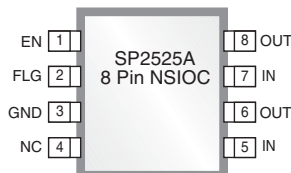


USB High-Side Power Switch

FEATURES

- +3.0V to +5.5V Input Voltage Range
- 500mA Continuous Load Current per Channel
- 2.6V Undervoltage Lockout
- 1.25A Short Circuit Current Limit
- 100mΩ Maximum On-Resistance
- 75μA On-State Supply Current
- 1μA Shutdown Current
- Output can be Forced Higher than Input (Off-State)
- Thermal Shutdown
- Slow Turn On and Fast Turn Off



Now Available in Lead Free Packaging

- Active-High Version: SP2525A-1
- Active-Low Version: SP2525A-2

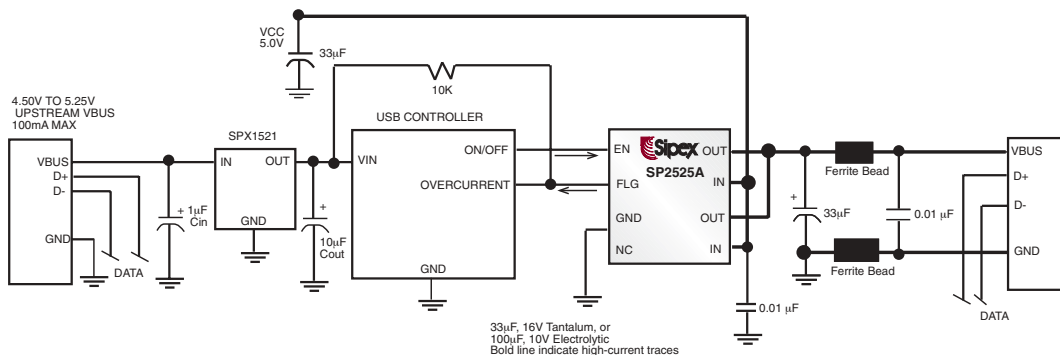
APPLICATIONS

- USB Power Management
- Hot Plug-In Power Supplies
- Battery Charger Circuit

DESCRIPTION

The SP2525A device is an integrated high-side power switch for self-powered ideal for self-powered and bus-powered Universal Serial Bus (USB) applications. The high-side switches are MOSFET with 70mΩ RDS(ON), which meets USB voltage drop requirements for maximum transmission wire length. Multi-purpose open-drain fault flag output indicates over-current limiting, thermal shutdown, or undervoltage lockout for each channel. Output current is typically limited to 0.85A below the 5A safety requirement, and the thermal shutdown functions shuts the switch off to prevent damage under overcurrent condition. Guaranteed minimum output rise time limits inrush current during hot plug-in, minimizing EMI and preventing the voltage at upstream port from dropping excessively.

TYPICAL APPLICATION CIRCUIT



One Port Self Powered Hub

ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

Supply Voltage (V_{IN}).....7.0V
 Fault Flag Voltage (V_{FLG}).....7.0V
 Fault Flag Current (I_{FLG}).....50mA

Enable Input (V_{EN}).....-0.3V - 15V
 Operating Temperature Range.....-40°C to +85°C
 Storage Temperature Range.....-65°C to +150°C
 Power Dissipation Per Package
 8-pin NSOIC (derate 6.14mW/°C above +70°C).....500mW

ELECTRICAL CHARACTERISTICS

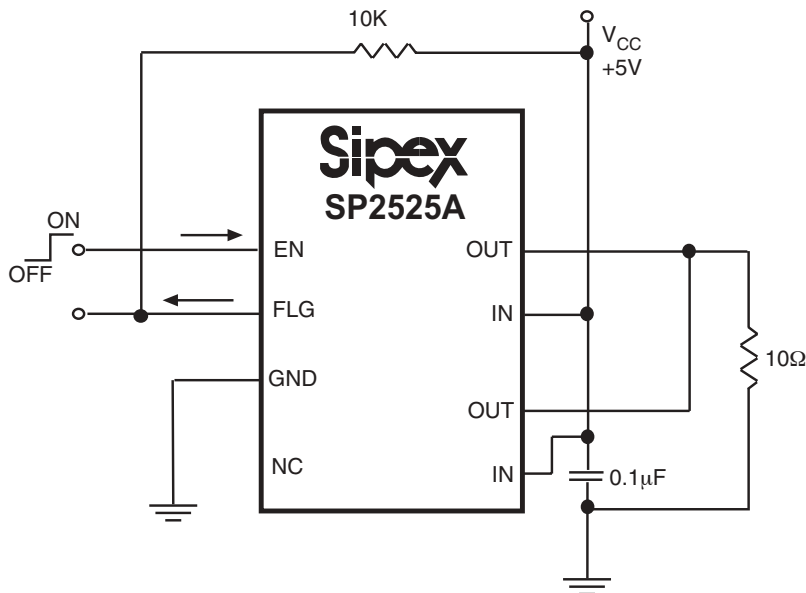
Unless otherwise noted, the following specifications apply for $V_{IN} = +5.0V$, $T_A = 25^\circ C$.

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Supply Current		0.75 75	5.0 100	μA	$V_{EN} = \text{Logic "0"}$ OUT = Open $V_{EN} = \text{Logic "1"}$ OUT = Open
Enable Input Voltage	2.4	1.7 2.0	0.8	V	$V_{EN} = \text{Logic "0"}$ $V_{EN} = \text{Logic "1"}$
Enable Input Current		0.01 0.01	1 1	μA	$V_{EN} = \text{Logic "0"}$ $V_{EN} = \text{Logic "1"}$
Enable Input Capacitance		1		pF	
Output Mosfet Resistance		70	100	m Ω	
Output Turn-On Delay		100		μs	$R_L = 10\Omega$ each output
Output Turn-On Rise Time		1000	4000	μs	$R_L = 10\Omega$ each output
Output Turn-Off Delay		0.8	20	μs	$R_L = 10\Omega$ each output
Output Turn-Off Fall Time		0.7	20	μs	$R_L = 10\Omega$ each output
Output Leakage Current			10	μA	
Current Limit Threshold	0.6	1.0	1.25	A	
Over-Temperature Shutdown Threshold		135 125		$^\circ C$	T_J increasing T_J decreasing
Error Flag Output Resistance		10 15	25 40	Ω	$V_{IN} = 5V, I_L = 10mA$ $V_{IN} = 3.3V, I_L = 10mA$
Error Flag Off Current		0.01	1	μA	$V_{FLAG} = 5V$
UVLO Threshold		2.6 2.4		V	V_{IN} increasing V_{IN} decreasing

PIN DESCRIPTION

Pin Number	Pin Name	Description
1	EN	Enable Input Active High for SP2525A-1 and Active Low for SP2525A-2.
2	FLG	An active-low and open-drained fault flag output for power switch. It can indicate current limit if CTL is active. In normal mode operation, it also can indicate thermal shutdown or undervoltage.
3	GND	Chip power ground.
4	NC	Not internally connected.
5, 7	IN	Power supply input.
6, 8	OUT	MOSFET switch output.

TEST CIRCUIT



Error Flag

An error Flag is an open-drained output of an N-channel MOSFET, the FLG output is pulled low to signal the following fault conditions: input undervoltage, output current limit, and thermal shutdown.

Current Limit

The current limit threshold is preset internally. It protects the output MOSFET switches from damage resulting from undesirable short circuit conditions or excess inrush current, which is often encountered during hot plug-in. The low limit of the current limit threshold of the SP2525A allows a minimum current of 0.5A through the MOSFET switches. A current limit condition will signal the error flag.

Thermal Shutdown

When temperature of SP2525A exceeds 135°C for any reasons, the thermal shutdown function turns off the MOSFET switch and signals the error flag. A hysteresis of 10°C prevents the MOSFETs from turning back on until the chip temperature drops below 125°C.

Supply Filtering

A 0.1μF to 1μF bypass capacitor from IN to GND, located near the device, is strongly recommended to control supply transients. Without a bypass capacitor, an output short may cause sufficient ringing on the input (from supply lead inductance) to damage internal control circuitry.

Transient Requirements

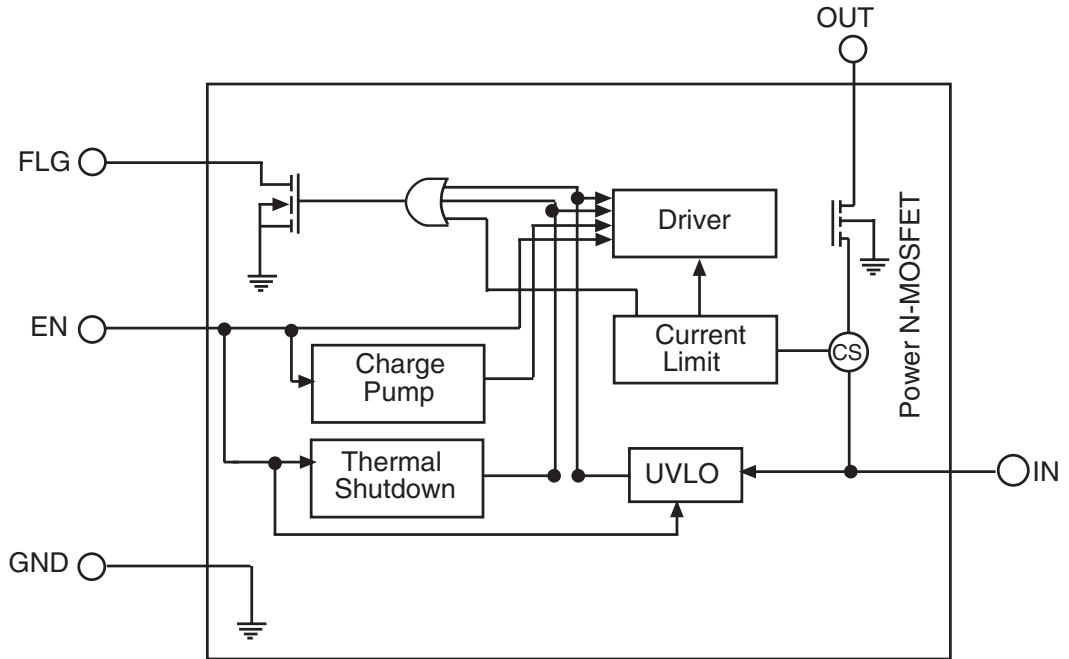
USB supports dynamic attachment (hot plug-in) of peripherals. A current surge is caused by the input capacitance of downstream device. Ferrite beads are recommended in series with all power and ground connector pins. Ferrite beads reduce EMI and limit the inrush current during hot-attachment by filtering high-frequency signals.

Short Circuit Transient

Bulk capacitance provides the short-term transient current needed during a hot-attachment event. A 33 μF/16V tantalum or a 100μF/10V electrolytic capacitor mounted close to downstream connector each port should provide transient drop protection

Printed Circuit Layout

The Power circuitry of USB printed circuit boards requires a customized layout to maximize thermal dissipation and to minimize voltage drop and EMI.



TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = +5.0V$, single MOSFET switch section, and $T_{AMB} = +25^{\circ}C$ unless otherwise noted.

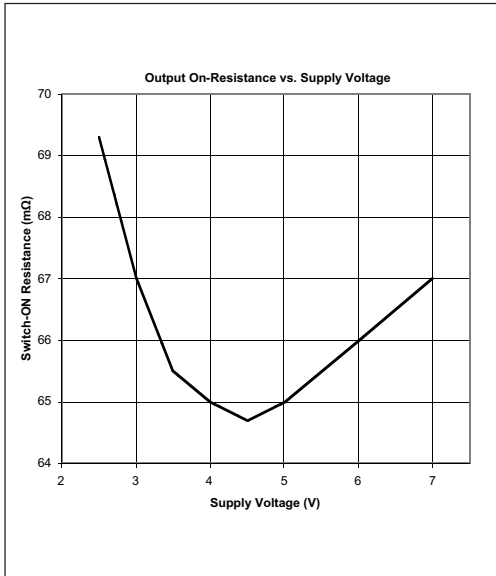


Figure 1. Output On-Resistance vs. Supply Voltage

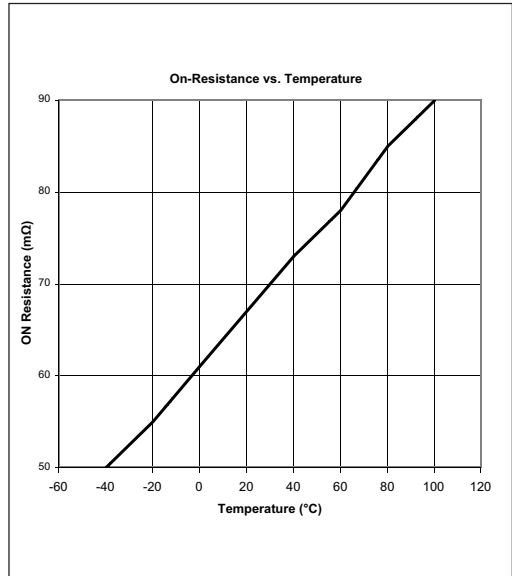


Figure 2. Output On-Resistance vs. Temperature

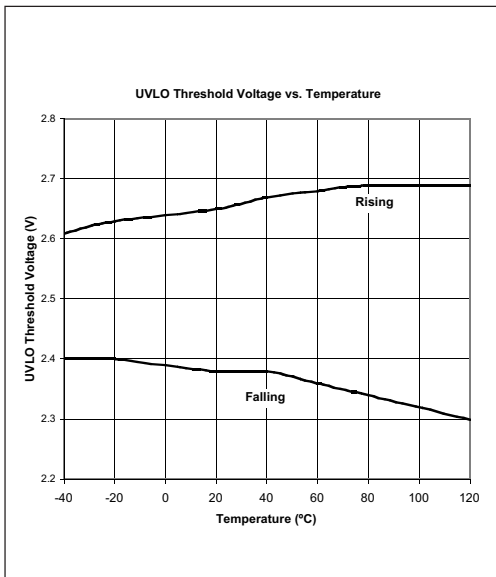


Figure 3. UVLO Threshold Voltage vs. Temperature

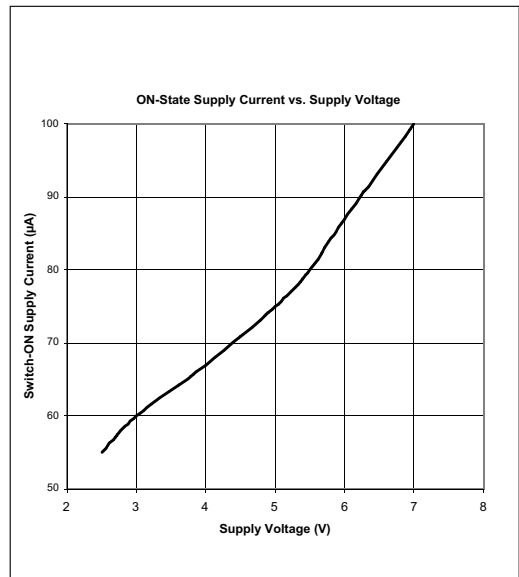


Figure 4. On-state Supply Current vs. Supply Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = +5.0V$, single MOSFET switch section, and $T_{AMB} = +25^{\circ}C$ unless otherwise noted.

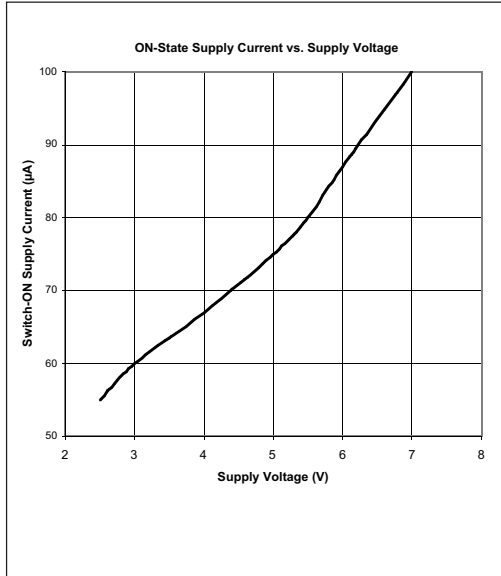


Figure 5. On-state Supply Current vs. Temperature

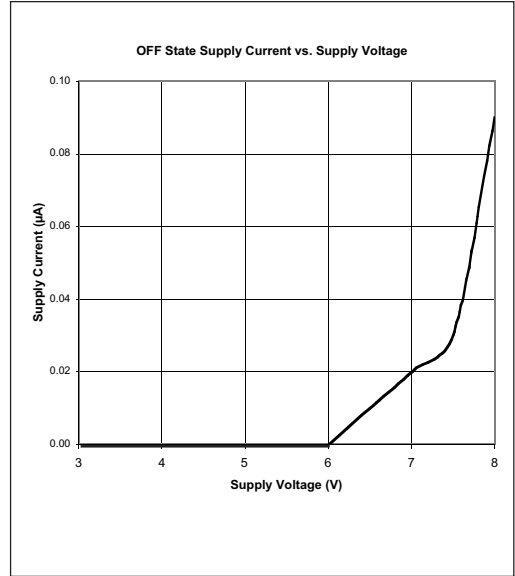


Figure 6. Off-state Supply Current vs. Supply Voltage

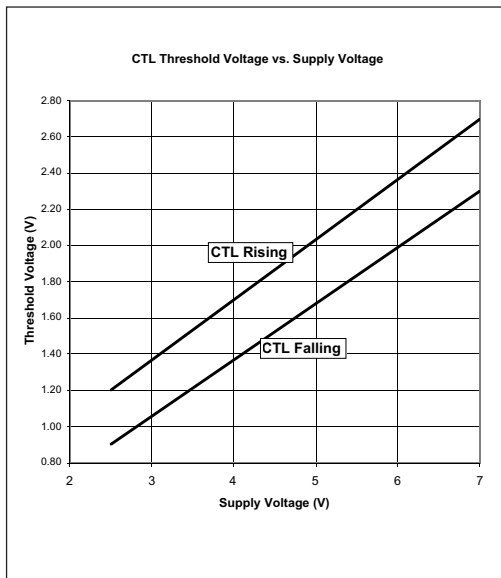


Figure 7. Control Threshold vs. Supply Voltage

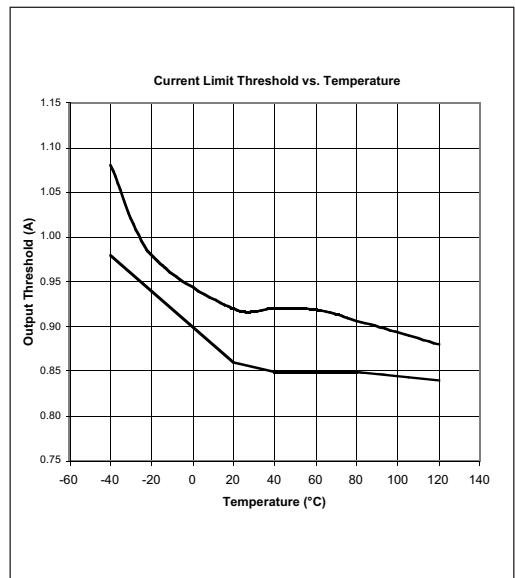


Figure 8. Current Limit Threshold vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = +5.0V$, single MOSFET switch section, and $T_{AMB} = +25^{\circ}C$ unless otherwise noted.

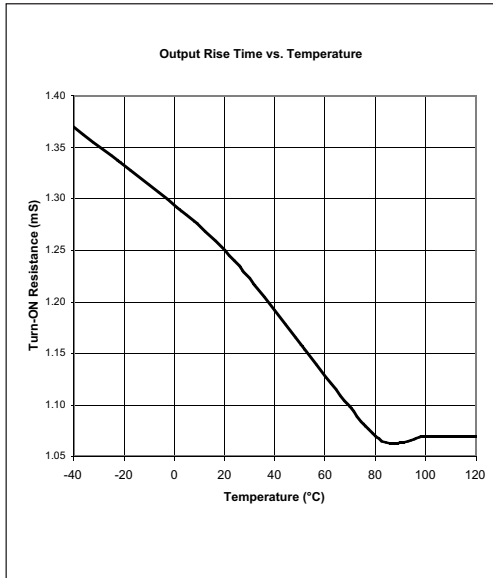


Figure 9. Output Rise Time vs. Temperature

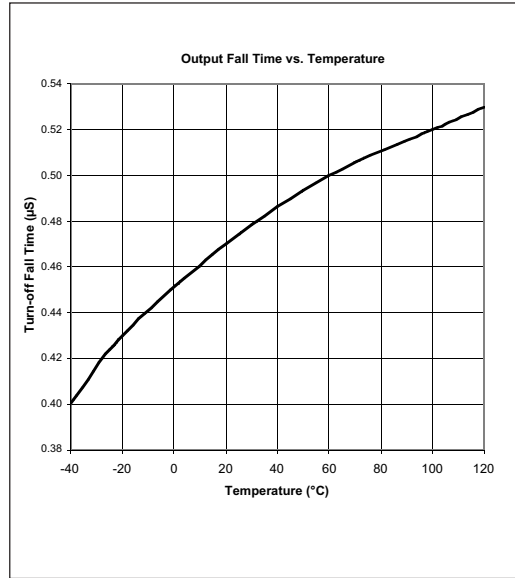
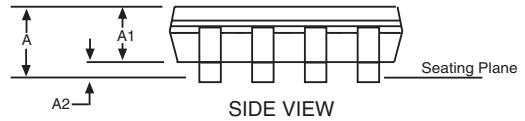
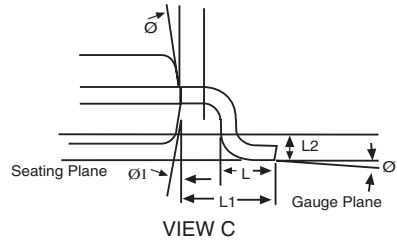
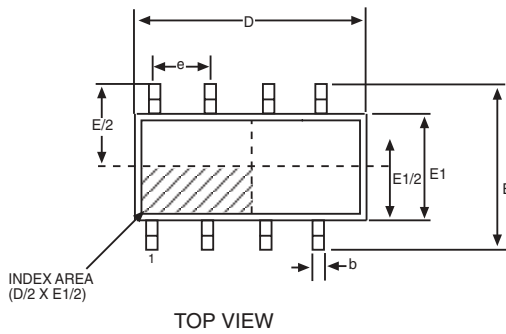
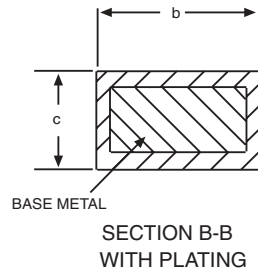
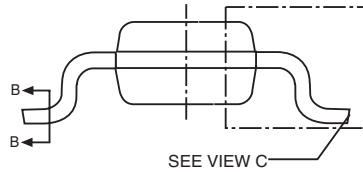


Figure 7. Output Fall Time vs. Temperature



8 Pin NSOIC JEDEC MO-012 (AA) Variation			
SYMBOL	MIN	NOM	MAX
A	1.35	-	1.75
A1	0.1	-	0.25
A2	1.25	-	1.65
b	0.31	-	0.51
c	0.17	-	0.24
D	4.90 BSC		
E	6.00 BSC		
E1	3.90 BSC		
e	1.27 BSC		
L	0.4	-	1.27
L1	1.04 REF		
L2	0.25 BSC		
∅	0°	-	8°
∅1	5°	-	15°

Note: Dimensions in (mm)



ORDERING INFORMATION

Part Number	Temperature Range	Package Types
SP2525A-1EN	-40°C to +85°C	8-pin NSOIC
SP2525A-1EN/TR	-40°C to +85°C	8-pin NSOIC
SP2525A-2EN	-40°C to +85°C	8-pin NSOIC
SP2525A-2EN/TR	-40°C to +85°C	8-pin NSOIC

Available in lead free packaging. To order add "-L" suffix to part number.

Example: SP2525A-1N/TR = standard; SP2525A-1N-L/TR = lead free

/TR = Tape and Reel

Pack quantity is 2,000 for NSOIC.

 [CLICK HERE TO ORDER SAMPLES](#) 



ANALOG EXCELLENCE

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