



USB to CAN Bus Bridge IC

HT42B536-x

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www.holtek.com

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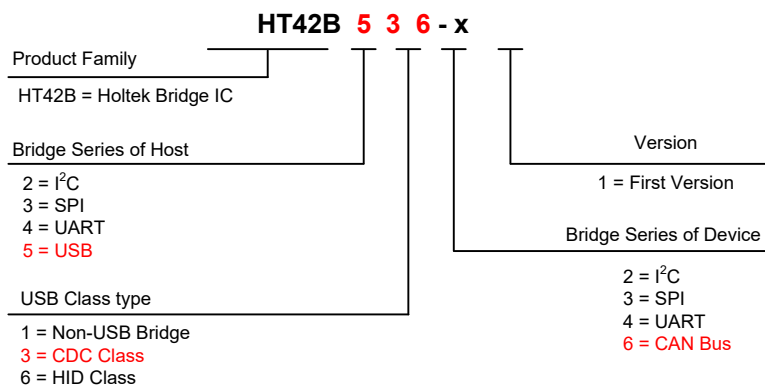
Features

- Operating voltage (V_{DD}): 3.3V~5.5V
- Power down and wake-up functions to reduce power consumption
- Fully integrated 12MHz oscillator with 0.25% accuracy for all USB modes which requires no external components
- USB interface
 - ♦ USB 2.0 Full Speed compatible
 - ♦ Implements USB protocol composite device
 - Communication Device Class (CDC) for communications and configuration
 - ♦ Integrated an internal 1.5k Ω pull-high resistor on D+ pin
- CAN Bus Controller
 - ♦ Conforms to ISO11898-1 and CAN 2.0A/B
 - ♦ CAN frame format allows bit rates up to 1 Mbit/s and payloads up to 8 byte per frame
 - ♦ Supported CAN modes: Normal, Loopback, Listen
- Support standard Windows® drivers for Virtual COM Port (VCP): Windows XP (SP2), Vista, Windows 7, Windows 8 (only an INF file is required), driver-free for Windows 10 and later
- Support Android 4.0 or later version and Mac OS X
- Package type: 16-pin NSOP

General Description

The HT42B536-x is a high performance USB to CAN Bus bridge controller with fully integrated USB and CAN Bus interface functions, designed for applications that communicate with various types of CAN Bus. The device includes a USB 2.0 full speed compatible interface which is used for PC communication. The CAN Bus interface supports the CAN 2.0A/B protocol specifications and compatible with the ISO11898-1 standards.

HOLTEK Bridge IC Naming Rules



Selection Table

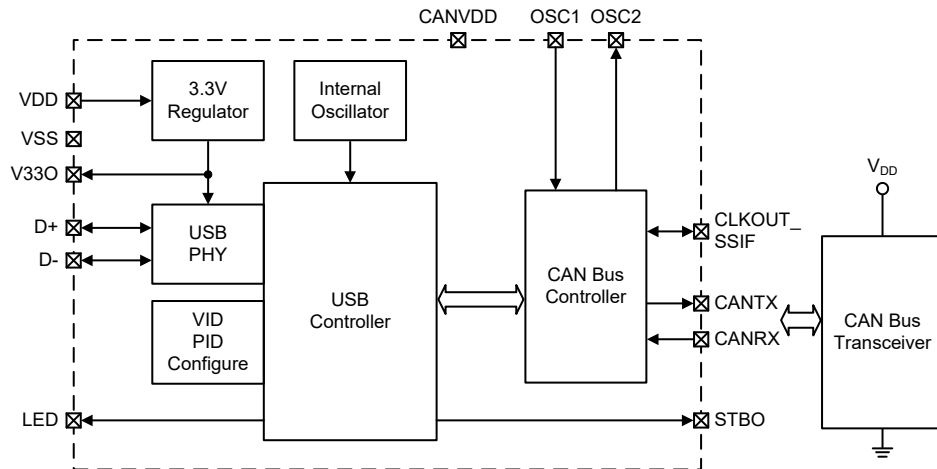
• USB Bridge Selection Table

Part No.	Description	V _{DD}	USB	Virtual COM	HID	FIFO/Buffer	Interface Data Rate	I/O V _{DD}	Package
HT42B536-x	USB to CAN Bus Bridge	3.3V~5.5V	Full-Speed	√	—	TX: 32 bytes RX: 64 bytes	CAN Bus Up to 1Mbps	—	16NSOP
HT42B532-x	USB to I ² C Bridge			√	—	TX: 62 bytes RX: 62 bytes	Up to 400kHz	√	8SOP 10MSOP
HT42B533-x	USB to SPI Bridge			√	—	TX: 128 bytes RX: 128 bytes	Up to 8MHz	√	10MSOP 16NSOP
HT42B534-x	USB to UART Bridge			√	—	TX: 128 bytes RX: 128 bytes	Up to 3Mbps Baud	√	8SOP 10SOP/MSOP 16NSOP
HT42B564-x	USB (HID) to UART Bridge			—	√	TX: 32 bytes RX: 32 bytes	Up to 115.2kbps Baud	√	10SOP

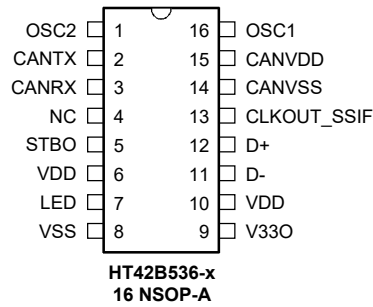
• CAN Bus Bridge Selection Table

Part No.	Description	V _{DD}	Interface Data Rate	FIFO/Buffer	CAN Bus Data Rate	Package
HT42B216-x	I ² C to CAN Bus Bridge	3.0V~5.5V	Up to 400kHz	TX: 28 bytes RX: 28 bytes	Up to 1Mbps	16NSOP
HT42B316-x	SPI to CAN Bus Bridge		Up to 12MHz	TX: 28 bytes RX: 28 bytes		16NSOP
HT42B416-x	UART to CAN Bus Bridge		Up to 115.2kbps Baud	TX: 28 bytes RX: 28 bytes		16NSOP

Block Diagram



Pin Assignment



Pin Description

Pin Name	Type	Description
D+	I/O	USB D+ line
D-	I/O	USB D- line
CANTX	O	Transmit output pin to CAN bus
CANRX	I	Receive input pin from CAN bus
STBO	O	Mode indication STBO pin output low, indicating normal mode STBO pin output high, indicating standby mode
LED	O	CAN Bus signal LED indication, active low
CLKOUT_SSIF	O	Clock output pin with CAN Bus CLK; it should connect a 510K resistor to ground
OSC1	I	CAN Bus Controller Oscillator input
OSC2	O	CAN Bus Controller Oscillator output
V33O	O	3.3V regulator output
CANVDD	PWR	CAN Bus Controller positive power supply
CANVSS	PWR	CAN Bus Controller negative power supply
VDD	PWR	USB Bus positive power supply
VSS	PWR	Negative power supply, ground
NC	—	Not connected

Absolute Maximum Ratings

Supply Voltage	$V_{SS}-0.3V$ to $6.0V$
Input Voltage	$V_{SS}-0.3V$ to $V_{DD}+0.3V$
Storage Temperature.....	$-60^{\circ}C$ to $150^{\circ}C$
Operating Temperature.....	$-40^{\circ}C$ to $105^{\circ}C$
I_{OL} Total	80mA
I_{OH} Total	-80mA
Total Power Dissipation	500mW

Note: These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of the device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

D.C. Characteristics

 $T_a = -40^{\circ}\text{C} \sim 105^{\circ}\text{C}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
V _{DD}	Operating Voltage	—	V _{DD} =CANV _{DD}	3.3	—	5.5	V
I _{DD}	Operating Current	5V	No load	—	17	20	mA
I _{SUS}	USB Suspend Current	5V	Suspend mode, no load, USB on, CAN Bus sleep, other peripherals off	—	360	460	μA
V _{IL}	Input Low Voltage	—	—	0	—	0.2V _{DD}	V
V _{IH}	Input High Voltage	—	—	0.8V _{DD}	—	V _{DD}	V
I _{OL}	Sink Current for I/O Ports	3.3V	V _{OL} =0.1V _{DD}	4	8	—	mA
		5V		10	20	—	mA
I _{OH}	Source Current for I/O Ports	3.3V	V _{OH} =0.9V _{DD}	-2	-4	—	mA
		5V		-5	-10	—	mA
I _{LEAK}	Input Leakage Current	3.3V	V _{IN} =V _{DD} or V _{IN} =V _{SS}	—	—	±1	μA
		5V		—	—	±1	μA
V _{V330}	3.3V Regulator Output Voltage	5V	I _{V330} =70mA	3.0	3.3	3.6	V
R _{UDP1}	Pull-high Resistance between D+ and V330	3.3V	—	-5%	1.5	+5%	kΩ

A.C. Characteristics

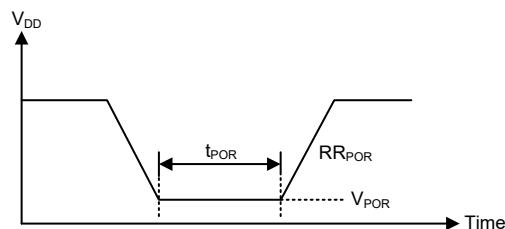
 $T_a = -40^{\circ}\text{C} \sim 105^{\circ}\text{C}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
f _{HIRC}	High Speed Internal RC Oscillator Frequency	3.3V~5.5V	USB mode	-0.25%	12	+0.25%	MHz
f _{CAN}	CAN Bus System Clock (OSC)	3.3V~5.5V	—	—	16	—	MHz
t _{SST}	System Start-up Timer Period	—	RX pin Wake-up from power down mode	16	—	—	t _{HIRC}
t _{RSTD}	System Reset Delay Time	—	Power-on reset	25	50	100	ms

Power-on Reset Characteristics

 $T_a = -40^{\circ}\text{C} \sim 105^{\circ}\text{C}$

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
V _{POR}	V _{DD} Start Voltage to Ensure Power-on Reset	—	—	—	—	100	mV
RR _{POR}	V _{DD} Rising Rate to Ensure Power-on Reset	—	—	0.035	—	—	V/ms
t _{POR}	Minimum Time for V _{DD} Stays at V _{POR} to Ensure Power-on Reset	—	—	1	—	—	ms



CAN Bus Interface

The HT42B536-x contains a CAN Bus control unit. For the connection to the physical layer additional transceiver hardware is required. Two pins of CANTX and CANRX interface to the CAN Bus Transceiver. The CAN Bus Controller supports the CAN 2.0 Part A and B protocol specifications and compatible with the ISO11898-1 standards. It is capable of transmitting and receiving standard and extended messages. It also capable of both acceptance filtering and message handler.

The CAN Bus control unit is connected to the external 16MHz high speed crystal oscillator via the OSC1 and OSC2 pins. In addition, the CLKOUT_SSIF pin needs to be connected to a 510K resistor to ground to ensure that the CAN Bus control unit operates normally.

USB Interface

The USB interface, being USB 2.0 full-speed compatible, is a 4-wire series bus that allows communication between a host device and up to 127 peripheral devices on the same bus. A token based protocol method is used by the host device for communication control. Other advantages of the USB bus include live plugging and unplugging and dynamic device configuration. As the complexity of USB data protocol does not permit comprehensive USB operation information to be provided in this datasheet, the reader should therefore consult other external information for a detailed USB understanding.

USB Interface Operation

To communicate with an external USB host, the internal USB module has the external pins known as D+ and D- along with the 3.3V regulator output pin V33O. A Serial Interface Engine (SIE) decodes the incoming USB data stream and transfers it to the correct endpoint buffer memory known as the FIFO. The USB module has 4 endpoints, EP0 ~ EP3. The endpoint 0 supports the Control transfer while the endpoint 1 ~ endpoint 3 support the Interrupt or Bulk transfer. The HT42B536-x Bridge IC supports the USB Communication Device Class (CDC) for communications and configuration.

Endpoint	Transfer Type
0	Control
1	Interrupt
2	Bulk Out
3	Bulk In

USB Endpoint Transfer Type

If there is no signal on the USB bus for over 3ms, the USB device will enter the suspend mode. The device enters the suspend state to meet the requirements of the USB suspend current specification. When the resume signal is asserted by the USB host, the device will be woken up and leave the suspend mode.

As the USB device has a remote wake-up function, the USB device can wake up the USB host by sending a remote wake-up pulse. Once the USB host receives a remote wake-up signal from the USB device, the host will send a resume signal to device.

USB VID and PID Configure

The device has configured the default Vender ID (VID: 0x04D9), Product ID (PID: 0xB536) and product description strings of “USB to CAN Bridge”.

This device has been configured to the default USB configuration data as shown in the following table.

Parameter	Value (Hex)
USB Vendor ID (VID)	0x04D9
USB Product ID (PID)	0xB536
Remote wake-up	Default disable
Manufacturer Name	Holtek
Product Description	USB to CAN Bridge

HT42B536-x Protocol Description

The HT42B536-x protocol, which starts with ASCII and ends with the Carriage Return character, CR (0x0D), is used to configure CAN communication parameters and convert between USB data and CAN messages.

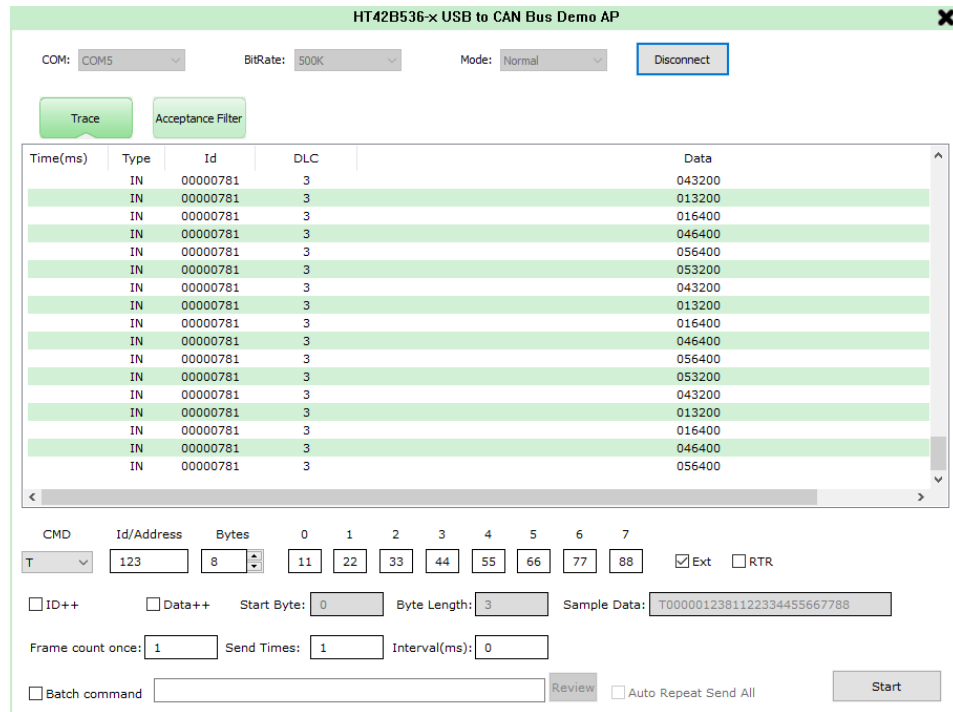
Command Set

Command	Response	Function
Open/Close the CAN bus device		
O[CR]	[CR]	Open the CAN bus device in Normal mode
I[CR]	[CR]	Open the CAN bus device in Loopback mode
L[CR]	[CR]	Open the CAN bus device in Listen mode
C[CR]	[CR]	Close the CAN bus device if it is opened
Setting CAN Btrrate (Standard)		
S0[CR]	[CR]	Set the CAN bus bitrate to 5K
S1[CR]	[CR]	Set the CAN bus bitrate to 10K
S2[CR]	[CR]	Set the CAN bus bitrate to 20K
S3[CR]	[CR]	Set the CAN bus bitrate to 50K
S4[CR]	[CR]	Set the CAN bus bitrate to 100K
S5[CR]	[CR]	Set the CAN bus bitrate to 125K
S6[CR]	[CR]	Set the CAN bus bitrate to 250K
S7[CR]	[CR]	Set the CAN bus bitrate to 500K
S8[CR]	[CR]	Set the CAN bus bitrate to 800K
S9[CR]	[CR]	Set the CAN bus bitrate to 1M
Transmitting a CAN Frame		
tiildddd...dd[CR]	z[CR]	Transmits a standard CAN frame (11-bit) over the CAN bus
Tiiiiiiildddd...dd[CR]	Z[CR]	Transmits an extended CAN frame (29-bit) over the CAN bus
Transmitting a Remote Request CAN Frame		
riii[CR]	z[CR]	Transmits a standard remote request (11-bit) over the CAN bus
Riiiiiiil[CR]	Z[CR]	Transmits an extended remote request (29-bit) over the CAN bus
Setting Acceptance Mask		
miii[CR]	[CR]	Set acceptance filter mask for standard CAN frame (11-bit) identifier
miiiiiiil[CR]	[CR]	Set acceptance filter mask for extended CAN frame (29-bit) identifier
Setting Acceptance Code		
Miii[CR]	[CR]	Set acceptance filter code for standard CAN frame (11-bit) identifier
Miiiiiiil[CR]	[CR]	Set acceptance filter code for extended CAN frame (29-bit) identifier
Getting Status Flags		
F[CR]	Fxx[CR]	Get CAN bus status
Getting Version Information		
v[CR]	vXXXX[CR]	Get the current firmware version

USB to CAN Bus Bridge DLL User Guide

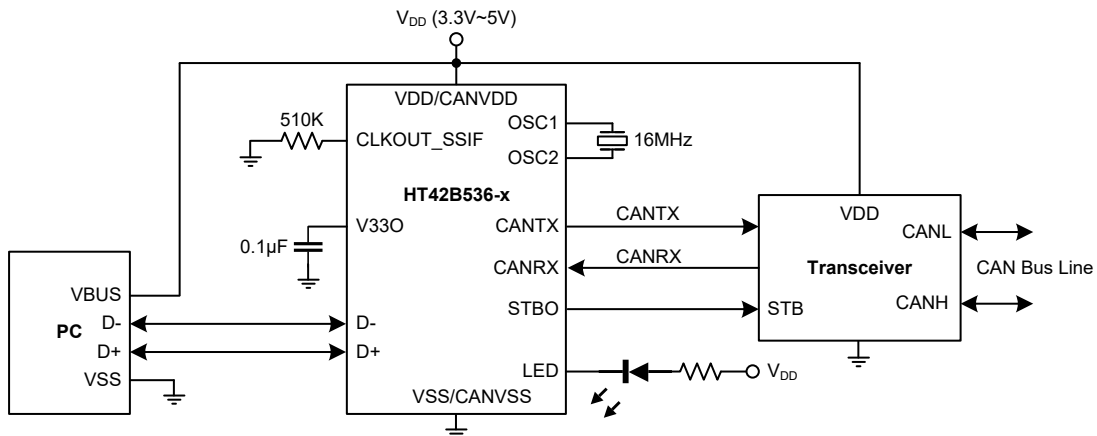
Holtek provides UsbCANBusTool and DLL for customer development.

The UsbCANBusTool is a test tool for the HT42B536-x device. It is a Windows application software that can view, send and record CAN messages.



The UsbCANBusTool & DLL instructions can be downloaded from the Holtek website.

Application Circuits



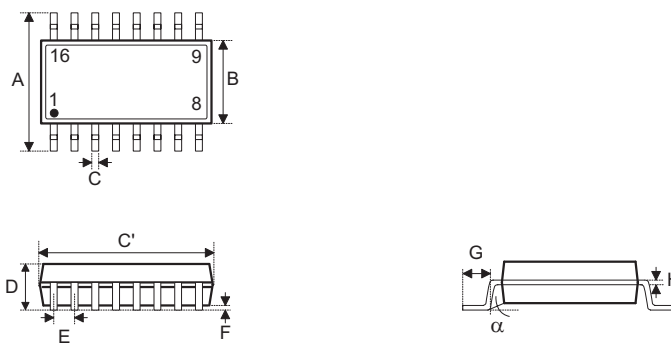
Package Information

Note that the package information provided here is for consultation purposes only. As this information may be updated at regular intervals users are reminded to consult the [Holtek website](#) for the latest version of the [Package/Carton Information](#).

Additional supplementary information with regard to packaging is listed below. Click on the relevant section to be transferred to the relevant website page.

- Package Information (include Outline Dimensions, Product Tape and Reel Specifications)
- The Operation Instruction of Packing Materials
- Carton information

16-pin NSOP (150mil) Outline Dimensions



Symbol	Dimensions in inch		
	Min.	Nom.	Max.
A	0.236 BSC		
B	0.154 BSC		
C	0.012	—	0.020
C'	0.390 BSC		
D	—	—	0.069
E	0.050 BSC		
F	0.004	—	0.010
G	0.016	—	0.050
H	0.004	—	0.010
α	0°	—	8°

Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	6.00 BSC		
B	3.90 BSC		
C	0.31	—	0.51
C'	9.90 BSC		
D	—	—	1.75
E	1.27 BSC		
F	0.10	—	0.25
G	0.40	—	1.27
H	0.10	—	0.25
α	0°	—	8°

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