

IN5732

4BIT SINGLE CHIP MICROCOMPUTER

The IN5732 is a CMOS 4-bit single chip microcomputer that operate on low voltage, very low current and contain LCD drivers. They also contain a 4 bit parallel processing ALU, a program memory ROM, many LCD segment outputs, a prescaler, an oscillator. The IN5732 is especially suited for use in high-grade timepieces, time controllers, electronic calculators, LCD games with timepiece. The IN5732 is especially suited for use in audio equipment, copiers, facsimiles with LCD and sub CPU applications.

FEATURES

| | | |
|---|--|--------------------------------|
| Supply voltage | 1.5V or 3V (Mask option-selectable) | |
| Current dissipation | 3.0 μ A Typ. (Ag Battery version, 32KHz crystal oscillation, during timekeeping operation) 1.5 μ A Typ. (Li Battery version, 32KHz crystal oscillation, during timekeeping operation) | |
| Oscillation | Crystal oscillation for timekeeping (32.768 KHz); or CR oscillator. | |
| Output pins for LCD drive | 27 pins | |
| | Drivable LCD panel | Number of Drivable LCD segment |
| | 1/2 bias 1/3 duty | 81 segments |
| | 1/2 bias 1/2 duty | 54 segments |
| | Static | 27 segments |
| On chip melody function | 3 octaves (the melody length is software-controlled. One Musical note requires one byte.) | |
| Number of input pins | 8 | |
| Number of out pins | 3 pins (Output dedicated to alarm: 2 pins, general-purpose output: 1 pin). | |
| Possible to use LCD panel drive output pins as output pin-only ports (Mask option-selectable) | | |
| ROM | 2048 X 8 bits | |
| RAM | 48 X 4 bits | |
| Cycle Time | CR oscillation at 65 Hz | 60us |
| | 32.768 KHz crystal | 122us |
| On chip step-up / step down circuit | | |
| Instruction set | 92 instructions | |
| Table read instruction | | |
| | 1 level subroutine nesting on-chip 15 bit divider for timekeeping (delivers an overflow single every 64ms/500ms when a 32.768 KHz crystal is used). | |
| HALT function | | |

IN5732

ABSOLUTE MAXIMUM RATINGS at Ta=25 ,V_{DD}=0V

| Parameter | Sign. | Pins and Conditions | Value | Unit |
|------------------------|--------------------------------------|--|-------------------------------|------|
| Maximum Supply Voltage | V _{SS1} V _{SS2} | | -4.0 to +0.3 -4.0 to +0.3 | V |
| Maximum Input Voltage | V _{IN} | S1-4, M1-4, 32Hz, TEST, 10P, OSCIN, RES | V _{SS1} -0.3 to +0.3 | V |
| Maximum Output Voltage | V _{OUT1} | 32Hz, CUP2, OSCOUT, ALM1, ALM2, LIGHT | V _{SS1} -0.3 to +0.3 | V |
| | V _{OUT2} | SEGOUT, COM1, COM2, COM3, CUP1 | V _{SS2} -0.3 to +0.3 | V |
| Operating Temperature | Topg | | -10 to +65 | °C |
| Storage Temperature | Tstg | | -30 to +125 | °C |

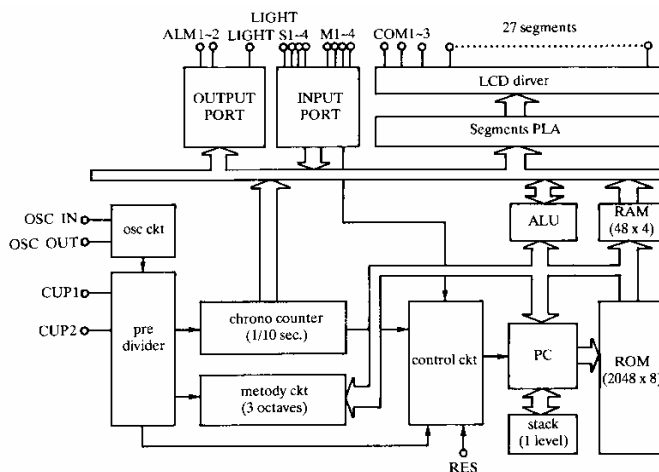
ALLOWABLE OPERATING CONDITIONS at Ta=25 + 2°C, V_{DD}=0V

| Parameter | Sign. | Pins and Conditions | min | typ | max | Unit |
|-------------------------|------------------|-----------------------------------|------------------|-----|---------------------------|------|
| Supply Voltage | V _{SS1} | | -1.65 | | -1.30 | V |
| | V _{SS2} | | -3.3 | | -2.4 | V |
| Input 'H'-Level Voltage | V _{IH} | S1-4, M1-4, RES | -0.2 | | 0 | V |
| Input 'L'-Level Voltage | V _{IL} | S1-4, M1-4, RES | V _{SS1} | | V _{SS1} +0 .2 | V |
| Operating Frequency | fopgl | Ta=-10 to + 65 °C, crystal OSC | 32 | 32. | 33 | kHz |
| | fopg2 | Ta=-10 to + 65 °C, CR OSC | | 768 | | kHz |

ELECTRICAL CHARACTERISTICS at Ta=25 +0.2°C V_{DD}=0V

| Parameter | Sign. | Pins and Conditions | min | typ | max | Unit |
|---|-------------------|--|-------|-----|-----------------------|------|
| Input Resistance | R _{INIA} | V _{SS1} =-1.55V, V _{IL} =V _{SS1} +0.2V, 'L'level hold tr, *1 | 200 | | 2000 | kΩ |
| | R _{INIB} | V _{SS1} =-1.55V, 'L'level pull-in tr, *1 | 200 | | 2000 | kΩ |
| | R _{IN2} | V _{SS1} =-1.55V, TEST, RES | 10 | | 300 | kΩ |
| Output 'H'-Level Voltage | V _{OH1} | V _{SS1} =-1.55V, I _{OH} =-0.4uA, *2 | -0.2 | | | V |
| Output 'L'-Level Voltage | V _{OL1} | V _{SS1} =-1.55V, I _{OL} =0.4uA, *2 | | | V _{SS2} +0.2 | V |
| Output 'H'-Level Voltage | V _{OH2} | V _{SS1} =-1.55V, I _{OH} =-4uA, COM1, COM2, COM3 | -0.2 | | | V |
| Output 'H'-Level Voltage | V _{OH3} | V _{SS1} =-1.35V, I _{OH} =-250uA, ALM1, ALM2, LIGHT | -0.65 | | -1.30 | V |
| Oscillation Start Time | t _{ST} | C _O =C _G =20pF, crystal OSC (C _I ≤25kΩ) | | | 10 | sec |
| Oscillation Compensation Capacitance | 10P | External pin | 8 | 10 | 12 | pF |

BLOCK DIAGRAM



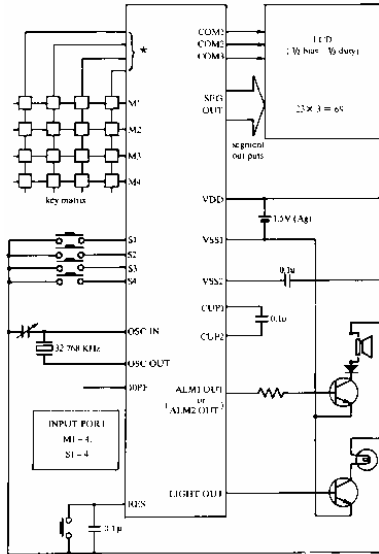
PIN DESCRIPTION

| Pad No. | Pin Name | Input/Output | Function |
|--------------------------|------------------------------------|--------------|--|
| 33 | OSCIN | Input | Crystal OSC mode 32.768kHz crystal is connected across OSCIN and OSCOUT for oscillation. Used as reference clock for timepiece and system clock. CR OSC mode |
| 35 | OSCOUT | Output | R and C are connected across OSCIN and OSCOUT for oscillation. Used as system clock. |
| 34 | 10P | | Connected to OSCOUT and used as OSC phase compensation capacitor. |
| 31 30 3 2 | S1 S2 S3 S4 | Input | Input-only port. LSI system is reset by applying V" to S1 to S4 simultaneously. |
| 4 5 6 7 | M1 M2 M3 M4 | Input | Input pins for placing data in RAM. |
| 32 | RES | Input | Input pin for resetting LSI system. |
| 57 | BAK | | (-) power supply pin for logic unit inside the LSI. For Li battery version, a capacitor must be connected across BAK and V" to prevent logic unit from malfunctionin . |
| 52 | LIGHT | Output | Output-only pin Suited for delivering signal to drive transistor for light. |
| 53 54 | ALM1 ALM2 | Output | Output-only pin Used to deliver *4kHz, 2kHz, 1kHz modulation signal with instruction. Also used to deliver non-modulation signal. Used to deliver melody signal of 3 octaves with instruction. |
| 1 | V _{DD} | | (+) power supply pin. |
| 55 56 | V _{SS2} V _{SS1} | | (-) power supply pin. Ag battery version, Li battery version, EXT-V version: mask option selectable. Also used as power supply for LCD drive. |
| 28 29 | CUP1 CUP2 | | Pins for connecting voltage step-up (step-down) capacitor. |
| 25 37 51 | COM1 COM2 COM3 | Output | Output pins for LCD panel common plate. |
| 19 - 23 | | Output | Segment driver |
| 38 - 50 | | Output | Output pins for LCD panel segments. Mask option permits Seg 14 to Seg 27 (pad No.10 to 23)to be used as output ports. |
| 27 36 26 8 9 | 32Hz T3 TEST TEST TEST | Test | Test pins (not used by user) |

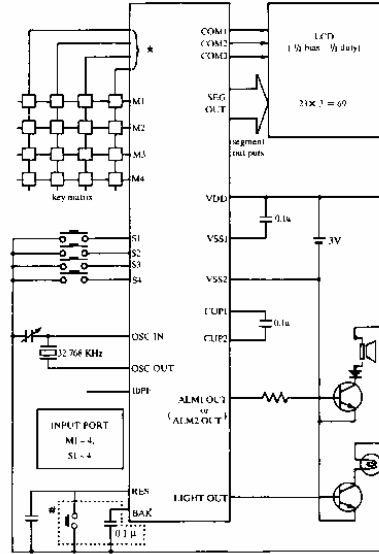
SAMPLE APPLICATION CIRCUITS

(1) Ag battery used application (1/2 bias 1/3 duty): * 4 segment outputs are used for output ports.

(2) Li battery used application or EXT-V Used application (1/2 bias 1/3 duty): * 4 segment outputs are used for output ports.



Crystal OSC (Power supply: Ag battery version)



Crystal OSC (Power supply: Li battery version) # Components inside the dot line can be disconnected for EXT- V application.