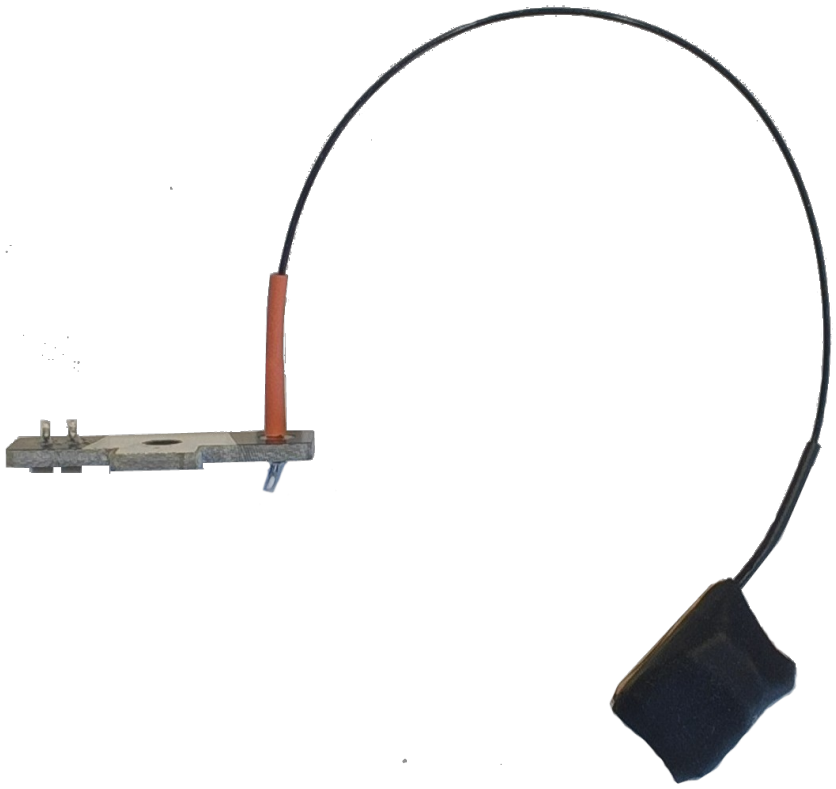
PIRATELOGIC
AUDIO ELECTRONICS

StarBass

MOTIONAL FEEDBACK ACCELERATION SENSORS



user manual

DRAFT

Contents

Before you start ....

Thank you for purchasing an Piratelogic Starbass accelerometer sensor, please note this manual is subject to permanent development so expect grammar & spell checks, corrections and improvements, read the ERRATA section before using this accelerometer.

Prerequisites

For successful use of this sensor the following working prerequisites are needed.

- ESD safe working environment : Starbass sensors contains ESD sensitive jFet devices, please adhere to guidelines for safe handling of ESD sensitive components during use of the sensors.
- SMD soldering station : the EVE design uses surface mount technology and requires handling and use of an appropriate soldering station to avoid thermal damage to the used parts when soldered onto the PCB.

Warranty / Disclaimer / Copyright

Although this accelerometer sensor has been developed with lots of love, tenderness and devotion and has been tested with numerous servo systems it is subject to constant research and development and as such no guarantees and/or warranties can be given for the correct / optimal / failure free working of the sensor. No responsibility is taken for any damage resulting from the use of this module. The Starbass circuit design is free for use both for hobby as well commercially.

Designing & building servo drive systems requires a thorough understanding of and working experience with the underlying electronics. An engineering degree and experience with component level board repair is strongly advised. This is NO starter project !!!!

Pricing & Availability

Ready build and tested sensors are available for 75 euro a piece by sending an email to chris*nospam*piratelogic.nl – replace *nospam* with the standard @. Pricing excludes VAT and shipment.

MAY THE MUSIC PASSING THROUGH THIS DEVICE

SOMEHOW HELP TO BRING JUST A LITTLE MORE PEACE

TO THIS TROUBLED WORLD

Sensor basics

Murata PKGS-90LDP1-R

All Piratelogic acceleration sensors are based upon the Murata PKGS shock sensor series which translate externally applied impact or vibration into an electrical signal.

Originally developed for use in drop and shock detection circuits, these sensors can withstand shocks up to 1500G and combine a wide frequency range with low distortion in a hermetically sealed housing.

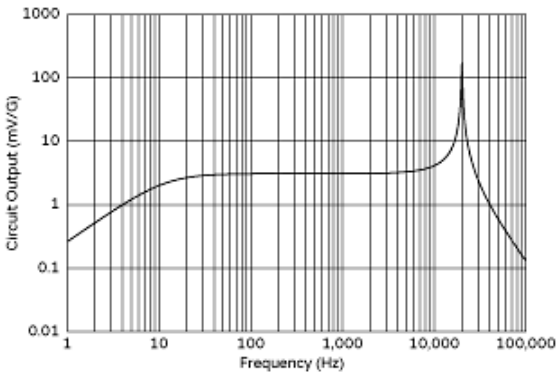
Operating Temperature Range	-40℃ to 85℃
Primary Axis Inclined Angle	0°
Sensitivity(typ.)	0.84pC/G
Capacitance(typ.)	770pF
Insulation Resistance(min.)	500MΩ
Non-linearity(typ.)	1%
Shock Resistance	1500G (0.5ms duration)
Sensitivity Type	Electric charge sensitivity type
Resonance Frequency	20kHz
Storage Temperature Range	-40℃ to 85℃

Shock sensor specs

Please refer to the Murata website for additional information regarding the performance, functions, quality, management, and safety of the shocksensors.

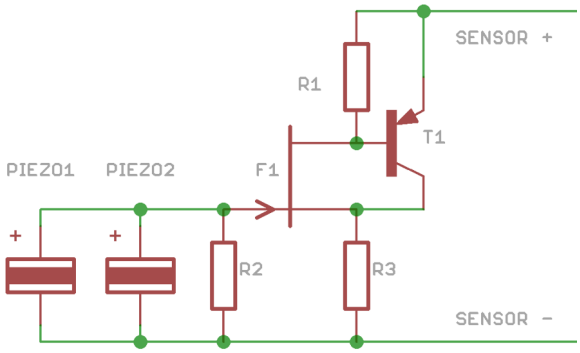
Frequency response

Please note the highQ sensor resonance peak at 20 Khz, when designing feedback loop electronics make sure to use a steep low pass filter in the sensor amplifier to avoid the peak from entering your signal chain.



Sensor Schematic

All StarBass accelerometers are equipped with an onboard buffer circuit, two parallel mounted piezo sensors piezo1 and piezo2, a gate resistor R2, a low noise jFet transistor F1, a drain resistor R1, a source resistor R3. The output of the sensor are designated sensor + and sensor -.



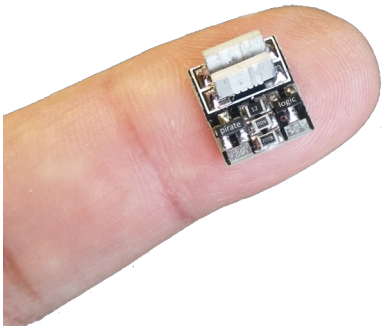
The Starbass family

Piratelogic offers accelerometer products for a wide variety of low note drivers ranging from small 0.8inch VC home use to large 4 inch pro models, drivers using an extended pole piece for BL over Xmax linearisation and low profile drivers. To assist the user in the selection process the following information is given. Please note that all StarBass sensors register axial acceleration info only with complete absence of non axial information caused by VC deformation, while at the same time don't suffer from transformation effects such as the case with pickup-coil based systems. All StarBass accelerometers feature a low distortion design with a current output, shielding against EMI, RF and static electricity.

Starbass ClingOn

Low MMS 2P motional feedback accelerometer for use with pole piece extended motors, designed to be vertically mounted against the outer voice coil former. Available with 3 primary axis, see **sensor selection** for more info. The ClingOn is 11mm wide, 12mm high and 6mm thick., the standard coax connection cable length is 10cm. Typical sensitivity is 1mV/G.

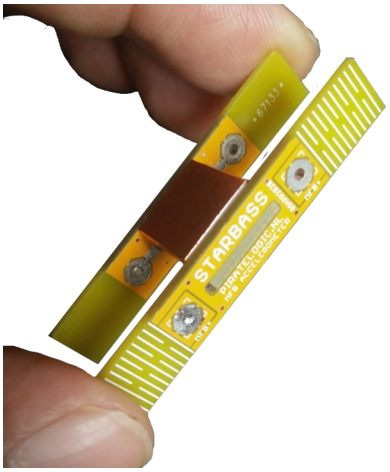
Current status : production v2023



Starbass 54

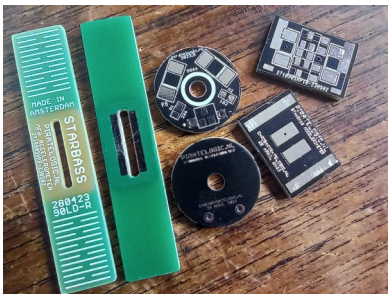
Low MMS 2P motional feedback accelerometer for use with voice coil diameters between 30 and 54 mm or 1.25" - 2", designed to be mounted inside the voice coil former. Typical sensitivity is 1mV/G.

Current status: production version 6, in stock.



Custom sensors

With a minimum order quantity of 100 pieces custom tailored Starbass sensors are available geared towards usage with specific drivers.



Sensor selection

The quality of a motional feedback system is largely determined by the sensor signal which must accurately reflect the electrical signal driving to the voicecoil. Any deviation in conformity between the two will introduce errors in the control loop resulting in added distortion. Depending on the construction of the driver – *see the excellent Purifi blog post on sources of driver distortion* – the voice coil is where the drivers motion is most consistent with the supplied electrical signal.

Sensor signal quality

The quality of the sensor signal is mainly determined by the following factors:

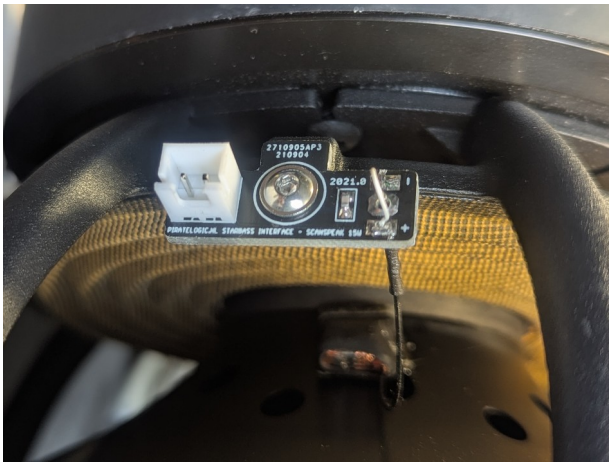
- signal bandwidth i.e. the lowest and highest frequencies the sensor can follow. The bandwidth of the sensor signal is determined by both mechanical and electrical factors where the electrical factor consists of the jFet buffer input impedance and sensor capacitance RC product and the sensor's own resonance. The mechanical factor is determined by the location and mounting method where rigid mounting provides the greatest bandwidth.
- signal phase in relation to the driving electrical signal. To obtain stable feedback, there should be as little phase difference as possible between the incoming voice coil and the sensor measurement signal.
- signal purity, I.e absence of signals not present in the original supplied electrical signal, such as transformation effects with pickup coil based sensors, cone breakup or non-axial deformations of the voice coil/cone.

Sensor choice

If you are a driver manufacturer and wish to add servo functionality to your product line try to design your motor in a way that it supports placement of an incoil sensor like Kef did.

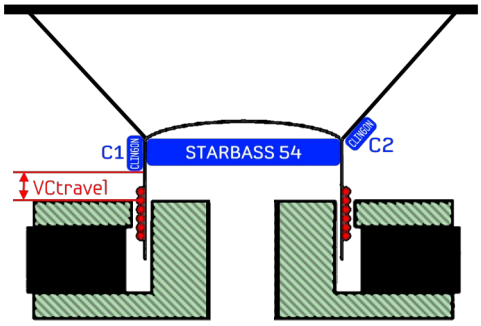
If you opt for an aftermarket modification, choose a driver which its dustcap can be removed and replaced without damage.

In the unfortunate case where the use of in-coil sensor is ruled out due to usage of an extended polepiece or because the dustcap simply does not allow removal due to the use of high temprature adhesives choose a ClingOn sensor.



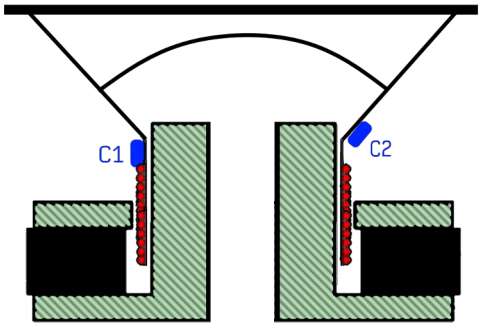
Sensor placements

Depending on the selected driver, the following sensor placement solutions are available.



Accelerometer and placement choices for the most used driver motor structure:

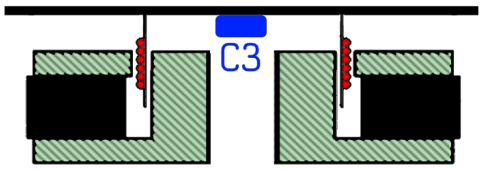
1. StarBass 54 requires disassembly of the dustcap, best quality feedback signal for VC diameters between 1.5 and 2 inch. Balanced loading, between 3 and 4 grams addition to MMS.
2. ClingOn C1 with 90° primary axis, no dustcap disassembly required, usability depends on VCtravel, risk of unbalanced loading with low MMS cones.
3. ClingOn C2 with 45° primary axis, no dustcap disassembly required, Risk of unbalanced loading with low MMS cones, risk of cone breakup information pickup.



Accelerometer and placement choices for extended polepiece motor structures:

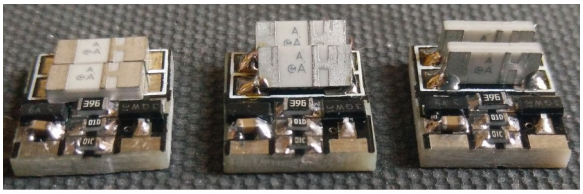
Due to the used of an extended pole piece the use of a StarBass 54 is ruled out. This setup has successfully been tested with Peerless XLS10, WaveCor SW023 and Purifi PTT drivers.

1. ClingOn C1 with 90° primary axis, no dustcap disassembly required, usability depends on Vctravel, risk of unbalanced loading with low MMS cones.
2. ClingOn C2 with 45° primary axis, no dustcap disassembly required, Risk of unbalanced loading with low MMS cones, risk of cone breakup information pickup.



Accelerometer and placement choices for flat panel motor structures:

ClingOn C3 with 0° primary axis, usage of ClingON accelerometers with this type of motor structure has not been tested but is given in response to a DIYaudio post by Lejonkungen investigating it's use with a TangBand w3-1876 .



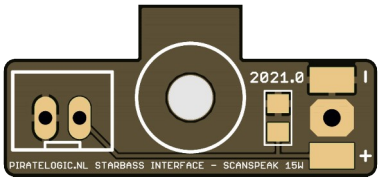
When ordering ClingOn accelerometers please indicated the desired primary axis,

- ClingOn C1 : 90°
- ClingOn C2: 45°
- ClingOn C3: 0°

Sensor Installation

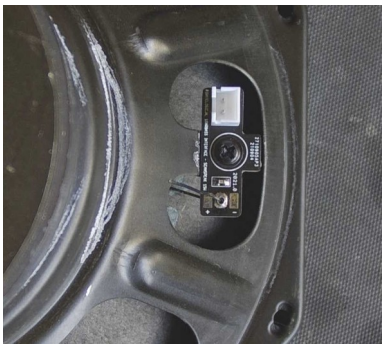
Interface pcb

Both Starbass 54 and Clingon sensors come with an interface pcb allowing easy mounting onto the driver frame and connection to the loop electronics via a JST XH connector. The left XH pin is connected to ground, the right pin to the sensor output.



Interface pcb placement

Both modern as older model drivers are generally equipped with an additional mounting tab as shown here with a vintage Philips driver. The interface PCB is easily attached to the driver frame using an M3 screw, to prevent possible interference the frame is grounded via the XH connector.



ClingOn sensor placement

The sensor should be mounted as shown here with the sensor's connecting wire pointing up when the driver rests on the magnet while ensuring it remains curved across the entire cone's travel without becoming taut.

The same applies to the connection of a StarBass 54 sensor, where the connection wire must be placed through the cone

Document Revisions

Prior to starting work please check if the datestamp at the footer of this page corresponds with the one in the online version at https://piratelogic.nl/data/docs/products/starbass/piratelogic.clingon.user.manual.en.pdf

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