

4-BIT TELEPHONE CONTROLLER

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1. GENERAL DESCRIPTION

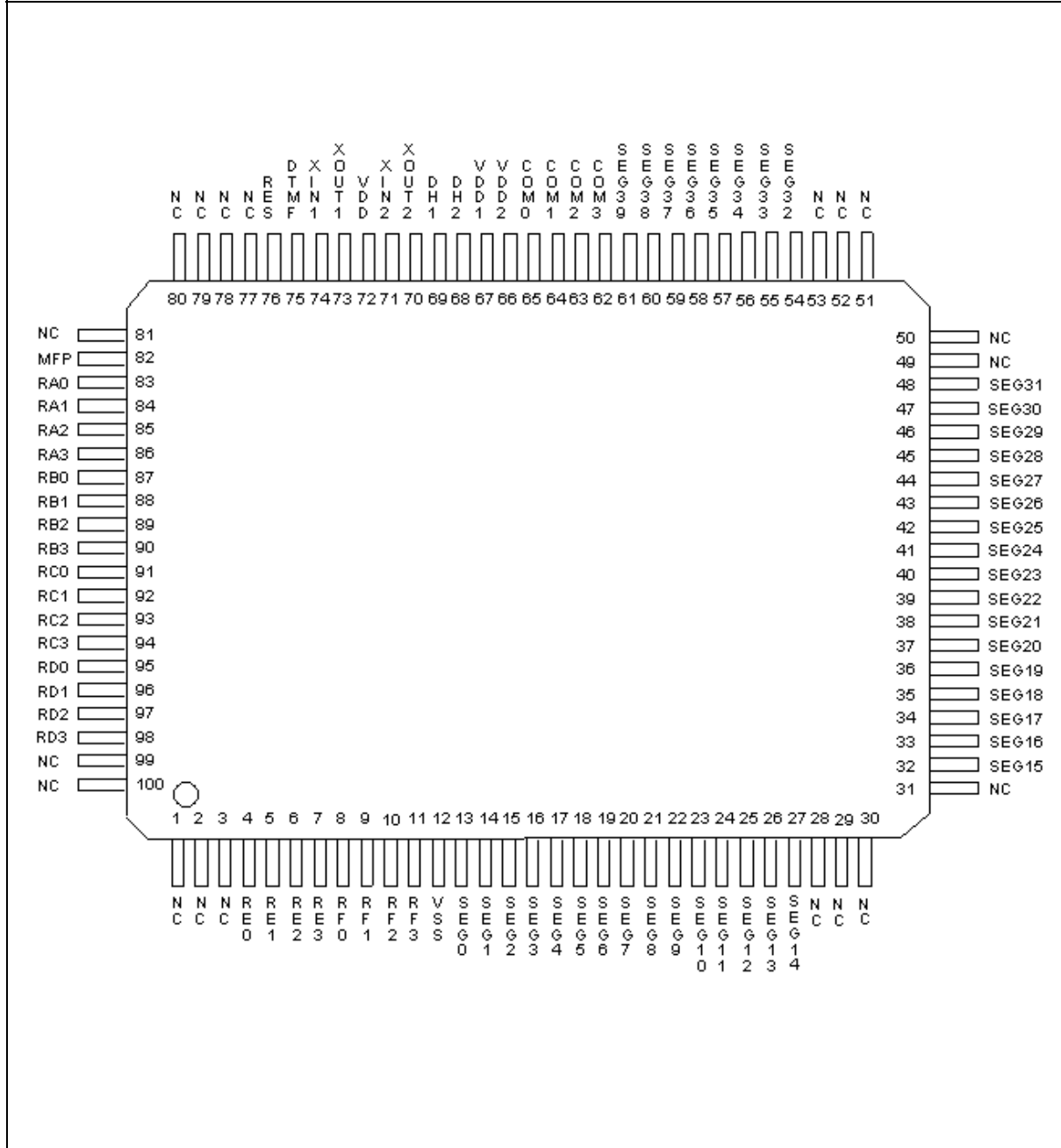
The W742S82A is a high-performance 4-bit micro controller (μC) that provides an LCD driver. The device contains a 4-bit ALU, two 8-bit timers, two dividers (for two oscillators) in dual-clock operation, a 40×4 LCD driver, six 4-bit I/O ports (including 1 output port for LED driving), and one channel DTMF generator. There are also five interrupt sources and 16-levels of subroutine nesting for interrupt applications. The W742S82A operates on very low current and has two power reduction modes, are the dual-clock slow operation and STOP mode, which help to minimize power dissipation.

2. FEATURES

- Operating voltage: 2.4V – 5.5V
- Dual-clock operation or single-clock operation (By option)
- Main-oscillator
 - Connect to 3.58 MHz crystal or 400 KHz that can be selected by option code
 - Crystal or RC oscillator can be selected by code option
- Sub-oscillator
 - Connect to 32768 Hz crystal only
- Memory
 - 16384 x 16 bits program MASK ROM (including 64K x 4 bit look-up table)
 - 2048 x 4 bits data RAM (including 16 nibbles x 16 pages working registers)
 - 40 x 4 LCD data RAM
- 24 input/output pins
 - Port for input only: 1 ports/4 pins (RC)
 - Input/output ports: 3 ports/12 pins (RA, RB & RD)
 - High sink current output port for LED driving: 1 port /4 pins (RE)
 - Port for output only: 1 port/ 4 pins (RF)
- Power-down mode
 - Hold function: no operation (main-oscillator and sub-oscillator still operate)
 - Stop function: no operation (main-oscillator and sub-oscillator are stopped)
 - Dual-clock slow operation mode: the system will operate by the sub-oscillator ($F_{\text{OSC}} = F_s$ and F_m is stopped)
- Five types of interrupts
 - Four internal interrupts (Divider0, Divider1, Timer 0, Timer 1)
 - One external interrupts (RC Port)

- LCD driver output
 - 40 segments x 4 commons
 - 1/4 duty 1/3 bias driving mode
 - Clock source should be the sub-oscillator clock in the dual-clock operation mode
- MFP output pin
 - Output is software selectable as modulating or non-modulating frequency
 - Works as frequency output specified by Timer 1
- DTMF output pin
 - Output is one channel Dual Tone Multi-Frequency signal for dialing
- Two built-in 14-bit frequency dividers
 - Divider0: the clock source is the output of the main-oscillator
 - Divider1: the clock source is the output of the sub-oscillator (dual-clock mode) or the $F_{osc}/128$ (single-clock mode)
- Two built-in 8-bit programmable countdown timers
 - Timer 0: one of two internal clock frequencies ($F_{osc}/4$ or $F_{osc}/1024$) can be selected
 - Timer 1: with auto-reload function and one of three internal clock frequencies (F_{osc} , $F_{osc}/64$ or F_s) can be selected by MR1 register; and the specified frequency can be delivered to MFP pin
- Built-in 18/15-bit watchdog timer selectable for system reset; enable the watchdog timer or not is determined by code option
- Powerful instruction set
- 16-levels subroutine (include interrupt) nesting

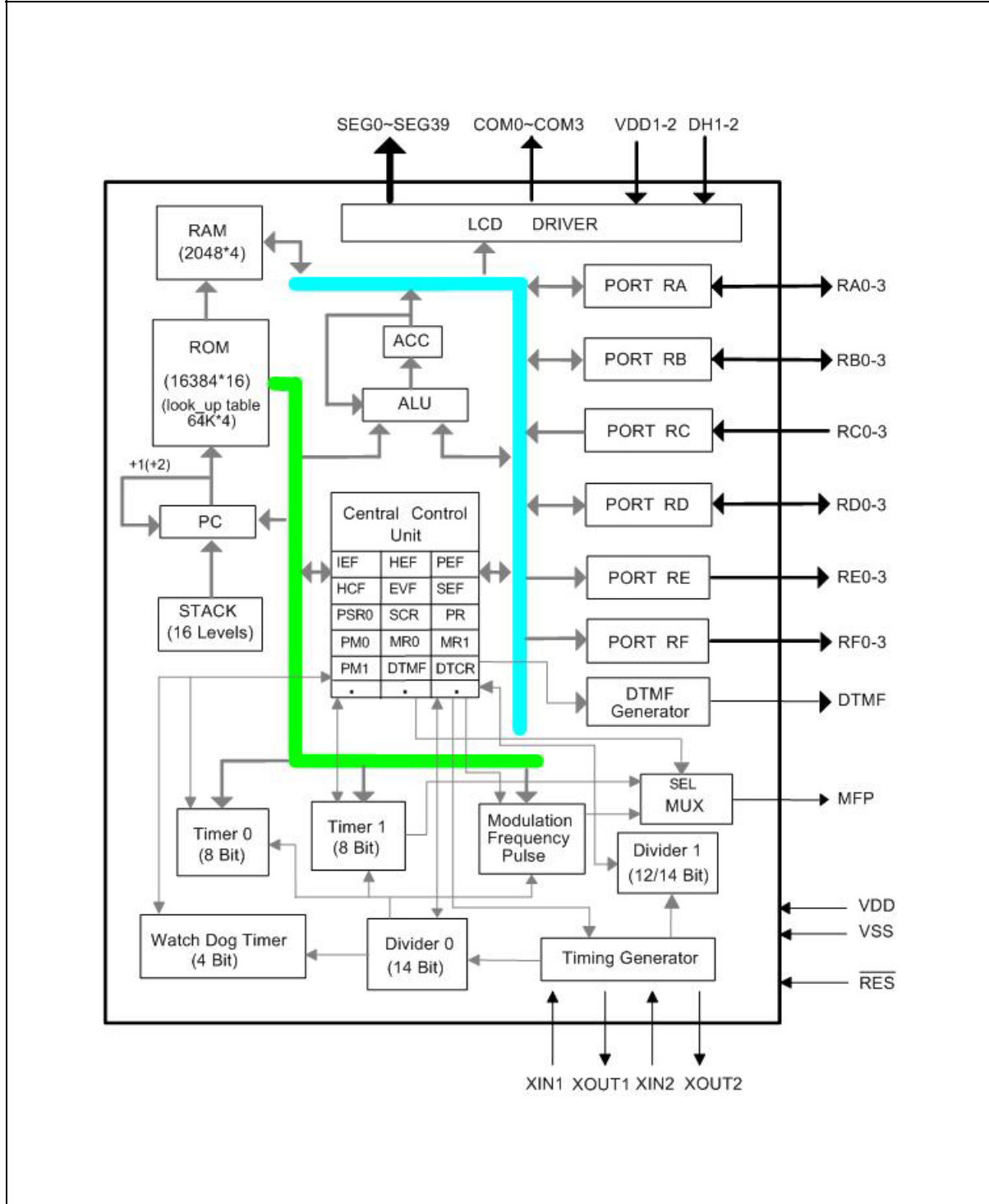
3. PIN CONFIGURATION



4. PIN DESCRIPTION

SYMBOL	I/O	FUNCTION
XIN2	I	Input pin for sub-oscillator. Connected to 32.768KHz crystal only.
XOUT2	O	Output pin for sub-oscillator with internal oscillation capacitor. Connected to 32.768KHz crystal only.
XIN1	I	Input pin for main-oscillator. Connected to 3.58MHz or 400KHz crystal or RC to generate system clock.
XOUT1	O	Output pin for main-oscillator. Connected to 3.58MHz or 400KHz crystal or RC to generate system clock.
RA0-RA3	I/O	Input/Output port. Input/output mode specified by port mode 1 register (PM1).
RB0-RB3	I/O	Input/Output port. Input/output mode specified by port mode 2 registers (PM2).
RC0-RC3	I	4-bit port for input only. Each pin has an independent interrupt capability.
RD0-RD3	I/O	Input/Output port. Input/output mode specified by port mode 5 registers (PM5).
RE0-RE3	O	Output port only. With high sink current capacity for the LED application.
RF0-RF3	O	Output port only.
MFP	O	Output pin only. This pin can output modulating or non-modulating frequency, or Timer 1 specified frequency. It can be selected by bit 0 of BUZCR (BUZCR.0).
DTMF	O	This pin can output dual-tone multi-frequency signal for dialing.
RES	I	System reset pin with pull-high resistor.
SEG0-SEG39	O	LCD segment output pins.
COM0-COM3	O	LCD common signal output pins. The LCD alternating frequency can be selected by code option.
DH1, DH2	I	Connection terminals for voltage double (half) capacitor.
VDD1 VDD2	I	Positive (+) supply voltage terminal. Refer to Functional Description.
VDD	I	Positive power supply (+).
VSS	I	Negative power supply (-).
VPP	I	This pin has the built-in pull-low resistor.
MODE	I	This pin has the built-in pull-low resistor.
DATA	I/O	This pin has the built-in pull-low resistor.

5. BLOCK DIAGRAM



6. ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Supply Voltage to Ground Potential	-0.3 to +7.0	V
Applied Input/Output Voltage	-0.3 to +7.0	V
Power Dissipation	120	mW
Ambient Operating Temperature	0 to +70	°C
Storage Temperature	-55 to +150	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

7. DC CHARACTERISTICS

(VDD-VSS = 3.0 V, Fm = 3.58MHz, Fs = 32.768 KHz, Ta = 25° C, LCD on; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX	UNIT
Op. Voltage	VDD	-	2.4	-	5.5	V
Op. Current (Crystal type)	IOP1	No load (Ext-V) In dual-clock normal operation	-	0.9	2.5	mA
Op. Current (Crystal type)	IOP3	No load (Ext-V) In dual-clock slow operation and Fm is stopped	-	10	20	μA
Hold Current (Crystal type)	IHM1	Hold mode No load (Ext-V) In dual-clock normal operation	-	-	450	μA
Hold Current (Crystal type)	IHM3	Hold mode No load (Ext-V) In dual-clock slow operation and Fm is stopped	-	5	10	μA
Stop Current (Crystal type)	ISM1	Stop mode No load (Ext-V) In dual-clock normal operation	-	-	1	μA

DC Characteristics, continued

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Low Voltage	V _{IL}	-	V _{SS}	-	0.3 V _{DD}	V
Input High Voltage	V _{IH}	-	0.7 V _{DD}	-	V _{DD}	V
MFP Output Low Voltage	V _{ML}	I _{OL} = 3.5 mA	-	-	0.4	V
MFP Output High Voltage	V _{MH}	I _{OH} = 3.5 mA	2.4	-	-	V
Port RA, RB, RD and RF Output Low Voltage	V _{ABL}	I _{OL} = 2.0 mA	-	-	0.4	V
Port RA, RB, RD and RF Output high Voltage	V _{ABH}	I _{OH} = 2.0 mA	2.4	-	-	V
LCD Supply Current	I _{LCD}	All Seg. ON	-	-	6	μA
SEG0-SEG39 Sink Current (Used as LCD output)	I _{OL1}	V _{OL} = 0.4V V _{LCD} = 0.0V	90	-	-	μA
SEG0-SEG39 Drive Current (Used as LCD output)	I _{OH1}	V _{OH} = 2.4V V _{LCD} = 3.0V	90	-	-	μA
Port RE Sink Current	I _{EL}	V _{OL} = 0.9V	10	-	-	mA
Port RE Source Current	I _{EH}	V _{OH} = 2.4V	0.4	1.2	-	mA
DTMF Output DC level	V _{TDC}	R _L = 5KΩ, V _{DD} = 2.5 to 3.8V	1.1	-	2.8	V
DTMF Distortion	T _{HD}	R _L = 5KΩ, V _{DD} = 2.5 to 3.8V	-	-30	-23	dB
DTMF Output Voltage	V _{TO}	Low group, R _L = 5KΩ	130	150	170	mVrms
Pre-emphasis		Col/Row	1	2	3	dB
DTMF Output Sink Current	I _{TL}	V _{TO} = 0.5V	0.2	-	-	mA
Pull-up Resistor	R _C	Port RC	150	250	350	KΩ
RES Pull-up Resistor	R _{RES}	-	20	100	500	KΩ

8. AC CHARACTERISTICS

(VDD-VSS = 3.0 V, Fm = 3.58MHz, Fs = 32.768 KHz, Ta = 25° C, LCD on; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Op. Frequency	FOSC	Crystal type	-	3.58	-	MHz
Instruction Cycle Time	Ti	One machine cycle	-	4/FOSC	-	S
Reset Active Width	TRAW	FOSC = 32.768 KHz	1	-	-	μS
Interrupt Active Width	TIAW	FOSC = 32.768 KHz	1	-	-	μS

9. VERSION HISTORY

VERSION	DATE	DESCRIPTION
A1	Sep 19, 2006	Preliminary Release
A2	Oct 31, 2006	Formal Release
A3	Sep, 18, 2008	Change LOGO
A3.1	Oct, 20, 2009	Release Day data correction

Important Notice

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