Z90219/213/212/211/218

Z8® DIGITAL TELEVISION CONTROLLERS

FEATURES

Device	ROM (KB)	RAM* (Bytes)	I/O Lines	Voltage Range
Z90211	16 (OTP)	237	20	4.5V to 5.5V
Z90218	8	237	20	4.5V to 5.5V
Z90212	12	237	20	4.5V to 5.5V
Z90213	16	237	20	4.5V to 5.5V
Z90219	32 (ext.)	237	N/A	4.5V to 5.5V

Note: OTP and Z9021x products under development

Z8-Based CMOS Microcontroller for Consumer Television, Cable Box, and Satellite Receiver Applications.

- 42-Pin SDIP Package
- Z8® Microcontroller Core at 6 MHz
- Mask ROM sizes Available in 8, 12 and 16 Kbytes
- Eleven Pulse Width Modulators
- On-Chip Infrared (IR) Capture Registers
- Four Channel 3-bit Analog-to-Digital Converter
- Twenty General Purpose I/O Pins
- I^2C Serial Communication Port)

On Screen Display (OSD) Section

- Supports Displays up to 10 rows by 24 Columns with 256 Characters
- Character Cell Resolution of 14 Pixels by 18 Scan lines
- Variable Inter-row Spacing from 0-15 Horizontal Scan Lines
- Foreground and Background Colors Fully Programmable by Character

GENERAL DESCRIPTION

The Z9021x Digital Television Controller (DTC) family is Zilog's latest and most powerful Z8-based DTC product offering. These parts feature larger system RAM and ROM options, together with a host of new features including a new color palette system, flexible inter-row spacing, higher character cell resolution, background mesh effect, dedicated I.R. capture registers, on-chip Analog-to-Digital conversion, and a hardware Master mode I^2C interface. The familiar Z8 core in combination with these advanced features makes the Z9021x family an ideal choice for low to mid-range televisions in both PAL and NTSC markets.

The Z9021x family consists of two basic device types; Z9020x and Z9021x. The only difference between the two types is the presence of a hardware I^2C serial communication port and half-tone OSD circuitry on the Z9021x family. Of course I^2C communication is supported on the Z9020x family in software with the dedication of any two I/O pins to the task.

The Z9021x family takes full advantage of the Z8's expanded register file space to offer greater flexibility in On Screen Display creation.

BLOCK DIAGRAM

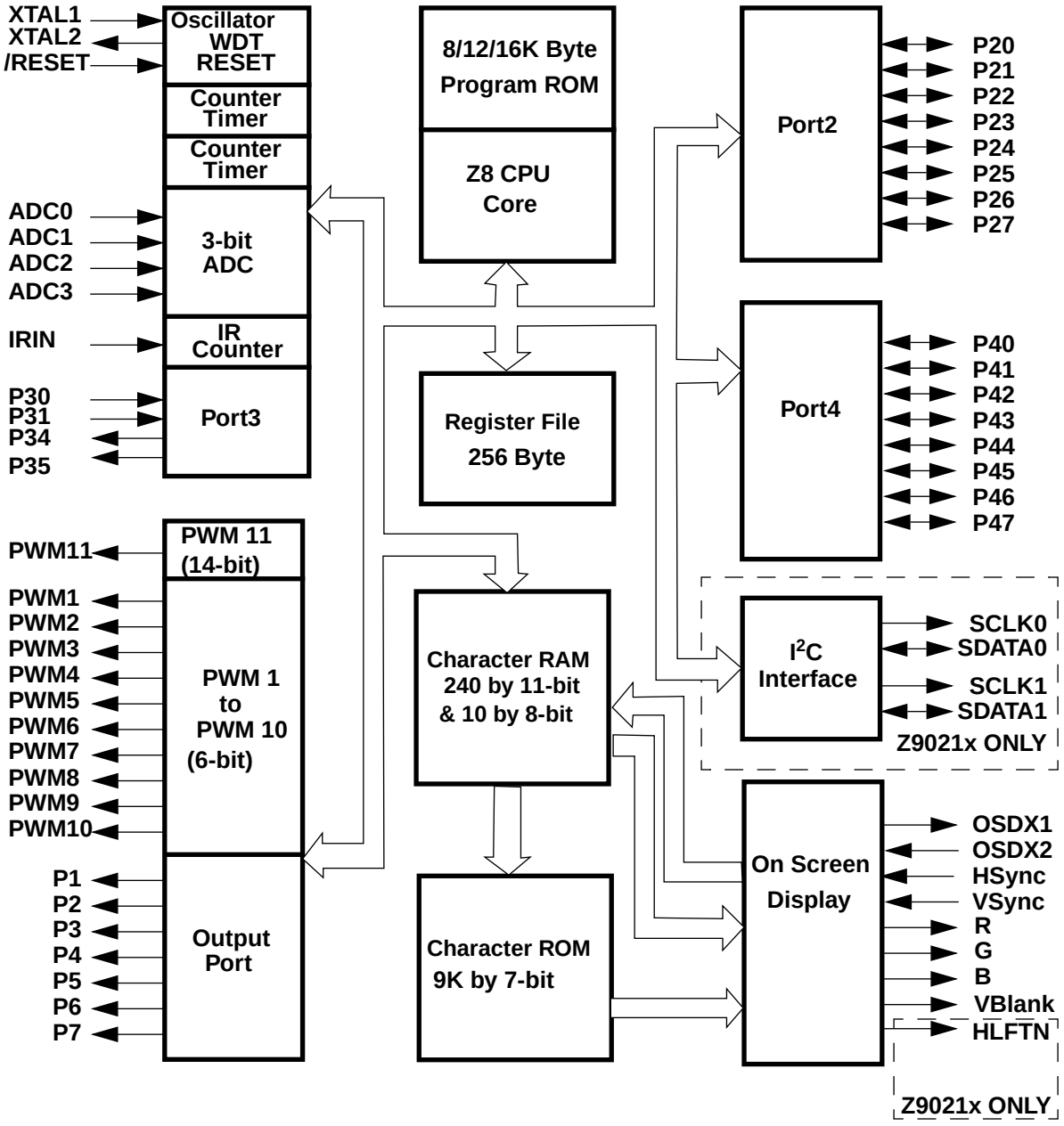
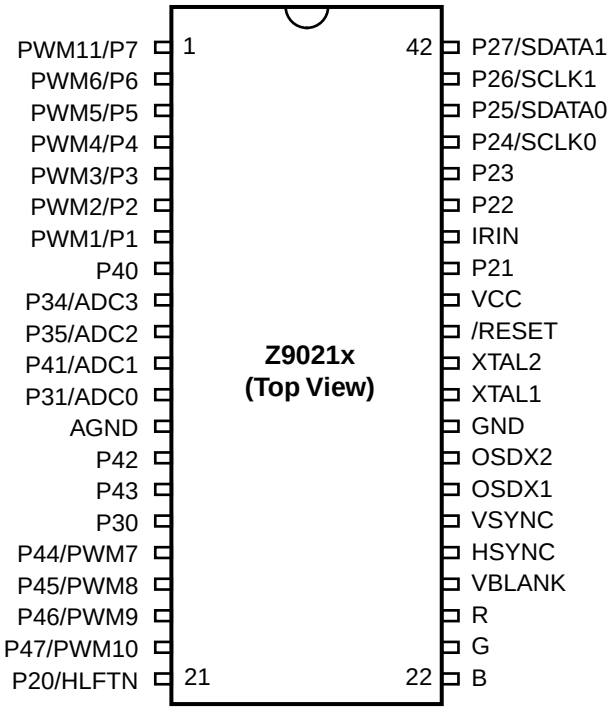


Figure 1. Functional Block Diagram

PIN IDENTIFICATION



PIN IDENTIFICATION

Table 1. Z9021x 42L SDIP Package

Pin Function	Pin Number	I/O/PWR	Reset State	Name
+5 Volts	34	PWR	PWR	VCC
0 Volts	30,13	PWR	PWR	GND,AGND
Infra Red remote capture input	36	I	I	IRIN
14-bit Pulse Width Modulator output	1	O	O	PWM11
6-bit Pulse Width Modulator output	20,19,18,17,2,3,4, 5,6,7	O	O	PWM[10:1]
Fixed output ports	7,6,5,4,3,2,1	O	O	P[1:7]
Bit programmable Input/Output ports	42,41,40,39,38,37, 35,21	I/O	I	P2[7:0]
Half tone output	21	O	I	HLFTN
I²C Data	40,42	I/O	I	SDATA0,1
I²C Clock	39,41	O	I	SCLK0,1
Fixed output ports	10,9	O	O	P3[5:4]
Fixed input ports	12,16	I	I	P3[1:0]
Bit programmable Input/Output ports	20,19,18,17,15,14, 11,8	I/O	I	P4[7:0]
Crystal oscillator input	31	I	I	XTAL1
Crystal oscillator output	32	O	O	XTAL2
Dot clock oscillator input	28	I	I	OSDX1
Dot clock oscillator output	29	O	O	OSDX2
Horizontal Sync	26	I	I	HSYNC
Vertical Sync	27	I	I	VSYNC
Video blank	25	O	O	VBLANK
Video R,G,B	24,23,22	O	O	R,G,B
3-bit Analog to Digital converter input	9,10,11,12	AI	I	ADC[3:0]
Device reset	33	I	I	/RESET

ABSOLUTE MAXIMUM RATINGS

Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; operation of the device at any condition above those indicated in the operational sections of these specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

Table 2.

Symbol	Parameters	Min	Max	Units	Notes
V_{cc}	Power Supply Voltage	-0.3	+7	V	
V_i	Input Voltage	-0.3	V_{cc}+0.3	V	
V_o	Output Voltage	-0.3	V_{cc}+0.3	V	
I_{oh}	Output Current High		-10	mA	per pin
I_{oh}	Output Current High		-100	mA	per device
I_{ol}	Output Current Low		20	mA	per pin
I_{ol}	Output Current Low		200	mA	per device
T_a	Operating Temperature	0	70	^oC	
T_{STG}	Operating Temperature	-55	150	^oC	

DC CHARACTERISTICS

T_A =0°C to + 70°C; V_{CC} = +4.5V to +5.5V; F_{OSC} = 6MHz

Table 3.

Symbol	Parameter	Min	Typical	Max	Units	Conditions
V_{cc}	Power Supply Voltage	4.75	5.00	5.25	V	
V_{ih}	Input Voltage High	$0.7V_{cc}$	3.0	V_{cc}	V	
V_{il}	Input Voltage Low	0	1.48	$0.2V_{cc}$	V	
V_{ihc}	Input XTAL/Osc in High	$0.8V_{cc}$	3.2	V_{cc}	V	
V_{ilc}	Input XTAL/Osc In Low		0.98	$0.07V_{cc}$	V	
V_{oh}	Output Voltage High	V_{cc}-0.4	4.75		V	I_{oh}=-0.75mA
V_{ol}	Output Voltage Low		0.16	0.4	V	I_{ol}=1.00mA
V_{hy}	Schmitt Hysteresis	$0.1V_{cc}$	0.8		V	
I_{ir}	Reset Input Current		-46	-80	uA	V_{rl}=0V
I_{il}	Input Leakage	-3.0	0.01	3.0	uA	0V,V_{cc}
I_{ol}	Tri-State Leakage	-3.0	0.02	3.0	uA	0V,V_{cc}
I_{cc}	Supply Current		13.2	20	mA	All inputs at rail;outputs floating
I_{cc1}	Sleep Mode Current		3.2	6	mA	All inputs at rail;outputs floating
I_{cc2}	Stop Mode Current		0.1	10	uA	All inputs at rail;outputs floating

Note: Typical values measured at 25°C. Minimum and Maximum values given from 0°C to 70°C.

AC CHARACTERISTICS

Table 4.

No	Symbol	Parameter	Min	Max	Unit
1	T_pC	Input clock period	166	1000	ns
2	T_rC, T_fC	Clock input raise and fall		25	ns
3	T_wC	Input clock width	35		ns
4	$T_wT_{in}L$	Timer input low width	70		ns
5	$T_wT_{in}H$	Timer input high width	$3T_pC$		
6	T_pT_{in}	Timer input period	$8T_pC$		
7	T_rT_{in}, T_rT_{in}	Timer input raise and fall		100	ns
8	T_wIL	Int request input low	70		ns
9	T_wIH	Int request input high	$3T_pC$		
10	T_dPOR	Power-On reset delay	25	100	ms
11	$T_dLVIRES$	Low voltage detect to internal RESET condition	200		ns
12	T_wRES	Reset minimum width	$5T_pC$		
13	T_dH_sOl	H_{sync} start to V_{osc} stop	$2T_pV$	$3T_pV$	
14	T_dH_sOh	H_{sync} start to V_{osc} start		$1T_pV$	

AC TIMING DIAGRAMS

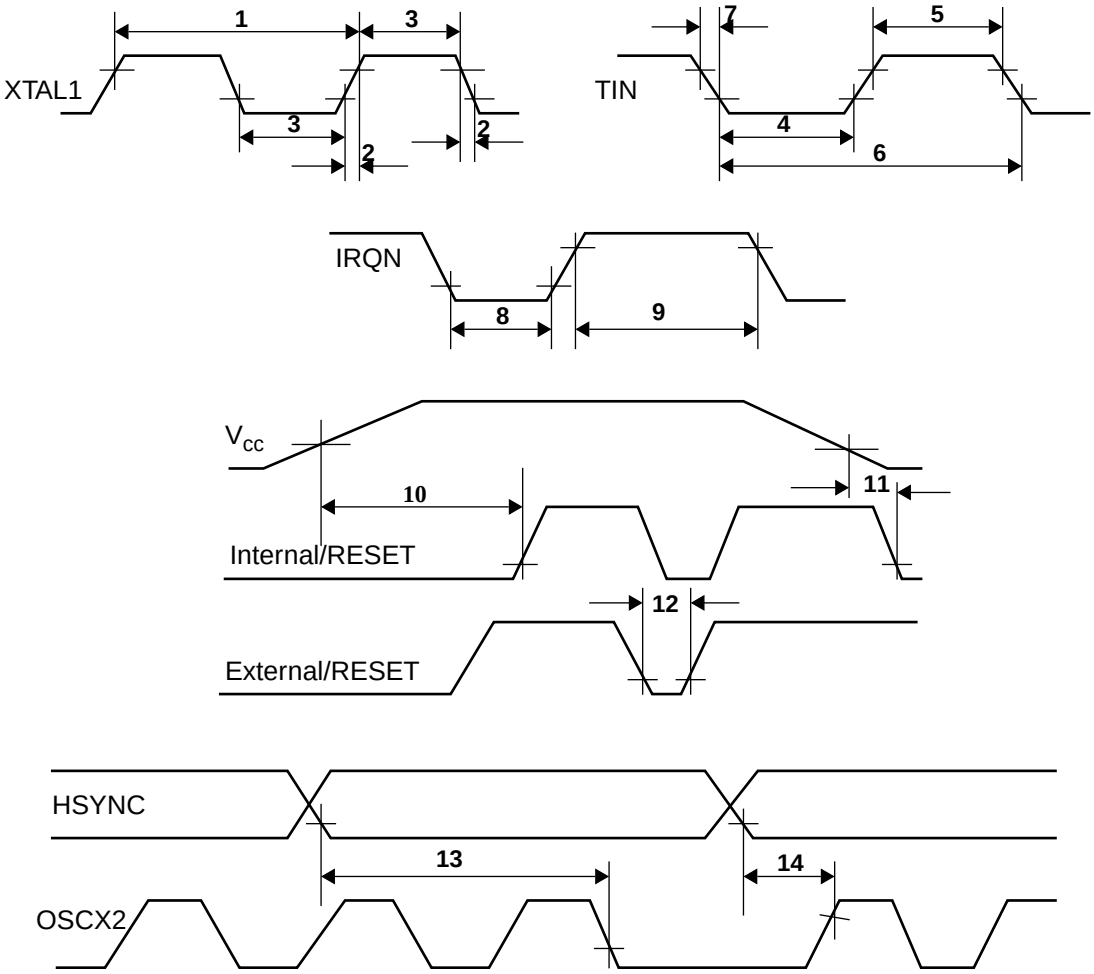


Figure 2. Timing Diagram

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