



UC1730
UC2730
UC3730

Thermal Monitor

FEATURES

- On-Chip Temperature Transducer
- Temperature Comparator Gives Threshold Temperature Alarm
- Power Reference Permits Airflow Diagnostics
- Precision 2.5V Power Reference Permits Airflow Diagnostics
- Transducer Output is Easily Scaled for Increased Sensitivity
- Low 2.5mA Quiescent Current

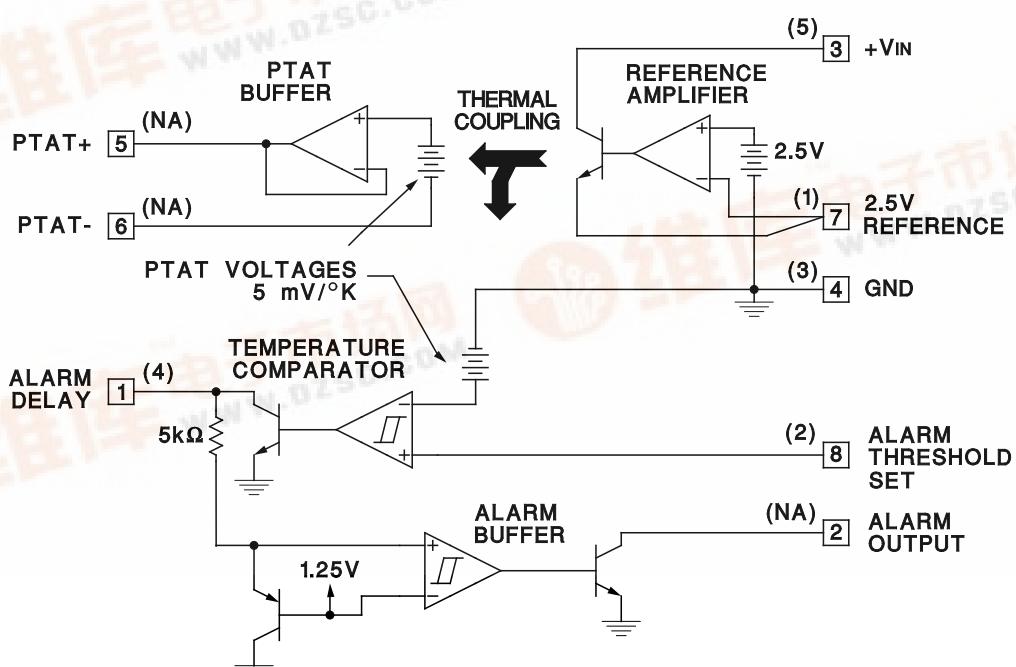
DESCRIPTION

The UC1730 family of integrated circuit devices are designed to be used in a number of thermal monitoring applications. Each IC combines a temperature transducer, precision reference, and temperature comparator allowing the device to respond with a logic output if temperatures exceed a user programmed level. The reference on these devices is capable of supplying in excess of 250mA of output current – by setting a level of power dissipation the rise in die temperature will vary with airflow past the package, allowing the IC to respond to airflow conditions

These devices come in an 8-Pin DIP, plastic or ceramic, a 5-Pin TO-220 or a PLCC-20 version. In the 8-Pin version, a PTAT (proportional to absolute temperature) output reports die temperature directly. This output is configured such that its output level can be easily scaled up with two external gain resistors. A second PTAT source is internally referenced to the temperature comparator. The other input to this comparator can then be externally programmed to set a temperature threshold. When this temperature threshold is exceeded an alarm delay output is activated. Following the activation of the delay output, a separate open collector output is turned on. The delay pin can be programmed with an external RC to provide a time separation between activation of the delay pin and the alarm pin, permitting shutdown diagnostics in applications where the open collector outputs of multiple parts are wire OR'ed together.

The 5-Pin version in the TO-220 package is well suited for monitoring heatsink temperatures. Enhanced airflow sensitivities can be obtained with this package by mounting the device to a small heatsink in the airstream. This version of the device does not include the PTAT output or the open collector alarm output.

BLOCK DIAGRAM



Pin numbers shown for 8-Pin DIP, () number for 5-Pin TO-220.

UC1730
UC2730
UC3730

ABSOLUTE MAXIMUM RATINGS

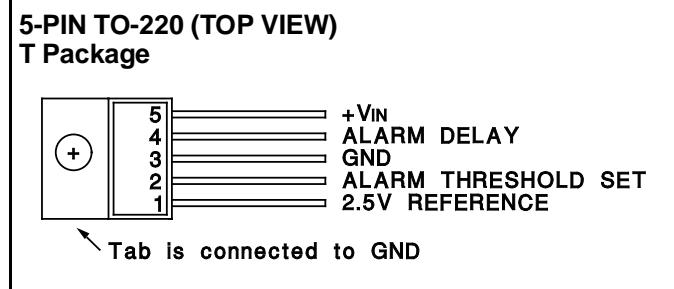
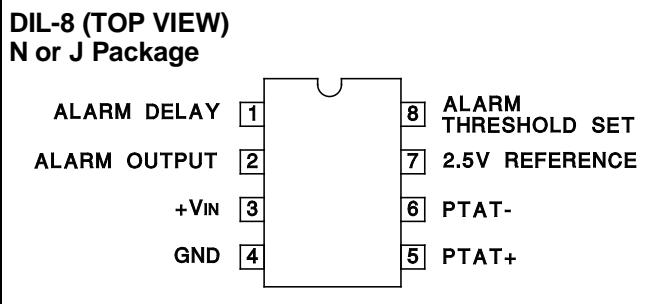
Input Supply Voltage, (+VIN)	40V
Alarm Output Voltage (8-Pin Version Only)	40V
Alarm Delay Voltage	10V
Alarm Threshold Set Voltage	10V
2.5V Reference Output Current	-400 mA
Alarm Output Current (8-Pin Version Only)	0 mA
Power Dissipation at $T_A = 25^\circ\text{C}$ (Note 2)	1000 mW
Power Dissipation at $T_C = 25^\circ\text{C}$ (Note 2)	2000 mW
Thermal Resistance Junction to Ambient	
N, 8-Pin Plastic DIP	110°C/W
J, 8-Pin Ceramic DIP	110°C/W

T, 5-Pin Plastic DIP TO-220	65°C/W
Thermal Resistance Junction to Case	
N, 8-Pin Plastic DIP	60°C/W
J, 8-Pin Ceramic DIP	40°C/W
T, 5-Pin Plastic TO-220	5°C/W
Operating Junction Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Lead Temperature (Soldering, 10 Seconds)	300°C

Note 1: Voltages are referenced to ground. Currents are positive into, negative out of, the specified terminals.

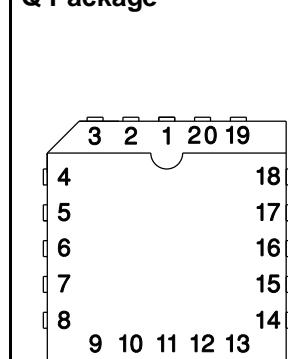
Note 2: Consult Packaging section of Databook for thermal limitations and considerations of package.

CONNECTION DIAGRAMS



PLCC-20 (TOP VIEW)

Q Package



PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1-3
ALARM DELAY	4
ALARM OUTPUT	5
+VIN	6
GND	7
N/C	8-13
PTAT+	14
PTAT-	15
2.5V REFERENCE	16
2.5V REFERENCE	17
ALARM THRESHOLD SET	18
N/C	19-20

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for $T_J = 0^\circ\text{C}$ to $+100^\circ\text{C}$ for the UC3730, -25°C to $+100^\circ\text{C}$ for the UC2730 and -55°C to $+125^\circ\text{C}$ for the UC1730, $+VIN = +5\text{V}$, and $PTAT- = 0\text{V}$. $T_A = T_J$.

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
INPUT SUPPLY					
Supply Current	+VIN = 35V		2.8	4.0	mA
	+VIN = 5V		2.3	3.5	mA
REFERENCE					
Output Voltage	$T_J = 25^\circ\text{C}$	2.475	2.5	2.525	V
	Over Temperature	2.46		2.54	V
Load Regulation	$I_{OUT} = 0$ to 250mA		8.0	25	mV
Line Regulation	$+VIN = 5$ to 25V		1.0	5.0	mV
TEMPERATURE COMPARATOR					
Temperature Comparator Threshold	at 300°K (26.85°C), Nominally $5\text{mV}/^\circ\text{K}$, V_{INPUT} High to Low	1.475	1.50	1.525	V
Temperature Error		-10		10	°C
Threshold Line Regulation	$+VIN = 5$ to 25V		0.005	0.02	%/V
Temperature Linearity	Note 2		2.0	5.0	°C
Threshold Hysteresis		3.0	8.0	15	mV
Input Bias Current	V_{INPUT} at 1.5V	-0.5	-0.1		μA
Max Output Current	$V_{OUT} = 1\text{V}$	1.2	3.0		mA
Output Sat Voltage	$I_{OUT} = 100\text{μA}$		0.05	0.25	V

UC1730
UC2730
UC3730

ELECTRICAL

CHARACTERISTICS (cont):

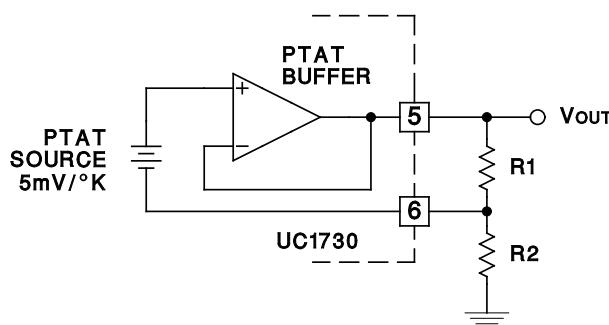
Unless otherwise stated, these specifications apply for $T_J = 0^\circ\text{C}$ to $+100^\circ\text{C}$ for the UC3730, -25°C to $+100^\circ\text{C}$ for the UC2730 and -55°C to $+125^\circ\text{C}$ for the UC1730, $+V_{IN} = +5\text{V}$, and $PTAT- = 0\text{V}$. $TA = T_J$.

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
TEMPERATURE COMPARATOR (cont.)					
Output Leakage Current	$V_{OUT} = 1\text{V}$		0.01	1.0	μA
PTAT BUFFER (8-Pin N, or J Version Only)					
Output Voltage	at 300°K (26.85°C), Nominally $5\text{mV}/^\circ\text{K}$	1.460	1.50	1.54	V
	In 10X Config. + $V_{IN} = 25\text{V}$	14.6	15	15.4	V
Temperature Error		-12		12	$^\circ\text{C}$
Temperature Linearity (Note 2)			2.0	5.0	$^\circ\text{C}$
Line Regulation	$+V_{IN} = 5$ to 25V		0.02	0.04	$%/V$
Load Regulation	$I_{OUT} = 0$ to 2mA		1.0	3.0	mV
Dropout Voltage	$PTAT + TO + V_{IN}$		1.9	2.5	V
Input Bias Current at $PTAT-$ Input		-3.0	-1.0		μA
ALARM BUFFER COMPARATOR (8-Pin N, or J Version Only)					
Threshold Voltage (V_{TH})	Alarm Delay Input Low to High	1.1	1.2	1.3	V
Threshold Hysteresis Voltage	Alarm Delay Voltage $> V_{TH}$		100	250	mV
Input Bias Current	Alarm Delay Voltage $< V_{TH}$		0.1	0.5	μA
Max Output Current	$V_{OUT} = 1\text{V}$	7.0	15		mA
Output Sat Voltage	$I_{OUT} = 3\text{mA}$		0.25	0.45	V
Output Leakage	$V_{OUT} = 35\text{V}$		0.1	2.0	μA

Note 2: This parameter is guaranteed by design and is not tested in production.

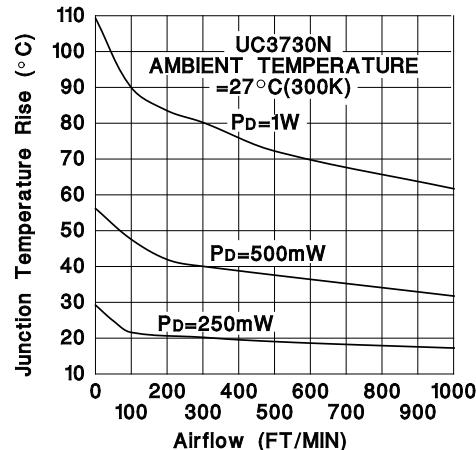
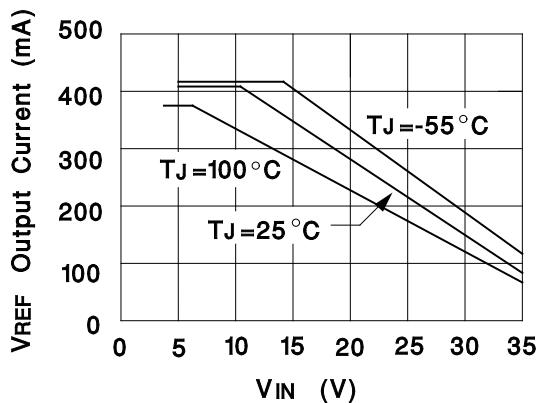
APPLICATIONS AND OPERATION INFORMATION

Scaling the PTAT Output (8 Pin Version Only)



$$V_{OUT} = 5 \times \left(1 + \frac{R_2}{R_1}\right) \text{mV/}^\circ\text{K}$$

(Recommended Range for R_1 is 2k to 4k)



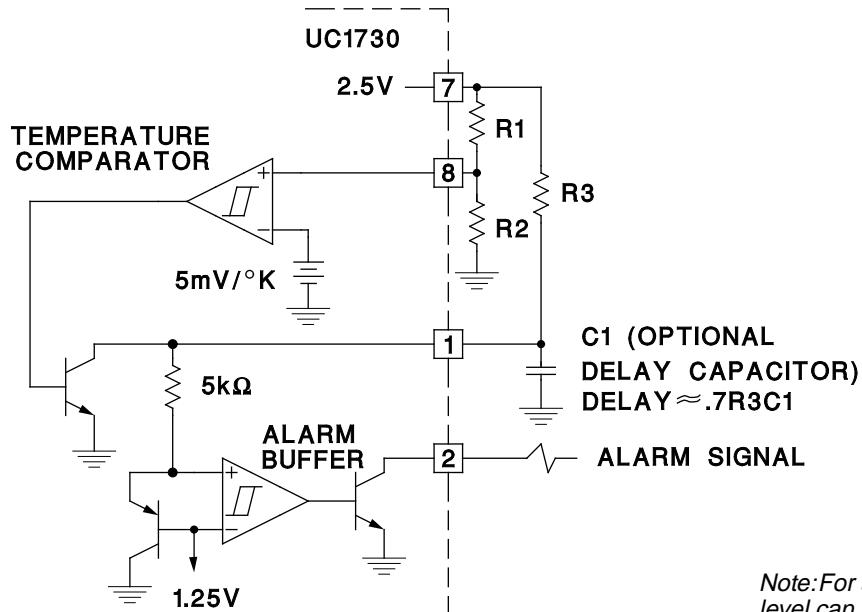
V_{REF} Maximum Output Current vs Input Supply

Junction Temperature Rise vs Airflow UC3730N (8-Pin Plastic DIP)

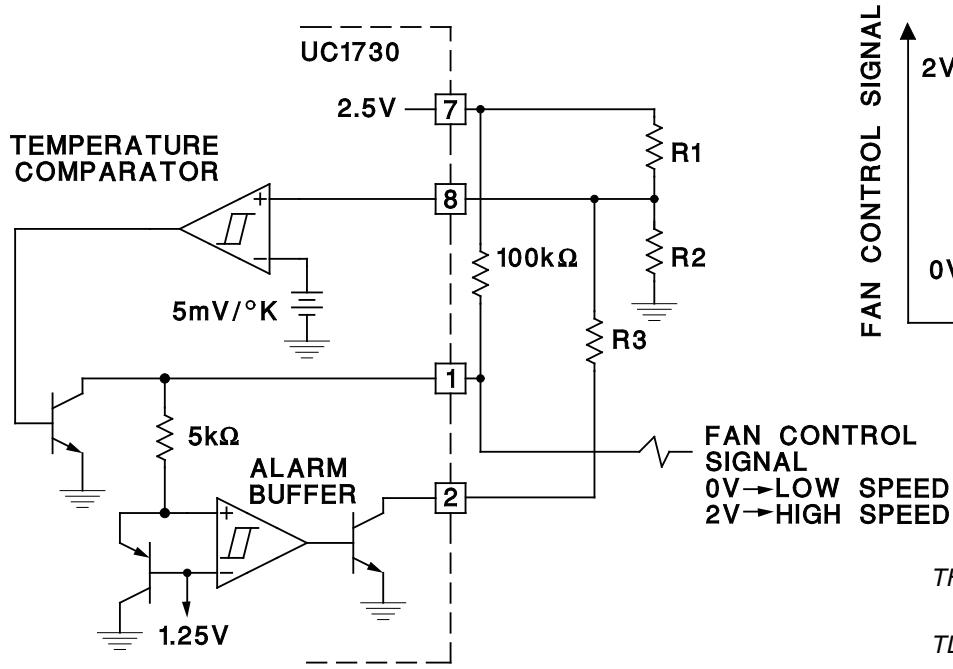
UC1730
UC2730
UC3730

APPLICATIONS AND OPERATION INFORMATION (Cont.)

Setting a Temperature Threshold



Dual Speed Fan Control



IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.