

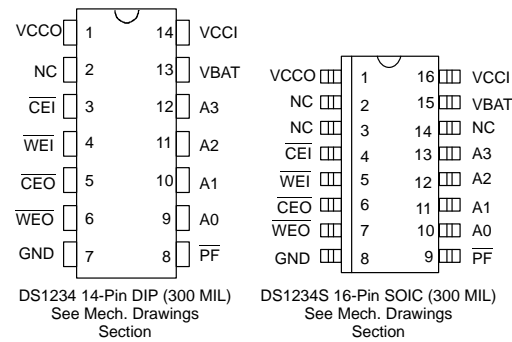
**DALLAS**  
SEMICONDUCTOR

## DS1234 Conditional Nonvolatile Controller Chip

### FEATURES

- Converts CMOS static RAMs into nonvolatile memories
- Software-controlled write inhibit
- Software-controlled battery disconnect extends battery life
- Unconditionally write protects when  $V_{CC}$  is out of tolerance
- Consumes less than 100 nA of battery current
- Power fail signal can be used to interrupt processor on power failure
- Low forward voltage drop on the  $V_{CC}$  switch
- Optional 16-pin SOIC surface mount package

### PIN ASSIGNMENT



### PIN DESCRIPTION

$V_{CCO}$	– RAM Supply
NC	– No Connection
$\overline{CEI}$	– Chip Enable Input
$\overline{WEI}$	– Write Enable Input
$\overline{CEO}$	– Chip Enable Output to RAM
$\overline{WEO}$	– Write Enable Output to RAM
GND	– Ground
$\overline{PF}$	– Power Fail Output
A0-A3	– Address Inputs
$V_{BAT}$	– Battery Input
$V_{CCI}$	– +5V Supply

### DESCRIPTION

The DS1234 is a CMOS circuit that converts CMOS RAM into nonvolatile memory and adds two software selectable switches. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, chip enable and write enable to the RAM are inhibited to accomplish write protection, and the battery is switched on to supply the memory with uninterrupted power. The two software selectable switches provided by the DS1234 are capable of inhibiting both the write

enable to the RAM and the battery backup circuitry by a pattern recognition sequence across four address lines. Inhibiting the write enable to the nonvolatile RAM provides data integrity by isolating the memory contents from external change. The second switch provides added flexibility and increases battery life to the system by enabling/disabling the battery for shipment or storage, or when battery backup is not needed.



**ADDRESS INPUT PATTERN** Table 1

Address Inputs	CYCLE NUMBER															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A3	1	0	1	0	0	0	1	1	0	1	0	*	*	*	*	*
A2	0	1	0	1	1	1	0	0	1	0	1	0	0	0	1	1
A1	1	0	1	0	0	0	1	1	0	1	0	1	1	1	0	0
A0	0	1	0	1	1	1	0	0	1	0	1	0	0	0	1	1

**CONTROL SELECT** Table 2

WEI Battery Control					Operation
11	12	13	14	15	
0	X	X	X	X	Read Only Operation
1	X	X	X	X	Read/Write Operation
X	1	0	1	0	Enables Nonvolatile Controller*

X = Don't Care

\*Any other combination turns controller off

**ABSOLUTE MAXIMUM RATINGS\***

Voltage on any Pin Relative to Ground	-0.3V to +7.0V
Operating Temperature	0°C to 70°C
Storage Temperature	-55°C to +125°C
Soldering Temperature	260°C for 10 seconds

\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

**RECOMMENDED DC OPERATING CONDITIONS**

(0°C to 70°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Power Supply Voltage	$V_{CCI}$	4.5	5.0	5.5	V	1
Input High Voltage	$V_{IH}$	2.2		$V_{CC}+0.3$	V	1
Input Low Voltage	$V_{IL}$	-0.3		+0.8	V	1
Battery Voltage	$V_{BAT}$	2.5		3.5	V	

**DC ELECTRICAL CHARACTERISTICS**(0°C to 70°C;  $V_{CCI}=5V \pm 10\%$ )

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Supply Current	$I_{CCI}$			5	mA	2
Supply Current @ $V_{CCO} = V_{CCI} - 0.2$	$I_{CCO}$			80	mA	3
Input Leakage	$I_{IL}$	-1.0		+1.0	$\mu A$	
Output Leakage	$I_{LO}$	-1.0		+1.0	$\mu A$	
Output Current @ 2.4V	$I_{OH}$	-1.0			mA	4
Output Current @ 0.4V	$I_{OL}$			4.0	mA	4

(0°C to 70°C;  $V_{CCI} \leq V_{BAT}$ )

CEO, WEO Output	$V_{OHL}$	$V_{BAT}-0.2$			V	6
Battery Current	$I_{BAT}$			0.1	$\mu A$	7
Battery Backup Current @ $V_{CCO} = V_{BAT} - 0.3V$	$I_{CCO1}$			100	$\mu A$	5

**CAPACITANCE**(T<sub>A</sub>=25°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Input Capacitance	C <sub>IN</sub>			5	pF	
Output Capacitance	C <sub>OU</sub>			7	pF	

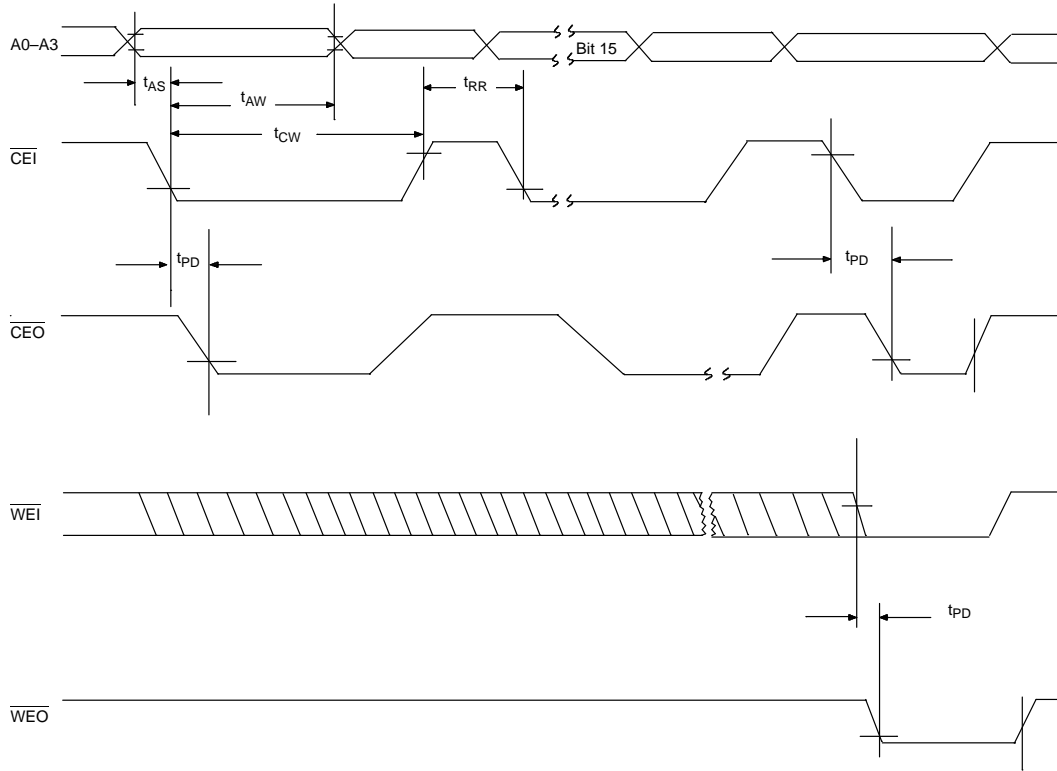
**AC ELECTRICAL CHARACTERISTIC**(0°C to 70°C; V<sub>CCI</sub> = 5V ± 10%)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Address Setup	t <sub>AS</sub>	0			ns	
Address Hold	t <sub>AH</sub>	50			ns	
Read Recovery	t <sub>RR</sub>	40			ns	
$\overline{\text{CEI}}$ Pulse Width	t <sub>CW</sub>	110			ns	
Propagation Delay	t <sub>PD</sub>			20	ns	

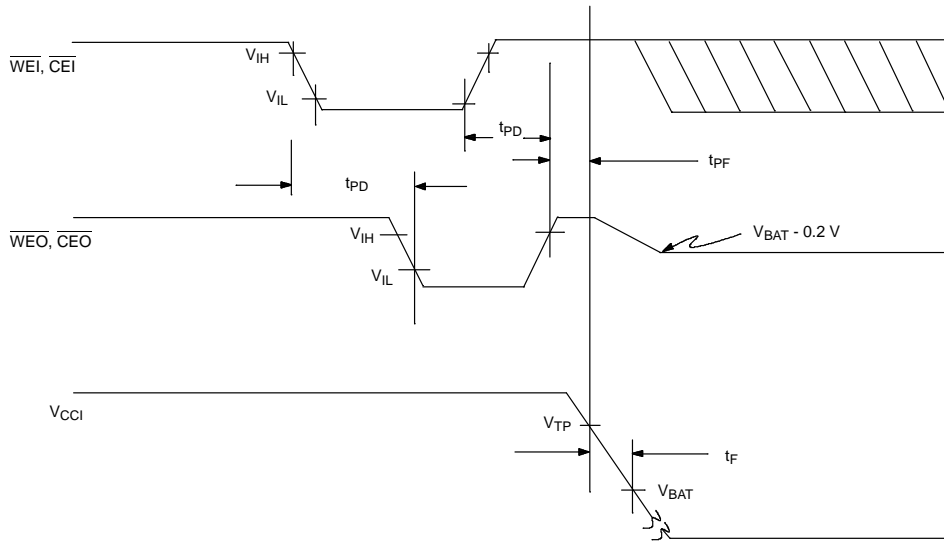
(0°C to 70°C; V<sub>CCI</sub> < V<sub>TP</sub>)

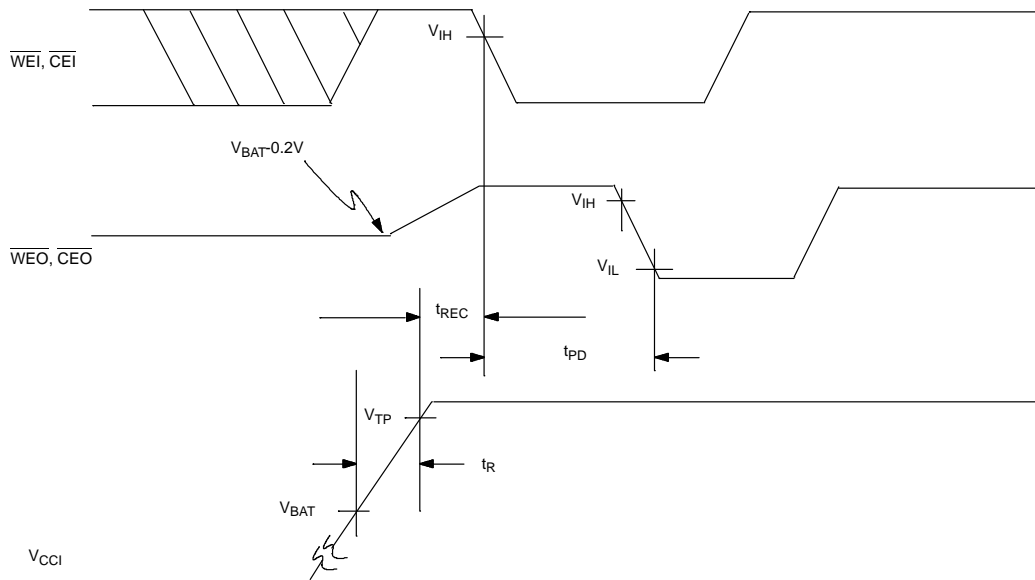
Recovery at Power Up	t <sub>REC</sub>			2	ms	
V <sub>CC</sub> Slew Rate Power Down	t <sub>F</sub>	10			μs	
V <sub>CC</sub> Slew Rate Power Up	t <sub>R</sub>	0			μs	
$\overline{\text{CEI}}$ High to Power Fail	t <sub>PF</sub>	0			ns	

**TIMING DIAGRAM: SWITCH SETTING**



**TIMING DIAGRAM: POWER DOWN**



**TIMING DIAGRAM: POWER-UP****NOTES:**

1. All voltages are referenced to ground.
2. Measured with  $V_{CC0}$ ,  $\overline{CEO}$  and  $\overline{WEO}$  open.
3.  $I_{CC0}$  is the maximum average load that the DS1234 can supply to the memories.
4. Measured with a load as shown in Figure 2.
5.  $I_{CC01}$  is the maximum average load current that the DS1234 can supply to the memories in the battery backup mode.
6.  $\overline{CEO}$  and  $\overline{WEO}$ , outputs can only sustain leakage current in the battery backup mode.
7.  $I_{BAT}$  is the total load current that the DS1234 uses from the battery input pin with  $V_{CC0}$ ,  $\overline{CEO}$ , and  $\overline{WEO}$  open.

**OUTPUT LOAD Figure 2**