?? http://hddscan.com/doc/HDD_from_inside.html
??:Artem Rubtsov
(Artem Rubtsov ???HDDScan????,???i365 Datarecovery ???????)

??:OSSLab thx, freddie

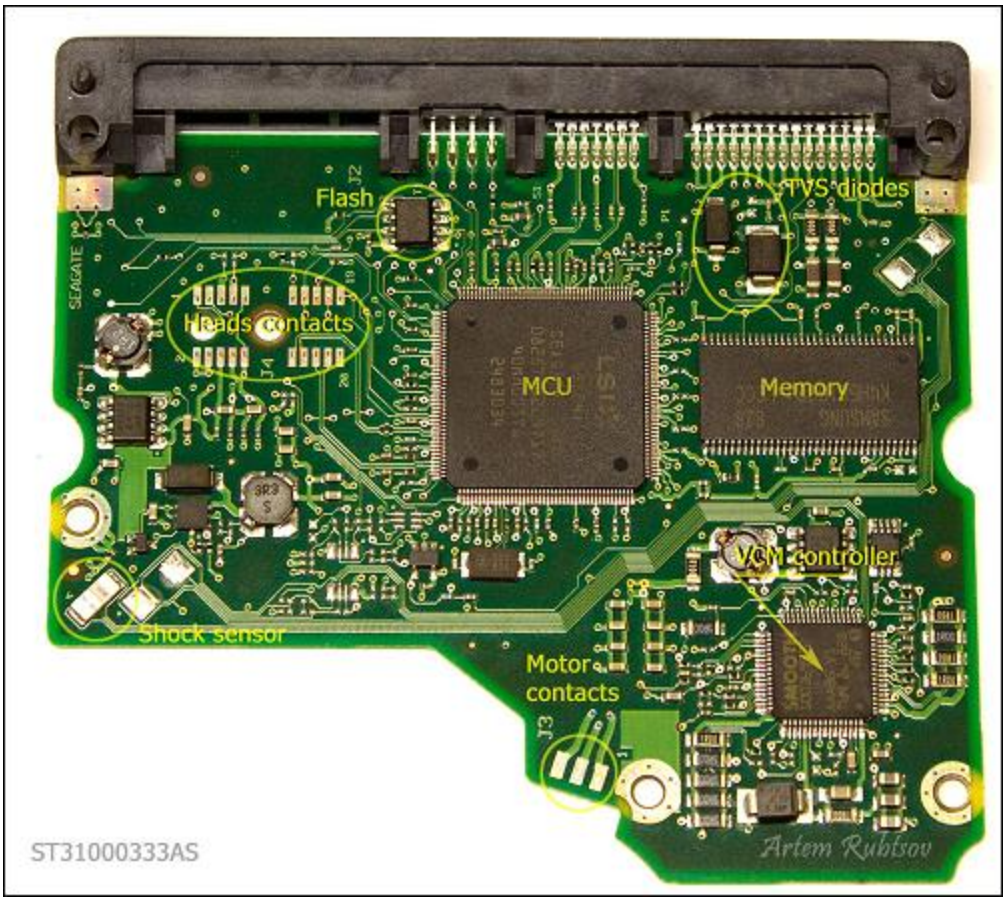
???????????????.

1TB Seagate ST31000333AS

??????? ?SATA?????????????????????PCB?

PCB?????????????????????????????????HDA?????????????

????PCB??????????????????????



??PCB???????MCU (Micro Controller Unit),MCU????:
1.??????A/D,D/A
2.??????????.
3.MCU ????Protocol ????????.

DDR DRAM 32MB ,???32MB Cache ????????????????.
?????, ??????embedded system .????OS??.

??????Voice Coil Motor controller???VCM??????PCB?????????VCM????????????????????VCM???????????

Flash????????????????????DATA ??????????MCU?????Flash??
??PCB?????Flash????????Flash?????????MCU?????

?????

????????????????????????VCM????VCM??

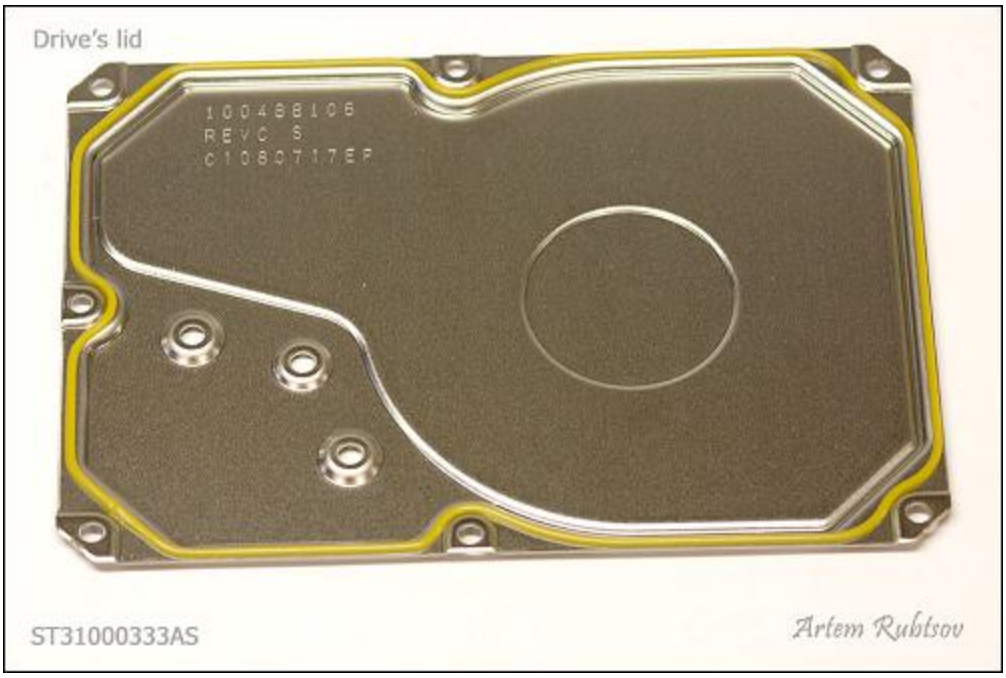
??????????????????!
??????????????????????VCM??

???

??????????????????????(Transient Voltage Suppression diode)????TVS???????????PCB????????????????????????
???TVS????????????????????????????????TVS???????5V????12V???

??????????????PCB??????????????HDA??HDA??
??

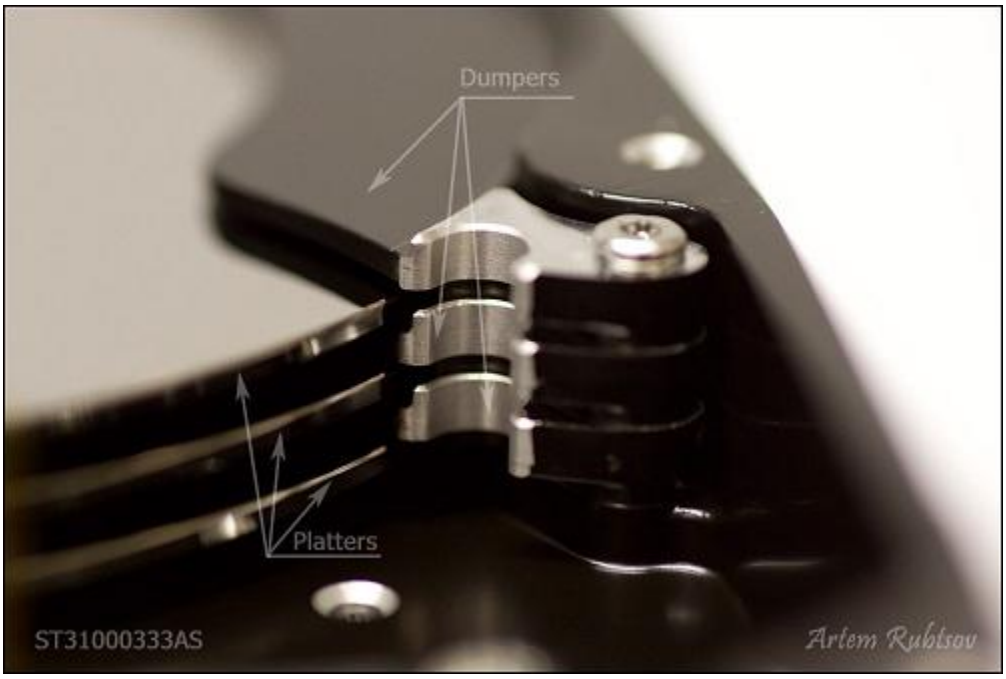
??????????????????????



??????????????????????????????
??????????????????HDA?

??
??????????????????????????Separators located between platters??
??????????????????

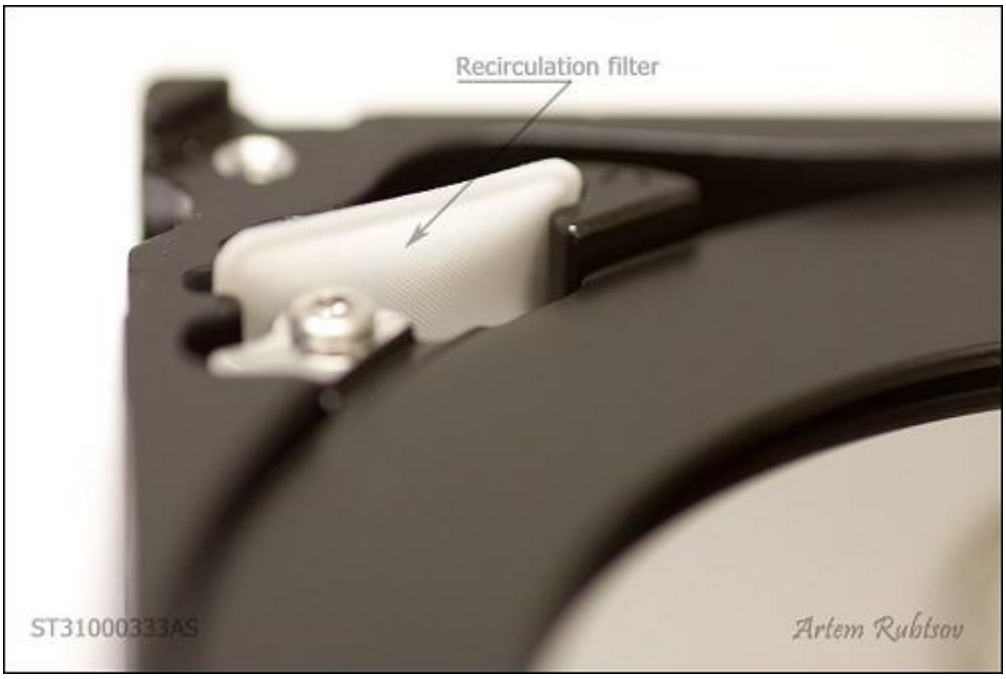
??????????????????


Dumpers
Platters
ST31000333AS
Artem Rubtsov

??

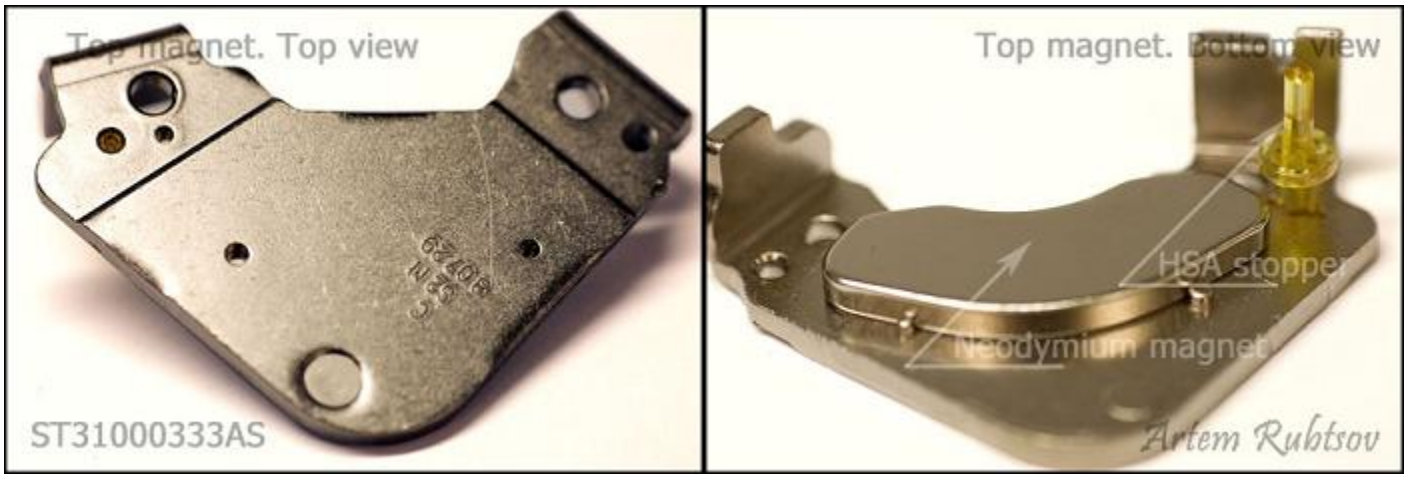

HSA in the parking area
ST31000333AS
Artem Rubtsov

??
????????????????????????? (Recirculation filter)??
??



Now we are going to remove top magnet to see what is under.

??????????????????



??????????????????????????????????1300??
??????????????????(HSA Stopper)????????????????????????????

??

??????(HSA Stopper)??????????????????????????????

??????????????????HDA????????

??????????????????????

There is the other HSA stopper. And you also can the second magnet. The Voice coil is a part of HSA, Voice coil and the magnets form Voice Coil Motor or VCM. VCM and HSA form the Actuator - a device which moves the heads. Tricky black plastic thingy called Actuator latch is a protection device - it will release HSA when drive un-parking (loading) heads normally and it should block HSA movements in the moment of impact if drive was dropped. Basically it protects (should, at least) heads from unwanted movements when HSA is in parking area.

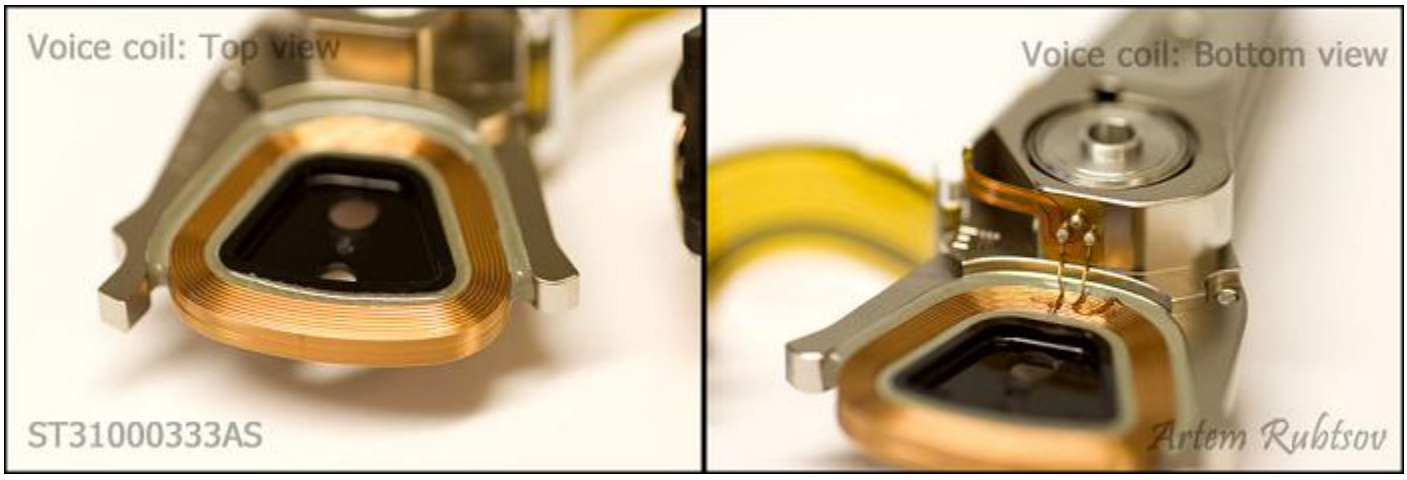
??(VCM)??VCM?HSA???????????????? ????????????????? ??

??????????????

???HSA?Head Stack Assembly??????)?????HGA ,VCM,Bearing.

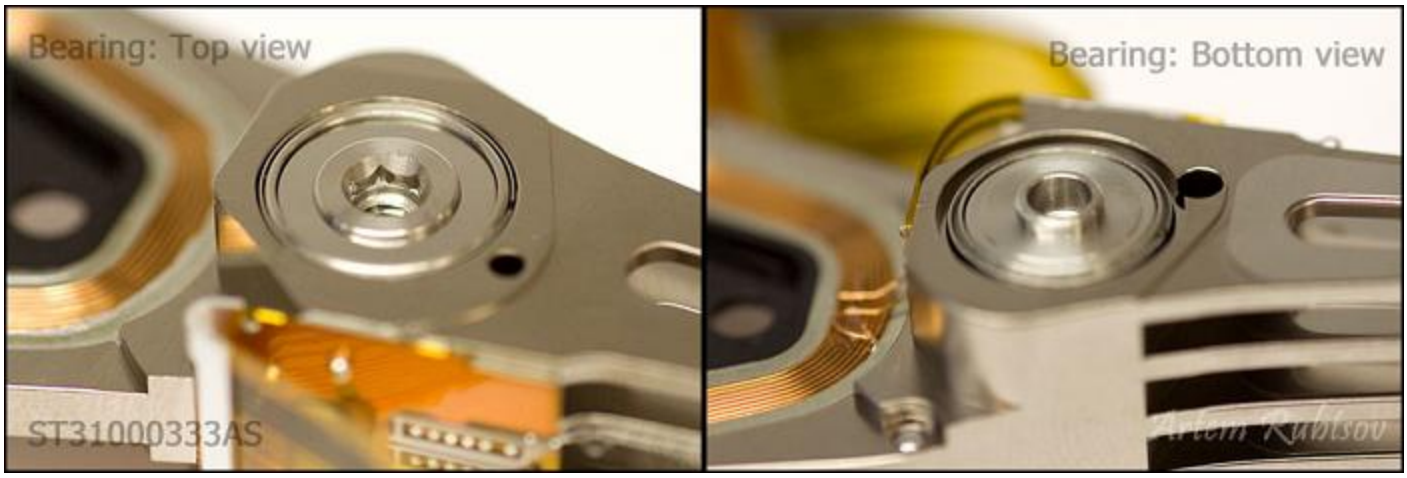
HSA ??(Heads Gimbal Assembly)???HGA (?????) ??????
????HGA?????????????????
??????????????????FPC?FPC??????????????????

???????????????



Voice coil connected to FPC

?????FPC

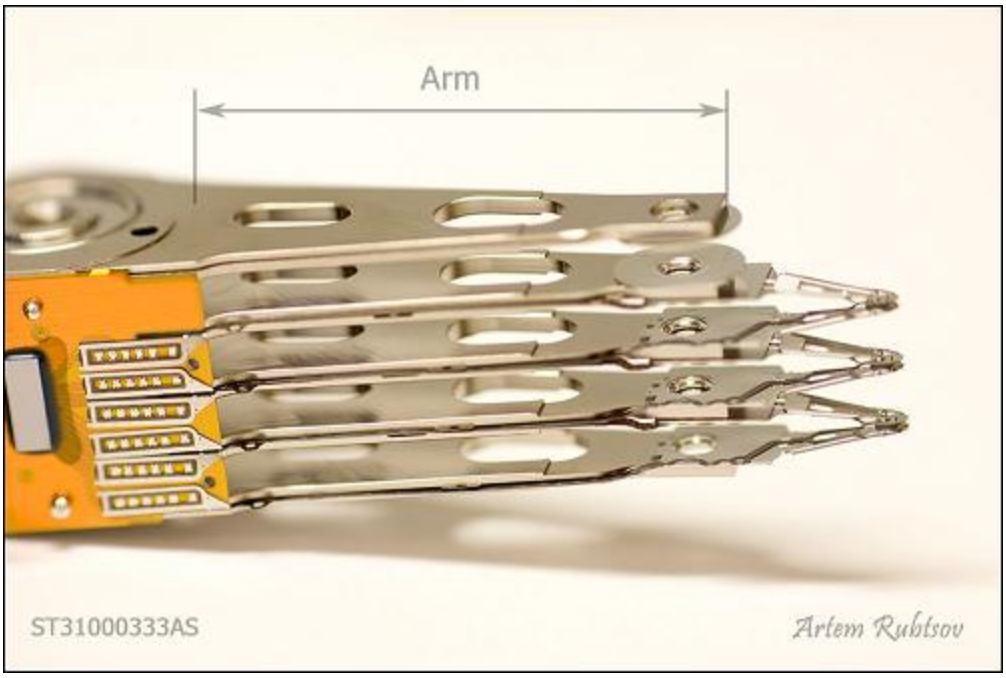


Here is the bearing

?????

????????

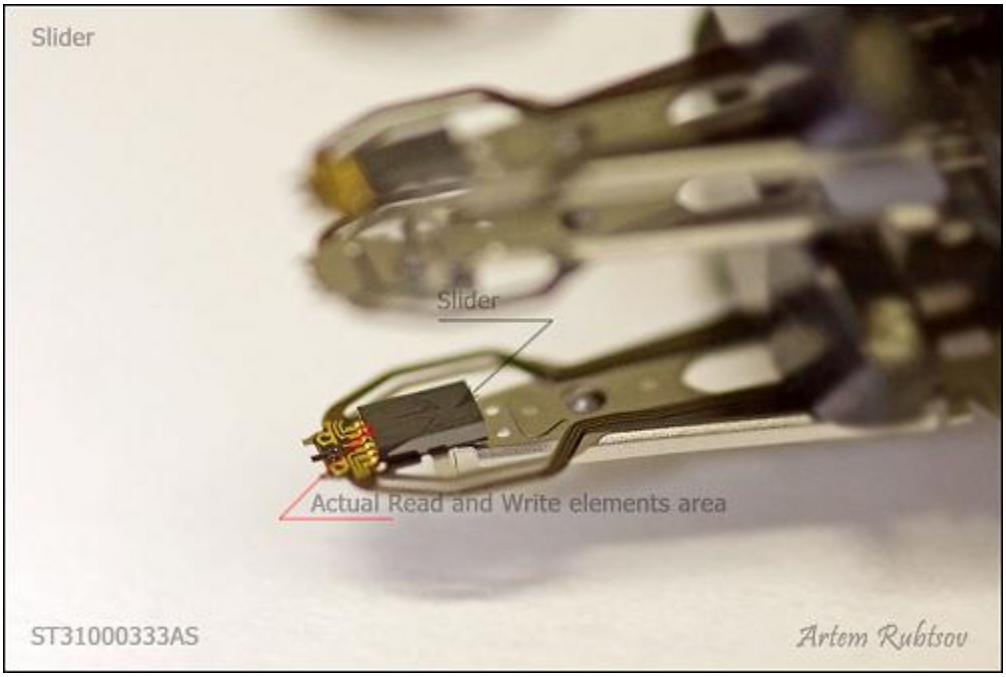
??????????????????????????????????HDA??



??????????????????????????????

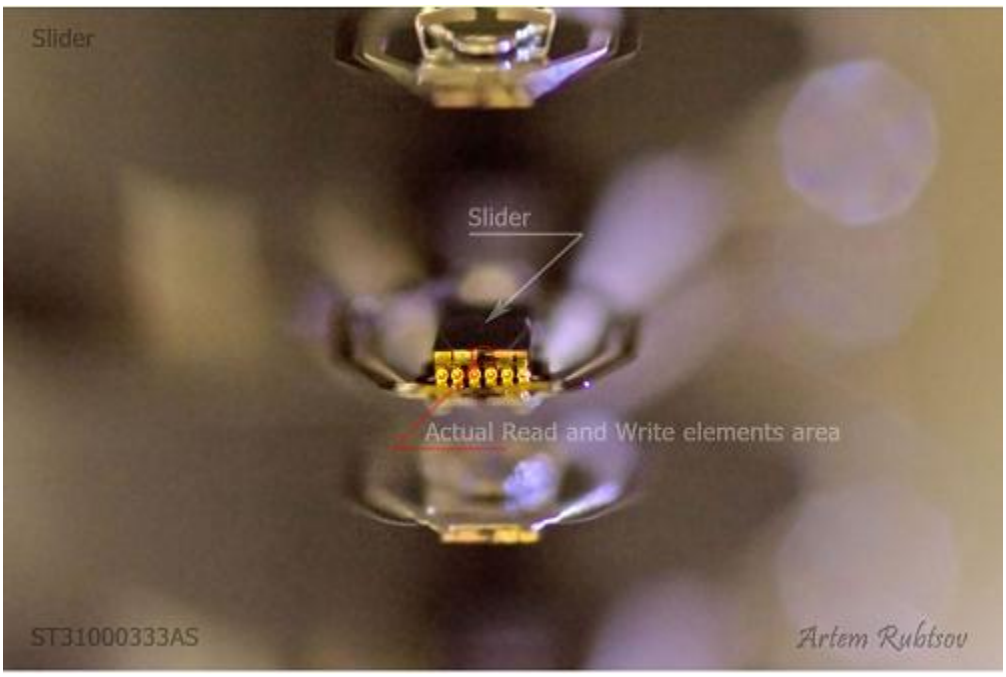
HGA??
??????????????????5-10??????????????????????25000???
??HDA?????????????

??????????????????????????????????????



??(Air Bearing Surface)??ABS? ABS?????????????????

???????????????



????????

??????????????????????(preamplifier)???preamp????????????????????????

????????HDA????PCB????????????????????????????????????1GHz????????????PCB????????????????????
????????????

The preamp has much more tracks going to the heads (right side) than to the HDA (left side), it's because HDD can work only with one "head" (pair of read an write elements) at a time. HDD sends control signals to the preamp and the preamp selects the head which HDD needs at the current moment. This HDD has six contacts per "head", why so many? One contact is for ground, other two for read and write elements. Other two for microactuators - special piezoelectric or magnetic devices which can move or rotate slider, it helps tune up heads position under a track. And finally the last contact is for a heater. The heater can help adjust heads flying height. The heater can heat the gimbal - special joint which connects slider to HGA, the gimbal made from two stripes of different alloys with different thermal expansion. Once gimbal got heated it bents itself toward platter's surface and this action reduces flying height. After cooling down the gimbal straights itself.

????????????????????HDA????????????????????????(???????)??
??????
????????????????????????????????for ground????????????????????????(????????????????????????)????????????
??(?????????????HGA????????????????????????????)?????????????
??

??????????????????top dumper?

top dumper????

?????HDA??HSA?top dumper?

??????????????????????????????

???????????


Platters clamp: Top view
ST31000333AS
Platters clamp: Bottom view
Artem Rubtsov

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HDA
Bottom magnet
Top platter
Spindle hub
ST31000333AS
Artem Rubtsov

??????????????????????????????????


Spacer ring
Second platter
ST31000333AS
Artem Rubtsov

??dumper?

????????????????????????


Spacer ring
ST31000333AS
Artem Rubtsov

???????HDA???????????????????


Base
Spindle hub
Breath filter
ST31000333AS
Artem Rubtsov

??????????????????????????????


Breath filter
ST31000333AS
Artem Rubtsov

??