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TEXAS INSTRUMENTS

TEXAS INSTRUMENTS — REAL WORLD SIGNAL PROCESSING™

Demonstration Platform

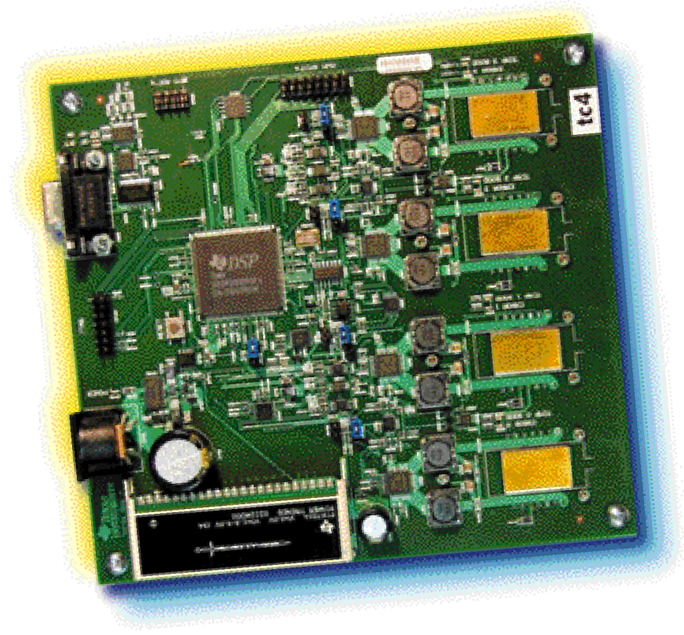
The Quad-Channel Thermal Electric Cooler (TEC)

Key Features
- TI TMS320F2812 DSP for digital control loop
- DRV592 efficient (>90%) TEC driving
- Low-noise bridge measurement with INA326
- Four-channel TLV5627 DAC for temperature set-point control
- Real world pump laser thermistors used
- Strip chart monitoring via PC
- ±2.5mK temperature accuracy

New from Texas Instruments (TI), the Quad TEC Platform is a four-channel thermo electric cooler that keeps pump lasers at a very precisely regulated temperature. This capability is extremely important to system performance because slight temperature deviations shift the wavelength of the light carrier, which is as short as a few hundred nanometers. Shifts in the wavelength or transmission frequency cause increased bit error rates, slowing down data communication.

The quad-channel TEC control is thermally characterized with a pump laser. The platform utilizes dummy resistors that closely model the thermal characteristics of the laser. The laser's thermal time constant is 4.20 seconds, while the dummy resistor responds in 4.35 seconds. For accurate simulation, the quad-channel TEC control uses thermistors commonly employed with pump lasers. Additionally, designers can digitally control temperature set-points with a digital-to-analog converter (DAC), which is controlled by a TI TMS320F2812 DSP that in turn interfaces to a PC or laptop via a serial cable. While hardware status is directly indicated with on-board LEDs, PC software allows temperature monitoring of the dummy lasers with strip charts.

All four TEC/laser units and the driving and sensing electronics are clearly visible. The F2812 DSP, which is the foundation of the Quad TEC platform, offers processing power and peripherals to control up to eight channels simultaneously. In addition, the system features the Excalibur™ high-power DC/DC converter module from TI's Plug-in Power Solutions products. Accurate temperature control is achieved by a deviation of ±2.5 mK.



Target Applications
- Optical Networking
- Wireless base stations
- Industrial applications

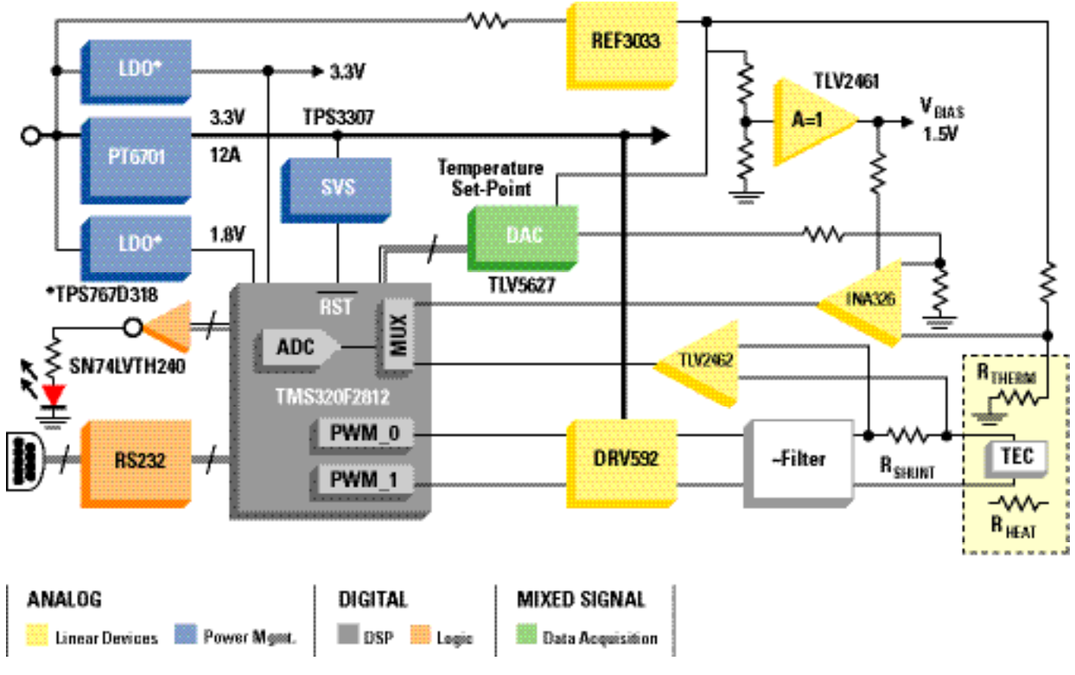
Quad-Channel TEC Control with F2812 DSP—Single Channel Block Diagram

The Quad TEC, shown in the block diagram below, uses a combination of digital signal processing for controlling analog circuits that monitor temperature and drift and that adjust the current to the thermo-electric cooler. The heat normally generated by the laser(s) is modeled accurately with dummy resistors (R_{HEAT}).

A TMS320F2812 DSP handles data I/O through an RS-232 port, LED status indication on the board and temperature drift compensation. The on-chip analog-to-digital converter (ADC) of the F2812 measures the temperature error, amplified by the low-noise INA326 instrumentation amplifier. Safety circuitry is provided measuring current through the TEC using a sense resistor, buffered through a TLV2462. A four-channel DAC, the TLV5627, is used to program different temperature set-points, which allows the display of the TEC's transient response.

An efficient PWM current driver, the DRV592, is controlled by the PWM output of the F2812 DSP. It regulates the current required by the thermo-electric cooler to compensate for the laser's heat output. A thermistor, which is commonly used with pump lasers, attaches to the dummy resistor. A change in temperature unbalances the H-bridge resistor network, which is monitored by the INA236 instrumentation amplifier, feeding back any differential to the F2812's multiplexer and ADC where it is digitally corrected.

Quad-Channel TEC Control With F2812 DSP—Single Channel Block Diagram



Quad TEC Platform Kit

The Quad TEC Platform Kit (No. 6443607) contains the following:

- Printed wiring board
- Bill of materials
- Schematics
- Software
- Documentation
- Getting started guide
- Serial RS232 cable

Get Started Today

To learn more about the Quad TEC Platform, please contact your local TI field sales office, Product Information Centers, or visit URL:
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Notes: