Demonstration Platform

TI CAN-Bus Kit #6445694
with Bus Corruptor and Adjustable Packet Rate

Key Features
- **Interoperability** of 5-V and 3.3-V CAN-Bus transceivers
- **Multi-master operation** of the CAN Bus
- **Bus arbitration** operation
- **Performance** with injected error conditions
- **Adjustable packet rate**

A Controller-Area-Network (CAN)-Bus system enables device communication in harsh environments, found in industrial automation, military and automotive applications. As a multi-master system, each device (node) obtains bus access through its unique priority code (address) and broadcasts messages to all bus participants simultaneously. The robustness of the CAN architecture, proven for nearly 18 years, is now complemented with TI's fail-safe CAN transceivers.

Target Applications:
- Motor control
- Solenoid control
- Process control
- Robotics
- Base station control
- UPS control
- HVAC
- Building automation
- Medical devices
- Down-hole instrumentation
- Automotive
- Avionics
- Railway signaling
- Military

Texas Instruments' CAN-Bus demonstration platform is a minimalist 3-node, mixed-voltage demonstration system. It showcases TI's robust SN65HVD230 (3 V) and SN65HVD251 (5 V) CAN transceivers.

Each node features a different TI processor with on-board CAN controller (see Figure 1). TI offers solutions for industrial applications that need high-performance DSP functionality (i.e., for motion control), low-cost DSP-based architectures (i.e., for monitoring) and ARM-based automotive applications.

This CAN-Bus demonstration kit simulates industrial and automotive control environments (see Figure 2):
- A **Motor Node** controls speed or position of a stepper motor. A shaft position sensor continuously loads the bus with low-priority data packets. This node further contains a light source, which is either manually controlled or receives messages from a photo detector on the Sensor Node.
- A **Sensor Node** monitors temperature of a heating element and controls a fan. It also senses

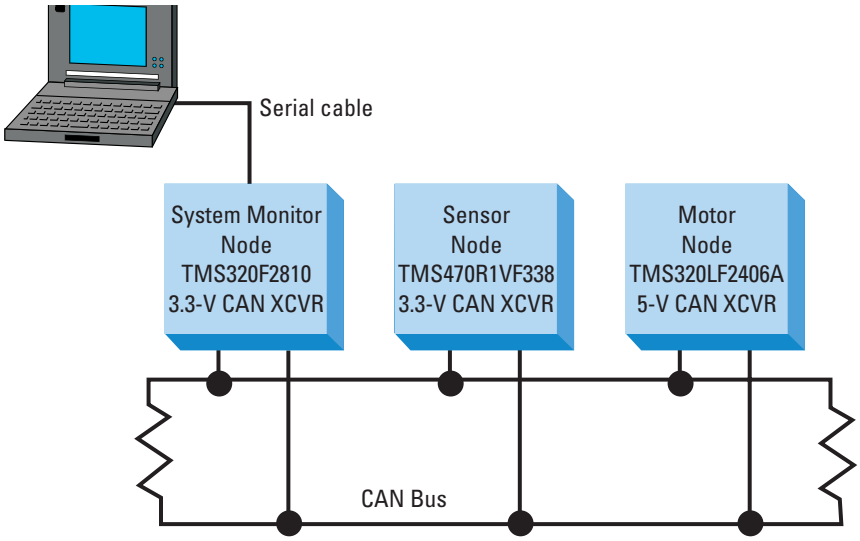

Figure 1. CAN-bus nodes.

ambient light conditions. Light and temperature data generate additional high-priority data packets. The Sensor Node will also display the motor shaft position, regardless of the system operating with or without external PC control and with or without the System Monitor Node.

- A **System Monitor Node** sounds an audible beep when packet latency is increasing due to bus loading, priority calls or error injections. This node can be connected to an external PC through a RS-232 serial cable. The PC/laptop controls the bus packet rate and provides bus statistics such as packet rate and packet error rate.

The Bus Corruptor

CAN-Bus specifications, ISO11898 and TI product specifications demand CAN-Bus transceivers to survive a number of failure conditions. In addition to the three nodes, a bus corrupter is included to demonstrate the survivability of common failure modes, allowing the user to stress the transceiver with the following bus conditions, but only one at a time:

1. CAN_H open
2. CAN_L open
3. CAN_H shorted to V_{CC}
4. CAN_L shorted to V_{CC}
5. CAN_H shorted to GND
6. CAN_L shorted to GND
7. CAN_H shorted to CAN_L
8. Loss of termination network
9. Excessive termination
10. Unpowered CAN node

TI CAN-Bus transceivers are not only robust enough to withstand each failure but operate at previous performance levels after the fault is removed. Bus loading, shown as packet rate, is accomplished with manual speed control of the stepper motor and from the PC graphical user interface by adjusting an artificial packet generator rate.

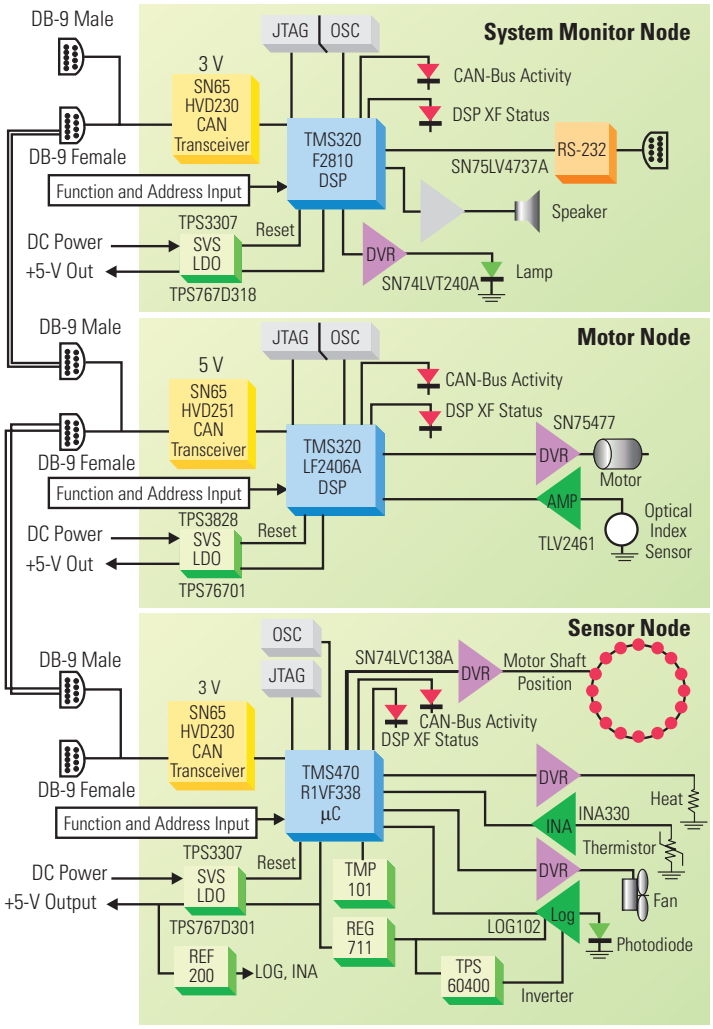

Figure 2: CAN-Bus Platform Block Diagram

TI offers complete solutions for motor control, temperature control and data acquisition, including power management. See page three of our product selection guide on how to connect your application reliably with CAN.

Automotive Grade Devices

TI offers semiconductors for CAN applications that follow AEC-Q100 specifications. AEC-Q100 is an industry standard specification developed by major automotive manufacturers and suppliers that outlines the recommended new product and major change qualification requirements and procedures. See page three of our product selection guide for a list of available devices.

CAN-Bus Platform Kit

The CAN-Bus Platform Kit (#6445694) contains the following:

- Three printed circuit boards (CAN nodes) with switchable bus termination resistors
- Two CAN-Bus cables (DB-9 connectors)
- One RS-232 serial cable
- A CD containing:
  - Bill-of-Materials
  - Schematics
    - Stepper motor control
    - Motion control
    - Analog temperature control
    - Digital temperature control
  - Software (executables)
  - Software source code
  - Design documentation
  - CAN application notes
  - Getting started guide

Product Selection Guide

CAN Bus Transceivers

Device	Drivers	Receivers	Supply Voltage	Low-Power Modes	Package	Temp Range (°C)
SN65HVD230D	1	1	3.3 V	Stand-By	SOIC-8	–40 to +85
SN65HVD230Q	1	1	3.3 V	Stand-By	SOIC-8	–40 to +125
SN65HVD231D	1	1	3.3 V	Sleep	SOIC-8	–40 to +85
SN65HVD231Q	1	1	3.3 V	Sleep	SOIC-8	–40 to +125
SN65HVD232D	1	1	3.3 V	None	SOIC-8	–40 to +85
SN65HVD232Q	1	1	3.3 V	None	SOIC-8	–40 to +125
SN65HVD233	1	1	3.3 V	Stand-By	SOIC-8	–40 to +125
SN65HVD251D	1	1	5 V	Stand-By	SOIC-8	–40 to +125

DSP with CAN Controller

Device	CPU	RAM (words)	Flash (words)	ROM (words)	Voltage	Package	MIPS
TMS320F2812	32 b	18 k[2]	128 k	4 k[1]	1.9 V/3.3 V	176 LQFP 179 µ*BGA	150
TMS320F2810	32 b	18 k	64 k	4 k[1]	1.9 V/3.3 V	128 LQFP	150
TMS320LF2407A	16 b	2.5 k	32 k	256[1]	3.3 V	144 LQFP	40
TMS320LF2406A	16 b	2.5 k	32 k	256[1]	3.3 V	100 LQFP	40
TMS320LC2406A	16 b	2.5k	–	32 k	3.3 V	100 LQFP	40
TMS320LF2403A	16 b	1 k	16 k	256[1]	3.3 V	64 TQFP	40
TMS320F243	16 b	544	8 k	–	5 V	144 LQFP	20

[1] Boot ROM

[2] Can be extended through an external memory interface

DSP Knowledge Base: http://www-k.ext.ti.com/sc/technical-support/knowledgebase.asp?dsp

DSP Power Management Devices

Converter Type	<250 mA	500 mA	750 mA	1 A	2 A	4 A
Dual plug-in	–	–	–	PT6930	PT6930	PT6940
Plug-in	PT5520	PT5520	PT5520	PT5520	PT5500	PT5400
DC/DC converter	TPS62200	TPS62000	TPS54310	TPS54310	TPS54310	TPS54610
DC/DC controller	TPS40000	TPS40000	TPS40000	TPS40000	TPS40000	TPS40000
Dual LDO[3]	TPS70751	TPS70151	TPS767D318	TPS767D318	TPS70351	–
Low drop-out	TPS79401	TPS79501	TPS77701	TPS72501	TPS75201	TPS75601

[3] Current shown for powering DSP core. I/O capability for the dual LDO is rated approximately 50% of core current.

Special Function High-Performance Analog

Device	Platform Application	Key Specification	Package (smallest)
TMP101	Digital heater element temperature measurement	–40°C to +125°C	SOT23-6
LOG102	Photodiode signal conditioning	6-decades dynamic range	SOIC-14
INA330	Temperature error amplifier	3-V operation, rail-to-rail output	MSOP-10
TLV2461	Stepper motor optical index amplifier	3-V operation	SOT23-5
TPS60400	–5-V supply for LOG102	Input range up to 5.5 V	SOT23-5
REG711-5	+5-V supply for LOG102	Automatic step-up/down	MSOP-8
TPS3307-33	Triple supply supervisor	Adjustable 3rd trip point	TSSOP-8
REF200	Voltage reference for INA Log-amp reference current	±0.5% accuracy 25 ppm drift	SOIC-8

For technical assistance, contact TI's Product Information Center at (972) 644-5580 or visit http://www-k.ext.ti.com/sc/technical_support/pic/americas.htm

Automotive Grade Devices Available as AEC-Q100 or Automotive Specials

Device	Description
SN65HVD251	5-V CAN-bus transceiver
SN65HVD230/231/232Q	3.3-V CAN-bus transceivers
TMS470R1VF338[4]	RISC microcontroller with CAN controller
TMP101	Digital temperature sensor with I^2C serial interface
TPS3838L30-Q1	220-nA CPU supervisor with 10 ms/200 ms selectable delay time
TPS769xx	Ultra-low-power 100-mA low-dropout linear regulator
UCC280x	Low-power BiCMOS current-mode PWM controller
SN74LVC138A	3-line to 8-line decoder/demultiplexer
SN74LVT240A	3.3-V ABT octal buffers/drivers with 3-state outputs
SN74AHC123A	Dual retriggerable monostable multivibrators
SN74LVC2G06	Dual-inverter buffer/driver with open-drain output
SN74LVC1G66	Single analog switch
SN74AHCT1G126	Single bus buffer gate with 3-state output

[4] Note: The VF338 was developed specifically for the automotive market. TI's technical support for the VF338 is only able to service automotive customers at this time.

For additional information on Texas Instruments automotive qualified devices, please see http://www.ti.com/sc/auto.

TI Worldwide Technical Support

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