

Dual USB High Side Power Switch

B2526

Description

The Bay Linear B2526 is a dual high-side power switch recommended for self-powered and bus-powered universal serial bus (USB) application conforming to USB requirements. USB voltage drop requirements, fault current limited to 750mA, flag output to indicate fault connections to the local USB controller are features that meet USB requirements.

Additional features such as thermal shutdown to prevent catastrophic switch failure from excessively high current loads, under voltage lockout (UVLO) to ensure that the device remains off unless there is a valid input voltage present, and 3.3V or 5V logic compatible enable inputs. Two versions of the enable pin, Active High or Active Low are available in 8-pin Dip and 8-pin SOIC packages.

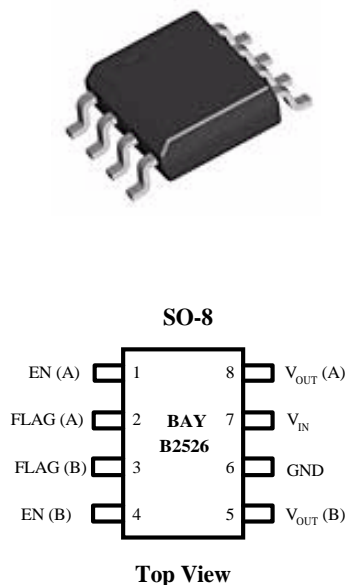
Features

- 3.0V to 5.5V Input
- 110 μ A Typical on-State Supply Current
- 1 μ A Typical off-State Supply Current
- 500mA Minimum Continuous Load Current
- 1.25A Maximum Current Limit
- 2.4V Typical Under Voltage Lockout (UVLO)
- Open-Drain Fault Flag Pin
- Thermal Shutdown
- Available with Active-High or Active-Low Enable

Applications

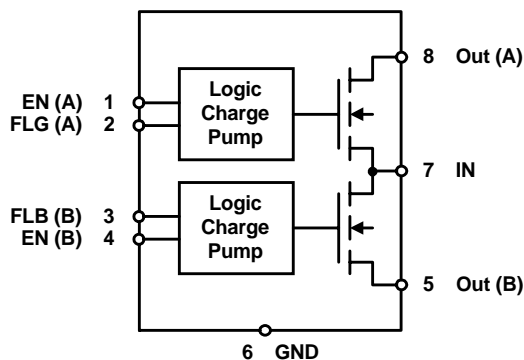
- USB Host and self-Powered Hubs
- USB Power Management
- Battery-Charger Circuits
- Hot Plug-In Power Supplies
- Bus-Powered Hubs

Package Information



Ordering Information

Package	Enable	
	Active High	Active Low
SO-8	B2526-1M	B2526-2M
8 DIP	B2526-1P	B2526-2P



ABSOLUTE MAXIMUM RATINGS

Supply Voltage.....	6V
Fault Flag Voltage.....	6V
Fault Flag Current.....	50mA
Output Voltage.....	6V
Output Current.....	Internally Limited
Enable Input.....	-0.3V to 12V
Storage Temperature.....	-65°C to +150°C
Lead Temperature (Soldering 5 sec.).....	260°C

OPERATING RATING

Supply Voltage.....	+3V to +5.5V
Ambient Operating Temperature.....	-40°C to +85°C

Thermal Resistance

SOIC.....	120°C/W
DIP.....	130°C/W

ELECTRICAL CHARACTERISTICS at $V_{IN} = 5V$, $T_a = 25^\circ C$, unless otherwise specified. (Note 1)

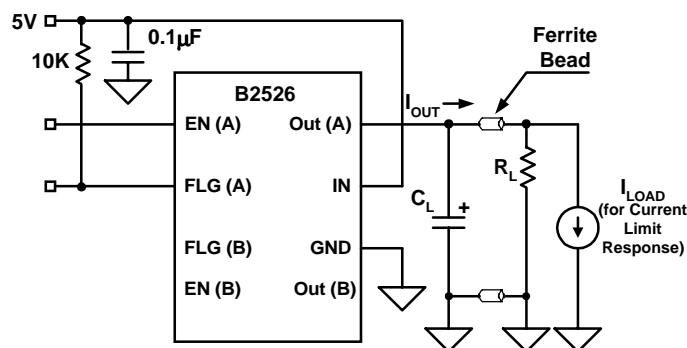
Parameters		Typ			Units
			Min	Max	
Supply Current	(Note1) Switch Off, OUT = Open (Note1) Switch On, OUT = Open	0.75 110		5 160	μA
Enable Input Threshold	Low to High Transition High to Low Transition, (Note1)	2.1 1.9	0.8	2.4	V
Enable Input Current	$V_{EN} = 0V$ to 5.5V	± 0.01	-1	1	μA
Enable Input Capacitance		1			pF
Switch Resistance	$V_{IN} = 5V$ $I_{OUT} = 500mA$, Each Switch $V_{IN} = 3.3V$ $I_{OUT} = 500mA$, Each Switch	100 140		140 180	$m\Omega$
Output Turn-On Delay	$R_L = 10\Omega$	0.5			ms
Output Turn-On Rise Time	$R_L = 10\Omega$	1			ms
Output Turn-Off Delay	$R_L = 10\Omega$	1		20	μs
Output Turn-Off Fall Time	$R_L = 10\Omega$	1		20	μs
Output Leakage Current	Each output (output disabled)			10	μA
Continuous Load Current	Each output	0.5			A
Short Circuit Current Limit	Each output (enable into load), $V_{OUT} = 4.0V$	0.5	0.75	1.25	A
Current Limit Threshold	Ramped Load applied to enable output, $V_{OUT} \leq 4.0V$		1.6	2.2	A
Over temperature Shutdown Threshold	T_J Increasing T_J Decreasing		135 125		$^\circ C$
Error Flag Output Resistance	$V_{IN} = 5.0V$, $I_L = 10mA$ $V_{IN} = 3.3V$, $I_L = 10mA$		10 15		Ω
Error Flag Off Current	$V_{FLAG} = 5V$		0.01	1	μA
UVLO Threshold	$V_{IN} =$ Increasing $V_{IN} =$ Decreasing		2.5 2.3		V

General Note: Devices are ESD protected, however, handling precautions recommended.

Note 1: Off is $\leq 0.8V$ and is $\geq 2.4V$ for the B2526-1. Off is $\geq 2.4V$ and on is $\leq 0.8V$ for the B2526-2. The Enable input has approximately 200mV of hysteresis.

TEST CIRCUIT

(Only 1 Output Shown)



Functional Characteristics Test Circuit

PIN DESCRIPTION

Pin No.	Pin Name	Pin Function
1 & 4	EN (A)/(B)	Enable (Input): Logic-compatible enables input. High input > 2.1V typical. Low input < 1.9V typical (B2526-1 active high, B2526 -2 active low).
2 & 3	FLAG (A)/(B)	Fault Flag (Output): Active-low, open-drain output. Indicates over current, UVLO and thermal shutdown.
6	GND	Ground: Supply return.
7	V _{IN}	Supply Input: Output MOSFET drain. Also supplies IC's internal circuitry. Connect to positive supply.
8 & 5	V _{OUT} (A)/(B)	Switch Output: Output MOSFET source. Typically connect to switched side of load.

DETAILED DESCRIPTION**Power Switch**

The power switch is an N-Channel MOSFET with a maximum on-state resistance of 140mΩ (V_{IN} = 5V). the power switch supplies a minimum of 500mA per switch.

Enable

The Logic enable disables the power switch and the bias for the charge pump, driver and other circuitry to reduce the supply current to less than 5μA when a logic high is present on the EN pin for B2526-2 or a logic low is present on EN for B2526-1. The enable input is compatible with both TTL and CMOS logic levels.

Driver

The driver controls the gate voltage of the power switch. To Limit large current surges the driver incorporates circuitry that controls the rise and fall times of the output voltage.

Charge Pump

An internal charge pump supplies power to the driver circuit and provides the necessary voltages to pull the gate of the MOSFET above the source.

Fault Flag FLG (A)/(B)

FLG is a N-Channel, open drain MOSFET output. The fault flag is active (low) for one or more of the following conditions: under-voltage (while 2V < V_{IN} < 2.7V), current limit or thermal shutdown. The flag output MOSFET is capable of sinking a 10mA load to typically 100mV above ground. Multiple FLG pins may be "wired NORed" to a common pull-up resistor.

Thermal Shutdown

An internal thermal sense circuit shuts off the power switch when the junction temperature rises to approximately 150°C. Hysteresis is built into the thermal sense circuit.

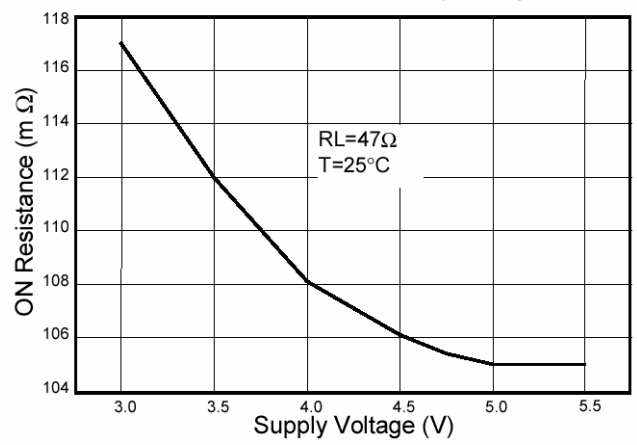
Current Sense

A sense FET monitors the current supplied to the load. When an overload or short circuit is encountered, the current sense circuitry sends a control signal to the driver. The driver in turn reduces the gate voltage and sends the power FET into its saturation region, which switches the output into a constant current mode. The 2526 current-limit profile exhibits a small foldback effect of approximately 500mA. Once this current-limit threshold is exceeded the device enters constant current mode. The constant current is specified as the short circuit current limit in the "Electrical Characteristics" table. It is important to note that the 2526 will deliver load current up to the current-limit Threshold which is typically 1.6A (2.2Amax)."

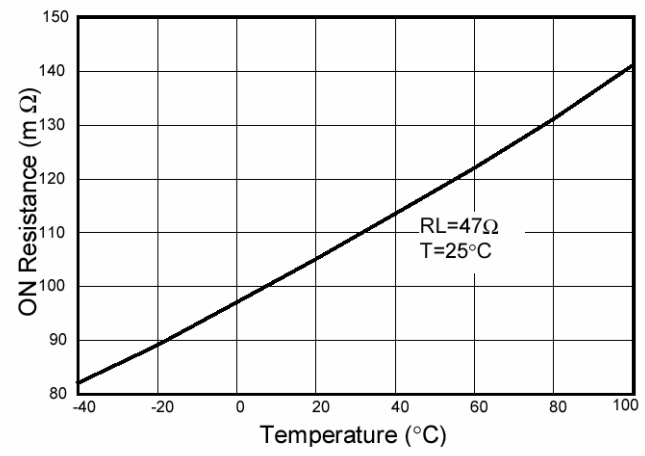
Under-Voltage Lockout (UVLO)

UVLO prevents the output MOSFET from turning on until V_{IN} exceeds 2.5V. In the under-voltage state, the FLG will be low. After the switch turns on, if the voltage drops below approximately 2.3V, UVLO shuts off the output MOSFET and signals fault flag. Under-voltage detection functions only when at least one switch is enabled.

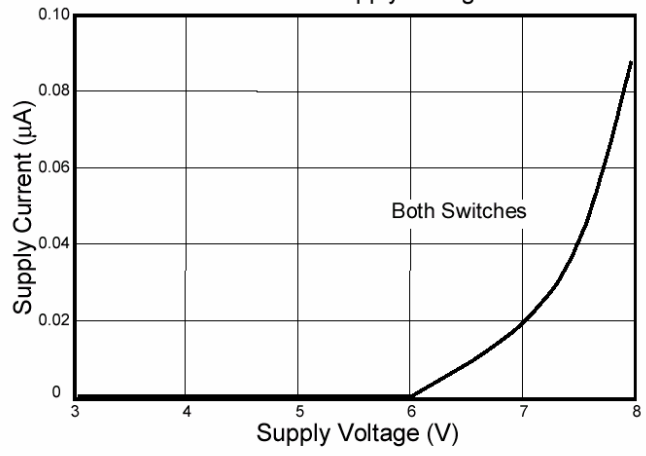
ON Resistance vs. Supply Voltage



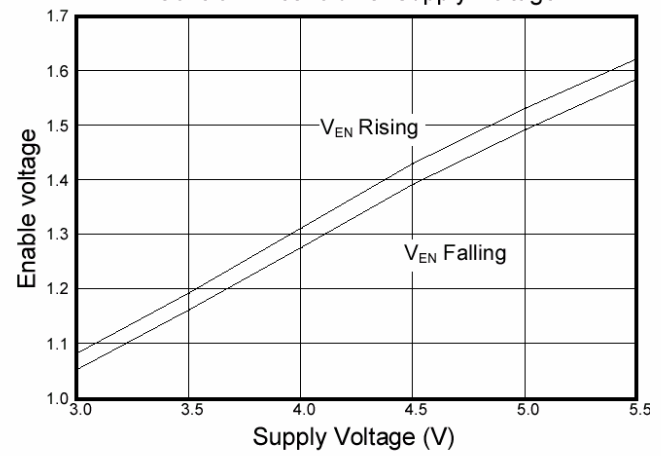
Output On Resistance vs. Temperature



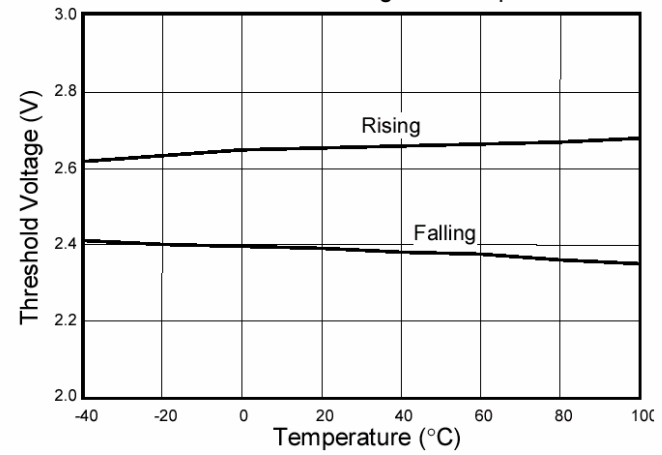
OFF State Current vs. Supply Voltage



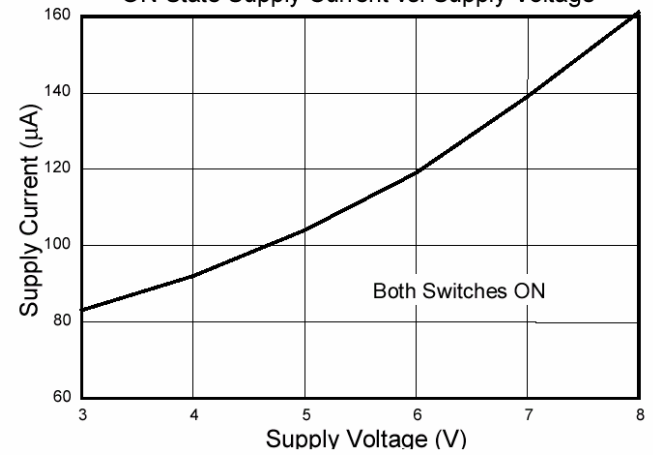
Control Threshold vs. Supply Voltage

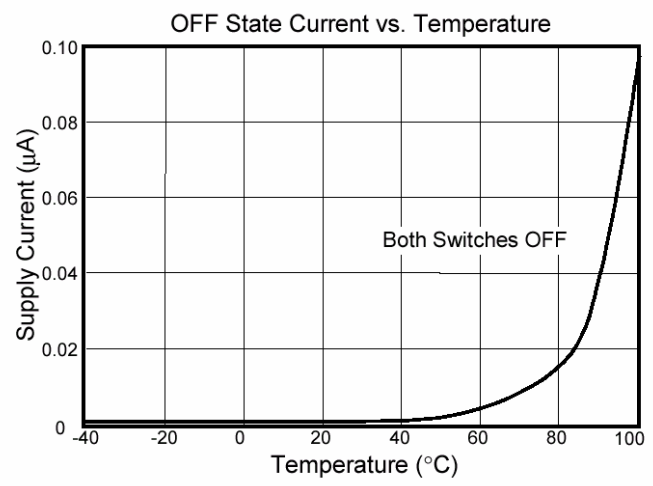
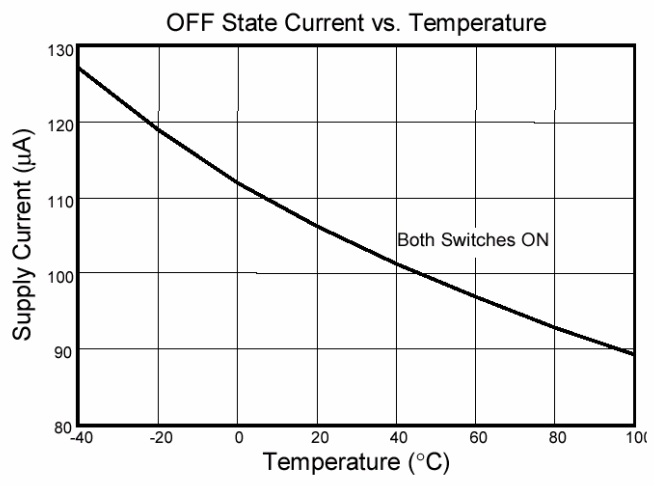
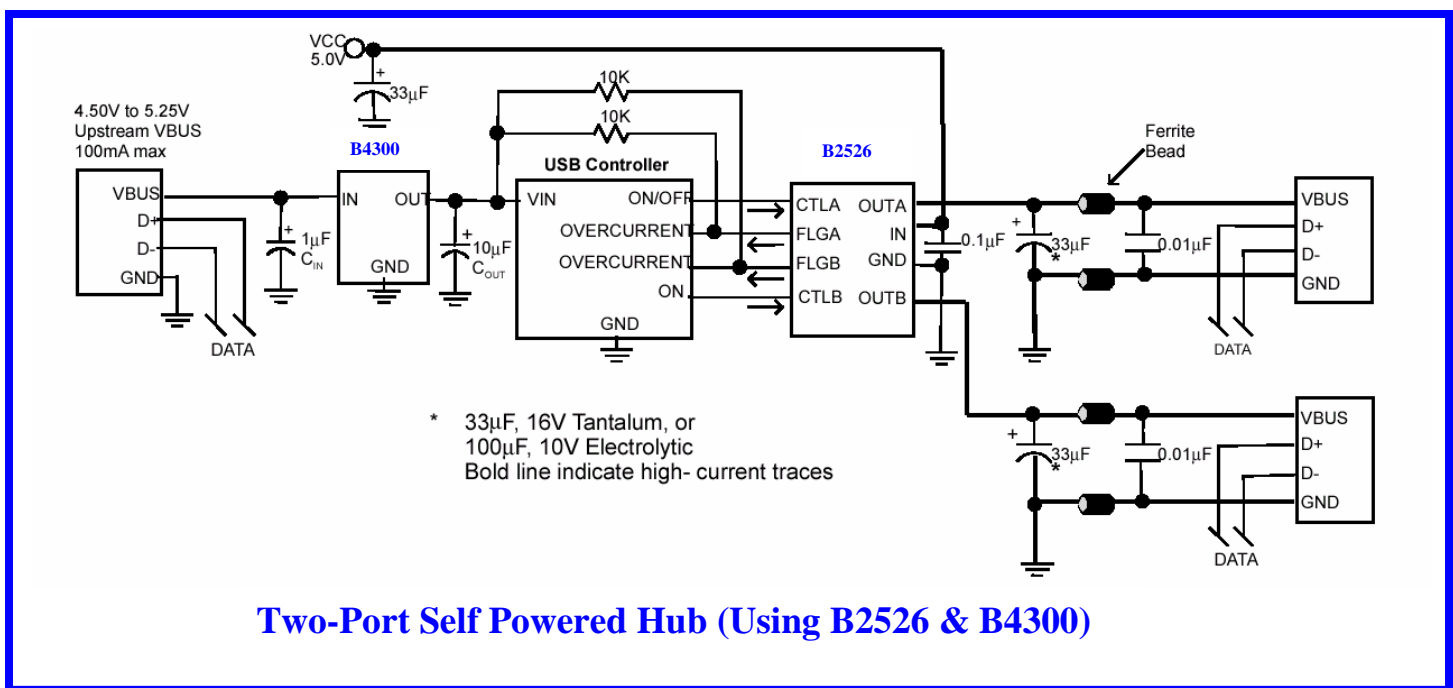


UVLO Threshold Voltage vs. Temperature

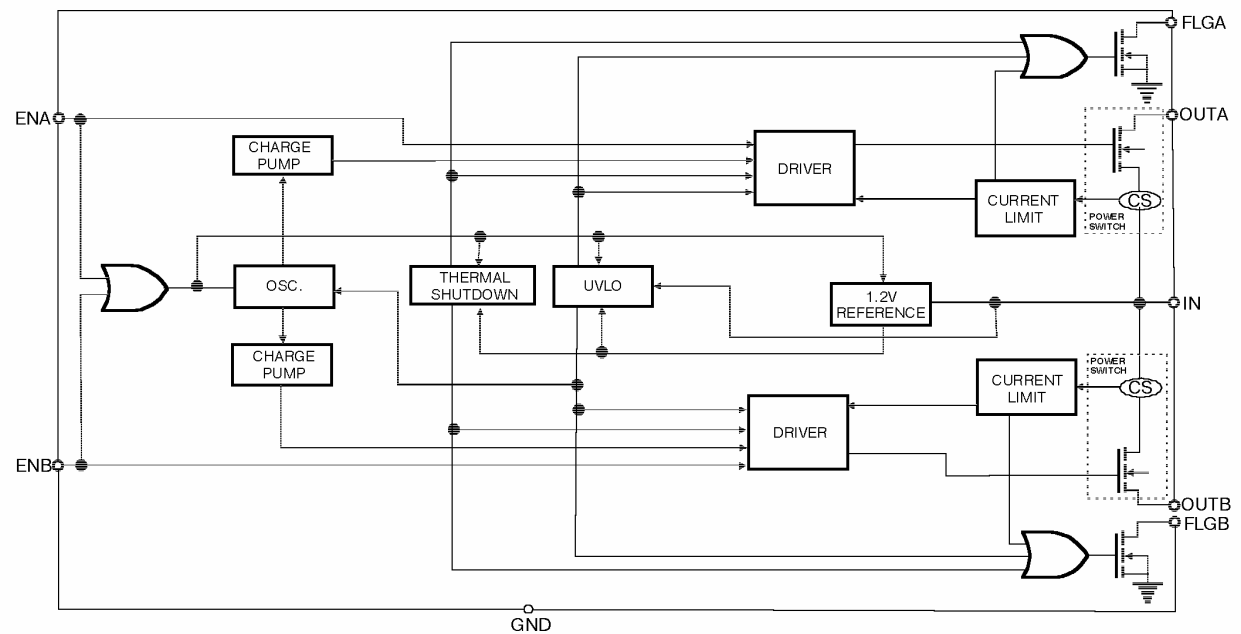


ON State Supply Current vs. Supply Voltage

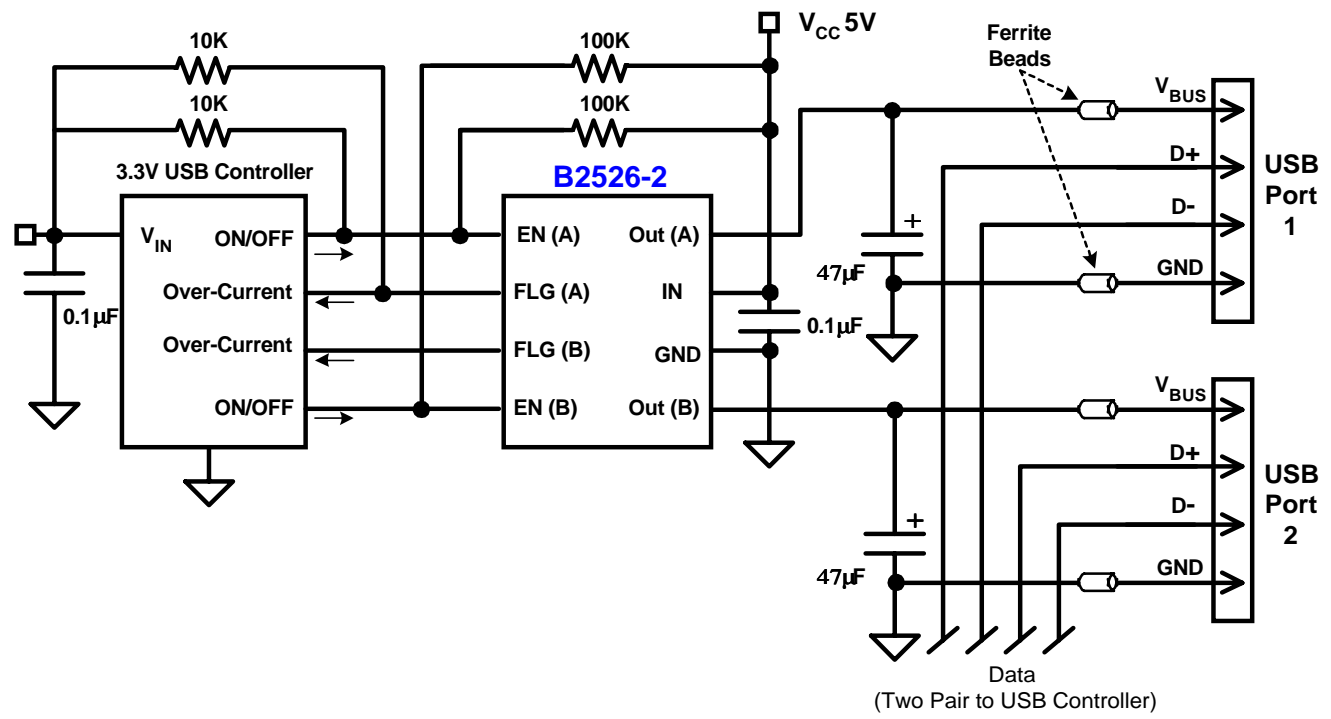




BLOCK DIAGRAM



TYPICAL APPLICATION



2 Port USB Self-Powered Hub

Advance Information- These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/or initial prototype evaluation.

Preliminary Information- These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including "Typical" for each customer application.

LIFE SUPPORT AND NUCLEAR POLICY

Bay Linear products are not authorized for and should not be used within life support systems which are intended for surgical implants into the body to support or sustain life, in aircraft, space equipment, submarine, or nuclear facility applications without the specific written consent of Bay Linear President.
