GFM DC-DC Converter

PRELIMINARY 8 TO 50 VOLT INPUT – 30 WATT – HIGH EFFICIENCY

MIL-STD Pedigree. Exceptional Value.

FEATURES

- Output trim +/-10%
- Up to 80 volt transient for up to 50 ms
- Fully isolated magnetic feedback
- Typical efficiency 90% or greater
- Up to 30 watts
- -40°C to +105°C operation
- Remote sense capability
- Indefinite short circuit protection
- Wide 8 to 50 volt input
- Inhibit and sync functions
- Assembled in a MIL-PRF-38534 certified facility

MODELS Output Voltage (V)
SINGLE
5
12
15

PERFORMANCE QUALIFICATION

Qualified to MIL-PRF-38534, Group C

- Temperature cycle -40- to +105°C 10 times
- Constant Acceleration to 3000 g
- Burn-in, 96 hours
- Final electrical
- Gross and fine leak hermeticity test
- Final visual

PACKAGING

- Hermetically sealed, nickel plated, steel case
- Compact footprint
- Typical case dimensions (see Figure 9 on page 8): 2.09 x 1.110 x 0.400 inches (53.09 x 28.19 x 10.16 mm)
- Weight: 55 grams max.

DESCRIPTION

Now, you don't need to compromise reliability to keep costs down. The GFM's innovative design combines the performance and efficiency you're looking for with Crane's legendary reliability and support. The GFM offers a high density footprint and is assembled in the same facility where Crane builds its ultra-reliable Class H and Class K products used on major space programs around the world. You can be confident that it provides the same documented quality and reliability of traditional converters costing more than double the price.

The Interpoint® GFM Series™ is hermetically sealed in a steel case and is ideal for use in military jets, helicopters, commercial air, ground vehicles and low orbit satellites. The converters are screened to perform over the temperature range of -40°C to +105°C assuring reliable operation in the most demanding of environments.

They are ideal for use in programs requiring high reliability, small size, and high efficiency. The series offers a wide input voltage range of 8 to 50 volts with 80 volt transient for 50 ms.

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Sense Pin fir Voltage Drop Compensation

A special remote sensing feature maintains the desired output voltage at the load. See Figure 1.

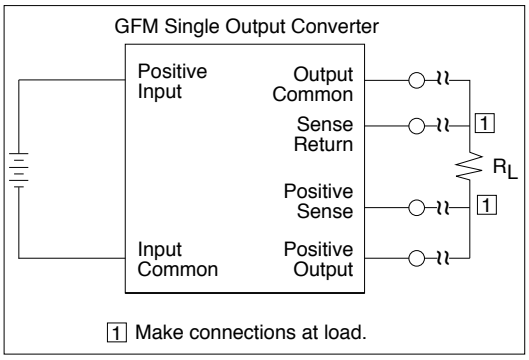

Figure 1: Sense Connections to Compensate for Voltage Drop

When the sense feature is not used, connect the sense lines to their respective output terminals. See Figure 2.

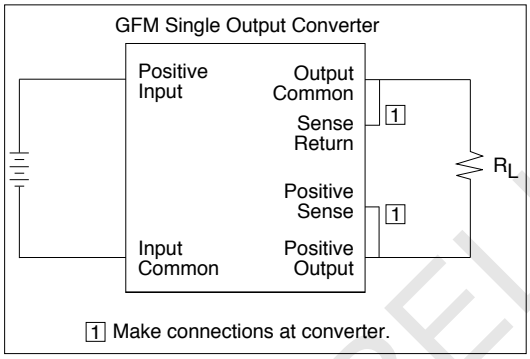

Figure 2: Sense Connections if Not Used

Output Voltage Trim ±10%

Placing a resistor between the Trim pin and the corresponding output will adjust the voltage up or down. In the trim formulas, V_{OUT} is the desired output voltage. Formulas are given for the 15 volt single. The 5 and 12 volt singles will be provided in a later datasheet revision.

NOTE: Do not exceed the maximum output power rating when trimming up.

NOTE: Do not exceed the maximum output current rating when trimming down.

Trim Up 15 Single

The maximum trim up voltage is to 17.25 volts. Connect a resistor (R_T) between Trim and Sense Return. See Figure 3.

The formula for trimming up is R_T (kohm) = 201.5/(Vout-15.04)-91

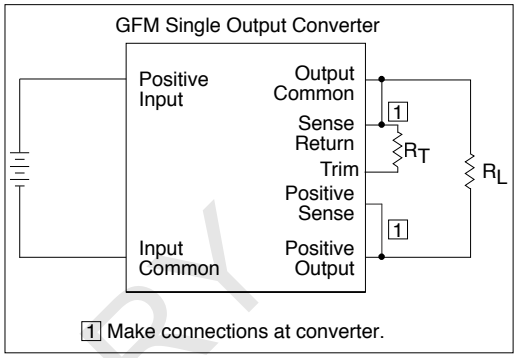

Figure 3: Trim Up Using Sense Return

Trim Down 15 Single

The minimum trim down voltage is 12.75 volts. Connect a resistor (R_T) between Trim and Positive Sense. The minimum trim down R_T is 270 kohms. See Figure 4.

The formula for trimming down is R_T (kohm) =

$$\frac{\left(\left(\frac{V_{OUT}}{2.5} - 1\right) + 80.6\right)}{6.01 - \frac{V_{OUT}}{2.5}} - 91$$

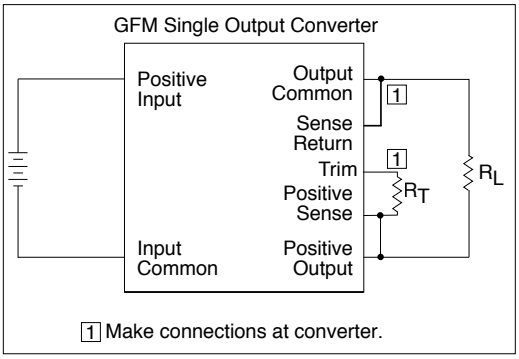

Figure 4: Trim Down Using Positive Sense

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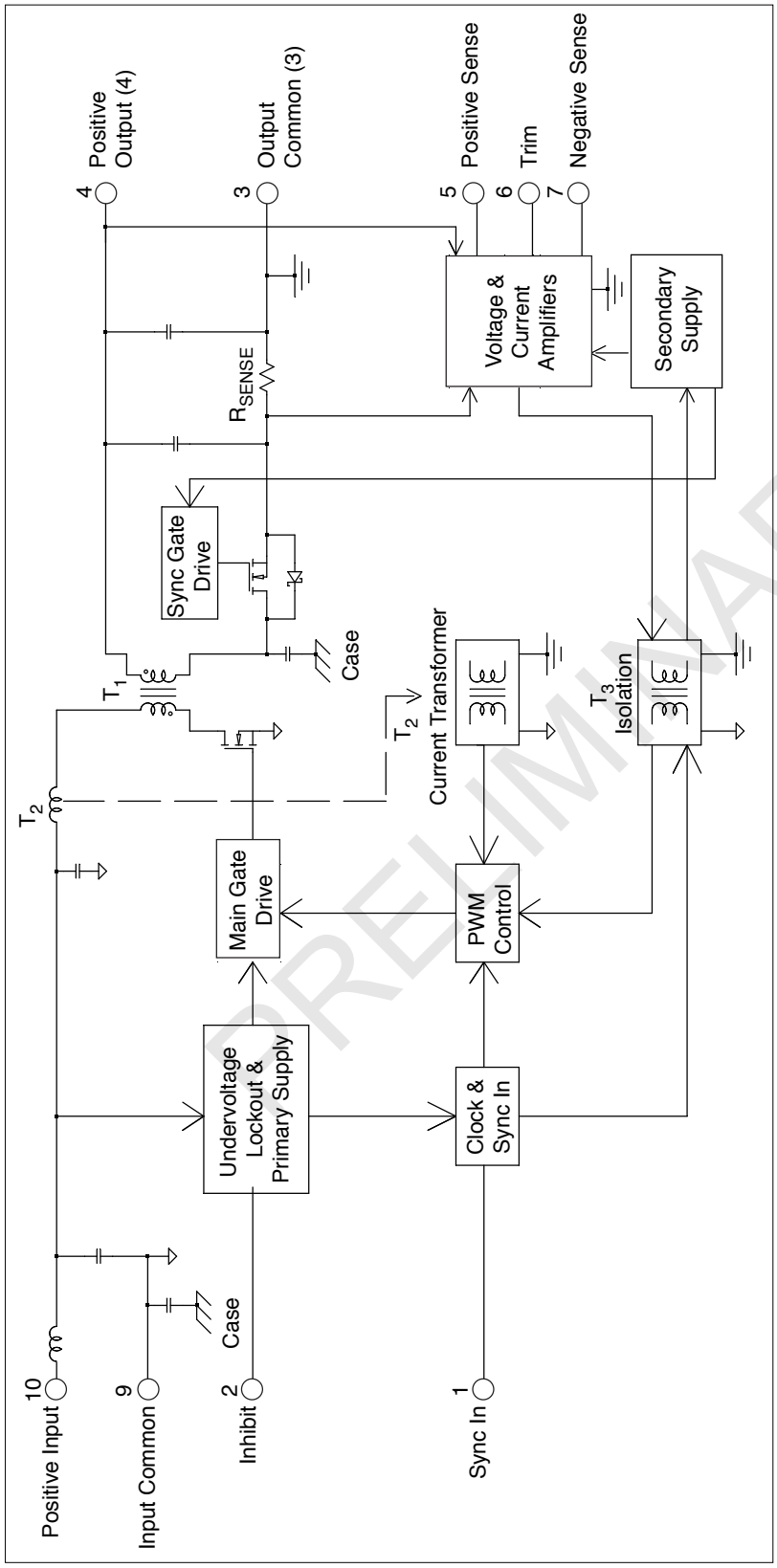

FIGURE 5: GFM BLOCK DIAGRAM

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PIN OUT	
Pin	**Single Output**
1	Sync In
2	Inhibit
3	Output Common
4	Positive Output
5	Positive Sense
6	Negative Sense
7	Trim
8	Case Ground
9	Input Common
10	Positive Input

TABLE 1: PIN OUT

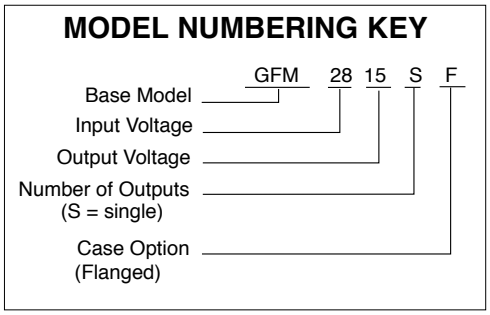

FIGURE 6: MODEL NUMBERING KEY

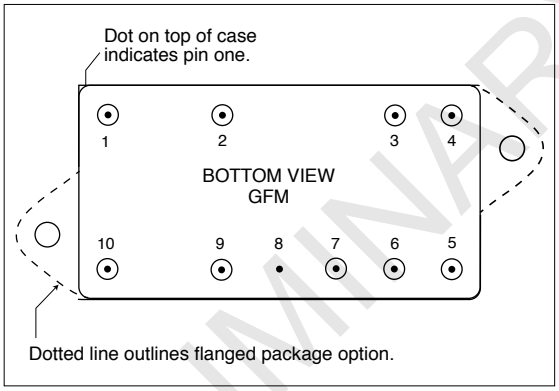

FIGURE 7: GFM SINGLE PIN OUT

MODEL NUMBER OPTIONS TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.				
CATEGORY	**Base Model and Input Voltage**	**Output Voltage**	**Number of Outputs [1]**	**Screening [2]**
OPTIONS	GFM28	05, 12, 15	S	(standard, leave blank) ES SX
FILL IN FOR MODEL # [4]	GFM28	_____	_____	/ _____

Notes
1. Number of Outputs: S is a single output.
2. Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 5 on page 9.
4. If ordering by model number add suffix "-Q" to request solder dipped leads (GFM2815SF/SX-Q). Available for all screening levels.

TABLE 2: GFM MODEL NUMBER OPTIONS

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TABLE 3: OPERATING CONDITIONS, 25°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

GFM SERIES		ALL MODELS			
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
LEAD SOLDERING TEMPERATURE [1]	10 SECONDS MAX.	—	—	300	°C
STORAGE TEMPERATURE [1]		-65	—	+150	°C
CASE OPERATING TEMPERATURE	FULL POWER	-40	—	+105	°C
DERATING OUTPUT POWER/CURRENT [1]	LINEARLY	From 100% at 105°C to 0% at 125°C			
ISOLATION: INPUT TO OUTPUT OR ANY PIN TO CASE EXCEPT CASE PIN	500 VDC AT 25°C	100	—	—	Megohms
UNDERVOLTAGE LOCKOUT -40°C TO +105°C	RISING V_{IN} (TURN ON)	7.6	8.0	8.4	V
	FALLING V_{IN} (TURN OFF)	6.2	6.9	7.9	
CURRENT LIMIT [3]	% OF FULL LOAD	—	130	—	%
AUDIO REJECTION [1]		—	50	—	dB
SWITCHING FREQUENCY	-40°C TO +105°C	380	—	420	kHz
SYNCHRONIZATION	INPUT FREQUENCY	380	—	480	kHz
	DUTY CYCLE [1]	40	—	60	%
	ACTIVE LOW	—	—	0.8	V
	ACTIVE HIGH [1]	4.5	5.0	5.5	
	REFERENCED TO	INPUT COMMON			
	IF NOT USED	CONNECT TO INPUT COMMON OR LEAVE UNCONNECTED			
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin [3]	INHIBIT PIN PULLED LOW [2]	—	—	1.5	V
	INHIBIT PIN SOURCE CURRENT [1]	0.5	2	4	mA
	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin [3]	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN PIN VOLTAGE [1]	6.5	6.9	8.2	V

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Tested with inhibit pin connected to input common.
3. An external inhibit interface should be used to pull the inhibit low or leave it floating. The inhibit pin can be left unconnected if not used.

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TABLE 4: PRELIMINARY ELECTRICAL CHARACTERISTICS 25°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

SINGLE OUTPUT MODEL		GFM2805SF			GFM2812SF			GFM2815SF			
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
OUTPUT VOLTAGE	T_C = 25°C	4.90	5.00	5.10	11.80	12.00	12.20	14.75	15.00	15.25	V
OUTPUT CURRENT	V_{IN} = 8 TO 50 V	—	—	5	—	—	2.5	—	—	2	A
OUTPUT POWER	V_{IN} = 8 TO 50 V	—	—	25	—	—	30	—	—	30	W
OUTPUT RIPPLE	20 Hz to 10 MHz	—	60	—	—	60	—	—	60	—	mV p-p
LINE REGULATION	V_{IN} = 8 TO 50	—	10	20	—	10	20	—	10	20	mV
LOAD REGULATION	NO LOAD TO FULL	—	10	20	—	10	20	—	10	20	mV
INPUT VOLTAGE	CONTINUOUS [2]	8	28	50	8	28	50	8	28	50	V
NO LOAD TO FULL	TRANSIENT [1, 3]	—	—	80	—	—	80	—	—	80	V
INPUT CURRENT	NO LOAD	—	60	120	—	60	120	—	60	120	mA
	INHIBITED	0.5	2	4	0.5	2	4	0.5	2	4	
INPUT RIPPLE CURRENT	20 Hz to 10 MHz	—	30	—	—	30	—	—	30	—	mA p-p
EFFICIENCY		—	88	—	—	90	—	—	90	—	%
LOAD FAULT [4]	POWER DISSIPATION	—	2.5	—	—	2.5	—	—	2.5	—	W
SHORT CIRCUIT	RECOVERY [1]	—	10	—	—	10	—	—	10	—	ms
STEP LOAD RESPONSE [4, 5]	TRANSIENT	—	±650	—	—	±650	—	—	±650	—	mV pk
50% - 100% - 50%	RECOVERY	—	250	—	—	250	—	—	250	—	us
STEP LINE RESPONSE [1, 4, 6]	TRANSIENT	—	±600	—	—	±600	—	—	±600	—	mV pk
16 - 50 -16 V	RECOVERY	—	250	—	—	250	—	—	250	—	µs
START-UP [4, 7]	DELAY	—	10	—	—	10	—	—	10	—	ms
FULL LOAD	OVERSHOOT [1]	—	—	25	—	—	25	—	—	25	mV pk
CAPACITIVE LOAD [8]		—	25	—	—	25	—	—	25	—	uF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Input voltage range is for continuous voltage. See Table 3 on page 5 for UVLO turn-on and turn-off.
3. Up to 80 volt transient for up to 50 ms.
4. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
5. Step load test is performed at 10 microseconds typical.
6. Step line test is performed at 100 microseconds ± 20 microseconds.
7. Tested on release from inhibit.
8. No effect on DC performance.

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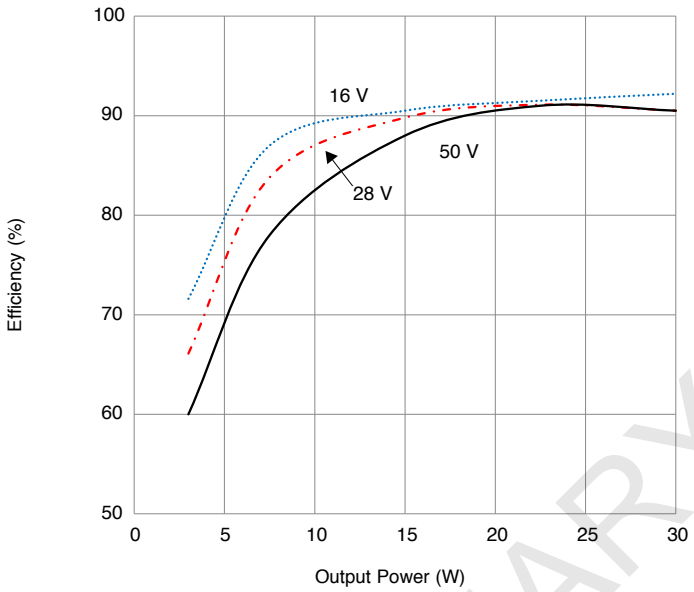


GFM2815S Efficiency

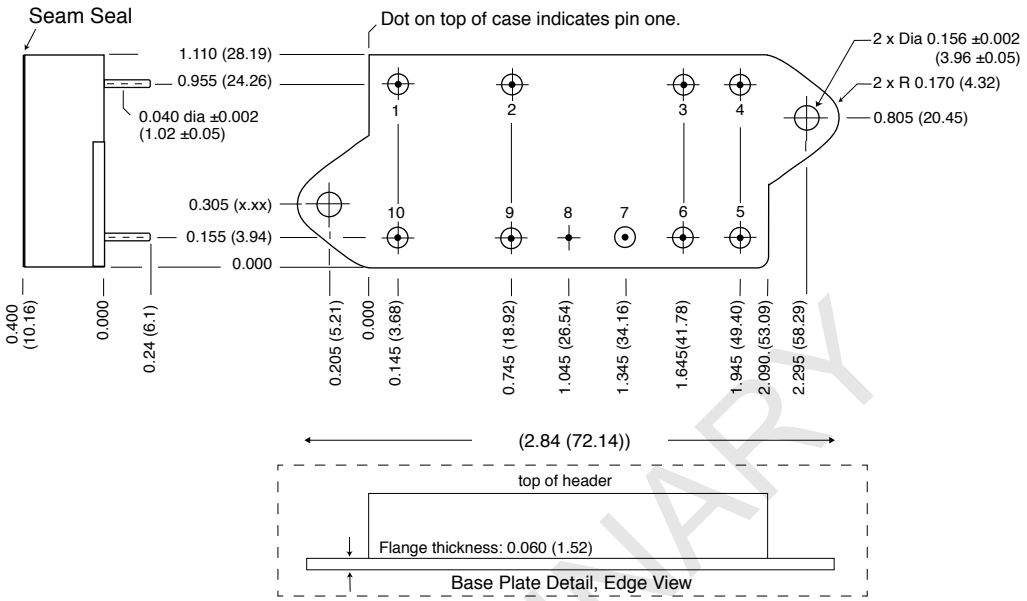
FIGURE 8

GFM DC-DC Converter

PRELIMINARY 8 TO 50 VOLT INPUT – 30 WATT – HIGH EFFICIENCY

BOTTOM VIEW GFM FLANGED

Flanged cases: Designator "F" required in Case Option position of model number



Weight: 55 grams maximum

Case dimensions in inches (mm)
Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.3) for two decimal places
unless otherwise specified

CAUTION
Heat from reflow or wave soldering may damage the device.
Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials

Header	Cold Rolled Steel/Nickel
Cover	Kovar/Nickel
Pins	Copper Alloy #52/Nickel, glass compression seal Seal hole 0.092 ±0.002 (3.05 ± 0.05)

Please refer to the numerical dimensions for accuracy.

FIGURE 9: GFM FLANGED

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ENVIRONMENTAL SCREENING

TEST PERFORMED	
Temperature Cycle (10 times) Method 1010, Cond. B, -40°C to +105°C, case	■
Burn-in Method 1015 [1] 96 hours	■
Final Electrical Test MIL-PRF-38534, -40°C, +25°C, +105°C case	■
Hermeticity Test Fine Leak, Cond. A_2, helium	■
Final visual inspection Method 2009	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Note
1. Burn-in temperature designed to bring the case temperature to +105°C minimum. Burn-in is a powered test.

TABLE 5: ENVIRONMENTAL SCREENING