Wide Input Voltage Range 10mA Ultra-Low Iq

High PSRR Linear Regulator SSP7785

General Description

The SSP7785 is a high−performance linear regulator, offering a very wide operating input voltage range of up to 450 VDC, with an output current of up to 10 mA. Ideal for high input voltage applications.

The SSP7785 family offers ±5% initial accuracy, extremely high−power supply rejection ratio and ultra−low quiescent current. The SSP7785 is optimized for high−voltage line and load transients, making this part ideal for harsh environment applications.

The SSP7785 is offered in fixed output voltage options 2.7V,3.3V and 5.0V.

ESOP-8

Features

- Wide Input Voltage Range:
  DC:Up to 450 V
  AC:85V to 260V(half−wave rectifier and 2.2μF capacitor)
- 10 mA Guaranteed Output Current
- Ultra Low Quiescent Current: Typ. 10μA (VOUT ≤ 5V)
- ±5% Accuracy Over Full Load, Line and Temperature Variations
- Ultra−high PSRR: 70dB at 60Hz, 90dB at 100kHz
- Stable with Ceramic Output Capacitor 22μF MLCC
- Thermal Shutdown and Current Limit Protection
- Available in Thermally Enhanced ESOP8 Package
- This is a Pb−Free Device

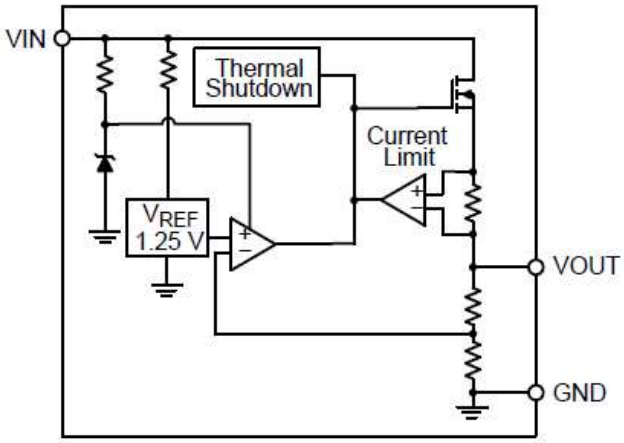
Applications

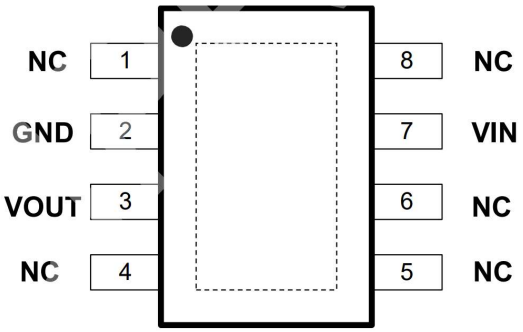
- Industrial Applications, Home Appliances
- Home Metering / Network Application
- Off-line Power Supplies

Order Information

Part No	Detectable Voltage	Package	Devices per reel
SSP7785-2.7V	2.7V	ESOP8	4000PCS
SSP7785-3.3V	3.3V		
SSP7785-5.0V	5.0V		

Block Diagram and Pin Arrangement Diagram





Pin Assignment

Pin No.	Pin Name	Description
1/4/5/6/8	NC	Not Connect.
2	GND	Ground connection.
3	VOUT	Regulator Output. Connect 22μF or larger MLCC capacitor from VOUT to GND.
7	VIN	Supply Voltage Input. Connect 2.2μF capacitor from VIN to GND.

Functional Description

The SSP7785 is a high−performance linear regulator, offering a very wide operating input voltage range.The SSP7785 family offers ±5% initial accuracy, extremely high−power supply rejection ratio and ultra−low quiescent current.The SSP7785 is offered in fixed output voltage options 2.7V,3.3Vand5.0V.

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage	VIN	-0.3~8.0	V
Output Voltage	VOUT	−0.3~8	V
Maximum Junction Temperature	TJ(MAX)	150	°C
Storage Temperature	TSTG	−55~150	°C
ESD Capability, HBM（All pins except HV pin no.1）	ESDHBM	2000	V
ESD Capability, Machine Model	ESDMM	200	V

Thermal Information

Parameter	Symbol	Value	Unit
Thermal Resistance (Junction-to-Air)	θ_{JA}	40	°C/W

Electrical Characteristics(Vout=2.7V)

−40°C ≤ TJ ≤ 85°C; VIN = 340V; IOUT = 100μA, CIN = 2.2μF, COUT = 22μF, unless otherwise noted. Typical values are at TJ = +25°C.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Input Voltage DC	VIN		50		450	V
Output Voltage Accuracy	VOUT	TJ=25°C, Iout=100μA, 50V≤Vin≤450V	2.5785	2.7	2.8215	V
	VOUT	−40°C≤TJ≤85°C, Iout=100μA, 50V≤Vin≤450 V	2.565	2.7	2.835	V
Line Regulation	RegLINE	50V≤Vin≤450V, Iout=100μA	−0.5	0.1	+0.5	%/V
Load Regulation	RegLOAD	100μA≤ IOUT≤10mA, Vin=50V	−1.0	0.66	+1.0	%
Maximum Output Current	IOUT	50V≤Vin≤450V	10.5			mA
Quiescent Current	IQ	IOUT=0, 50V≤Vin≤450V		16	25	μA
Ground Current	IGND	50V≤Vin≤450V, 0<IOUT≤10mA			28	μA
Power Supply Rejection Ratio	PSRR	Vin=340VDC+1 Vpp modulation, Iout=100μA, f = 1kHz		70		dB
Noise	VNOISE	f=100Hz to 100kHz Vin=340VDC, Iout=100μA		420		μVrms
Thermal Shutdown Temperature	TSD	Temperature increasing from TJ = +25°C		145		°C
Thermal Shutdown Hysteresis	TSDH	Temperature falling from TSD	–	10	–	°C

Electrical Characteristics(Vout=3.3V)

−40°C ≤ TJ ≤ 85°C; VIN = 340V; IOUT = 100μA, CIN = 2.2μF, COUT = 22μF, unless otherwise noted. Typical values are at TJ = +25°C.

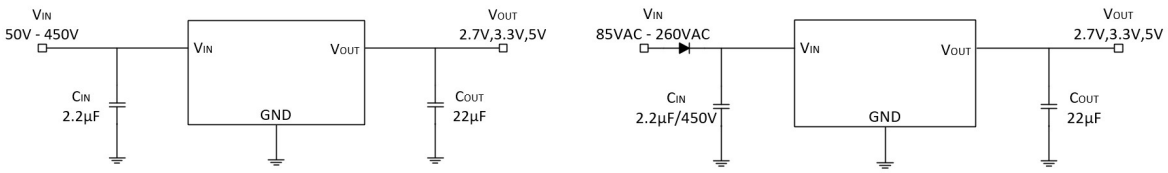
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Input Voltage DC	VIN		50		450	V
Output Voltage Accuracy	VOUT	TJ=25°C, Iout=100μA, 50V≤Vin≤450V	3.1515	3.3	3.4485	V
	VOUT	−40°C≤TJ≤85°C, Iout=100μA, 50V≤Vin≤450 V	3.135	3.3	3.465	V
Line Regulation	RegLINE	50V≤Vin≤450V, Iout=100μA	−0.5	0.2	+0.5	%/V
Load Regulation	RegLOAD	100μA≤ IOUT≤10mA, Vin=50V	−1.0	0.6	+1.0	%
Maximum Output Current	IOUT	50V≤Vin≤450V	10.5			mA
Quiescent Current	IQ	IOUT=0, 50V≤Vin≤450V		16	25	μA
Ground Current	IGND	50V≤Vin≤450V, 0<IOUT≤10mA			28	μA
Power Supply Rejection Ratio	PSRR	Vin=340VDC+1 Vpp modulation, Iout=100μA, f = 1kHz		70		dB
Noise	VNOISE	f=100Hz to 100kHz Vin=340VDC, Iout=100μA		420		μVrms
Thermal Shutdown Temperature	TSD	Temperature increasing from TJ = +25°C		145		°C
Thermal Shutdown Hysteresis	TSDH	Temperature falling from TSD	–	10	–	°C

Electrical Characteristics(Vout=5V)

−40°C ≤ TJ ≤ 85°C; VIN = 340 V; IOUT = 100μA, CIN = 2.2μF, COUT = 22μF, unless otherwise noted. Typical values are at TJ = +25°C.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Input Voltage DC	VIN		50		450	V
Output Voltage Accuracy	VOUT	TJ=25°C, Iout=100μA, 50V≤Vin≤450V	4.775	5.0	5.225	V
	VOUT	−40°C≤TJ≤85°C, Iout=100μA, 50V≤Vin≤450 V	4.75	5.0	5.25	V
Line Regulation	RegLINE	50V≤Vin≤450V, Iout=100μA	−0.5	0.2	+0.5	%/V
Load Regulation	RegLOAD	100μA≤ IOUT≤10mA, Vin=50V	−1.0	0.66	+1.0	%
Maximum Output Current	IOUT	50V≤Vin≤450V	10.5			mA
Quiescent Current	IQ	IOUT=0, 50V≤Vin≤450V		16	25	μA
Ground Current	IGND	50V≤Vin≤450V, 0<IOUT≤10mA			28	μA
Power Supply Rejection Ratio	PSRR	Vin=340VDC+1 Vpp modulation, Iout=100μA, f = 1kHz		70		dB
Noise	VNOISE	f=100Hz to 100kHz Vin=340VDC, Iout=100μA		300		μVrms
Thermal Shutdown Temperature	TSD	Temperature increasing from TJ=+25°C		145		°C
Thermal Shutdown Hysteresis	TSDH	Temperature falling from TSD	–	10	–	°C

Application Circuits



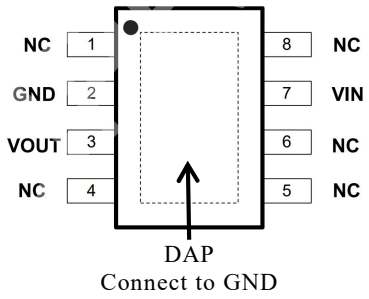
Input Decoupling (C1)

A 1µF capacitor either ceramic or electrolytic is recommended and should be connected close to the input pin of SSP7785. Higher value 2.2 µF is necessary to sustain the required minimum input voltage at full load for AC voltage as low as 85 V with half wave rectifier.

Output Decoupling (C2)

The SSP7785 Regulator does not require any specific Equivalent Series Resistance (ESR). Thus capacitors exhibiting ESRs ranging from a few mΩ up to 0.5Ω can be used safely. The minimum decoupling value is 22 µF. The regulator accepts ceramic chip capacitors as well as tantalum devices or low ESR electrolytic capacitors. Larger values improve noise rejection and load transient response.

Layout Recommendations



The DAP is used as a thermal connection to remove heat from the device to an external heat-sink in the form of the copper area on the printed circuit board. The DAP is physically connected to backside of the die, but is not internally connected to device ground. The DAP should be soldered to the Ground Plane copper.

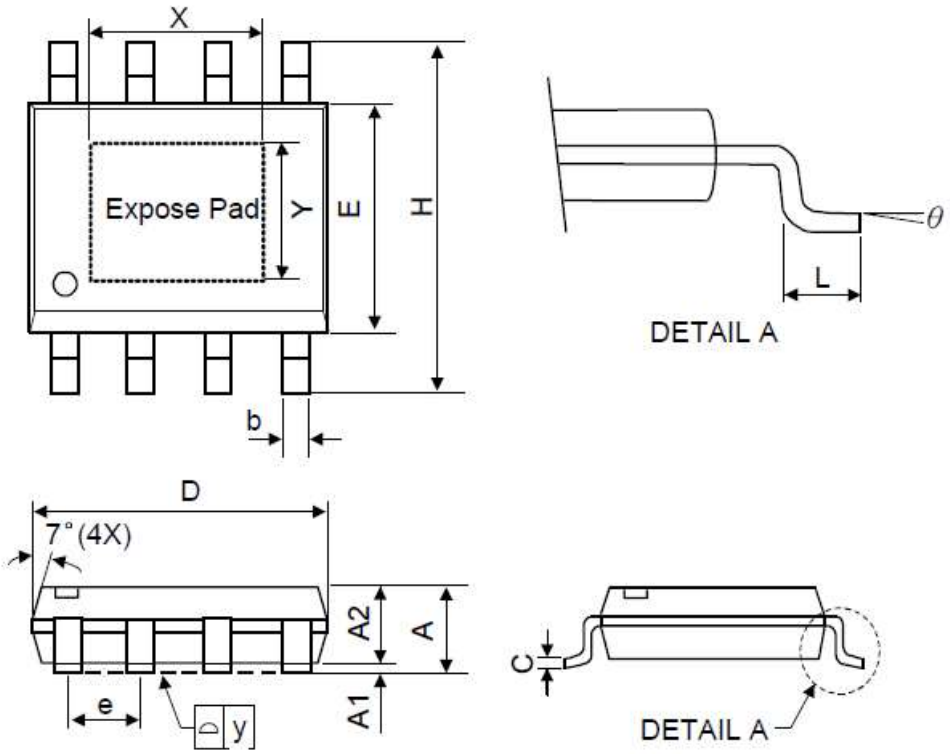
Please be sure the VIN and GND lines are sufficiently wide. When the impedance of these lines is high, there is a chance to pick up noise or to cause the malfunction of regulator.

Set external components, especially the output capacitor, as close as possible to the circuit, and make leads as short as possible.

Thermal

As power across the SSP7785 increases, it might become necessary to provide some thermal relief. The maximum power dissipation supported by the device is dependent upon board design layout and used package. Mounting pad configuration on the PCB, the board material, and also the ambient temperature affect the rate of temperature rise for the part. This is stating that when the SSP7785 has good thermal conductivity through the PCB, the junction temperature will be relatively low with high power dissipation applications.

Package Information（ESOP8）



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.75	-	-	0.069
A1	0.00		0.15	0.00	-	0.06
A2	1.25	-	-	0.049	-	-
C	0.1	0.2	0.25	0.0075	0.008	0.01
D	4.7	4.9	5.1	0.185	0.193	0.2
E	3.7	3.9	4.1	0.146	0.154	0.161
H	5.8	6	6.2	0.228	0.236	0.244
L	0.4	-	1.27	0.015	-	0.05
b	0.31	0.41	0.51	0.012	0.016	0.02
e	1.27BSC			0.050BSC		
y	-	-	0.1	-	-	0.004
X	-	2.34	-	-	0.092	-
Y	-	2.34	-	-	0.092	-
θ	0°	-	8°	0°	-	8°

Special Instructions

The company reserves the right of final interpretation of this specification.

Version Change Description

Version：V1.1 Author：Yangyang Time：2021.9.28

Modify the record：

1. Re-typesetting the manual and checking some data