







# TECHNICAL DOCUMENTATION

COMMERCIAL CODE: HPG1

PRODUCT NAME:
Handheld Pocket Generator

DATE: 20/10/2011

REVISION: 01

MANUFACTURED BY

Velleman NV
Legen Heirweg 33
9890 Gavere
Belgium

| PREPARED BY | APPROVED BY |
| --- | --- |
| Stephan Santens | / |
| Date:20/10/2011 | Date: |

# PRODUCT DESCRIPTION:

# 1MHz POCKET FUNCTION GENERATOR

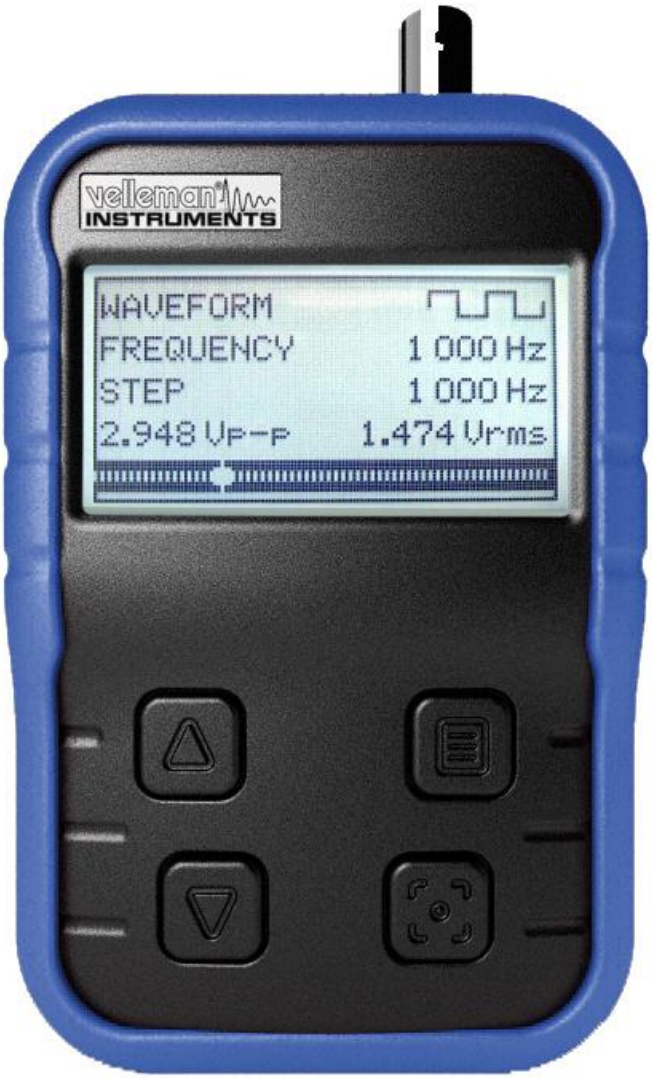
A complete function generator in pocket format!
Now you can take test signals on the move, 3 waveforms can be selected.
Set the output voltage or frequency and select signal waveform using the on the screen menu.
A powerful sweep function is also included.

## Features

- DDS type generator (Direct Digital Synthesis)
- DAC resolution: 10 bits
- frequency range: from 1Hz to 1.000.000Hz (± 0.01%)
- frequency steps: 1Hz, 10Hz, 100Hz, 1kHz and 10kHz
- waveforms: sine, square and triangle
- sweep function with bi-direction option
- output voltage: max. 8Vpp
- real output level measurement: dBm / Vrms or Vpp readout (±3%)
- typical sine wave distortion (THD): < 0.1% @ 0dB / 600 ohms
- square wave rise/fall time: typ. 0.2µs
- output impedance: 50 ohms
- multi-language menu (Eng / Fre / Dut / Ge / Es )
- white LED backlight
- charging power supply: 9Vdc/200mA
- operates on NiMH rechargeable battery pack (included)
- dimensions: 74 x 114 x 29mm / 2.9 x 4.5 x 1.14"

- **in the box**:
    - handheld Pocket Generator
    - getting started manual
    - BNC adapter, BNC male to RCA female
    - BNC male to 2x 4mm banana plug
    - USB power supply adaptor

# PRODUCT PICTURE:






**USB charger**

# 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 ans 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 battery addendum

## Declaration of Conformity

CE

We, Manufacturer

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

declare that the product

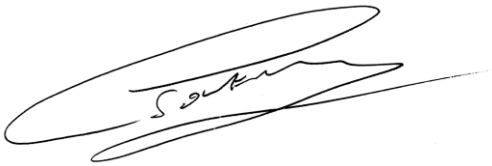
**HPG1 Personal Pocket Generator**

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 |
| FCC Part 15 | Part B Unintentional radiators |

**For the manufacturer**

Date: 19/07/2010



Signature: _____

Name: Stephan Santens
Technical Director

# DIAGRAMS

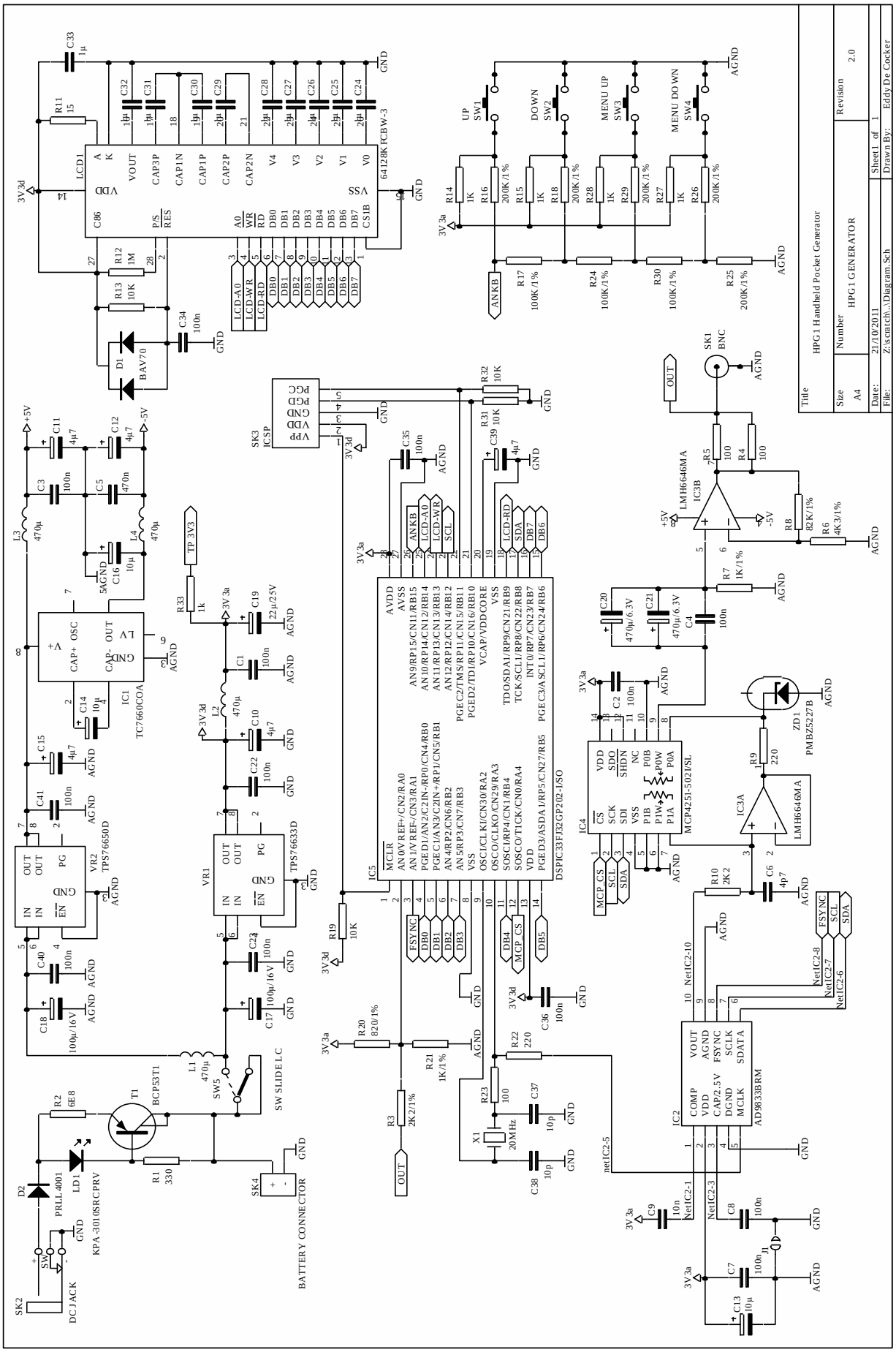
# PCB

# PARTSLIST

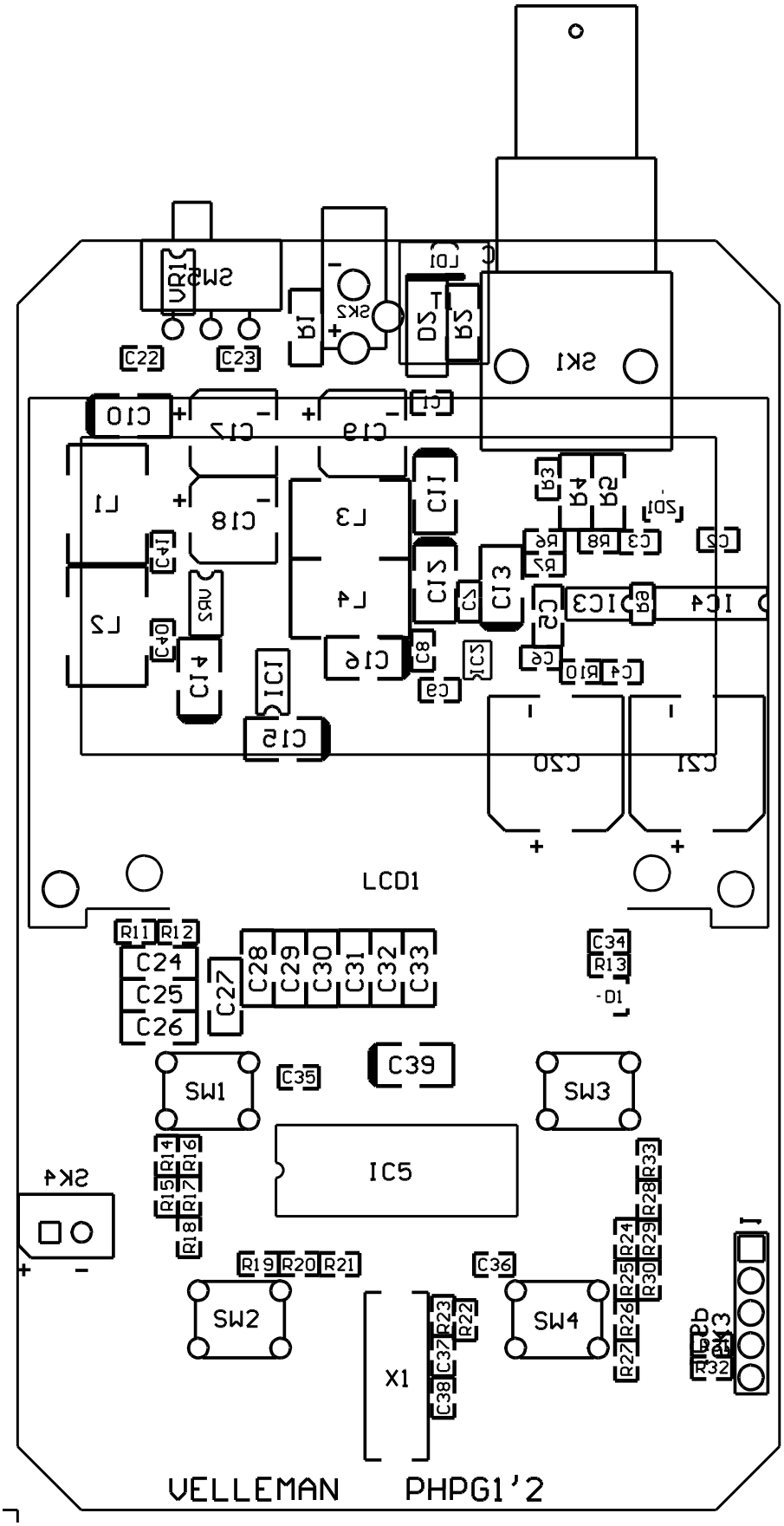
# AND

# MEASUREMENT RESULTS

# GIAGRAM


Title
HPG1 Handheld Pocket Generator
Size
A4
Number
HPG1 GENERATOR
Revision
2.0
Date:
21/10/2011
Sheet1 of 1
File:
Z:\scratch\...\Diagram.Sch
Drawn By:
Eddy De Cocker
LCD1
64128K FCBW-3
IC1
TC7660COA
VR1
TPS76633D
VR2
TPS76650D
IC2
AD9833BRM
IC3A
LMH6646MA
IC3B
LMH6646MA
IC4
MCP4251-5021/SL
IC5
DSPIC33FJ32GP202-I/SO
T1
BCP53T1
D1
BAV70
D2
PRLL4001
LD1
KPA-3010SRCPRV
X1
20MHz
SW5
SW SLIDE LC
SK1
BNC
SK2
DC JACK
SK3
ICSP
SK4
BATTERY CONNECTOR
ZD1
PMBZ5227B
UP
SW1
DOWN
SW2
MENU UP
SW3
MENU DOWN
SW4
TP 3V3
OUT
ANKB
LCD-A0
LCD-WR
LCD-RD
SDA
SCL
DB7
DB6
DB5
DB4
DB3
DB2
DB1
DB0
FSYNC
MCP_CS
NetIC2-1
NetIC2-3
NetIC2-5
NetIC2-6
NetIC2-7
NetIC2-8
NetIC2-10
3V3d
3V3a
+5V
-5V
AGND
GND

# ASSEMBLY



**HPG1**

**Assembly** components

| | |
|---|---|
| BHPS140 | Enclosure for HPG1 (4 parts) |
| HOLHPG1 | Flexible Holster for HPG1 BLUE like sample |
| CKSHPS140 | Metal screen on bottom layer for HPG1 |
| PS/10 | Screw Plas-Tech 30° 2,5x10 |
| STICK HPG1 | Back side info sticker (47x19mm) for HPG1 |
| SERIALNR | Production serial nr (YY-MM-00000) |
| HPS50EMBLEM | Sticker Instruments logo (idem HPS50 / HPS140) |
| BPHPS140 | Rechargeable battery pack 4 x AAA/800mAh NiMH |
| DYWINDOWHPS140 | Display window (59x33x1mm Polycarbonate Clear Lexan) |

**Packing**

| | |
|---|---|
| PS5TO9USB | USB power supply adaptor 5V to 9V/200mA from Minwa |
| DHPG1 | Printed Packing box for HPG1 |
| HHPG1 | User manual for HPG1 |
| CBNC15 | BNC male to RCA female connector |
| CBNC35 | BNC male to 2 x 4mm banana plug |

**Capacitors**

| | | |
|---|---|---|
| 100N | C1...C4, C7, C8, C40, C41 | smd capacitor |
| 470N | C5 | smd capacitor |
| 4P7 | C6 | smd capacitor |
| 10N | C9 | smd capacitor |
| 4µ7/16V | C10...C12, C15 | smd tantalum capacitor 16V |
| 10µ/16V | C13, C14, C16 | smd tantalum capacitor 16V |
| 100µ/16V | C17, C18 | smd electrolytic capacitor 16V |
| 22µ/25V | C19 | smd electrolytic capacitor 25V |
| 470µ/6.3V | C20, C21 | smd electrolytic capacitor 6.3V |
| 100N | C22, C23, C34...C36 | smd capacitor |
| 1µ | C24...C33 | smd capacitor |
| 10P | C37, C38 | smd capacitor |
| 4µ7/16V | C39 | smd tantalum capacitor 16V |

**Choke**

| | | |
|---|---|---|
| 470µH | L1...L4 | smd choke |

**Connectors**

| | | |
|---|---|---|
| BNC057 | SK1 | BNC connector pcb mount right angle |
| AJ218B | SK2 | DC Jack pin 1.3mm (h=7.4 w=5 d=11.4mm) |
| HDR1X5 | SK3 | pin header 5-pole |
| MOLEX48152-02 | SK4 | pcb male battery connector (MOLEX 48152-02) |

**Diodes**

| | | |
|---|---|---|
| BAV70 | D1 | smd high speed double diode |
| PRLL4001 | D2 | smd rectifier diode |
| KPA-3010SRCPRV | LD1 | smd side view red led KPA-3010SRC-PRV (Kingbright) |

**Zenerdiode**

| | | |
|---|---|---|
| PMBZ5227B | ZD1 | smd 3.6V/250mW zener diode |

**Display**

| | | |
|---|---|---|
| 64128KFCBC-3 | LCD1 | Displaytech Graphic LCD 64x128 white background |

**Ic's**

| | | |
|---|---|---|
| TC7660COA | IC1 | Microchip Charge pump DC-to-DC voltage converter |
| AD9833BRM | IC2 | smd programmable waveform generator |
| LMH6646MA | IC3 | smd dual high speed rail-to rail voltage feedback op amplifier |
| MCP4251-502I/SL | IC4 | smd dual SPI digital potentiometer |
| dsPIC33FJ32GP202-I/SO | IC5 | High performance 16bit dsp microcontroller |

**Pcb**

| | | |
|---|---|---|
| PHPG1'2 | | Gold plated two layer PCB edition 2 for HPG1 |

Regulator

| | | |
|---|---|---|
| TPS76633D | VR1 | smd low-power 3.3V/250mA low-dropout positive regulator |
| TPS76650D | VR2 | smd low-power 5V/250mA low-dropout positive regulator |

**Xtal**

| | | |
|---|---|---|
| 20MHz | X1 | smd quartz crystal |

**Resistors**

| | | |
|---|---|---|
| 330 (1206) | R1 | smd resistor |
| 6R8 (1206) | R2 | smd resistor |
| 2K2/1% (0603) | R3 | smd resistor 1% |
| 100 (1206) | R4, R5 | smd resistor |
| 4K3/1% (0603) | R6 | smd resistor 1% |
| 1K/1% (0603) | R7 | smd resistor 1% |
| 82K/1% (0603) | R8 | smd resistor 1% |
| 220 (0603) | R9 | smd resistor |
| 2K2 (0603) | R10 | smd resistor |
| 15 (0603) | R11 | smd resistor |
| 1M (0603) | R12 | smd resistor |
| 10K (0603) | R13, R19, R31, R32 | smd resistor |
| 1K (0603) | R14, R15, R27, R28, R33 | smd resistor |
| 200K/1% (0603) | R16, R18, R25, R26, R29 | smd resistor 1% |
| 100K/1% (0603) | R17, R24, R30 | smd resistor 1% |
| 820/1% (0603) | R20 | smd resistor 1% |
| 1K/1% (0603) | R21 | smd resistor 1% |
| 220 (0603) | R22 | smd resistor |
| 100 (0603) | R23 | smd resistor |

**Switches**

| | | |
|---|---|---|
| KRS0611 | SW1...SW4 | Tactile switch 6x6mm height 4.3mm |
| TS-13PLC | SW5 | TS-13P slide switch print 90° ON-ON |

**Transistor**

| | | |
|---|---|---|
| BCP53T1 | T1 | smd pnp medium power transistor |

## Radiation test measurement:

## WORST POSITION TEST PROBE

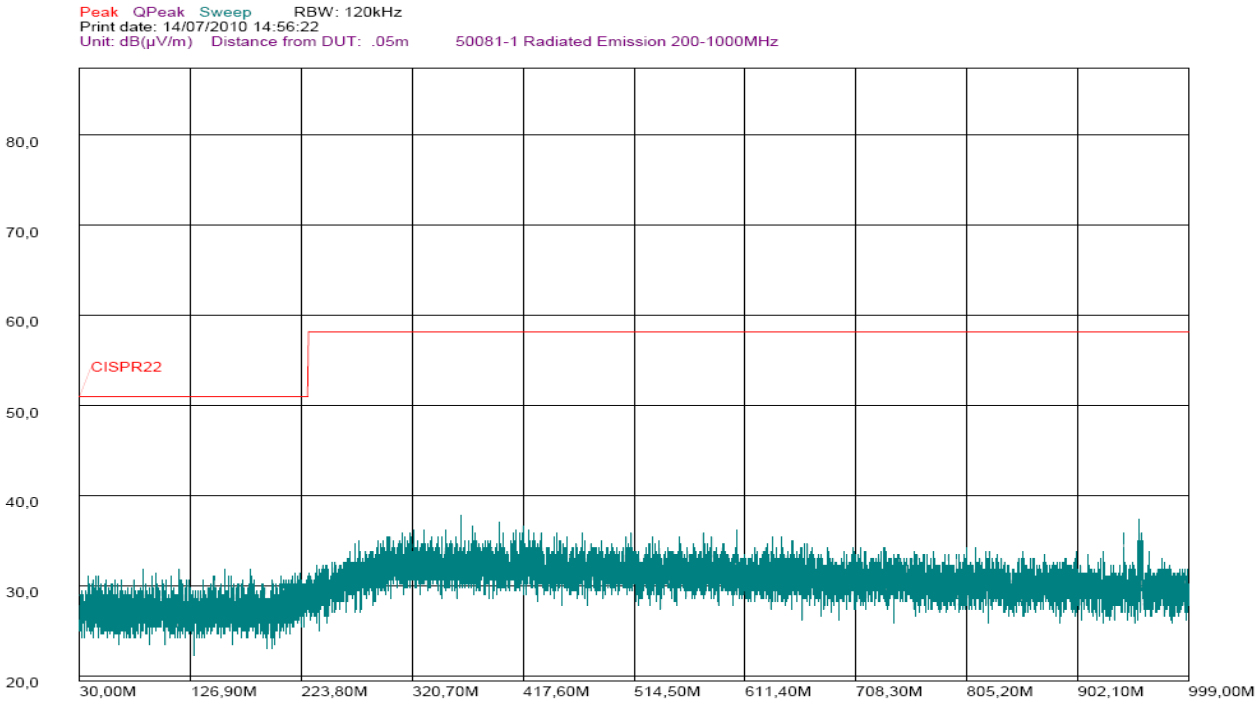
Peak QPeak Sweep
Print date: 14/07/2010 14:57:21
Unit: dB(µV/m) Distance from DUT: .05m 50081-1 Radiated Emission 200-1000MHz

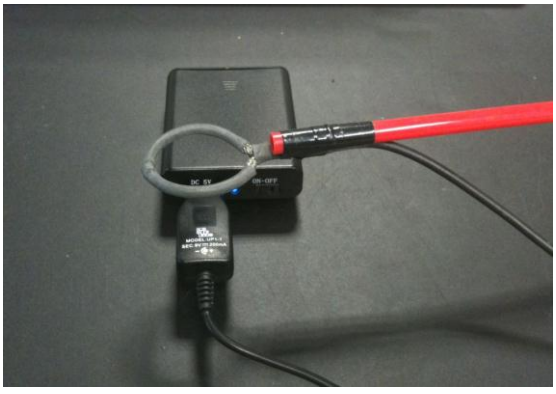
**Notes:**

Velleman instruments
HPS140 USB charger
Worst position

- Also used for HPG1

EN55022 Field strenght
Start: 30MHz
Stop: 1GHz



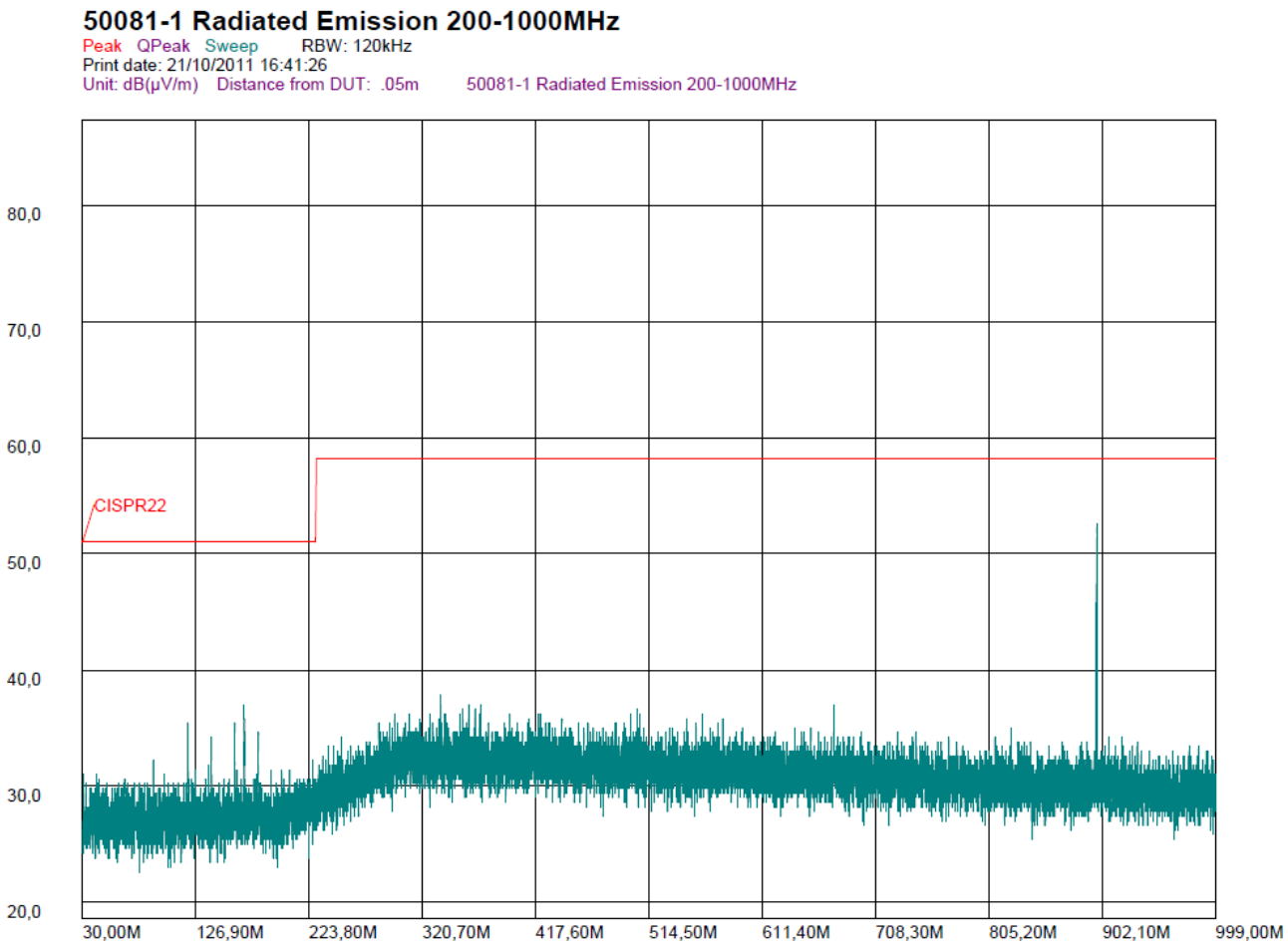
## 50081-1 Radiated Emission 200-1000MHz

Peak QPeak Sweep
Print date: 21/10/2011 16:44:36
Unit: dB(µV/m) Distance from DUT: .05m 50081-1 Radiated Emission 200-1000MHz

**Notes:**

Velleman instruments
HPG1 Pocket Generator
Worst position

EN55022 Field strenght
Start: 30MHz
Stop: 1GHz






## Addendum:

## Battery information:

*BATTERY SPECIFICATION* *Model: CYH-44AAA800*

## *Basic*

| | | |
|---|---|---|
| Type | | Sealed Rechargeable Ni-MH |
| Model | | CYH-44AAA800 |
| Size | | AAA |
| Nominal Voltage (V) | | 1.2 |
| Nominal Capacity (mAh) | | 800 |
| Dimension | Diameter (mm) | $10.5^{0}_{-0.7}$ |
| | Height (mm) | $44.0^{\pm 0.5}$ |
| Standard Charging | Current (mA) | 80 |
| | Time (h) | 16 |
| Quick Charging | Current (mA) | 240 |
| | Time (h) | 4 |
| Rapid Charging | Current (mA) | 400 |
| | Time (h) | 2.2 |
| Operation Temperature(℃) | Standard Charging | 0~45 |
| | Rapid Charging | 10~40 |
| | Discharging | -20~65 |
| | Storage | -20~35(RH≤85%) |
| Permanent Charging Current (mA) | | 27~45 |
| Maxinmum Discharging Current (mA)(continuous) | | 1600 |
| Charge Impedance (mΩ) | | ≤40 (1000Hz) |
| Discharge Cut-off Voltage (V) | | 1.00 |
| Charge Retention (20°C) | | ≥60% |
| Weight Approx. (g) | | 13. 5 |

## *B. Test Report*

Tests are carried out within one month of delivery under the following condition:

**1. Ambient Conditions:**

Room Temperature 20±5 ℃

Relative Humidity 65%±20%

**2. Capacity Testing**

**2.1 Standard Charging**

0.2C discharge to 1.00V/cell

0.1C charging for 16 hours

Rest for 1 hours

0.2C discharge to 1.00V/cell.

Within 3 charge/discharge cycles, the mininum capacity is no less than 760mAh, the typical capacity is no less than 800mAh.

# MATERIAL SAFETY DATA SHEET

## Section I – Product Identification

Product Name: Nickel Metal Hydride Battery (All models)
Trade Name: Cyber-Power Nominal Voltage: 1.2V
Chemical System: Nickel/Metal Hydride Designated for Recharge:
_X_Yes ___ No

## Section II – Hazardous Ingredients

IMPORTANT NOTE: The battery cell is contained in a hermetically-sealed case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, hazardous materials are fully contained inside the battery cell. The battery cell should not be opened or exposed to heat because exposure to the following ingredients contained within could be harmful under some circumstances. The following information is provided for the user's information only.

| Chemical Name | Content (approx. wt%) | CAS number: |
|---|---|---|
| Nickel | 4.9% | 7440-02-0 |
| Nickel hydroxide | 23.9% | 12054-48-7 |
| Cobalt Monoxide | 2.7% | 7440-48-4 |
| Teflon (PTFE) | 0.4% | 9002-84-0 |
| Mischmetal Powder（Co+Ni+La+Ce） | 34.3% | Co：7440-48-4<br>Ni：7440-02-0<br>La：7439-91-0<br>Ce：7440-45-1 |
| Copper | 5.4% | 7440-50-8 |
| Nickel （plated steel） | 16.9% | 7439-89-6（ 12054-48-7） |
| Rubber | 0.3% | 25038-36-2 |
| Nylon | 0.6% | 32131-17-2 |
| Polypropylene | 2.0% | 9003-07-0 |
| KOH+NaOH+LiOH | 3.2% | 1310-58-3<br>1310-73-2<br>1310-66-3 |
| H2O (Water) | 5.5% | 7732-18-5 |

## Section III—Physical Data for Battery

| | | |
|---|---|---|
| Melting Point (。F) NA | Boiling Point (。F) NA | % Volatile volume NA |
| Vapor Pressure (mm Hg) NA | Evaporation Rate | Vapor Density (Air=1) NA |
| Specific Gravity (H2O) NA | Solubility in Water NA | Appearance and Odor<br>No Ordor |

## Section IV—Fire and Explosion Hazard Data

Flash Point: NA Lower Explosive Limit: NA Upper Explosive Limit: NA

Extinguishing Media: Any class of extinguishing medium may be used on the batteries or their packing material.

Special Fire Fighting Procedures: Exposure to temperatures of above 212 deg. F can cause venting of the liquid electrolyte. Internal shorting could also cause venting of the electrolyte. There is potential exposure to iron, nickel, cobalt, rare earth metals (cerium, lanthanum neodymium, and praseodymium), manganese, and aluminum fumes during fire; use self-contained breathing apparatus.

## Section V- Health Hazard Data

Threshold Limit Values: See Section II

Effects of a Single (Acute) Overexposure:

Inhalation: During Normal use inhalation is an unlikely route of exposure due to containment of hazardous

materials within the battery case. However, should the batteries be exposed to extreme heat or pressure causing a breach in the battery cell case, exposure to the constituents may occur. Inhalation of cobalt dusts may result in pulmonary burns.

Ingestion: If the battery case is breached in the digestive tract, the electrolyte may cause localized burns.

Skin Absorption: No evidence of adverse effects from available data.

Skin Contact: Exposure to the electrolyte contained inside the battery may result in chemical burns. Exposure to nickel may cause dermatitis in some sensitive individuals.

Eye Contact: Exposure to the electrolyte contained inside the battery may result in severe irritation and chemical burns.

Carcinogenicity:

Nickel has been identified by the National Toxicology Program (NTP) as reasonably anticipated to be a carcinogen. Cobalt has been identified by IARC as a 2B carcinogen.

Other Effects of Repeated (Chronic) Exposure:

Chronic overexposure to nickel may result in cancer; dermal contact may result in dermatitis in sensitive individuals.

Medical Conditions Aggravated by Overexposure:

A knowledge of the available toxicology information and of the physical and chemical and chemical properties of the material suggests that overexposure is unlikely to aggravate existing medical conditions.

Emergency and First Aid Procedures:

Swallowing: Do not induce vomiting. Seek medical attention immediately.

Skin: If the internal cell material of an opened battery cell comes into contact with the skin, immediately flush with water for at least 15 minutes.

Inhalation: If potential for exposure to fumes or dusts occurs, remove immediately to fresh air and seek medical attention.

Eyes: If the contents from an opened battery come into contact with the eyes, immediately flush eyes with water continuously for at least 15 minutes. Seek medical attention.

## Section VI - Reactivity Data

The batteries are stable under normal operating conditions.

Hazardous polymerization will not occur.

Hazardous decomposition products: oxides of nickel, cobalt, manganese, lanthanum, and cerium.

Conditions to avoid: heat, open flames, sparks, and moisture.

Potential incompatibilities (i.e., material to avoid contact with): The battery cells are encased in a non-reactive container; however, if the container is breached, avoid contact of internal battery components with acids, aldehydes, and carbonate compounds.

## Section VII – Spill and Leak Procedures

Spill and leaks are unlikely because cells are contained in a hermetically-sealed case. If the battery case is breached, don protective clothing that is impervious to caustic materials and absorb or pack spill residues in inert

material. Dispose in accordance with applicable state and federal regulations.

## Section VIII—Safe Handling and Use (Personal Protective Equipment)

Ventilation Requirements: Not required under normal use.
Respiratory Protection: Not required under normal use.
Eye Protection: Not required under normal use.
Gloves: Not required under normal use.

## Section IX- Precautions for Safe Handling and Use

Storage: Store in a cool place, but prevent condensation on cell or battery terminals. Elevated temperatures may result in reduced battery life. Optimum storage temperatures are between –31。F and 95。F.

Mechanical containment: If there are special encapsulation or sealing requirements, consult Cyber-Power about possible cell hazard precautions or limitations.

Handling: Accidental short circuit will bring high temperature elevation to the battery as well as shorten the battery life. Be sure to avoid prolonged short circuit since the heat can burn attendant skin and even rupture of the battery cell case. Batteries packaged in bulk containers should not be shaken. Metal covered tables or belts used for assembly of batteries into devices can be the source of short circuits; apply insulating material to assembly work surface.
If soldering or welding to the case of the battery is required, consult Cyber-Power for proper precautions to prevent seal damage or external short circuit.

Charging: This battery is designed for recharging. A loss of voltage and capacity of batteries due to self-discharge during prolonged storage is unavoidable. Charge battery before use. Observe the specified charge rate since higher rates can cause a rise in internal gas pressure, which may result in damaging heat generation or cell rupture and/or venting.

Labeling: If normal label warning is not visible, it is important to provide a device label stating:

CAUTION: Do not dispose in fire, mix with other battery types, charge above specified rate, connect improperly, or short circuit, which may result in overheating, explosion or leakage of cell contents.

## Section X- Recycling and Disposal

Cyber-Power encourages battery recycling. Our Nickel Metal Hydride batteries are not defined by the government as hazardous waste and are safe for disposal in the normal municipal waste stream. These batteries, however, do contain recyclable materials.

DO NOT INCINERATE or subject battery cells to temperatures in excess of 212 deg. F. Such treatment can cause cell rupture.

## Section XI – Transportation

Sealed Nickel Metal Hydride batteries are considered to be “dry cell” batteries and are not subject to dangerous goods regulation for the purpose of transportation by the U. S. Department of Transportation, the International Civil Aviation Organization, the International Air Transport Association or the International Maritime Dangerous Goods regulations. The only DOT requirements for shipping Nickel Cadmium batteries is Special Provision 130 which states: “Batteries, dry are not subject to the requirements of this subchapter only when they are offered for transportation in a manner that prevents the dangerous evolution of heat (for example, by the effective insulation of exposed terminals).” IATA requires that batteries being transported by air must be protected from short-circuiting and protect from movement that could lead to short-circuiting.

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HPG1-Technical Doc V1.doc
2011