

SGHR5012S 40V-60V Input, 50W DC/DC converter Space application

Design

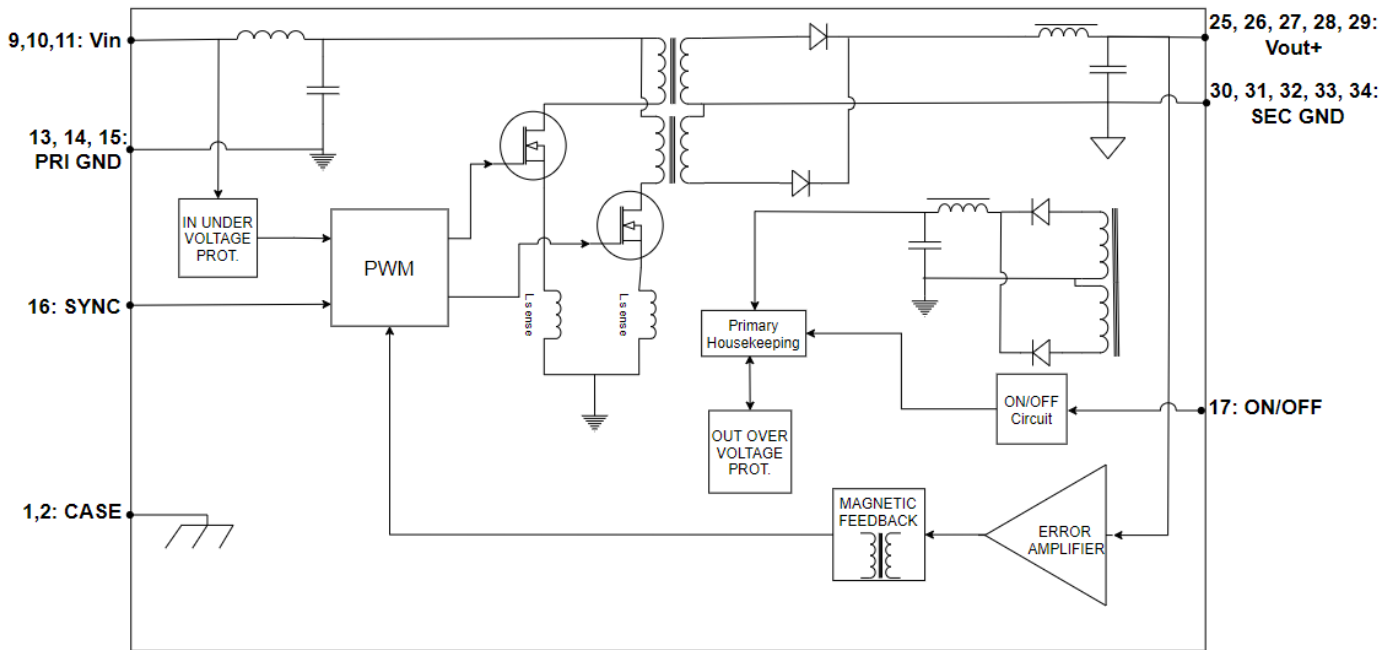
The **SGHR5012S** is a single output 12V / 50W DC/DC converter module designed and manufactured by Aerospace Power Group GmbH, and based on the space heritage (300 FM).

The design complies with ECSS-E-ST-20C and with the derating rules specified in ECSS-Q-ST-30-11C, up to a case temperature of 80°C (not operative MIL renege -55°C to 125°C), and the qualification and production screening and acceptance test meet the generic procurement requirements for hybrids ECSS-Q-ST-60-05C.

Features

- Overall efficiency 85%
- Input voltage 50V to 60V (Input fault tolerance up to 80V)
- Output 12V fixed (small external adjustment to voltage output is possible, in agreement with APG).
- Operational temperature range: -40°C +80°C case temperature (within derating rules ECSS-Q-ST-30-11C)
- Magnetic feedback
- External ON/OFF capability
- Protections:
 - Input under-voltage protection with hysteresis.
 - Output over-voltage protection (latching).
 - Input over-voltage protections (latching).
- Radiation tolerance (based on internal component qualification and analysis):
 - TID: 50krad or 100krad

Block diagram



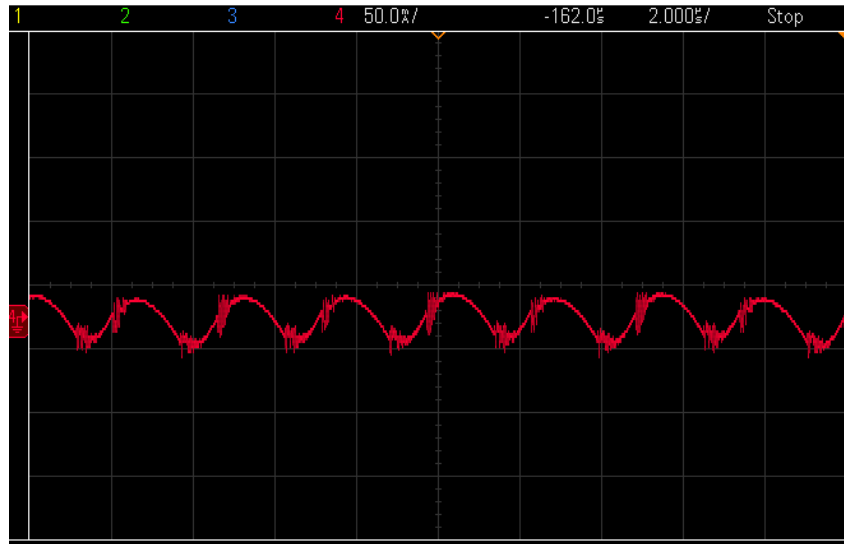
Electrical characteristics and performances

Performances in the range [-40°C; +80°C], input voltage 50V, full load (unless otherwise specified).

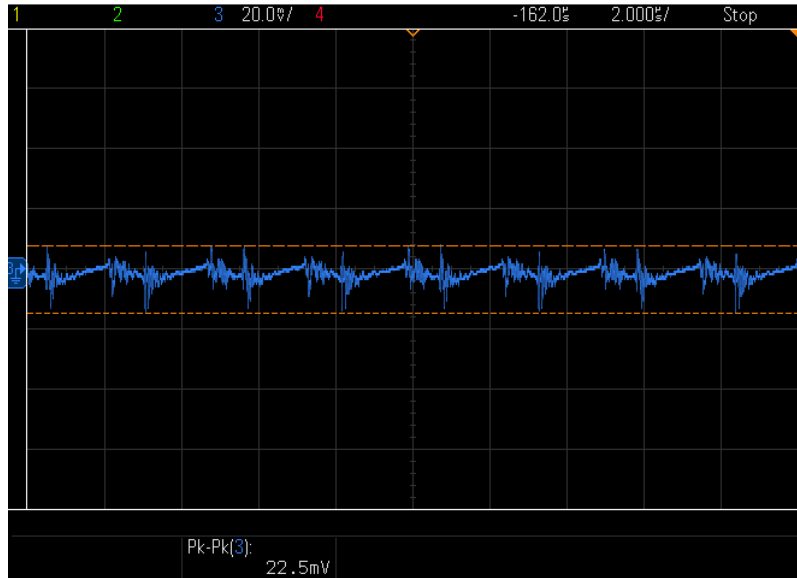
Parameter	Description	Min	Typ	Max	Unit
Input Section					
Operating input voltage	Continuous	40	50	60	V
Fault input voltage tolerance	Continuous	-	-	80	V
Under voltage lockout	Turn ON	-	-	36	V
	Turn OFF	-	-	35	V
Current Consumption	Inhibited	-	3	7	mA
	No Load	-	40	50	mA
Ripple current	Full load, 20Hz to 10Mhz	-	45	60	mApp

Parameter	Description	Min	Typ	Max	Unit
Output Section					
Output Voltage	T _{CASE} = 25°C	11.95	12.00	12.05	V
	T _{CASE} = -40°C ÷ +80°C	11.90	-	12.10	V
Power		-	-	50	W
Current	Output	0	-	4.17	A
Ripple voltage	Switching frequency	-	10	20	mVpp
Spikes	High frequency		25		mVpp
Line regulation	V _{IN} = 40V to 60V input	-	2	5	mV
Load regulation	No Load to Full Load	-	2	5	mV
Load step output transient	Half Load to Full Load	-	-	300	mV _{PK}
Load step recovery		-	0.5	-	msec
Start up output overshoot	0V to 50V	-	-	0	mV _{PK}
Start up delay	0V to 50V	-	20	25	msec
Functions					
Inhibit	OFF PIN 17 grounded to PRI_GND) (I _{sink} < 0.5mA)			1	V
	ON PIN 17 high impedance or > 9V		Left open (or >9V)		-
Overvoltage Protection	Activation above nominal output voltage (load output from 15W to 50W)			25	%
Other data					
Efficiency		-	85	87	%
Capacitive load		-	-	300	μF
Switching frequency	Without external synchronization	190	200	210	kHz

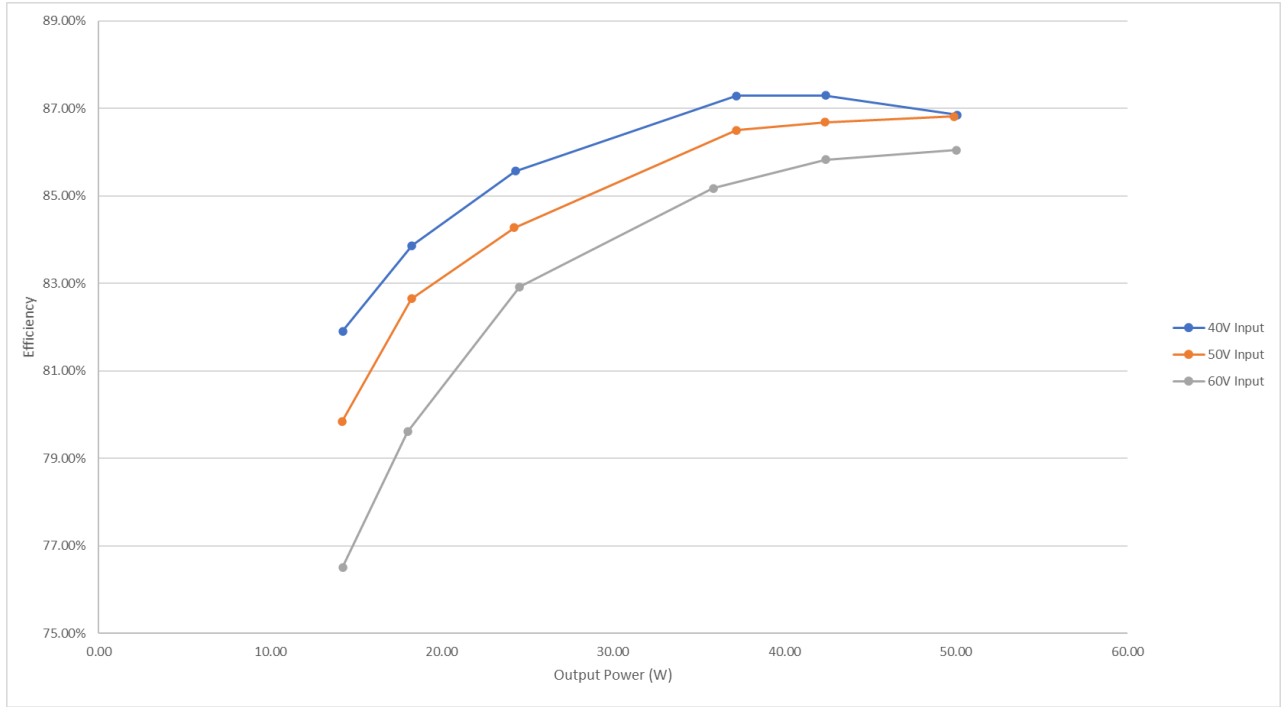
Parameter	Description	Min	Typ	Max	Unit
Clock frequency	Without external synchronization	380	400	420	kHz
Isolation (input to output)	500 V _{DC}	10	-	-	MΩ
Storage temperature		-55°C	-	125°C	°C
Soldering temperature		-	-	300	°C
Weight		-	-	215	g



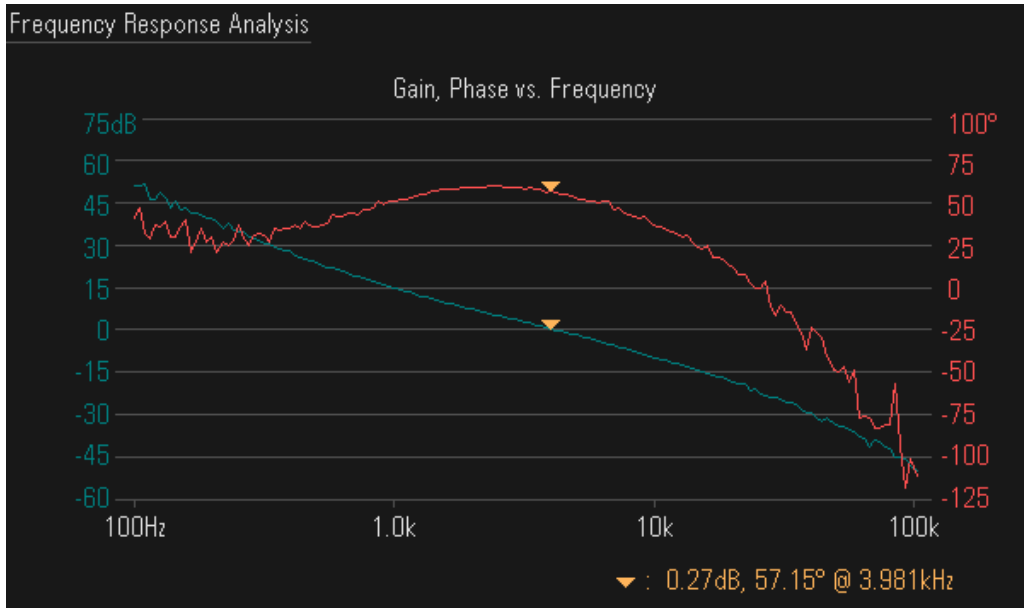
Typical input current ripple: 50V In; 50W Out



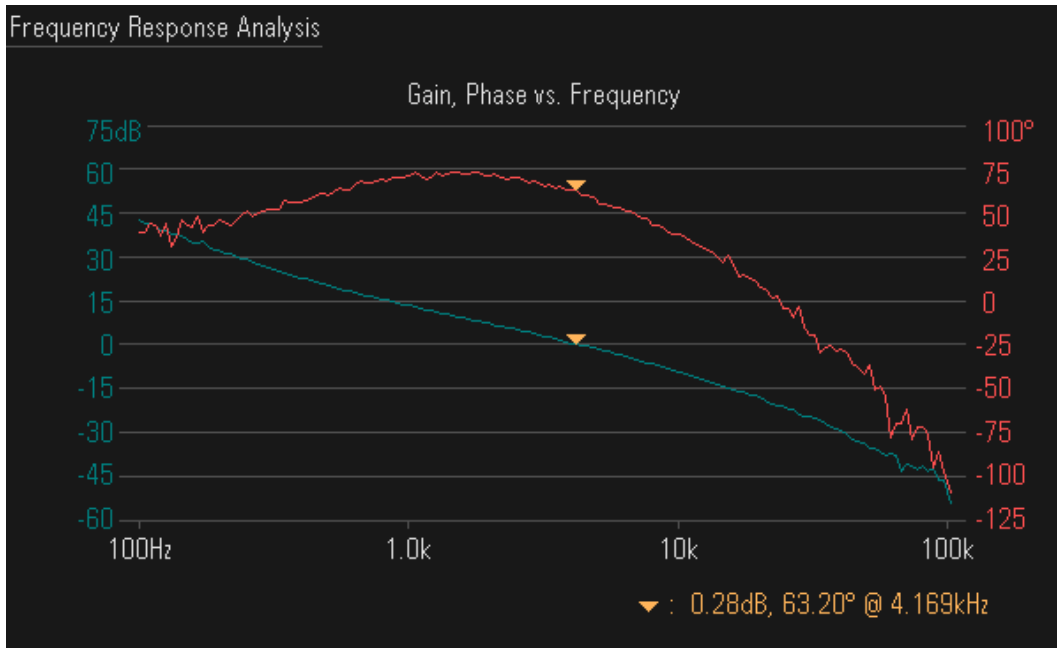
Typical output voltage ripple: 50V In; 50W Out



Efficiency single out 12V @ 25°C

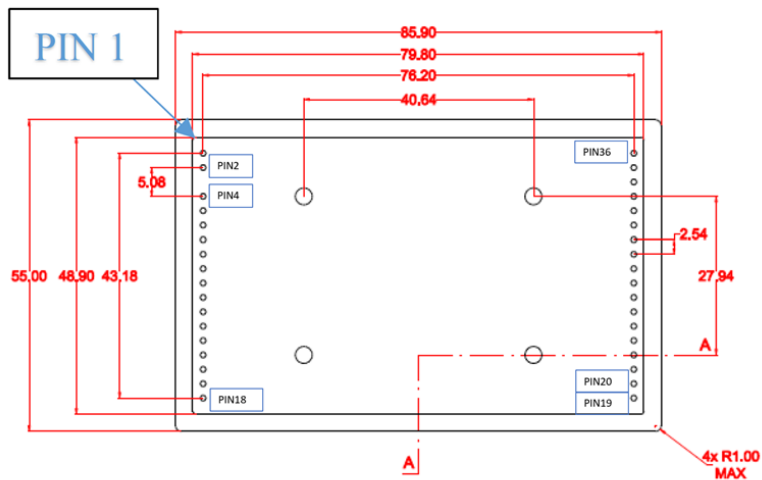
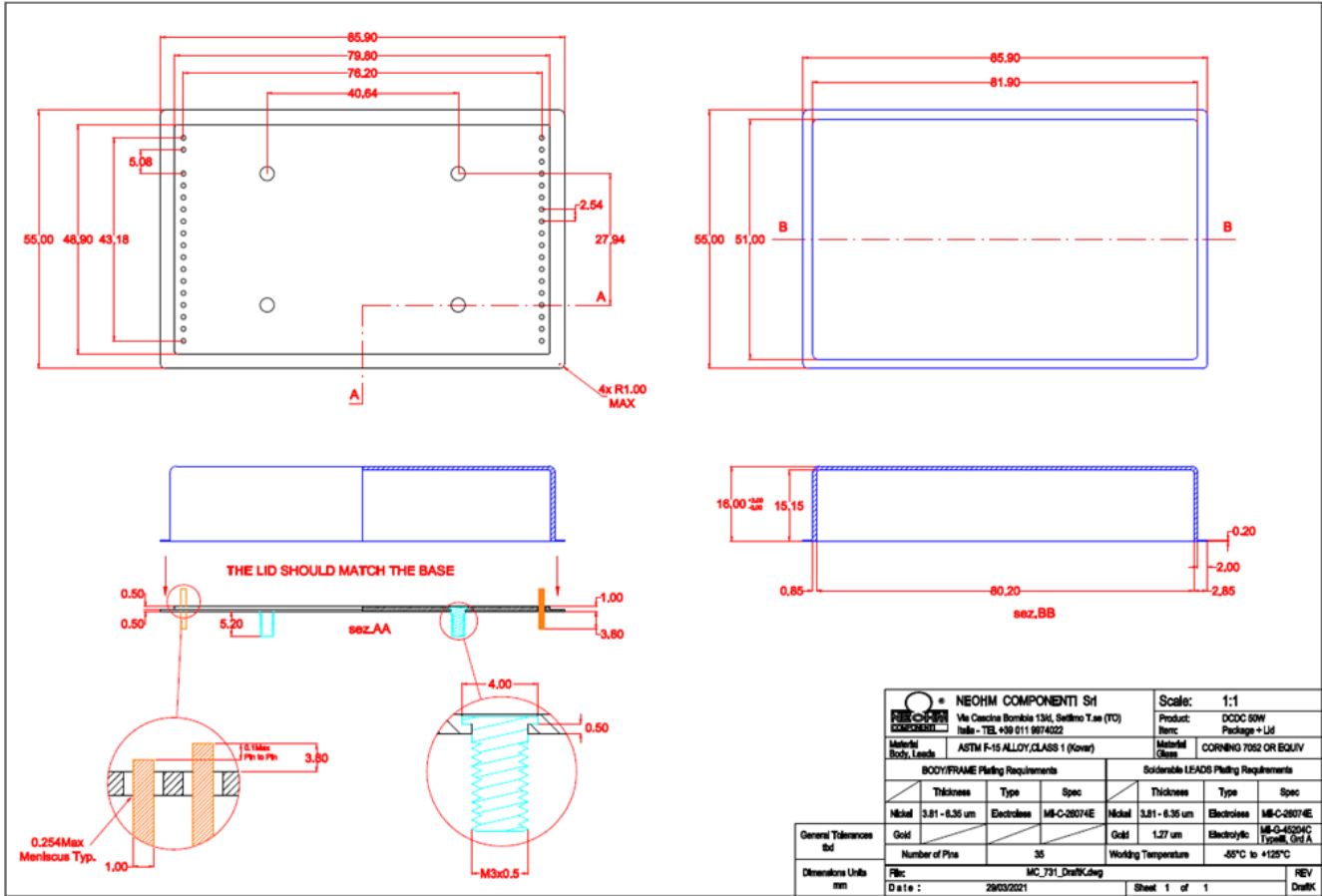


Stability: 50V In; 15W Out



Stability: 50V In; 50W Out

Case and pin out

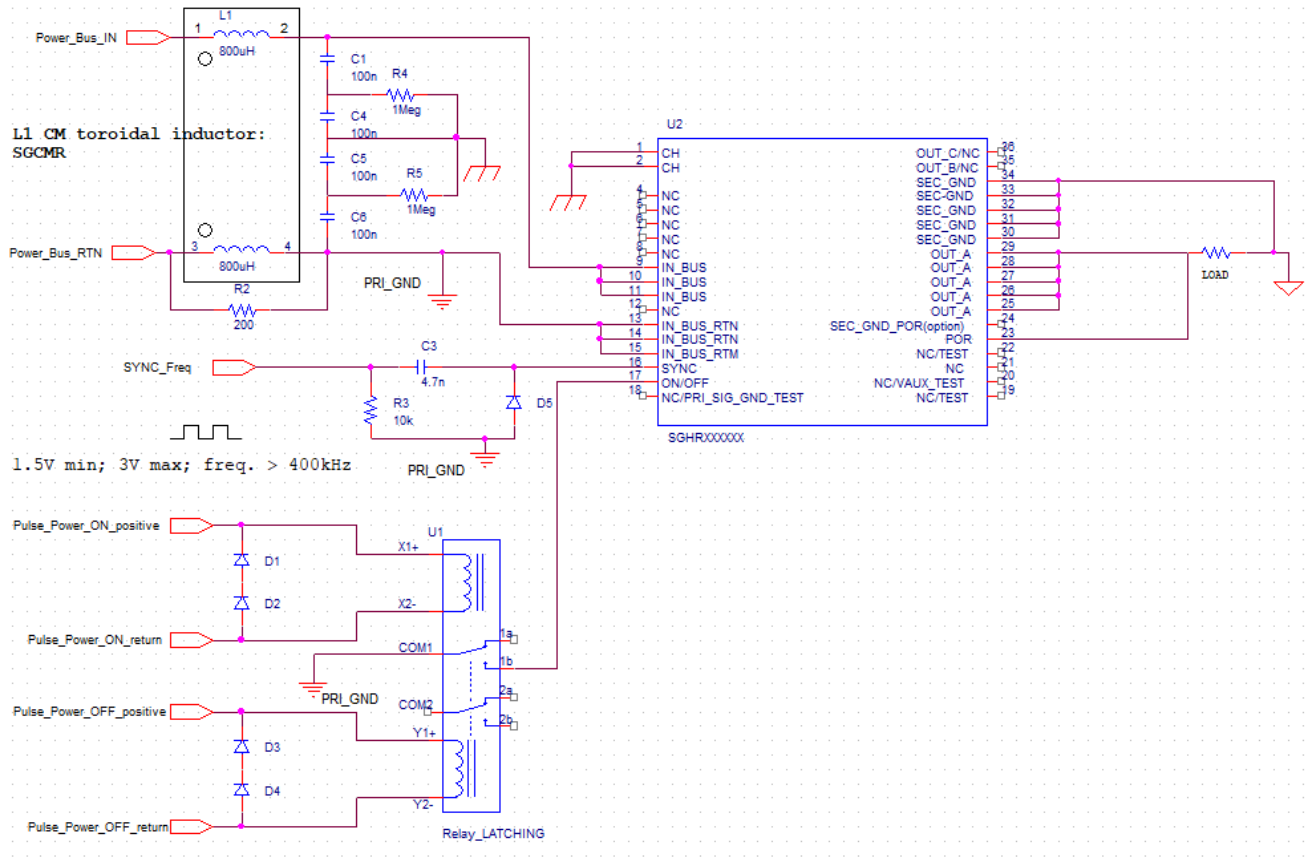


Pin number	Pin name	Description
1	CH	Chassis.
2	CH	Chassis.
4	NC	Do not connect.
5	NC	Do not connect.
6	NC	Do not connect.
7	NC	Do not connect.
8	NC	Do not connect.
9	IN_BUS	Power Bus Input.
10	IN_BUS	Power Bus Input.
11	IN_BUS	Power Bus Input.
12	NC	Do not connect.
13	IN_BUS_RTN	Power Bus Return.
14	IN_BUS_RTN	Power Bus Return.
15	IN_BUS_RTN	Power Bus Return.
16	SYNC	Synchronization input: signal amplitude shall be between 1.5V and 3.0V; Synchronization frequency shall be at least 10% higher than 400KHz ¹ (twice the switching frequency of the DC/DC).
17	ON/OFF	OFF < 1V (I _{sink} < 0.5mA) ON = high impedance or > 9V For isolated pulsed TC see the connection diagram in the section below.
18	NC/PRI_SIG_GND_TEST	Do not connect; control logic ground for APG manufacturing and acceptance testing.
19	NC/TEST	Do not connect; protection reference voltage for APG manufacturing and acceptance testing.
20	NC/VAUX_TEST	Do not connect; primary housekeeping voltage for APG manufacturing and acceptance testing; the VAUX voltage may be used by the customer previous agreement with APG technical experts.
21	NC	Do not connect.
22	NC/TEST	Do not connect; access point for APG manufacturing and acceptance stability test.
23	POR	Point of Regulation; shall be connected to OUT_A, separated from the main current path, directly on the load.
24	SEC_GND_POR (Option)/NC	Point of Regulation secondary ground; shall be connected to SEC_GND, separated from the main current path, directly on the load return. If the option is not present, do not connect.

¹ The 400KHZ corresponds to the internal oscillator frequency. If required by the customer, this frequency can be set to a lower value, to allow synchronization at lower frequency than 440kHz.

Pin number	Pin name	Description
25	OUT_A	Main regulated output.
26	OUT_A	Main regulated output.
27	OUT_A	Main regulated output.
28	OUT_A	Main regulated output.
29	OUT_A	Main regulated output.
30	SEC_GND	Secondary ground return (main current path).
31	SEC_GND	Secondary ground return (main current path).
32	SEC_GND	Secondary ground return (main current path).
33	SEC_GND	Secondary ground return (main current path).
34	SEC_GND	Secondary ground return (main current path).
35	OUT_B/NC	Second output; not connected in case of single output module.
36	OUT_C/NC	Third output; not connected in case of single or dual output module.

Connection diagram



Common mode inductor

The SGHR series has embedded differential mode filter; to complete the EMI filter, a common mode filter needs to be added as close as possible to the PCB input power connector.

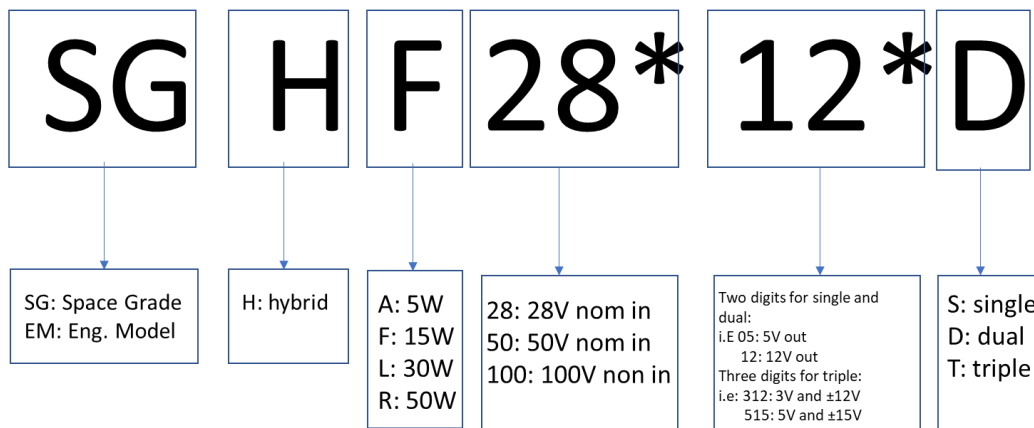
The Schematic of the common mode filter is shown in the connection diagram above.

The toroidal common mode inductor can be supplied by APG with the code **SGCMR**:

SGCMR	
Max external diameter	12.0 mm
Min internal diameter	1.5 mm
Max Height	7.2 mm
PIN 1, 2, 3, 4 wire diameter	0.6 mm
Max weight	3 g

Ordering Information

Part Number	Description
EMHR2805S	Engineering Model suitable for EM and EQM, 20V to 38V input, 50W single 5V output
SGHR2805S	Space grade radiation tolerant flight model, 20V to 38V input, 50W single 5V output



SG version available in version -50k: 50krad and -100k: 100krad.

For customization of the product (input voltage range, output voltages, etc.) please contact info@aerospacepg.com.

For reliability data please contact info@aerospacepg.com.