

1.5A Constant Voltage and Constant Current Buck with Cable Resistance Compensation

GENERAL DESCRIPTION

The PT1115 is a low cost, high efficiency pulse-width modulated (PWM) switching mode buck converter with both constant voltage (CV) and constant current (CC) functions. The input voltage of PT1115 can be as high as 35V at which the over-voltage protection is triggered. The Vin pin is capable of sustaining 48V that further improves the reliability of the PT1115 under the conditions of hot swap and surging voltages. In the CC mode, the output current variation is less than $\pm 4\%$ of the nominal value which can be set up to 1.5A by the current sensing resistor. In the CV mode, the feedback voltage is controlled within $\pm 2\%$. In the PT1115, output cable wire resistance compensation, is implemented to offset up to 600mV voltage drop along the cable. The amount of compensation can be programmed by an external resistor based on the cable resistance.

The PT1115 based system can achieve better EMI performance because of spread spectrum. The PT1115 provides protections of over-voltage, under-voltage lockout, short-ground, peak current limit, and over-temperature shutdown to guarantee safe applications under extreme conditions.

The PT1115 is available in a SOP-8 package

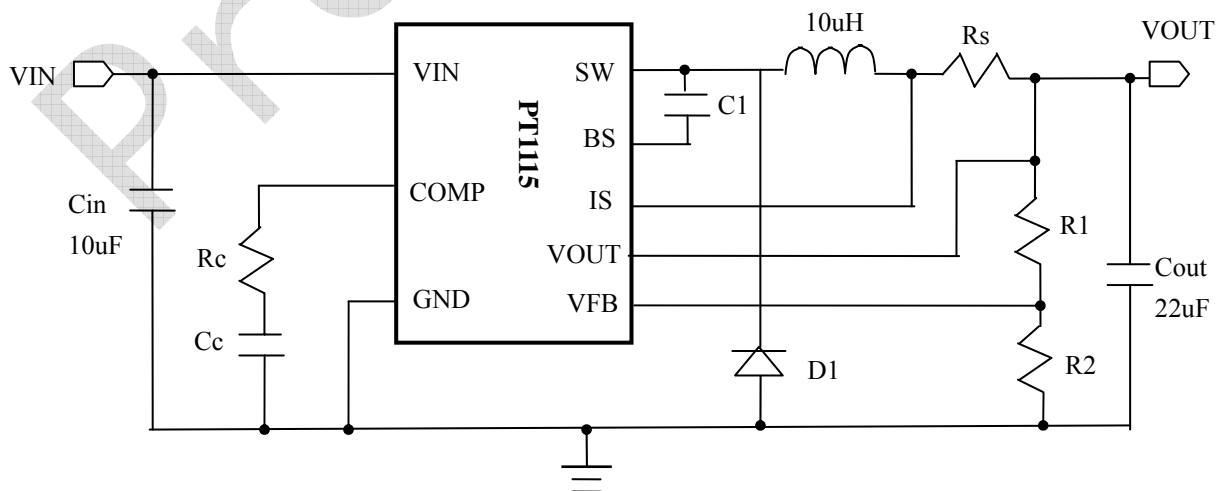
FEATURES

- 7.2~35V operating input voltage range
- 700 kHz fixed switching frequency.
- PWM control
- $\pm 4\%$ output current accuracy in the CC mode
- 0.5~1.5A output current set by a small current sensing resistor
- $\pm 2\%$ feedback voltage accuracy in the CV mode
- Cable wire resistance compensation.
- Input and output over voltage protection (OVP)
- Short-ground protection
- Cycle-by-cycle switching peak current limit
- Soft start for power-up
- 150°C over temperature shutdown
- under-voltage lockout (UVLO)
- Frequency dithering to reduce EMI
- 100mW no load power consumption
- SOP-8 package

APPLICATIONS

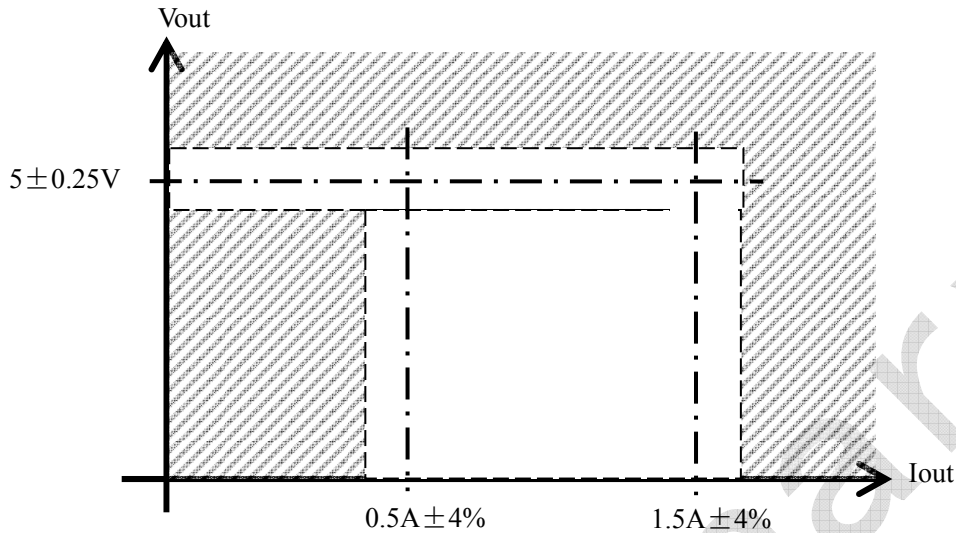
- Automobile chargers
- Step-down DC/DC conversion
- LCD TVs
- Larger current battery charging adaptors

TYPICAL APPLICATION CIRCUIT

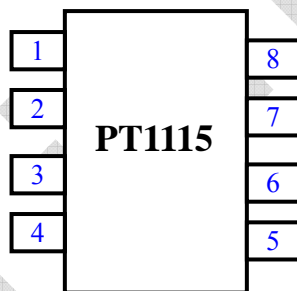


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OUTPUT V-I CURVE



PIN ASSIGNMENT



SOP-8 Top View

PIN DESCRIPTIONS

SOP-8	PIN NAME	DESCRIPTION
1	VIN	Input voltage
2	GND	Ground
3	COMP	External compensation resistor and capacitor
4	VFB	Feedback voltage
5	VOUT	Connect to output voltage
6	IS	Connect positive terminal of current sensing resistor
7	BS	Connect an external capacitor to sw for high side driver's power and cable compensation
8	SW	Power switch connect to inductor

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ABSOLUTE MAXIMUM RATINGS (Note 1)

SYMBOL	ITEMS	VALUE	UNIT
BS, IS, VOUT, VIN	Supply Voltage	-0.3~48	V
VFB COMP	I/O Pin	-0.3~7	V
SW	Power Switch	-0.3~48	V
I _{sw}	Switch Output Current	3.0	A
T _{J(MAX)}	Junction Temperature Range	-40~125	°C
T _{STG}	Storage Temperature	-65 to 150	°C
T _{Solder}	Lead temperature (Soldering)	260°C, 10s	

RECOMMENDED OPERATING RANGE

SYMBOL	ITEMS	VALUE	UNIT
V _{IN}	Supply Voltage	+7.2 ~ +35	V
SW	Power Switch	0~35	V
T _A	Operating Ambient Temperature Range	-40 to +70	°C
	ESD Susceptibility (Note 2)	2	kV
P _{TR1}	Package Thermal Resistance, SOP-8 θ _{JA}	120	°C/W

Note 1: Absolute Maximum ratings are threshold limit values that must not be exceeded even for an instant under any conditions. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation below these limits. Recommended Operating Range indicates conditions for which the device is functional, but do not guarantee specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Range. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

Note 2: Human body model, 100pF discharged through a 1.5kΩ resistor.

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ELECTRICAL CHARACTERISTICS (Note 3)

See the Typical Application Circuit, the following specifications apply for $V_{IN}=12V$, $V_{out}=5V$, $T_A=25^\circ C$, unless otherwise specified.

SYMBOL	ITEMS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{FB}	Output Feedback Voltage		0.98	1.0	1.02	V
ΔV_{OUT}	Output ripple voltage				80	mVp-p
V_{OVPH}	Vin over voltage protection triggering threshold	V_{IN} rising		38		V
V_{OVPL}	Vin over voltage protection releasing threshold	V_{IN} dropping	35	36		V
V_{UVLOL}	Vin UVLO locking voltage	V_{IN} dropping		6.5		V
V_{UVLOH}	Vin UVLO releasing voltage	V_{IN} rising		7.0	7.2	V
t_{UVLO}	Delay time of UVLO	V_{IN} dropping, $F_{SW}=150kHz$		0.5		ms
ΔV_{LNE}	V_{IN} line regulation	$V_{in} = 12\sim 28V$		0.2	0.5	%
ΔV_{LOAD}	V_{OUT} load regulation	$I_{out}=50mA\sim 400mA$ (I_{out})set=500mA, (Note 4)		0.2	0.5	%
$P_{NO LD}$	No load power dissipation	$I_{out} = 0$, $V_{in} = 12\sim 35V$		100		mW
ΔV_{Temp}	V_{OUT} temperature coef.	$I_{out} = 50mA$ Temp = $-40^\circ C \sim 70^\circ C$		100		ppm/ $^\circ C$
V_{CS}	Current sensing voltage	In CC mode, $V_{out} > 2.0V$	192	200	208	mV
F_{SW}	Switching frequency		800	700	600	kHz
I_{LIMIT}	Switch Peak Current Limit	$R_S=0.135\ ohm$	2.0	2.5	3.0	A
T_{START}	Power on soft start time			500		us
T_{SD}	Thermal shutdown temperature			150		$^\circ C$
ΔT_{SD}	T_{SD} Hysteresis			20		$^\circ C$

Note 3: Datasheet specifications with min/max limits are guaranteed by design, test, or statistical analysis.

Note 4: The constant current is set by the sensing resistor, $(I_{out})_{set} = 200mV/R_s$.

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APPLICATION INTRODUCTION

1. cable compensation

In the PT1115, output cable wire resistance compensation, is implemented to offset up to 600mV voltage drop along the cable. The amount of compensation can be programmed by an external resistor based on the cable resistance.

(1) when constant voltage (CV mode)

$C_{bs}=10\text{nf}$, no cable compensation,

$$\text{Output_Voltage} = V_{out,typ}$$

$C1=47\text{nf}$,

$$\text{Output_Voltage} = V_{out,typ} + 1 \cdot (V_{is} - V_{out})$$

$C1=100\text{nf}$,

$$\text{Output_Voltage} = V_{out,typ} + 2 \cdot (V_{is} - V_{out})$$

$C1=220\text{nf}$,

$$\text{Output_Voltage} = V_{out,typ} + 3 \cdot (V_{is} - V_{out})$$

$$V_{out,typ} = 5V ,$$

(2) when constant current (CC mode)

$$V_{is} - V_{out} \approx 0.2V , \text{ when CC change to}$$

CV, output voltage is

$C1=10\text{nf}$, no cable compensation,

$$\text{Output_Voltage} = V_{out,typ}$$

$C1=47\text{nf}$,

$$\text{Output_Voltage} = V_{out,typ} + 1 * 0.2$$

$C1=100\text{nf}$,

$$\text{Output_Voltage} = V_{out,typ} + 2 * 0.2$$

$C1=220\text{nf}$,

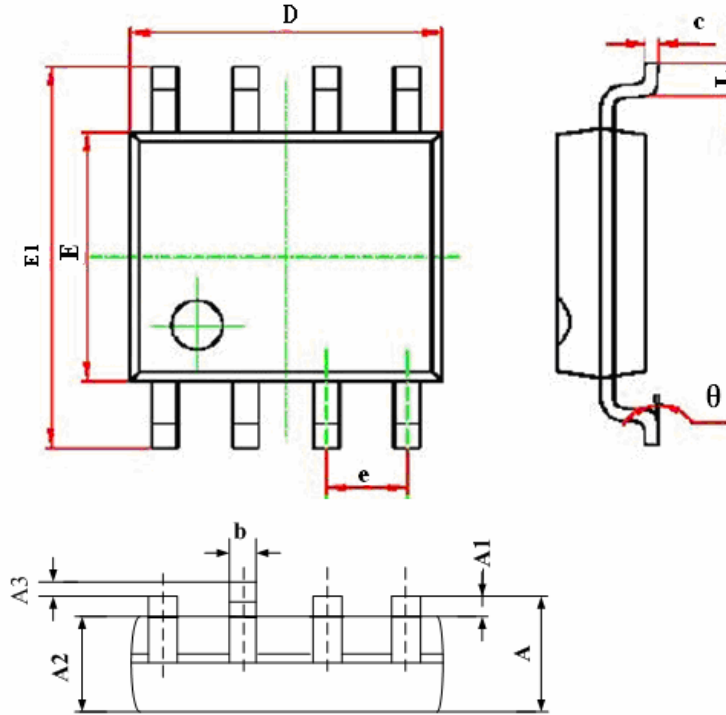
$$\text{Output_Voltage} = V_{out,typ} + 3 * 0.2$$

$C1$ is connected between bs and sw pins

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PACKAGE INFORMATION

SOP8 Package



SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCHES	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
A3	0.000	0.127	0.000	0.005
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050(BSC)	
L	0.400	1.270		
θ	0°	8°	0°	8°