

Step-Down DC/DC Controller

■ FEATURES

- Operation Voltage up to 15V.
- Simple Voltage-Mode PWM Control.
- Fast Transient Response.
- 2V and 1.3V \pm 2% Feedback Voltage Reference Option.
- Adjustable Current Limit without External Sense Resistors.
- 200KHz Typical Switching Frequency.
- Short-Circuit Protection with Low Short Circuit Output Current.

■ APPLICATIONS

- Power Supply for Motherboard V_{GTL} (1.5V Output)
- Power Supply for Motherboard $V_{I/O}$.
- High-Power 5V to 3.xV DC/DC Regulators.
- Low-Voltage Distributed Power Supplies.

■ DESCRIPTION

The SS6579 is a high-power, high-efficiency voltage-mode DC/DC controller for motherboard $V_{I/O}$ power supply applications. Designed to drive an N-channel MOSFET in a standard buck topology, the SS6579 features a high voltage CMOS output driver, short-circuit protection, and 8-pin package.

An external 4-bit Digital-to-Analog Converter (DAC) can be used along with the SS6579 to adjust the output voltage from 2.0V to 3.5V in 0.1V increments. Table 1 on the following page specifies the corresponding output voltage for 16 combinations of DAC inputs as in the typical application circuit.

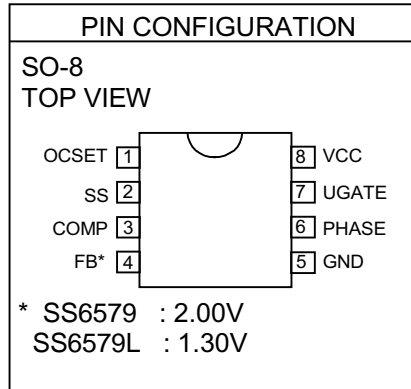
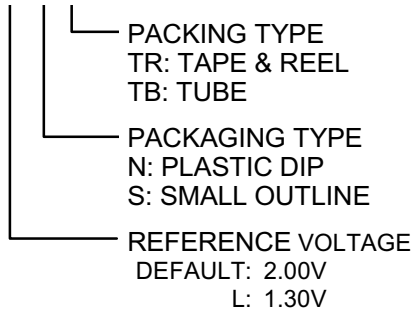
The 200KHz switching frequency allows for using small external components while maintaining high conversion efficiency. The 11MHz bandwidth and 6V/ μ S slew rate of the error amplifier ensures high converter bandwidth and fast transient response.

The SS6579 provides adjustable overcurrent and short-circuit protections by sensing the output current across the on resistance of the external N-channel MOSFET rather than an external low value sense resistor.

The SS6579L provides lower reference voltage (1.30V) than the default (2.00V, SS6579) for lower V_{OUT} requirement.

ORDERING INFORMATION

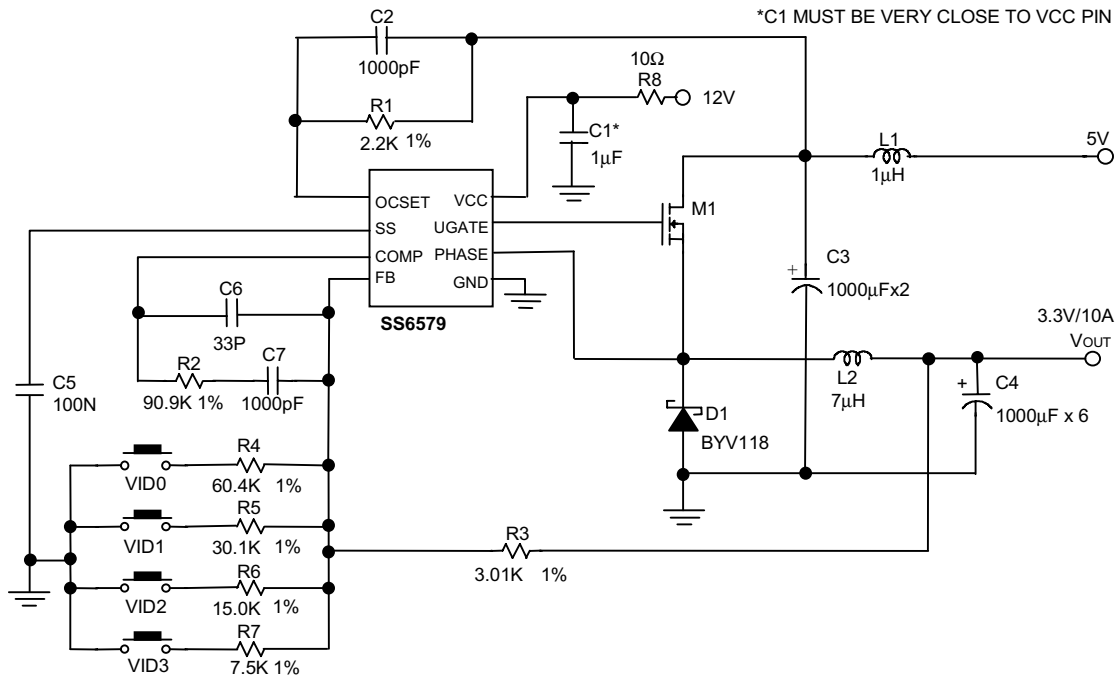
SS6579XCXXX



Example: SS6579CSTR

- 2.00V Version in SO-8 Package & Taping & Reel Packing Type
- (CN is not available in TR packing)

TYPICAL APPLICATION CIRCUIT



Switching Regulator Circuit

Table 1. Output Voltage Program

VID3	VID2	VID1	VID0	VOUT
1	1	1	1	2.00V
1	1	1	0	2.10V
1	1	0	1	2.20V
1	1	0	0	2.30V
1	0	1	1	2.40V
1	0	1	0	2.50V
1	0	0	1	2.60V
1	0	0	0	2.70V
0	1	1	1	2.80V
0	1	1	0	2.90V
0	1	0	1	3.00V
0	1	0	0	3.10V
0	0	1	1	3.20V
0	0	1	0	3.30V
0	0	0	1	3.40V
0	0	0	0	3.50V

■ ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} 15V
 Input, Output, or I/O Voltage GND -0.3V to $V_{CC}+0.3V$
 ESD Classification Class 2

Recommended Operating Conditions

Supply Voltage, V_{CC} 12V \pm 10%
 Ambient Temperature Range 0°C~70°C
 Junction Temperature Range 0°C~ 100°C

Thermal Information

Thermal Resistance, θ_{JA} (Typical, Note 1)
 SOIC Package 100°C/W
 SOIC Package (with 3 in² of Copper) 90°C/W
 Maximum Junction Temperature (Plastic Package) 150°C
 Maximum Storage Temperature Range -65°C~150°C
 Maximum Lead Temperature (Soldering 10 Sec) 300°C
 Note 1: θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

■ TEST CIRCUIT

Refer to TYPICAL APPLICATION CIRCUIT.

ELECTRICAL CHARACTERISTICS ($V_{CC}=12V$, $T_A=25^{\circ}C$, unless otherwise specified.)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
VCC Supply Current						
Nominal Supply	UGATE Open	I_{VCC}		2.3		mA
Power-On Reset						
V _{CC} Threshold	V _{OCSET} =4.5V				10.4	V
Oscillator						
Frequency			175	200	225	KHz
Max. Duty Cycle					100	%
Internal Reference Voltage						
Reference Voltage	SS6579 SS6579L		1.96 1.27	2.00 1.30	2.04 1.33	V
Error Amplifier						
DC Gain				76		dB
Gain-Bandwidth Product		GBW		11		MHz
Slew Rate		SR		6		V/ μ S
Gate Driver						
Upper Gate Source		R _{UGATE}		8	12	Ω
Upper Gate Sink		R _{UGATE}		5.5	10	Ω
Protection						
OCSET Current Source	V _{OCSET} = 4.5VDC	I _{OCSET}	170	200	230	μ A
SS Current		I _{SS}		10		μ A

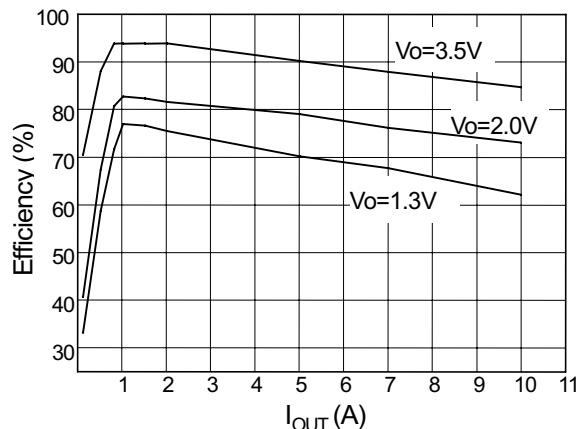
TYPICAL PERFORMANCE CHARACTERISTICS


Fig. 1 Efficiency vs. Load Current

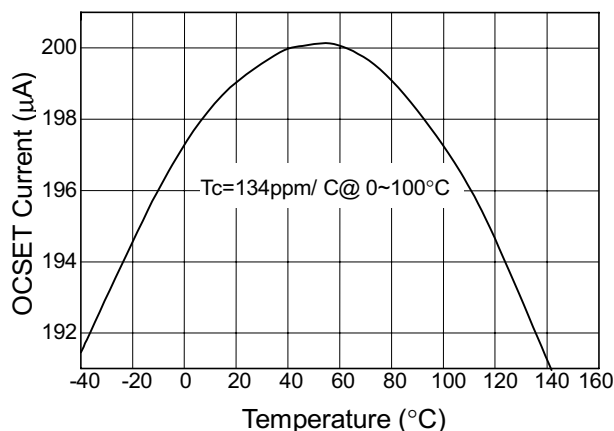


Fig. 2 OCSET Current vs. Temperature

■ **TYPICAL PERFORMANCE CHARACTERISTICS(Continued)**

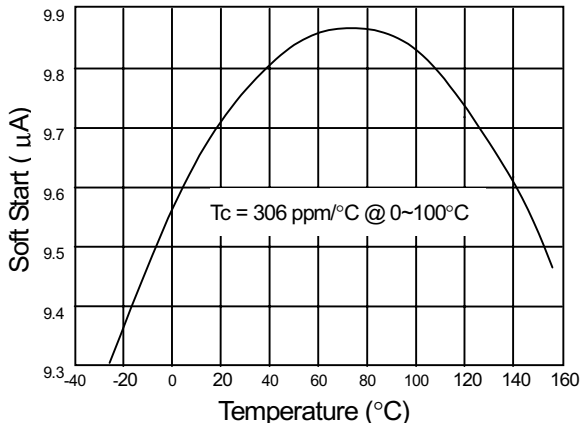


Fig. 3 Soft-Start Current vs. Temperature

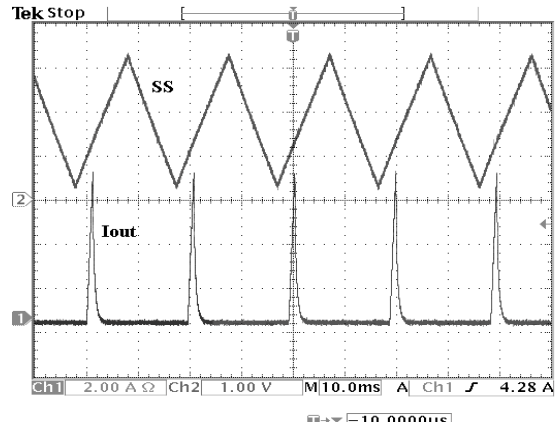


Fig. 4 Over-Current Operation

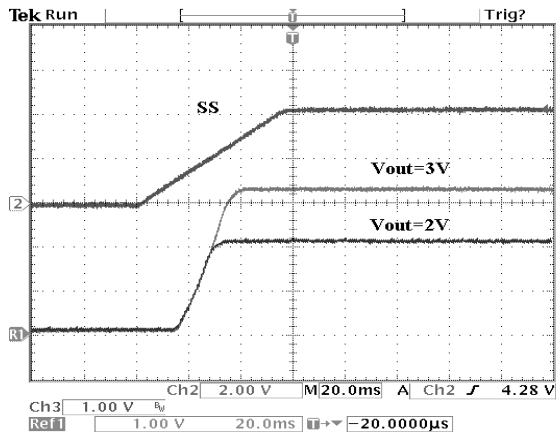


Fig. 5 Soft Start Initiates Output

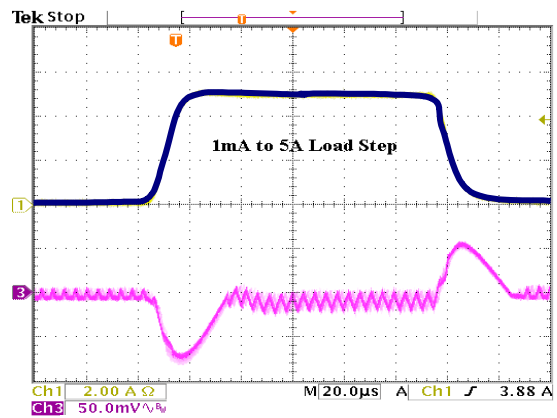
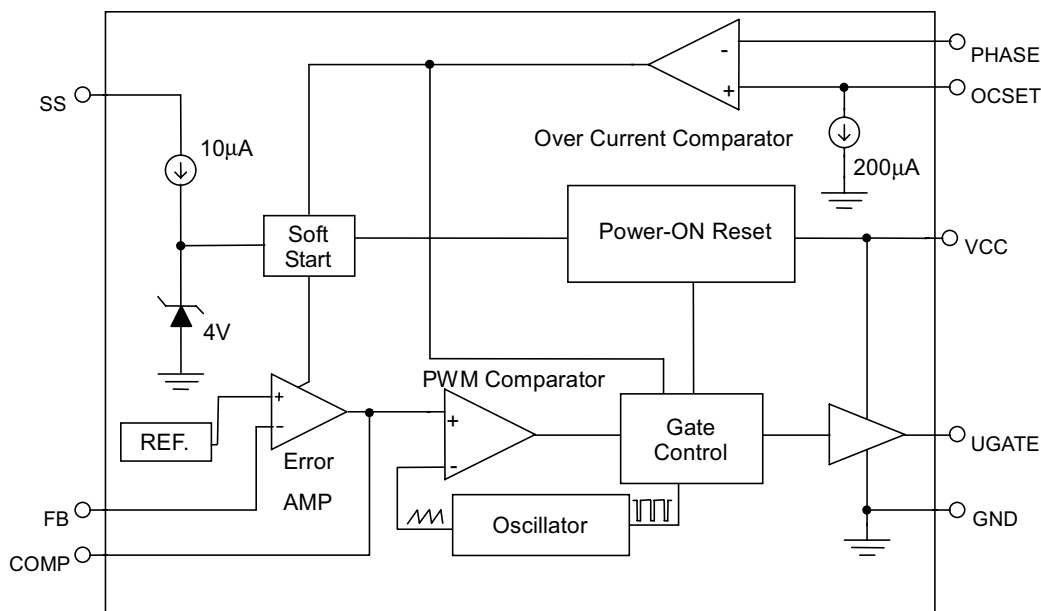


Fig. 6 Transient Response

■ BLOCK DIAGRAM



■ PIN DESCRIPTIONS

PIN 1: OCSET- Current limit sense pin. Connect a resistor R_{OCSET} from this pin to the drain of the external MOSFET. R_{OCSET} , an internal $200\mu A$ current source (I_{OCSET}), and the external MOSFET on-resistance ($R_{DS(ON)}$) jointly set the overcurrent trip point according to the following equation:

$$I_{PEAK} = \frac{I_{OCSET} \times R_{OCSET}}{R_{DS(ON)}}$$

If FB pin voltage is sensed to be below 50% of the internal voltage reference V_{DAC} , the overcurrent comparator cycles the soft-start function.

PIN 2: SS - Soft start pin. Connect a capacitor from this pin to ground. An internal $10\mu A$ current source provides soft start function for the converter.

PIN 3: COMP - External compensation pin. This pin is connected to error

amplifier output and PWM comparator. A RC network is connected to FB pin to compensate the voltage-control feedback loop of the converter.

PIN 4: FB - The error amplifier inverting input pin. The FB pin and COMP pin are used to compensate the voltage-control feedback loop.

$$V_{OUT} = 1.3V * \left(1 + \frac{R3}{R4}\right) \text{ for SS-AIC1579L}$$

$$V_{OUT} = 2V * \left(1 + \frac{R3}{R4}\right) \text{ for SSAIC1579}$$

Refer to Fig. 7.

PIN 5: GND - Ground pin.

PIN 6: PHASE - Overcurrent detection pin. Connect the PHASE pin to source of the external N-MOSFET. This pin detects the voltage drop across the MOSFET $R_{DS(ON)}$ for overcurrent protection.

- PIN 7: UGATE - External MOSFET gate drive pin.
Connect this pin to gate of the external MOSFET.
- PIN 8: VCC - The chip power supply pin.
Recommended supply voltage is 12V.

APPLICATION CIRCUIT

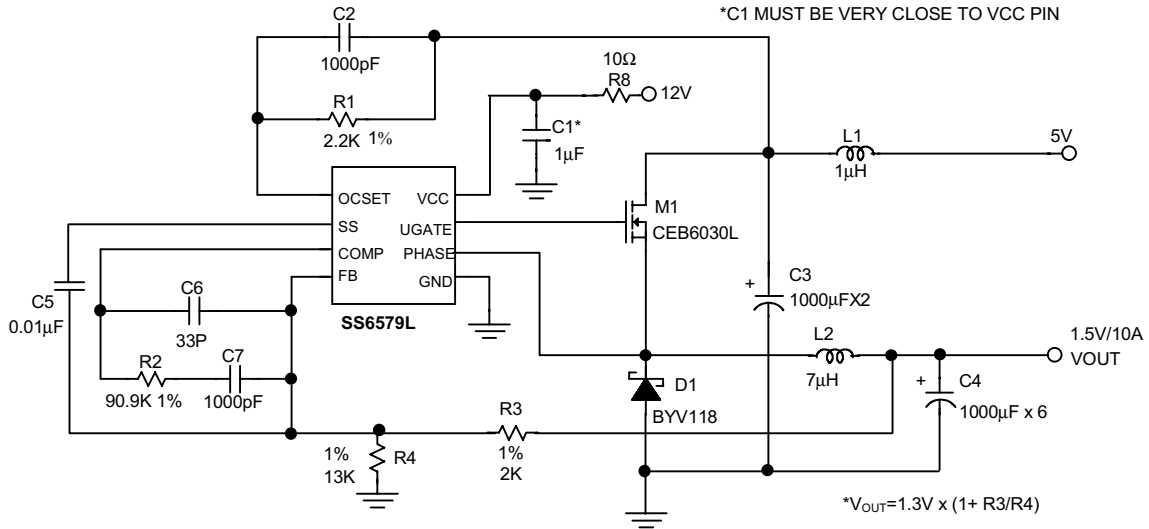
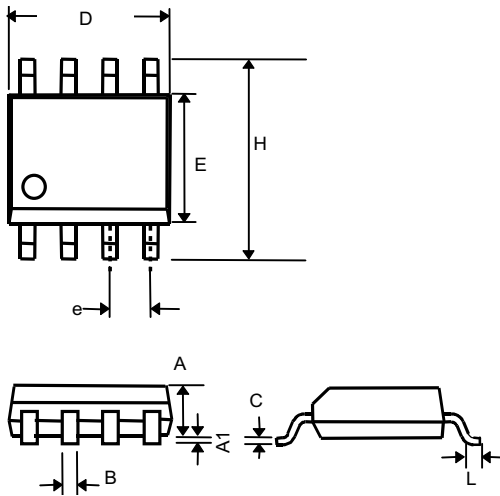


Fig. 7 DC/DC Buck Converter Circuit

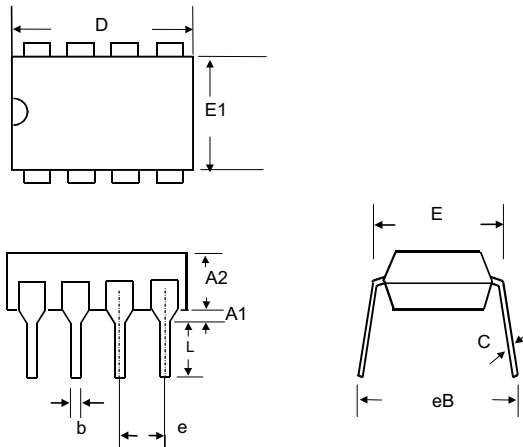
PHYSICAL DIMENSIONS

- 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

- **8 LEAD PLASTIC DIP (unit: mm)**



SYMBOL	MIN	MAX
A1	0.381	—
A2	2.92	4.96
b	0.35	0.56
C	0.20	0.36
D	9.01	10.16
E	7.62	8.26
E1	6.09	7.12
e	2.54 (TYP)	
eB	—	10.92
L	2.92	3.81

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.