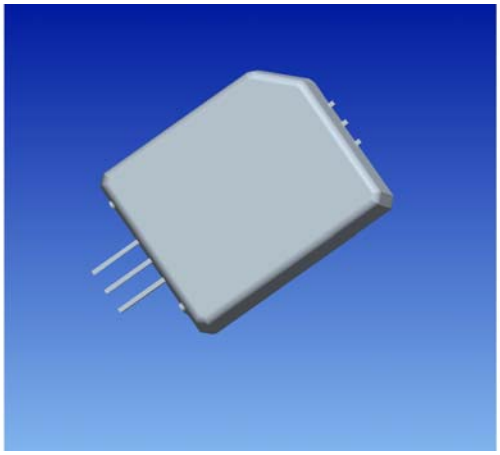
GS-R24P

1.8W TO 8W STEP-DOWN SWITCHING REGULATOR FAMILY

PRELIMINARY

FEATURE

- MTBF 1 000 000 hours (T_{amb}=25°C)
- 1.5A max output current
- 35V max input voltage
- 1.5V max drop-out voltage
- Remote logic inhibit/enable
- Not-latching overload and short circuit protection
- Thermal shutdown
- Fixed or adjustable output
- No heatsink required

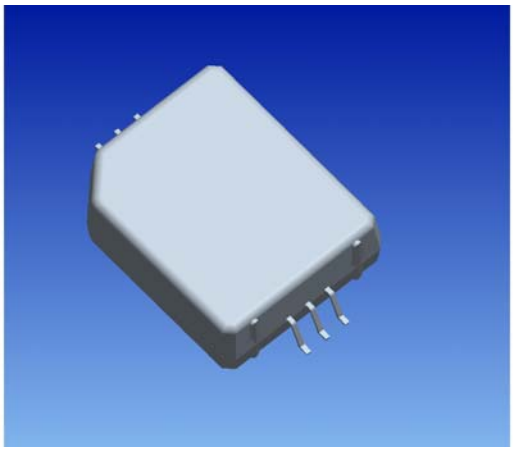


Packing type: V = vertical PTH

DESCRIPTION

The GS-R24P series is a family of high efficiency step down switching voltage regulator, designed to replace linear regulators.

Based on STM L5973 device, this non isolated family of regulators are suitable for the full spectrum of applications including telecom, industry, computer and distributed power system applications having a widely ranging input voltage.



Packing type: H = horizontal PTH
S = horizontal SMD

This is preliminary information on a new product now in development. Details are subject to change without notice.

SELECTION CHART

Type Ordering Number	Output Voltage [V]	Input Voltage [V]	Output Ripple [mVpp]	Efficiency [%]	Package (P)*	Notes
GS-R24(P)0181.5	1.8 ± 4%	16 ÷ 35	35	72	H-S-V	Fixed output voltage
GS-R24(P)0251.5	2.5 ± 4%	16 ÷ 35	35	76	H-S-V	Fixed output voltage
GS-R24(P)0331.5	3.3 ± 4%	16 ÷ 35	35	82	H-S-V	Fixed output voltage
GS-R24(P)0501.5	5.0 ± 4%	16 ÷ 35	35	85	H-S-V	Fixed output voltage
GS-R24(P)0001.5	1.235 ÷ 5.5	16 ÷ 35	50	68 ÷ 85	H-S	Progr. output voltage

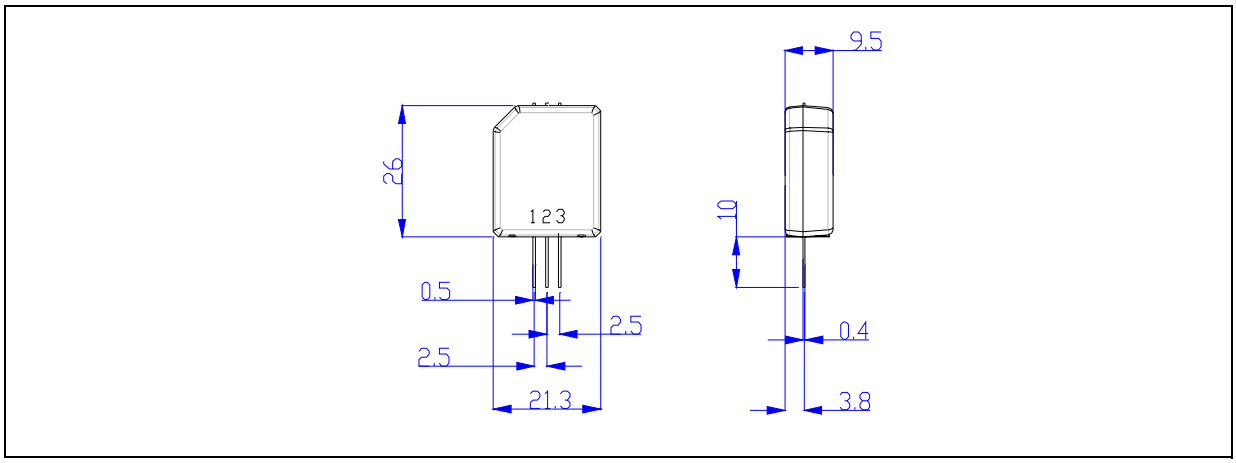
* Packing Legend (P)
H = horizontal through hole
S = horizontal SMD
V = vertical through hole

ABSOLUTE MAXIMUM RATINGS

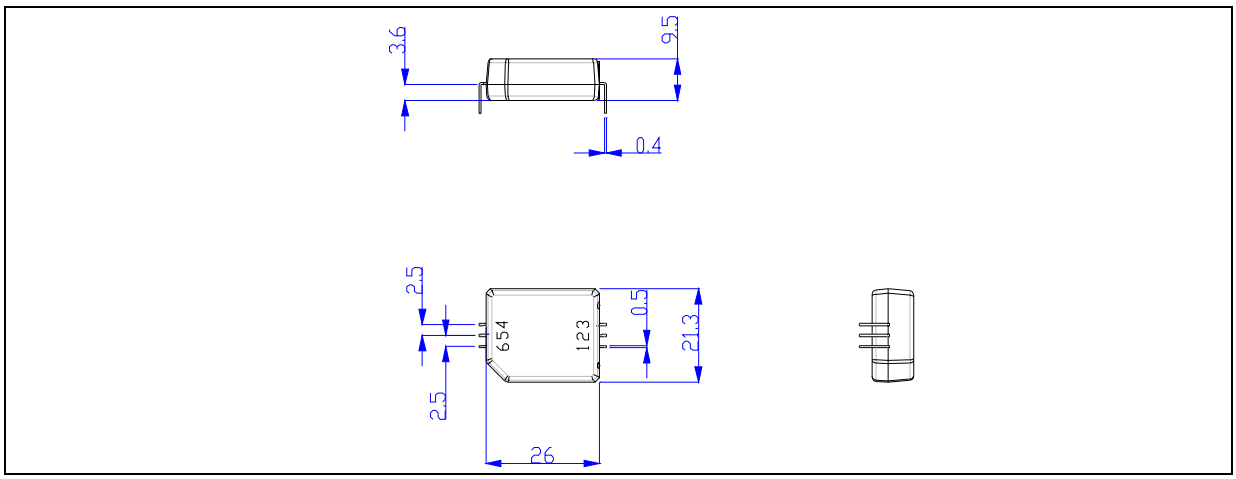
Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for GS-R24(P)XXX1.5)	36	V
I_{out}	Maximum Output Current	int. limit	
V_4	INH	-0.3 to V_i	V
V_6	FB	4	V
T_{stg}	Storage Temperature Range	-40 ÷ 105	°C
T_{op}	Operating Ambient Temperature	-25 ÷ 70	°C
T_{op1}	Operating Ambient Temperature with current derating	-25 ÷ 85	°C

CONNECTION DIAGRAM AND MECHANICAL DATA

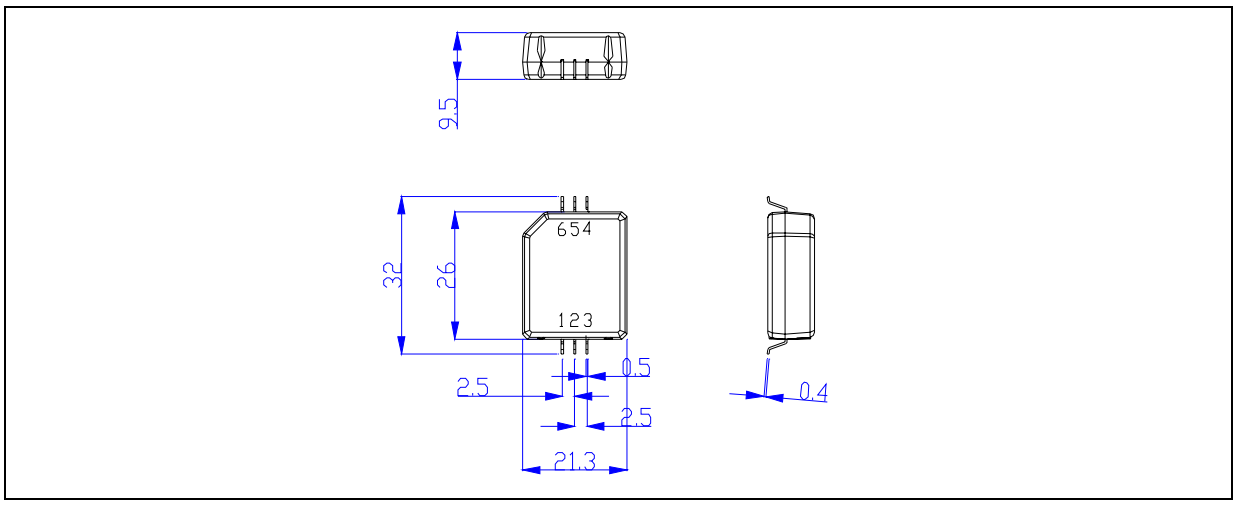
GS-R24Vxxx1.5



GS-R24Hxxx1.5



GS-R24Sxxx1.5



PIN DESCRIPTION

Pin	Function	Description
1	Input +	DC input voltage
2	Input/Output GND	Return for input/output voltage source
3	V_{out}	Regulated power output
4	INH	A logical level (active high) disables the device, when it is open an internal pull up disables the device
5	V_{out-c}	Regulated output point for additional compensation
6	FB	Feedback input, available on adjustable device and on request for additional compensation

ELECTRICAL CHARACTERISTICS All versions (T_{amb}=25°C, unless otherwise specified.)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_r	Ripple Voltage	V_i =24V I_o = 1.5A		35	50	mVpp
	Temperature Stability	V_i =V_o + 1.5V I_o = 1.5A				mV/°C
I_o	Output Current	V_i =16 ÷ 35V	0		1.5	A
I_{oL}	Current Limit	V_i =16 ÷ 35V		2.5	3.5	A
I_q	Quiescent Current	V_i =24V I_o = 0A		1.8	2.5	mA
f_s	Switching Frequency	V_i =24V I_o = 1.5A	225	250	275	kHz
SRV	Supply Voltage Rejection					mV/V
R_{th}	Thermal Resistance	Case to ambient				°C/W

ELECTRICAL CHARACTERISTICS for horizontal versions only (T_{amb}=25°C, unless otherwise specified.)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_{qst-by}	Total Stand-by Quiescent Current	V_{inh}>2.2V V_i = 35V		80	150	µA
INH	INH Threshold Voltage	Device ON			0.8	V
		Device OFF	2.2			V
V_{FB}	Feedback Voltage	V_i =16 ÷ 35V I_o = 0÷1.5A	1.22	1.235	1.25	V

USER NOTES

Input Voltage

The recommended operating maximum DC Input Voltage is 35V inclusive of ripple voltage.

Inhibit function

The inhibit feature allows to put in stand-by mode the device.

With INH pin 4 higher than 2.2V the device is disabled and the power consumption is reduced to less than 150µA for V_i = 35V.

With INH pin lower than 0.8V, the device is enabled.

If the INH pin is left floating, an internal pull up ensures that the voltage at the pin reaches the inhibit threshold and the device is disabled.

The pin is also V_i compatible.

Current protection

The device has two current limit protections, pulse by pulse and frequency fold back.

The current is sensed through a resistor and if reaches the threshold, the on time is reduced and consequently the output voltage too.

Since the minimum switch ON time (necessary to avoid false overcurrent signal) is not enough to obtain a sufficiently low duty cycle at 250 Hz, the output current, in strong overcurrent or short circuit conditions, could increase again.

For this reason the switching frequency is also reduced, so keeping the inductor current under its maximum threshold.

The frequency depends on the feedback voltage.

As the feedback voltage decreases (due to the reduced duty cycle), the switching frequency decrease too.

Thermal shutdown

The shutdown block generates a signal that turns off the power stage if the temperature of the internal chip goes higher than a fixed internal threshold (150 ºC).

The sensing element of the chip is very close to the PDMOS area, so ensuring an accurate and fast temperature detection.

An hysteresis of approximately 20ºC avoids that the devices turns on and off continuously.

Thermal Characteristics

Output voltage programming (GS-R24H(S)0001.5 only)

The GS-R24P output voltage is 5.54V ±4%, to reduce this value connect a resistor between pin 6 (FB) and pin 5 (V_{out-c}).

The resistor must be located very close to the proper pins, to minimize the injected noise (see figure 1).

The resistor value is calculated using the following formula:

$Rv=[(V_{out}-1.235)*11.3]/(5.54-V_{out})$ [kOhm]

V_{out} can be adjusted between 1.235V (Rv=0 Ohm) and 5.54V (Rv=open)

Loop compensation (GS-R24H(S)0001.5 only)

If required by particular load conditions, it is possible to change the feedback loop compensation, adding an external capacitor between pin 6 (FB) and pin 5 (V_{out-c}), which will act as speed up (see figure 2).

ADDITIONAL FEATURES AND PROTECTIONS

Feedback disconnection

In case of feedback disconnection, the duty cycle increases versus the maximum allowed value, bringing the output voltage close to the input supply.

THis condition could destroy the load.

To avoid this dangerous condition, the device is turned off if the internal feedback pin remains floating.

Output overvoltage protection

The overvoltage protection, OVP, is realized by using an internal comparator, which input is connected to the feedback, that turns off the power stage when the OVP threshold is reached.

This threshold is typically 30% higher than the feedback voltage.

Figure 1

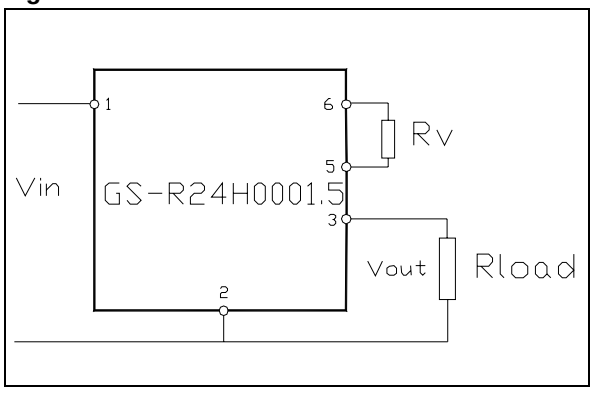
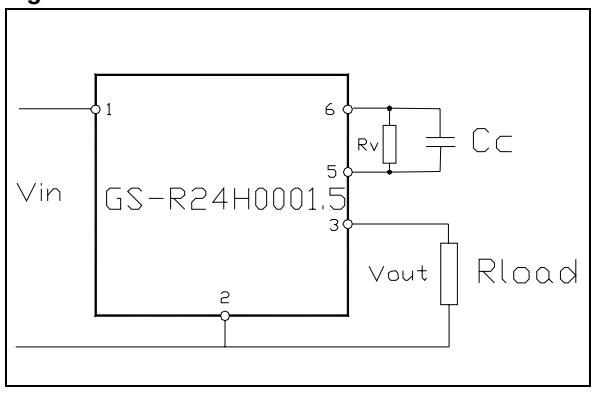


Figure 2



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