



YXTXX_OTP Series

深圳宇芯科技发展有限公司

Shenzhen yuxin Technology Development Limit Corporation

YXTxxx_OTP SERIES DATASHEET

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1. General Description

The YXT_XXX_OTP series are very low cost voice and melody synthesizer with 4-bit CPU. They have various features including 4-bit ALU, EPROM, RAM, I/O ports, timers, clock generator, voice and melody synthesizer, and PWM (Direct drive) or D/A current outputs, etc. The audio synthesizer contains one voice-channel and two melody-channels. Furthermore, they consist of 27 instructions in these devices. With CMOS technology and halt function can minimize power dissipation. Their architectures are similar to RISC, with two stages of instruction pipeline. They allow all instructions to be executed in a single cycle, except for program branches and data table read instructions (which need two instruction cycles).

2. Features

- (1) Single power supply can operate from 2.2~5.5V at 4MHz or 3.6~5.5V at 8MHz.
- (2) Program ROM: YXT1504P /YXT310P is 16k x 10 bits;
- (3) 1 set of 16-bit DPR can access up to 64k x 10 bits melody data memory space, and 1 set of 18-bit VPR can access up to 256k x 10 bits voice data memory space. And 1 set of 19bit VPR can access up to 512 x10 bit voice data memory space.

| Product | Voice Duration(SEC) | Voice Pointer(VPR) | ROM Size(10-bit) |
|----------|---------------------|--------------------|------------------|
| YXT1504P | 15 | 16-BIT | 48k |
| YXT310P | 31 | 17-BIT | 96k |

- (4) Data Registers:
 - a) 128 x 4-bit data RAM (00-7Fh).
 - b) Unbanked special function registers (SFR) range: 00h-2Fh.
- (5) I/O Ports:

| Product | I/O | Port Name |
|---------|-----|-----------|
| | | |



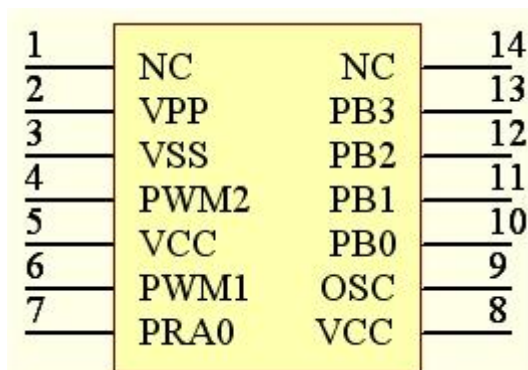
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| | | |
|----------|----|---------|
| YXT1504P | 8 | PRA-PRB |
| YXT310P | 12 | PRA-PRD |

- a) PRA: 4-bit I/O Port A (10h) can be programmed to input/output individually. (Register control)
- b) PRB: 4-bit I/O Port B (13h) can be configured to input/output individually. (Code option)
- c) PRC: 4-bit I/O Port C (14h) can be programmed to input/output individually. (Register control)
- d) PRD: 4-bit I/O Port D (15h) can be programmed to input/output individually. (Register control)
- (6) On-chip clock generator: Resistive Clock Drive (RM) or Crystal oscillator (HM).
- (7) Timer: 1-set Voice Interrupt (Timer0: a 9-bit auto-reload timer/counter).
- (8) Stack: 2-level subroutine nesting.
- (9) Built-in 4-level Volume Control can be programmed.
- (10) Built-in 8-level DAC current output can be configured. (Code option)
- (11) Built-in IR Carrier Output: Port B[1] can be configured as IR pin by 38k / 56kHz. (Code option)
- (12) External Reset: Port B[3] can be configured as reset pin. (Code option)
- (13) HALT and Release from HALT function to reduce power consumption.
- (14) Watch Dog Timer (WDT)
- (15) Instruction: 1-cycle instruction except for table read and program branches which are 2-cycles.
- (16) Number of instruction: 27.
- (17) DAC: 1 channel voice and dual tone melody synthesizer (One 9-bit Cout or 8-bit PWM output).

3. Pin Assignment (YXT1504P)

14Pin Skinny DIP 300mil



Pin Description

| PAD NAME | PIN attr. | Description |
|-----------|-----------|--|
| PWM2/Cout | O | PWM2 output, or Current Output of Audio. |



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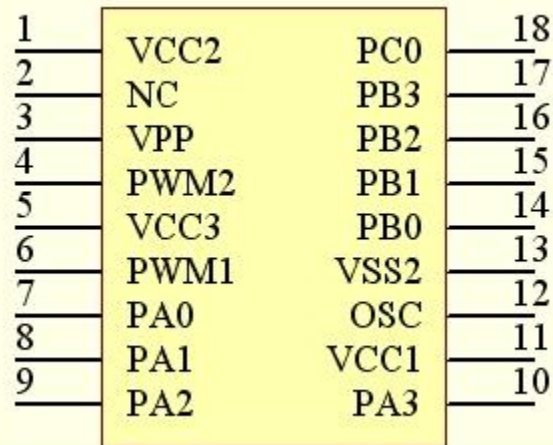
| | | |
|--------------|-------|--|
| PWM1 | O | PWM1 output. |
| Vdd1~2 | POWER | Power supply during operation. |
| PRA0~3 | I/O | I/O port can be programmed to input/output individually. Input type with weak pull-low or fix-input-floating capability Buffer Output type. |
| PRB0 / OSC2 | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability. Buffer Output type. HM mode Crystal input. |
| PRB1 / IR | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability. Buffer Output type. Code option selected as an IR Carrier Output with 38k / 56kHz |
| PRB2 | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability Buffer Output type. |
| PRB3 / Reset | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability. Buffer Output type. Code option selected as an external RESET pin with weak pull-low |
| OSC1 | I | RM mode Oscillator input. HM mode Crystal input. |
| GND1~3 | POWER | Ground Potential |
| VPP | POWER | Connect to VDD during normal operation. Connect to High Voltage when programming EPROM. |

4. Pin Assignment (YXT310P)

18Pin Skinny DIP 300mil



YXTXX_OTP Series



| PAD NAME | PIN attr. | Description |
|------------------|-----------|--|
| PWM2/Cout | O | PWM2 output, or Current Output of Audio. |
| PWM1 | O | PWM1 output. |
| Vdd1~2 | POWER | Power supply during operation. |
| PRA0~3 PRC0~3 | I/O | I/O port can be programmed to input/output individually. Input type with weak pull-low or fix-input-floating capability Buffer Output type. |
| PRB0 / OSC2 | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability. Buffer Output type. HM mode Crystal input. |
| PRB1 / IR | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability. Buffer Output type. Code option selected as an IR Carrier Output with 38k / 56kHz |
| PRB2 | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability Buffer Output type. |
| PRB3 / Reset | I/O | I/O port can be configured to input/output individually. Input type with weak pull-low or fix-input-floating capability. Buffer Output type. Code option selected as an external RESET pin with weak pull-low |
| OSC1 | I | RM mode Oscillator input. HM mode Crystal input. |
| GND1~3 | POWER | Ground Potential |



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| | | |
|-----|-------|--|
| VPP | POWER | Connect to VDD during normal operation. Connect to High Voltage when programming EPROM. |
|-----|-------|--|

5. Absolute Maximum Rating

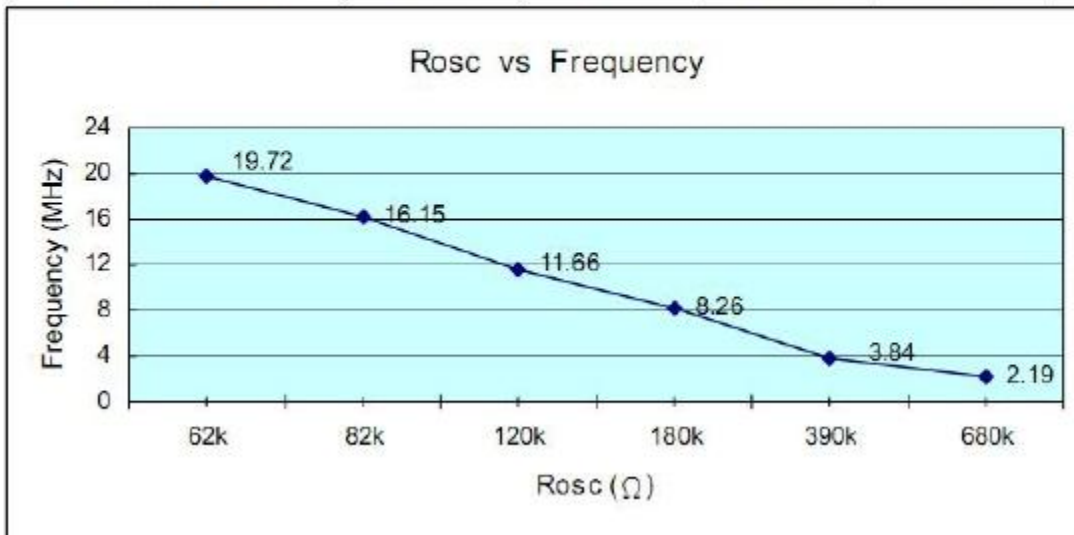
| Symbol | Rating | Unit |
|-----------------|-------------------------|------|
| Vdd-Vss | -0.5 ~ +7.0 | V |
| Vpp-Vss | -0.5 ~ +12.5 | V |
| Vin | Vss-0.3 < Vin < Vdd+0.3 | V |
| Vout | GND < Vout < Vdd | V |
| Top (operating) | 0 ~ +70 | ℃ |
| Tst (storage) | -25 ~ +85 | ℃ |

6. DC Characteristics

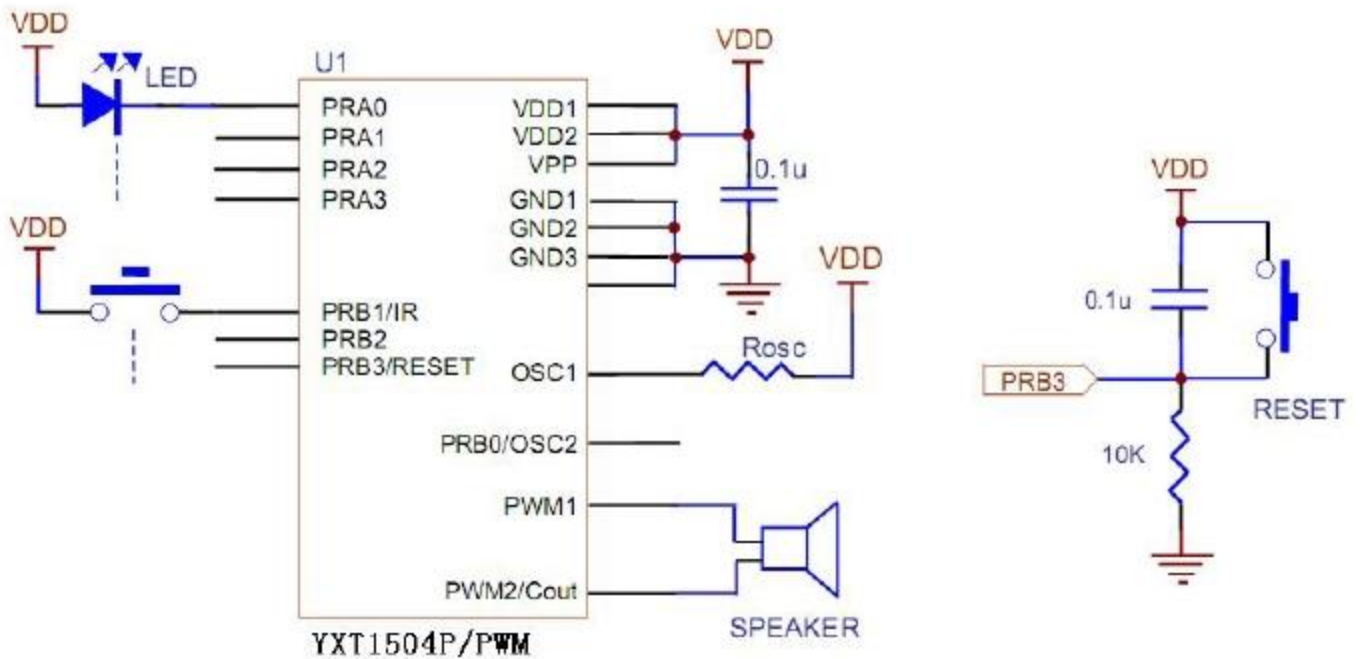
| Symbol | Parameter | Vdd | Min. | Typ. | Max. | Unit | Condition |
|--------|--|-----------|-----------|------|------|------|--|
| Vdd | Operating voltage | | 2.2 | 3 | 5.5 | V | Fosc=4MHz |
| Isb | Supply current | Standby | 3 | | 1 | uA | 4MHz, RM, HALT Mode |
| | | | 4.5 | | 1 | | |
| Iop | Supply current | Operating | 3 | 1 | | mA | 4MHz, RM, no load |
| | | | 4.5 | 2.5 | | | |
| Iih | Input current (Internal pull low) | 3 | | 5 | | uA | Input ports with weak pull-low |
| | | 4.5 | | 12 | | | |
| Ioh | Output-high current | 3 | | -3.5 | | mA | Voh=2.6V |
| | | 4.5 | | -7.5 | | | Voh=3.7V |
| Iol | Output-low current | 3 | | 3.92 | | mA | Vol=0.4V |
| | | 4.5 | | 9.43 | | | Vol=0.8V |
| Ioh | PWM output current | 3 | | -25 | | mA | Vdd=3V, Voh=2.4V |
| Iol | | 3 | | 25 | | | Vdd=3V, Vol=0.6V |
| Cout | DAC output current (8-level option) | 3 | 0.8 ~ 5.8 | | | mA | 4MHz, RM (Full scale) |
| | | 4.5 | 0.9 ~ 6.5 | | | | |
| dF/F | Frequency stability | | -5 | | 5 | dF/F | $\frac{F_{osc}(3v-2.4v)}{F_{osc}(3v)}$ |
| dF/F | Fosc lot variation | | -10 | | 10 | dF/F | Vdd=3V, Rosc=390k, (~4MHz) |

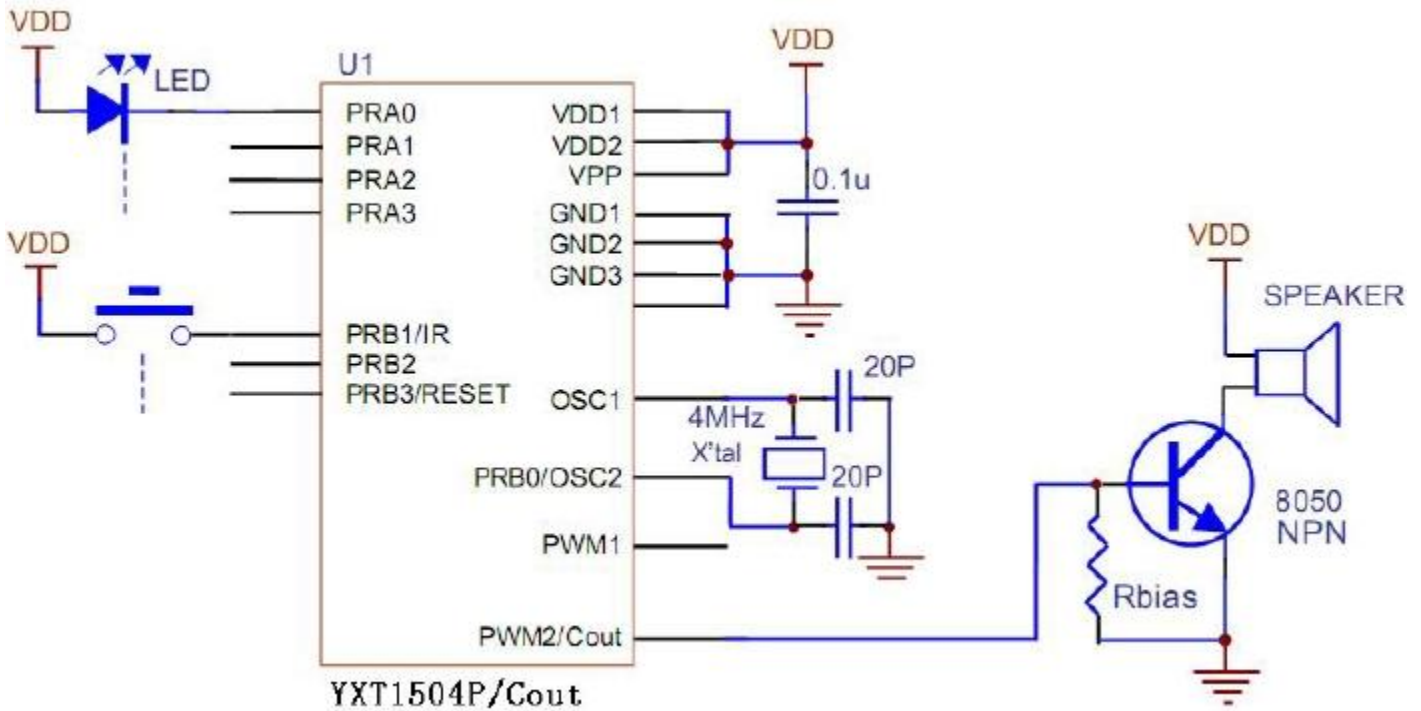
FIGURE 2: Frequency vs. Rosc (at 3V)

| Resistor (Rosc ohms) | 62k | 82k | 120k | 180k | 390k | 680k |
|----------------------|-------|-------|-------|------|------|------|
| Frequency (MHz) | 19.72 | 16.15 | 11.66 | 8.26 | 3.84 | 2.19 |



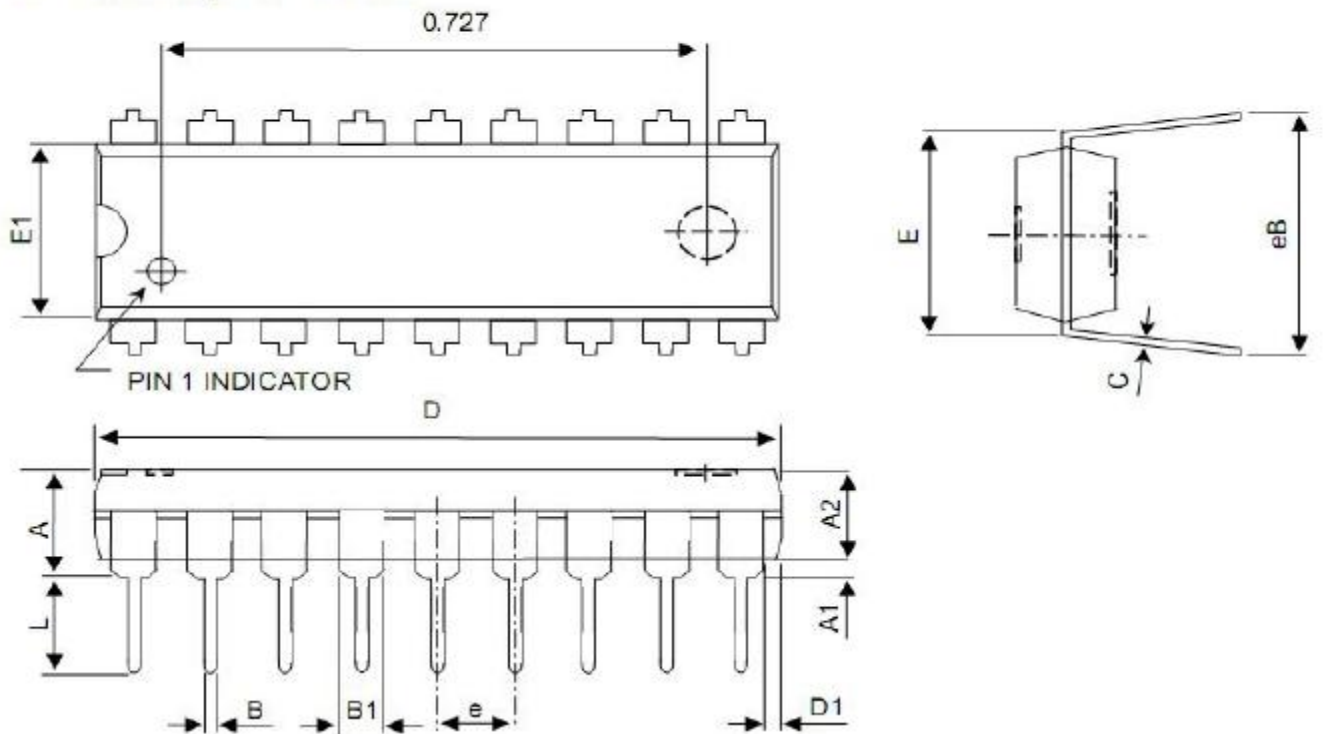
7. Application Circuit





8. Package Dimension of AM4EA015A

18Pin Skinny DIP 300 mil





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| Symbols | Dimension In Millimeters | | | Dimension In Inches | | |
|---------|--------------------------|-------|-------|---------------------|-------|-------|
| | Min | Nom | Max | Min | Nom | Max |
| A | - | | 4.75 | - | - | 0.18- |
| A1 | 0.38 | - | - | 0.015 | - | - |
| A2 | - | 3.3 | 3.56 | - | 0.13 | 0.14 |
| B | 0.36 | 0.46 | 0.56 | 0.014 | 0.018 | 0.022 |
| B1 | 1.27 | 1.52 | 1.78 | 0.05 | 0.06 | 0.07 |
| C | 0.2 | 0.25 | 0.33 | 0.008 | 0.01 | 0.013 |
| D | 22.71 | 22.96 | 23.11 | 0.894 | 0.904 | 0.91 |
| E | 7.62 | - | 8.26 | 0.017 | 0.022 | 0.027 |
| E1 | 6.4 | 6.5 | 6.65 | 0.3 | - | 0.325 |
| e | - | 2.54 | - | 0.252 | 0.256 | 0.262 |
| L | 3.18 | - | - | 0.125 | 0.1 | - |
| eB | 8.38 | - | 9.65 | 0.33 | - | 0.38 |