Table 1. ADT7484A PIN ASSIGNMENT

Pin No.	Mnemonic	Type	Description
1	V_{CC}	Power Supply	3.3 V 10%
2	GND	Ground	Ground Pin
3	D1+	Analog Input	Positive Connection to Remote Temperature Sensor
4	D1−	Analog Input	Negative Connection to Remote Temperature Sensor
5	ADD1	Digital Input	SST Address Select
6	RESERVED	Reserved	Connect to Ground
7	ADD0	Digital Input	SST Address Select
8	SST		

Table 5. ELECTRICAL CHARACTERISTICS
(T_A = T_{MIN} to T_{MAX}, V_{CC} = V_{MIN} to V_{MAX}, unless otherwise noted)

Parameter	Conditions	Min	Typ	Max	Unit
Power Supply					
Supply Voltage, V_{CC}		3.0	3.3	3.6	V
Undervoltage Lockout Threshold		−	2.8	−	V
Average Operating Supply Current, I_{DD}	Continuous Conversions	−	3.8	5.0	mA
Temperature-to-Digital Converter					
Local Sensor Accuracy	40 C T_A 70 C, V_{CC} = 3.3 V 5% −40 C T_A +100 C	− −	+1.0 −	1.75 4.0	C
Remote Sensor Accuracy	−40 C T_D +125 C; T_A = 25 C; V_{CC} = 3.3 V −40 C T_D +125 C; −40 T_A 70 C, V_{CC} = 3.3 V 5% −40 C T_D +125 C; −40 T_A +100 C	− − −	− +1.0 −	1.0 1.75 4.0	C
Remote Sensor Source Current	Low Level Mid Level High Level	− − −	12 80 204	− − −	μA
Resolution		−	0.016	−	C
Series Resistance Cancellation	The ADT7484A and ADT7486A Cancel 1.5 kΩ in Series with the Remote Thermal Diode	−	1.5	−	kΩ
Conversion Time (Local Temperature) (Note 1)	Averaging Enabled	−	12	12	ms
Conversion Time (Remote Temperature) (Note 1)	Averaging Enabled	−	−	38	ms
Total Monitoring Cycle Time (Note 1)	Averaging Enabled	−	−	50	ms
Digital Inputs (ADD0, ADD1)					
Input High Voltage, V_{IH}		2.3	−	−	V
Input Low Voltage, V_{IL}		−	−	0.8	V
Input High Current, I_{IH}	V_{IN} = V_{CC}	−1.0	−	−	μA
Input Low Current, I_{IL}	V_{IN} = 0	−	−	1.0	μA
Pin Capacitance		−	5.0	−	pF
Digital I/O (SST Pin)					
Input High Voltage, V_{IH}		1.1	−	−	V
Input Low Voltage, V_{IL}		−	−	0.4	V
Hysteresis (Note 1)	Between Input Switching Levels	−	150	−	mV
Output High Voltage, V_{OH}	I				

Table 5. ELECTRICAL CHARACTERISTICS (continued)
($T_A = T_{MIN}$ to T_{MAX}, $V_{CC} = V_{MIN}$ to V_{MAX}, unless otherwise noted)

Parameter	Conditions	Min	Typ	Max	Unit
SST Timing					
Bitwise Period, t_{BIT}		0.495	–	500	μs
High Level Time for Logic 1, t_{H1} (Note 2)	t_{BIT} Defined in Speed Negotiation	0.6 t_{BIT}	0.75 t_{BIT}	0.8 t_{BIT}	μs
High Level Time for Logic 0, t_{H0} (Note 2)		0.2 t_{BIT}	0.25 t_{BIT}	0.4 t_{BIT}	μs
Time to Assert SST High for Logic 1, $t_{SU, HIGH}$		–	–	0.2 t_{BIT}	μs
Hold Time, t_{HOLD} (Note 3)	See SST Specification Rev 1.0	–	–	0.5 t_{BIT-M}	μs
Stop Time, t_{STOP}	Device Responding to a Constant Low Level Driven by Originator	1.25 t_{BIT}	2 t_{BIT}	2 t_{BIT}	μs
Time to Respond After a Reset, t_{RESET}		–	–	0.4	ms
Response Time to Speed Negotiation After Powerup	Time after Powerup when Device Can Participate in Speed Negotiation	–	500	–	μs

TYPICAL PERFORMANCE CHARACTERISTICS (Cont’d)

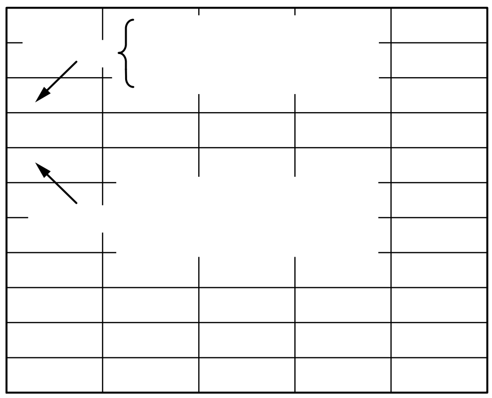


Figure 8. Remote Temperature Error vs. PCB Resistance

Figure 9. Temperature Error vs. Common-Mode Noise Frequency

Figure 10. Local Temperature Error vs. Power Supply Noise

Figure 11. Remote Temperature Error vs. Capacitance Between D1+ and D1

Figure 12. Temperature Error vs. Differential-Mode Noise Frequency

Figure 13. Remote Temperature Error vs. Power Supply Noise

Product Description

The ADT7484A is a single remote temperature sensor, and the ADT7486A is a dual temperature sensor for use in PC applications. The ADT7484A/ADT7486A accurately measure local and remote temperature and communicate over a one-wire Simple Serial Transport (SST) bus interface.

SST Interface

Simple Serial Transport (SST) is a one-wire serial bus and a communications protocol between components intended for use in personal computers, personal handheld devices, or other industrial sensor nets. The ADT7484A/ADT7486A support SST specification Rev 1.

SST is a licensable bus technology from Analog Devices, Inc., and Intel Corporation. To inquire about obtaining a copy of the Simple Serial Transport Specification or an SST technology license, please email Analog Devices, at sst_licensing@analog.com or write to Analog Devices, 3550 North First Street, San Jose, CA 95134, Attention: SST Licensing, M/S B7-24.

ADT7484A/ADT7486A Client Address

The client address for the ADT7484A/ADT7486A is selected using the address pin. The address pin is connected to a float detection circuit, which allows the ADT7484A/ ADT7486A to distinguish between three input states: high, low (GND), and floating. The address range for fixed a0098 ThNTw(ADT7484A/ADT746e1icTJ2logy T0 Tj-30x48 bet0x5019

Temperature Measurement

The ADT7484A/ADT7486A each have two dedicated temperature measurement channels: one for measuring the temperature of an on-chip band gap temperature sensor, and one for measuring the temperature of a remote diode, usually located in the CPU or GPU.

The ADT7484A monitors one local and one remote temperature channel, whereas the ADT7486A monitors one local and two remote temperature channels. Monitoring of each of the channels is done in a round-robin sequence. The monitoring sequence is in the order shown in Table 11.

Table 11. TEMPERATURE MONITORING SEQUENCE

Channel Number	Measurement	Conversion Time (ms)
0	Local Temperature	12
1	Remote Temperature 1	38
2	Remote Temperature 2 (ADT7486A Only)	38

Temperature Measurement Method

A simple method for measuring temperature is to exploit the negative temperature coefficient of a diode by measuring the base-emitter voltage (V_{BE}) of a transistor operated at constant current. Unfortunately, this technique requires calibration to null the effect of the absolute value of V_{BE}, which varies from device to device.

The technique used in the ADT7484A/ADT7486A measures the change in V_{BE} when the device is operated at three different currents.

Figure 14 shows the input signal conditioning used to measure the output of a remote temperature sensor. This figure shows the remote sensor as a substrate transistor, which is provided for temperature monitoring on some microprocessors, but it could also be a discrete transistor. If a discrete transistor is used, the collector is not grounded and should be linked to the base. To prevent ground noise from interfering with the measurement, the more negative terminal of the sensor is not referenced to ground, but is biased above ground by an internal diode at the D1− input. If the sensor is operating in an extremely noisy environment, C1 can be added as a noise filter. Its value should not exceed 1,000 pF.

To measure ΔV_{BE}, the operating current through the sensor is switched between three related currents. Figure 14 shows N1 I and N2 I as different multiples of the current I. The currents through the temperature diode are switched between I and N1 I, giving ΔV_{BE1}, and then between I and N2 I, giving ΔV_{BE2}. The temperature can then be calculated using the two ΔV_{BE} measurements. This method can also cancel the effect of series resistance on the temperature measurement. The resulting ΔV_{BE} waveforms are passed through a 65 kHz low-pass filter to remove noise and then through a chopper-stabilized amplifier to amplify and rectify the waveform, producing a dc voltage proportional to ΔV_{BE}. The ADC digitizes this voltage, and a temperature measurement is produced. To reduce the effects of noise, digital filtering is performed by averaging the results of 16 measurement cycles for low conversion rates. Signal conditioning and measurement of the internal temperature sensor is performed in the same manner.

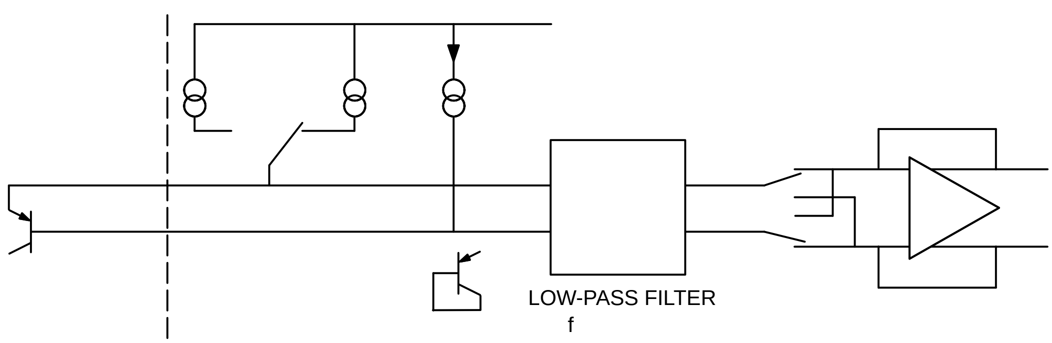


Figure 14. Signal Conditioning for Remote Diode Temperature Sensors

Reading Temperature Measurements

The temperature measurement command codes are detailed in Table 12. The temperature data returned is two bytes in little endian format, that is, LSB before MSB. All temperatures can be read together by using Command Code 0x00 with a read length of 0x04. The command codes and returned data are described in Table 12.

Table 12. TEMPERATURE CHANNEL COMMAND CODES

Temp Channel	Command Code	Returned Data
Internal	0x00	LSB, MSB
External 1	0x01	LSB, MSB
External 2	0x02	LSB, MSB
All Temps	0x00	Internal LSB, Internal MSB; External 1 LSB, External 1 MSB; External 2 LSB, External 2 MSB

SST Temperature Sensor Data Format

The data for temperature is structured to allow values in the range of 512 C to be reported. Thus, the temperature sensor format uses a twos complement, 16-bit binary value to represent values in this range. This format allows temperatures to be represented with approximately a 0.016 C resolution.

Table 13. SST TEMPERATURE DATA FORMAT

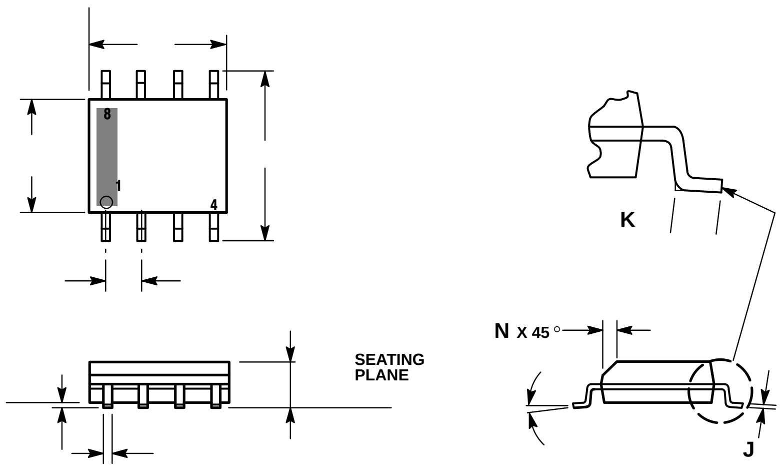
Temperature (C)	Twos Complement

there are two thermocouples with a big temperature differential between them, thermocouple voltages should be much less than 200 mV.

6. Place a 0.1 μF bypass capacitor close to the device.
7. If the distance to the remote sensor is more than eight inches, the use of a twisted-pair cable is recommended. This works for distances of about 6 feet to 12 feet.
8. For very long distances (up to 100 feet), use

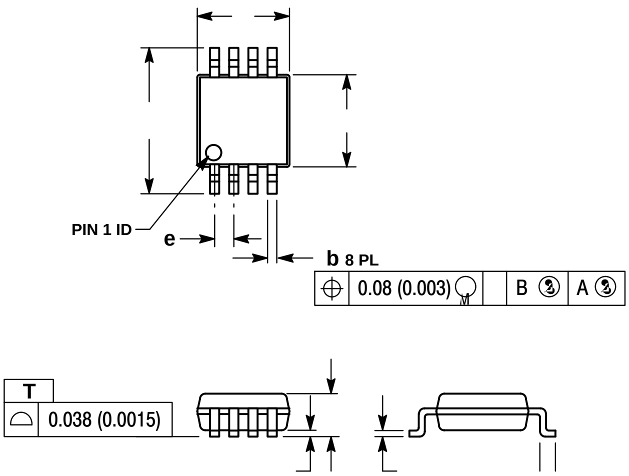
PACKAGE DIMENSIONS

SOIC 8 NB
CASE 751−07
ISSUE AK



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

PACKAGE DIMENSIONS



E:
1. D E A D E A C E A 14.5 , 1982.
2. C D E : E E.
3. D E A D E C DE D F A . A E B . D F A . A E B E CEED 0.15 (0.006) E DE.
4. D E B D E C DE E EAD F A . EAD F A A E CEED 0.25 (0.010) E DE.
5. 846A−01 B E E, E A DA D 846A−02.

PACKAGE DIMENSIONS

MSOP10
CASE 846AC−01
ISSUE O