OKI semiconductor

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MSM5832 MICROPROCESSOR REAL-TIME CLOCK/CALENDAR

GENERAL DESCRIPTION

The MSM5832 is a monolithic, metal-gate CMOS integrated circuit that functions as a real time clock/calendar for use in bus-oriented microprocessor applications. The on-chip 32,768 Hz crystal controlled oscillator time base is counted down to provide addressable 4-bit I/O data of SECONDS, MINUTES, HOURS, DAY-OF-WEEK, DATE, MONTH, and YEAR. Data access is controlled by 4-bit address, chip select, read, write and hold inputs. Other functions include 12H/24H format selection, leap year identification and manual ±30 second correction.

The MSM5832 normally operates from a 5 volt ±5% supply. Battery back-up operation down to 2.2 volts allows continuation of time keeping when main power is off. One test input facilitates rapid testing of the time keeping operations. The MSM5832 is offered in an 18-lead dual-in-line plastic (RS suffix) package.

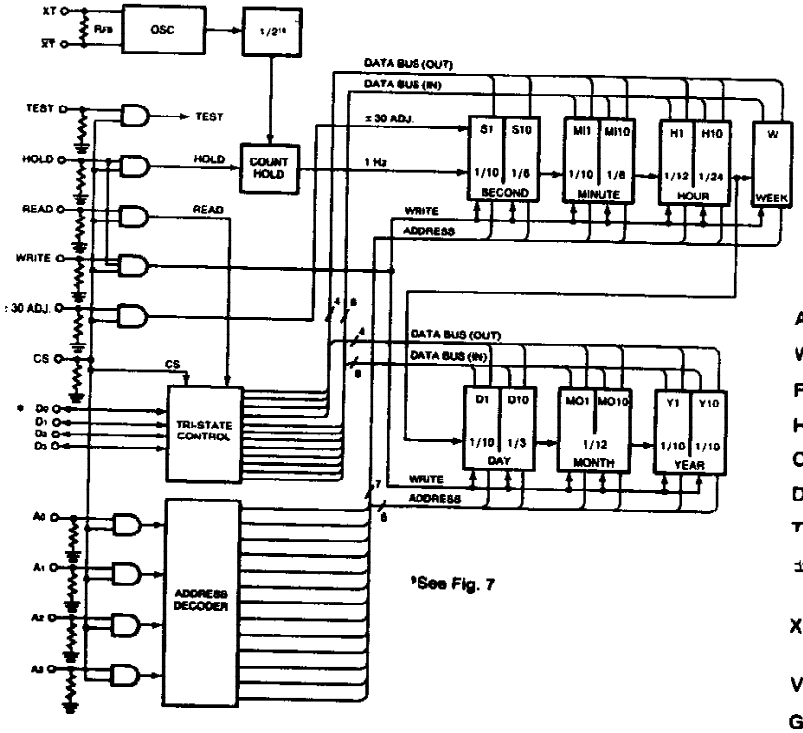
FEATURES

- Microprocessor bus-oriented

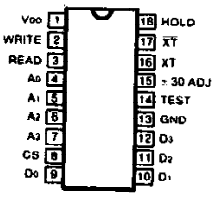
TIME	MONTH	DATE	YEAR	DAY OF WEEK
23:59:59	12 -	31 -	99 -	7

- 4-BIT DATA BUS
- 4-BIT ADDRESS
- Read, Write, Hold, Chip select inputs
- Interrupt signal outputs—1024, 1, 1/60, 1/3600 Hz
- 32.768 KHz crystal controlled operation
- Leap year register bit
- 12 or 24 hour format
- ±30 second error correction
- Single 5 volt power supply
- Back-up battery operation to V_{DD}=2.2 V
- Low Power Dissipation
  90 μw Max. at V_{DD}=3 V
  2.5 mw Max. at V_{DD}=5 V
- High Density 300 mil 18-Pin Package

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



A_0 to A_3: Address Inputs

WRITE: Write Enable

READ: Read Enable

HOLD: Count Hold Enable

CS: Chip Select

D_0 to D_3: Data Input/Output

TEST: Test Input

±30 ADJ: ±30 Second Correction Input

XT & $\overline{XT}$: xtal oscillator connections

V_{DD}: +5 V Supply

GND: Ground

FUNCTION TABLE

FIGURE 1

ADDRESS INPUTS				INTERNAL COUNTER	DATA I/O				DATA LIMITS	NOTES
A_0	A_1	A_2	A_3		D_0	D_1	D_2	D_3		
0	0	0	0	S 1	*	*	*	*	0 ~ 9	S_1 or S_{10} are reset to zero irrespective of input data D_0~D_3 when write instruction is executed with address selection
1	0	0	0	S 10	*	*	*		0 ~ 5	
0	1	0	0	MI 1	*	*	*	*	0 ~ 9	
1	1	0	0	MI 10	*	*	*		0 ~ 5	
0	0	1	0	H 1	*	*	*	*	0 ~ 9	
1	0	1	0	H 10	*	*	†	†	0~1 / 0~2	D_2="1" for PM D_3="1" for 24 hour format D_2="0" for AM D_3="0" for 12 hour format
0	1	1	0	W	*	*	*		0 ~ 6	
1	1	1	0	D 1	*	*	*	*	0 ~ 9	
0	0	0	1	D 10	*	*	†		0 ~ 3	D_2 ="1" for 29 days in month 2 D_2 ="0" for 28 days in month 2 (2)
1	0	0	1	MO 1	*	*	*	*	0 ~ 9	
0	1	0	1	MO 10	*				0 ~ 1	
1	1	0	1	Y 1	*	*	*	*	0 ~ 9	
0	0	1	1	Y 10	*	*	*	*	0 ~ 9	

(1) *data valid as "0" or "1"
blank does not exist (unrecognized during a write and held at "0" during a read)
†data bits used for AM/PM, 12/24 HOUR and leap year must be masked from the H10 and D10 registers for correct time to be read.
(2) If D_2 previously set to "1", upon completion of month 2 day 29, D_2 will be internally reset to "0"

TYPICAL CHARACTERISTICS—Oscillator Frequency Deviations

Frequency Deviation *vs* Temperature

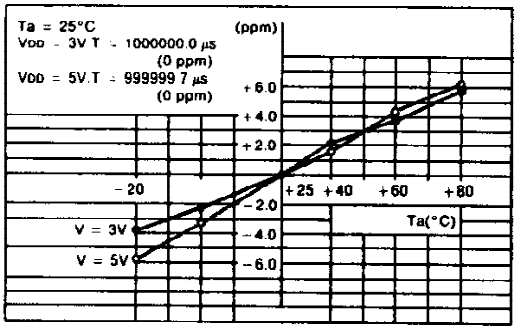


FIGURE 2

Frequency Deviation *vs* Supply Voltage

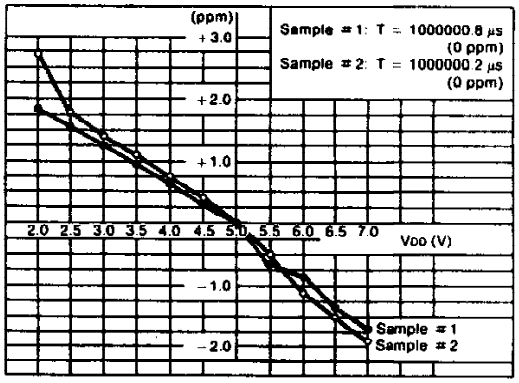


FIGURE 3

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_{DD}	−0.3 ~ 7.0	V
Input Voltage	V_{IN}	−0.3 ~ V_{DD} +0.3	V
Data I/O Voltage	V_D	−0.3 ~ V_{DD} +0.3	V
Storage Temperature	T_{stg}	−55 ~ 150	°C

Note: Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.