

Single High-Side Power Switch With Control Function

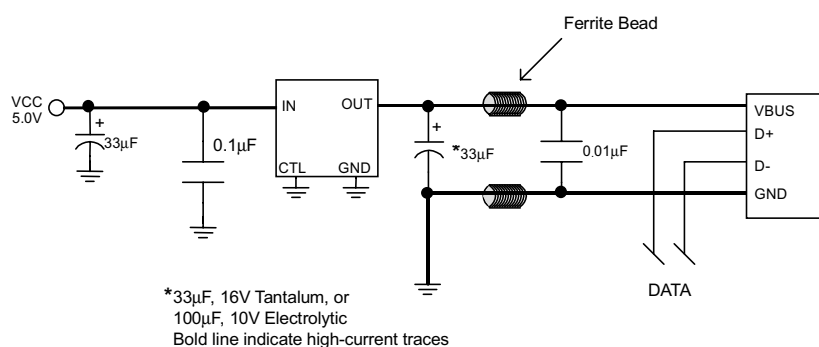
FEATURES

- 120m Ω (5V Input) High-Side MOSFET Switch.
- 500mA Continuous Load Current.
- 80 μ A Typical On-State Supply Current.
- 1 μ A Typical Off-State Supply Current.
- Current-Limit / Short Circuit Protection.
- Thermal Limiting Protection under Overcurrent Condition.
- Undervoltage Lockout Ensures that Switch is off at Start Up.
- Output can be Forced Higher than Input (Off-State).
- Slow Turn ON and Fast Turn OFF.
- Active-High or Active-Low Enable.

APPLICATIONS

- Motherboard USB Management.
- USB Power Management.
- Hot Plug-In Power Supplies.
- Battery-Charger Circuit.
- Power Distribution Switch.

TYPICAL APPLICATION CIRCUIT



USB High-Side Power Switch

DESCRIPTION

The SS6521 is an integrated high-side power switch for self-powered and bus-powered Universal Serial Bus (USB) applications. The high-side switch is a MOSFET with 120m Ω $R_{DS(ON)}$, which meets USB voltage drop requirements for maximum transmission wire length. The switch ON/OFF is controlled by CTL pin.

Output current is typically limited to 1.0A, well below the 5A safety requirement, and thermal shutdown function shuts the switch off to prevent damage under overcurrent conditions.

Guaranteed minimum output rise time limits inrush current during hot plug-in, minimizing EMI and preventing the voltage at upstream port from dropping excessively.

ORDERING INFORMATION

SS6521-XCXXX

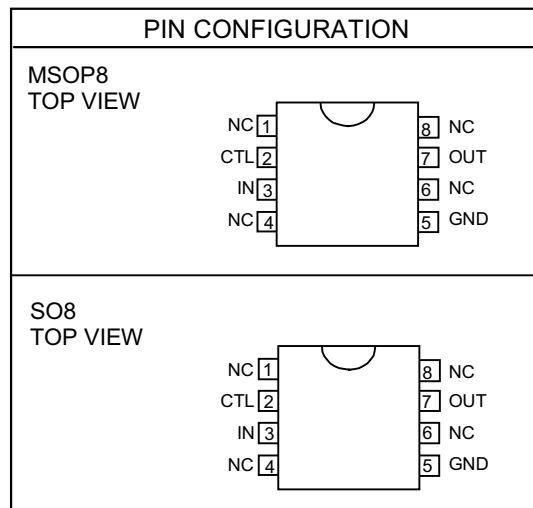
PACKING TYPE
TR: TAPE & REEL
TB: TUBE
BG: BAG (for SOT-89-5)

PACKAGING TYPE
O: MSOP
S: SO8
W: SOT-89-5

CONTROL POLARITY
0: Active Low
1: Active High

Example: **SS6521-0COTR**

→ Active Low Version, in MSOP
Package & Taping & Reel Packing
Type



ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{IN}) 7.0V

Operating Temperature Range -40°C ~ 85°C

Storage Temperature Range -65°C ~ 150°C

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

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply Current	Switch Off, OUT=Open		0.75	2	μA
	Switch On, OUT=Open		80	100	
Control Input Voltage	V_{CTL} =Logic "0"			0.8	V
	V_{CTL} =Logic "1"	2.4			
Control Input Current	V_{CTL} =Logic "0"		0.01	1	μA
	V_{CTL} =Logic "1"		0.01	1	
Output MOSFET Resistance	$I_{OUT} = 500mA$		120	180	$m\Omega$
Output Turn-On Rise Delay	$R_L = 10\Omega$		30		μS
Output Turn-On Rise Time	$R_L = 10\Omega$		500		μS
Output Turn-Off Delay	$R_L = 10\Omega$		0.2	10	μS

ELECTRICAL CHARACTERISTICS (Continued)

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Turn-Off Fall Time	$R_L = 10\Omega$		0.2	10	μS
Output Leakage Current				2	μA
Current Limit Threshold		0.6	1.0	1.25	A
Thermal Limit			110		$^{\circ}\text{C}$
UVLO Threshold	V_{IN} Increasing		2.8		V
	V_{IN} Decreasing		2.6		

TYPICAL PERFORMANCE CHARACTERISTICS

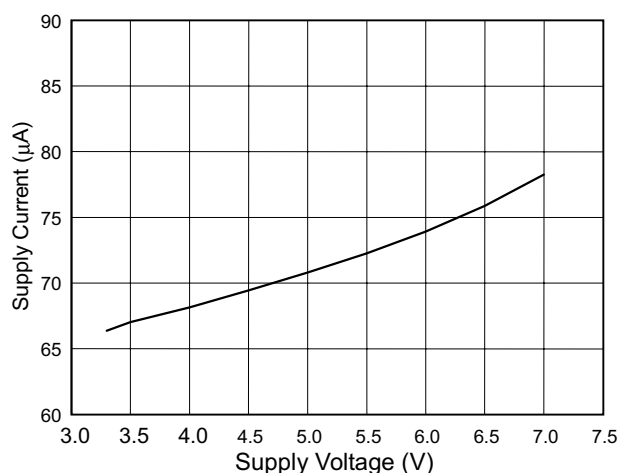


Fig. 1 On-State Supply Current vs. Supply Voltage

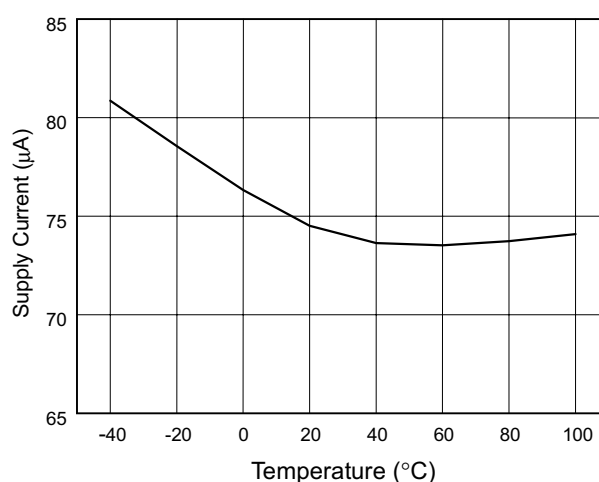


Fig. 2 On-State Supply Current vs. Temperature

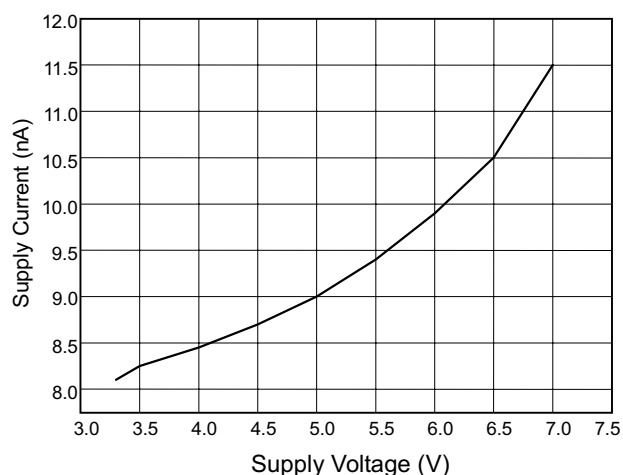


Fig. 3 Off-State Supply Current vs. Supply Voltage

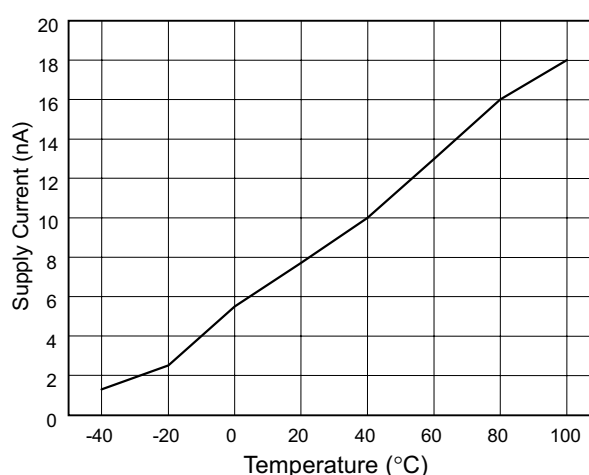


Fig. 4 Off-State Supply Current vs. Temperature

■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

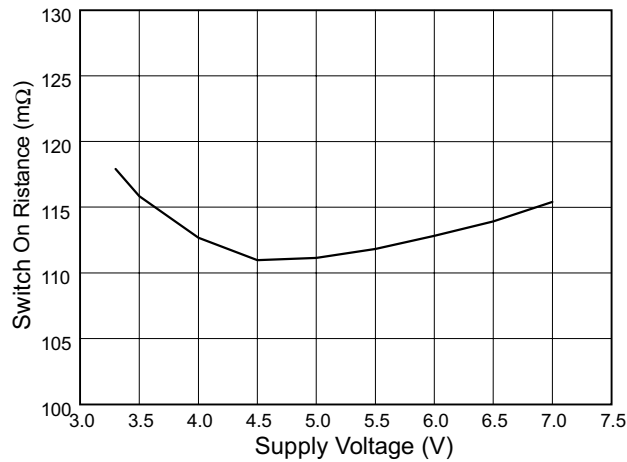


Fig. 5 Output On Resistance vs. Supply Voltage

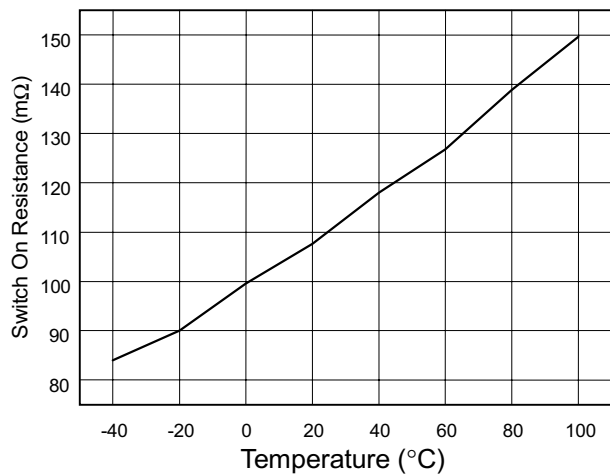


Fig. 6 Output On Resistance vs. Temperature

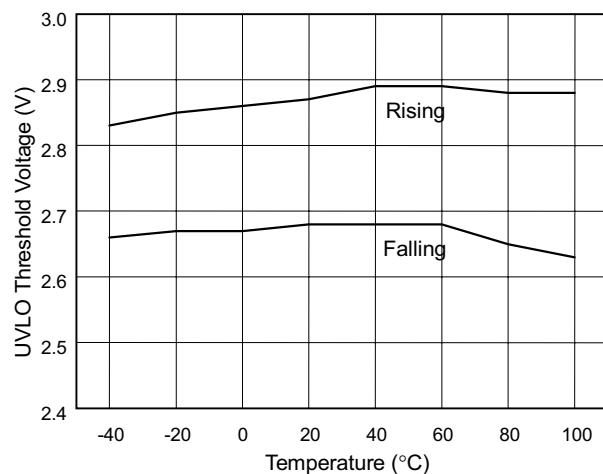


Fig. 7 UVLO Threshold Voltage vs. Temperature

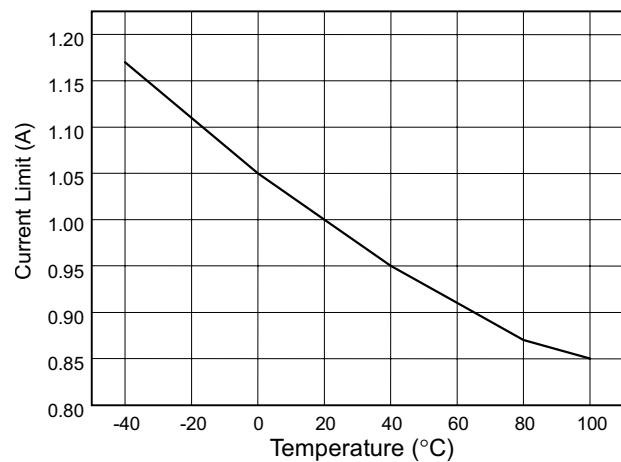


Fig. 8 Current Limit Threshold vs. Temperature

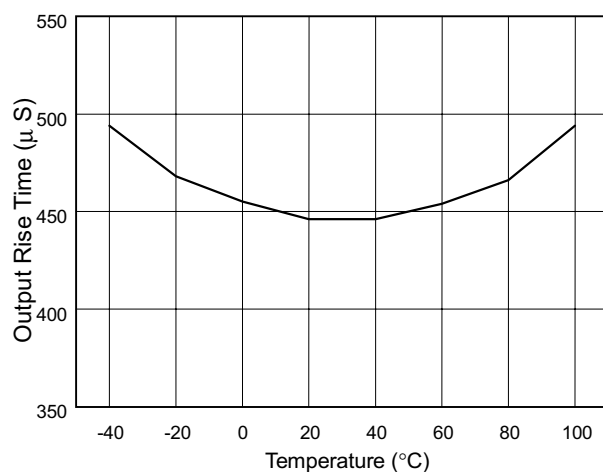


Fig. 9 Output Rise Time vs. temperature

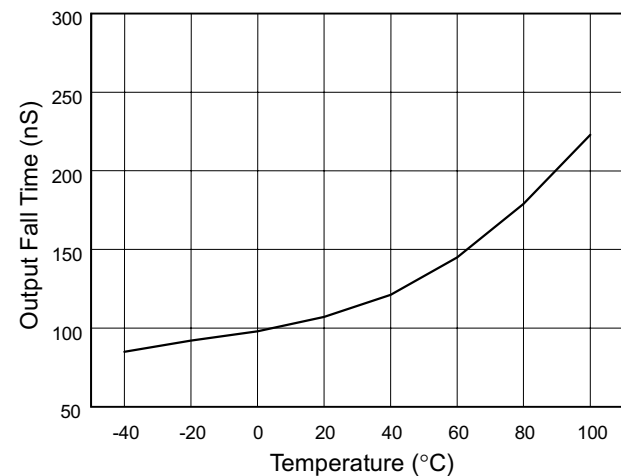


Fig. 10 Output Fall Time vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

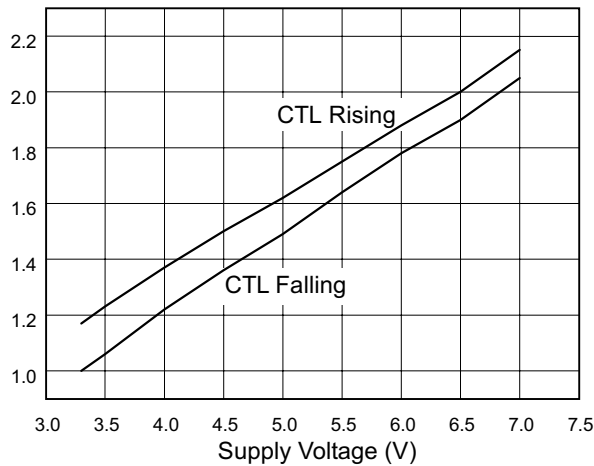


Fig. 11 CTL Threshold Voltage vs. Supply Voltage

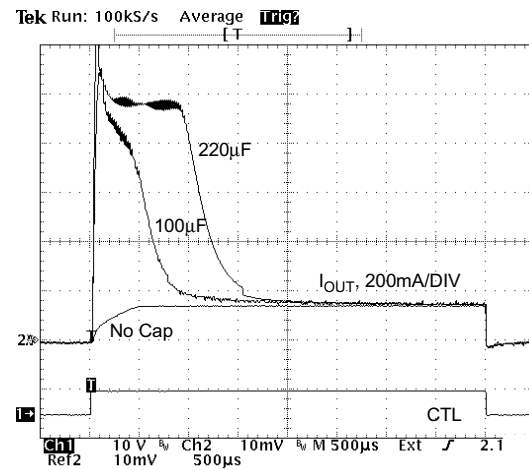


Fig. 12 Turn On Characteristic (35Ω, Loading)

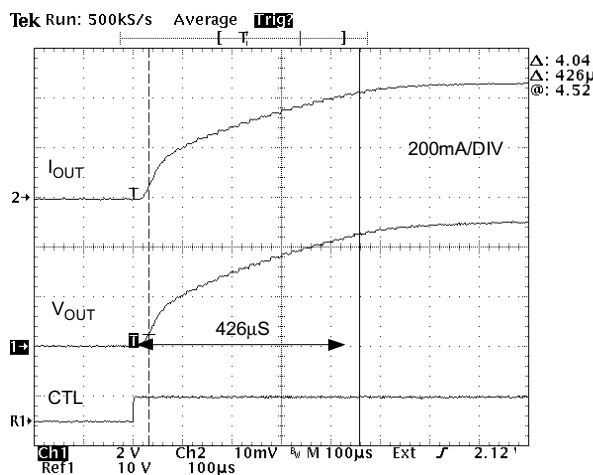


Fig. 13 Turn On Rising Time (10Ω loading)

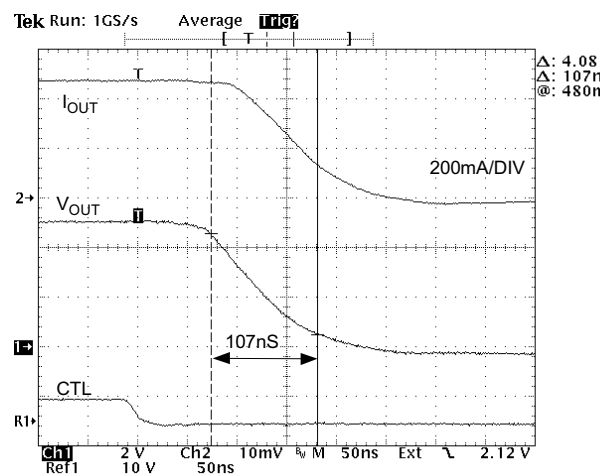


Fig. 14 Turn Off Falling Time (10Ω loading)

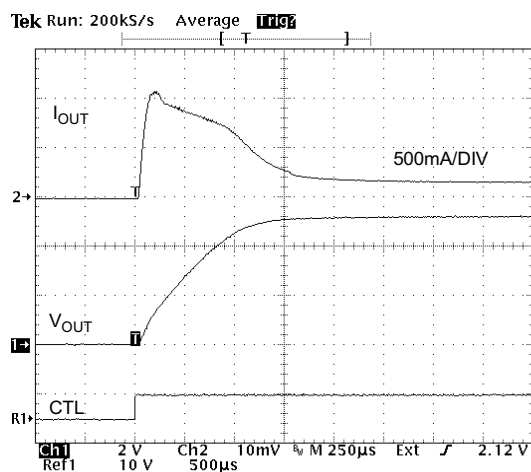


Fig. 15 Turn On Characteristic (35Ω, 100μF Loading)

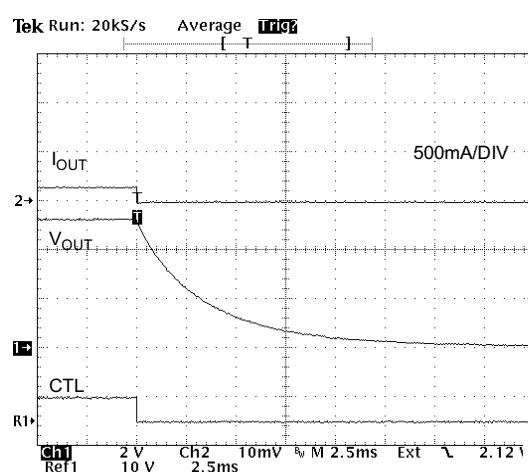


Fig. 16 Turn Off Falling Time (35Ω, 100μF Loading)

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

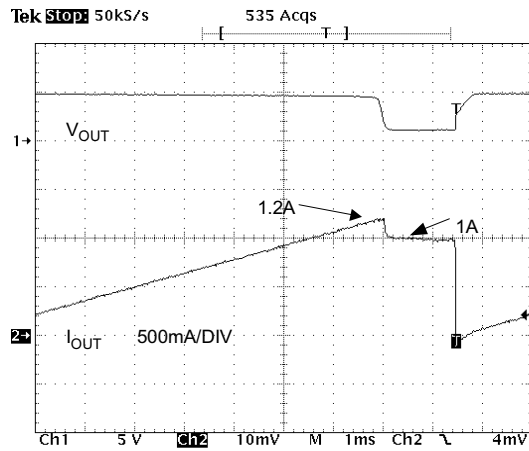


Fig. 17 Current Limit Threshold

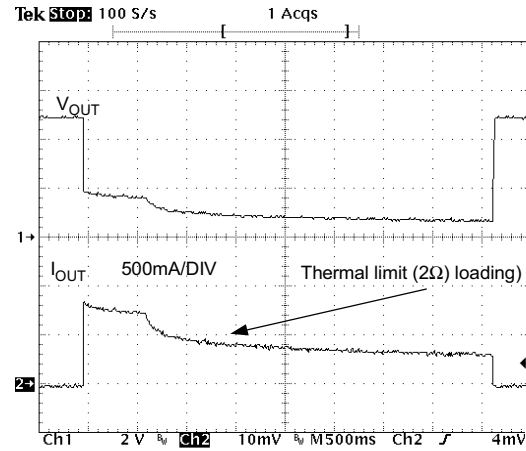


Fig. 18 Thermal Limiting Transient Response

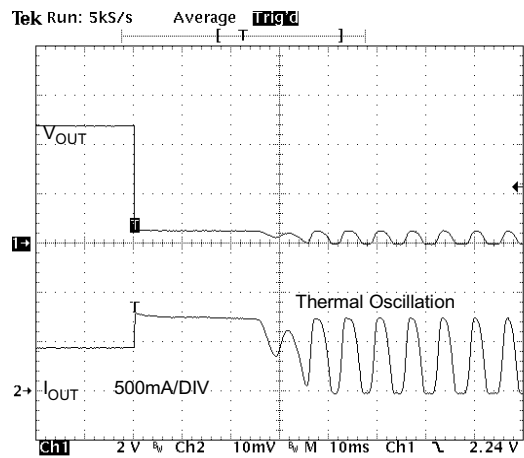


Fig. 19 Short Circuit Testing

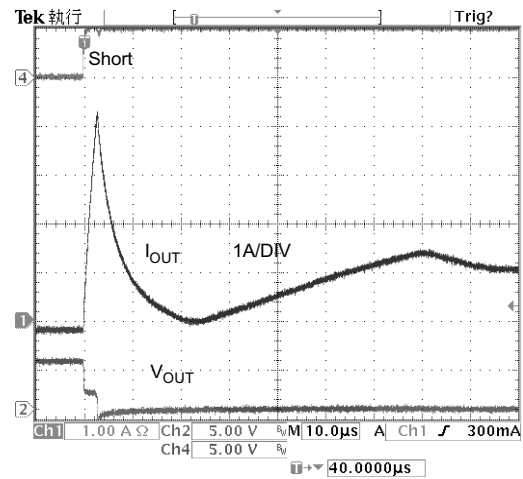
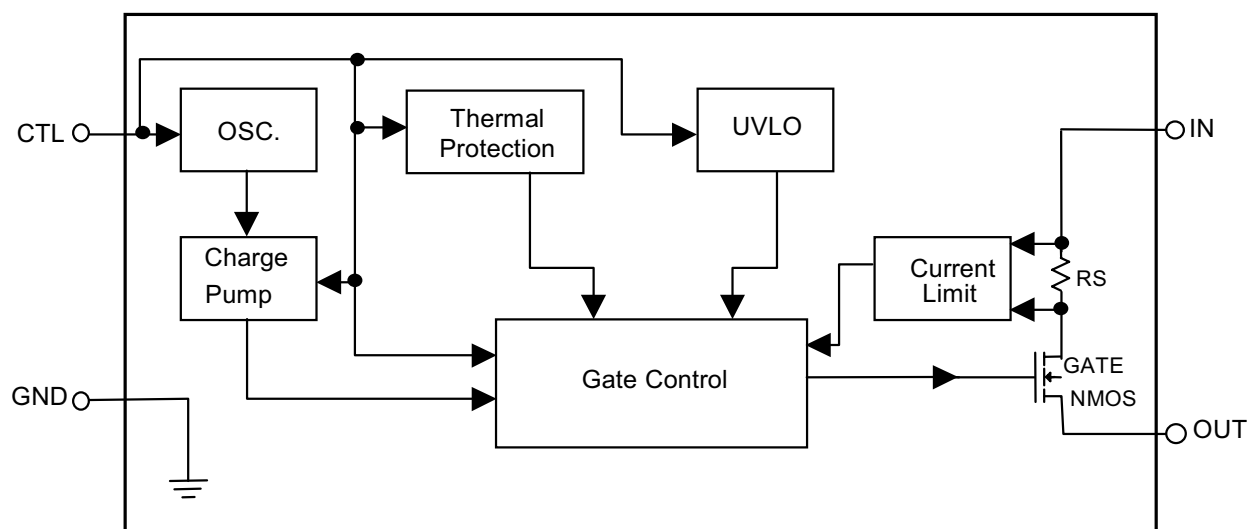


Fig. 20 Short Circuit Response Time

■ BLOCK DIAGRAM



■ PIN DESCRIPTIONS

PIN 1/4/6/8: NC:

PIN 2: CTL - TTL compatible control input. It controls the power switch turn-on/turn-off. Active High for SS6521-1 and active low for SS6521-0.

PIN 3: IN - Power supply input.

PIN 5: GND - Chip power ground.

PN 7: OUT - MOSFET switch output.

■ APPLICATION INFORMATION

Current Limit

The current limit threshold is preset internally. It protects the output MOSFET switches from damage due to undesirable short circuit conditions or excess inrush current often encountered during hot plug-in. The SS6521 allows minimum 500mA continuous load current per Channel.

Thermal Protection

When the chip temperature exceeds 110°C, the thermal protection function works.

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 Droop Requirements

USB support 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. With a 33μF, 16V tantalum or 100μF, 10V electrolytic capacitor mounted close to downstream connector should provide transient drop protection.

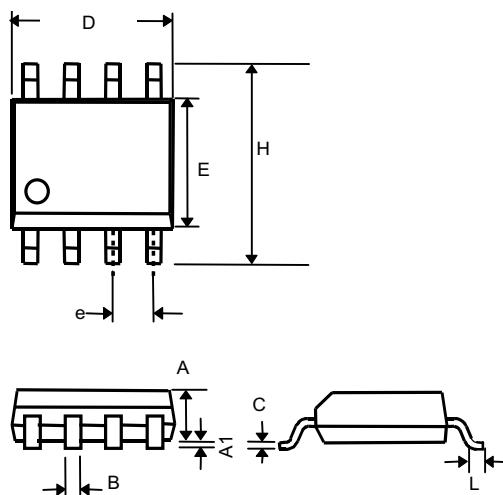
Printed Circuit Layout

The power circuitry of USB printed circuit boards requires a customized layout to maximize thermal

dissipation and to minimize voltage drop and EMI.

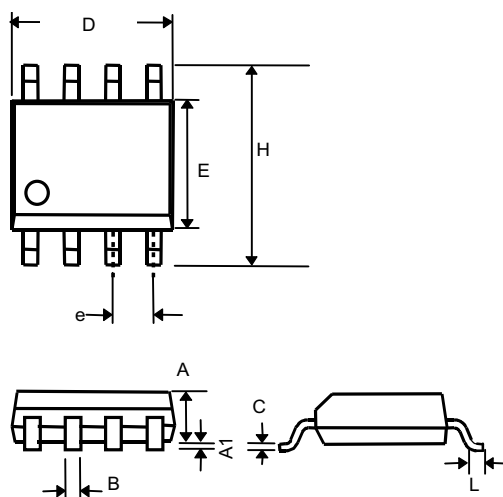
■ PHYSICAL DIMENSIONS

● MSOP 8 (unit: mm)



SYMBOL	MIN	MAX
A	0.76	0.97
A1	--	0.20
B	0.28	0.38
C	0.13	0.23
D	2.90	3.10
E	2.90	3.10
e	0.65	
H	4.80	5.00
L	0.40	0.66

● 8 LEAD PLASTIC SO (unit: mm)



SYMBOL	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.33	0.51
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27(TYP)	
H	5.80	6.20
L	0.40	1.27

Information furnished by Silicon Standard Corporation is believed to be accurate and reliable. However, Silicon Standard Corporation makes no guarantee or warranty, express or implied, as to the reliability, accuracy, timeliness or completeness of such information and assumes no responsibility for its use, or for infringement of any patent or other intellectual property rights of third parties that may result from its use. Silicon Standard reserves the right to make changes as it deems necessary to any products described herein for any reason, including without limitation enhancement in reliability, functionality or design. No license is granted, whether expressly or by implication, in relation to the use of any products described herein or to the use of any information provided herein, under any patent or other intellectual property rights of Silicon Standard Corporation or any third parties.