

AN-876 Replacing National's LM75 with the Analog Devices, Inc. ADT75

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INTRODUCTION

The ADT75 has two grades, the ADT75A and the ADT75B. The ADT75B is a higher temperature accurate part, and the ADT75A is designed as a second source for the LM75. The ADT75 is a functional and pin- and package-compatible replacement for the LM75. No software or hardware change is required when replacing the LM75 with the ADT75.

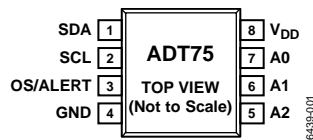


Figure 1. ADT75 Pin Configuration

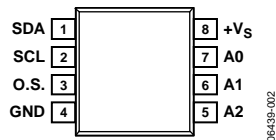


Figure 2. LM75 Pin Configuration

TEMPERATURE ERROR PERFORMANCE OVER TEMPERATURE

The performance capabilities of the ADT75A grade and LM75 over temperature are completely compatible. Both parts have similar performance graphs (see Figure 3).

Note that if more accuracy is required, the ADT75B grade is recommended.

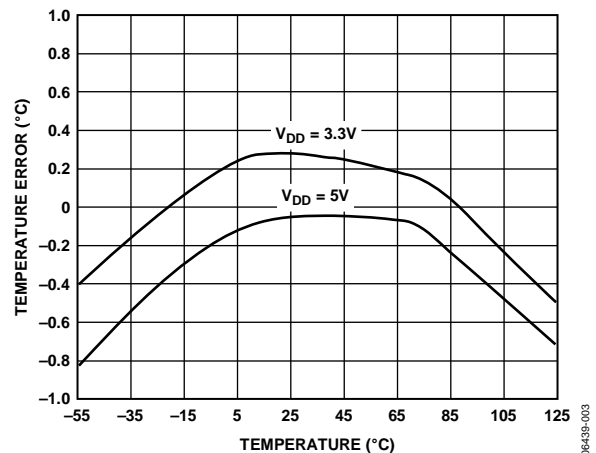


Figure 3. ADT75 and LM75—Typical Temperature Accuracy

COMPATIBILITY

Table 1. Feature Comparison of the ADT75 and the LM75

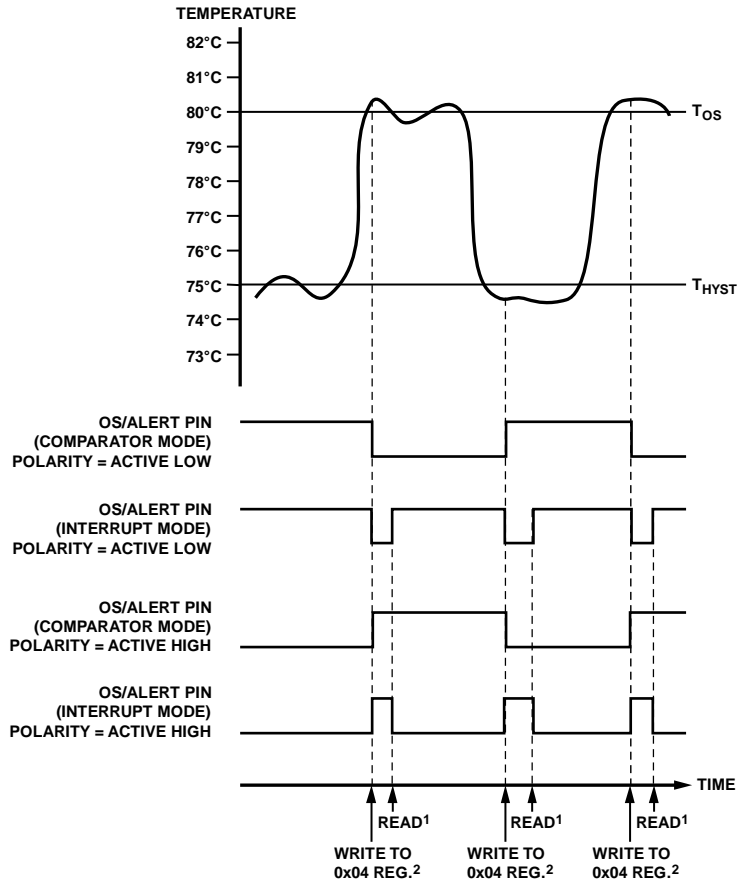
Feature	ADT75A	LM75
I ² C Interface	Yes	Yes
I ² C Bus Address	Yes	Yes
8-Lead MSOP and 8-Lead SOIC	Yes	Yes
Identical Register Addresses ¹	Yes	Yes
Identical Register Content	Yes	Yes
Identical Temperature Accuracy	Yes	Yes
9-Bit Resolution	Yes	Yes
3.3 V and 5 V Operation	Yes	Yes
Similar AC/DC Parameters	Yes	Yes
Identical OS and Configuration Functions	Yes	Yes
Twos Complement Coding	Yes	Yes

¹ The ADT75 and the LM75 have identical register content. The ADT75 contains additional register bits for one shot mode, SMBus alert enable, and extra temperature resolution bits. The contents of all these additional registers can be ignored without having to modify LM75 software.

OVERTEMPERATURE MODES

- The ADT75 powers up in default as an OS pin. The LM75 also powers up in default as an OS pin.
- The comparator mode is the default overtemperature power-up mode for both the ADT75 and the LM75.
- Both parts can be programmed to have the OS pin be either active low or active high. Both parts follow the interrupt response shown in Figure 4.

Note that there is an additional feature on the ADT75 that is not available on the LM75. This is the SMBus alert function. If the user chooses to employ this feature on the ADT75, Bit 7 of the configuration register must be set to enable.



¹READ FROM ANY REGISTER.
²THERE IS A 60ms DELAY BETWEEN WRITING TO THE ONE-SHOT REGISTER AND THE OS/ALERT PIN GOING ACTIVE. THIS IS DUE TO THE CONVERSION TIME.

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Figure 4. OS/ALERT Output Temperature Response Diagram

DIFFERENCES BETWEEN THE ADT75 AND THE LM75

The ADT75 has two grades, the ADT75A and the ADT75B. The ADT75B is a higher temperature-accurate part. The ADT75A is designed as a second source for the LM75. There are small differences between the ADT75A and the LM75 that do not affect the capability of either part being used in the same socket. The ADT75A differences are an enhancement on the LM75 and are listed in Table 2.

Table 2. Differences Between the ADT75A and the LM75

Feature	LM75		ADT75A	
	Comments	Conditions	Comments	Conditions
V _{DD}		3.3 V only and 5 V only		3.0 V to 5.5 V
Data Sheet Specifications at V _{DD}		3.3 V and 5 V		3 V to 5.5 V
Temperature Range		-55°C to +125°C		-55°C to +125°C
Temperature Accuracy	T _A = -55°C to +125°C	±3°C maximum	T _A = +100°C to +125°C	4.5 V to 5.5 V, ±2°C typical
Resolution (Bits)		8, 9		8, 9, 10, 11, 12
Temperature Conversion Time (Maximum)		100 ms		60 ms
Supply Current (I ² C Inactive)	LM75B @ 3.3 V and 5 V LM75C @ 3.3 V and 5 V	500 µA 1 mA	V _{DD} = 3.3 V V _{DD} = 5 V	500 µA 525 µA
Shutdown Current (3.3 V)		4 µA typical	Typical = 3 µA	8 µA maximum
Shutdown Current (5 V)		6 µA typical	Typical = 5.5 µA	12 µA maximum
One-Shot Register	Not present on LM75	N/A	Present on ADT75; ¹ current consumption @ 3.3 V	78.6 µW typical
SMBus Alert	Not present on LM75	N/A	Setting Bit D7 in the configuration register enables SMBus alert function, if required	

¹ Specially designed to reduce power consumption.

The temperature accuracy specifications of the ADT75B are far better than those of the LM75, as shown in Table 3.

Table 3. Comparison of Temperature Accuracy Specifications for the LM75 and the ADT75B

LM75		ADT75B	
Temperature Range	Accuracy	Temperature Range	Accuracy
T _A = -25°C to +100°C	±2°C maximum	T _A = 0°C to 70°C	±1°C maximum
T _A = -55°C to +120°C	±3°C maximum	T _A = -25°C to +100°C	±2°C maximum
		T _A = -55°C to +100°C	±3°C maximum
		T _A = 100°C to 125°C @ 3 V to 3.6 V V _{DD}	±3°C maximum

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ONE-SHOT REGISTER

One-shot mode is a feature of the [ADT75](#). It is not available in the LM75. LM75 software has no effect on this register and, therefore, does not need to be modified.

This register is specifically designed to minimize power consumption. See the ADT75 data sheet for more information.

When one-shot mode is active, the following sequence of events occurs:

1. The ADT75 is powered down.
2. 0x04 is written to the address pointer register.
3. A conversion is performed
4. The part returns to power-down.

Table 4. ADT75 Registers

Pointer Address	Register Name	Power-On Default
0x00	Temperature Value	0x00
0x01	Configuration	0x00
0x02	T _{HYST}	0x4B00 (75°C)
0x03	T _{OS} Setpoint	0x5000 (80°C)
0x04	One Shot	0xFF