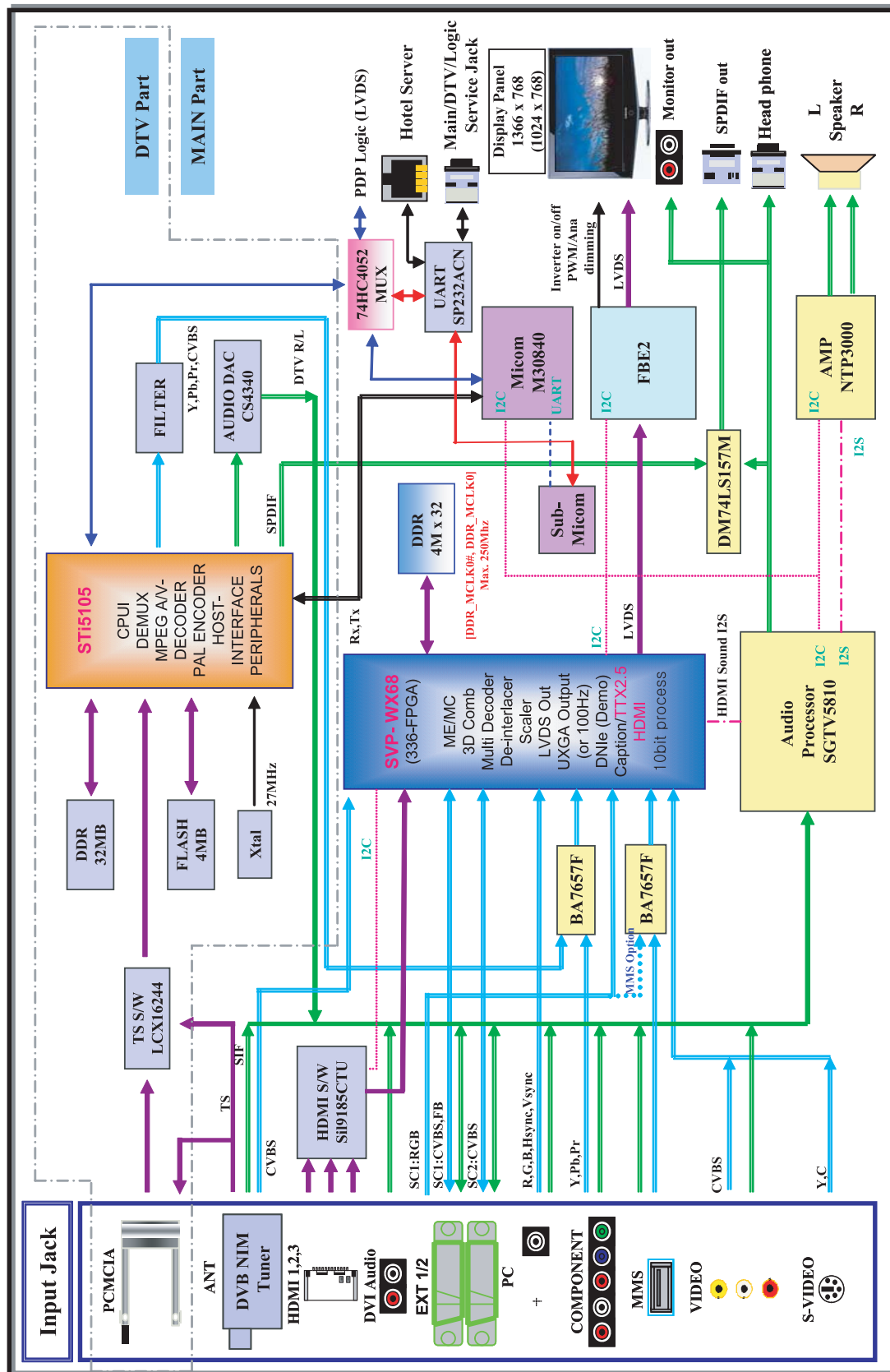
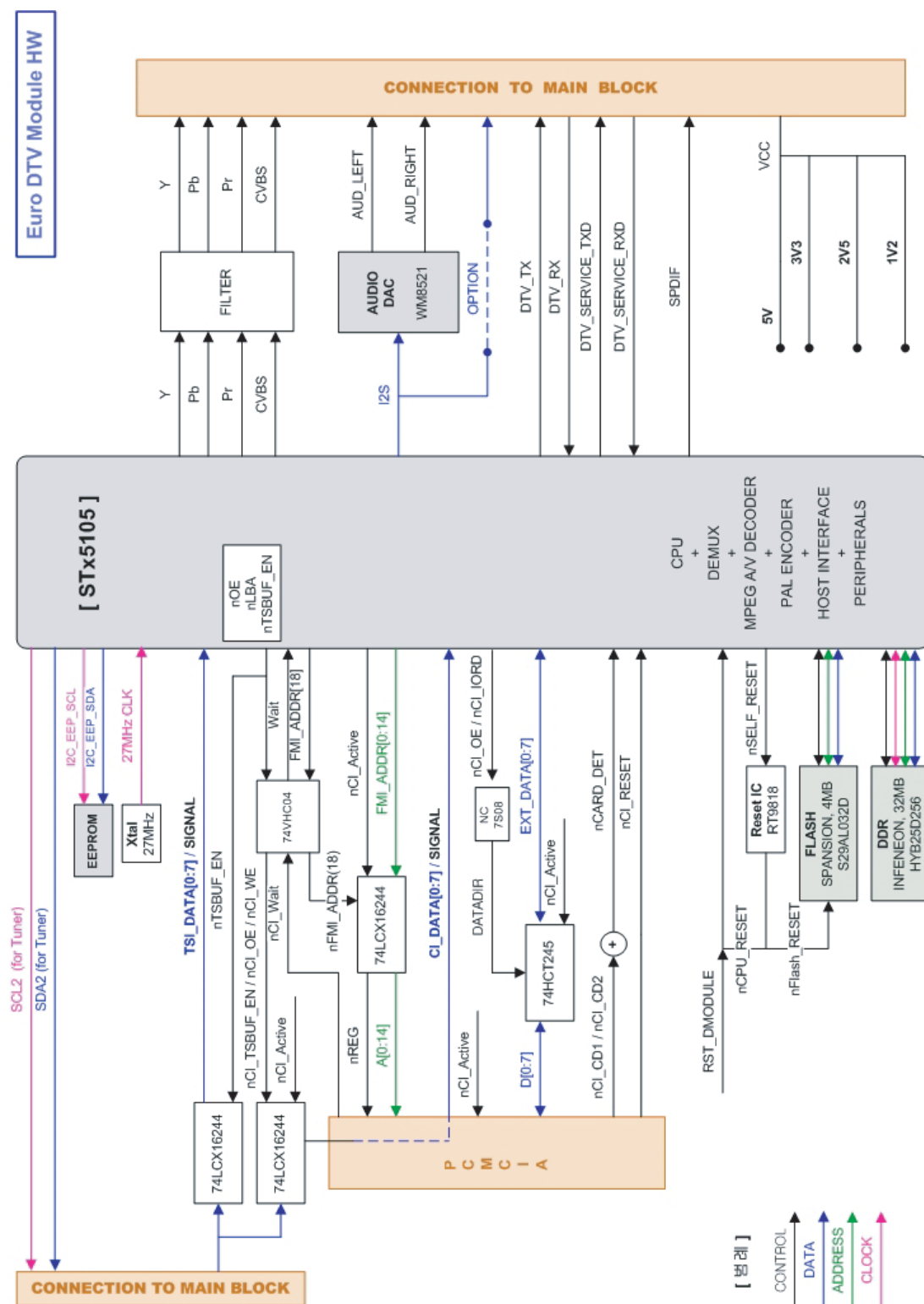


13 Circuit Descriptions

13-1 Main Signal Description



13-2 DTV Signal Description



13-3 RF/DTV Tuner (DNOS403MH261B(S)) SPEC.

1. Description

1-1 Receiving System : Designed to cover all bands in VHF and UHF including digital terrestrial(DVB-T) and hyper channels for CCIR system.

1-2 It built in COFDM-Demod IC & Analog Demod IC (PAL B/G, I, D/K, SECAM L/L')

1-3 Receiving Channel : 47MHz ~ 862MHz

1-4 Intermediate Frequency : Digital(center) 36.167 MHz, Analog(picture) 38.9MHz

1-5 Input Impedance : 75Ω, Unbalanced.

1-6 Terminals name and function

Pin No	Connection	Remark	Pin No	Connection	Remark
1	LNA 9V	Only Analog part	15	N.C	
2	RF AGC		16	SYNC	
3	5V		17	VALID	
4	AFT		18	MD7	MPEG data output7
5	30V		19	MD6	MPEG data output6
6	N.C (AS)		20	MD5	MPEG data output5
7	RESET	Initial power-up, Reset need Low status $\leq 50\text{mS}$	21	MD4	MPEG data output4
8	ERROR		22	MD4	MPEG data output3
9	VIDEO OUT		23	MD2	MPEG data output2
10	N.C		24	MD1	MPEG data output1
11	SIF OUT		25	MD0	MPEG data output0
12	3.3V		26	MPEG CLK	
13	GND		27	SDA	
14	N.C		28	SCL	

2. Mechanical Characteristics

2-1 Dimensions : refer Fig1

2-2 Weight : 60g

2-3 RF input : DIN jack(female)

2-4 Holding Strength of Ant jack.

Initial Inserting Force : 5.0kg max.

Extracting Force After 5 Cycles : 0.7kg min.

2-5 Terminal Strength

The terminal shall not withdraw to the inside
when a force of 1.0Kgf(9.8N) is applied to the end.

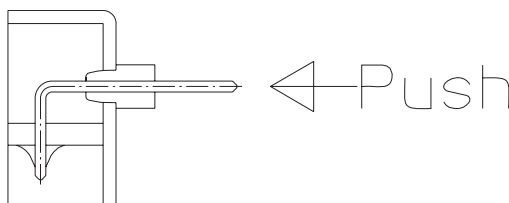


Fig - 2

3. General Characteristics

3-1 Temperature Range

Storage Temperature : -20°C ~ +80°C

Operation Temperature : 0°C ~ +65°C

3-2 Test conditions : All data hold under following conditions

T(amb.) : +25±2°C / Humidity : 45 ~ 65 % RH

Supply voltage(5V) : +5V ± 2%

Supply voltage(9V) : +9V ± 2%

Tuning voltage (BT) : +30V ± 2%

Supply voltage(3.3V) : +3.3V ± 2%

3-3 Current Consumption

Supply Voltage (5V) : Typ 210mA, Max 240mA

Supply Voltage (9V) : Typ 40mA, Max 70mA

Tuning Voltage(30V) : Max 2mA

Supply Voltage(3.3V) : Max 240mA Max 260mA

4. Electrical Characteristics (RF block & Digital Demodulation)

4-1 Input Frequency Range

Analog VHF-Low Band : 48.25MHz ~ 168.25MHz

VHF-High Band : 175.25MHz ~ 463.25MHz

UHF Band : 471.25MHz ~ 855.25MHz

DVB-T VHF-High Band : 174(177.5)MHz ~ 230(226.5)MHz

UHF Band : 470(474)MHz ~ 862(858)MHz

4-2 Input Signal Level : -80dBm ~ -10dBm (AveragePower, 64QAM, 2/3CR)

4-3 Voltage Gain

1st IF : 40dB typ. 38dBmin.

4-4 Noise Figure

1st IF : 4.5dB typ. 6.5dB max. (at max. gain)

4-5 OFDM-Demod IC : MT5131 (produced by MediaTek)

4-6 Input Impedance : 75Ω

4-7 RF Input/Output Return Loss : -8dB typ. -6dB min.

4-8 IF Frequency

1) Digital center frequency : 36.125MHz

2) Analog (PAL B/G, I, D/K, SECAM L/L')

Picture intermediate frequency :

38.9MHz(PAL B/G & SECAM L), 33.9MHz(SECAM L')

Sound intermedate frequency :

33.4MHz(B/G), 32.9MHz(I), 32.4MHz(D/K,SECAM L), 40.4MHz(SECAM L')

4-9 Spurious Signals at Input Terminal

Local Oscillator Leakage : 46dBuV max.

4-10 Reference Frequency

The X-tal for the RF block's PLL : 4MHz

4-11 Phase Noise (step frequency 166.67kHz for digital)

@ 1kHz : -84dBc/Hz typ. -75dBc/Hz max.

@ 10kHz : -90dBc/Hz typ. -80dBc/Hz max.

4-12 Control Data Bus : I²C

4-13 Control Data Format : refer 5 section

4-14 Image PAL Interference Protection Ratio

: -49dB typ. -46dB min (at 2K, 8K mode) Note1.

4-15 Adjacent PAL Interference Protection Ratio. (N ± 1 channel)

: -38dB typ. -35dB min (at 2K, 8K mode) Note1.

4-16 Adjacent DVB-T Interference Protection Ratio. (N ± 1 channel)

: -33dB typ. -30dB min (at 2K, 8K mode) Note1.

4-17 Co-Channel PAL Interference Ratio.

: +1dB typ. +4dB min (at 2K, 8K mode) Note1.

◆ Note1 :

Desire input signal condition

a : Modulation - 64QAM

b : Guard Interval - 1/32

c : Puncture Rate - 2/3

Undesired input signal condition :

PAL : Video 75% color bars

FM sound : 1kHz tone (P/S : 13dB, ± 50kHz deviation, freq. P/S : 6.0MHz)

※ Adjacent & Image channel PAL interference test procedure

a. Turn DVB-T source off ; adjust PAL PSP level to -25dBm

b. Turn PAL off ; turn DVB-T on

c. Adjust DVB-T to -25dBm

d. Turn PAL on and increase step PAL level to see the pixelation on the screen

e. Note protection ratio as the difference value between DVB-T and PAL's level

※ Co-Channel PAL interference test procedure

a. Turn PAL source off ; adjust DVB-T level to -50dBm

b. Turn DVB-T off ; turn PAL on

c. Adjust PAL to -50dBm

d. Turn DVB-T on and increase step attenuator in PAL channel until QEF.

4-18 Input Carrier to Noise (Additive White Gaussian Noise, QEF. Condition)

: 17.4dB typ. 18.4dB max. (64QAM, 2K,8K Mode, Code rate:2/3, input level:-50dBm)

: 22.5dB typ. 23.5dB max. (64QAM, 2K,8K Mode, Code rate:7/8, input level:-50dBm)

4-19 Sensitivity (QEF. Condition)

: -80dBm typ. -78.5dBm max.(64QAM, 2K,8K Mode, Code rate:2/3,Guard Interval 1/32)

: -76dBm typ. -74.7dBm max.(64QAM, 2K,8K Mode, Code rate:7/8,Guard Interval 1/32)

4-20 Multipath channel Interference (64QAM, 2K, 2/3code rate, 1/32G.I)

4-21 C(N+1) Performance in Single Frequency Networks outside the guard interval

- NorDig Unified Test Specification, ver 1.0 (Task 3.28)

13 Circuit Descriptions

short echo : 20.5dB max

Pin No	Delay(us)	Relative Attenuation(dB)
1	0	2.8
2	0.05	0
3	0.4	3.8
4	1.45	0.1
5	2.3	2.6
6	2.8	1.3

long echo : 21.5dB max

Pin No	Delay(us)	Relative Attenuation(dB)
1	0	0
2	5	9
3	14	22
4	35	25
5	54	27
6	75	28

short delay parameter

long delay parameter

4-22 Performance in Time-Varying Channels

- NorDig Unified Test Specification, ver 1.0 (Task 3.25)

Mode	0dB echo delay[us]	Frequency Separation [Hz]	C/N[dB]
{8K, 64-QAM, R=3/4, $\Delta/T_u=1/4$ }	20us	0Hz	Max 29.5
{8K, 64-QAM, R=3/4, $\Delta/T_u=1/4$ }	20us	1Hz	
{8K, 64-QAM, R=3/4, $\Delta/T_u=1/4$ }	20us	5Hz	
{8K, 64-QAM, R=3/4, $\Delta/T_u=1/4$ }	20us	10Hz	
{8K, 64-QAM, R=3/4, $\Delta/T_u=1/4$ }	20us	15Hz	
{8K, 64-QAM, R=3/4, $\Delta/T_u=1/4$ }	20us	20Hz	

4-23 C(N+1) Performance in Single Frequency Networks for more than one echo

- NorDig Unified Test Specification, ver 1.0 (Task 3.26)

8K, 64-QAM, R=3/4, $\Delta/T_0=1/4$						
Main Path		Pre echo		Post echo		C/N[dB]
Att[dB]	Delay[dB]	Att[dB]	Delay[dB]	Att[dB]	Delay[dB]	
0	0	0	-100	0	100	Max 26.5
0	0	3	-100	3	100	
0	0	6	-100	6	100	
0	0	9	-100	9	100	
0	0	12	-100	12	100	
0	0	15	-100	15	100	
0	0	18	-100	18	100	
0	0	21	-100	21	100	
0	0	15	-100	0	100	
0	0	15	-100	3	100	
0	0	15	-100	6	100	
0	0	15	-100	9	100	
0	0	15	-100	12	100	
0	0	15	-100	18	100	
0	0	15	-100	21	100	
0	0	0	-100	15	100	
0	0	3	-100	15	100	
0	0	6	-100	15	100	
0	0	9	-100	15	100	
0	0	12	-100	15	100	
0	0	18	-100	15	100	
0	0	21	-100	15	100	

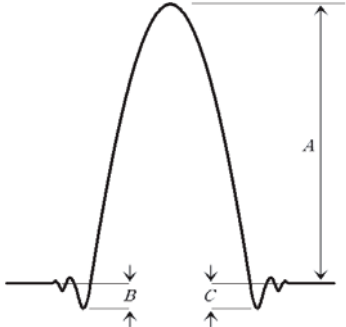
Delay(us)	Echo attenuation in dB relative reference									
	-260	-230	-200	-150	-120	120	150	200	230	260
Mode										
8K, 64-QAM, R=2/3, $\Delta/T_U=1/8$	15	-	13	10	5	5	10	13	-	15
8K, 64-QAM, R=2/3, $\Delta/T_U=1/4$	10	5	n/a	n/a	n/a	n/a	n/a	n/a	5	10
8K, 64-QAM, R=3/4, $\Delta/T_U=1/4$	12	6	n/a	n/a	n/a	n/a	n/a	n/a	6	12

5. Electrical Characteristics (Analog Demodulation)

5-1 PIF characteristics

Parameter		Specification			Unit	Remark
		Min.	Typ.	Max.		
Video Output Level		0.95	1.0	1.05	Vp-p	*Input level : 70dBuV *PAL : 87.5% mod. *75 Ω Terminated
Luminance S/N Ratio		45	47	-	dB	*Input level : VHF 70dBuV UHF 70dBuV *HPF : 100kHz *LPF : 5MHz, SC trap : ON *100% white signal (0.7Vp-p) *PAL : 87.5% mod. *Weight : OFF
Sensitivity	VHF	-	41	43	dBuV	S/N = 30dB, LNA ON HPF : 100kHz LPF : 5MHz, SC trap : ON 100% white signal PAL : 87.5% mod.
	UHF	-	43	45		
Chroma Distortion	DP	-8	3	+8	Deg	*Input level : 70dBuV *10 stair step *PAL : 87.5% mod.
	DG	-8	3	+8	%	
Y/C Delay		-120	0	50	nsec	Y is reference(B/G MODE)
Video Frequency Response						
	1.0MHz	-1.0	0	+1.5	dB	*Input level : 70dBuV *Vedio Signal - PAL : 87.5 %, AM MOD - Muli - Burst Signal
PAL	2.0MHz	-1.5	0	+2.0		
SECAM L	3.0MHz	-2.5	0	+2.5		
	4.0MHz	-3.0	0	+3.0		
	4.43MHz	-4.0	-1.5	+3.0		
Video Frequency Response						
	1.0MHz	-1.0	0	+1.5	dB	*Input level : 70dBuV *Vedio Signal - SECAM : 95 %, AM MOD - Muli - Burst Signal
SECAM L'	2.0MHz	-1.5	0	+2.0		
	3.0MHz	-2.5	0	+2.5		
	4.0MHz	-3.0	0	+3.0		
	4.43MHz	-4.0	-2.5	+3.0		
BURST LEVEL		240	300	360	mV	*Input level : 70dBuV *Vedio Signal - PAL : 87.5 %, AM MOD (Standard Color Bar Signal)

13 Circuit Descriptions

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
Ringin g & S hoot		5	8	%	<p>Input Signal : 2T-Pulse or Dot&cross (B/G mode)</p> <p>Shoot Tolerance(Pre & Over) :</p> $\text{Shoot(max)} \leq \frac{(A \times 8)}{100}$ <p>Bilateral Symmetry : Typical Balanced</p> 

5-2 AFT Characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
AFT Alignment Accuracy	+50	0	-50	KH z	<p>Alignment center : 2.5V</p> <p>IF input level : 90dBuV</p> <p>P/S = -10dB</p> <p>Standard color bar :87.5% mod.</p>

5-3 Audio characteristics

Parameter	Specification			Unit	Remark
	Min	Typ	Max		
SIF OUT Level	70	90		dBuV	Standard color bar 87.5% mod.
	200	400		mVp-p	Standard color bar 87.5% mod.

13-4 DTV MAIN ChipSet

13-5-1 STx5105 SPEC.

Enhanced ST20 32-bit VL-RISC CPU

- 200 MHz, single cycle cache/4 Kbyte instruction cache,/ 4 Kbyte data cache, 2 Kbyte SRAM

Unified memory interface

- Up to 133 MHz, 16-bit wide DDR SDRAM interface

Programmable flash memory interface

- 4 separately configurable banks, 8/16-bits wide
- SRAM, peripheral, Flash, SFlash™ support
- Support for low cost DVB-CI

Programmable transport interface (PTI)

- Single transport stream input
- Support for DVB transport streams
- Integrated DVB, ICAM descramblers

MPEG-2 MP@ML video decoder

- Fully programmable horizontal and vertical SRCs

Graphics/display

- 4 display planes
- 8 bpp CLUT graphics, 256 x 30 bits (AYCbCr) CLUT entries. 16 bpp true color graphics, RGB565, ARGB1555, ARGB4444 formats. Link-list control
- Alpha blending, antialiasing, antialiasing, antiflicker filters
- 2D paced blitter engine with fill function
- Blitter based display compositor

PAL/NTSC/SECAM encoder

- RGB, CVBS, Y/C and YUV outputs with four 10-bit DAC outputs. RGB/CVBS or YUV/CVBS or YC/CVBS.
- Encoding of CGMS, Teletext, WSS, VPS, close caption

Audio subsystem

- MPEG-1 layers I/II
- Simultaneous MPEG audio decode and output of Dolby streams on S/PDIF
- IEC958/IEC1937 digital audio output interface
- Integrated stereo audio DAC system

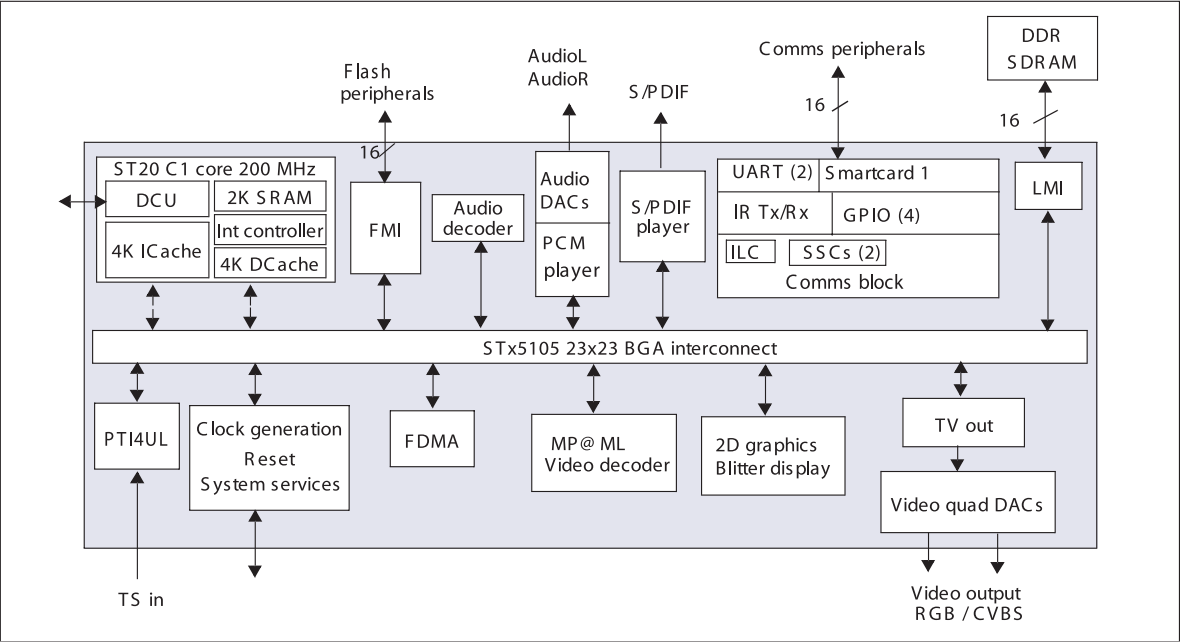
Central DMA controller

On-chip peripherals

- Two ASCs (UARTs) with Tx and Rx FIFOs
- Three 8-bit banks of parallel I/O and one 7-bit bank
- One smartcard interface and clock generator
- Two SSCs for I²C/SPI master/slave interfaces
- Infrared transmitter/receiver
- Integrated VCXO
- Low-power / RTC / watchdog controller

JTAG/TAP interface

Package 23 x 23 PBGA



13-4-3 S29AL032D(Flash Memory) SPEC.

Distinctive Characteristics

Architectural Advantages

- **Single power supply operation**
 - Full voltage range: 2.7 to 3.6 volt read and write operations for battery-powered applications
- **Manufactured on 200-nm process technology**
 - Fully compatible with 0.23 μm Am29LV320D, 0.32 μm Am29LV033C, and 0.33 μm MBM29LV320E devices
- **Flexible sector architecture**
 - Boot sector models: Eight 8-Kbyte sectors; sixty-three 64-Kbyte sectors; top or bottom boot block configurations available
 - Uniform sector models: Sixty-four 64-Kbyte sectors
- **Sector Protection features**
 - A hardware method of locking a sector to prevent any program or erase operations within that sector
 - Sectors can be locked in-system or via programming equipment
 - Temporary Sector Unprotect feature allows code changes in previously locked sectors
- **Unlock Bypass Program Command**
 - Reduces overall programming time when issuing multiple program command sequences
- **Secured Silicon Sector**
 - 128-word sector for permanent, secure identification through an 8-word random Electronic Serial Number
 - May be programmed and locked at the factory or by the customer
 - Accessible through a command sequence
- **Compatibility with JEDEC standards**
 - Pinout and software compatible with single-power supply Flash
 - Superior inadvertent write protection

Package Options

- **48-ball FBGA**
- **48-pin TSOP**
- **40-pin TSOP**

Performance Characteristics

- **High performance**
 - Access times as fast as 70 ns

- **Ultra low power consumption (typical values at 5 MHz)**
 - 200 nA Automatic Sleep mode current
 - 200 nA standby mode current
 - 9 mA read current
 - 20 mA program/erase current
- **Cycling endurance: 1,000,000 cycles per sector typical**
- **Data retention: 20 years typical**

Software Features

- **CFI (Common Flash Interface) compliant**
 - Provides device-specific information to the system, allowing host software to easily reconfigure for different Flash devices
- **Erase Suspend/Erase Resume**
 - Suspends an erase operation to read data from, or program data to, a sector that is not being erased, then resumes the erase operation
- **Data# Polling and toggle bits**
 - Provides a software method of detecting program or erase operation completion
 - Unlock Bypass Program Command
Reduces overall programming time when issuing multiple program command sequences

Hardware Features

- **Ready/Busy# pin (RY/BY#)**
 - Provides a hardware method of detecting program or erase cycle completion
- **Hardware reset pin (RESET#)**
 - Hardware method to reset the device to reading array data
- **WP#/ACC input pin**
 - Write protect (WP#) function allows protection of two outermost boot sectors (boot sector models only), regardless of sector protect status
 - Acceleration (ACC) function provides accelerated program times

Memo