

EMC1402 Comparison to Pin Compatible Devices

1 Preface

This application note provides information for software or firmware changes when using devices that are pin and functionally compatible with the EMC1402. It also provides information on general temperature monitor settings for common measurement diode types.

2 Audience

This application note is targeted at system designers. It is assumed that the familiar with reading and writing devices via the SMBus or I²C communications protocols.

3 References

The following document should be referenced when using this application note:

- SMSC EMC1402 Datasheet

4 Overview

The EMC1402 is an SMBus temperature sensor that monitors two zones and can generate two system interrupts. It is the successor and functional equivalent to the EMC1002 with enhanced capabilities.

Similar temperature sensors are available from several suppliers in a pin compatible 8 pin package. This application note contrasts the register set of some of these devices. The goal of the application note is to provide information on replacing a competitor's part with the EMC1402, and understanding what changes to the system software may be required to use the EMC1402.

5 Temperature Measurement Features

The EMC1402 offers advanced temperature measurement features not available in the competitive devices. These features include Resistance Error Correction (also offered by the ADT7461 device), Ideality Factor compensation, and support for the BJT transistor model used to measure certain CPU diodes (Beta Compensation).

The transistor model support circuitry (referred to as Beta Compensation) automatically detects the presence of a CPU diode or a diode-connected BJT transistor and adjusts its internal circuitry to correct for beta variations as necessary. The Beta Compensation circuitry is designed to measure 45nm, 65nm, and 90nm Intel CPU diodes accurately.

Table 5.1 Temperature Measurement Features

MEASUREMENT DIODE	EMC1402	ADM1032	MAX6649	ADT7461	G781
Intel CPU Diode requiring Transistor model	Supported by Default Settings	Not Supported	Not Supported	Not Supported	Not Supported
AMD Diode	Disable REC (set bit 4 in register 03h or 09h) and Beta Compensation (set register 25h to 07h)	Supported by Default Settings	Supported by Default Settings	Not supported (Series Resistance Cancellation cannot be disabled)	Supported by Default Settings
2N3904 - "diode connected" transistor	Supported by Default Settings	Supported by Default Settings	Supported by Default Settings	Supported by Default Settings	Supported by Default Settings

6 Accessing Registers

A 2-wire serial interface that is SMBus compatible gives the user access to byte-wide registers. Temperature data and status information is read from some registers. Alarm threshold values and control bits are written to other registers. The devices compared are very similar, and differences are highlighted in this document.

6.1 Register Types

Four categories of register access exist in these devices:

1. Write only - W
2. Read only - R
3. Read/Write at the same address - R/W
4. Read at one address/Write at another address - The EMC1402 does not require this operation however it is included to show functionality of pin compatible devices.

6.2 Register Comparisons

When reading this table, blank spaces indicate full register compatibility between all devices. Deltas are highlighted and explained in detail below.

Table 6.1 EMC1402 Competitive Register Comparison

ADDRESS (HEX)	R/W	REGISTER NAME	EMC1402	ADM1032	MAX6649	ADT7461	G781
00	R	Int Temp High Byte	All Devices Compatible				
01	R	Ext Temp High Byte	All Devices Compatible				
02	R	Status	All Devices Compatible				

Table 6.1 EMC1402 Competitive Register Comparison (continued)

ADDRESS (HEX)	R/W	REGISTER NAME	EMC1402	ADM1032	MAX6649	ADT7461	G781
03 Note 6.1	R	Configuration	See Table 6.3				
04 Note 6.1	R	Conversion Rate	Max 64 / sec	Max 64 / sec	Max 4 / sec	Max 64 / sec	Max 16 / sec
05 Note 6.1	R	Int Temp High Limit	All Devices Compatible				
06 Note 6.1	R	Int Temp Low Limit	All Devices Compatible				
07 Note 6.1	R	Ext Temp High Limit, High Byte	All Devices Compatible				
08 Note 6.1	R	Ext Temp Low Limit, High Byte	All Devices Compatible				
09 Note 6.1	W	Configuration	See Table 6.3				
0A Note 6.1	W	Conversion Rate	Max 64 / sec	Max 64 / sec	Max 4 / sec	Max 64 / sec	Max 16 / sec
0B Note 6.1	W	Int Temp High Limit	All Devices Compatible				
0C Note 6.1	W	Int Temp Low Limit	All Devices Compatible				
0D Note 6.1	W	Ext Temp High Limit, High Byte	All Devices Compatible				
0E Note 6.1	W	Ext Temp Low, Limit, High Byte	All Devices Compatible				
0F	W	One-Shot	All Devices Compatible				
10	R	External Temp Low Byte	All Devices Compatible				
11	R/W	Ext Temp Offset High Byte	Scratchpad Only	Ext Temp Offset High Byte	Internal Temp Low Byte - See Table 6.2	Ext Temp Offset High Byte	Ext Temp Offset High Byte
12	R/W	Ext Temp Offset Low Byte	Scratchpad Only	Ext Temp Offset Low Byte	Not Present	Ext Temp Offset Low Byte	Ext Temp Offset Low Byte
13	R/W	Ext Temp High Limit, Low Byte	Ext Temp High Limit, Low Byte	Ext Temp High Limit, Low Byte	Not Present	Ext Temp High Limit, Low Byte	Ext Temp High Limit, Low Byte
14	R/W	Ext Temp Low Limit, Low Byte	Ext Temp Low Limit, Low Byte	Ext Temp Low Limit, Low Byte	Not Present	Ext Temp Low Limit, Low Byte	Ext Temp Low Limit, Low Byte
19	R/W	Ext THERM Limit	All Devices Compatible				
20	R/W	Int THERM Limit	All Devices Compatible				
21	R/W	THERM Hysteresis	All Devices Compatible				

Table 6.1 EMC1402 Competitive Register Comparison (continued)

ADDRESS (HEX)	R/W	REGISTER NAME	EMC1402	ADM1032	MAX6649	ADT7461	G781
22	R/W	Consecutive ALERT	See Section 6.4				
25	R/W	Ext Diode Beta Config	Unique	Not Present	Not Present	Not Present	Not Present
27	R/W	Ext Diode Ideality Factor	Unique	Not Present	Not Present	Not Present	Not Present
29	R	Int Temp Low Byte	See Table 6.2	Not Present	Not Present - See Table 6.2	Not Present	Not Present
40	R/W	Filter Control	Unique	Not Present	Not Present	Not Present	Not Present
1F	R/W	Channel Mask Register	Unique	Not Present	Not Present	Not Present	Not Present
FD	R	Product ID	20	Not Present	Not Present	Not Present	Not Present
FE	R	Manufacture ID	5D	41	4D	41	47
FF	R	Revision Number	1	51	59	51	01 or 03

Note 6.1 The EMC1402 supports both read and write capabilities at this register address.

6.3 Register Address Deltas

The following table shows individual registers that are not at a common address across all devices.

Table 6.2 Register Address Deltas

REGISTER NAME	EMC1402	ADM1032	MAX6649	ADT7461	G781
Internal Temperature Low Byte	29	n/a	11	n/a	n/a

6.4 Register Function Deltas

The following registers have functional differences between the various devices as indicated.

6.4.1 Configuration Register Delta

The EMC1402 will behave the same as the ADM1032 in it's default configuration. The only differences are that two features which reduce reading errors are enabled, REC and dynamic averaging.

Table 6.3 Configuration Register Delta

REGISTER BIT	EMC1402	ADM1032	MAX6649	ADT7461	G781
Default	0000_0000b	0000_0000b	0000_0000b	0000_0000b	0000_0000
Bit 7	0 = ALERT on 1 = ALERT off	0 = ALERT on 1 = ALERT off	0 = ALERT on 1 = ALERT off	0 = ALERT on 1 = ALERT off	0 = ALERT on 1 = ALERT off
Bit 6	0 = converting 1 = low power mode	0 = converting 1 = low power mode	0 = converting 1 = low power mode	0 = converting 1 = low power mode	0 = converting 1 = low power mode
Bit 5	0 = ALERT 1 = THERM2	Reserved	Reserved	0 = ALERT 1 = THERM2	Reserved
Bit 4	0 = REC enabled 1 = REC disabled	Reserved	Reserved	Reserved	Reserved
Bit 3	0	Reserved	Reserved	Reserved	Reserved
Bit 2	0 = low temp range 1 = high temp range	Reserved	Reserved	0 = low temp range 1 = high temp range	Reserved
Bit 1	0 = dynamic averaging on 1 = dynamic averaging off	Reserved	Reserved	Reserved	Reserved
Bit 0	0	Reserved	Reserved	Reserved	Reserved

6.4.2 Consecutive Alert / Fault Queue Delta

The EMC1402 offers additional consecutive alert / fault queue options that are not supported by the other devices by extending this programmability to the THERM output. Other consecutive alert / fault queue deltas are shown in [Table 6.4](#).

Table 6.4 Consecutive Alert / Fault Queue Delta

	EMC1402	ADM1032	MAX6649	ADT7461	G781
Number of Consecutive Alerts	1 - 4	1 - 4	1 - 3	1 - 4	1 - 4 with extended but compatible encoding
SMBus Timeout Control	Bit 7	Bit 7	n/a	Bit 7	n/a

7 SMBus Protocol Support

The EMC1402 does not support Packet Error Checking while both the ADM1032 and ADT7461 do. This is not a commonly used feature of the SMBus protocol.



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