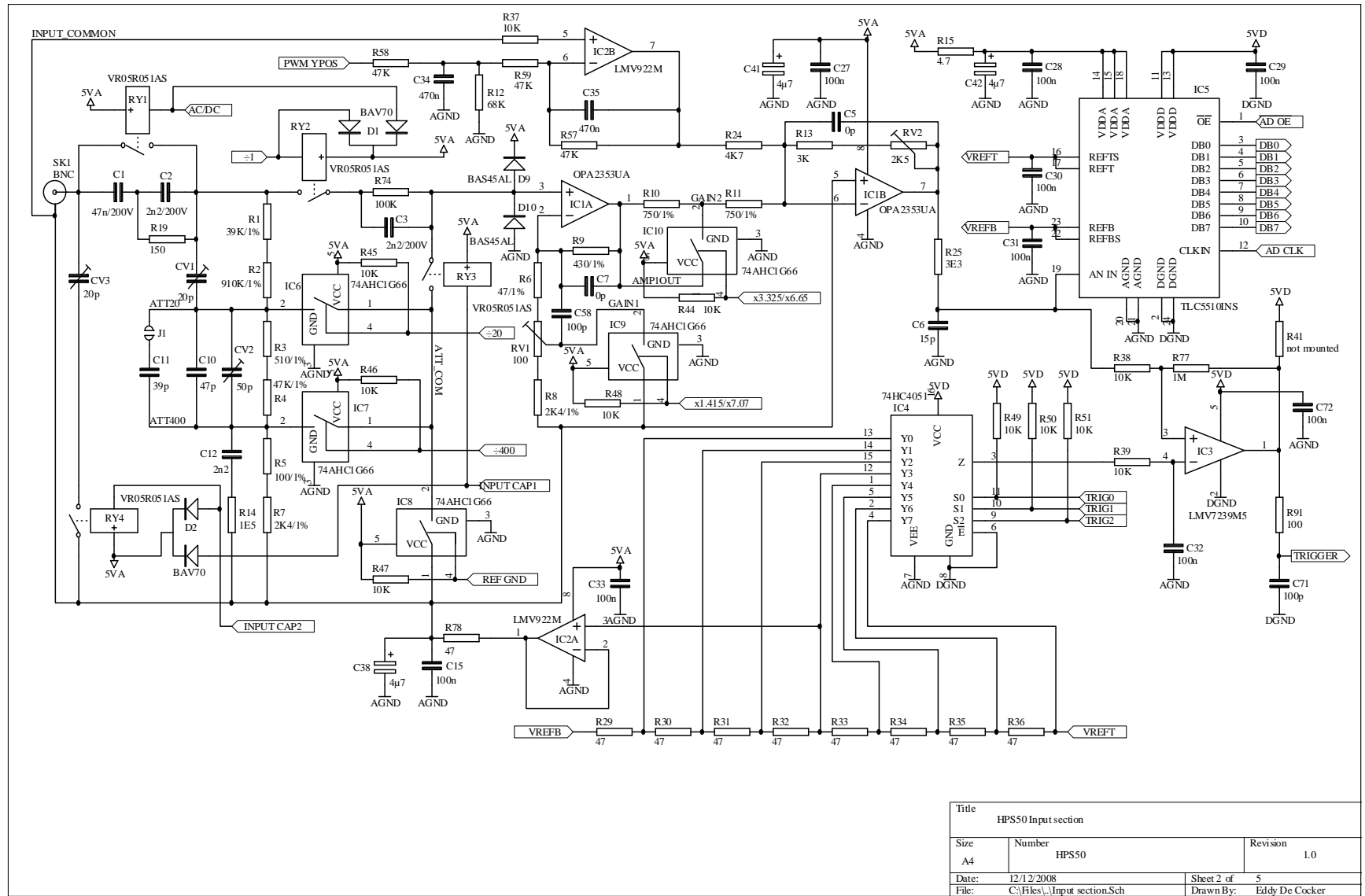
**For the manufacturer**

Date: 22/04/2009

Signature: \_\_\_\_\_

Name: Stephan Santens  
Technical Director

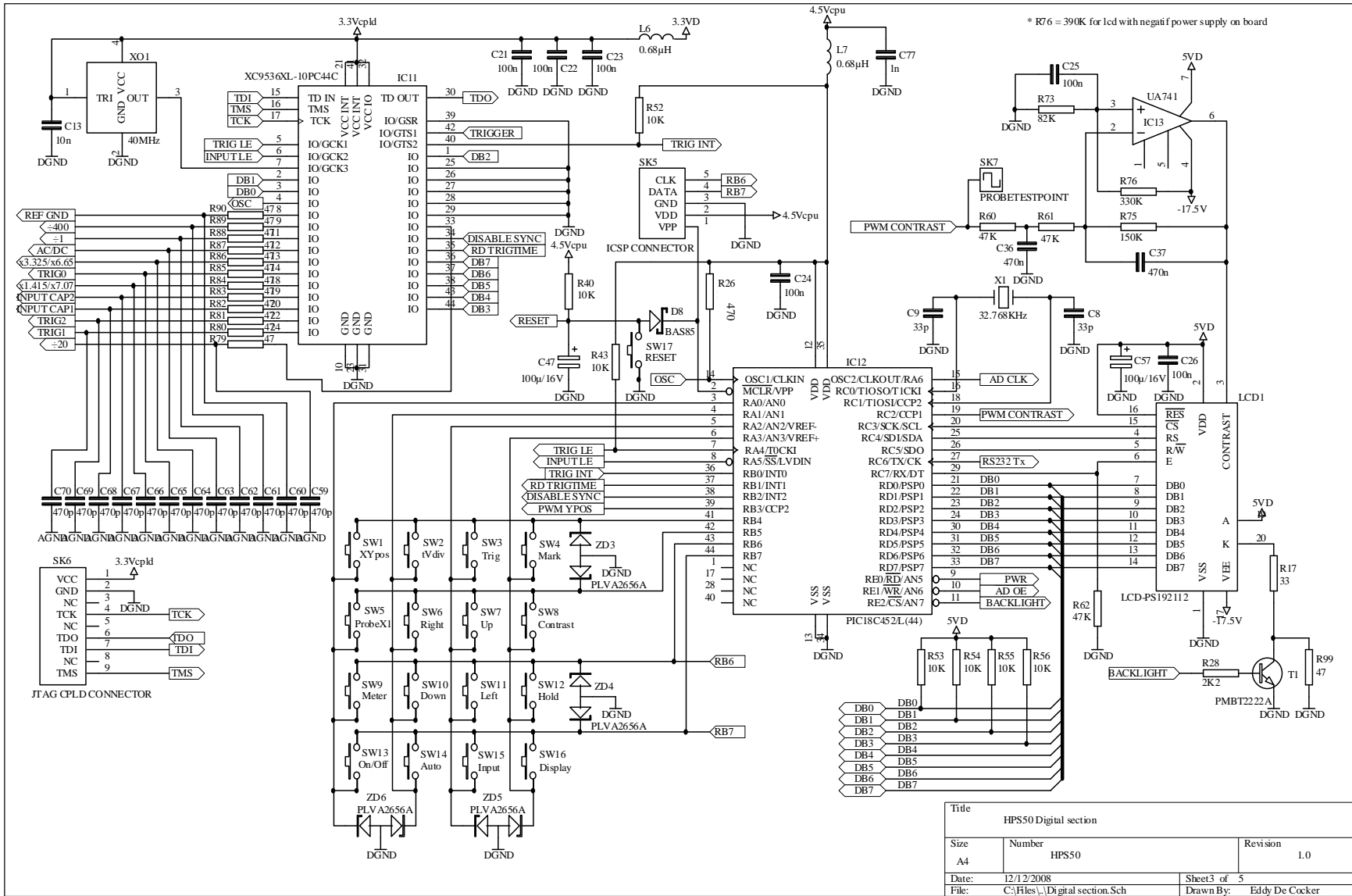
**DIAGRAMS**  
**PARTSLIST**  
**AND**  
**MEASUREMENT RESULTS**



INPUT SECTION

Title			
HPS50 Input section			
Size	Number	Revision	
A4	HPS50	1.0	
Date:	12/12/2008	Sheet 2 of	5
File:	C:\Files\...\Input section.Sch	Drawn By:	Eddy De Cocker

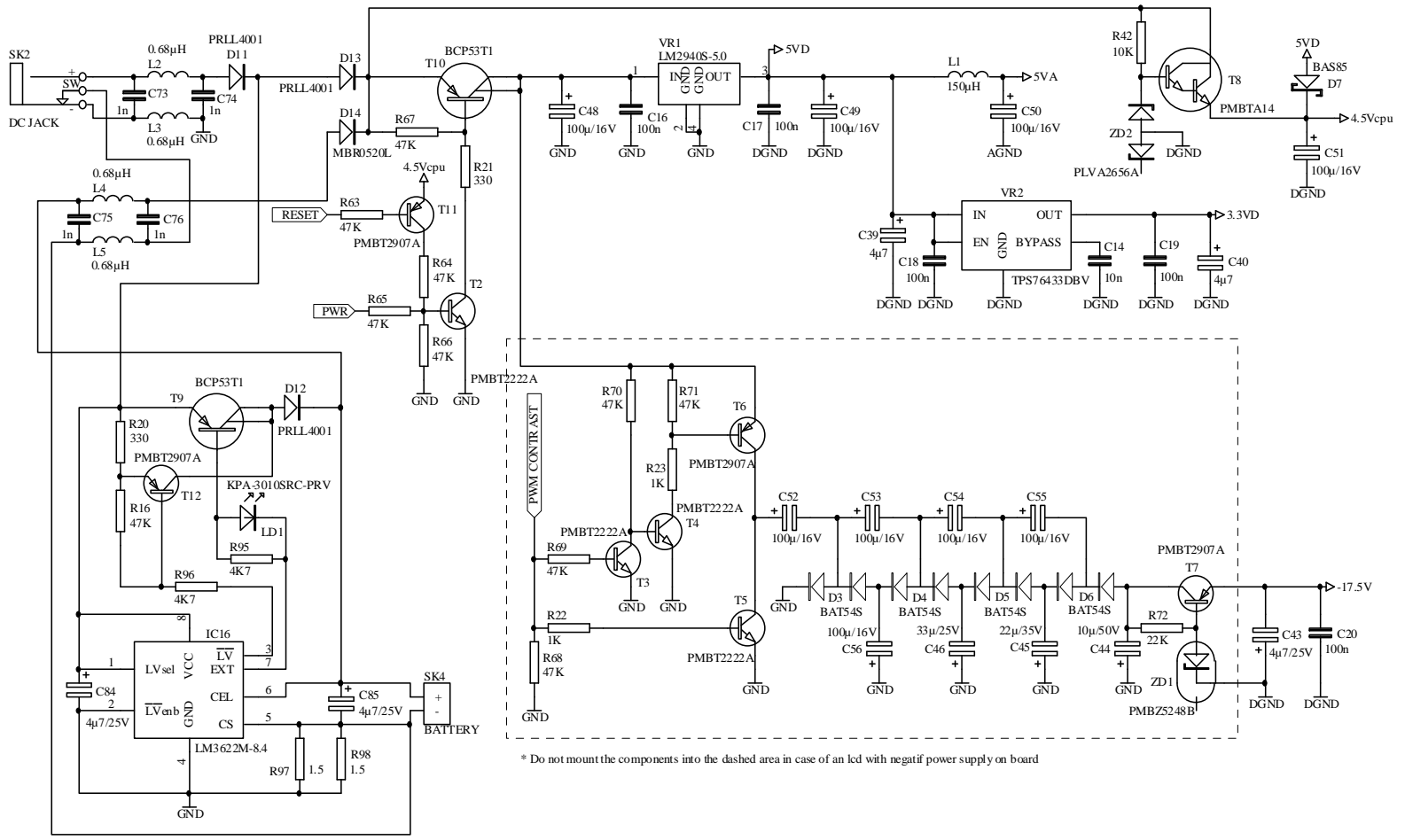




\* R76 = 390K for lcd with negativ power supply on board

DIGITAL SECTION

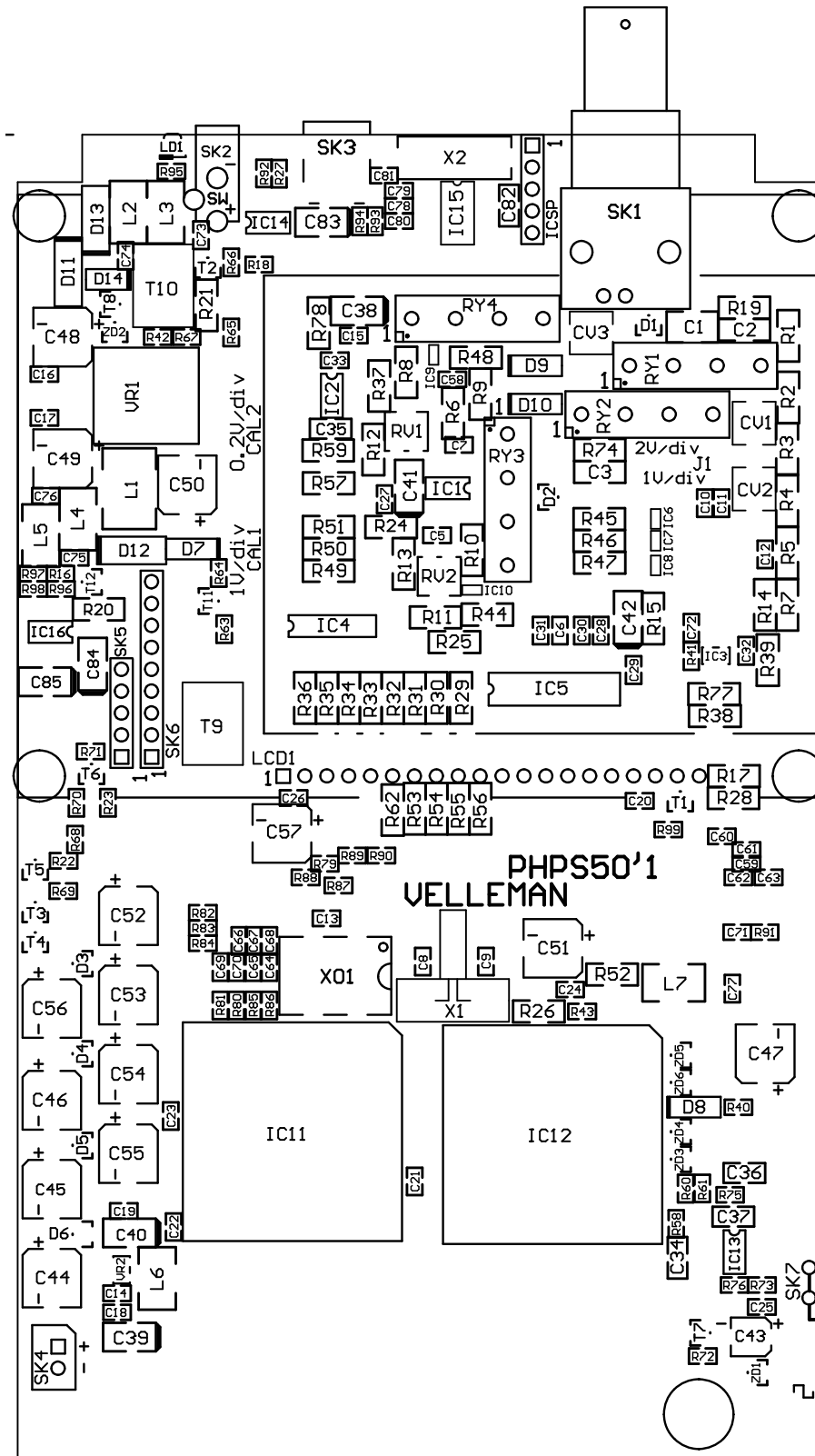
Title			HPS50 Digital section			
Size	A4	Number	HPS50		Revision	1.0
Date:	12/12/2008		Sheet 3 of 5		Eddy De Cocker	
File:	C:\Files\...\Digital section.Sch		Drawn By:		Eddy De Cocker	



POWER SUPPLY SECTION

Title			
HPSS0 Power supply section			
Size	Number	Revision	
A4	HPSS0	1.0	
Date:	12/12/2008	Sheet 4 of	5
File:	C:\Files\...\Power supply section.Sch	Drawn By:	Eddy De Cocker

# ASSEMBLY



## PARTS LIST

<b>CAP_HPS50</b>	<b>Capacitors for HPS50</b>	
47N/200V	smd capacitor 200V	C1
2N2/200V	smd capacitor 200V	C2, C3
15P	smd capacitor	C6
33P	smd capacitor	C8, C9
47P	smd capacitor	C10
39P	smd capacitor	C11
2N2	smd capacitor	C12
10N	smd capacitor	C13, C14, C80
100N	smd capacitor	C15...C33, C72, C81
470N	smd capacitor	C34...C37, C82
4 $\mu$ 7/25V	smd tantalum capacitor 25V	C38...C42, C83...C85
4 $\mu$ 7/25V	smd electrolytic capacitor 25V	C43
10 $\mu$ /50V	smd electrolytic capacitor 25V	C44
22 $\mu$ /35V	smd electrolytic capacitor 35V	C45
33 $\mu$ /25V	smd electrolytic capacitor 25V	C46
100 $\mu$ /16V	smd electrolytic capacitor 16V	C47...C57
100P	smd capacitor	C58, C71
470P	smd capacitor	C59...C70
1N	smd capacitor	C73...C77
22P	smd capacitor	C78, C79
20P/TRIM	smd ceramic capacitor trimmer	CV1, CV3
50P/TRIM	smd ceramic capacitor trimmer	CV2
<b>CHOKE_HPS50</b>	<b>Chokes for HPS50</b>	
150 $\mu$ H	smd RF choke	L1
0.68 $\mu$ H	smd RF choke	L2...L7
<b>CON_HPS50</b>	<b>Connectors for HPS50</b>	
BNC057	BNC connector pcb mount right angle	SK1
AJ218B	DC JACK pin 1.3mm (h=7.4 w=5 d=11,4mm)	SK2
MUCAP5*10	Mini USB connector	SK3
BATCON	Battery connector MOLEX 48152-02	SK4
HDR1X5	pin header 5-pole	ICSP
HDR1X20	pin header 20-pole	LCD1
BATLIP553	Battery lip + pole ( idem VM130T)	SK7

<b>DIODE_HPS50</b>	<b>Diodes for HPS50</b>	
BAV70	smd high speed double diode	D1, D2
BAT54S	smd Schottky barrier double diode	D3...D6
BAS85	smd Schottky barrier diode	D7, D8
BAS45AL	smd low-leakage diode	D9, D10
PRLL4001	smd rectifier diode	D11...D13
MBR0520L	smd schottky rectifier diode	D14
KPA-3010SRC-PRV	Kingbright KPA-3010SRC-PRV smd LED red water clear	LD1
<b>DISPLAY_HPS50</b>	<b>Display assembly for HPS50</b>	
BOLTM2,5X3MM	M2,5mm x 3mm pan head bolt	
HDR20FEM	Female header 20 pole connector	
SPACER5MM_M2,5	5MM M2,5 spacer	
PG192112WRS	Graphic LCD 192x112 white backlight no neg. supply on board	LCD1
<b>IC_HPS50</b>	<b>IC's for HPS50</b>	
OPA2353UA	smd dual high-speed, single supply, Rail-to-Rail	IC1
LMV932MA (from 16/5/05)	smd low power dual operational amplifier	IC2
LMV7239M5	smd 45ns, 2.7V to 5V comparator with push-pull output	IC3
74HC4051	smd 8-channel analog multiplexer/demultiplexer	IC4
TLC5510AINSR	smd 8-bit high-speed A/D Converter	IC5
74AHC1G66	smd CMOS bilateral switch	IC6...IC10
44PLCC	LEADLESS CHIP CARRIER 44P NON STAGGERED	IC11, IC12
VKHPS50-IC11	Programmed cpld for HPS50 - ic11	IC11
VKHPS50-IC12	Programmed $\mu$ controller for HPS50 - ic12	IC12
UA741CD	smd general purpose operational amplifier	IC13
MOC213-M	smd optocoupler	IC14
PIC18F14K50-I/SS	$\mu$ controller wit usb interface	IC15
LM3622M-8.4	Lithium-Ion battery charger	IC16
<b>PCB_HPS50</b>	<b>Printed circuit board for HPS50</b>	
_PHPS50'1	Gold plated two layer PCB for handheld scope HPS50	
<b>QUARTZ_HPS50</b>	<b>Crystal, oscillator for HPS50</b>	
32.768KHZ	smd watch crystal	X1
XO-40MHZ	smd crystal clock oscillator	XO1
12MHZ	smd crystal	X2

<b>REG_HPS50</b>	<b>Voltage regulators for HPS50</b>	
LM2940S-5.0	smd 5V/1A low dropout voltage regulator	VR1
_TPS76433DBV	smd low-power 3.3V/150mA low-dropout positive voltage regulator	VR2
<b>RELAY_HPS50</b>	<b>Relays for HPS50</b>	
VR05R051AS	Reed relais 5VDC / 0.5A / 50mW SIL 1 FORM A	RY1...RY4
<b>RES_HPS50</b>	<b>Resistors for HPS50</b>	
39K/1% (1206)	smd resistor 1%	R1
910K/1% (1206)	smd resistor 1%	R2
510/1% (1206)	smd resistor 1%	R3
47K/1% (1206)	smd resistor 1%	R4
100/1% (1206)	smd resistor 1%	R5
47/1% (1206)	smd resistor 1%	R6
2K4/1% (1206)	smd resistor 1%	R7, R8
430/1% (1206)	smd resistor 1%	R9
750/1% (1206)	smd resistor 1%	R10, R11
68K (1206)	smd resistor	R12
3K/1% (1206)	smd resistor 1%	R13
1R5 (1206)	smd resistor	R14
4R7 (1206)	smd resistor	R15
47K (0603)	smd resistor	R16, R58, R60,R61, R63...R71
33 (1206)	smd resistor	R17
150 (0603)	smd resistor	R18
150 (1206)	smd resistor	R19
330 (1206)	smd resistor	R20, R21
1K (0603)	smd resistor	R22, R23
4K7 (1206)	smd resistor	R24
3R3 (1206)	smd resistor	R25
470 (1206)	smd resistor	R26
4K7 (0603)	smd resistor	R27, R93, R95, R96
2K2 (1206)	smd resistor	R28
47 (1206)	smd resistor	R29...R36, R78
10K (1206)	smd resistor	R37...R39, R44...R56
10K (0603)	smd resistor	R40, R42, R43
47K (1206)	smd resistor	R57, R59, R62
22K (0603)	smd resistor	R72
82K (0603)	smd resistor	R73
100K (1206)	smd resistor	R74

150K (0603)	smd resistor	R75
330K (0603)	smd resistor	R76
1M (1206)	smd resistor	R77
47 (0603)	smd resistor	R79...R90, R99
100 (0603)	smd resistor	R91
39K (0603)	smd resistor	R92
10 (0603)	smd resistor	R94
1R5 (0603)	smd resistor	R97, R98
100/TRIM	smd resistor trimmer	RV1
2K5/TRIM	smd resistor trimmer	RV2
<b>TRANS_HPS50</b>	<b>Transistors for HPS50</b>	
PMBT2222A	smd npn switching transistor	T1...T5
PMBT2907A	smd pnp switching transistor	T6, T7, T11, T12
PMBTA14	smd npn darlington transistor	T8
BCP53T1	smd pnp medium power transistor	T9, T10
<b>ZENER_HPS50</b>	<b>Zener diodes for HPS50</b>	
PMBZ5248B	smd zener diode 18V/250mW	ZD1
PLVA2656A	smd double zener diode 5V6/180mW	ZD2...ZD6

## Radiation test measurement:

### HAMEG Instruments HPS50

Sam: 23/04/2009 12:59:23

Print date: 23/04/2009 13:01:27

Unit: dB( $\mu$ V/m) Distance from DUT: .1m UNCAL

CF: 530,00MHz  
RBW: 120,00kHz  
REF: 30,0dB( $\mu$ V/m)  
Videofilter: Off  
TG: OFF

SPAN: 1000,0MHz  
ATTN.: 0,0dB  
10dB/div

### Notes:

VELLEMAN Instruments

HPS50 Personal Scope

EN55022 Field strenght

Start frequency: 30MHZ

End frequency: 1GHz

Bandtwith: 120kHz

horizontal proble

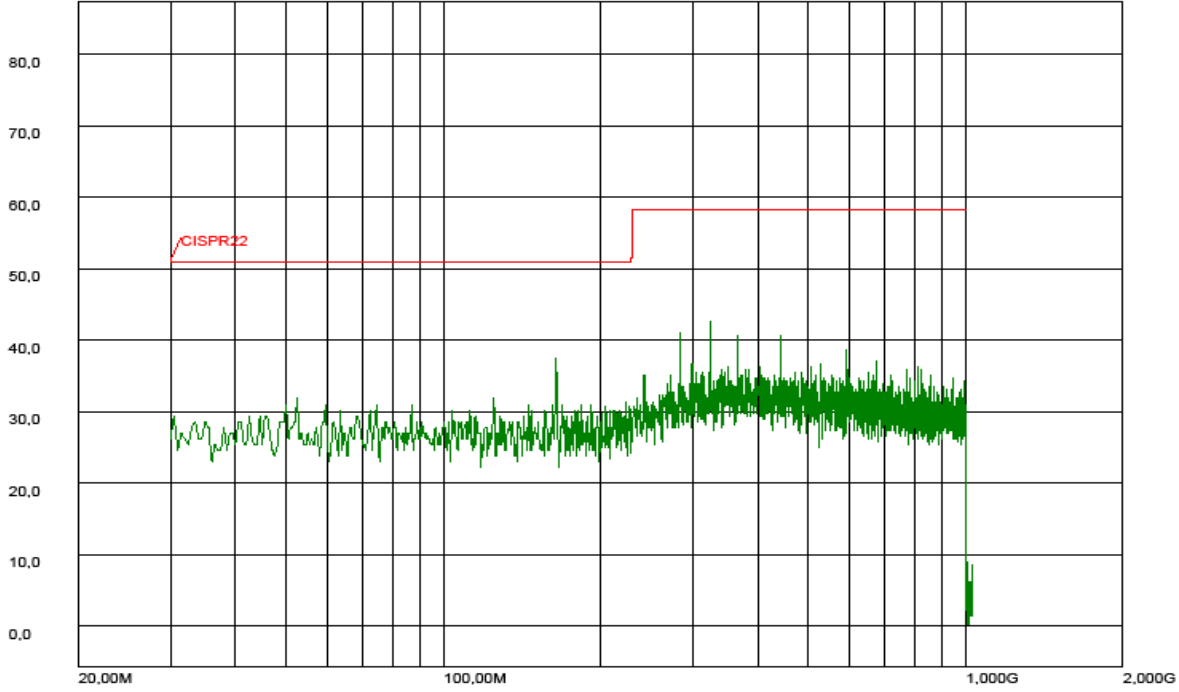
30dB Probe correction attenuation





**WORST POSITION TEST PROBE FRONT**

**HAMEG Instruments HPS50**  
Sam: 23/04/2009 12:59:23 RBW: 120kHz  
Print date: 23/04/2009 13:01:02  
Unit: dB( $\mu$ V/m) Distance from DUT: .1m UNCAL

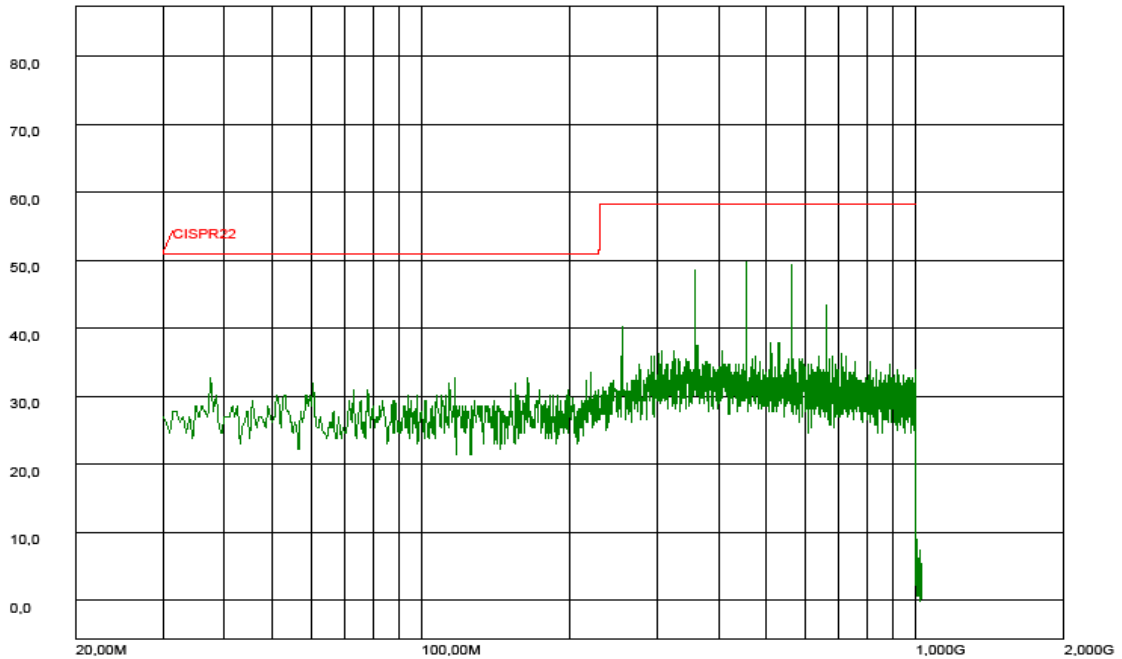




## WORST POSITION TEST PROBE BACK

### HAMEG Instruments PCSGU250 back

Sam: 8/10/2008 11:53:36 RBW: 120kHz  
Print date: 8/10/2008 11:57:30  
Unit: dB( $\mu$ V/m) Distance from DUT: .1m UNCAL



## Addendum:

### Battery information:



To: Whom it may concern

Ref. No. PZ06-0216

March 10, 2006

SANYO GS Soft Energy CO., LTD.

Development Dept.

### Declaration of RoHS Compliance

The contents of RoHS Directive Substance in our products meet the standard complied with RoHS Directive.

RoHS Directive Substance:

Cd, Pb, Hg, Cr(VI), PBB, PBDE

Product: Lithium-ion Cells

Formula: Lithium Cobalt Dioxide/Carbon

General Manager

Name: Haruhiko TAKEMURA

Signature: *Haruhiko Takemura*

Date: *Mar. 10, 2006*

SANYO GS Soft Energy Co., Ltd.

Development Dept.




5 Ichinodan-Cho Shinden, Kisshoin, Minami-Ku.

Kyoto 601-8397 Japan

Tel: +81 75 311 1338



## Mains adaptor:

	
<b>Minwa Electronics Co., Ltd.</b>	
22/F, Far East Finance Centre, 16 Harcourt Rd., Admiralty, Hong Kong Tel.: (852) 25573245 Fax.: (852) 28972085, 28975517 Email: sales@minwa.com.hk	
<b>DECLARATION OF CONFORMITY</b>	
<b>Certificate of Conformity</b> <b>Directive for Electromagnetic Compatibility</b> <b>2004/108/EEC</b> <b>Low Voltage Directive 2006/95/EC</b>	
<b>Certification Number:</b>	<b>MP0148-A</b>
<b>Product :</b>	<b>AC/DC Adaptor</b>
<b>Type Designation :</b>	<b>MWS935-12V/T1CE/H+</b>
<b>Costruction Same As Our Model Type :</b>	<b>Nil</b>
<b>Tested According To EMC Standard :</b>	
EN55014-1:2006 EN55014-2:1997+A1:2001 EN61000-3-2:2006 EN61000-3-3:1995+A1:2001+A2:2005	
This is to declare that the EUT of the above model/product technically complies with the European Union 2004/108/EEC directive requirement.	
<b>Tested According To LVD Standard :</b>	
EN61558-1:1997+A1:1998+A11:2003 EN61558-2-6:1997	
This refers to the above mentioned product. This is to declare that the model is in conformity with Annex I of the Low Voltage Directive 2006/95/EC, and in its latest amended version.	
<b>Date :</b> 27-Apr-2009	<i>For and on behalf of</i> <b>Minwa Electronics Co., Ltd.</b> FOR AND ON BEHALF OF MINWA ELECTRONICS CO., LTD.  Authorized Signature
<b>Name :</b> Mr. Qing Shi	Authorized Signature

Velleman NV  
Legen Heirweg 33  
9890 Gavere  
Belgium

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