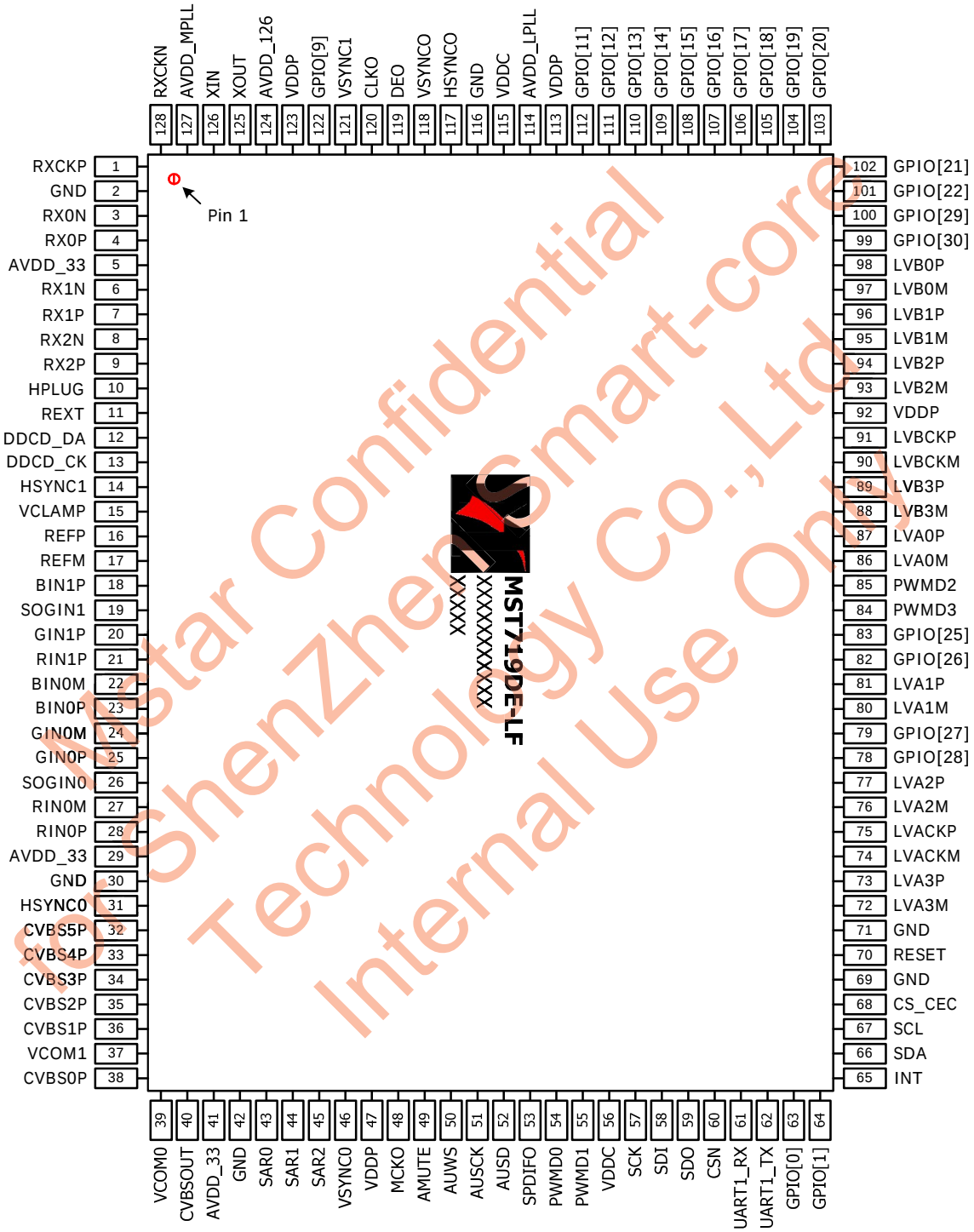
FEATURES

- Video Decoder
  - Supports NTSC, PAL and SECAM video input formats
  - 2-D NTSC and PAL comb filter for Y/C separation of CVBS input
  - Multiple CVBS and S-video inputs
  - Supports Closed-caption and V-chip
  - Supports Teletext 1.5 and capable Teletext 10 page navigation
  - ACC, AGC, and DCGC (Digital Chroma Gain Control)
- Analog Input
  - Supports RGB input format from PC, camcorders and GPS
  - Supports YCbCr inputs from conventional video source and HDTV
  - Supports SCART-RGB with Fast Blanking input
  - Supports video input 480i, 480p, 576i, 576p, 720p, 1080i; RGB input resolution in 640x480, 800x480, 800x600, 1024x768, 1280x1024, 1366x768, 1440x900, 1680x1050 (WSXGA+)
  - 3-channel low-power 10-bit ADCs integration for YCbCr and RGB
  - Supports RGB composite sync input (CSYNC), SOY, SOG, HSYNC, and VSYNC
  - On-chip clock synthesizer and PLL
  - Auto-position adjustment, auto-phase adjustment, auto-gain adjustment, and auto-mode detection
- Digital Input
  - HDMI 1.3A, HDCP 1.2, and DVI 1.0 compliant receiver
  - TMDS clock operation speed 25MHz ~225MHz (up to 1080P 60Hz 12-bit resolution)
  - Supports ITU-BT.656 shared with GPIO pins
- Color Engine
  - Brightness, contrast, saturation, and hue adjustment
  - 9-tap programmable multi-purpose FIR (Finite Impulse Response) filter
  - Differential 3-band peaking engine
  - Vertical peaking
  - Spatial noise reduction
  - Luminance Transient Improvement (LTI)
  - Chrominance Transient Improvement (CTI)
  - Black Level Extension (BLE)
  - White Level Extension (WLE)
  - Favor Color Compensation (FCC)
  - 3-channel gamma curve adjustment
  - Independent 6 color of saturation, hue, and brightness control
- Scaling Engine/Panel Interface
  - Pixel clock of panel output supports up to 150Mhz
  - Supports digital panels up to 1366x768,1440x900 and 1680x1050
  - Supports single/dual 8-bit LVDS panel outputs
  - Supports 8-bit TTL panel output
  - Supports mini-LVDS output with TCON signals
  - Supports various displaying modes
  - Supports horizontal panorama scaling
- Miscellaneous
  - Built-in MCU
  - 3-wire serial bus interface for configuration setup
  - Built-in internal OSD with 512 programmable fonts, 1、2 or 3 bit per pixel color, 256-color palettes, and 24-bit color resolution
  - Supports CVBS out
  - Supports digital I2S and SPDIF output
  - Spread spectrum clocks
  - 3.3V output pads with programmable driving current
  - 128-pin LQFP package

GENERAL DESCRIPTION

The MST719DE is a high quality ASIC for NTSC/PAL/SECAM, and HDMI LCD-TV application. It receives analog NTSC/PAL/SECAM CVBS and S-Video inputs from TV tuners, DVD or VCR sources, including weak and distorted signals, as well as analog RGB and YCbCr. Automatic gain control (AGC) and 10-bit 3-channel A/D converters provide high resolution video quantization. With automatic video source and mode detection, users can easily switch and adjust variety of signal sources. Multiple internal adaptive PLLs precisely extract pixel clock from video source and perform sharp color demodulation. Built-in line-buffer supports adaptive 2-D comb filter, 2-D sharpening, and synchronization stabler in a condense manner. The output format of MST719DE supports programmable 8-bit TTL or LVDS digital or mini-LVDS digital TFT-LCD modules.

PIN DIAGRAM (MST719DE)



PIN DESCRIPTION

Analog Interface

Pin Name	Pin Type	Function	Pin
REXT	Analog Input	External Resister 390 ohm to AVDD_33	11
VCLAMP		CVBS/YC Mode Clamp Voltage Bypass	15
REFP		Internal ADC Top De-coupling Pin	16
REFM		Internal ADC Bottom De-coupling Pin	17
BIN1P	Analog Input	Analog Blue Input from Channel 1	18
SOGIN1	Analog Input	Sync On Green input from Channel 1	19
GIN1P	Analog Input	Analog Green Input from Channel 1	20
RIN1P	Analog Input	Analog Red Input from Channel 1	21
BIN0M	Analog Input	Reference Ground for Analog Blue Input	22
BIN0P	Analog Input	Analog Blue Input from Channel 0	23
GIN0M	Analog Input	Reference Ground for Analog Green Input	24
GIN0P	Analog Input	Analog Green Input from Channel 0	25
SOGIN0	Analog Input	Sync On Green Input from Channel 0	26
RINM	Analog Input	Reference Ground for Analog Red Input	27
RIN0P	Analog Input	Analog Red Input from Channel 0	28
HSYNC1	Schmitt Trigger Input w/ 5V-tolerant	Analog HSYNC Input from Channel 1	14
VSYNC1	Schmitt Trigger Input w/ 5V-tolerant	Analog VSYNC Input from Channel 1	121
HSYNC0	Schmitt Trigger Input w/ 5V-tolerant	HSYNC / Composite Sync for VGA Input from channel 0	31
VSYNC0	Schmitt Trigger Input w/ 5V-tolerant	VSYNC for VGA Input from channel 0	46

Analog Video Input/Output Interface

Pin Name	Pin Type	Function	Pin
CVBS5P	Analog Input	CVBS (Composite) Video Input Channel 5	32
CVBS4P	Analog Input	CVBS (Composite) Video Input Channel 4	33
CVBS3P	Analog Input	CVBS (Composite) Video Input Channel 3	34
CVBS2P	Analog Input	CVBS (Composite) Video Input Channel 2	35
CVBS1P	Analog Input	CVBS (Composite) Video Input Channel 1	36
CVBS0P	Analog Input	CVBS (Composite) Video Input Channel 0	38
VCOM1	Analog Input	CVBS Video Input Reference Ground	37

Pin Name	Pin Type	Function	Pin
VCOM0	Analog Input	CVBS Video Input Reference Ground	39
CVBSOUT	Analog Output	CVBS (Composite) Video Output	40

Analog Audio Input/Output Interface

Pin Name	Pin Type	Function	Pin
MCKO	Output	I2S Audio Master Clock Output	48
AMUTE	Output	I2S Audio Output Mute Control	49
AUWS	Output	I2S Word Select Output; 4mA driving strength	50
AUSCK	Output	I2S Audio Bit Clock Output	51
AUSD	Output	I2S Audio Serial Data Output; 4mA driving strength	52
SPDIFO	Output	Audio S/PDIF Output; 4mA driving strength	53

DVI/HDMI Interface

Pin Name	Pin Type	Function	Pin
RX0N	Input	Negative DVI/HDMI Input for Data Channel 0	3
RX0P	Input	Positive DVI/HDMI Input for Data Channel 0	4
RX1N	Input	Negative DVI/HDMI Input for Data Channel 1	6
RX1P	Input	Positive DVI/HDMI Input for Data Channel 1	7
RX2N	Input	Negative DVI/HDMI Input for Data Channel 2	8
RX2P	Input	Positive DVI/HDMI Input for Data Channel 2	9
RXCKN	Input	Negative DVI/HDMI Input for Clock Channel	128
RXCKP	Input	Positive DVI/HDMI Input for Clock Channel	1
HPLUG	Input	Hot Plug Detection for DVI/HDMI	10

LVDS Interface

Pin Name	Pin Type	Function	Pin
LVA0P	Output	LVDS A-Link Channel 0 Positive Data Output	87
LVA0M	Output	LVDS A-Link Channel 0 Negative Data Output	86
LVA1P	Output	LVDS A-Link Channel 1 Positive Data Output	81
LVA1M	Output	LVDS A-Link Channel 1 Negative Data Output	80
LVA2P	Output	LVDS A-Link Channel 2 Positive Data Output	77
LVA2M	Output	LVDS A-Link Channel 2 Negative Data Output	76
LVA3P	Output	LVDS A-Link Channel 3 Positive Data Output	73
LVA3M	Output	LVDS A-Link Channel 3 Negative Data Output	72

Pin Name	Pin Type	Function	Pin
LVACKP	Output	LVDS A-Link Positive Clock Output	75
LVACKM	Output	LVDS A-Link Negative Clock Output	74
LVB0P	Output	LVDS B-Link Channel 0 Positive Data Output	98
LVB0M	Output	LVDS B-Link Channel 0 Negative Data Output	97
LVB1P	Output	LVDS B-Link Channel 1 Positive Data Output	96
LVB1M	Output	LVDS B-Link Channel 1 Negative Data Output	95
LVB2P	Output	LVDS B-Link Channel 2 Positive Data Output	94
LVB2M	Output	LVDS B-Link Channel 2 Negative Data Output	93
LVB3P	Output	LVDS B-Link Channel 3 Positive Data Output	89
LVB3M	Output	LVDS B-Link Channel 3 Negative Data Output	88
LVBCKP	Output	LVDS B-Link Positive Clock Output	91
LVBCKM	Output	LVDS B-Link Negative Clock Output	90

Mini-LVDS Interface

Pin Name	Pin Type	Function	Pin
LLV0P	Output	Mini-LVDS L-Link Channel 0 Positive Data Output	112
LLV0N	Output	Mini-LVDS L-Link Channel 0 Negative Data Output	111
LLV1P	Output	Mini-LVDS L-Link Channel 1 Positive Data Output	110
LLV1N	Output	Mini-LVDS L-Link Channel 1 Negative Data Output	109
LLV2P	Output	Mini-LVDS L-Link Channel 2 Positive Data Output	108
LLV2N	Output	Mini-LVDS L-Link Channel 2 Negative Data Output	107
LLV3P	Output	Mini-LVDS L-Link Channel 3 Positive Data Output	102
LLV3N	Output	Mini-LVDS L-Link Channel 3 Negative Data Output	101
LLV4P	Output	Mini-LVDS L-Link Channel 4 Positive Data Output	98
LLV4N	Output	Mini-LVDS L-Link Channel 4 Negative Data Output	97
LLV5P	Output	Mini-LVDS L-Link Channel 5 Positive Data Output	96
LLV5N	Output	Mini-LVDS L-Link Channel 5 Negative Data Output	5
LLV6P	Output	Mini-LVDS L-Link Channel 6 Positive Data Output	94
LLV6N	Output	Mini-LVDS L-Link Channel 6 Negative Data Output	93
LLVCKP	Output	Mini-LVDS L-Link Positive Clock Data Output	100
LLVCKN	Output	Mini-LVDS L-Link Negative Clock Data Output	99
RLV0P	Output	Mini-LVDS R-Link Channel 0 Positive Data Output	91
RVL0N	Output	Mini-LVDS R-Link Channel 0 Negative Data Output	90
RLV1P	Output	Mini-LVDS R-Link Channel 1 Positive Data Output	89
RVL1N	Output	Mini-LVDS R-Link Channel 1 Negative Data Output	88
RLV2P	Output	Mini-LVDS R-Link Channel 2 Positive Data Output	87
RVL2N	Output	Mini-LVDS R-Link Channel 2 Negative Data Output	86
RLV3P	Output	Mini-LVDS R-Link Channel 3 Positive Data Output	81

Pin Name	Pin Type	Function	Pin
RVL3N	Output	Mini-LVDS R-Link Channel 3 Negative Data Output	80
RLV4P	Output	Mini-LVDS R-Link Channel 4 Positive Data Output	77
RVL4N	Output	Mini-LVDS R-Link Channel 4 Negative Data Output	76
RLV5P	Output	Mini-LVDS R-Link Channel 5 Positive Data Output	75
RVL5N	Output	Mini-LVDS R-Link Channel 5 Negative Data Output	74
RLV6P	Output	Mini-LVDS R-Link Channel 6 Positive Data Output	73
RVL6N	Output	Mini-LVDS R-Link Channel 6 Negative Data Output	72
RLVCKP	Output	Mini-LVDS L-Link Positive Clock Data Output	79
RLVCKN	Output	Mini-LVDS L-Link Negative Clock Data Output	78

TTL Output Interface

Pin Name	Pin Type	Function	Pin
CPV	I/O w/ Pull-down Resistor	Gate Driver Scanning Clock	64
TP	I/O w/ Pull-down Resistor	Column Driver Output Control	117
POL	I/O w/ Pull-down Resistor	Column Driver Output Polarity Control	118
STH_F	I/O w/ Pull-down Resistor	A-Link (First) Column Driver Start Control	119
STV	I/O w/ Pull-down Resistor	Gate Driver Start Control	120
OE	I/O w/ Pull-down Resistor	Gate Driver Output Enable	122

Digital Panel Output Interface

Pin Name	Pin Type	Function	Pin
CLKO	Output	Display Clock Output	120
DEO	Output	Display Enable Output	119
VSYNCO	Output	Vertical Sync Output	118
HSYNCO	Output	Horizontal Sync Output	117
BOUT[7:0]	Output	Blue channel Output [7:0]	81, 80, 77-72
GOUT[7:0]	Output	Green channel Output [7:0]	94, 93, 91-86
ROUT[7:0]	Output	Red channel Output [7:0]	108,107, 102, 101, 98-95

Video Interface

Pin Name	Pin Type	Function	Pin
VCLK	Input	ITU-R BT.656 Clock Input	100
VD[7:0]	Input	ITU-R BT.656 Data Input Bit[7:0]	112-109, 109-103

Internal MCU Interface with Serial Flash Memory

Pin Name	Pin Type	Function	Pin
SAR2	Analog Input	SAR Low Speed ADC Input 2	45
SAR1	Analog Input	SAR Low Speed ADC Input 1	44
SAR0	Analog Input	SAR Low Speed ADC Input 0	43
SCK	Output	SPI Interface Sampling Clock	57
SDI	Output	SPI Interface Data-In	58
SDO	Input	SPI Interface Data-Out	59
CSN	Output	SPI Interface Chip Select	60
UART1_RX	I/O w/5V-tolerant	Universal Asynchronous Receiver 1	61
UART1_TX	I/O w/5V-tolerant	Universal Asynchronous Transmitter 1	62
GPIO[30:23]	Input/Output	General Purpose Input/Output; 4mA driving strength	99, 100, 78, 79, 82, 83
GPIO[20:17]	Input/Output	General Purpose Input/Output; 4mA driving strength	103-101, 104-112
GPIO[9]	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	122
GPIO[1:0]	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	64, 63
INT	Input	Interrupt Input for IR Receiver	65
SDA	I/O w/ 5V-tolerant, w/ pull-up resistor	3-Wire Serial Bus Data	66
SCL	Input w/ 5V-tolerant	3-Wire Serial Bus Clock	67
CS_CEC	Input w/ 5V-tolerant	Chip Selection for 3-wire Serial / HDMI Consumer Electronics Control	68

Misc. Interface

Pin Name	Pin Type	Function	Pin
DDCD_DA	I/O w/ 5V-tolerant	HDCP Serial Bus Data / DDC Data of DVI/HDMI Port	12
DDCD_CK	Input w/ 5V-tolerant	HDCP Serial Bus Clock / DDC Clock of DVI/HDMI Port	13
RESET	Schmitt Trigger Input w/ 5V-tolerant	Hardware Reset; active high	70
XOUT	Analog Output	Crystal Oscillator Output	125
XIN	Analog Input	Crystal Oscillator Input	126
PWMD0	Output	Pulse Width Modulation Output; 4mA driving strength	54
PWMD1	Output	Pulse Width Modulation Output; 4mA driving strength	55
PWMD2	Output	Pulse Width Modulation Output; 4mA driving strength	85
PWMD3	Output	Pulse Width Modulation Output; 4mA driving strength	84

Power Pins

Pin Name	Pin Type	Function	Pin
AVDD_126	1.26V Power	HDMI Digital Power	124
AVDD_33	3.3V Power	ADC Power	5, 29, 41
AVDD_LPLL	3.3V Power	LPLL Power	114
AVDD_MPLL	3.3V Power	MPLL Power	127
VDDC	1.26V Power	Digital Core Power	56, 115
VDDP	3.3V Power	Digital Input/Output Power	47, 92, 113, 123
GND	Ground	Ground	2, 30, 42, 69, 71, 116

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

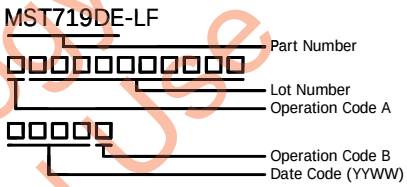
Parameter	Symbol	Min	Typ	Max	Units
3.3V Supply Voltages	V_{VDD_33}	-0.3		3.6	V
1.26V Supply Voltages	V_{VDD_126}	-0.3		1.32	V
Input Voltage (5V tolerant inputs)	$V_{IN5Vtol}$	-0.3		5.0	V
Input Voltage (non 5V tolerant inputs)	V_{IN}	-0.3		V_{VDD_33}	V
Ambient Operating Temperature	T_A	0		70	°C
Storage Temperature	T_{STG}	-40		150	°C
Junction Temperature	T_J			150	°C
Thermal Resistance (Junction to Air) Natural Conversion	θ_{JA}		TBD		°C/W
Thermal Resistance (Junction to Case) Natural Conversion	θ_{JC}		TBD		°C/W

Note: Stresses above those listed in Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and does not imply functional operation of the device. Exposure to absolute maximum ratings for extended periods may affect device reliability.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
MST719DE-LF	0°C to +70°C	LQFP	128

MARKING INFORMATION



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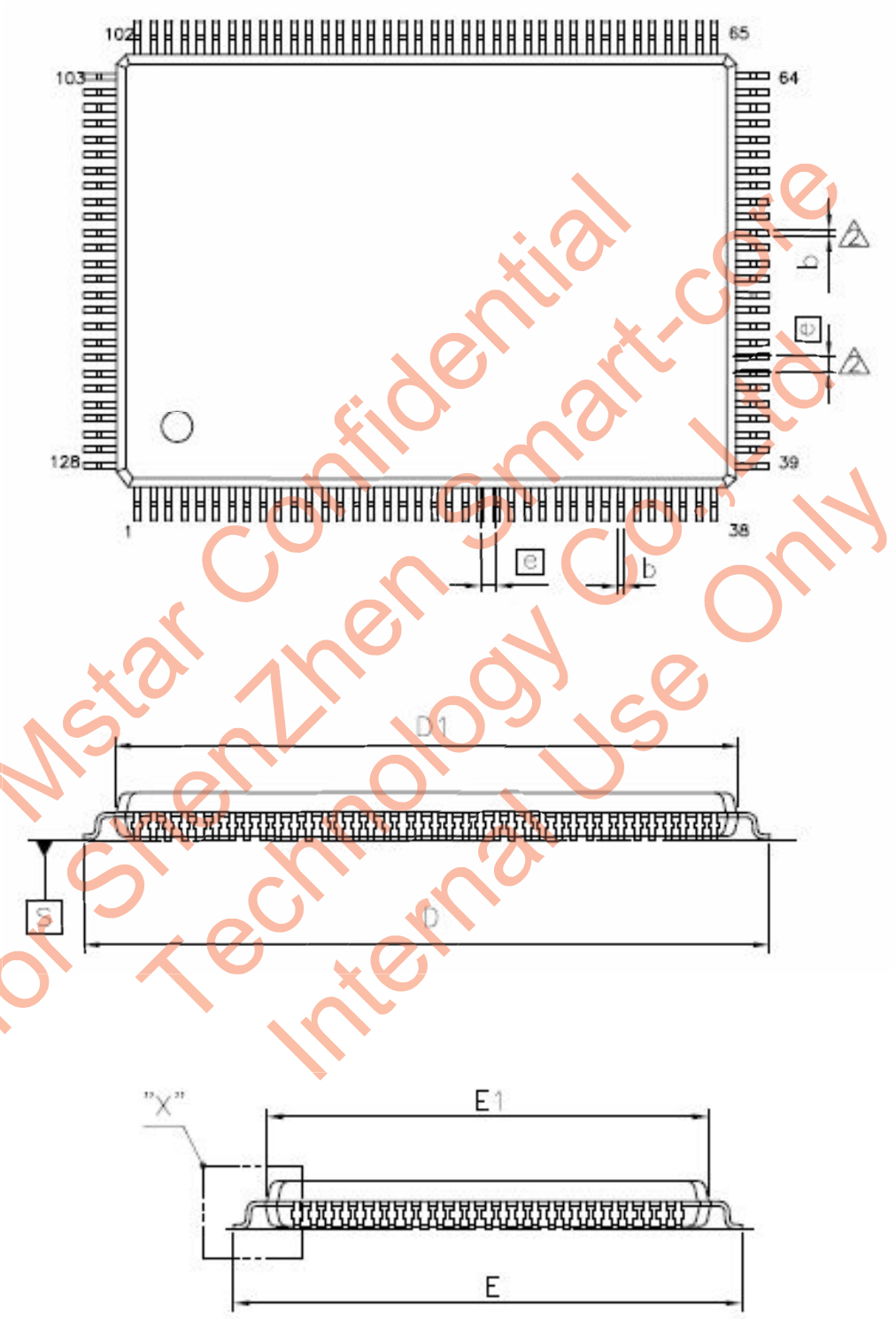
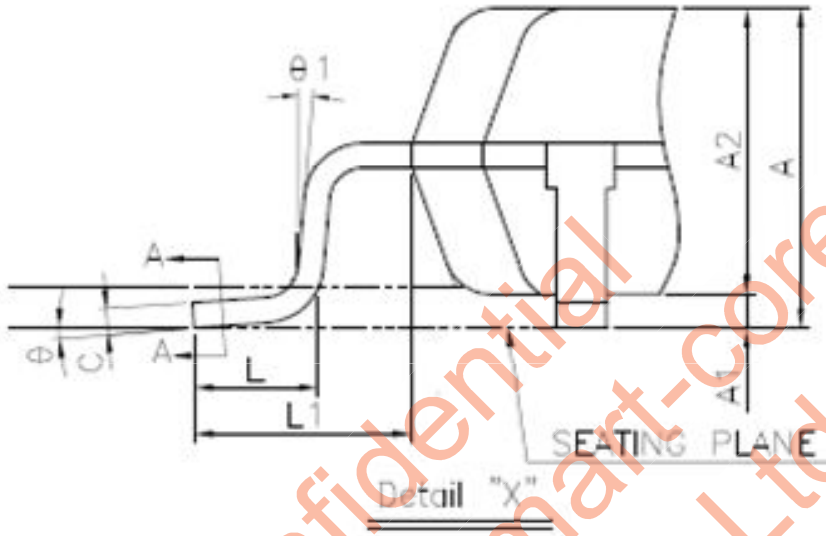
Electrostatic charges accumulate on both test equipment and human body and can discharge without detection. MST719DE comes with ESD protection circuitry; however, the device may be permanently damaged when subjected to high energy discharges. The device should be handled with proper ESD precautions to prevent malfunction and performance degradation.

REVISION HISTORY

Document	Description	Date
MST719DE_ds_v01	• Initial release	Dec 2007

MECHANICAL DIMENSIONS





Symbol	Millimeter			Inch		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.60	-	-	0.063
A1	0.05	-	0.15	0.002	-	0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
b	0.17	0.22	0.27	0.007	0.009	0.011
c	0.09	-	0.20	0.004	0.006	0.008
D	21.90	22.00	22.10	0.862	0.866	0.870
D1	19.90	20.00	20.10	0.783	0.787	0.791
E	15.90	16.00	16.10	0.626	0.630	0.634
E1	13.90	14.00	14.10	0.547	0.551	0.555
e	-	0.50	-	-	0.020	-
L	0.45	0.60	0.75	0.018	0.024	0.030
L1	1 REF.			0.039 REF.		
θ	0°	3.5°	7°	0°	3.5°	7°
θ1	0°	-	-	0°	-	-