# **High-Temperature Guide**





Amplifiers Data Converters Digital Signal Processors Interface Microcontrollers Power Management



## High Temperature

## 😔 Overview

## **Design considerations**

The Texas Instruments High Reliability (HiRel) group offers a wide range of semiconductors for use in High Temperature. Many applications need electronics that operate outside the typical industrial operating temperature range and even beyond the standard military temperature range of  $-55^{\circ}$ C to  $+125^{\circ}$ C. These applications have special requirements for qualification and packaging. TI has developed semiconductors to satisfy the needs for quality and reliability in areas that need detailed characterization, operating life tests and special packaging.

#### High Temperature applications

- Oil and gas exploration and production
- Undersea cabling
- Industrial
- Medical
- Aerospace
- LED Lighting
- Motor control

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#### **High Temperature**

Texas Instruments has a new line of devices that can withstand operating temperatures from -55°C to +210°C. These High Temperature (HT) offerings provide a solution to the needs of customers requiring extreme temperature operation for a variety of applications. TI HiRel continues to expand these offerings with new parts to provide a complete signal chain solution for customers.

For more information about TI's HiRel and HT products, see www.ti.com/ht.

#### High Temperature offerings

TI offers 3 types of packages to support different application and size requirements of high temperature electronics:

- Ceramic Packaging for 210°C
- Known Good Die (KGD) for 210°C
- Plastic packaging for 175°C

TI High Temperature (HT) ceramic and KGD parts are characterized to +210°C, operate in an extended temperature range of -55°C to 210°C, and have a high temperature operating life of 1000 hours. There are several ways TI provides a ruggedized plastic package for our 175C offerings. We have a different material set than the commercial/industrial devices to improve reliability at temperature.



## High Temperature

## Applications Processor

## OMAPL137-HT

Get samples, datasheets and evaluation modules at www.ti.com/product/OMAPL137-HT

#### Key Features:

- 300 MHz Dual-core ARM926EJ-S and TMS320C674x DSP
- High-level real-time operating system
- Robust 1.8V/3.3V peripherals offering (i.e. Ethernet MAC, EMIF 1/2, USB2.0 OTG, McASP, etc.)
- Watch-dog timer
- Pin for pin compatible with C6747 DSP
- 176-pin plastic Quad-Flat-Pack (PTP) package

High-Temperature dual core (ARM926EJ-S and TMS320C674x DSP) applications processor designed for use in applications up to 175°C harsh environments enabling harsh environment intelligent electronic processing.

#### Benefits:

- Compatible with C6747 DSP
- Controlled Baseline
- One Assembly/Test Site
- One Fabrication Site
- Extended Product Life Cycle
- Product Traceability
- Extended Product-Change Notification

#### Temperature Range:

-55°C to +175°C

ARM9 DSP **OMAP-L137** Subsystem Subsystem DSP + ARM ARM C674x 926EJ-S DSP CPU Core 300 MHz 300 MHz L1P 32K L1P 16K L1D 32K L1D 16K 128KB LCD L2 256K RAM Controlle Switched Central Resource (SCR)/EDMA Peripherals Connectivity System USB USB WD PWM EMAC UHPI 2.0 1.1 Timer (3) Serial Interfaces **Program/Data Storage** Async McASP UART SDRAM SPI PC MMC/SC EMIF 32-bit (2) (3) (3) (3) 16-bit

## High Temperature

## Analog to Digital Converter

#### SM28VLT32-HT - 4MB Flash Memory

Get samples, datasheets and evaluation modules at www.ti.com/product/SM28VLT32-HT

#### Key Features:

- 32-megabit flash memory device
- Compatible
- 3.3-V supply for IO, 1.8 V for core
- 2-M x 16-bit word access
- Asynchronous read/write/erase operations
- 12-MHz maximum clock frequency
- Data retention: 1000 hrs
- 14-pin ceramic FP (HKN) package and KGD

Texas Instruments is now sampling the industry's first high temperature 4MB Flash memory device for Harsh Environments. TI's SM28VLT32-HT provides guaranteed high temperature Flash read and writing operation and small ruggedized packaging tailored for extreme temperature environments. The SM28VLT32-HT has an operating temperature from -55°C up to 210°C designed for data logging and firmware designs.

#### Benefits:

- Controlled baseline
- One assembly/test site
- One fabrication site
- Extended product life cycle
- Product traceability
- Extended product-change notification

#### Temperature Range:

• -55°C to +210°C



## **Selection Tables**

## High Temperature

#### High Temperature Plastic Products 150-175°C

Part	Description	Package/Temperature	
Signal Conditioning			
INA128-HT	Low Power Instrumentation Amplifiers	D - 175°C	
THS4521-HT	Low Power Differential Amplifier	D - 175°C	
Data Converters			
ADS1282-HT	Ultra High Resolution Delta Sigma ADC	PW - 175°C	
Interface			
SN65HVD233-HT	3.3-V CAN Transceiver	D - 175°C	
SN65HVD1040-HT	5V CAN Transceiver	D - 175°C	
SN65HVD11-HT	3.3-V RS-485 Transceiver	D - 175°C	
IS07221C-HT	Dual Channel, 1/1, 25Mbps Digital Isolator	D - 175°C	
Power			
TPS76901-HT	Low-Power 100-mA LDO Regulator	DBV - 175°C	
TPS40200-HT	Wide Input Buck DC/DC Controller	D - 175°C	
TPS54362-HT	1-A 48-V Step-Down DC/DC Converter with Low Iq	PW - 175°C	
TPS62110-HT	17-Vin, 1.5-A, Synchronous Step-Down Converter	PWP - 175°C	
Microcontrollers / Processors			
MSP430F2619S-HT	16-Bit Ultra-Low-Power MCU (150°C max)	PM - 150°C	
OMAPL137-HT	Low Power Dual-Core Processor (ARM9+DSP)	PTP - 175°C	

## **Selection Tables**

## 🔁 High Temperature

#### High Temperature Products 210°C

Part	Description	Pin/Package(s)	
Signal Conditioning			
0PA2333-HT	1.8-V Micropower CMOS Op Amp	HKJ, KGD, HKQ	
OPA211-HT	Low Noise, Low Power, Precision Op Amp	HKJ, KGD, HKQ	
OPA820-HT	Unity-Gain Stable, Low Noise, Voltage-Feedback Operational Amplifier	KGD	
INA129-HT	Low Power Instrumentation Amplifier	HKJ, KGD, HKQ	
INA333-HT	Low Power, Precision Instrumentation Amplifier	HKJ, KGD, HKQ	
INA271-HT	Voltage Output Current-Shunt Monitor	HKJ, KGD, HKQ	
THS4521-HT	Low Power Differential Amp	HKJ, KGD, HKQ	
Data Converters			
ADS1243-HT	24-Bit ADC, 8 Ch, PGA 1:128, 50/60 Hz Notch	KGD, JD	
ADS1278-HT	Octal, 24-Bit Analog-to-Digital Converters	HFQ, KGD, HKP	
ADS1282-HT	Ultra High Resolution Delta Sigma ADC	JDJ, KGD	
ADS6142-HT	14-bit 65MSPS ADC with selectable parallel CMOS or LVDS outputs	KGD	
ADS8320-HT	16-Bit, 100kSPS, Analog-to-Digital Converter	HKJ, KGD, HKQ	
Interface			
SN65HVD233-HT	3.3-V CAN Transceiver	HKJ, KGD, HKQ	
SN65HVD1040-HT	5V CAN Transceiver	KGD, HKQ	
SN65HVD11-HT	3.3-V RS-485 Transceiver	HKJ, KGD, HKQ	
Power			
REF5025-HT	Low Noise, Very Low Drift, 2.5V Voltage Reference	HKJ, KGD, HKQ	
TPS76901-HT	Low-Power 100-mA LDO Regulator	HKJ, KGD, HKQ	
TPS40200-HT	Wide Input Buck DC/DC Controller	HKJ, KGD	
TPS40210-HT	Wide Input Range Current Mode Boost Controller	HKK, KGD	
TPS62000-HT	Step-Down Low Power DC-DC Converter	HKK, KGD	
Microcontrollers / Processors			
SM470R1B1M-HT	ARM7TDMI(tm) Flash Microcontroller	HFQ, KGD, HKP	
SM320F2812-HT	Digital Signal Controller	HFG, KGD	
SM320F28335-HT	Delfino Digital Signal Controller	GB, KGD	
Memory			
SM28VLT32-HT*	4-MB Flash Storage Device	HKN, KGD	

\* in qualification

## Resources

## 🔁 TI Worldwide Technical Support

## **Internet**

**TI Semiconductor Product Information Center Home Page** support.ti.com

#### TI E2E<sup>™</sup> Community Home Page

e2e.ti.com

## **Product Information Centers**

America	as Phone	+1(972) 644-5580
Brazil	Phone	0800-891-2616
Mexico	Phone	0800-670-7544
Int	Fax ternet/Email	+1(972) 927-6377 support.ti.com/sc/pic/americas.htm

## Europe, Middle East, and Africa

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 00800 275 83927)

 International
 +49 (0) 8161 80 2121

 Russian Support
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**Note:** The European Free Call (Toll Free) number is not active in all countries. If you have technical difficulty calling the free call number, please use the international number above.

Fax	+(49) (0) 8161 80 2045
Internet	support.ti.com/sc/pic/euro.htm
Direct Email	asktexas@ti.com

#### Japan

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International Domestic	support.ti.com/sc/pic/japan.htm www.tij.co.jp/pic
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Note: mobile	Toll-free numb and IP phone	pers do not support s.	
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China		800-820-8682	
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Indonesia		001-803-8861-1006	
Korea		080-551-2804	
Malay	sia	1-800-80-3973	
New Zealand		0800-446-934	
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