

RTD2662/2660 series

Flat Panel Display Controller

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1. Features

General

- Embedded 3 DDC with DDC1/2B/CI
- Zoom scaling up and down
- Embedded one MCU with SPI flash controller.
- It contains 8 ADCs in D-connector, LED backlight, and key pad application
- It supports infrared remote function
- 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 1920(WUXGA)/1440-pixel width(option)

Analog RGB Input Interface

- 2 Analog input supported with internal switch
- Integrated 8-bit triple-channel 210/165MHz ADC/PLL(option)
- 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
- Y/Pb/Pr support up to HDTV 1080p resolution

Embedded Video Decoder

- High performance AV 2D Comb-filter
- Support Composite, S Video, Component input
- Support VBI with Closed caption/ V chip slicer

Video Input Interface

- Support 8-bit video (ITU 656) format input

HDMI Digital Input Interface with HDCP

(This function will be canceled in RTD2660)

- Dual HDMI Input with embedded high speed switch
- Single link on-chip TMDS receiver
- Long cable support to 165Mhz
- Adaptive algorithm for TMDS capability
- Data enable only mode support
- High-Bandwidth Digital Content Protection (HDCP 1.1)
- Enhanced protection of HDCP secret key
- CEC function supported
- Capable of 8-channel I2S/SPDIF output in HDMI application

Embedded MCU

- Industrial standard 8051 core with serial flash up to 256K bytes
- Low speed ADC for various application
- Infrared function supported
- 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
- 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/XVYCC function for video sharpness
- DLTI/DCTI/ Noise reduction for video quality

VividColor™

- Independent color management (ICM)
- Dynamic contrast control (DCC)

Output Interface

- Fully programmable display timing generator
- Flexible data pair swapping for easier system design.
- Programmable TCON function support
- 1 and 2 pixel/clock panel support and up to 170MHz, 1920/1440-pixel width(option)
- Multi-output interface (LVDS/ TTL) on single PCB
- Spread-Spectrum DPLL to reduce EMI
- Fixed Last Line output for perfect panel capability

Embedded OSD

- Embedded 16.5K SRAM dynamically stores OSD command and fonts
- Support multi-color RAM font, 1, 2 and 4-bit per pixel
- 16 color palette with 24bit true color selection
- Maximum 8 window with alpha-blending/ gradient /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
- Special function for closed-caption and CGMS

Power & Technology

- 3.3V / 1.8V power supply

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(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 low 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: 1K ohm
RX2P_0/V8_0	AI	3	TMDS Differential signal Input/VIDEO 8-0	
RX2N_0/V8_1	AI	4	TMDS Differential signal Input/VIDEO 8-1	
RX1P_0/V8_2	AI	5	TMDS Differential signal Input/VIDEO 8-2	
RX1N_0/V8_3	AI	6	TMDS Differential signal Input/VIDEO 8-3	
RX0P_0/V8_4	AI	7	TMDS Differential signal Input/VIDEO 8-4	
RX0N_0/V8_5	AI	8	TMDS Differential signal Input/VIDEO 8-5	
RXCP_0/V8_6	AI	9	TMDS Differential signal Input/VIDEO 8-6	
RXCN_0/V8_7	AI	10	TMDS Differential signal Input/VIDEO 8-7	
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	no power 5V tolerance
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	no power 5V tolerance
ADC_VDD	AG	23	ADC Power	(1.8V)
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+)	
B1-/V8_7	AI	31	Negative BLUE analog input	

			(Pb-)VIDEO 8-7	
B1+/V8_6	AI	32	Positive BLUE analog input (Pb+)/VIDEO 8-6	
G1-/V8_5	AI	33	Negative GREEN analog input (Y-)/VIDEO 8-5	
G1+/V8_4	AI	34	Positive GREEN analog input (Y+)/VIDEO 8-4	
SOG1/V8_3	AI	35	Sync-On-Green/ VIDEO 3	
R1-/V8_2	AI	36	Negative RED analog input (Pr-)/VIDEO 8-2	
R1+/V8_1	AI	37	Positive RED analog input (Pr+)/VIDEO 8-1	
ADC_GND/VADC_GND	AP	38	ADC/VADC GND	
AHS1/V8_0	I	39	ADC horizontal sync input/VIDEO 8-0	no power 5V tolerance
AVS1/VCLK	I	40	ADC horizontal sync input/VIDEO clock	no power 5V tolerance
Vin+0/V8_7	AI	41	Positive video analog input 0/VIDEO 8-7	
Vin-0/V8_6	AI	42	Negative video analog input 0/VIDEO 8-6	
Vin+1/V8_5	AI	43	Positive video analog input 1/VIDEO 8-5	
Vin-1/V8_4	AI	44	Negative video analog input 1/VIDEO 8-4	
Vin+2/V8_3	AI	45	Positive video analog input 2/VIDEO 8-3	
Vin-2/V8_2	AI	46	Negative video analog input 2/VIDEO 8-2	
Vin+3/V8_1	AI	47	Positive video analog input 3/VIDEO 8-1	
Vin-3/V8_0	AI	48	Negative video analog input 3/VIDEO 8-0	
VADC_VDD	AG	49	Video decoder ADC POWER	(3.3V)
A-ADC0/GPIO/AVOUT/VCLK	IO	50	MCU ADC Input /MCU GPIO/AVOUT/VIDEO clock	
A-ADC1/GPIO	IO	51	6-bit MCU ADC Input/MCU GPIO	6 bit
A-ADC2/GPIO	IO	52	6-bit MCU ADC Input /MCU GPIO	6 bit
A-ADC3/GPIO	IO	53	6-bit MCU ADC Input/MCU GPIO	6 bit
A-ADC4/GPIO	IO	54	6-bit MCU ADC Input /MCU GPIO	6 bit
B-ADC0/GPIO/PWM1/PWM5	IO	55	10-bit MCU ADC Input/MCU GPIO/PWM	10 bit
B-ADC1/GPIO/IIC_SCL	IO	56	10-bit MCU ADC Input /MCU GPIO/IIC BUS	10 bit
B-ADC2/GPIO/IIC_SDA	IO	57	10-bit MCU ADC Input/MCU GPIO/IIC BUS	10 bit
DDC_SCL1/GPIO	IO	58	DDC1(pen drain I/O)/MCU GPIO	No power 5V tolerance
DDC_SDA1/GPIO	IO	59	DDC1(Open drain I/O)/MCU GPIO	No power 5V tolerance
VCK	P	60	Digital Power	(1.8V)
GNDK	G	61	Digital Ground	
PVCC	P	62	Pad power	3.3V
NC	--	63	Not connected	
SD0/SPDIF0/TCON[0]/GPIO/IrDA	IO	64	IIS-SD0 /SPDIF0 / TCON /MCU GPIO/ Infrared remote data pin	
WS/GPIO/TCON[7][1]/PWM1	IO	65	IIS-WS /MCU GPIO / TCON /PWM	

SCK/TCON[4][2]/GPIO/ BLU7	IO	66	IIS-SCK / TCON /MCU GPIO/TTL Data Bus	
MCK/TCON[5][9]/GPIO/ BLU6	IO	67	IIS-MCK / TCON /MCU GPIO/TTL Data Bus	
SD0/SPDIF0/TCON[13][3]/GPIO/BLU5	IO	68	IIS-SD0 /SPDIF0 / TCON /MCU GPIO/TTL Data Bus	
SPDIF1/SD1/TCON[7][3] /GPIO/IICSCL/BLU4	IO	69	SPDIF1 /IIS-SD1 / TCON /MCU GPIO/IIC BUS /TTL Data Bus	
SPDIF2/SD2/TCON[9][1 1]/GPIO/IICSDA/BLU3	IO	70	SPDIF2 /IIS-SD2 / TCON /MCU GPIO/IIC bus/TTL Data Bus	
SPDIF3/SD3/TCON[10][8]/GPIO/PWM1/PWM5/ BLU2	IO	71	SPDIF3 /IIS-SD3 / TCON /MCU GPIO/PWM /TTL Bata Bus	
NC	--	72	Not connected	
VCCK	P	73	Digital Power	(1.8V)
BLU7/BLU1/TXO3+ /GPIO	IO	74	TTL Data Bus(BLU7,BLU1)/LVDS /MCU GPIO	
BLU6/BLU0/TXO3- /GPIO	IO	75	TTL Data Bus(BLU6,BLU0)/LVDS /MCU GPIO	
BLU5/GRN7/TXOC+ /GPIO	IO	76	TTL Data Bus(BLU5,BLU7)/LVDS/MCU GPIO	
BLU4/GRN6/TXOC- /GPIO	IO	77	TTL Data Bus(BLU4,BLU6)/LVDS/MCU GPIO	
BLU3/GRN5/TXO2+ /GPIO	IO	78	TTL Data Bus(BLU3,BLU5)/LVDS/MCU GPIO	
BLU2/GRN4/TXO2- /GPIO	IO	79	TTL Data Bus(BLU2,BLU4)/LVDS/MCU GPIO	
GRN7/GRN3/TXO1+ /GPIO	IO	80	TTL Data Bus(GRN7,GRN3)/LVDS/MCU GPIO	
GRN6/GRN2/TXO1- /GPIO	IO	81	TTL Data Bus(GRN6,GRN2)/LVDS/MCU GPIO	
GRN5/GRN1/TXO0+ /GPIO	IO	82	TTL Data Bus(GRN5,GRN1)/LVDS/MCU GPIO	
GRN4/GRN0/TXO0- /GPIO	IO	83	TTL Data Bus(GRN4,GRN0)/LVDS/MCU GPIO	
PVCC	P	84	Pad power	3.3V
PGND	G	85	Pad ground	
GRN3/RED7/TXE3+ /GPIO	O	86	TTL Data Bus(GRN3,RED7)/LVDS	
GRN2/RED6/TXE3- /GPIO	O	87	TTL Data Bus(GRN2,RED6)/LVDS	
RED7/RED5/TXEC+ /GPIO	O	88	TTL Data Bus(RED7,RED5)/LVDS	
RED6/RED4/TXEC- /GPIO	O	89	TTL Data Bus(RED6,RED4)/LVDS	
RED5/RED3/TXE2+ /GPIO	O	90	TTL Data Bus(RED5,RED3)/LVDS	
RED4/RED2/TXE2- /GPIO	O	91	TTL Data Bus(RED4,RED2)/LVDS	
RED3/RED1/TXE1+ /GPIO	O	92	TTL Data Bus(RED3,RED1)/LVDS	
RED2/RED0/TXE1- /GPIO	O	93	TTL Data Bus(RED2,RED0)/LVDS	
TXE0+/DENA	O	94	LVDS/TTL Data enable	
TXE0-/DHS	O	95	LVDS/TTL Display H-sync	
GPIO/PWM0/DCLK	IO	96	MCU GPIO/PWM/TTL Display clock	No power 5V tolerance
GPIO/PWM1/DVS	IO	97	MCU GPIO/PWM/TTL Display V-sync	No power 5V tolerance
GPIO/PWM2	IO	98	MCU GPIO/PWM	No power 5V tolerance
GPIO/PWM3/TCON[11][6]	IO	99	MCU GPIO/PWM/TCON	No power 5V tolerance
GPIO/PWM4/TCON[12][3]	IO	100	MCU GPIO/PWM/TCON	No power 5V tolerance
GPIO/PWM5/TCON[0]	IO	101	MCU GPIO/PWM/TCON	No power 5V

SD3/SPDIF3/TCON[10]/GPIO/PWM0	IO	102	IIS-SD3/SPDIF3/TCON/MCU GPIO/PWM	No power 5V tolerance
SD2/SPDIF2/TCON[8]/GPIO/IICSCL/PWM1	IO	103	IIS-SD2/SPDIF2/TCON[8]/MCU GPIO/IICSCL/PWM1	No power 5V tolerance
SD1/SPDIF1/TCON[5]/GPIO/IRQB/IICSDA	IO	104	IIS-SD1/SPDIF1/TCON[5]/MCU GPIO/IRQ Bar/IICSDA	No power 5V tolerance
SD0/SPDIF0/TCON[9]/GPIO	IO	105	IIS-SD0/SPDIF0/TCON/MCU GPIO	No power 5V tolerance
PVCC	P	106	Pad 3.3V power	3.3V
PGND	P	107	Pad 3.3V GND	
MCK/TCON[7]/GPIO	IO	108	IIS-MCK/TCON/MCU GPIO	No power 5V tolerance
SCK/TCON[3]/GPIO	IO	109	IIS-SCK/TCON/MCU GPIO	No power 5V tolerance
WS/TCON[6]/GPIO	IO	110	IIS-WS/TCON/MCU GPIO	No power 5V tolerance
SD0/SPDIF0/TCON[4]/GPIO	IO	111	IIS-SD0/SPDIF0/TCON/MCU GPIO	No power 5V tolerance
SD1/SPDIF1/TCON[9]/GPIO	IO	112	IIS-SD1/SPDIF1/TCON/MCU GPIO	No power 5V tolerance
SD2/SPDIF2/TCON[1]/GPIO/IrDA	IO	113	IIS-SD2/SPDIF2/TCON/MCU GPIO/Infrared remote data pin	No power 5V tolerance
SD3/SPDIF3/TCON[13]/GPIO/VCLK	IO	114	IIS-SD3/SPDIF3/TCON/MCU GPIO/VIDEO 8-clock	No power 5V tolerance
SPI_SCLK/SDIO	IO	115	SPI flash serial data input/external MCU serial control I/F data in	No power 5V tolerance
SI/MCU_SCLK	IO	116	SPI flash serial clock/external MCU serial control I/F clock	No power 5V tolerance
SO/SCSB	IO	117	SPI flash serial data output /external MCU serial control I/F chip select	No power 5V 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(0 volts) or External MCU(3.3 volts)).	No power 5V tolerance
NC	--	119	Not connected	
VCKK	P	120	Digital 1.8V Power	1.8V
DDCSCL3/GPIO	IO	121	DDC3(Open drain I/O)/MCU GPIO	No power 5V tolerance
DDCSDA3/GPIO	IO	122	DDC3(Open drain I/O)/MCU GPIO	No power 5V tolerance
DDCSDA2/GPIO	IO	123	DDC2(Open drain I/O)/MCU GPIO	No power 5V tolerance
DDCSCL2/GPIO	IO	124	DDC2(Open drain I/O)/MCUGPIO	No power 5V tolerance
RESETB	I	125	Chip Reset Bar	Low active; No power 5V tolerance
CEC	I/O	126	CEC bus	Pull up 27k ohm resistance to 3.3V power; No power 5V tolerance



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XO	AO	127	Crystal Output	No power 5V tolerance
XI	AI	128	Crystal Input	No power 5V tolerance

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MCU GPIO assignment

PIN No.	MCU GPIO Name
50	P6.0
51	P6.1
52	P6.2
53	P6.3
54	P6.4
55	P6.5

56	P6.6
57	P6.7
58	P3.0/RXD(I/O)
59	P3.1/TXD(O)
64	P1.0/T2(I)
65	P1.1/T2EX(I)
66	P1.2/CLKO2(O)
67	P1.3
68	P1.4
69	P1.5
70	P1.6
71	P1.7
74	P9.0
75	P9.1
76	P9.2
77	P9.3
78	P9.4
79	PA.0
80	PA.1
81	PA.2
82	PA.3
83	PA.4
94	P5.0 (removed)
95	P5.1 (removed)
96	P5.2
97	P5.3
98	P5.4
99	P5.5
100	P5.6
101	P5.7
102	P7.6
103	P7.5
104	P7.4
105	P8.0
108	P8.1/CLKO1(O)
109	P3.2/INT0(I)
110	P3.3/INT1(I)

111	P3.4/I0
112	P3.5(BS)/T1
113	P3.6
114	P3.7
121	P7.3
122	P7.2
123	P7.1

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2. Chip Data Path Block Diagram

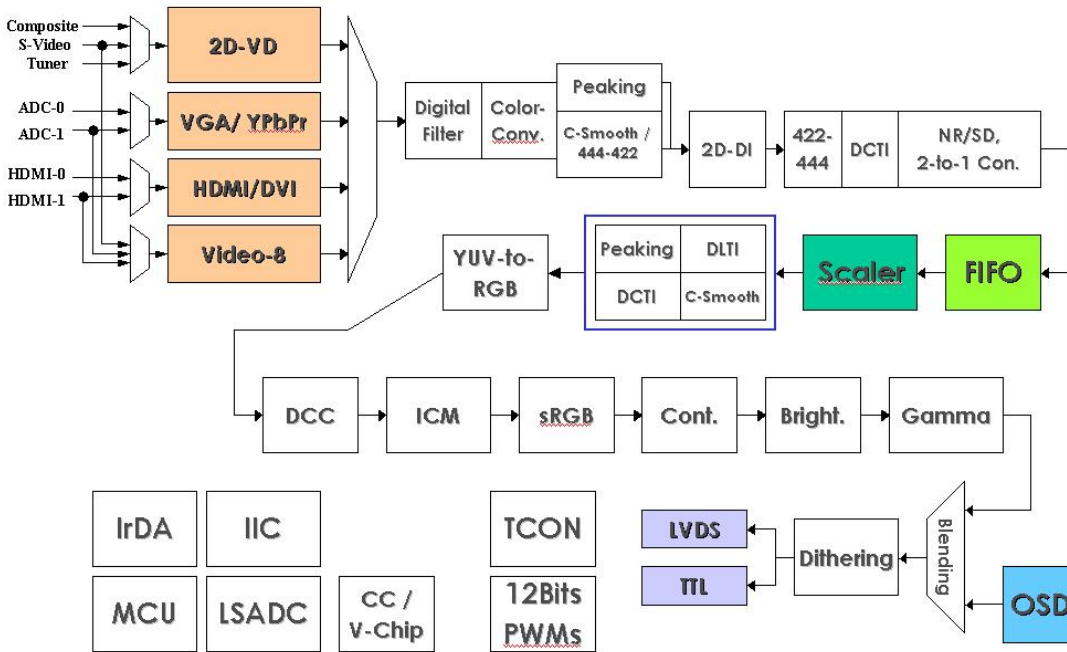


Figure 1

3. 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
Electrostatic Discharge	V _{ESD}			±2.5	kV
Latch-Up	I _{LA}			±100	mA
Ambient Operating Temperature	T _A	0		70	°C
Storage temperature (plastic)	T _{STG}	-55		125	°C
Thermal Resistance (Junction to Air)	θ _{JA}			25	°C/W
Junction Acceptable Temperature	T _J			125	°C

Table 2 DC Characteristics/Operating Condition

(0°C < T_A < 70°C)

【Power consumption : Embedded MCU】

Dot-pattern(check_11).

【1】 VGA-in: 1600x1200/75Hz , display to 1680x1050/75Hz , DCLK=170MHz.

Pattern Generator : 『 Chroma 2227 』 ; Pattern Name : 『 Dot 』 pattern

【2】 HDMI-in: 1600x1200/60Hz , display to 1680x1050/60Hz.

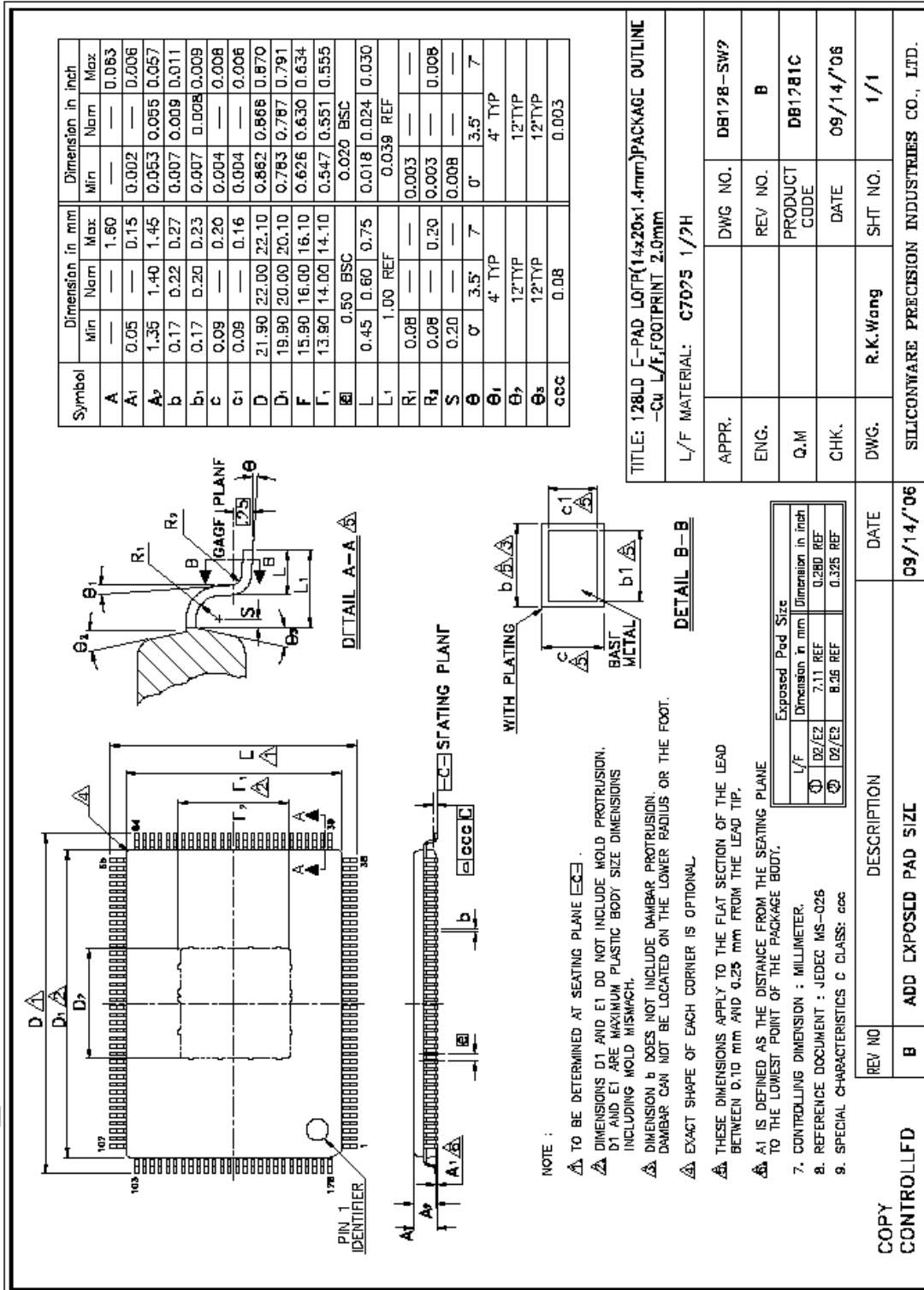
Pattern Generator : 『 QunatumData 882 』 ; Pattern Name : 『 Check11 』 (256 gray scale)

【3】 Video Decoder-in : DVD-player ; AV-in ; display to 1680x1050

Power Name	Voltage	Operating(mA)	Power saving(mA)	Power down(mA)
VCCK(core)(VGA)	1.8V	438	14.9	5.9
VCCK(core)(HDMI)	1.8V	455	8.5	6.1
VCCK(core)(Video Decoder)	1.8V	232	8.6	6.1
ADC_VDD	1.8V	123	0.1	0.1
TMDS_VDD	3.3V	173	19.9	19.9
VADC_VDD	3.3V	65.6	0.1	0.1
PVCC(LVDS)	3.3V	78.5	2.5	2.5
PVCC(TTL)	3.3V	34.1	12.8	12.8

4. Mechanical Specification

128 Pin Package



5. Ordering Information

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