



MB140 IDTV SERVICE MANUAL

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1. INTRODUCTION

17MB140R3 main board is driven by MStar SOC. This IC is a single chip iDTV solution that supports channel decoding, MPEG decoding, and media-center functionality enabled by a high performance AV CODEC and CPU.

Key features include:

- Combo Front-End Demodulator
- A multi standart A/V format decoder
- The MACEpro video processor
- Home theatre sound processor
- Rich internet connectivity and completed digital home network solution
- Dual-stream decoder for 3D contents
- Multi-purpose CPU for OS and multimedia
- Peripheral and power management
- Embedded DRAM

Supported peripherals are:

- 1 RF input VHF I, VHF III, UHF
- 1 Satellite input
- 1 Side AV (CVBS, R/L_Audio)
- 1 SCART socket(Common)
- 1 PC input(Common)
- 3 HDMI input
- 1 Common interface(Common)
- 1 Optic/ Coax S/PDIF output
- 1 Headphone(Common)
- 2 USB(1x common, 1x optional)
- 1 Ethernet-RJ45
- 1 External Touchpad/Keyboard/Magic Button
- 1 DVD(Optional)

2. T/T2/C/A TUNER (U15)

Description

The Si2151 is Silicon Labs' sixth-generation hybrid TV tuner supporting all worldwide terrestrial and cable TV standards. Requiring no external balun, SAW filters, wirewound inductors or LNAs, the Si2151 offers the lowest-cost BOM for a hybrid TV tuner. Also included are an integrated power-on reset circuit and an option for single power supply operation. As with prior-generation Silicon Labs TV tuners, the Si2151 maintains very high linearity and low noise to deliver superior picture quality and a higher number of received stations when compared to other silicon tuners. The Si2151 offers increased immunity to WiFi and LTE interference, eliminating the need for external filtering. For the best performance with next-generation digital TV standards, such as DVB-T2/C2, the Si2151 delivers industry-leading phase noise performance.

Features

- Worldwide hybrid TV tuner
 - Analog TV: NTSC, PAL/SECAM
 - Digital TV: ATSC/QAM, DVB-T2/T/C2/C, ISDB-T/C, DTMB
 - 1.7 MHz, 6MHz, 7MHz, 8MHz and 10MHz channel bandwidths
 - 42-1002 MHz frequency range
- Industry-leading margin to A/74, NorDig, DTG, ARIB, EN55020, OpenCable™, DTMB
- Lowest BOM for a hybrid TV tuner
 - No balun, SAW filters, or external inductors required
 - Increased ESD protection on 4pins
- Best-in-class real-world reception
 - Lowest phase noise
 - High Wi-Fi and LTE immunity
- Low power consumption
 - 3.3 V and 1.8 V power supplies
 - Integrated 1.8 V LDO for 3.3 V single-supply operation
- Integrated power-on reset circuit
- Standard CMOS process
- 3x3 mm, 24-pin QFN package
- RoHS compliant

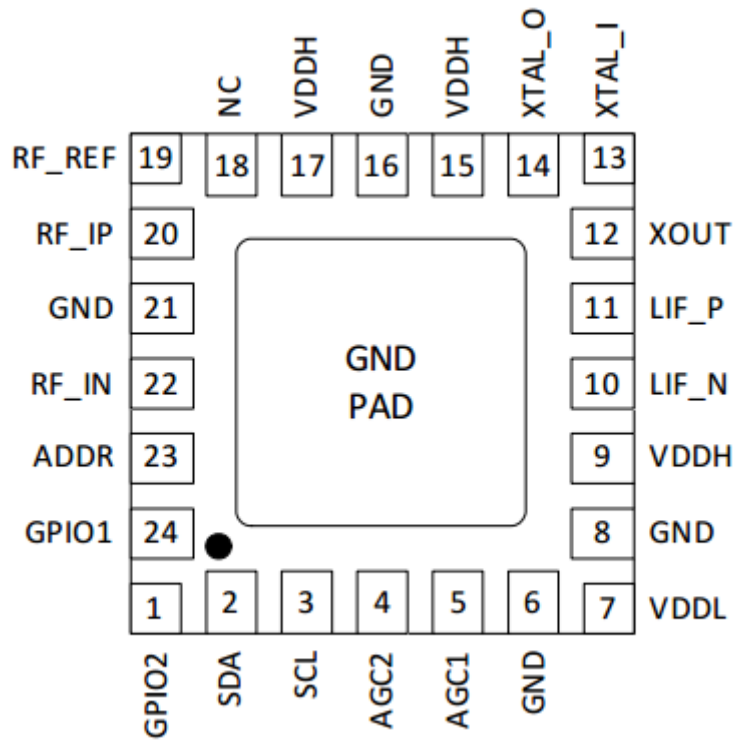


Figure: Pin description

Pin Number(s)	Name	I/O
1*	GPIO2	I/O
2	SDA	I/O
3	SCL	I
4*	AGC2	I
5*	AGC1	I
6	GND	S
7	VDDL	S
8	GND	S
9	VDDH	S
10	LIF_N	O
11*	LIF_P	O
12	XOUT	O

13	XTAL_I	I
14	XTAL_O	O
15	VDDH	S
16	GND	S
17	VDDH	S
18*	NC	NC
19	RF_REF	O
20	RF_IP	I
21	GND	S
22	RF_IN	I
23	ADDR	I
24*	GPIO1	I/O

*Note: Pin should be left floating if unused.

Table: Pin functions

3. S/S2 TUNER & DEMODULATOR (U16) OPTIONAL

Description

The M88TS2022 is a single-chip, direct-conversion tuner for digital satellite receiver applications. It offers the industry's most integrated solution to a satellite tuner function, simplifying the front-end designs. The device also provides an RF bypass output for driving a second tuner module.

This device incorporates the following functional blocks on a single chip: an LNA, quadrature down-converting mixers, a low phase noise and fast locking frequency synthesizer with on-chip loop filters, a DC offset cancellation loop with integrated loop filters, self calibrated programmable baseband channel filters, an integrated RF AGC loop, and crystal oscillators with an integrated auxiliary clock output.

As a result of integrating all the blocks, the M88TS2022 has the least number of pins compared with other conventional solutions, and requires the least external components. In typical applications, the M88TS2022 requires only one crystal, one bypass capacitor, one matching network, and a few external resistors. The device also has the industry's smallest latency, as it uses a fast locking PLL and a fast settling DC offset cancellation architecture.

The M88TS2022 can be configured via a 2-wire serial bus. The chip is available in a 28-pin QFN package.

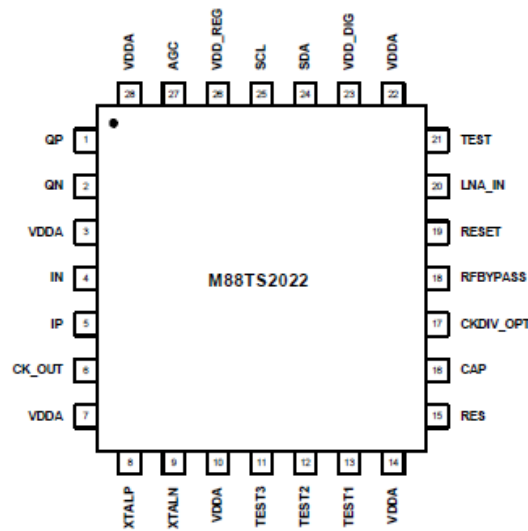


Figure : Pin Description

Features

- Single-Chip tuner
- Compliant with DVB-S2 and ABS-S standards
- Support PSK, (PSK and 16APSK)
- Direct-conversion from L-band to baseband
- Symbol rate:1 to 45 Msymbol/s
- Integrated VCOs and PLL, with on-chip inductors varactors and loop filter
- Integrated RF AGC for optimal performance
- Integrated baseband DC offset cancellation removes external loop filters
- Excellent immunity to strong adjacent undersired channels
- Integrated clock driver provides auxiliary divided clock output for other devices
- Selectable RF bypass
- Support sleep mode
- 2-wire serial bus with 3.3V compatible logic levels
- Power supply+3.3V
- 28-pin QFN package
- RoSH compliant

4. AUDIO AMPLIFIER STAGES

A. MAIN AMPLIFIER (U6)(6-8-10 W OPTION)

Description

The AD52060 is a high efficiency stereo class-D audio amplifier with adjustable power limit function. The loudspeaker driver operates from 8V~26V supply voltage. It can deliver 20W/CH output power into 8 Ω loudspeaker within 1% THD+N at 24V supply voltage and without external heat sink when playing music.

AD52060 provides parallel BTL (Mono) application, and it can deliver 40W into 4 Ω loudspeaker at 24V supply voltage. The adjustable power limit function allows users to set a voltage rail lower than half of 5V to limit the amount of current through the speaker.

Output DC detection prevents speaker damage from long-time current stress. AD52060 provides superior EMC performance for filter-free application. The output short circuit and over temperature protection include auto-recovery feature.

Features

- Single supply voltage
 - 8V~26V for loudspeaker driver
 - Built-in LDO output 5V for others
- Loudspeaker power from 24V supply
 - BTL Mode: 20W/CH into 8 Ω @<1% THD+N
 - PBTL Mode: 40W/CH into 4 Ω @<10% THD+N
- Loudspeaker power from 12V supply
 - BTL Mode: 10W/CH into 8 Ω @<10% THD+N
- 88% efficient Class-D operation eliminates need for heat sink
- Differential inputs
- Four selectable, fixed gain settings
- Internal oscillator
- Short-Circuit protection with auto recovery option
- Under-Voltage detection
- Over-Voltage protection
- Pop noise and click noise reduction
- Adjustable power limit function for speaker protection
- Output DC detection for speaker protection
- Filter-Free operation

- Over temperature protection with auto recovery
- Superior EMC performance
- TV audio
- Boom-Box
- Powered speaker
- Monitors
- Consumer Audio Equipment

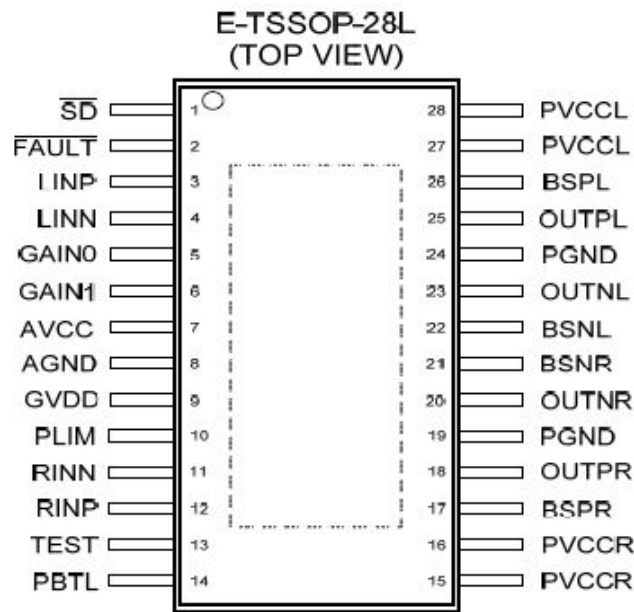


Figure: Pin Assignments

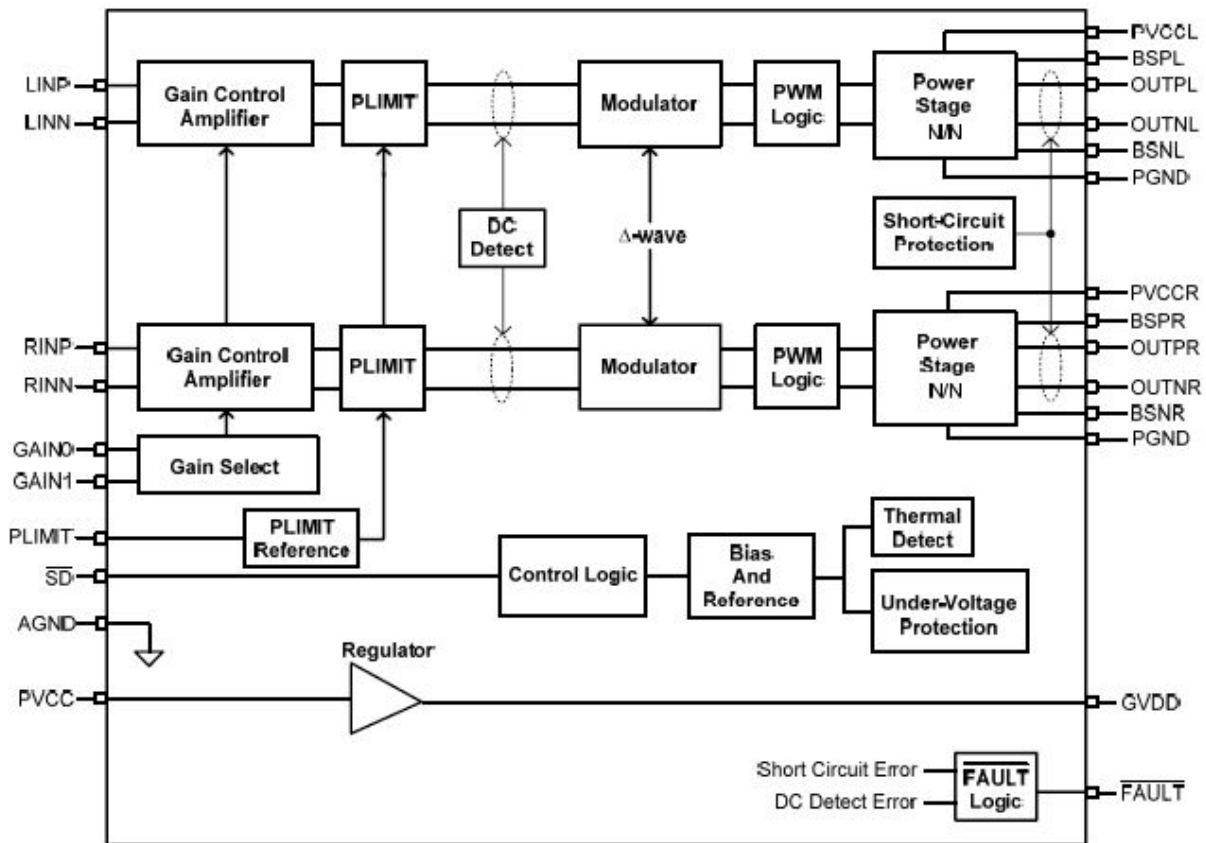


Figure: Functional Block Diagram

Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device.

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	MAX	UNIT
PVCC	Supply voltage	PVCC _L , PVCC _R	-0.3	30	V
V _i	Interface pin voltage	\overline{SD} , GAIN0, GAIN1, PBTL, \overline{FAULT} , PLIMIT	-0.3	30	V
T _A	Operating free-air temperature range		-40	85	°C
T _J	Operating junction temperature range		-40	150	°C
T _{stg}	Storage temperature range		-65	150	°C
R _L	Minimum Load Resistance	BTL: PVCC > 13V	4.8		Ω
		BTL: PVCC ≤ 13V	3.2		Ω
		PBTL	3.2		Ω

Table: Absolute Maximum Ratings

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	MAX	UNIT
PVCC	Supply voltage	AVCC, PVCCCL, PVCCR	8	26	V
V _{IH}	High-level input voltage	SD, GAIN0, GAIN1, PBTL	2		V
V _{IL}	Low-level input voltage	SD, GAIN0, GAIN1, PBTL		0.8	V
V _{OL}	Low-level output voltage	FAULT, R _{PULL-UP} =100k, V _{CC} =16V		0.8	V
I _{IH}	High-level input current	SD, GAIN0, GAIN1, PBTL, V _I =2V, V _{CC} =18V		50	μA
I _{IL}	Low-level input current	SD, GAIN0, GAIN1, PBTL, V _I =0.8V, V _{CC} =18V		5	μA
I _{OH}	High-level output current	V _I =2V, V _{CC} =18V		50	μA
I _{OL}	Low-level output current	V _I =0.8V, V _{CC} =18V		50	μA
T _A	Operating free-air		-40	85	°C

Table: Recommended Operating Conditions

B. MAIN AMPLIFIER (U7)(2.5 W OPTION)

Description

The AD52010 is a 3.0W stereo, filter-less class-D audio amplifier. Operating with 5.0V loudspeaker driver supply, it can deliver 3.0W output power into 4 ohm loudspeaker within 10% THD+N or 2.6W at 1% THD+N. The AD52010 is a stereo audio amplifier with high efficiency and suitable for the notebook computer, and portable multimedia device.

Features

- Supply voltage range: 2.5 V to 5.5 V
- Support single-ended or differential analog input
- Low Quiescent Current
- Low Output Noise
- Low shut-down current
- Short power-on transient time
- Internal pull-low resistor on shut-down pins
- Short-circuit protection
- Over-temperature protection
- Loudspeaker power within 10% THD+N
 - 1.78W/ch into 8 ohm loudspeaker
 - >3W/ch into 4 ohm loudspeaker
- Loudspeaker efficiency

- 93% @ 8 ohm, THD+N=10%
- 85% @ 4 ohm, THD+N=10%
- E-TSSOP-14L package
- Integrated Feedback Resistor of 300kW

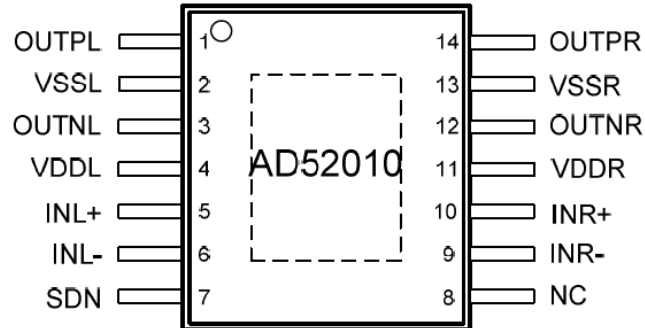


Figure: Pin description

NAME	PIN	IO TYPE	DESCRIPTION
	E-TSSOP-14		
OUTPL	1	O	Positive output for left channel.
VSSL	2	G	Power ground for left channel.
OUTNL	3	O	Negative output for left channel.
VDDL	4	P	Power supply for left channel.
INL+	5	I	Positive differential input for left channel.
INL-	6	I	Negative differential input for left channel.
SDN	7	I	Shutdown AD52010 (Low active logic).
NC	8	NC	No internal connected.
INR-	9	I	Negative differential input for right channel.
INR+	10	I	Positive differential input for right channel.
VDDR	11	P	Power supply for right channel.
OUTNR	12	O	Negative output for right channel.
VSSR	13	G	Power ground for right channel.
OUTPR	14	O	Positive output for right channel.
Thermal pad	N/A	G	To connect the package exposed pad to PCB for thermal power dissipation.

Table:Pin functions

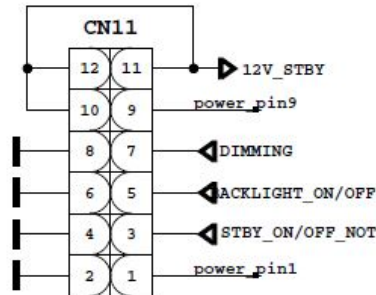
SYMBOL	PARAMETER	MIN	MAX	UNIT
VDD	Supply for analog cells & loudspeaker driver	2.5	5.5	V
V _{IH}	High-Level Input Voltage	1.3	-	V
V _{IL}	Low-Level Input Voltage	-	0.35	V
T _J	Junction operating temperature	-40	125	°C
T _a	Ambient Operating Temperature	-40	85	°C

Table: Recommended operating conditions

5. POWER STAGE

Power socket is used for taking voltages which are 12V_stby and 24V (VDD_Audio for 10W option). These voltages are produced in power card. Also socket is used for giving dimming, backlight and stand-by signals with power card. It is shown in figure.

W/B2B



W/B2CABLE

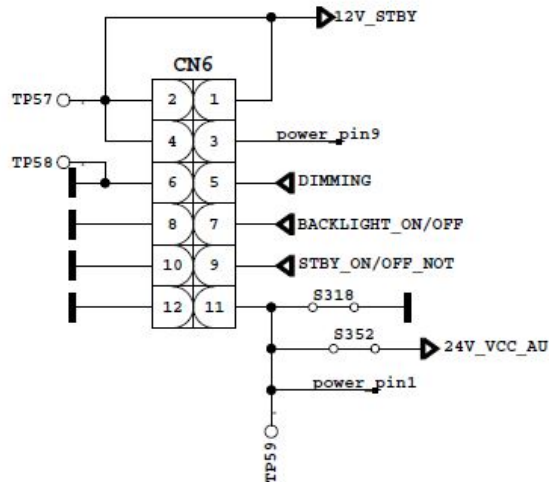
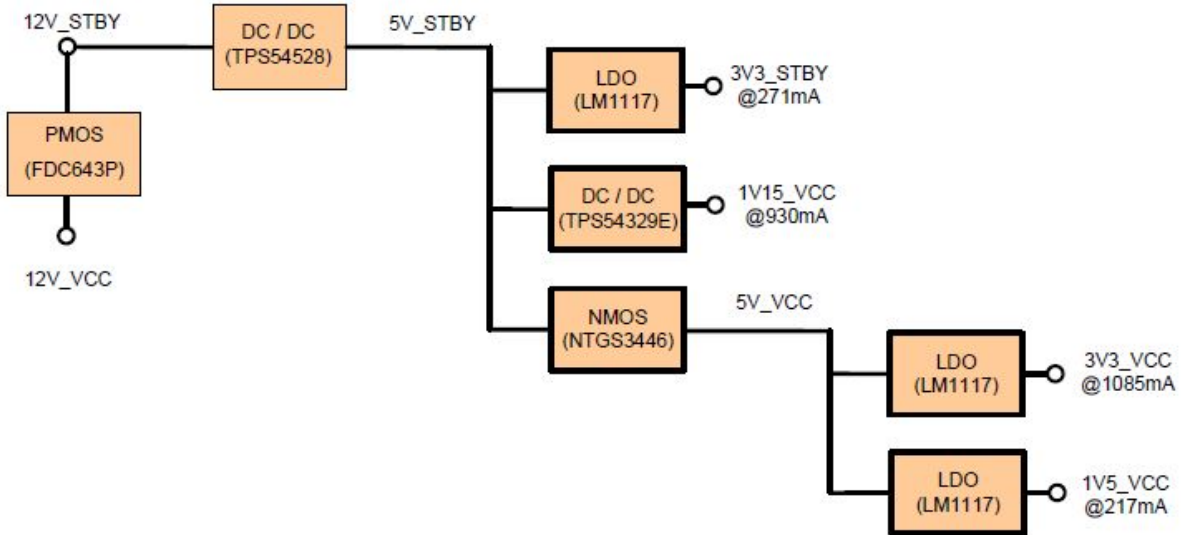
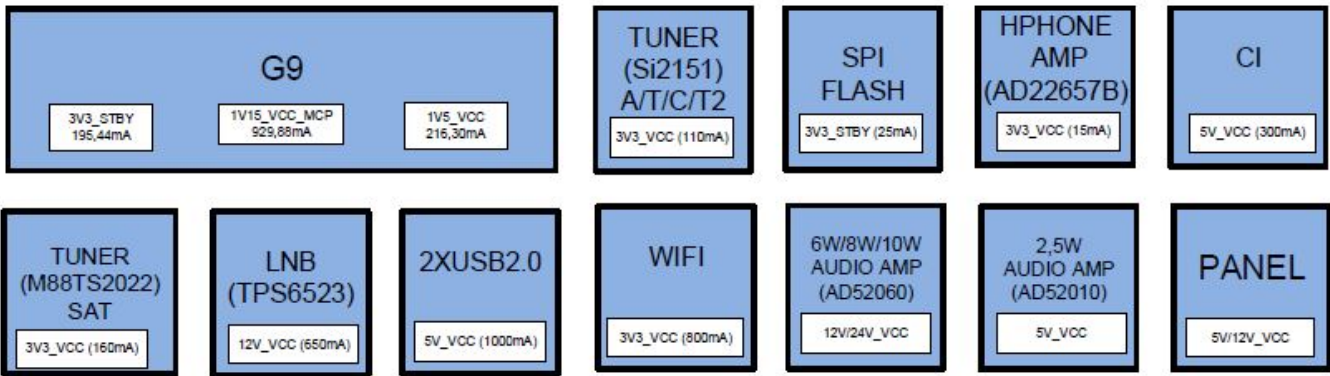


Figure: Power socket and power options



List of the components are:

- NTGS3446
- FDC642P
- TPS54528
- TPS54329E
- LM1117

Description and Features

Single P-Channel 2.5V Specified PowerTrench[®] MOSFET
-20 V, -4.0 A, 65 mΩ

Features

- Max $r_{DS(on)}$ = 65 mΩ at $V_{GS} = -4.5$ V, $I_D = -4.0$ A
- Max $r_{DS(on)}$ = 100 mΩ at $V_{GS} = -2.5$ V, $I_D = -3.2$ A
- Fast switching speed
- Low gate charge (11nC typical)
- High performance trench technology for extremely low $r_{DS(on)}$
- SuperSOT[™]-6 package: small footprint (72% smaller than standard SO-8); low profile (1 mm thick)
- Termination is Lead-free and RoHS Compliant

General Description

This P-Channel 2.5V specified MOSFET is produced using Fairchild's advanced PowerTrench[®] process that has been especially tailored to minimize on-state resistance and yet maintain low gate charge for superior switching performance.

These devices have been designed to offer exceptional power dissipation in a very small footprint for applications where the larger packages are impractical.

Applications

- Load switch
- Battery protection
- Power management

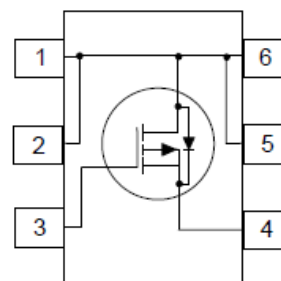
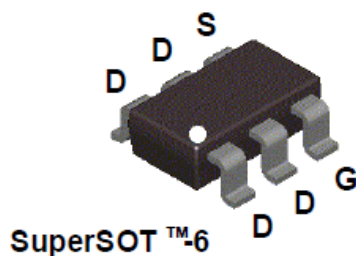


Figure: Pin description

NGTS3446

Features

- Ultra Low RDS(ON)
- Higher Efficiency Extending Battery Life
- Logic Level Gate Drive
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- IDSS Specified at Elevated Temperature
- Pb-Free Package is Available

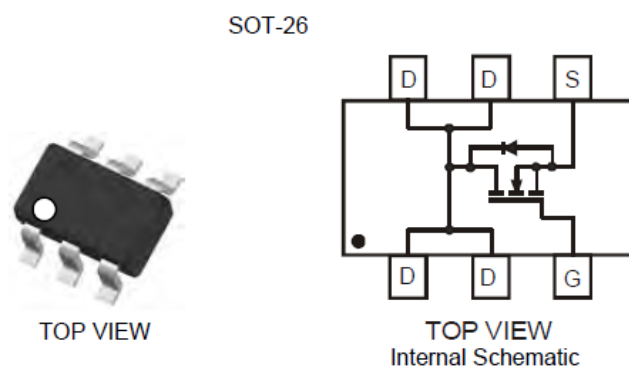


Figure: Pin description

TPS54528

Description

The TPS54528 is an adaptive on-time D-CAP2™ mode synchronous buck converter. The TPS54528 enables system designers to complete the suite of various end-equipment power bus regulators with a cost effective, low component count, low standby current solution. The main control loop for the TPS54528 uses the D-CAP2™ mode control that provides a fast transient response with no external compensation components. The adaptive on-time control supports seamless transition between PWM mode at higher load conditions and Eco-mode™ operation at light loads. Eco-mode™ allows the TPS54528 to maintain high efficiency during lighter load conditions. The TPS54528 also has a proprietary circuit that enables the device to adopt to both low equivalent series resistance (ESR) output capacitors, such as POSCAP or SP-CAP, and ultra-low ESR ceramic capacitors. The device operates from 4.5-V to 18-V VIN input. The output voltage can be programmed between 0.76 V and 6.0 V. The device also features an adjustable soft start time. The TPS54528 is available in the 8-pin DDA package, and designed to operate from -40 C to 85 C.

Features

- D-CAP2™ Mode Enables Fast Transient Response
- Low Output Ripple and Allows Ceramic Output Capacitor
- Wide VIN Input Voltage Range: 4.5 V to 18 V
- Output Voltage Range: 0.76 V to 6.0 V
- Highly Efficient Integrated FETs Optimized for Lower Duty Cycle Applications
 - 65 mΩ (High Side) and 36 mΩ (Low Side)
- High Efficiency, less than 10 μA at shutdown
- High Initial Bandgap Reference Accuracy
- Adjustable Soft Start
- Pre-Biased Soft Start
- 650-kHz Switching Frequency (f_{SW})
- Cycle By Cycle Over Current Limit
- Auto-Skip Eco-mode™ for High Efficiency at Light Load

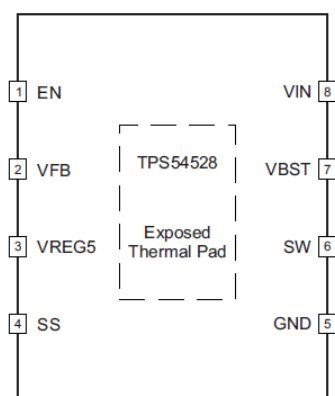


Figure: Pin description

PIN		DESCRIPTION
NAME	NO.	
EN	1	Enable input control. EN is active high and must be pulled up to enable the device.
VFB	2	Converter feedback input. Connect to output voltage with feedback resistor divider.
VREG5	3	5.5 V power supply output. A capacitor (typical 1 μF) should be connected to GND. VREG5 is not active when EN is low.
SS	4	Soft-start control. An external capacitor should be connected to GND.
GND	5	Ground pin. Power ground return for switching circuit. Connect sensitive SS and VFB returns to GND at a single point.
SW	6	Switch node connection between high-side NFET and low-side NFET.
VBST	7	Supply input for the high-side FET gate drive circuit. Connect 0.1μF capacitor between VBST and SW pins. An internal diode is connected between VREG5 and VBST.
VIN	8	Input voltage supply pin.
Exposed Thermal Pad	Back side	Thermal pad of the package. Must be soldered to achieve appropriate dissipation. Must be connected to GND.

Table: Pin functions

RT7278

Description

The RT7278 is a synchronous step down converter with Advanced Constant On-Time (ACOTTM) mode control. The ACOTTM provides a very fast transient response with few external components. The low impedance internal MOSFET supports high efficiency operation with wide input voltage range from 4.5V to 17V. The proprietary circuit of the RT7278 enables to support all ceramic capacitors. The output voltage can be adjustable between 0.8V and 8V. The soft-start is adjustable by an external capacitor.

Features

- ACOT™ Mode Enables Fast Transient Response
- 4.5V to 17V Input Voltage Range
- 3A Output Current
- 60mΩ Internal Low Side N-MOSFET
- Advanced Constant On-Time Control
- Support All Ceramic Capacitors
- Up to 95% Efficiency
- 700kHz Switching Frequency
- Adjustable Output Voltage from 0.8V to 8V
- Adjustable Soft-Start
- Cycle-by-Cycle Current Limit
- Input Under Voltage Lockout
- Thermal Shutdown Protection
- RoHS Compliant and Halogen Free

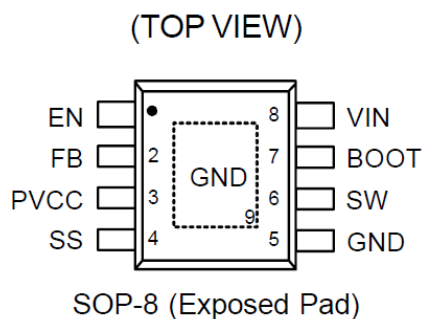


Figure: Pin description

Pin No.		Pin Name	Pin Function
SOP-8 (Exposed Pad)	WDFN-10L 3x3		
1	1	EN	Enable Input. A logic-high enables the converter; a logic-low forces the IC into shutdown mode reducing the supply current to less than 10 μ A.
2	2	FB	Feedback Input. It is used to regulate the output of the converter to a set value via an external resistive voltage divider. The feedback reference voltage is 0.765V typically.
3	3	PVCC	Internal Regulator Output. Connect a 1 μ F capacitor to GND to stabilize output voltage.
4	4	SS	Soft-Start Control Input. SS controls the soft-start period. Connect a capacitor from SS to GND to set the soft-start period. A 3.9nF capacitor sets the soft-start period of V _{OUT} to 1.5ms.
5, 9 (Exposed Pad)	5, 11 (Exposed Pad)	GND	Ground. The Exposed pad should be soldered to a large PCB and connected to GND for maximum thermal dissipation.
6	6, 7	SW	Switch Node. Connect this pin to an external L-C filter.
7	8	BOOT	Bootstrap for High Side Gate Driver. Connect a 0.1 μ F or greater ceramic capacitor from BOOT to SW pins.
8	9, 10	VIN	Supply Input. The input voltage range is from 4.5V to 17V. Must bypass with a suitably large ($\geq 10\mu$ F x 2) ceramic capacitor.

Table: Pin functions

TPS54329E

Description

The TPS54329E is an adaptive on-time D-CAP2 mode synchronous buck converter. The TPS54329E enables system designers to complete the suite of various end-equipment power bus regulators with a cost effective, low component count, low standby current solution. The main control loop for the TPS54329E uses the D-CAP2 mode control that provides a fast transient response with no external compensation components. The adaptive on-time control supports seamless transition between PWM mode at higher load conditions and Eco-mode™ operation at light loads. Eco-mode™ allows the TPS54329E to maintain high efficiency during lighter load conditions. The TPS54329E also has a proprietary circuit that enables the device to adopt to both low equivalent series resistance (ESR) output capacitors, such as POSCAP or SP-CAP, and ultra-low ESR ceramic capacitors. The device operates from 4.5-V to 18-V VIN input. The output voltage can be programmed between 0.76 V and 7 V. The device also features an adjustable soft start time. The TPS54329E is available in the 8-pin DDA package, and designed to operate from –40°C to 85°C.

Features

- D-CAP2™ Mode Enables Fast Transient Response
- Low Output Ripple and Allows Ceramic Output Capacitor
- Wide V_{IN} Input Voltage Range: 4.5 V to 18 V
- Output Voltage Range: 0.76 V to 7.0 V
- Highly Efficient Integrated FETs Optimized for Lower Duty Cycle Applications – 100 m Ω (High Side) and 74 m Ω (Low Side)
- High Efficiency, less than 10 μ A at shutdown
- High Initial Bandgap Reference Accuracy
- Adjustable Soft Start
- Pre-Biased Soft Start

- 650-kHz Switching Frequency (f_{sw})
- Cycle By Cycle Over Current Limit
- Auto-Skip Eco-mode™ for High Efficiency at Light Load

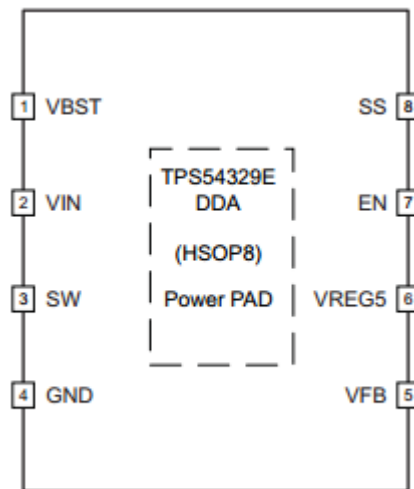


Figure: Pin description

PIN		DESCRIPTION
NAME	NO.	
VBST	1	Supply input for the high-side FET gate drive circuit. Connect 0.1 μ F capacitor between VBST and SW pins. An internal diode is connected between VREG5 and VBST.
VIN	2	Input voltage supply pin.
SW	3	Switch node connection between high-side NFET and low-side NFET.
GND	4	Ground pin. Power ground return for switching circuit. Connect sensitive SS and VFB returns to GND at a single point.
VFB	5	Converter feedback input. Connect to output voltage with feedback resistor divider.
VREG5	6	5.5 V power supply output. A capacitor (typical 0.47 μ F) should be connected to GND. VREG5 is not active when EN is low.
EN	7	Enable input control. EN is active high and must be pulled up to enable the device.
SS	8	Soft-start control. An external capacitor should be connected to GND.
Exposed Thermal Pad	Back side	Thermal pad of the package. Must be soldered to achieve appropriate dissipation. Must be connected to GND.

Table: Pin functions

LM1117

Description

The LM1117 is a series of low dropout voltage regulators with a dropout of 1.2V at 800mA of load current. It has the same pin-out as National Semiconductor's industry Standard LM317.

The LM1117 is available in an adjustable version, which can set the output voltage from 1.25V to 13.8V with only two external resistors. In addition, it is also available in five fixed voltages, 1.8V, 2.5V, 2.85V, 3.3V, and 5V.

The LM1117 offers current limiting and thermal shutdown. Its circuit includes a zener trimmed bandgap reference to assure output voltage accuracy to within $\pm 1\%$.

The LM1117 series is available in SOT-223, TO-220, and TO-252 D-PAK packages. A minimum of 10 μ F tantalum capacitor is required at the output to improve the transient response and stability.

Features

- Available in 1.8V, 2.5V, 2.85V, 3.3V, 5V, and Adjustable Versions
- Space Saving SOT-223 Package
- Current Limiting and Thermal Protection
- Output Current 800mA
- Line Regulation 0.2% (Max)
- Load Regulation 0.4% (Max)
- Temperature Range

— LM1117 0°C to 125°C

— LM1117I -40°C to 125°C

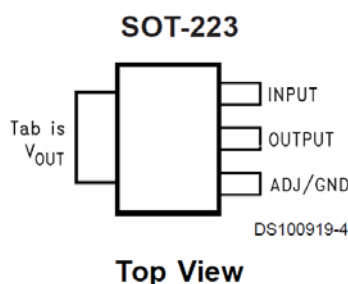


Figure: Pin description

AP2111H

Description

The AP2111 is CMOS process low dropout linear regulator with enable function, the regulator delivers a guaranteed 600mA (Min) continuous load current. The AP2111 provides 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 4.8V regulated output and 0.8V to 5V adjustable output, and provides excellent output accuracy 1.5%, it is also provides a excellent load regulation, line regulation and excellent load transient performance due to very fast loop response. The AP2111 has built-in auto discharge function. The AP2111 features low power consumption. The AP2111 is available in SOIC-8, PSOP-8 SOT-223 and SOT-23-5 packages.

Features

- Output Voltage Accuracy: $\pm 1.5\%$
- Output Current: 600mA (Min)
- Foldback Short Current Protection: 50mA
- Enable Function to Turn On/Off V_{OUT}

- Low Dropout Voltage (3.3V):
250mV (Typ) @ IO_{UT}=600mA
- Excellent Load Regulation: 0.2%/A (Typ)
- Excellent Line Regulation: 0.02%/V (Typ)
- Low Quiescent Current: 55μA (Typ)
- Low Standby Current: 0.01μA (Typ)
- Low Output Noise: 50μVRMS
- PSRR: 65dB @ f=1kHz, 65dB @ f=100Hz
- OTSD Protection
- Stable with 1.0μF Flexible Cap: Ceramic, Tantalum and Aluminum Electrolytic
- Operating Temperature Range: -40°C to 85°C
- ESD: MM 400V, HBM 4000V

H/HA Package
(SOT-223)



Figure: Pin description

MP1470H

Description

The MP1470H is a high-frequency, synchronous, rectified, step-down, switch-mode converter with internal power MOSFETs. It offers a very compact solution to achieve a 2A continuous output current over a wide input supply range, with excellent load and line regulation. The MP1470H has synchronous mode operation for higher efficiency over the output current-load range. Current-mode operation provides fast transient response and eases oop stabilization. Protection features include over-current protection and thermal shutdown. The MP1470H requires a minimal number of readily-available, standard, external components and is available in a space-saving 6-pin TSOT23 package.

Features

- Wide 4.5V-to-16V Operating Input Range
- 110mΩ/57mΩ Low-RDS(ON) Internal Power MOSFETs
- Proprietary Switching-Loss-Reduction Technique
- High-Efficiency Synchronous-Mode Operation
- Fixed 1MHz Switching Frequency at CCM Mode
- Internal AAM Power-Save Mode for High Efficiency at Light Load
- Internal Soft-Start
- Over-Current Protection and Hiccup

- Thermal Shutdown
- Output Adjustable from 0.8V
- Available in a 6-pin TSOT-23 package

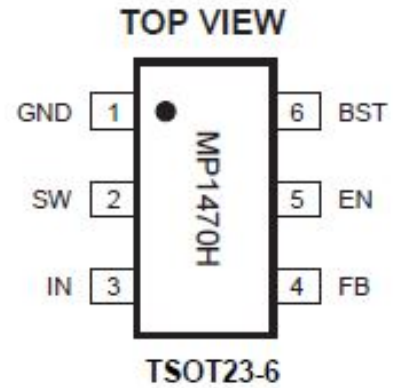


Figure: Pin description

6. MICROCONTROLLER

A. MSTAR MSD92LHSW2 (U1)

Description

MSD92LHSW2 is a highly integrated TV SoC solution for DVB-C/DVB-T/DVB-T2/ISDB-T/DVB-S/DVB-S2 digital television platform. Integrating latest advanced technologies, MSD92LHSW2 provides the most cost-efficient solution for multimedia TV application with creative and attractive features.

In order to achieve the lowest BOM cost in a multi-media TV platform, MSD92LHSW2 integrates DVB-C/DVB-T/DVB-T2/ISDB-T/DVB-S/DVB-S2 demodulators, TV/multi-media all-purpose AV decoder, VIF demodulator, and advanced Sound/Video processors into a single device. This not only reduces the overall BOM significantly, but also facilitates the design of originally-complicated TV systems for developers. In addition, the memory-embedded solution provided by MSD92LHSW2 can reduce the excessive work of memory interface routing on board and the risk of memory performance degradation while powering cost-down in the total system.

The powerful multimedia A/V decoder inside MSD92LHSW2 is hosted with a dedicated hardware video codec engine to secure fast and stable video streaming playback. Moreover, MSD92LHSW2 is equipped with a DSP specifically designated for audio application, including digital audio format decoding and advanced sound effects, and a high performance MIPS34Kf to manipulate all possible routines and house-keeping activities. With extendable USB 2.0 interface, an MSD92LHSW2 based system can turn into a high quality media-center in a simple manner.

The MSD92LHSW2 supports the latest MHL technology, which allows user to stream audio and full HD video from mobile devices to televisions. Power management and low-power design of MSD92LHSW2 make it possible to charge MHL devices even in standby mode. The MHL/HDMI dual-purpose port on MSD92LHSW2 will enable charging if MHL devices are automatically detected.

For average users, the MSD92LHSW2 provides multi-standard analog TV support with adaptive 3D video decoding and VBI data extraction. The built-in audio decoder is capable of decoding FM, AM, NICAM, A2, BTSC and sound standards. The MSD92LHSW2 also supplies all the necessary A/V inputs and outputs to complete a receiver design including HDMI receivers and component video ADCs. All input selection multiplexers for video and audio are integrated, including full SCART support with CVBS output. The equipped MStar High Performance Video Processor is the latest masterpiece of MStar technologies, providing excellent video and picture quality in Full-HD and large-scale display system. The MSD92LHSW2 also supports an ultra low power standby mode to meet the latest energy legislative requirements without any additional hardware.

Features

MSD92LHSW2 is a highly integrated single chip solution for digital

**DVB-C/DVB-T/DVB-T2/ISDB-T/DVB-S/
DVB-S2 TV system. Key features include:**

1. *DVB-C/DVB-T/DVB-T2/ISDB-T/DVB-S/DVB-S2 and Analog TV Front-End Demodulator*
 2. *Multi-Standard A/V Decoder*
 3. *MStar High Performance Video Processor*
 4. *Home Theater Sound Processor*
 5. *Embedded Memory for optimized BOM cost*
 6. *Multiple HDMI 1.4 Compliant Ports with ARC Support*
 7. *One MHL 2.1 Compliant Port*
 8. *Transport-Stream Input for Extended DTV System*
- **High Performance Micro-processor**
 - MIPS34Kf with 32KB/32KB I/D cache
 - Supports Hardware floating point unit
 - **HEVC/H.265 Video Decoder**
 - Supports HEVC/H.265 video decoding
 - Supports Main/Main-10 profile, level 4.1, high tier
 - Supports 8-bit/10-bit color depth
 - Supports resolution up to 1920x1080@60fps
 - Supports max bitrate upto 50 Mbps
 - **AVC/H.264 Video Decoder**
 - ITU-T H.264, ISO/IEC 14496-10 (main and high profile up to level 4.2) video decoding
 - Supports resolution up to 1920x1080@60fps
 - Supports bitrate up to 62.5Mbps, the upper limit of level 4.2
 - Supports resolutions for all DVB, ATSC, HDTV, DVD and VCD
 - Supports SVAFF 2ES (for Dual Decode)
 - Supports MVC 3D decoding upto 1080p@30fps
 - **MPEG-2 Video Decoder**
 - ISO/IEC 11172-2 MPEG-1 video format decoding
 - ISO/IEC 13818-2 MPEG-2 video MP@HL and HD level
 - Supports resolution up to HDTV (1080p, 1080i, 720p) and SDTV
 - **MPEG-4 Video Decoder**
 - ISO/IEC 14496-2 MPEG-4 ASP video decoding up to HD level
 - Supports resolutions up to HDTV (1080p@30fps)
 - Supports DivX Home Theater & HD profiles
 - Supports FLV version1 video format decoding
 - **AVS/AVS+ Video Decoder** *Optional*
 - Supports Broadcasting profile, level 6.0.1.08.60 (AVS+)
 - Supports Jizhun profile, level 6.0
 - Supports bitrate up to 50Mbps
 - Supports resolution up to 1920x1080@30fps
 - **RealMedia Video Decoder** *Optional*
 - Supports RV8, RV9, RV10 decoders
 - Supports file formats with RM and RMVB
 - Supports maximum resolution up to 1080p@30fps
 - Supports Picture Re-sampling
 - Supports in-loop de-block for B-frame
 - **Hardware JPEG Decoder**
 - Supports upto 640x480@30fps
 - Supports formats: 422/411/420/444/422T
 - Supports scaling down ratios: 1/2x1/2, 1/4x1/4, 1/8x1/8
 - Supports both color and grayscale pictures
 - Supports sequential mode, single scan
 - Supports programmable Region of Interest (ROI)
 - Following the file header scan the hardware decoder fully handles the decode process

- **VC-1 Video Decoder** ^{Optional}
 - Supports SMPTE-421M (WMV video) decoding up to MH@HL
 - Supports SMPTE-421M (VC1 video) decoding up to AP@L3 (2048x1024p30)
- **NTSC/PAL/SECAM Video Decoder**
 - Supports NTSC-M, NTSC-J, NTSC-4.43, PAL (B, D, G, H, M, N, I, Nc), and SECAM standards
 - Automatic standard detection
 - Motion adaptive 3D comb filter
 - Two configurable CVBS & Y/C S-video inputs
 - Supports Teletext, Closed Caption (analog CC 608/ analog CC 708/digital CC 608/digital CC 708), and V-chip and SCTE
- **Multi-Standard TV Sound Processor**
 - Supports BTSC/A2 demodulation
 - Supports NICAM/FM/AM demodulation
 - Supports MTS Mode Mono/Stereo/SAP in BTSC mode
 - Supports Mono/Stereo/Dual in A2/NICAM mode
 - Built-in audio sampling rate conversion (SRC)
 - Audio processing for loudspeaker channel, including volume, balance, mute, tone, EQ, virtual stereo/surround and treble/bass controls
 - Advanced sound processing options available, for example: Dolby¹, DTS²
 - Supports digital audio format decoding:
 - MPEG-1, MPEG-2 (Layer I/II), MP3, Dolby Digital (AC-3) ^{Optional}, AAC-LC, HE-AAC, WMA and supports Dolby Digital Plus ^{Optional}
 - Supports Audio Description
 - Supports programmable delay for audio/video synchronization
- **Audio Interface**
 - Three L/R audio line-inputs and two mono Mic. Inputs
 - One L/R outputs for main speakers, monitor output, and SCART output
 - Supports stereo headphone driver
 - I2S digital audio output
 - S/PDIF digital audio input & output
 - Supports HDMI receiver ARC function
- **Analog RGB Compliant Input Ports**
 - Three analog ports support up to 1080P
 - Supports PC RGB input up to SXGA@75Hz
 - Supports HDTV RGB/YPbPr/YCbCr
 - Supports Composite Sync and SOG Sync-on-Green
 - Automatic color calibration
- **Analogue RGB Auto-Configuration & Detection**
 - Auto input signal format and mode detection
 - Auto-tuning function including phasing, positioning, offset, gain, and jitter detection
 - Sync Detection for H/V Sync
- **DVI/HDCP/HDMI Compliant Input Ports**
 - Three HDMI/DVI Input ports
 - HDMI 1.4a Compliant
 - HDCP 1.4 Compliant
 - 225MHz @ 1080P 60Hz input with 12-bit Deep-color support
 - Supports CEC
 - Supports HDMI 3D format input
 - Supports UHD 30Hz down-scaling
 - Supports HDMI ARC
 - Single link DVI 1.0 compliant
 - Robust receiver with excellent long-cable support
 - Embedded HDCP key
- **HDMI/MHL Dual-Purpose Port**
 - MHL 2.1 Compliant
 - MHL/HDMI Auto-detection
 - Supports MHL charging in normal/standby mode

■ MStar High Performance Video Processor

- Video Processing Engine
 - Supports up to FHD@60p
 - 10-/12-bit Internal Data Processing
 - Dual-Engine Architecture supporting PIP/PBP
 - Arbitrary Frame Rate Conversion
- Video Care Technology
 - Video Line Broken Artifact Detection and Removal
- Fully Programmable Multi-Function Scaling Engine
 - High-Tap Filters with Programmable Parameter
 - An advanced Zoom Algorithm providing Aliasing/Ringing Suppression
 - Nonlinear Video Scaling supports various modes including Panorama
 - Supports Dynamic Scaling for RM, VC-1 Optional
 - Fully Programmable Zoom Ratios for Up/Down Scaling
 - Independent Horizontal and Vertical Zoom
- Deinterlacer
 - Motion Compensated Video Deinterlacing with Motion Object Stabilizer
 - Motion Adaptive Deinterlacer
 - Edge-Oriented Deinterlacer with Edge Smoothing and Artifact Removal
 - Automatic 3:2/2:2/M:N Pull-Down Detection and Recovery
- MStar Genuine 3D
 - Supports Mandatory 3D Format
- Motion Frame Rate Conversion
 - Supports Frame Repeat Frame Rate Conversion
- Backlight Technology
 - Content Adaptive LCD Backlight Control
- Response Time Compensation
 - Supports Overdrive Technology

■ MStar Professional PQ Engine

- UltraClear
 - MPEG Artifact Removal
 - ◇ Adaptive Block Noise Reduction
 - ◇ Mosquito Noise Reduction
 - UltraClear Noise Reduction
 - ◇ 3D Motion-Estimation Temporal Filtering
 - 3D Noise Reduction
 - ◇ 3D Temporal Noise Reduction for Lousy Air/Cable Input
 - ◇ Cross-Color Suppression Technology
 - ◇ Supports Hanging Dot Search & Removal
- S-Powers
 - Video Enhancement Processor
 - ◇ Advanced 3D Independent Multi-Band Control Sharpness Technology
 - ◇ Advanced Chroma Transient Improvement
 - ◇ Content Adaptive Contrast Enhancement with Chroma Compensated
 - Super Resolution
 - ◇ Local Detail Enhancement
 - ◇ Multi-Directional Jagged Compensation Technology
- MACE
 - MStar Advanced Color Engine (MACE)
 - ◇ 3D Independent and Accurate Multi-Adaptive Color Manager
 - ◇ Color Stain Removal Technology
 - Standard Color Format and Processing
 - ◇ Fully programmable Input/Output CSC
 - ◇ BT601, BT709, BT2020 (CL/NCL)
 - ◇ xvYCC601, xvYCC709
 - ◇ Fully Programmable 12-bit RGB Gamma

- Gamut Mapping
 - ◇ Nonlinear/Linear RGB Domain Gamut Mapping
 - ◇ Supports 2D Gamut Mapping
 - ◇ The 3rd Generation 3D Gamut Mapping Engine
- **Output Interface**
 - Single/Dual link 8/10-bit LVDS output
 - Supports panel resolution up to Full HD 1920x1080@ 60Hz (LVDS 2ch)
 - Supports TCON:EPI interface, panel resolution up to Full HD @ 60Hz
 - Supports programmable timing controller
 - Supports dithering options
 - Spread spectrum output frequency for EMI suppression
 - Supports 60Hz 3D polarized panel (line interleave)
 - Supports Cinema output mode
- **CVBS Video Outputs**
 - Supports CVBS bypass output
- **2D Graphics Engine**
 - Hardware Graphics Engine for responsive interactive applications
 - Supports point draw, line draw, rectangle draw/fill and text draw
 - Supports BitBlt, stretch BitBlt, italic BitBlt, Mirror BitBlt and rotate BitBlt
 - Supports alpha-blending operation
 - Supports source/destination color key and alpha key
 - Supports dither
 - Supports color space conversion and format transformation
 - Raster Operation (ROP)
 - Supports DFB and Porter-Duff operation
- **VIF**
 - Compliant with NTSC M/N, PAL B, G/H, I, D/K, SECAM L/L' standards
 - Support low IF architecture
 - Audio/Video internal dual-path processor
 - Locking range improvement
- **DVB-C Demodulator**
 - Compliant with ITU J.83 Annex A/C DVB-C (EN 300 429)
 - Supports 1-7.2 M Baud symbol rate
 - Automatic blind channel scan (constellation and symbol rate)
 - Supports LIF interfaces
 - IIS performance improvement
- **DVB-T Demodulator**
 - Compliant with DVB-T (ETSI EN 300 744)
 - Nordig 2.2.2, D-book 7.0 compliant
 - Accept low IF inputs in 6, 7, 8MHz channel bandwidths
 - Supports all guard intervals (1/32 to 1/4)
 - Supports all constellations (QPSK, 16-QAM, 64-QAM)
 - Ultra fast automatic blind UHF/VHF channel scan
 - Optimized for SFN channels with pre/post-cursive echoes inside/outside the guard
 - Phase-Noise suppression
 - Impulse-Noise suppression
 - All digital demodulation and timing recovery loops for tracking frequency and clock offset
 - Automatic co-channel and adjacent channel interference suppression
 - CNR performance improvement
 - Outside-GI performance improvement

■ DVB-T2 Demodulator

- Compliant with DVB-T2 (ETSI EN 302 755) v1.3.1, T2-base & T2-Lite profile
- Nordig Unified 2.2.2, D-Book 7.0 compliant
- Supports all guard intervals (1/128 to 1/4)
- Supports all FFT modes from 1K to 32K
- Supports all long and short block code rates (1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 2/5, 1/3)
- Supports all constellations (QPSK, 16-QAM, 64-QAM, 256-QAM)
- Transmit diversity (MISO) support
- Supports all scattered pilot patterns (PP1 to PP8)
- Supports rotated and non-rotated constellations
- Supports single and multiple PLPs
- Accept low IF inputs in 1.7, 5, 6, 7, 8MHz channel bandwidths
- All digital demodulation and timing recovery loops for tracking frequency and clock offset
- Automatic co-channel and adjacent channel interference suppression
- Impulse-Noise suppression
- Outside GI improvement
- Locking time improvement

■ ISDB-T Demodulator

- Compliant with ISDB-T ARIB STD-B31
- Compliant with ISDB-Tsb ARIB STD-B29
- Supports all modes defined in ISDB-T spec.
- Supports all guard ratios: 1/4, 1/8, 1/16, 1/32
- 42ms/channel, excluding AGC time and PLL sync
- Support LIF interfaces
- I2C repeater for tuner control from backend host controller
- Impulse-noise suppression
- Phase noise compensation
- Outside-GI performance improvement
- CNR performance improvement

■ DVB-S Demodulator

- Compliant with DVB-S (ETSI EN 300 421)
- Data Rate: 1-70 Msps
- Code Rates: 1/2, 2/3, 3/4, 5/6, 7/8
- Carrier frequency acquisition range: 5MHz
- Fast automatic blind scan of symbol rates and carrier frequencies
- Equalizer compensates for channel impairment
- DiSEqC™ 2.0 compatible with LNB controller
- Automatic co-channel and adjacent channel interference suppression
- Impulse-Noise suppression
- All digital demodulation and timing recovery loops for tracking frequency and clock offset
- Novel carrier recovery algorithms for tracking and compensating large phase noises
- Integrated FEC decoders for near Shannon limit performances
- Integrated signal quality and BER monitors
- Improved CNR performance

Parameter	Symbol	Min	Typ	Max	Unit
3.3V Supply Voltages	V_{VDD_33}	3.14		3.46	V
1.5V Supply Voltages	V_{VDD_15}	1.43		1.57	V
1.15V Supply Voltages	V_{VDD_115}	1.09	1.15	1.21	V
Core Supply Voltages	V_{VDD_core}	1.067	1.1	1.133	V
Ambient Operating Temperature	T_A	0		70	°C
Junction Temperature	T_J			125	°C

Table: Recommended operating conditions

7.3V 128M-BIT SERIAL FLASH MEMORY WITH DUAL/QUAD SPI & QPI

A. W25Q128FV (128M-BIT) SPI FLASH (U14)

Description

The W25Q128FV (128M-bit) Serial Flash memory provides a storage solution for systems with limited space, pins and power. The 25Q series offers flexibility and performance well beyond ordinary Serial Flash devices. They are ideal for code shadowing to RAM, executing code directly from Dual/Quad SPI (XIP) and storing voice, text and data. The device operates on a single 2.7V to 3.6V power supply with current consumption as low as 4mA active and 1µA for power-down. All devices are offered in space-saving packages.

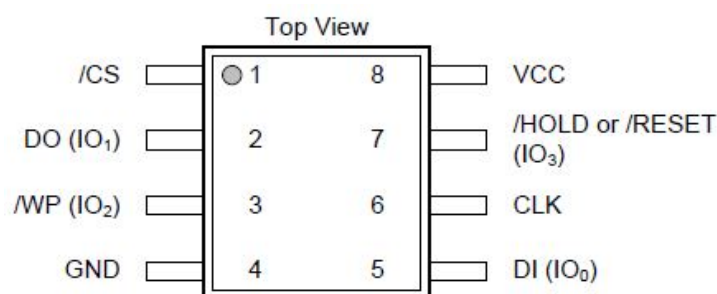
The W25Q128FV array is organized into 65,536 programmable pages of 256-bytes each. Up to 256 bytes can be programmed at a time. Pages can be erased in groups of 16 (4KB sector erase), groups of 128 (32KB block erase), groups of 256 (64KB block erase) or the entire chip (chip erase). The W25Q128FV has 4,096 erasable sectors and 256 erasable blocks respectively. The small 4KB sectors allow for greater flexibility in applications that require data and parameter storage. (See Figure 2.)

The W25Q128FV support the standard Serial Peripheral Interface (SPI), Dual/Quad I/O SPI as well as 2-clocks instruction cycle Quad Peripheral Interface (QPI): Serial Clock, Chip Select, Serial Data I/O0 (DI), I/O1 (DO), I/O2 (/WP), and I/O3 (/HOLD). SPI clock frequencies of up to 104MHz are supported allowing equivalent clock rates of 208MHz (104MHz x 2) for Dual I/O and 416MHz (104MHz x 4) for Quad I/O when using the Fast Read Dual/Quad I/O and QPI instructions. These transfer rates can outperform standard Asynchronous 8 and 16-bit Parallel Flash memories. The Continuous Read Mode allows for efficient memory access with as few as 8-clocks of instruction-overhead to read a 24-bit address, allowing true XIP (execute in place) operation.

A Hold pin, Write Protect pin and programmable write protection, with top or bottom array control, provide further control flexibility. Additionally, the device supports JEDEC standard manufacturer and device ID and SFDP Register, a 64-bit Unique Serial Number and three 256-bytes Security Registers.

Features

- **New Family of SpiFlash Memories**
 - W25Q128FV: 128M-bit / 16M-byte
 - Standard SPI: CLK, /CS, DI, DO, /WP, /Hold
 - Dual SPI: CLK, /CS, IO₀, IO₁, /WP, /Hold
 - Quad SPI: CLK, /CS, IO₀, IO₁, IO₂, IO₃
 - QPI: CLK, /CS, IO₀, IO₁, IO₂, IO₃
 - Software & Hardware Reset
- **Highest Performance Serial Flash**
 - 104MHz Single, Dual/Quad SPI clocks
 - 208/416MHz equivalent Dual/Quad SPI
 - 50MB/S continuous data transfer rate
 - More than 100,000 erase/program cycles
 - More than 20-year data retention
- **Efficient “Continuous Read” and QPI Mode**
 - Continuous Read with 8/16/32/64-Byte Wrap
 - As few as 8 clocks to address memory
 - Quad Peripheral Interface (QPI) reduces instruction overhead
 - Allows true XIP (execute in place) operation
 - Outperforms X16 Parallel Flash
- **Low Power, Wide Temperature Range**
 - Single 2.7 to 3.6V supply
 - 4mA active current, <1µA Power-down (typ.)
 - -40°C to +85°C operating range
- **Flexible Architecture with 4KB sectors**
 - Uniform Sector/Block Erase (4K/32K/64K-Byte)
 - Program 1 to 256 byte per programmable page
 - Erase/Program Suspend & Resume
- **Advanced Security Features**
 - Software and Hardware Write-Protect
 - Power Supply Lock-Down and OTP protection
 - Top/Bottom, Complement array protection
 - Individual Block/Sector array protection
 - 64-Bit Unique ID for each device
 - Discoverable Parameters (SFDP) Register
 - 3X256-Bytes Security Registers with OTP locks
 - Volatile & Non-volatile Status Register Bits
- **Space Efficient Packaging**
 - 8-pin SOIC / VSOP 208-mil
 - 8-pin PDIP 300-mil
 - 8-pad WSON 6x5-mm / 8x6-mm
 - 16-pin SOIC 300-mil (additional /RESET pin)
 - 24-ball TFBGA 8x6-mm
 - Contact Winbond for KGD and other options



PIN NO.	PIN NAME	I/O	FUNCTION
1	/CS	I	Chip Select Input
2	DO (IO1)	I/O	Data Output (Data Input Output 1) ⁽¹⁾
3	/WP (IO2)	I/O	Write Protect Input (Data Input Output 2) ⁽²⁾
4	GND		Ground
5	DI (IO0)	I/O	Data Input (Data Input Output 0) ⁽¹⁾
6	CLK	I	Serial Clock Input
7	/HOLD or /RESET (IO3)	I/O	Hold or Reset Input (Data Input Output 3) ⁽²⁾
8	VCC		Power Supply

Table: Pin description

8. USB INTERFACE

Mstar IC has two inputs port for USB.

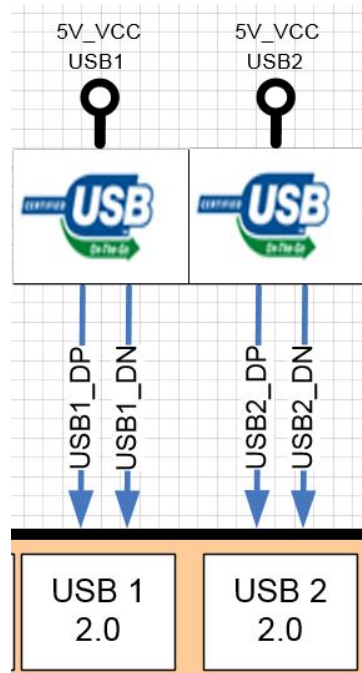


Figure: USB Block Diagram

9. CI INTERFACE

17MB140R3 Digital CI ve Smart Card Interface Block diagram:

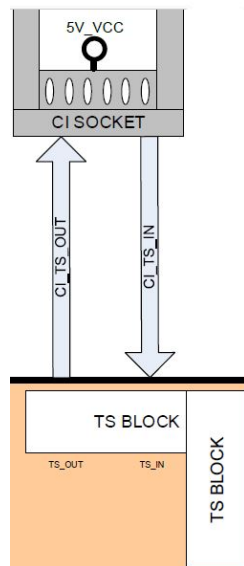


Figure: CI interface

10. SOFTWARE UPDATE

A. MAIN SW UPDATE

In MB140R3 project, please follow software update procedure:

1. mb140.bin, mb140_mboot.bin and usb_auto_update_G9.txt files should be copied directly inside of a flash memory (not in a folder).
2. Insert flash memory to the TV when TV is powered off.
3. While pushing the OK button in remote control, power on and wait. TV will power-up itself.
4. If First Time Installation screen comes, it means software update procedure is successful.

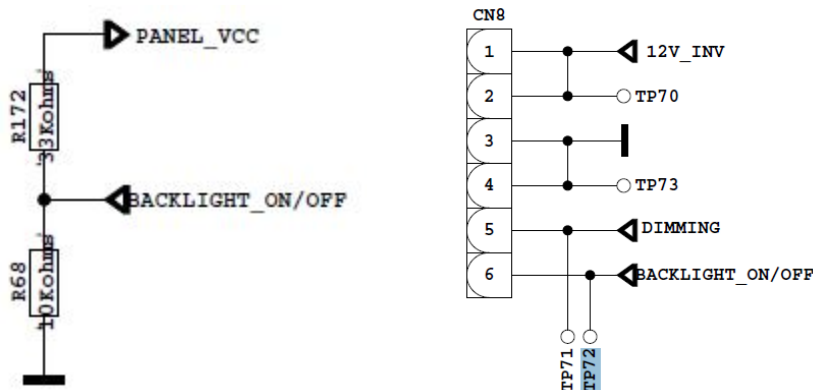
11. TROUBLESHOOTING

A. NO BACKLIGHT PROBLEM

Problem: If TV is working, led is normal and there is no picture and backlight on the panel.

Possible causes: Backlight pin, dimming pin, backlight supply, stby on/off pin

BACKLIGHT_ON/OFF pin should be high when the backlight is ON. BACKLIGHT_ON/OFF must be low when the backlight is OFF. If it is a problem, please check this pin and the panel cables. Also it can be tested in TP72 in main board.

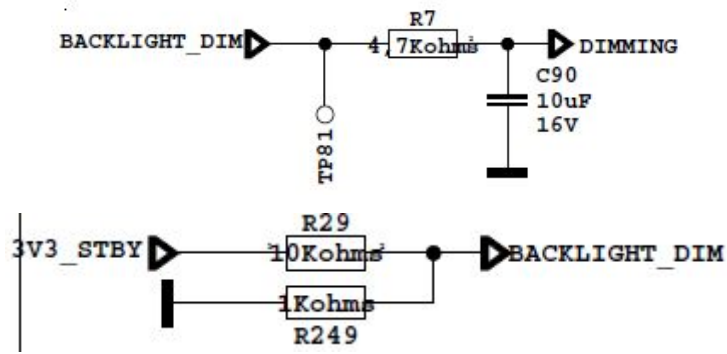


Backlight On/Off Circuit

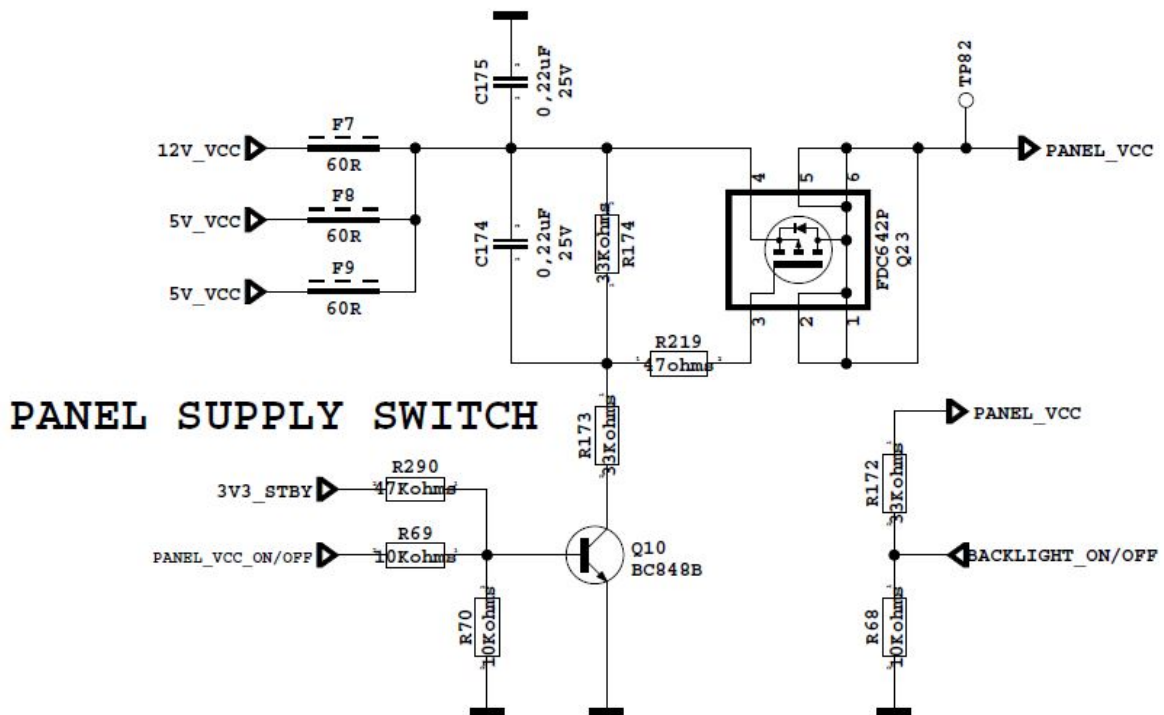


Dimming pin should be high or square wave in open position. If it is low, please check TP81 for Mstar side and panel or power cables, connectors.

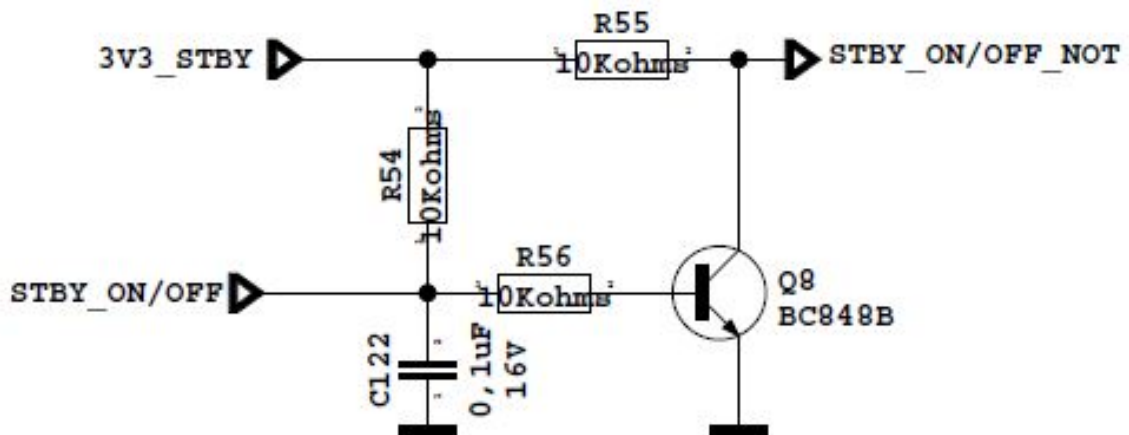
Dimming



Backlight power supply should be in panel specs. Please check Q23, shown below; also it can be checked TP82.



STBY_ON/OFF should be low for TV on condition, please check Q8's collector.

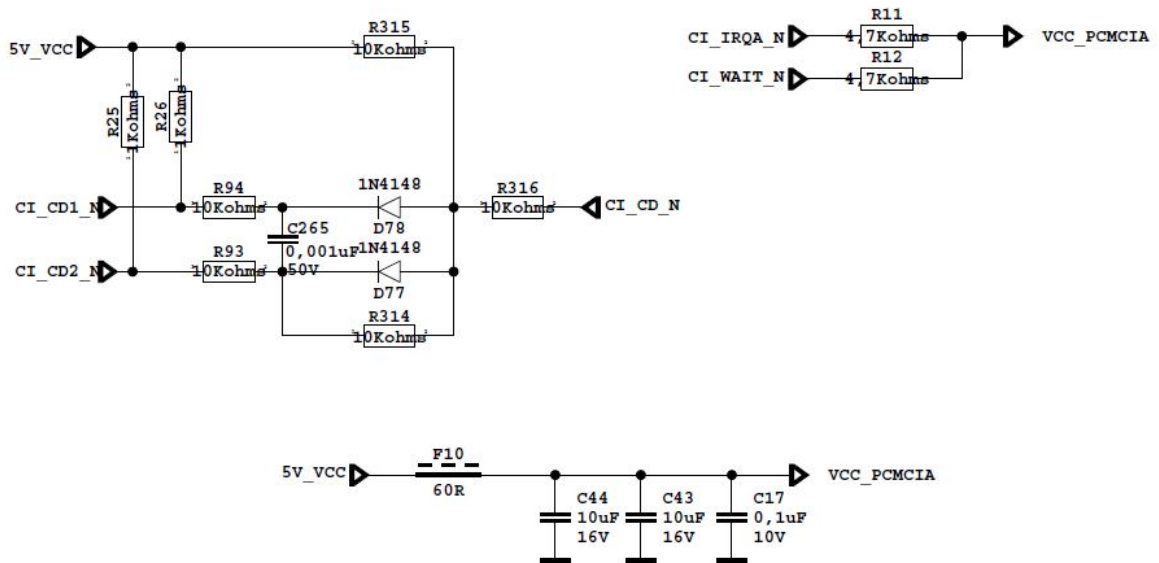


B. CI MODULE PROBLEM

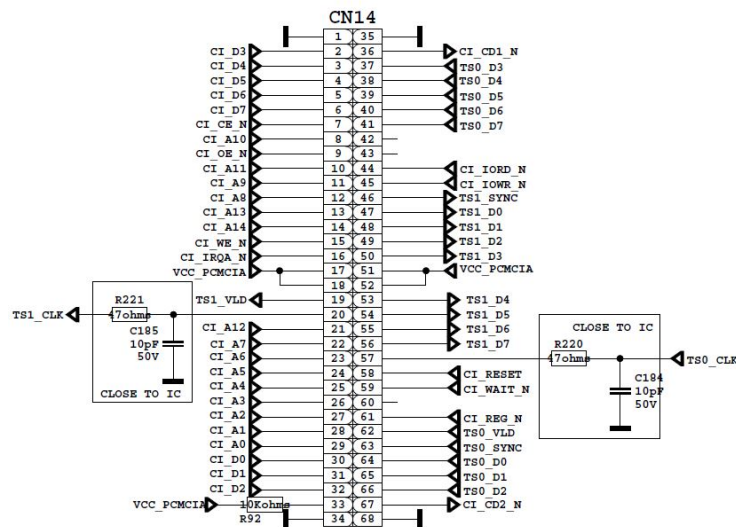
Problem: CI is not working when CI module inserted.

Possible causes: Supply, supply control pin, detects pins, mechanical positions of pins.

- CI supply should be 5V when CI module inserted. If it is not 5V please check VCC_PCMCIA, this pin should be low.



- Please check mechanical position of CI module. Is it inserted properly or not?
- Detect ports should be low. If it is not low please check CI connector pins, CI module pins.



C. STAYING IN STAND-BY MODE

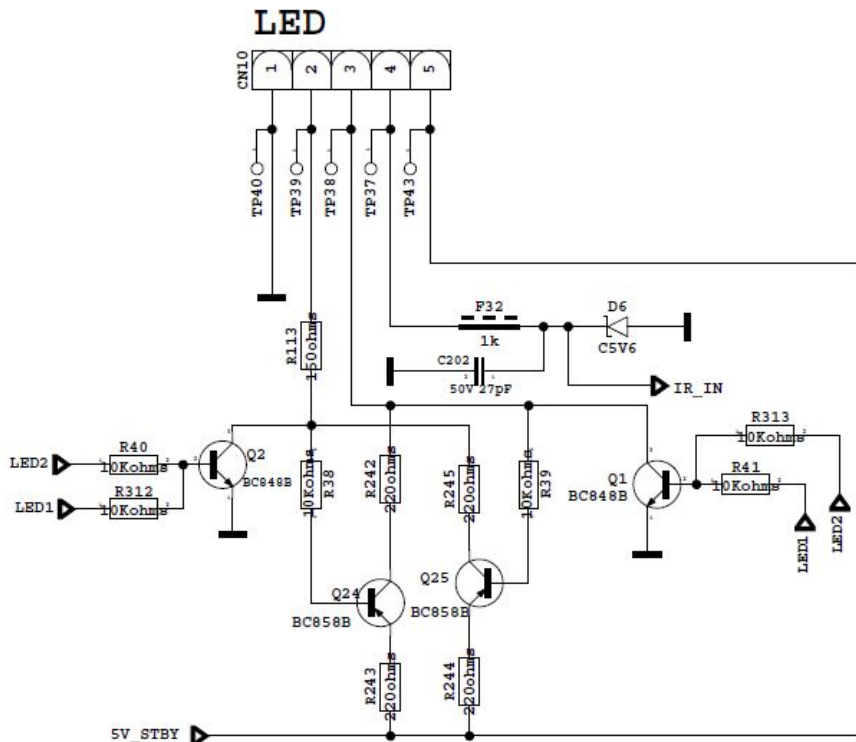
Problem: Staying in stand-by mode, no other operation.

This problem indicates a short on Vcc voltages. Protect pin should be logic high while normal operation. When there is a short circuit protect pin will be logic low. If you detect logic low on protect pin, unplug the TV set and control voltage points with a multimeter to find the shorted voltage to ground.

D. IR PROBLEM

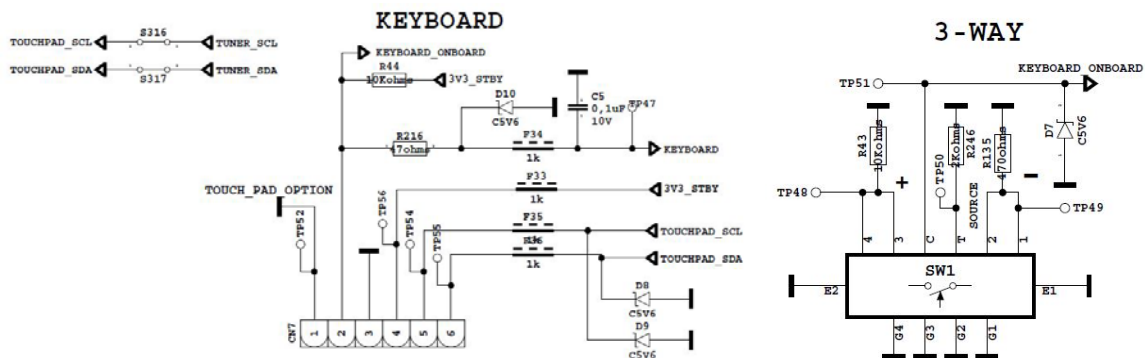
Problem: LED or IR not working

Check LED card supply on MB140R3 chasis.



E. KEYPAD TOUCHPAD PROBLEMS

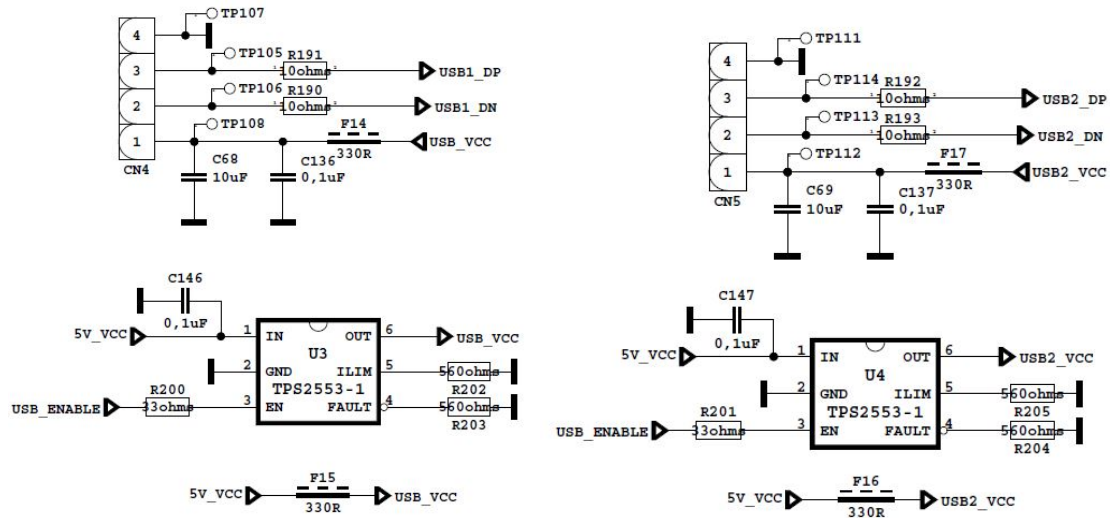
Problem: Keypad or Touchpad is not working. Check keypad supply on MB140R3.



F. USB PROBLEMS

Problem: USB is not working or no USB Detection.

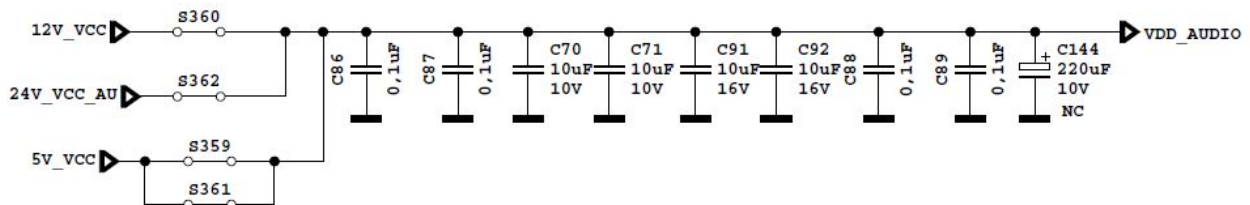
Check USB Supply, It should be nearly 5V. Also USB Enable should be logic high.



G. NO SOUND PROBLEM

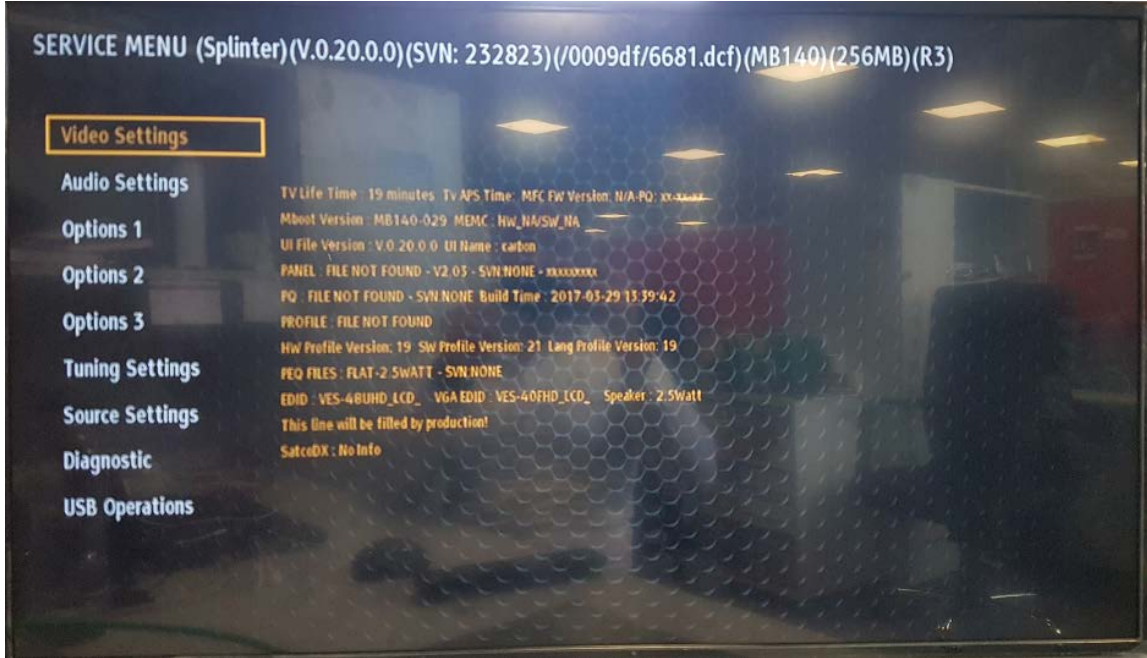
Problem: No audio at main TV speaker outputs.

Check supply voltages of 12V_VCC, VDD_AUDIO and 3V3_AMP with a voltage-meter. There may be a problem in headphone connector or headphone detect circuit (when headphone is connected, speakers are automatically muted). Measure voltage at HP_DETECT pin, it should be 3.3v.

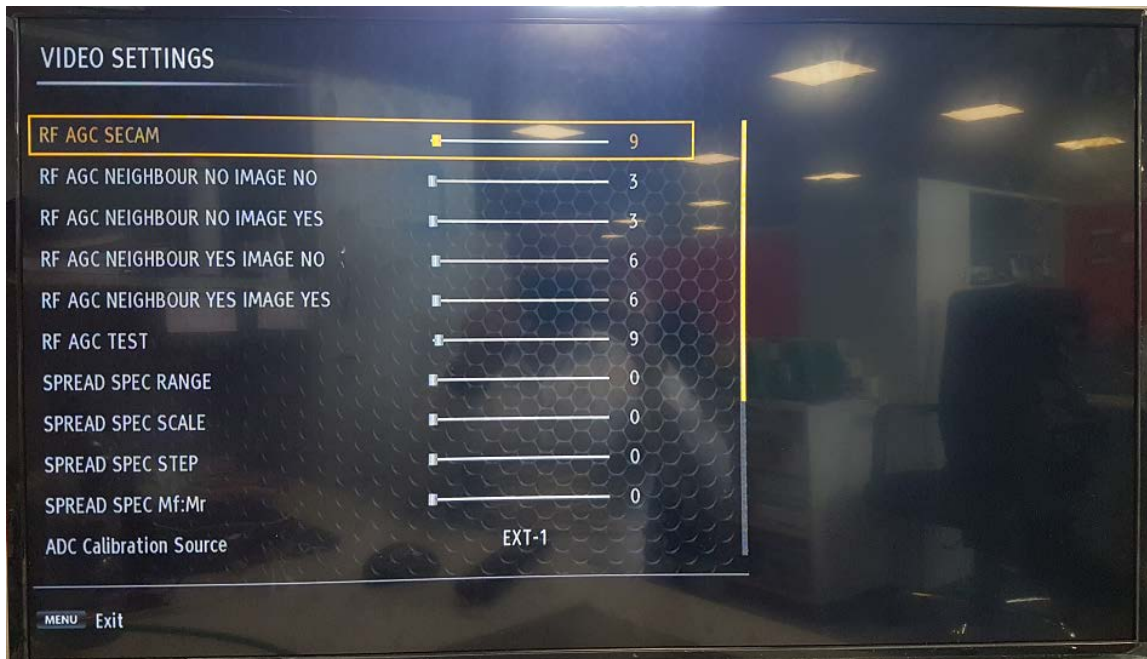


12. SERVICE MENU SETTINGS

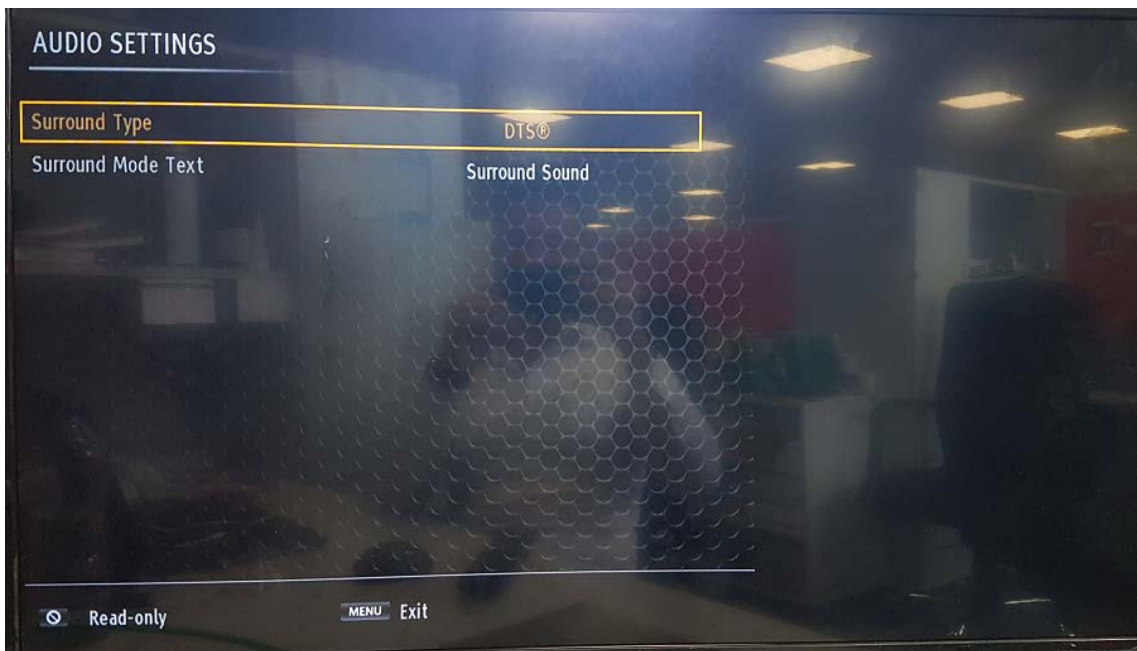
In order to reach service menu, first Press “MENU” buton, then write “4725” by usng remote controller. You can see the service menu main screen below. You can check SW releases by using this menu. In addition, you can make changes on video, audio etc. by using video settings, audio settings titles.



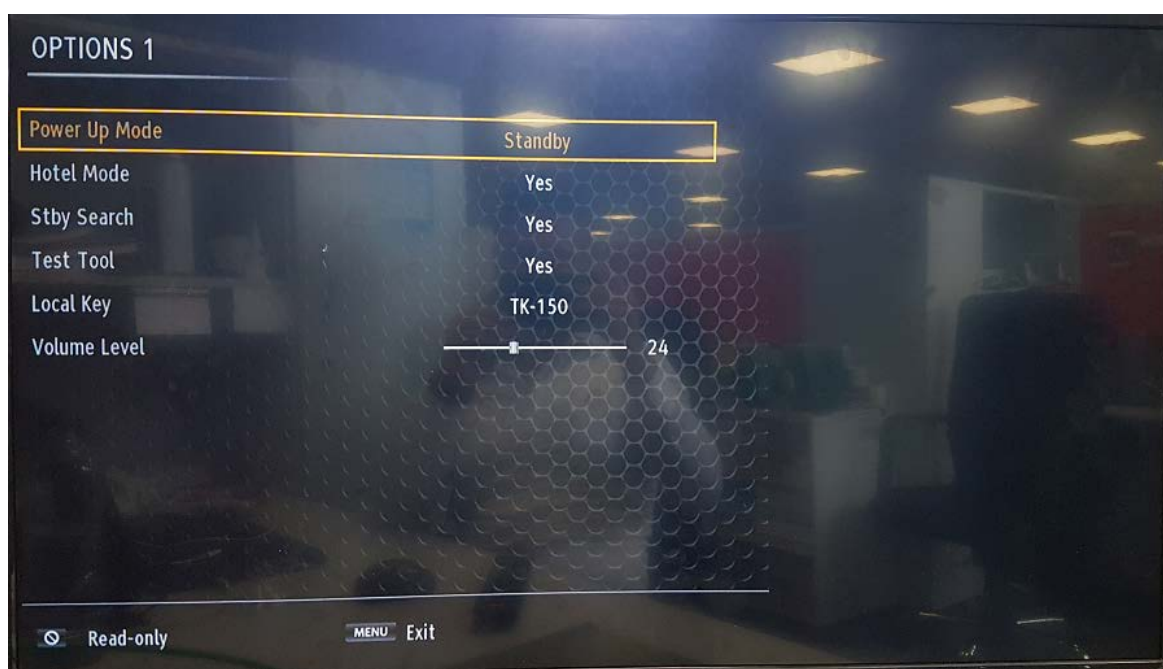
Service Menu Main Screen



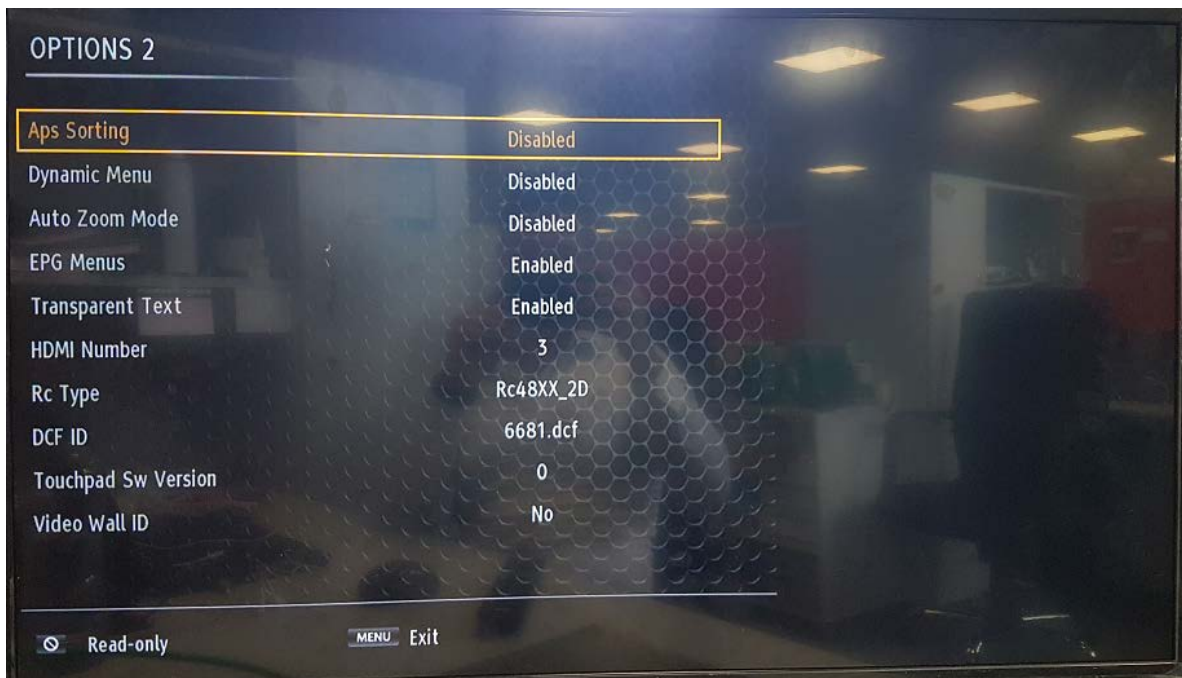
Video Settings



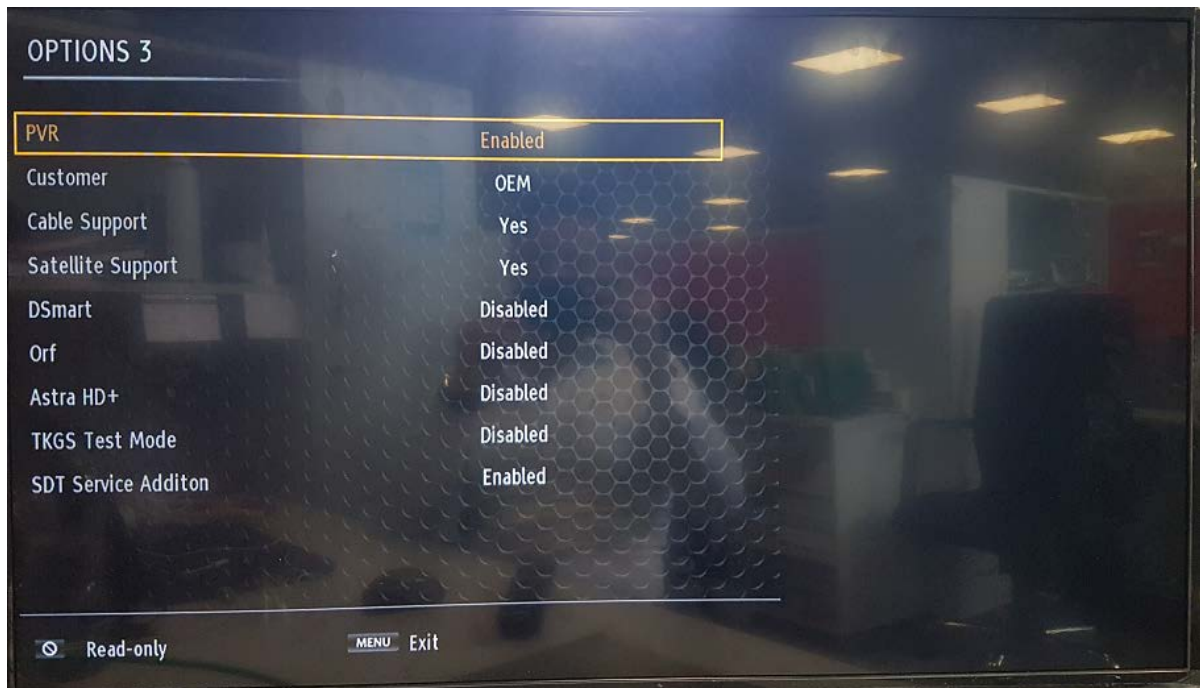
Audio Settings



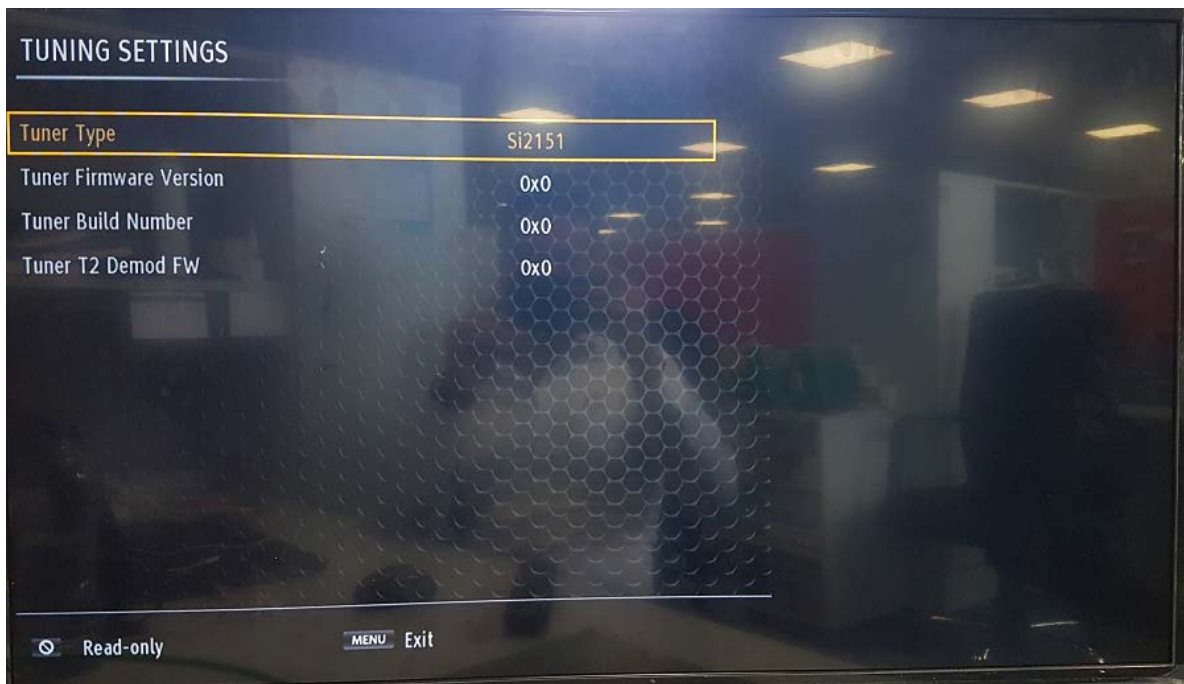
Options-1 Menu



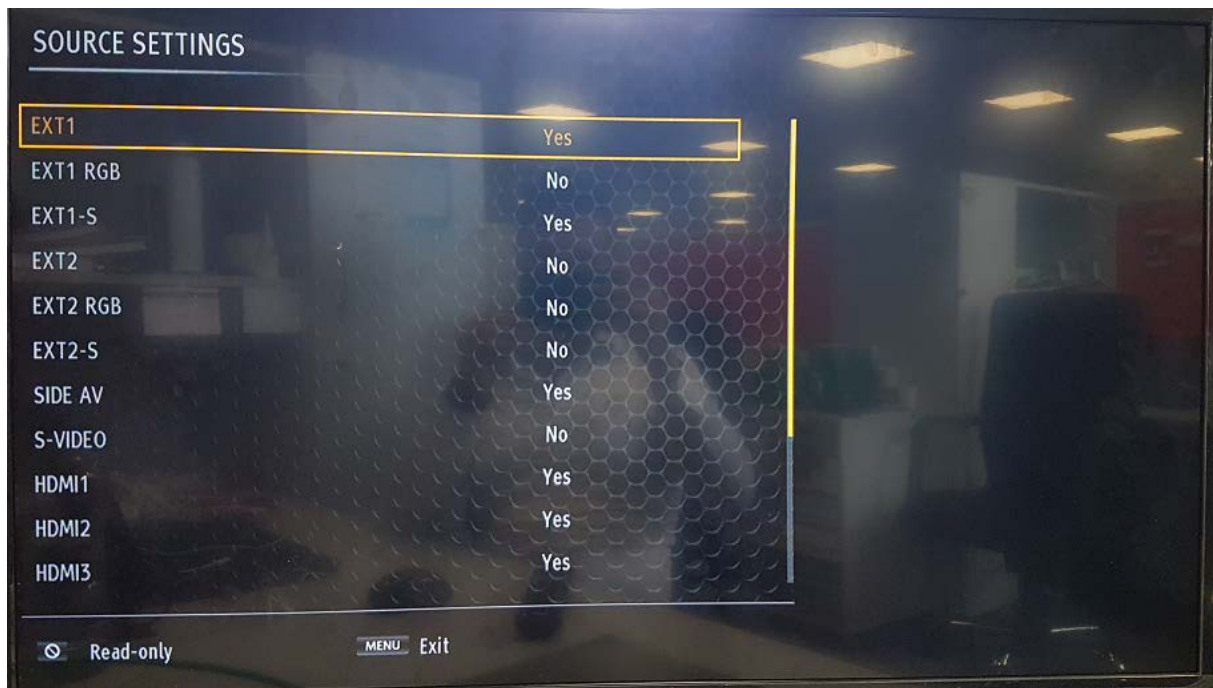
Options-2 Menu



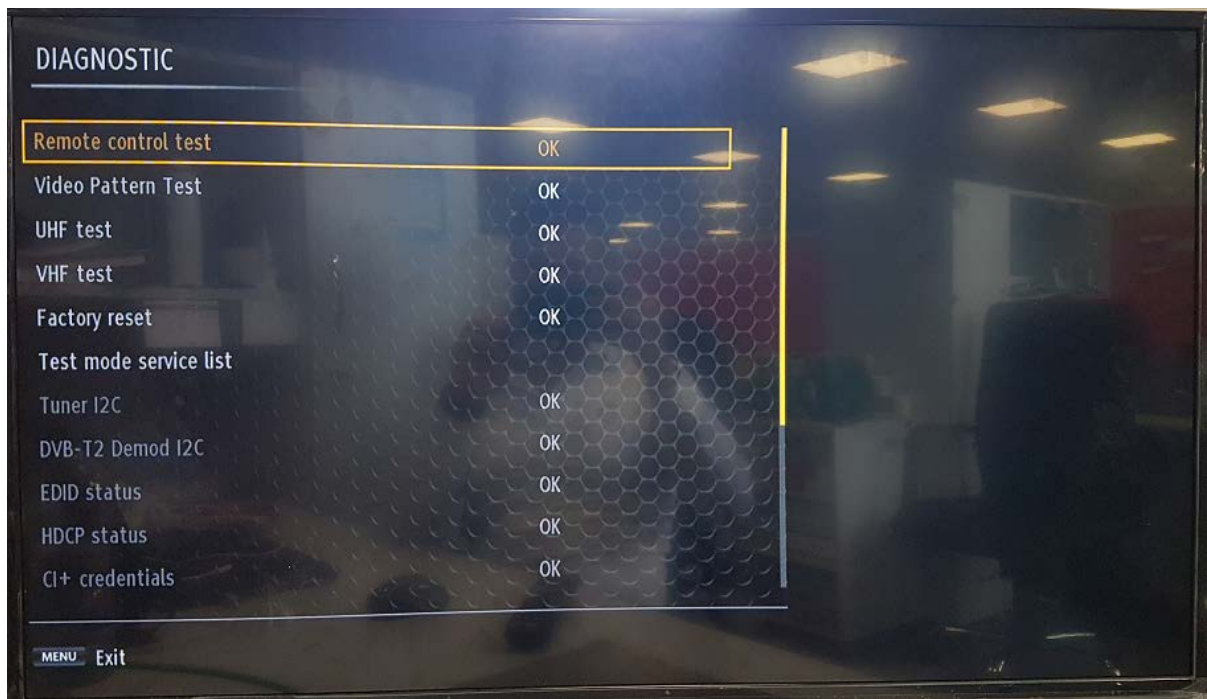
Options-3 Menu



Tuner Settings Menu



Source Settings Menu



Diagnostic Menu

13. GENERAL BLOCK DIAGRAM

