RTD 2271W / 2281W Family

Dual-Input LCD Display Controller

Brief Spec

Version 1.02
Last updated: 2009/12/22

1. Features

General
- Embedded 2 DDC with DDC1/2B/CI
- Zoom scaling up and down
- Embedded one MCU with SPI flash controller.
- It contains 4 ADCs in key pad application
- Require only one crystal to generate all timing.
- Programmable internal low-voltage-reset (LVR)
- High resolution 6 channels PWM output, and wide range selectable PWM frequency.
- Support input format up to FHD
- Support 27MHz/24MHz/14.318MHz crystal type

Analog RGB Input Interface
- 1 Analog input supported
- Integrated 8-bit triple-channel 210MHz ADC/PLL
- Embedded programmable Schmitt trigger of HSYNC
- Support Sync-On-Green (SOG) and various kinds of composite sync modes
- On-chip high-performance hybrid PLLs
- High resolution true 64 phase ADC PLL
- YPbPr support up to HDTV 1080p resolution

Digital Input Interface with HDCP
- Single link on-chip TMDS receiver support to 165Mhz
- Adaptive algorithm for TMDS capability
- Data enable only mode support
- High-Bandwidth Digital Content Protection (HDCP 1.3)
- Enhanced protection of HDCP secret key

Embedded MCU
- Industrial standard 8051 core with external serial flash
- Low speed ADC for various application
- I2C Master or Slave hardware supported

Auto Detection /Auto Calibration
- Input format detection
- Compatibility with standard VESA mode and support user-defined mode
- Smart engine for Phase/Image position/Color calibration

Scaling
- Fully programmable zoom ratios
- Independent horizontal/vertical scaling
- Advanced zoom algorithm provides high image quality
- Sharpness/Smooth filter enhancement
- Support non-linear scaling from 4:3 to 16:9 or 16:9 to 4:3

Color Processor
- True 10 bits color processing engine
- xvYCC supported
- sRGB compliance
- Advanced dithering logic for 18-bit panel color depth enhancement
- Dynamic overshoot-smear canceling engine
- Brightness and contrast control
- Programmable 10-bit gamma support
- Peaking/Coring function for video sharpness

VividColor™
- Independent color management (ICM)
- Dynamic contrast control (DCC)
- Precise color mapping (PCM)

Output Interface
- Fully programmable display timing generator
- Flexible data pair swapping for easier system design.
- 1 and 2 pixel/clock panel support and up to FHD resolution. 135MHz for single LVDS. 210MHz for dual LVDS.
- LVDS -output interface on single PCB
- Support 8-bit LVDS output
- Spread-Spectrum DPLL to reduce EMI
- Fixed Last Line output for perfect panel capability

Embedded OSD
- Embedded 20K SRAM dynamically stores OSD command and fonts
- Support multi-color RAM font, 1, 2 and 4-bit per pixel
- 64 color palette
- Maximum 18 window with alpha-blending/ gradient / gradient target color / gradient reversed color/ dynamic fade-in/fade-out, bordering/ shadow/3D window type
- Rotary 90,180,270 degree
- Independent row shadowing/bordering
- Programmable blinking effects for each character
- OSD-made internal pattern generator for factory mode
- Support 12x18~4x18 proportional font
- Hardware decompression for OSD font
- Support OSD scrolling
- Support 2 independent font based OSD

Power Supply
- 3.3V / 1.2V power supply
- Low standby current (<4mA)

2. Ordering Information

Part No.	VGA	DVI	HDMI	DP	HDCP	Audio	OD	FRC	Max. Resolution	Output	PKG
RTD2281W-GR	Yes (210MHz)	Yes	No	No	Yes	No	No	No	1920*1080 @ 75Hz	Dual-LVDS	QFP128 (green package)
RTD2271W-GR	Yes (210MHz)	Yes	No	No	Yes	No	No	No	1680*1050 @ 75Hz	Dual-LVDS	QFP128 (green package)

3. Chip Data Path Block Diagram

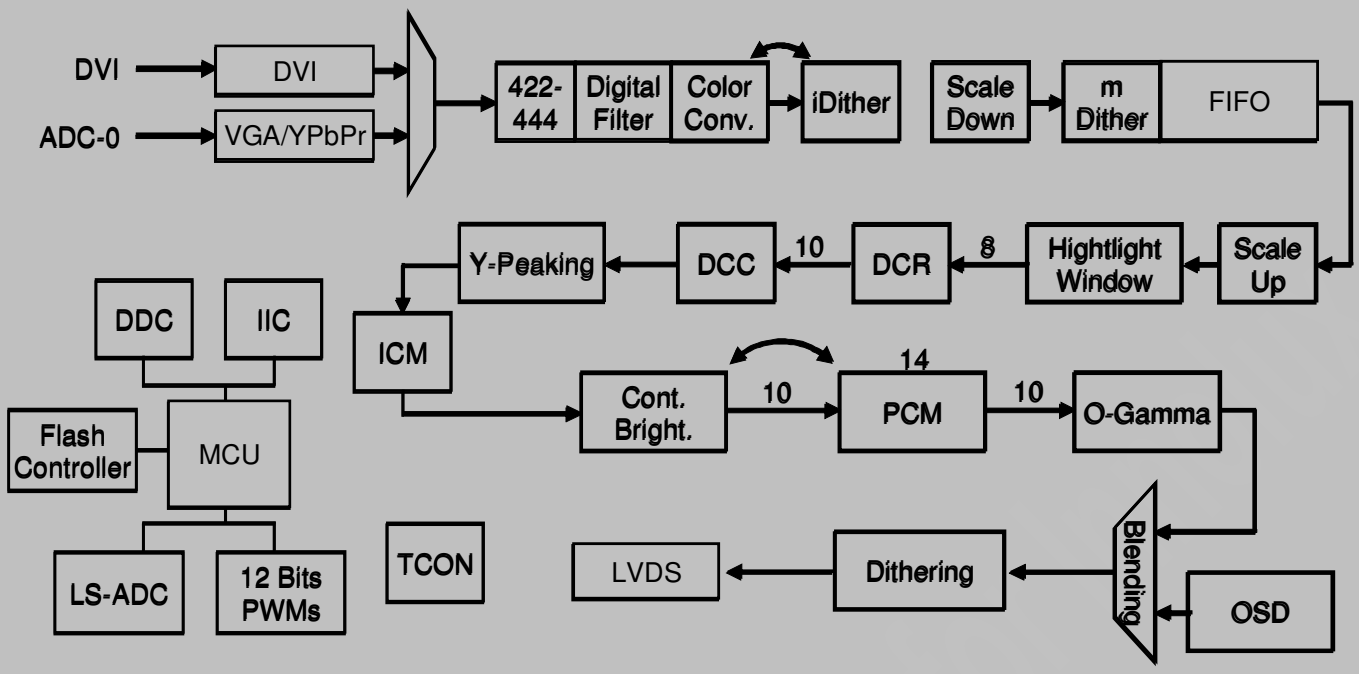
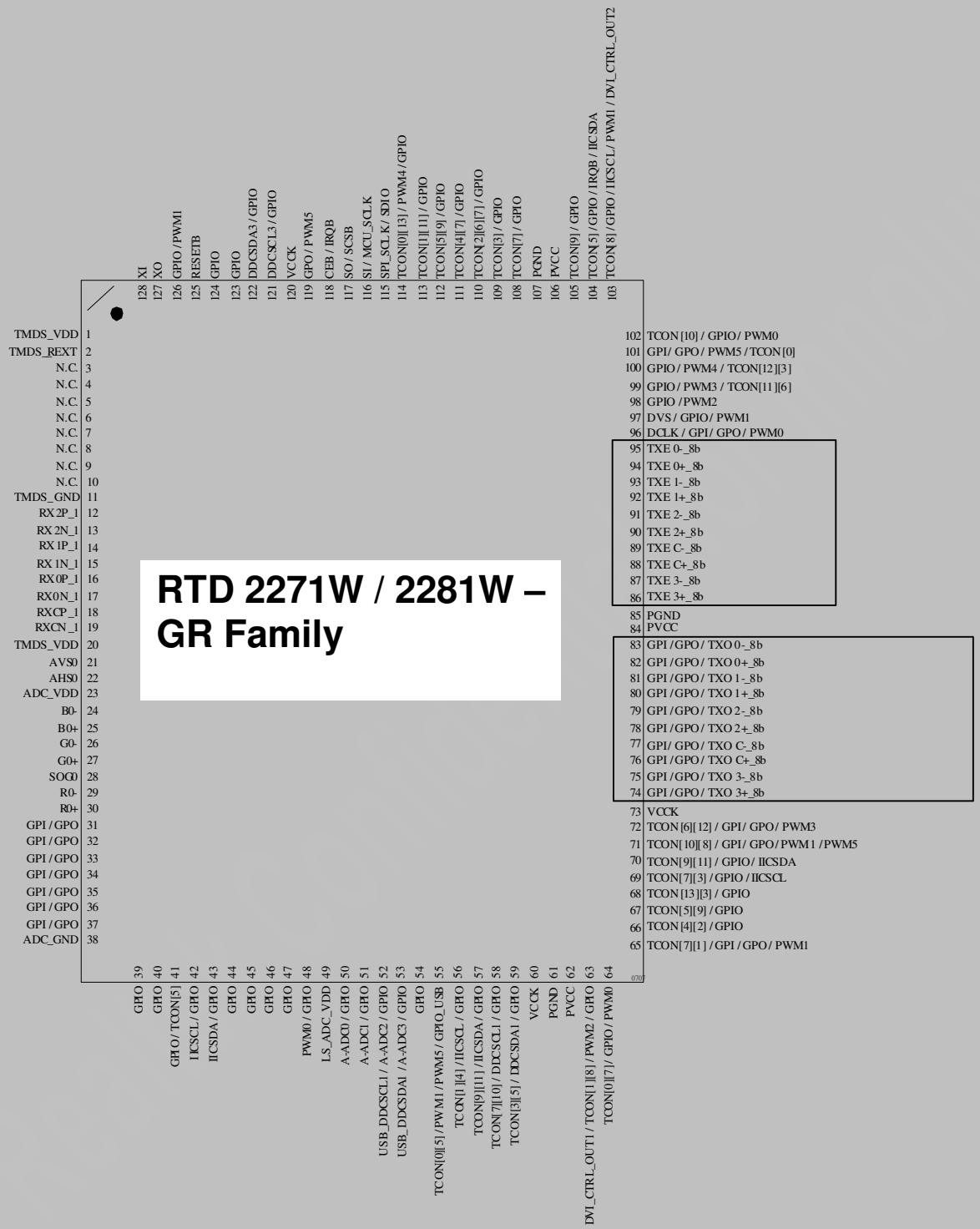


Figure1

4. Pin Diagram

128 Pin QFP



(Pin 119 : Power on latch Pin)

(when AC Power On , Power on latch pin must be “High”)

Table of Pin Assignment

(I/O Legend: A = Analog, I = Input, O = Output, P = Power, G = Ground)

Name	I/O	Pin #	Description	Note
TMDS_VDD	AP	1	TMDS power	(3.3 V)
TMDS_REXT	AI	2	Impedance Match Reference Resistor For Scan mode,it should be pulled high Scan mode: SI[7:0] is assigned to {124~121,114~111} SO[7:0] is assigned to {110~108,105~101} SE is assigned to 100.	Ref value: 6.2 K ohm (Reference to VCC)
N.C.	AI	3	Not connected	
N.C.	AI	4	Not connected	
N.C.	AI	5	Not connected	
N.C.	AI	6	Not connected	
N.C.	AI	7	Not connected	
N.C.	AI	8	Not connected	
N.C.	AI	9	Not connected	
N.C.	AI	10	Not connected	
TMDS_GND	AG	11	TMDS ground	
RX2P_1	AI	12	TMDS Differential signal Input	
RX2N_1	AI	13	TMDS Differential signal Input	
RX1P_1	AI	14	TMDS Differential signal Input	
RX1N_1	AI	15	TMDS Differential signal Input	
RX0P_1	AI	16	TMDS Differential signal Input	
RX0N_1	AI	17	TMDS Differential signal Input	
RXCP_1	AI	18	TMDS Differential signal Input	
RXCN_1	AI	19	TMDS Differential signal Input	
TMDS_VDD	AP	20	TMDS power	(3.3 V)
AVS0	I	21	ADC vertical sync input	5V tolerance even when power-off
AHS0	I	22	ADC horizontal sync input AVS0 and AHS0 could be used to select one of three scan chain. AHS0/AVS0: 2'b00: {i_chain[2:0], mcu_chain[1:0], vbi_chain[2:0]} 2'b01: d_chain 2'b10: vdec_chain Other are reserved	5V tolerance even when power-off
ADC_VDD	AP	23	ADC Power	(1.2V)
B0-	AI	24	Negative BLUE analog input (Pb-)	
B0+	AI	25	Positive BLUE analog input (Pb+)	
G0-	AI	26	Negative GREEN analog input (Y-)	
G0+	AI	27	Positive GREEN analog input (Y+)	
SOG0	AI	28	Sync-On-Green	
R0-	AI	29	Negative RED analog input (Pr-)	
R0+	AI	30	Positive RED analog input (Pr+)	
GPI/GPO	AI	31	MCU GPI/GPO	3.3 V tolerance
GPI/GPO	AI	32	MCU GPI/GPO	3.3 V tolerance
GPI/GPO	AI	33	MCU GPI/GPO	3.3 V tolerance
GPI/GPO	AI	34	MCU GPI/GPO	3.3 V tolerance

GPI/GPO	AI	35	MCU GPI	3.3 V tolerance
GPI/GPO	AI	36	MCU GPI/GPO	3.3 V tolerance
GPI/GPO	AI	37	MCU GPI/GPO	3.3 V tolerance
ADC_GND	AG	38	ADC ground	
GPIO	I	39	MCU GPIO	5V tolerance even when power-off
GPIO	I	40	MCU GPIO	5V tolerance even when power-off
GPIO/	AI	41	MCU GPIO/	5V tolerance even when power-off
GPIO/IICSCL	AI	42	MCU GPIO/IIC BUS	3.3 V tolerance
GPIO/IICSDA	AI	43	MCU GPIO/IIC BUS	3.3 V tolerance
GPIO	AI	44	MCU GPIO	3.3 V tolerance
GPIO	AI	45	MCU GPIO	3.3 V tolerance
GPIO	AI	46	MCU GPIO	3.3 V tolerance
GPIO	AI	47	MCU GPIO	3.3 V tolerance
GPIO/PWM0	AI	48	MCU GPIO/PWM	3.3 V tolerance
LS_ADC_VDD	AP	49	Low Speed ADC POWER	(3.3V)
A-ADC0/GPIO	IO	50	8-bit MCU ADC Input /MCU GPIO	3.3 V tolerance (GPIO open-drain)
A-ADC1/GPIO	IO	51	8-bit MCU ADC Input/MCU GPIO	3.3 V tolerance (GPIO open-drain)
A-ADC2/GPIO /USB_DDCSCL1	IO	52	8-bit MCU ADC Input /MCU GPIO /USB_DDCSCL1 When (Page 10, 0xA2[0] = 1) && (pin55 = 1), disable DDC function of pin 58, 59 and swap to pin 52, 53	3.3 V tolerance (GPIO open-drain)
A-ADC3/GPIO /USB_DDCSDA1	IO	53	8-bit MCU ADC Input/MCU GPIO /USB_DDCSDA1 When (Page 10, 0xA2[0] = 1) && (pin55 = 1), disable DDC function of pin 58, 59 and swap to pin 52, 53	3.3 V tolerance (GPIO open-drain)
GPIO	IO	54	MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
GPIO_USB/PWM1/PWM 5/TCON[5] [0]	IO	55	MCU GPIO_USB Ctrl/PWM/TCON	5V tolerance even when power-off (GPIO open-drain)

GPIO/IICSCL/ TCON[4] [1]	IO	56	/MCU GPIOD/IIC BUS/TCON	5V tolerance even when power-off (GPIO open-drain)
GPIO/IICSDA/TCON[11] [9]	IO	57	MCU GPIO/IIC BUS/TCON	5V tolerance even when power-off (GPIO open-drain)
DDCSCL1/GPIO/ TCON[10] [7]	IO	58	DDC1(Open drain I/O)/MCU GPIO/TCON	5V tolerance even when power-off (GPIO open-drain)
DDCSDA1/GPIO/ TCON[5] [3]	IO	59	DDC1(Open drain I/O)/MCU GPIO/TCON	5V tolerance even when power-off (GPIO open-drain)
VCCK	P	60	Digital Power	(1.2V)
PGND	G	61	Pad ground	
PVCC	P	62	Pad power	(3.3V)
GPIO/PWM2/ TCON[8] [1]/DVI_CTRL_OUT1	IO	63	MCU GPIO/PWM/TCON	5V tolerance even when power-off (GPIO open-drain)
TCON[7] [0]/ GPIO/PWM0	IO	64	TCON/MCU GPIO/PWM	5V tolerance even when power-off (GPIO open-drain)
GPI/GPO/ TCON[7][1]/PWM1	IO	65	MCU GPIO/ TCON/PWM	5V tolerance
TCON[4][2]/GPIO	IO	66	TCON/MCU GPIO	5V tolerance
TCON[5][9]/GPIO	IO	67	TCON/MCU GPIO	5V tolerance
TCON[13][3]/GPIO	IO	68	TCON/MCU GPIO	5V tolerance
TCON[7][3]/GPIO/IICSCL	IO	69	TCON/MCU GPIO/IIC BUS	5V tolerance
TCON[9][11]/GPIO/IICSDA	IO	70	TCON /MCU GPIO/IIC bus	5V tolerance
TCON[10][8]/GPI/GPO/PWM1/PWM5	IO	71	TCON /MCU GPI/GPO/PWM	5V tolerance
GPI/GPO/PWM3/TCON[12][6]	IO	72	MCU GPI/GPO/PWM/TCON	5V tolerance
VCCK	P	73	Digital Power	(1.2V)
TXO3+_8b/GPI/GPO	IO	74	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXO3-_8b /GPI/GPO	IO	75	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXOC+_8b/GPI/GPO	IO	76	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXOC-_8b/GPI/GPO	IO	77	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXO2+_8b/GPI/GPO	IO	78	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXO2-_8b/GPI/GPO	IO	79	LVDS 8bit/MCU GPIO	3.3 V tolerance

TXO1+_8b/GPI/GPO	IO	80	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXO1-_8b/GPI/GPO	IO	81	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXO0+_8b/GPI/GPO	IO	82	LVDS 8bit/MCU GPIO	3.3 V tolerance
TXO0-_8b/GPI/GPO	IO	83	LVDS 8bit/MCU GPIO	3.3 V tolerance
PVCC	P	84	Pad power	3.3V
PGND	G	85	Pad ground	
TXE3+_8b	O	86	LVDS 8bit	3.3 V tolerance
TXE3-_8b	O	87	LVDS 8bit	3.3 V tolerance
TXEC+_8b	O	88	LVDS 8bit	3.3 V tolerance
TXEC-_8b	O	89	LVDS 8bit	3.3 V tolerance
TXE2+_8b	O	90	LVDS 8bit	3.3 V tolerance
TXE2-_8b	O	91	LVDS 8bit	3.3 V tolerance
TXE1+_8b	O	92	LVDS 8bit	3.3 V tolerance
TXE1-_8b	O	93	LVDS 8bit	3.3 V tolerance
TXE0+_8b	O	94	LVDS 8bit	3.3 V tolerance
TXE0-_8b	O	95	LVDS 8bit	3.3 V tolerance
GPI/GPO/PWM0/DCLK	IO	96	MCU GPIO/PWM/Display clock	5V tolerance
GPIO/PWM1/DVS	IO	97	MCU GPIO/PWM/Display V-sync	5V tolerance
GPIO/PWM2	IO	98	MCU GPIO/PWM	5V tolerance
GPIO/PWM3/TCON[11][6]	IO	99	MCU GPIO/PWM/TCON	5V tolerance
GPIO/PWM4/TCON[12][3]	IO	100	MCU GPIO/PWM/TCON	5V tolerance
GPI/GPO/PWM5/TCON[0]	IO	101	MCU GPIO/PWM/TCON	5V tolerance
TCON[10]/GPIO/PWM0	IO	102	TCON/MCU GPIO/ PWM	5V tolerance
TCON[8]/GPIO/IICSCL/ PWM1/DVI_CTRL_OUT2	IO	103	TCON[8]/MCU GPIO/IICSCL/PWM1	5V tolerance
TCON[5]/GPIO /IRQB/IICSDA	IO	104	TCON[5]/MCU GPIO/IRQ Bar/IICSDA	5V tolerance
TCON[9]/GPIO	IO	105	TCON/MCU GPIO	5V tolerance
PVCC	P	106	Pad 3.3V power	3.3V
PGND	G	107	Pad 3.3V GND	
TCON[7]/GPIO	IO	108	TCON/MCU GPIO	5V tolerance
TCON[3]/ GPIO	IO	109	TCON/MCU GPIO	5V tolerance
TCON[7][6][2]/GPIO	IO	110	TCON/MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
TCON[7][4]/GPIO	IO	111	TCON/MCU GPIO	5V tolerance even when

				power-off (GPIO open-drain)
TCON[9][5]/GPIO	IO	112	TCON/MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
TCON[11][1]/GPIO	IO	113	TCON/MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
TCON[13][0]/GPIO/PWM4	IO	114	TCON/MCU GPIO/PWM	5V tolerance even when power-off (GPIO open-drain)
SPI_SCLK/SDIO	IO	115	SPI flash serial clock /external MCU serial control I/F data in	3.3 V tolerance (push pull)
SI/MCU_SCLK	IO	116	SPI flash serial data input /external MCU serial control I/F clock	3.3 V tolerance (push pull)
SO/SCSB	IO	117	SPI flash serial data output /external MCU serial control I/F chip select	3.3 V tolerance
CEB/IRQB	IO	118	SPI flash chip enable bar/IRQ Bar Note:It should be pulled down to 0 v or pulled up to 3.3 v in order to designate the MCU type(Internal MCU(3.3 volts) or External MCU(0 volts)).	3.3 V tolerance (push pull)
GPO/PWM5	IO	119	MCU GPO/PWM **(Power on latch Pin .)** **(when AC Power On , Power on latch Pin must be "High")**	5V tolerance even when power-off
VCCK	P	120	Digital 1.2V Power	1.2V
DDCSCL3/GPIO	IO	121	DDC3(Open drain I/O)/MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
DDCSDA3/GPIO	IO	122	DDC3(Open drain I/O)/MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
GPIO	IO	123	MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
GPIO	IO	124	MCU GPIO	5V tolerance even when power-off (GPIO open-drain)
RESETB	I	125	Chip Reset Bar	Low active; 5V tolerance

				even when power-off (GPIO open-drain)
GPIO/PWM1	I/O	126	MCU GPIO/PWM	5V tolerance (GPIO open-drain)
XO	AO	127	Crystal Output	
XI	AI	128	Crystal Input	

5. Electric Specification

DC Characteristics

Table 1 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Voltage on Input (5V tolerant)	V_{IN}	-1		5	V
Supply Voltage	PVCC	3.0	3.3	3.6	V
	VCCK	1.08	1.2	1.32	V
Electrostatic Discharge	V_{ESD}			±2.5	kV
Latch-Up	I_{LA}			±100	mA
Ambient Operating Temperature	T_A	0		70	ºC
Storage temperature (plastic)	T_{STG}	-55		125	ºC
Thermal Resistance (Junction to Air)	θ_{JA}			38	ºC/W
Junction Acceptable Temperature	T_j			125	ºC

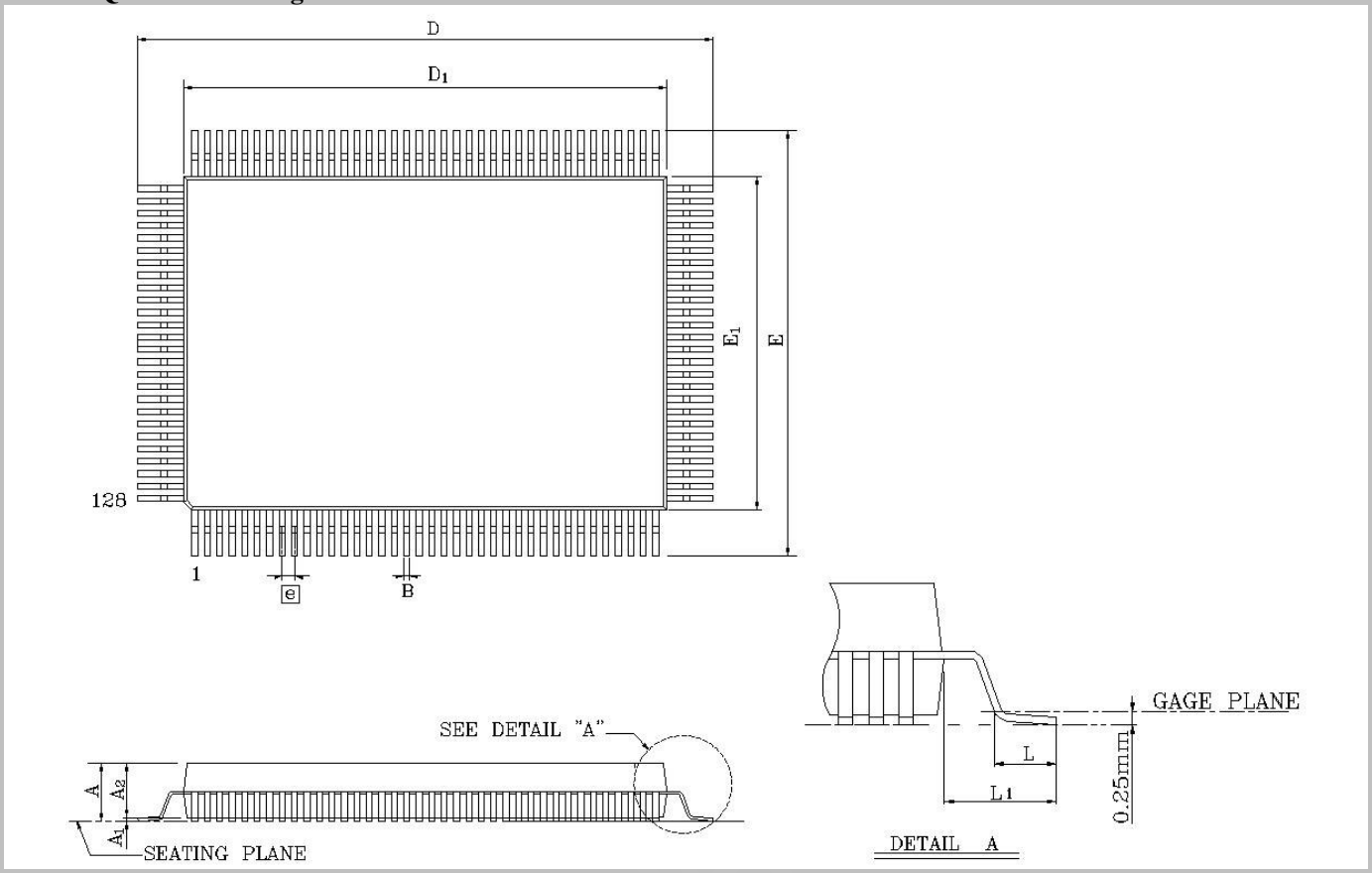
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Reset pulse period	Trst-en[1]	1120			ns
Power on reset period	Tpor-rst[2]	293			ms

1. 16 * x'tal_cycle(1/14.3Mhz)
2. 65536*64*Xtal_cycle(1/14.3Mhz)

6. Mechanical Specification

128 Pin Package (QFP)

Plastic Quad Flat Package 128 Leads 14x20mm^2 Outline



Symbol	Dimension in mm			Dimension in inch		
	Min	Nom	Max	Min	Nom	Max
A	—	—	3.40	—	—	0.134
A_1	0.25	—	—	0.010	—	—
A_2	2.50	2.70	2.90	0.100	0.106	0.114
b	0.17	0.22	0.27	0.007	0.009	0.011
D	23.2BSC			0.913BSC		
D_1	20.00BSC			0.787BSC		
E	17.20BSC			0.677BSC		
E_1	14.00BSC			0.551BSC		
e	0.50BSC			0.020BSC		
L	0.73	0.88	1.03	0.029	0.035	0.041
L1	1.60REF			0.063REF		

Notes：CONTROLLING DIMENSION：MILLIMETER(mm).