FEATURES

- NTSC/PAL/SECAM Video Decoder
  - Supports NTSC M, NTSC-J, NTSC-4.43, PAL (B,D,G,H,M,N,I,Nc), and SECAM
  - Automatic TV standard detection
  - 2D NTSC and PAL comb-filter for Y/C separation
  - 4 configurable CVBS & Y/C S-video inputs
  - Supports Closed-caption, and V-chip
  - CVBS video output
- Video IF for Multi-Standard Analog TV
  - Digital low IF architecture
  - Stepped-gain PGA with 26 dB tuning range and 1 dB tuning resolution
  - Maximum IF analog gain of 37dB in addition to digital gain
  - Programmable TOP to accommodate different tuner gain to optimize noise and linearity performance
- Multi-Standard TV Sound Decoding/Processing
  - Supports BTSC/A2/EIA-J demodulation and decoding
  - FM stereo & SAP demodulation
  - Audio processing for loudspeaker channel, including volume, balance, mute, tone, and P/G EQ
  - Mstar surround sound effect
- Digital Audio Interface
  - HDMI audio channel processing capability
  - Audio Line-In L/R x3
  - Audio Line-Out L/R x2
  - Built-in audio DAC
  - Built-in audio ADC
  - SIF audio input
- Analog RGB Compliant Input Ports
  - Two analog ports support up to UXGA
  - Supports HDTV RGB/YPbPr/YCbCr
  - Supports Composite Sync and SOG (Sync-on-Green) separator
  - Automatic color calibration
- DVI/HDCP/HDMI Compliant Input Port
  - One DVI/HDMI input port
  - Supports TMDS clock up to 225MHz @ 1080P 60Hz
  - Single link on-chip DVI 1.0 compliant receiver
  - High-bandwidth Digital Content Protection (HDCP) 1.1 compliant receiver
  - High Definition Multimedia Interface (HDMI) 1.3 compliant receiver with CEC support
  - Long-cable tolerant robust receiving
  - Support HDTV up to 1080P
- Auto-Configuration/Auto-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
- High-Performance Scaling Engines
  - Fully programmable shrink/zoom capabilities
  - Nonlinear video scaling supports various modes including Panorama
- Video Processing & Conversion
  - 3-D motion adaptive video de-interlacer
  - Automatic 3:2 pull-down & 2:2 pull-down detection and recovery
  - Edge-oriented adaptive algorithm for smooth low-angle edges
  - MStar 3rd Generation Advanced Color Engine (MStarACE-3) automatic picture enhancement gives:
    - Brilliant and fresh color
    - Intensified contrast and details
    - Vivid skin tone
    - Sharp edge
    - Enhanced depth of field perception
    - Accurate and independent color control
  - sRGB compliance allows end-user to experience the same colors as viewed on CRTs and other displays
  - Programmable 10-bit RGB gamma CLUT

- On-Screen OSD Controller
- 128/256 color palette
- 512 1/2/3-bit/pixel fonts
- Supports 2K attribute/code
- Horizontal and vertical stretch of OSD menus
- Pattern generator for production test
- Supports OSD MUX and alpha blending capability
- Supports blinking and scrolling for closed caption applications

■ LVDS Panel Interface
- Supports 8 bit dual link LVDS up to full HD (1920x1080)
- Supports 2 data output formats: Thine & TI data mappings
- Compatible with TIA/EIA
- Dithering with 6/8 bits options
- Reduced swing for LVDS for low EMI
- Supports flexible spread spectrum frequency with 360Hz~11.8MHz and up to 25% modulation

■ Integrated Micro Controller
- Embedded 8032 micro controller
- Configurable PWM's and GPIO's
- Low-speed ADC inputs for system control
- SPI bus for external flash

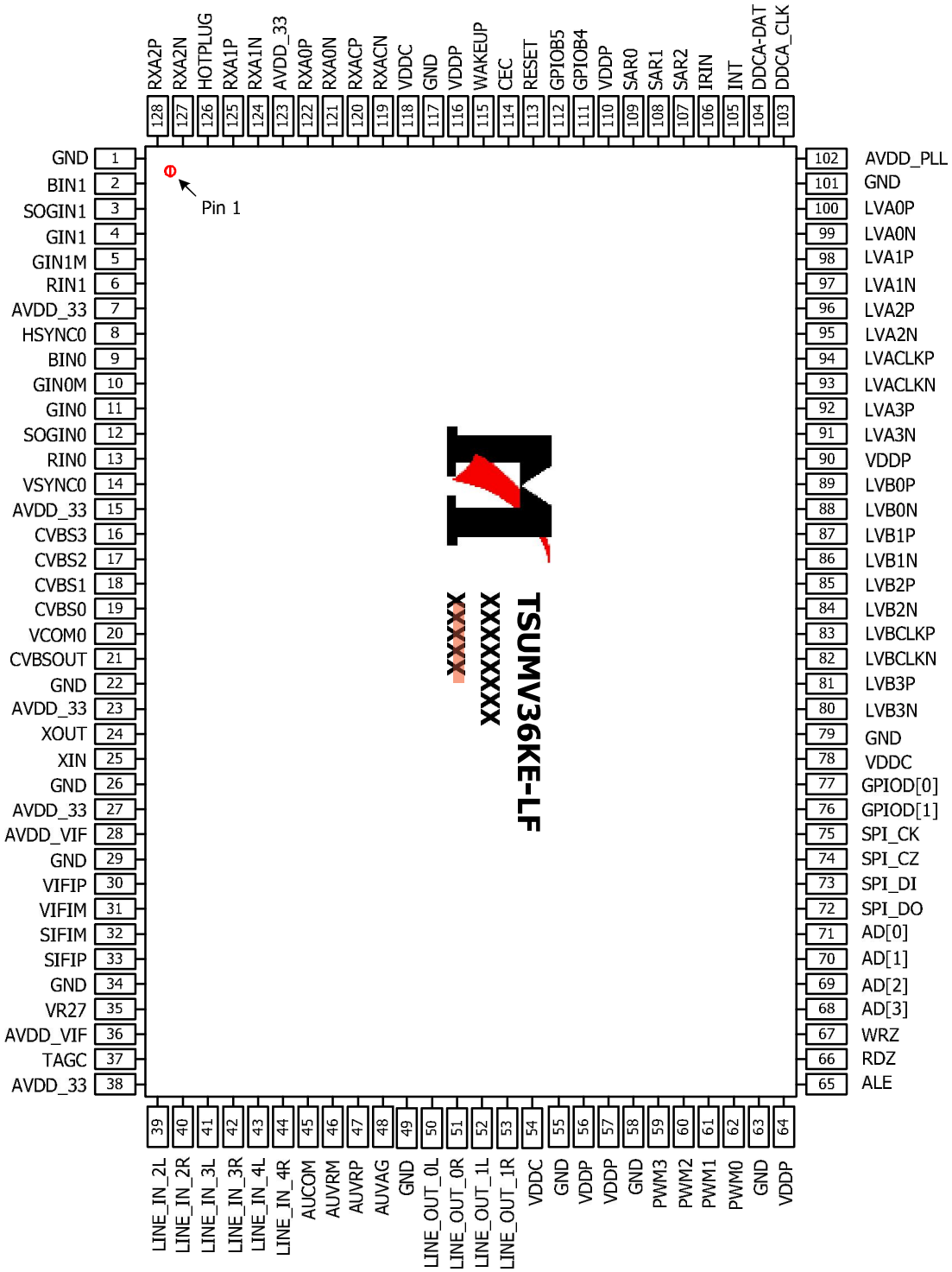
■ Miscellaneous
- 128-pin QFP package
- Integrated power management control with independent power plant to support deep sleep, and wake-up from various input

GENERAL DESCRIPTION

The TSUMV36KU is a high performance and all-in-one IC for multi-function LCD monitor/TV with resolutions up to full HD (1920x1080). It is configured with an integrated triple-ADC/PLL, an integrated DVI/HDCP/HDMI receiver, a multi-standard A/V front-end and baseband decoder, a video de-interlacer, a scaling engine, the MStarACE-3 color engine, an on-screen display controller and a built-in output panel interface. An embedded audio DSP processor gives various of audio manipulation functions for greater audience experiences.

To further reduce system costs, the TSUMV36KU also integrates intelligent power management control capability for green-mode requirements and spread-spectrum support for EMI management.

PIN DIAGRAM (TSUMV36KE)



DISCLAIMER

MSTAR SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. NO RESPONSIBILITY IS ASSUMED BY MSTAR SEMICONDUCTOR ARISING OUT OF THE APPLICATION OR USER OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

Electrostatic charges accumulate on both test equipment and human body and can discharge without detection. TSUMV36KE comes with ESD protection circuitry; however, the device may be permanently damaged when subjected to high energy discharges. The device should be handled with proper ESD precautions to prevent malfunction and performance degradation.

REVISION HISTORY

Document	Description	Date
TSUMV36KE_pd_v01	• Initial release	Sep 2009

ELECTRICAL SPECIFICATIONS

Analog Interface Characteristics

Parameter	Min	Typ	Max	Unit
VIDEO ADC Resolution		10		Bits
VIDEO ANALOG INPUT				
Input Voltage Range				
Minimum			0.5	V p-p
Maximum	1.0			V p-p
Input Bias Current			1	uA
Input Full-Scale Matching		1.5		%FS
Brightness Level Adjustment		62		%FS
SWITCHING PERFORMANCE				
Maximum Conversion Rate	165			MSPS
Minimum Conversion Rate			12	MSPS
HSYNC Input Frequency	15		200	kHz
PLL Clock Rate	12		165	MHz
PLL Jitter		500		ps p-p
Sampling Phase Tempco		15		ps/°C
DYNAMIC PERFORMANCE				
Analog Bandwidth, Full Power		250		MHz
DIGITAL INPUTS				
Input Voltage, High (V_{IH})	2.5			V
Input Voltage, Low (V_{IL})			0.8	V
Input Current, High (I_{IH})			-1.0	uA
Input Current, Low (I_{IL})			1.0	uA
Input Capacitance		5		pF
DIGITAL OUTPUTS				
Output Voltage, High (V_{OH})	VDDP-0.1			V
Output Voltage, Low (V_{OL})			0.1	V
VIDEO ANALOG OUTPUT				
CVBS Buffer Output				
Output Low		1.5		V
Output High		2.0		V

Parameter	Min	Typ	Max	Unit
AUDIO				
ADC Input		2.0		V p-p
DAC Output		2.0		V p-p
SIF Input Range				
Minimum			0.1	V p-p
Maximum	1.0			V p-p
FSSW Input[1]	0		1.8	V
SAR ADC Input	0		3.3	V
FB ADC Input[2]	0		1.25	V

Specifications subject to change without notice.
Notes:
1. **Input full scale is typically 1.8V, but input range is 0 ~ 3.3V.**
2. **Input full scale is 1.25V, but input range is 0 ~ 3.3V.**

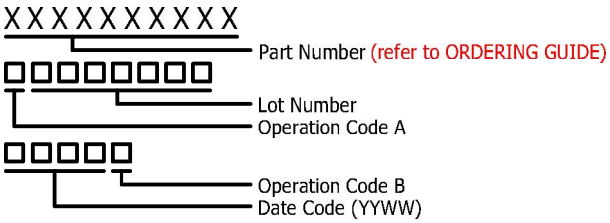
Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
3.3V Supply Voltages	V_{VDD_33}	3.14	3.6	V
1.26V Supply Voltages	V_{VDD_126}	1.2	1.32	V
Input Voltage (5V tolerant inputs)	$V_{IN5Vtol}$		5.0	V
Input Voltage (non 5V tolerant inputs)	V_{IN}		V_{VDD_33}	V
Ambient Operating Temperature	T_A	0	70	°C
Storage Temperature	T_{STG}	-40	150	°C
Junction Temperature	T_J		150	°C

ORDERING GUIDE

Part Number	Temperature Range	Package Description	Package Option
TSUMV36KU-LF	0°C to +70°C	QFP	128

MARKING INFORMATION



.

DISCLAIMER

MSTAR SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. NO RESPONSIBILITY IS ASSUMED BY MSTAR SEMICONDUCTOR ARISING OUT OF THE APPLICATION OR USER OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

Electrostatic charges accumulate on both test equipment and human body and can discharge without detection. TSUMV36KU comes with ESD protection circuitry; however, the device may be permanently damaged when subjected to high energy discharges. The device should be handled with proper ESD precautions to prevent malfunction and performance degradation.

REVISION HISTORY

Document	Description	Date
TSUMV36KU_ds_v01	• Initial release	Aug 2009
TSUMV36KU_ds_v02	• Revise typos in features	Sep 2009