

Step-Down DC/DC Controller with Shutdown

FEATURES

- Operating Voltage up to 15V.
- Simple Voltage-Mode PWM Control.
- Fast Transient Response.
- 2V and $1.3V \pm 2\%$ Feedback Voltage Reference Options.
- Adjustable Current Limit without External Sense Resistors.
- 200 KHz Switching Oscillator.
- Short-Circuit Protection with Low Short-Circuit Output Current.
- Low Shutdown Current
- Built-in Soft Start.

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 SS6580 is a high-power, high-efficiency voltage-mode switching regulator controller for motherboard $V_{I/O}$ power supply applications. Designed to drive an N-channel MOSFET in a standard buck topology, the SS6580 features a high voltage CMOS output driver with short-circuit protection in an 8-pin package.

An external 4-bit Digital-to-Analog Converter (DAC) can be used along with the SS6580 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 shown in the typical application circuit.

The 200 KHz switching frequency allows the use of small external components while maintaining high conversion efficiency. The 11MHz bandwidth and the $6V/\mu S$ slew rate of the error amplifier ensure high converter bandwidth and fast transient response.

The SS6580 provides both adjustable over-current and adjustable short-circuit protection by sensing the output current across the on-resistance of the external N-channel MOSFET, rather than an external low value sense resistor.

The SS6580L provides a lower reference voltage (1.30V) than the default SS6580 (2.00V) for lower V_{OUT} requirements.

ORDERING INFORMATION

SS6580XCXXX

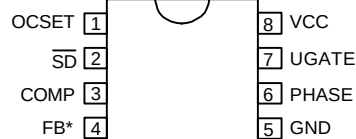
PACKING TYPE
TR: TAPE & REEL
TB: TUBE

PACKAGING TYPE
N: PLASTIC DIP
S: SMALL OUTLINE

REFERENCE VOLTAGE
DEFAULT: 2.00V
L: 1.30V

PIN CONFIGURATION

SO-8
TOP VIEW

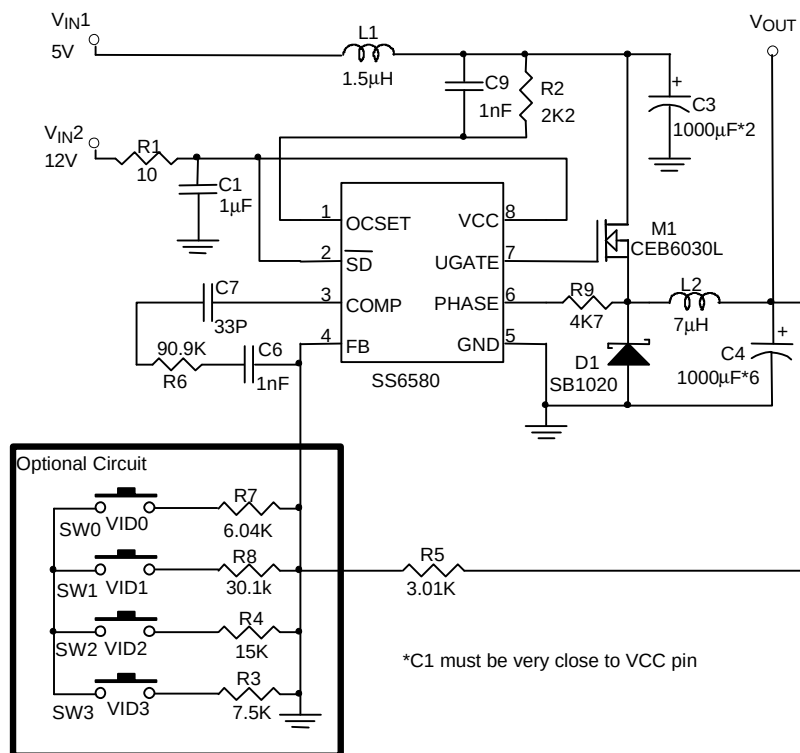


*SS6580: 2.00V
SS6580L: 1.30V

Example: SS6580CSTR

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

TYPICAL APPLICATION CIRCUIT



Supply DC-DC Step Down 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 (VCC=12V, T_A=25°C, unless otherwise specified.)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
VCC Supply Current						
Nominal Supply	UGATE Open	I _{VCC}		2		mA
Power-On Reset						
V _{CC} Threshold	V _{OCSET} =4.5V			9.5		V
Oscillator						
Frequency				200		KHz
Duty Cycle				88		%
Internal Reference Voltage						
Reference Voltage	SS6580 SS6580L		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	Comp=10pF	SR		6		V/μS
Gate Driver						
Upper Gate Source		R _{UGATE}		7		Ω
Upper Gate Sink		R _{UGATE}		5		Ω
Protection						
OCSET Current Source	V _{OCSET} =4.5VDC	I _{OCSET}		200		μA
SS Current		I _{SS}		10		μA
Shutdown						
Shutdown Low Input		V _{INL}		0.35		V
Shutdown High Input		V _{INH}	2			V
Shutdown Mode Current				1		μA

TYPICAL PERFORMANCE CHARACTERISTICS

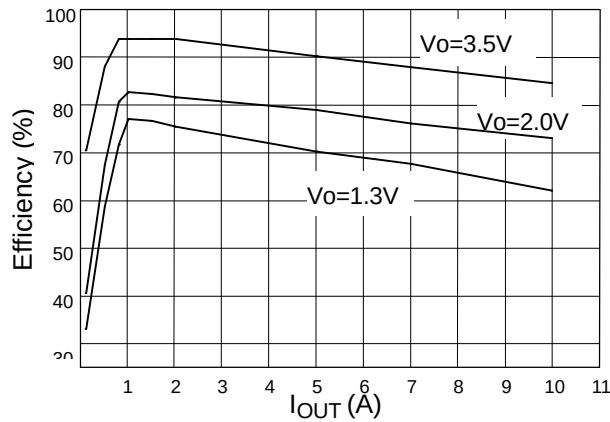


Fig. 1 Efficiency vs. Load Current

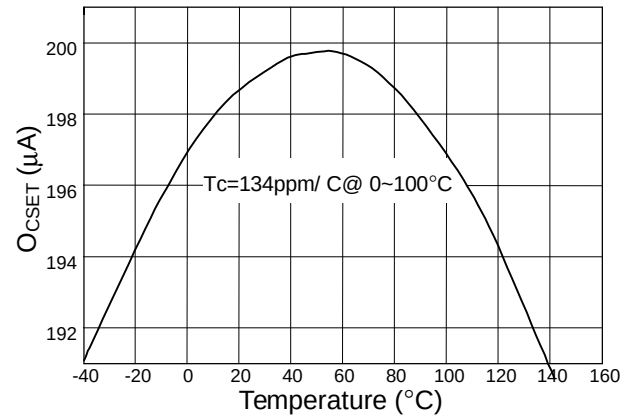


Fig. 2 OCSET Current vs. Temperature

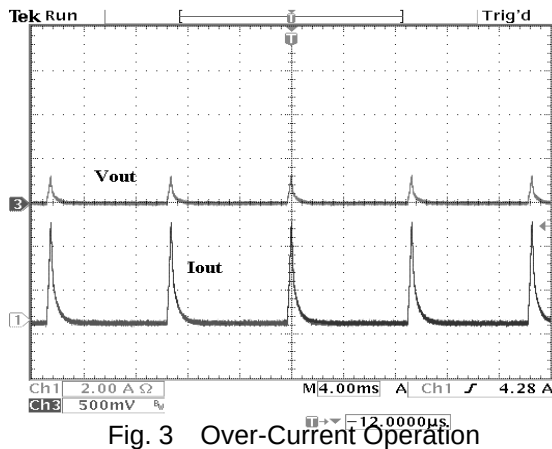


Fig. 3 Over-Current Operation

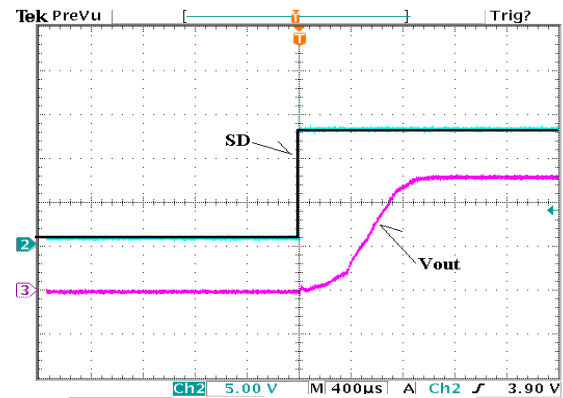


Fig. 4 Output Clamped by Built-In Soft Start

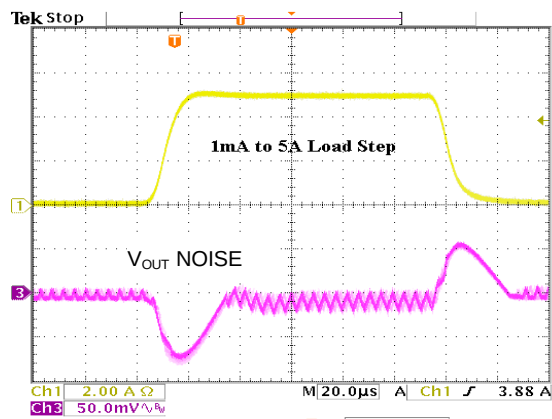
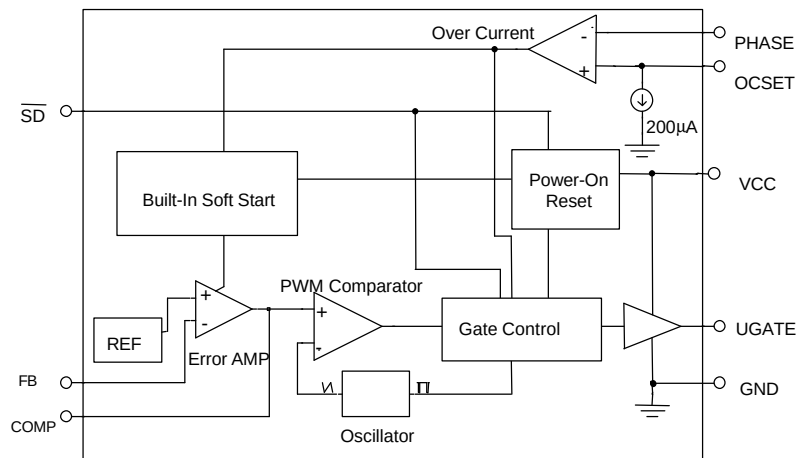


Fig. 5 Transient Response

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 over-current trip point according to the following equation:

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

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

PIN 2: $\overline{SD}$ - Shutdown pin. Connect this pin to ground for shutdown.

PIN 3: COMP - External compensation pin. This pin is connected to the error amplifier output and PWM comparator. An RC network is

connected to the 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.

PIN 5: GND - Ground pin.

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

PIN 7: UGATE - External MOSFET gate drive pin. Connect this pin to the gate of the external MOSFET.

PIN 8: VCC - The chip power supply pin. Recommended supply voltage is 12V.

■ APPLICATION CIRCUIT

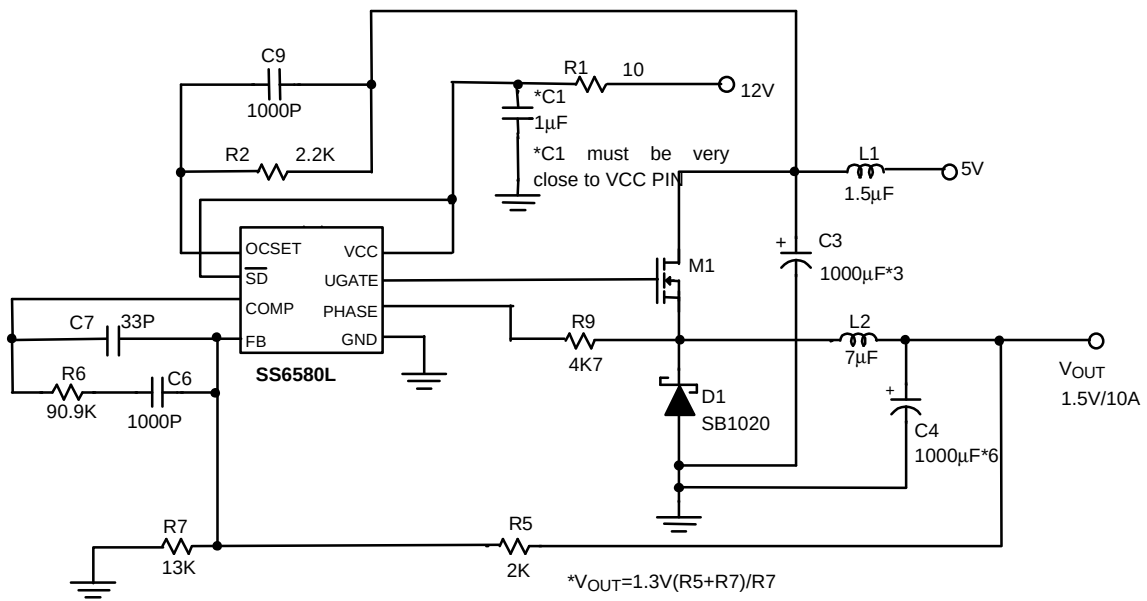
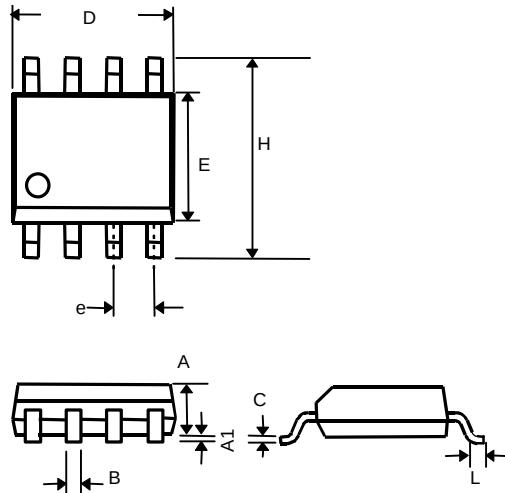


Fig. 6 DC/DC Step Down Circuit

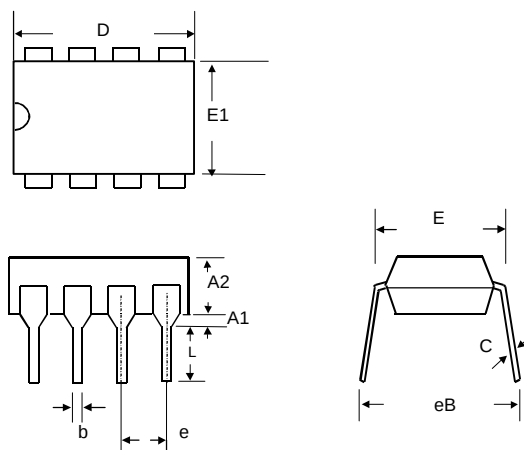
PHYSICAL DIMENSIONS

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

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