

MODULE D2 HARD DISK PCB REPAIR TRAINING

- D2.1 SMD Basic electronics for hard disk components and PCB repair, tools demo
- D2.2 Common problem in hard disk due to printed circuit board fault
- D2.3 Introduction to HARD DISK PCB , block diagram section of hard disk,
- D2.4 Power & protection section, DC to DC converter, (Mosfet, other smd component working and power detail in hard disk)
- D2.5 Mcu section, Data section, preamp section head (chip working concept power main signals)
- D2.6 Buffer Ram, flash rom section (working concept types and main signals)
- D 2.7 VCM Motor controller & read channel chip working concept and main signals
- D 2.8 Live pcb tracing, different volt of pcb, fault finding of hard disk pcb
- Online offline
- D2.9 Identify hard disk pcb no for donor pcb (Samsung, Seagate, wd, Hitachi, lbm , Maxtor,)
- D2.10 Replacing component and IC`s of hard disk (demo, video)
(understand different hard disk pcb, circuit troubleshooting chart)

D2.1 SMD Basic electronics for hard disk components and PCB repair

- Basic electronics fast revision
- Working concept of electronics component resistor, capacitor, diode, transistor, fuse, tvs diode, MOSFET, etc.
- Multimeter basic concept, testing different components
- Measuring and Identify ok, Short, Open components
- Introduction to component of hard disk PCB , resistor, capacitor, diode, transistor, MOSFET chips
- Removing and Inserting Different components
- Working concept of chips,

D2. 2 Common problems in hard disk due to pcb fault

- Totally dead Hard Drive does not spin up
- When hard disk connects to computer, computer does not start or hangs
- Broken power connectors
- Broken data connectors
- Spindle/arm driver chip failure
- You can see a burned component on the hard drive circuit board.
- Connector of motor or head is damaged
- Printed circuit board failures including pre-amplification
- TVS diode blow up
- Protection fuse, 0ohms resistor open
- PCB Damaged due to liquid
- Fire Damage
- Ceramic capacitor short
- Mosfet short, or not giving output

- Data connector resistor open
- Electric shock
- Pcb circuit open / short

D2. 3 INTRODUCTION HARD DISK PRINTED CIRCUIT BOARD, BLOCK DIAGRAM , SECTION OF PCB

INTRODUCTION TO DIFFERENT SECTION OF HARD DISK

- Introduction & Block diagram of hard disk printed circuit board
 - Identify different chips on hard disk
 - Mcu, driver chip, flash ram chip , buffer chip
 - Identify different component on hard disk
 - Resistor, capacitor, tvs diode, transistor, fuse , inductor, rectifier
 - identify circuit types, no models
 - Block diagram of hard disk pcb
 - How pcb work
 - Identify hard disk pcb

HARD DISK SECTION

- Hard disk Power section normal molex, sata
- Hard disk Dc to dc converter power section
- Hard disk Data section connection sata pata
- Hard disk Firmware section
- Hard disk Ram/ Buffer section
- Hard disk Vcm controller section
- Hard disk Spindle motor controller
- Hard disk Mcu section
- Hard disk Pre amplifier section
- Hard disk Head contact section
- Hard disk Spindle motor section

D2.4 Power section & DC to DC converter, (Mosfet & other smd component working and power detail in hard disk)

- Types of hard disk power connector
- Power input (sata pata)
- Pata old Molex 4 pin (5v & 12v)
- Sata connection 15 pin (5v, 3.3v, 12v)
- Checking hard disk open short thru power connector
- Understanding Protection circuit
- Semi conductor mosfeter transistor Manufacture name (Toshiba, NEC Rohm , Texas Instruments , Alpha & Omega , Anachip Corp, Diodes Inc, Philips Fairchild, Sanyo, International Rectifier,

STMicroelectronics, Texas Instruments, Texas Instruments, National Semiconductor, Microsemi Corporation, Fairchild, Fairchild, Fairchild, Microsemi, Philips, Rohm, Richtek, Schottky, Siliconix, STMicroelectronics, STMicroelectronics, Infineon, Unisem, International Rectifier, Youwang Electronics Co.Ltd, STMicroelectronics, Sundry:

- **Semi conductor mosfet transistor components (** 2SA1242, 2SA1615, 2SB1132, 2SB1412, 2SB962, 2SC2412K / 2SC4081 / 2SC4617 / 2SC5658 / 2SC1740S, 2SC3072, 2SC6052, 2SD1664, 2SD1758, 2SD1760, 2SD2098, D2118R, 2SD2150, 78L08A, 78M08A, AO4616, AO4619, AO4620, AP1506-50, M4532 / APM4532K, B240, BAS31, BC868-25, BSP100, FAN1537PA, FAN4274, FDFS2P102A, FDFS6N303, FDS6961A, FDS9431A, FDT434P, FJD3076, FW503, RF7101, IRF7207, IRF7326, IRF7326D2, IRFL014, IRFR024N, IRU1239SC, LD1117, LD1117DT33C, LD1117DT25C, LDR2533, LMV321 / LMV358 / LMV324, LP38691SD-2.5, LX1911, LX8815, LX8815-33, LX8816-04CDF, LX881733, MBRM130L, MBRS130L, MBRS2040LT3, MBRS320T3, MBRS340T3, MC34074AD, MSV358, NC7SZ126M5X, NDT014L, NTF6P02T3, NTMSD3P102R2, NTMSD3P303R2, NX2155H, NX7101IDM, NZT560/NZT560A, PBSS4350Z, PHC21025, PHK04P02T, PHN210T, PMBT2222A, PZT2222AT1, RDS035L03, RT8250, RT8284, RT9164-33CG, SD101CWS, ,i1413EDH, Si4833DY, SS13, STL102PM, ST1S03, ST1S06A, ST3L01K7R, ST755, STD1802T4, STJ009, STN715, STPS140A, STPS1L40A, STS2DPFS20V, TLE4417, TLE4418G, TLV271, TS272CD, uA78M08C, uPA2680T1E, US1237SC, UTC1117V33, VC4005, X0202BN,)
- Tvs diod, 0ohms resistor, fuse,
- Dc to dc converter
- Transistor used as switching
- Step down from 5v to 2.5
- Mosfet working function
- Testing of mosfet in hard disk pcb
- Linear output,
- swithching output
- work of inductor in hard disk
- PWM controller IC
- Power supply to different chips

D2.5 Mcu section, Data section, preamp section head (chip working concept power main signals)

- Data section of hard disk
- Sata connection 7 pin
- Signal detail of sata connection
- Pata connection of hard disk 40pin
- Signal detail of pata connection
- Connection detail of sata and pata connector
- Main control chip MCU manufacture (ardent, agere, pokar, seaglet, oscar, beagle, dsp, lucent, quantum, wdtsiemens, shxxx, tlxxxx)
- Hard disk mcu chips (
 - Working detail of MCU chip
 - Connection detail of MCU
 - Voltage of hard disk MCU chip
 - Hard disk head connector
 - Pin out detail of hard disk head connector

- Main signals detail of head contact
- Working concept of hard disk preamp
- Hard disk preamp chip manufacture with identify name (marvell, atmel=ATxxxx, sonyCXAXxxx, ST=Lxxx, TEXAS=SR1xxxx TEXAS=SSIxxxx, PHILIPS=TDAxxxx, VTC=VMxxx")
- **Hard disk preamp chips (ST Microelectronics (L6316 , L6319 , L6326, L6327, L6332, LD3110) Texas Instruments (SR1595AEA6, SR1621AAA, SR1621AAA4, SR1622ABA4, SR1622AB4, SR1622AB, SR1710AFA, SR1720DDA, SR1730, SR1731BBA4, SR1731BBA4DBT, SR1760, SR1766AA, TI / Silicon Systems (SSI 32R1571AR, SSI 32R1607AR, SSI 32R2100R / SSI 32R2101R / SSI 32R2102R, SSI 32R2103R / SSI 32R2104R / SSI 32R2105R, SSI 32R2110R / SSI 32R2111R, SSI 32R2112R, SSI 32R2124R Head Amplifiers (81G7004, MR5ML_B_DH, MR5ML_B_SK, MR5ML_B_SM, PA7531, PA7548B, SR1649, SR1682ACA, SR1682ADA, SR1855, SR1860BAA6, SR1972AAAA, SR1984CAA, SR1984BBA2, SR1984CAA_H, SR1984BBA2_H, SR1984CAA_HM, SR1984BBA2_HM, PA1300, PA7751, SR1676BCA50, SR1676BCA. SR1676BCA_2, SR1881AEA4, SR1880DEA8, SR3040, SR1676_FLT50, PA7800, PA7800_A, PA7558. SR1677, SR1843, SR1874, SR1972C_DL, R3480M, TLS26A974BB, SR1984CAA_HM_ND,SR1972_BHC ,PA7840M,PA7850, PA7871,SR1972ADA,SR3480ABA_H, SR3480ABA_M ,SR3480M_C Head Stacks (PA7548B, SR1649, SR1984CAA, SR1984BBA2, SR1984CAA_H, SR1984BBA2_H, SR1880DEA8 ,SR1881AEA4 ,A164AD, PA7548C, SR1651BAAM, SR1921, PA2540, SR1880DFA8, SR1881AFA4, A164AB, SR3480, PA7751B, PA7751C, PA7840) Marvell (81G3000, 81G3004, 81G3018, 81G4000, 81G4008, Atmel (AT78C6001, AT78C6002) Sony (CXA3238TN / CXA3239TN) Philips (TDA5152X, TDA5153, TDA5155, TDA5360, VTC Inc (V10615, VM3500, VM5131, VM5141)**
- Pin detail of hard disk preamp chip
- Connection of head, vcm coil, micro actuator
- Types of hard disk head
- Ferrite heads
- Amr heads
- Thin film heads
- Metal in gap (MIG) heads
- Tunneling magnetoresistive (TMR)
- Perpendicular magnetic recording (PMR)
- Giant magneto resistive (GMR)

D2.6 Buffer Ram, flash rom section (working concept types and main signals)

- Hard disk RAM BUFFER Chip manufacturer (**SAMSUNG=K4Snnxxxxx, HYNIX= HY57Vnnxxxxx, WINBOND=W94nnxxxxx, NEC=uPD45xxxx, MICRON TECH = MT48LCxxxxx, ESMT= M1xxxxxx, (2m, 8m, 16m 32M, 256k)**)
- **Hard disk RAM BUFFER chips (Hynix (HY5DU121622DTP-D43,HY512264JC-60, HY57V161610DTC-6, HY57V161610ETP-6, HY57V281620ETP-6, HY57V281620FTP-6, HY57V281620HCTP-6, HY57V641620ETP-6, HY57V641620FTP-6, HY57V641620HGT-6, HY57V561620FTP-6, HY5DU561622ETP-D43) Samsung Buffer Chip (K4D261638K-LC50, K4D551638H-LC50, K4H281638L-LCCC, K4H561638J-LCCC, K4H641638N-LCCC K4S161622D-TC70, K4S161622H-UC60, K4S281632F-UC60, K4S281632I-UC60, K4S641632F-TC60, K4S561632H-UC60, K4S641632H-UC60, K4S641632H-UC75, K4S641632K-UC60, K4S641632N-LC60, KM416C1204CT-45) WINBOND (W9412G6IH-5, W9425G6DH-5, W9425G6EH-5, W9464G6IB-5, W9464G6IH-5, W9812G6DH-6, W981616BH-6, W981616BH-7, W986416DH-6) Elite (M12L16161A, M12L64164A-5T, M13S128168A-5T, M13S2561616A-5T, M29F102BB, M5M411665ATP3, MSM54V24616-10TK, MSM56V16160F-7, MT46V16M16-5B, MT48LC1M16A1-6, MT48LC2M32B2-6G, MT48LC4M16A2P-6G.) Etrontech (EM638165TS-6G, EM636165TS-6G, EM6AA160TSA-5G, GLT5160L16-6TC,) Integrated Circuit Solution Inc (IC42S16100-6T) Sanyo (LC321664AJ-80, LC321667CT, LC384161CT-12) Qimonda (HYB25DC128160CE-5) ELPIDA (EDS6416AHTA-6BEH) Power chip Technology (A2V28S40CTP-G6, A43L8316V-7) NEC Electronics (uPD4504161G5-A12-7JF, uPD4516161, uPD4516161CG5)**

- Working function of Buffer chip
- Pin detail voltage supply of buffer chip
- Datasheet study of buffer chip
- Connection of buffer chip with other chip
- Hard disk EEPROM FLASH Chip manufacturer
(ATMEL=AT25xxx,AT45xxx,AT93xxx, ROHM=BR93xxx, SANYO=LE25xxx, ST MICROELECTRONICS = M25xxxx, FUJITSU=MBM29xxxx, MACRONIX=MX25xxxx, NATIONAL=NMxxxx, SILICON STORAGE=SSTnnxxxx, WINBOND=W25xxx)
- Hard disk EEPROM Flash chips(**silicon storage technology** (SST25VF512, SST25LF020A, SST25VF010A-33-4C-SAE, SST39LF100, SST45LF010-10-4C-SA,) **ST MICROELECTRONICS** (M25P40VP, M25P20VP, M25P05VP, M25P10V6, M25P10VP, M25P05AV, M29F102BB, M29W102BB) **ATMEL** (AT24C16N, AT25DF041A, AT25F512AN, AT25F1024, AT27C1024, AT45DB011B, AT49F1024, AT49LV1024-70VC, AT93C46D) **WINBOND** (W25X10, W25X10A, W25X10AVNIG, W25X20ALNIG, W25X20BLNIG, W25X40ALS15, W25X40AL09, W25X40AL014, W25X40LNEG, W29F102Q, W49F102Q-45, W49L102Q,) **ROHM** (BR93LC66, , BR93L76RF, BR93L66RF-WE2) **SANYO** (LE25FU106B, LE25FU206, LE25FU406B, LE25FV055T, LE25FW206, LE25FW406ATT, LE28F1101T-40,) **FUJITSU** (MBM29F200TC-70PFTN, MBM29LV004TC-90PTN) **MACRONIX** (MX25L8005, MX258005) **ST MICROELECTRONICS** (93C56W6, 93LC56, ST93C86WP) **NATIONAL SEMICONDUCTOR** (NM93C46) **SPANSION** S25FL040 **SEIKO** (S-93C76A, S93C66B)
- Working function of EEPROM
- Pin detail of EEPROM
- Connection of Flash EEPROM chip with other chip

D2. 7 VCM Motor controller & read channel chip working concept and main signals

- Hard disk Read Channel Chip manufacturer (**MARVEL**, **NATIONAL=DPxxxx**, **PHILIPS=p32xxxx**, **TEXAS=SPxxxx**,)
- Hard disk Read channel chips (**Silicon Systems** (32D5371/2 , 32D5373/4, 32D539, 32D5391/2/3, 32D4660/1/2/3/4/5/6, 32D4680, 32P3000/3001 , 32P3013, 32P3015/3016, 32P3030/31, 32P3040/41, 32P4730, 32P4741/44, 32P4742/46, 32P4752, 32P4782, 32P4782A, 32P4792, 32P4793, 32P4802,32P4903, 32P4904 ,32P4910/11 , 32P4910A/11A/12, 32P4915, 32P4920) **Read Channel Devices Silicon Systems** (32P4101A, 32P4103A, 32P4103B, 32P4103S, 32P4104H, 32P4104S, 32P4129, 32P4802, 32P4937A, SP4107A, SP4140A) **Marvell** (88C5520L 88C6590) **National Semiconductor** (DP84910) **Philips** (P32P4910A, P32P4911A) **Texas Instruments** (SP4107A)
- Working function of read channel chip
- Pin detail , voltage supply of read channel chip
- Hard disk motor controller chip manufacturer (**SMOOTH= Lxxxx**, **TEXAS INSTRUMENT = SHxxxxx**, **PTLxxxx**,**PHILIPS= TDAxxx**, **PANASONIC= ANxxxx**,**HITACHI= HA1xxxxx**, **Rxxxxx**, **TEXAS= TLSxxxxx**, **ALLEGRO = A89xxxxx**, **ATMEL= AT78xxxxx**)
- Hard disk motor controller chips (**ST Microelectronics**, **SMOOTH** (L6245, L6278, L6283, L6284, L7206, L7207, L7220, L7250, L7251) **Texas Instruments** (PTLS2270, SH6125B, SH6601AC, SH6601AD, SH6601AF, SH6761A, SH6770C, SH6782B, SH6950, SH6950D, SH6960B, SH6962B, SH6966, SH6968B, Si9961, Si9961A) **Philips** (TDA5143T, TDA5146T, TDA5147CH, TDA5147BH, TDA5147BH, TDA5147K, TDA5148K, TDA5149G, TDA5247HT, TDA5247HT, TDA5341, TDA5345HT) **Hitachi** (HA13545, HA13557AFH, HA13561F, HA13565F, HA13566AF, HA13571FR, HA13614FH, HA13626, HA13627, HA13645) **Texas Instruments** (TLS2205, TLS2230, TLS2242, TLS2252, TLS2255, TLS2291A, TLS2309, TLS2501, TLS2502/TLS2502B, TLS2503, TLS2505,) **Embedded Servo Acquisition** (32H6521, 32H6522, 32H6810B, 32H6811B, 32H6815 , 32H6826, 32H6829, 32H6829A ,32H6829, 32H6840 , 32H6900, 32H6742, 32H6816, 32H6818 , 32H6826, 32H6829, 32H6829A, 32H6829, 32H6900, 32H6910, TLS2231 , TLS2232, TLS2233, TLS2234, TLS2235, TLS2245, TLS2251, TLS2270 , TLS2271) **Panasonic** (AN8427FBP, AN8428NGAR , AN8428GAK) **Allegro** (8902-A, A8980CJT, A8983CJT) **Atmel** (AT78C7005, AT78C7015) **Fairchild** (KA2811C.)
- Working function of motor controller chips
- Pin detail, voltage supply of motor controller chip
- Spindle motor power supply from motor controller chip

- Switching , linear mosfet power controller
- Connection detail of motor controller chip with other chip

D2. 8 Live pcb tracing, different volt of pcb, fault finding of hard disk pcb

Online offline

- Offline tracing of hard disk pcb with multimeter
- Testing power connector main volt
- Testing tvs diode
- Testing all capacitor
- Testing spindle motor continuity
- Online Live tracing of PCB with multimeter
- Testing Power of mcu
- Testing Power on buffer chip
- Testing Power on read write chip
- Testing Power on spindle motor

D2. 9 Identify hard disk pcb no for donor pcb (Samsung, Seagate, wd, Hitachi, Ibm, Maxtor,)

- Hard disk model no
- Hard disk pcb no
- Hard isk pcb printer no
- Matching criteria of different hard disk
- Seagate Hard Drive PCB Swap Replacement Guide:
- Western Digital PCB Swap Replacement Guide
- Samsung PCB Swap Replacement Guide
- IBM Hitachi PCB Swap Replacement Guide
- Maxtor PCB Swap Replacement Guide
- Hitachi PCB Swap Replacement Guide
- Toshiba PCB Swap Replacement Guide
- When firmware replacement is important
- What is glist, plist on hard disk
- Service area on hard disk platter
- Which models required firmware chip replacement after swapping PCB
- Which models required no firmware replacement after swapping PCB

D2.10 Replacing component and IC`s of hard disk (demo, video)

- Removing and inserting of different component from hard disk PCB
- Removing resistor, mosfet, transistor, diode, fuse demo
- Removing and inserting of different chips from hard disk PCB
- Firmware chip, replacement idea
- Hard disk socket and connector