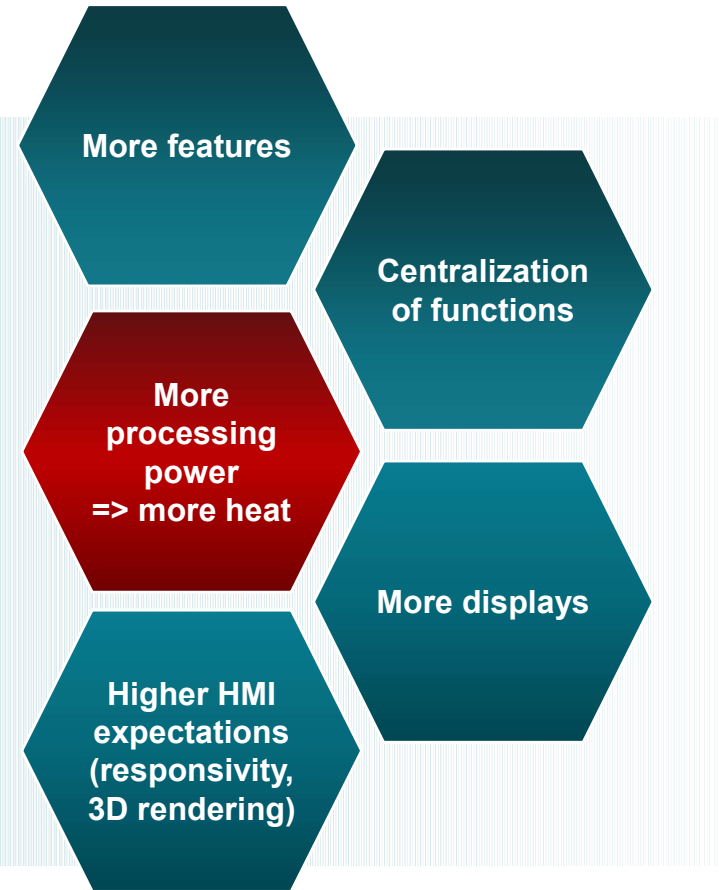


Infotainment & clusters

Achieving thermal safety



Tristan de Cande



Infotainment & clusters Thermal challenges

Head Unit

High-performance processor die temperature monitoring

Why?: Monitor temperature reliably at the core of the most critical component, the microprocessor



Suitable products:

- Remote temperature sensors: TMP451-Q1
- Thermistors: TMP61-Q1

Reconfigurable Cluster

System temperature monitoring

Why?: Get the most out of MCU performance with accurate temperature sensing



Suitable products:

- Analog temperature sensors: TMP235-Q1
- Thermistors: TMP61-Q1

USB chargers

Temperature threshold detection

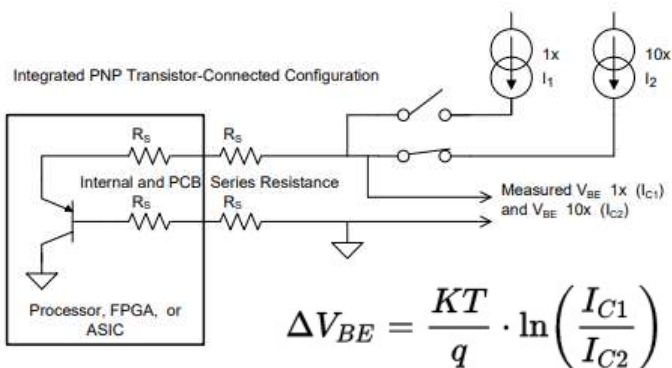
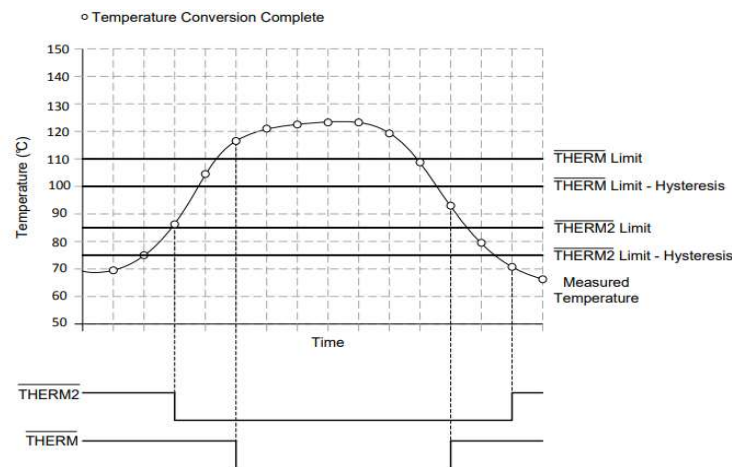
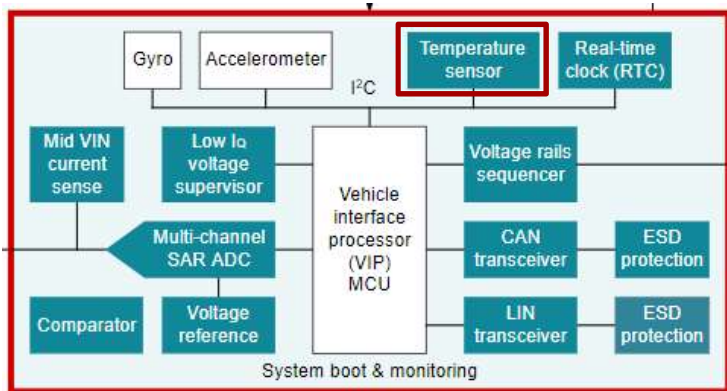
Why?: Seamlessly protect the system from overtemperature damage and protect passengers from injury



Suitable products:

- Temp switches: TMP390-Q1
- Thermistors: TMP61-Q1

Head unit Processor die temperature monitoring

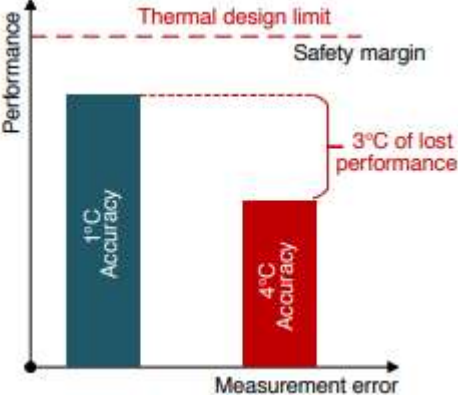
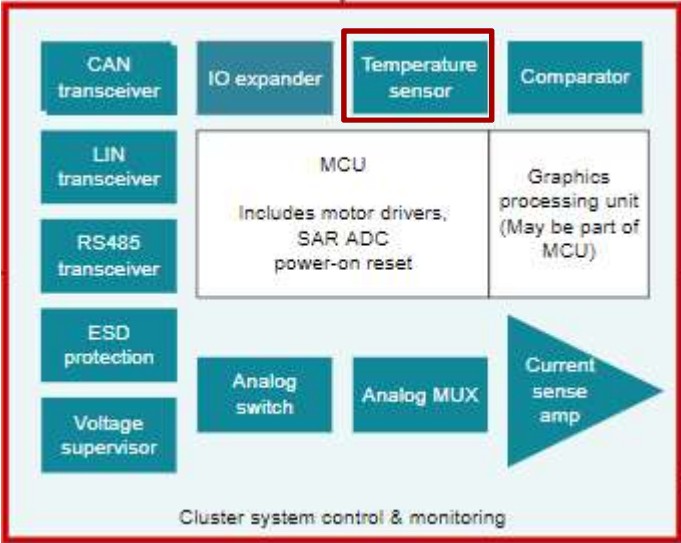


TMP451-Q1



Interface	I2C, SMBus
AEC-Q100	Grade 1
Accuracy	Local: ±1°C Remote: ±1°C
Power Supply	1.7-V to 3.6-V
Package	8-pin WSON with Wettable Flanks

Reconfigurable cluster System temperature monitoring

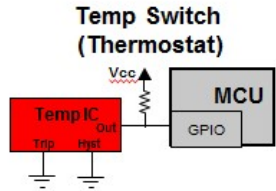
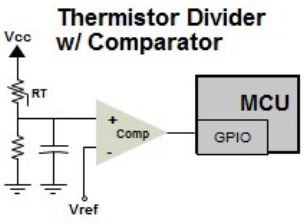
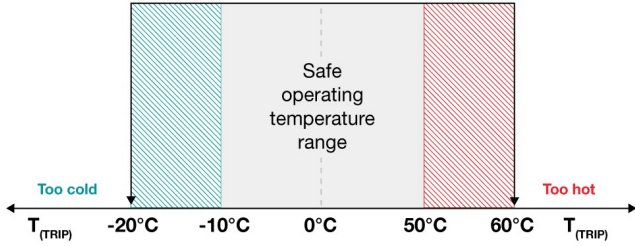
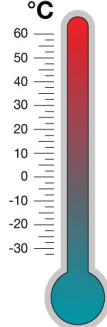
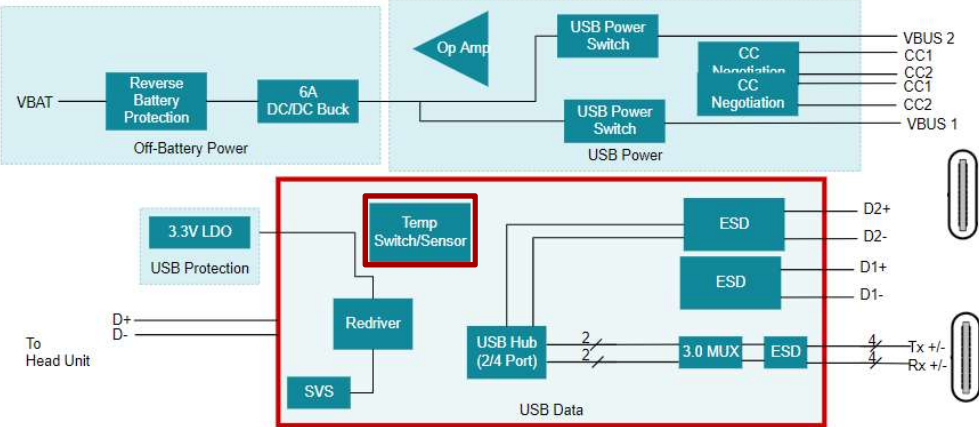


Output	10 mV/°C
AEC-Q100	Grade 1 and 0
Accuracy	Typ: ±0.5°C Max: ±2.5°C
Power Supply	2.3-V to 5.5-V
Package	3-pin SOT-23 (DBZ) 5-pin SC70 (DCK)

TMP235-Q1



USB chargers Temperature threshold detection



TMP390-Q1



Output	Channel A (overtemperature): +30 to +124°C, 2°C steps Channel B (undertemperature): -50 to +25°C, 5°C steps
AEC-Q100	Grade 1
Accuracy	Typ: ±1.5°C, Max: ±3.5°C
Power Supply	1.62-V to 5.5-V
Package	SOT-563 (1.60-mm × 1.20-mm)

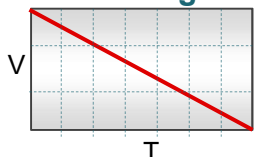
TI Portfolio Covering all thermal and moisture solutions

On Board Temperature Solutions

Local

Measures temp at device itself

Analog



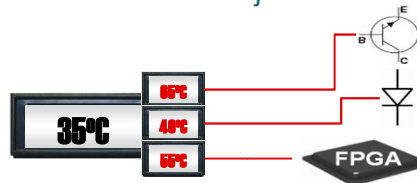
Digital



I2C
SPI
Pulse Count
UART

Remote

Multi-channel, Measures temp at external PN junction



Switch/Thermostat

Simple Over Temperature Protection

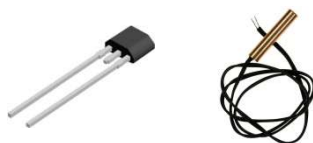


Alert

Off Board Temperature Solutions

2 Pin (Point to Point)

Can be integrated into probes
Up to 2 meters



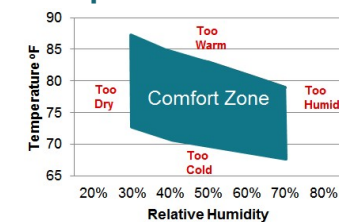
Daisy Chain

String multiple sensors in a single cable
Up to 300 meters



Humidity

Integrated Humidity & Temperature Sensors



Conclusion More learning on TI.com

TI Home > Sensors > Temperature sensors

Sensors

Product tree

- Humidity sensors (4)
- Magnetic sensors (21)
 - Hall effect latches & switches (13)
 - Linear Hall effect sensors (8)
- Specialty sensors (55)
 - Ambient light sensors (9)
 - Signal conditioners (37)
 - Time of flight (ToF) sensors (4)
 - Ultrasonic (9)
- Temperature sensors (163)**
 - Analog temperature sensors (46)
 - Digital temperature sensors (103)
 - Temperature switches (18)
 - Thermistors (2)
- mmWave sensors (7)
 - mmWave AWR (4)
 - mmWave IWR (3)

Overview | Products | Reference designs | **Design challenges**

Design challenges | Technology comparison

System monitoring | Ambient monitoring | Threshold detection | Compensation | Body monitoring | Fluid monitoring

Temperature monitoring and protection e-book

With over 40 years' experience helping customers optimize their temperature monitoring and protection designs, we've developed a comprehensive e-book covering six unique application challenges involving unique sensor placement and routing considerations. In the Temperature Monitoring and Protection e-book you will learn the design fundamentals of temperature sensing in real-world applications. The application notes and reference designs provide support and deep insights about the sensor selection process and the considerations required for optimal temperature response.

Topics include:

- Fundamentals of temperature sensing
- System temperature monitoring
- Ambient temperature monitoring
- Temperature threshold detection
- Temperature compensation and calibration
- Body temperature monitoring
- Fluid temperature monitoring

[Download the e-book](#)

The Engineer's Guide to Temperature Sensing
Temperature sensor design challenges and solutions ranging from thermistors to multi-channel remote-sensor ICs

TEXAS INSTRUMENTS

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- App notes
- Reference designs
- White papers
- Training videos

www.ti.com/temperature