SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

FEATURES

- Radiation tolerant space DC-DC converter
  - Single event effects (SEE) LET performance to 86 MeV cm^2/mg [1]
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA) [1] L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A) [1]
  - 10 mrad(Si)/sec dose rate (Condition D) [1]
- Operating temperature -55°C to +125°C
- Screened to MIL-PRF-38534 Class H and K [1]
- Input voltage range 35 to 55 volts
- Transient protection 80 volts for 50 ms
- Fully isolated
- Fixed high frequency switching
- Inhibit function
- Synchronization input
- Indefinite short circuit protection
- Undervoltage lockout

MODELS OUTPUT VOLTAGE (V)	
SINGLE	DUAL
3.3	±5
5	±7
5.2	±12
12	±15
15	

DESCRIPTION

The Interpoint® SMHF42 Series™ of 42 volt DC-DC converters offers a wide input voltage range of 35 to 55 volts and up to 15 watts of output power and are targeted for operation on a 42 volt satellite power bus. The units are capable of withstanding transients up to 80 volts for up to 50 ms.

SCREENING

SMHF42 converters offer screening to Class H or K and radiation hardness assurance (RHA) levels L - 50 krad(Si) or R - 100 krad(Si). Single event effects (SEE) LET performance to 86 MeV cm^2/mg. [1] See Table 10 on page 17 for more information. The converters are screened to MIL-PRF-38534. Class H, Class K, RHA L, RHA R, and SEE are pending product validation.

CONVERTER DESIGN

The SMHF42 converters are switching regulators that use a quasi-square wave, single-ended forward converter design with a constant switching frequency of 500 kHz typical. Isolation between input and output circuits is provided with a transformer in the forward path and a temperature compensated opto-coupler in the feedback control loop. The opto-coupler is radiation tolerant and is especially selected for space applications.

Dual output models maintain cross regulation with tightly coupled output magnetics. Up to 70% of the total output power is available from either output, providing the opposite output is simultaneously carrying 30% of the total output power. Predictable current limit is accomplished by directly monitoring the output load current and providing a constant current output above the overload point.

A feed-forward compensation system provides excellent dynamic response and audio rejection. Audio rejection is typically 50 dB. Typical output voltage response for a 50% to 100% step load transient is as low as 1.8% with a 100 μs recovery time, typical.

An inhibit terminal that can be used to disable internal switching, resulting in no output and very low quiescent input current. The converter is inhibited when the inhibit pin is pulled low. The unit is enabled when the pin, which is internally connected to a pull-up resistor, is left unconnected or is connected to an open-collector gate.

Synchronization allows the user to synchronize the switching frequency of the converter to the frequency of the system clock. This allows the user to adjust the nominal 500 kHz operating frequency to any frequency within the range of 500 kHz to 600 kHz by applying a compatible input of the desired frequency to pin 5.

Short circuit protection is provided by restricting the output current to approximately 140% of the full load output current. The output current is sensed in the secondary stage to provide highly predictable and accurate current limiting, and to eliminate foldback characteristics.

Undervoltage lockout prevents the converters from operating below approximately 30 volts input to keep system current levels smooth, especially during initialization or re-start operations.

1. Screened to MIL-PRF-38534. Class H, Class K, RHA L, RHA R, and SEE are pending product validation.

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

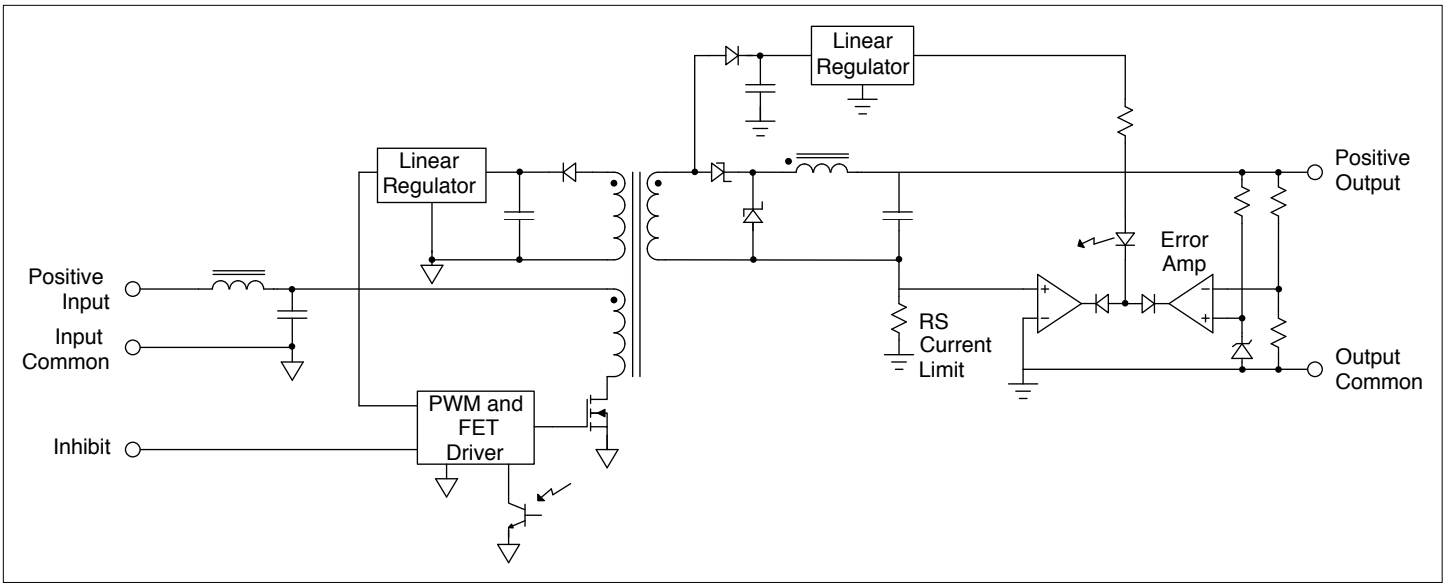


FIGURE 1: SMHF42 SINGLE OUTPUT, BLOCK DIAGRAM

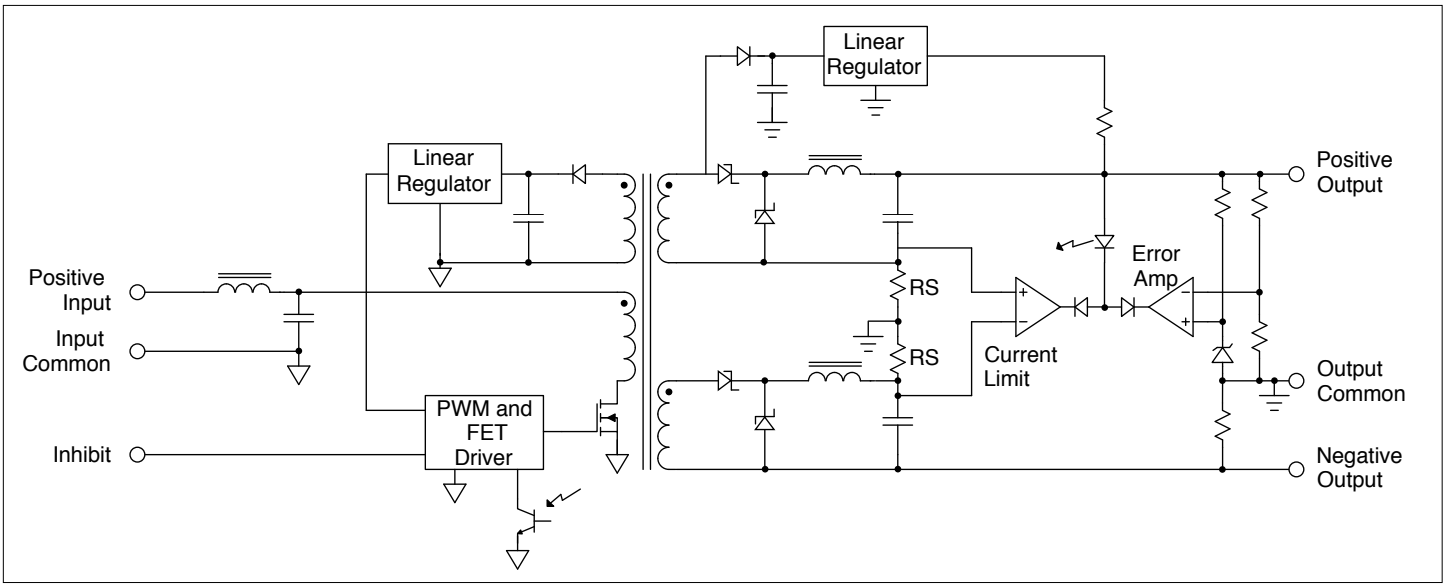


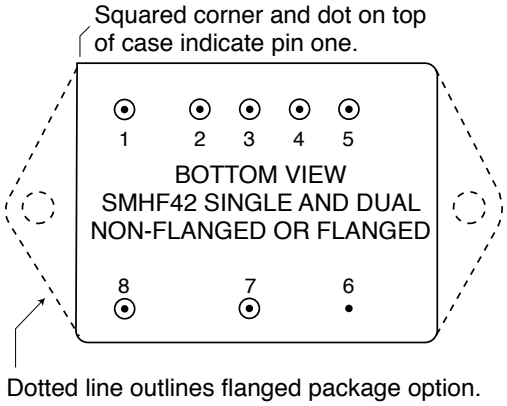
FIGURE 2: SMHF42 DUAL OUTPUT, BLOCK DIAGRAM

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

PIN OUT		
Pin	**Single Output**	**Dual Output**
1	Inhibit	Inhibit
2	No connection	Positive Output
3	Output Common	Output Common
4	Positive Output	Negative Output
5	Sync	Sync
6	Case Ground	Case Ground
7	Input Common	Input Common
8	Positive Input	Positive Input

TABLE 1: PIN OUT



See Figure 20 on page 14 and
Figure 21 on page 15 for dimensions.

FIGURE 3: PIN OUT

PINS NOT IN USE	
Inhibit (pin 1)	Leave unconnected
Sync (pin 5)	Connect to Input Common (pin 7)

TABLE 2: PINS NOT IN USE

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

MODEL NUMBERING KEY

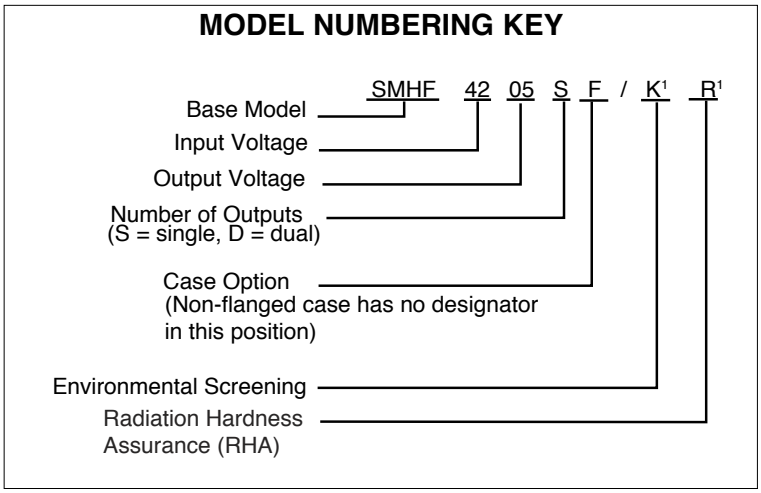


FIGURE 4: MODEL NUMBERING KEY

1. Screened to MIL-PRF-38534. Class H, Class K, RHA L, RHA R, and SEE are pending product validation.

MODEL NUMBER OPTIONS [1]

TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.

CATEGORY	Base Model and Input Voltage	Output Voltage [2]	Number of Outputs [3]	Case Option [4]	Screening [5]	RHA [6]
OPTIONS	SMHF42	3R3, 05, 5R2, 12, 15	S	(non-flanged, leave blank)	O	O
		05, 07, 12, 15	D	F (flanged)	H	L
					K	R
FILL IN FOR MODEL #	SMHF42	_____	_____	_____ /	_____	_____

Notes
1. See Figure 4 above for an example of a model number.
2. Output Voltage: An R indicates a decimal point. 3R3 is 3.3 volts out. The values of 3.3 and 5.2 are only available in single output models.
3. Number of Outputs: S is a single output and D is a dual output
4. Case Options: For the standard case (Figure 20 on page 14) leave the Case Option blank. For the flanged case option (Figure 21 on page 15), insert the letter F in the Case Option position.
5. Screening: Screened to MIL-PRF-38534. Class H and K are pending product validation. A screening level of O is a space prototype and is only available with RHA O. See Table 9 on page 16 and Table 10 on page 17 for more information.
6. RHA: Screened to MIL-PRF-38534. RHA L, RHA R and SEE are pending product validation. Interpoint model numbers use an "O" in the RHA designator position to indicate the "-" (dash) radiation hardness assurance level of MIL-PRF-38534, which is defined as "no RHA." RHA O is only available with screening level O. See Table 10 on page 17 for more information.

TABLE 3: MODEL NUMBER OPTIONS

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TABLE 4: OPERATING CONDITIONS - ALL MODELS, 25°C CASE, 42 VIN, UNLESS OTHERWISE SPECIFIED

SMHF42 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	-55	—	+125	°C
	ABSOLUTE [1]	-55	—	+135	
DERATING OUTPUT POWER/CURRENT [1]	LINEARLY	From 100% at 125°C to 0% at 135°C			
ESD RATING [1] MIL-PRF-38534, 3.9.5.8.2	MIL-STD-883 METHOD 3015 CLASS 1C	1000-1999			V
ISOLATION: INPUT TO OUTPUT OR ANY PIN TO CASE EXCEPT CASE PIN	@ 500 VDC AT 25°C	100	—	—	Megohms
UNDERVOLTAGE LOCKOUT [1]	V_{IN}	—	30	—	V
INPUT TO OUTPUT CAPACITANCE [1]		—	60	—	pF
CURRENT LIMIT [1, 2]	% OF FULL LOAD	—	140	—	%
AUDIO REJECTION [1]		—	50	—	dB
CONVERSION FREQUENCY	FREE RUN -55°C TO +125°C	480	500	620	kHz
SYNCHRONIZATION	INPUT FREQUENCY	500	—	600	kHz
	DUTY CYCLE [1]	40	—	50	%
	ACTIVE LOW	—	—	0.8	V
	ACTIVE HIGH [1]	4.5	—	5.0	
	REFERENCED TO	INPUT COMMON			
	IF NOT USED	CONNECT TO INPUT COMMON			
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin	INHIBIT PIN PULLED LOW	—	—	0.8	V
	INHIBIT PIN SOURCE CURRENT [1, 3]	—	—	1.5	mA
	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN INHIBIT PIN VOLTAGE [1]	7.5	—	12	V

For mean time between failures (MTBF) contact Applications Engineering
powerapps@crane-eg.com +1 425.882.3100 option 7

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Dual outputs: The over-current limit will trigger when the sum of the currents from both outputs reaches 140% (typical value) of the maximum rated "total" current of both outputs.
3. Inhibit current = Vin/35 k ohms.

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TABLE 5: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

SINGLE OUTPUT MODELS		SMHF423R3S			SMHF4205S			SMHF425R2S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		3.20	3.30	3.40	4.85	5.00	5.15	5.05	5.20	5.35	V
OUTPUT CURRENT	V_{IN} = 35 TO 55 V	—	—	2.4	—	—	2.4	—	—	2.4	A
OUTPUT POWER	V_{IN} = 35 TO 55 V	0	—	8	0	—	12	0	—	12.5	W
OUTPUT RIPPLE	T_C = 25°C	—	5	30	—	5	30	—	5	30	mV p-p
10 kHz - 10 MHz	T_C = -55°C TO +125°C	—	5	30	—	5	30	—	5	30	
LINE REGULATION	V_{IN} = 35 TO 55 V	—	1	10	—	1	10	—	1	10	mV
LOAD REGULATION	NO LOAD TO FULL	—	20	50	—	20	50	—	20	50	mV
INPUT VOLTAGE	CONTINUOUS	35	42	55	35	42	55	35	42	55	V
NO LOAD TO FULL	TRANSIENT 50 ms [1]	0	—	80	0	—	80	0	—	80	V
INPUT CURRENT	NO LOAD	—	25	50	—	25	40	—	25	40	mA
	INHIBITED	—	6	10	—	6	10	—	6	10	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	—	120	—	—	120	—	—	120	mA p-p
EFFICIENCY	T_C = 25°C	68	72	—	73	79	—	73	80	—	%
	T_C = -55°C TO +125°C	65	—	—	70	—	—	70	—	—	
LOAD FAULT [2]	POWER DISSIPATION	—	5	8	—	3.5	8	—	3.5	8	W
SHORT CIRCUIT	RECOVERY [1]	—	7.5	30	—	7.5	30	—	7.5	30	ms
STEP LOAD RESPONSE [3, 4]	TRANSIENT	—	±150	±400	—	±150	±400	—	±150	±400	mV pk
50% - 100% - 50%	RECOVERY	—	150	300	—	150	300	—	150	300	µs
STEP LINE RESPONSE [1, 4, 5]	TRANSIENT	—	±2	±5	—	±2	±5	—	±2	±5	%
± 2 V STEP TRANSIENT [6]	RECOVERY	—	150	—	—	100	—	—	100	—	µs
STARTUP [7]	DELAY	—	10	25	—	10	25	—	10	25	ms
	OVERSHOOT [1]	—	15	50	—	15	50	—	15	50	mV pk
CAPACITIVE LOAD [1]	T_C = 25°C	—	—	300	—	—	300	—	—	300	µF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Indefinite short circuit protection not guaranteed above 125°C (case)
3. Step load transition test is performed at 10 microseconds typical.
4. Recovery time is measured from application of the transient to the point at which Vout is within regulation.
5. Step line characterization test is performed at 100 microseconds ± 20 microseconds..
6. ± 2 V step transients from Vin 35 to 37 up to 55 and the reverse for 55 to 35.
7. Tested on release from inhibit.

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TABLE 6: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

SINGLE OUTPUT MODELS		SMHF4212S			SMHF4215S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		11.76	12.00	12.24	14.70	15.00	15.30	V
OUTPUT CURRENT	V_{IN} = 35 TO 55 V	—	—	1.25	—	—	1.00	A
OUTPUT POWER	V_{IN} = 35 TO 55 V	0	—	15	0	—	15	W
OUTPUT RIPPLE	T_C = 25°C	—	15	40	—	10	40	mV p-p
10 kHz - 10 MHz	T_C = -55°C TO +125°C	—	15	40	—	10	40	
LINE REGULATION	V_{IN} = 35 TO 55 V	—	5	20	—	8	30	mV
LOAD REGULATION	NO LOAD TO FULL	—	20	50	—	20	50	mV
INPUT VOLTAGE	CONTINUOUS	35	42	55	35	42	55	V
NO LOAD TO FULL	TRANSIENT 50 ms [1]	0	—	80	0	—	80	V
INPUT CURRENT	NO LOAD	—	25	55	—	25	62	mA
	INHIBITED	—	5	10	—	5	10	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	—	120	—	—	120	mA p-p
EFFICIENCY	T_C = 25°C	76	80	—	78	81	—	%
	T_C = -55°C TO +125°C	72	—	—	74	—	—	
LOAD FAULT [2]	POWER DISSIPATION	—	3.5	8	—	3.5	8	W
SHORT CIRCUIT	RECOVERY [1]	—	7.5	30	—	7.5	30	ms
STEP LOAD RESPONSE [3, 4]	TRANSIENT	—	±150	±500	—	±200	±500	mV pk
50% - 100% - 50%	RECOVERY	—	50	300	—	50	300	µs
STEP LINE RESPONSE [1, 4, 5]	TRANSIENT	—	±2	±5	—	±2	±5	%
± 2 V STEP TRANSIENT [6]	RECOVERY	—	150	—	—	150	—	µs
STARTUP [6]	DELAY	—	10	25	—	10	25	ms
	OVERSHOOT [1]	—	25	50	—	25	50	mV pk
CAPACITIVE LOAD [1]	T_C = 25°C	—	—	100	—	—	100	µF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Indefinite short circuit protection not guaranteed above 125°C (case)
3. Step load transition test is performed at 10 microseconds typical.
4. Recovery time is measured from application of the transient to the point at which Vout is within regulation.
5. Step line characterization test is performed at 100 microseconds ± 20 microseconds.
6. ± 2 V step transients from Vin 35 to 37 up to 55 and the reverse for 55 to 35.
7. Tested on release from inhibit.

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TABLE 7: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

DUAL OUTPUT MODELS		SMHF4205D			SMHF4207D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	$+V_{OUT}$	4.85	5.00	5.15	6.86	7.00	7.14	V
	$-V_{OUT}$	4.82	5.00	5.18	6.83	7.00	7.18	
OUTPUT CURRENT [2]	EITHER OUTPUT	—	±1.2	1.68	—	±0.850	1.190	A
V_{IN} = 35 TO 55 V	TOTAL	—	—	2.4	—	—	1.7	
OUTPUT POWER [2]	EITHER OUTPUT	—	±6	8.4	—	±5.95	8.33	W
V_{IN} = 35 TO 55 V	TOTAL	—	—	12	—	—	11.9	
OUTPUT RIPPLE	T_C = 25°C	—	30	95	—	20	60	mV p-p
± V_{OUT}, 10 kHz - 10 MHz	T_C = -55°C TO +125°C	—	30	95	—	20	60	
LINE REGULATION [3]	$+V_{OUT}$	—	2	10	—	2	10	mV
V_{IN} = 35 TO 55 V	$-V_{OUT}$	—	10	100	—	10	100	
LOAD REGULATION [3]	$+V_{OUT}$	—	5	25	—	5	20	mV
NO LOAD TO FULL	$-V_{OUT}$	—	80	150	—	100	200	
CROSS REGULATION [4]	EFFECT ON $-V_{OUT}$	—	6	7.5	—	—	—	%
INPUT VOLTAGE	CONTINUOUS	35	42	55	35	42	55	V
NO LOAD TO FULL	TRANSIENT 50 ms [1]	—	—	80	—	—	80	V
INPUT CURRENT	NO LOAD	—	25	50	—	25	60	mA
	INHIBITED	—	6	10	—	6	10	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	60	120	—	60	120	mA p-p
EFFICIENCY	T_C = 25°C	75	79	—	78	80	—	%
	T_C = -55°C TO +125°C	72	—	—	75	—	—	
LOAD FAULT [5]	POWER DISSIPATION	—	3	6	—	3	6	W
SHORT CIRCUIT	RECOVERY [1]	—	6	30	—	6	30	ms
STEP LOAD RESPONSE [6, 7, 8]	TRANSIENT	—	±200	±500	—	±200	±300	mV pk
50% - 100% - 50%	RECOVERY	—	90	400	—	90	120	µs
STEP LINE RESPONSE [1, 6, 9]	TRANSIENT	—	±2	±5	—	±2	±5	%
± 2 V STEP TRANSIENT [10]	RECOVERY	—	100	—	—	120	—	µs
STARTUP [11]	DELAY	—	12	25	—	10	25	ms
	OVERSHOOT [1]	0	100	500	—	100	500	mV pk
CAPACITIVE LOAD [1, 12]	T_C = 25°C	—	—	47	—	—	10	µF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Up to 70% of the total output power is available from either output providing the opposite output is simultaneously carrying 30% of the total output power. Each output must carry a minimum of 30% of the total output power in order to maintain regulation on the negative output.
3. Balanced loads.
4. Effect on $-V_{OUT}$ for the following conditions, percentages are of total power:
   $+P_O$ = 50%, $-P_O$ = 10%; $+P_O$ = 10%, $-P_O$ = 50%
   $+P_O$ = 70%, $-P_O$ = 30%; $+P_O$ = 30%, $-P_O$ = 70%
   All conditions are referenced to balanced loads of 50%/50%.
5. Indefinite short circuit protection not guaranteed above 125°C (case)
6. Recovery time is measured from application of the transient to point at which V_{OUT} is within regulation.
7. Response of either output with the opposite output held at half of the total output power.
8. Step load transition test is performed at 10 microseconds typical.
9. Step line characterization test is performed at 100 microseconds ± 20 microseconds.
10. ± 2 V step transients from Vin 35 to 37 up to 55 and the reverse for 55 to 35.
11. Tested on release from inhibit.
12. Applies to each output.

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TABLE 8: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

DUAL OUTPUT MODELS		SMHF4212D			SMHF4215D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	$+V_{OUT}$	11.76	12.00	12.24	14.70	15.00	15.30	V
	$-V_{OUT}$	11.70	12.00	12.30	14.63	15.00	15.38	
OUTPUT CURRENT [2]	EITHER OUTPUT	—	±0.625	0.875	—	±0.5	0.7	A
V_{IN} = 35 TO 55 V	TOTAL	—	—	1.25	—	—	1.0	
OUTPUT POWER [2]	EITHER OUTPUT	—	—	10.5	—	—	10.5	W
V_{IN} = 35 TO 55 V	TOTAL	—	—	15	—	—	15	
OUTPUT RIPPLE	T_C = 25°C	—	30	95	—	30	95	mV p-p
± V_{OUT}, 10 kHz - 10 MHz	T_C = -55°C TO +125°C	—	30	95	—	30	95	
LINE REGULATION [3]	$+V_{OUT}$	—	2	18	—	2	18	mV
V_{IN} = 35 TO 55 V	$-V_{OUT}$	—	10	100	—	10	100	
LOAD REGULATION [3]	$+V_{OUT}$	—	5	25	—	5	25	mV
NO LOAD TO FULL	$-V_{OUT}$	—	60	150	—	40	150	
CROSS REGULATION [4]	EFFECT ON $-V_{OUT}$	—	3	6	—	3	6	%
INPUT VOLTAGE	CONTINUOUS	35	42	55	35	42	55	V
NO LOAD TO FULL	TRANSIENT 50 ms [1]	—	—	80	—	—	80	V
INPUT CURRENT	NO LOAD	—	30	50	—	30	50	mA
	INHIBITED	—	6	10	—	6	10	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	55	120	—	55	120	mA p-p
EFFICIENCY	T_C = 25°C	76	80	—	76	82	—	%
	T_C = -55°C TO +125°C	74	—	—	74	—	—	
LOAD FAULT [5]	POWER DISSIPATION	—	3	6	—	3	6	W
SHORT CIRCUIT	RECOVERY [1]	—	6	50	—	6	50	ms
STEP LOAD RESPONSE [6, 7, 8]	TRANSIENT	—	±300	±600	—	±300	±600	mV pk
50% - 100% - 50% Bal Loads	RECOVERY	—	90	400	—	90	400	µs
STEP LINE RESPONSE [1, 6, 9]	TRANSIENT	—	±2	±5	—	±2	±5	%
± 2 V STEP TRANSIENT [10]	RECOVERY	—	150	—	—	150	—	µs
STARTUP [10]	DELAY	—	10	20	—	10	20	ms
	OVERSHOOT [1]	0	100	500	0	100	500	mV pk
CAPACITIVE LOAD [1, 11]	T_C = 25°C	—	—	10	—	—	10	µF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Up to 70% of the total output power is available from either output providing the opposite output is simultaneously carrying 30% of the total output power. Each output must carry a minimum of 30% of the total output power in order to maintain regulation on the negative output.
3. Balanced loads.
4. Effect on $-V_{OUT}$ for the following conditions, percentages are of total power:
   $+P_O$ = 50%, $-P_O$ = 10%; $+P_O$ = 10%, $-P_O$ = 50%
   $+P_O$ = 70%, $-P_O$ = 30%; $+P_O$ = 30%, $-P_O$ = 70%
   All conditions are referenced to balanced loads of 50%/50%.
5. Indefinite short circuit protection not guaranteed above 125°C (case)
6. Recovery time is measured from application of the transient to point at which V_{OUT} is within regulation.
7. Response of either output with the opposite output held at half of the total output power.
8. Step load transition test is performed at 10 microseconds typical.
9. Step line characterization test is performed at 100 microseconds ± 20 microseconds.
10. ± 2 V step transients from Vin 35 to 37 up to 55 and the reverse for 55 to 35.
11. Tested on release from inhibit.
12. Applies to each output.

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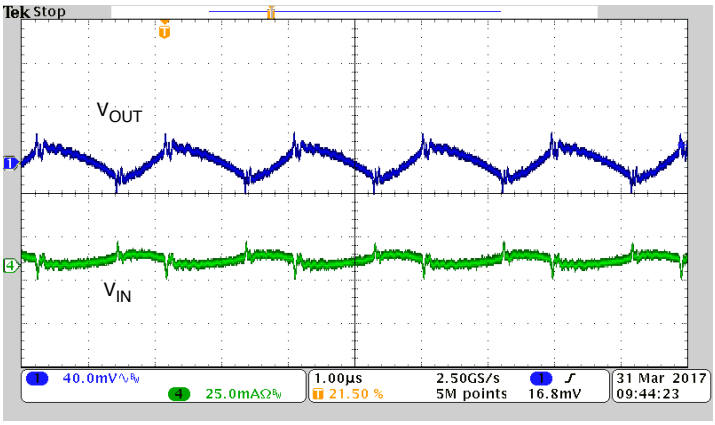
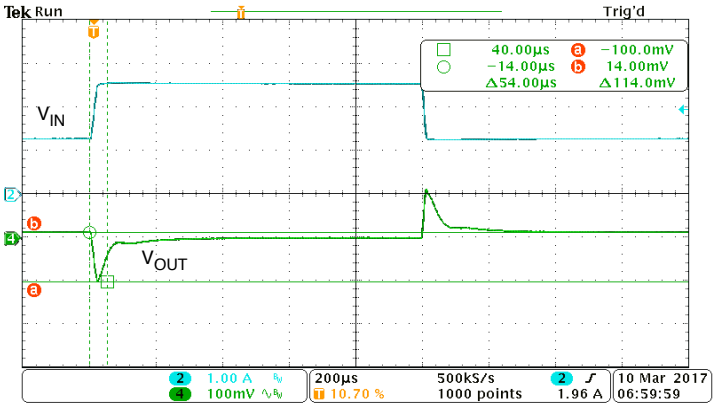
PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TYPICAL PERFORMANCE PLOTS: 25°C CASE, 42 V_{IN}, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.

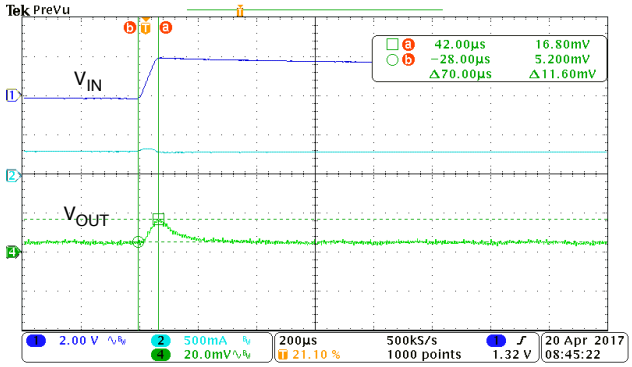


UNITS ARE PER DIVISION, 42 VIN, 100% LOAD
SMHF4215D INPUT AND OUTPUT RIPPLE
REPRESENTATIVE OF ALL SMHF42
FIGURE 5



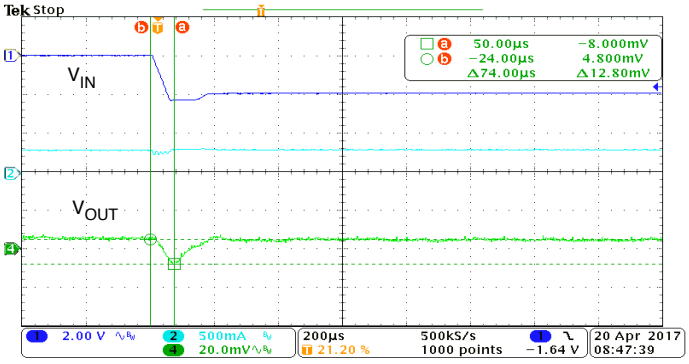
UNITS ARE PER DIVISION
SMHF4205S LOAD TRANSIENT 50-100-50%

FIGURE 6



UNITS ARE PER DIVISION
SMHF4205S LINE TRANSIENT 53 TO 55 VIN

FIGURE 7

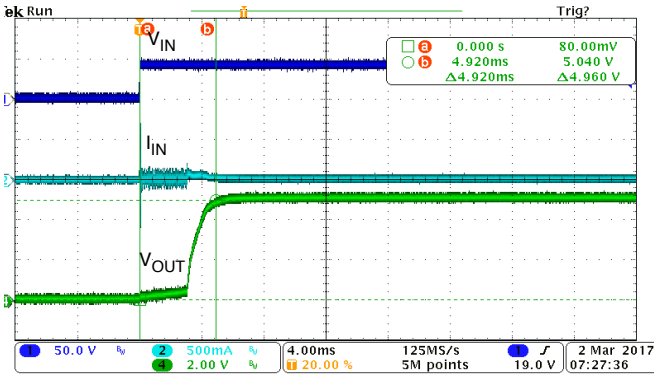


UNITS ARE PER DIVISION
SMHF4205S LINE TRANSIENT 55 TO 53 VIN

FIGURE 8

UNITS ARE PER DIVISION
SMHF4205S START-UP DELAY

FIGURE 9

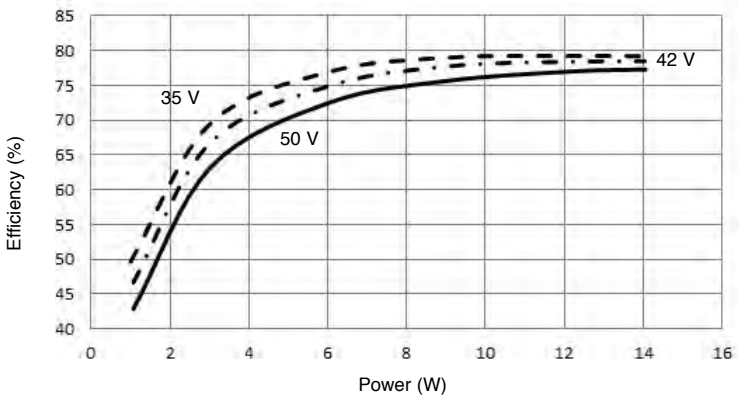


SMHF42 Single and Dual DC-DC Converters

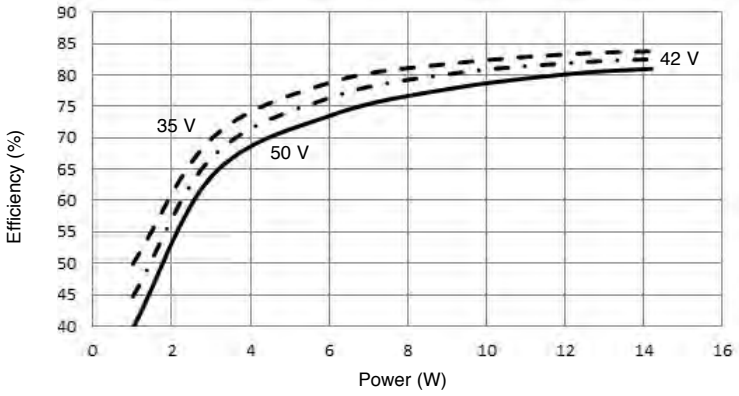
PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TYPICAL PERFORMANCE PLOTS: 25°C CASE, 42 V_{IN}, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.

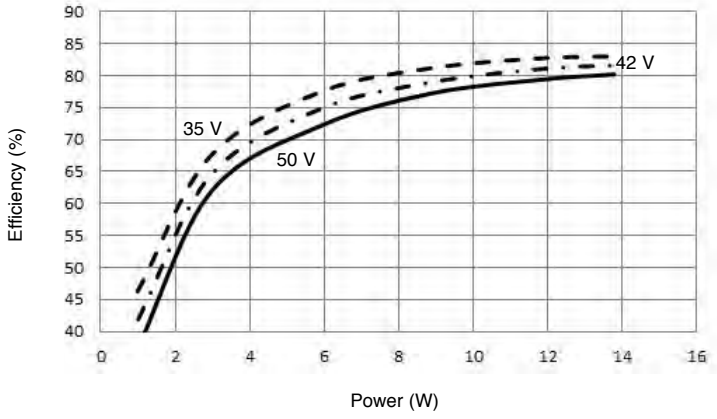
SMHF4205S EFFICIENCY
FIGURE 10



SMHF4212S EFFICIENCY
FIGURE 11



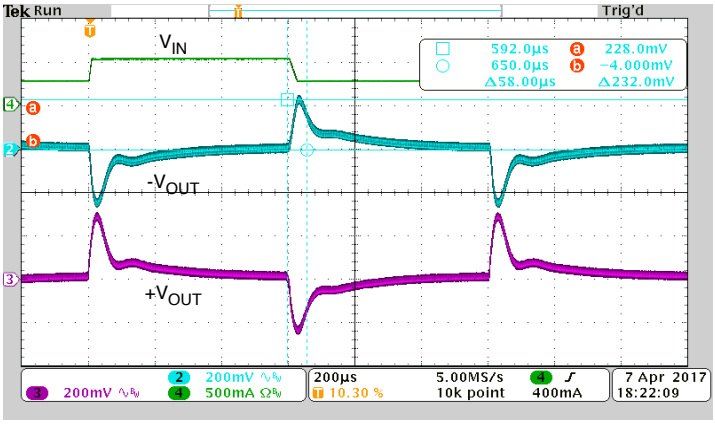
SMHF4215S EFFICIENCY
FIGURE 12



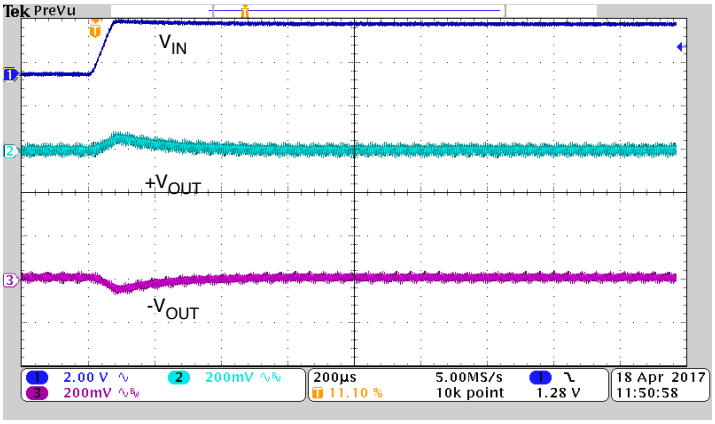
SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

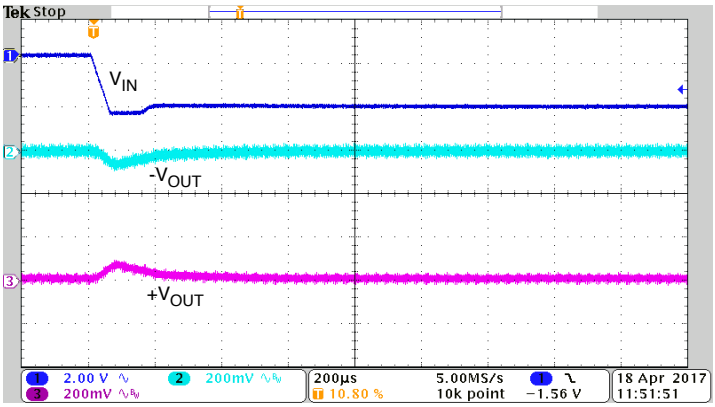
TYPICAL PERFORMANCE PLOTS: 25°C CASE, 42 V_{IN}, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.



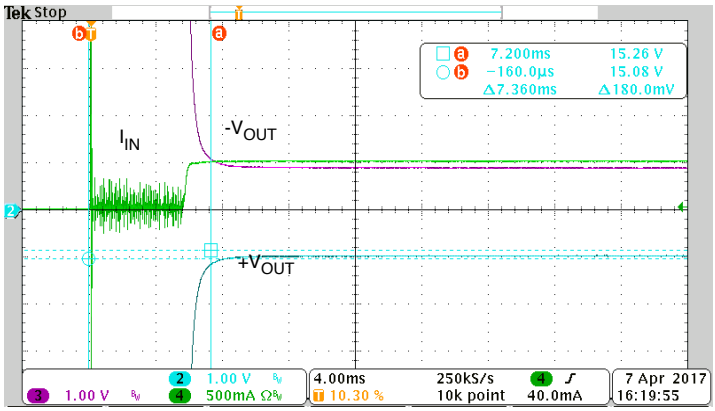
UNITS ARE PER DIVISION
SMHF4215D LOAD TRANSIENT 50-100-50%
FIGURE 13



UNITS ARE PER DIVISION
SMHF4215D LINE TRANSIENT 53-55 VIN
FIGURE 14



UNITS ARE PER DIVISION
SMHF4215D LINE TRANSIENT 55-53 VIN
FIGURE 15



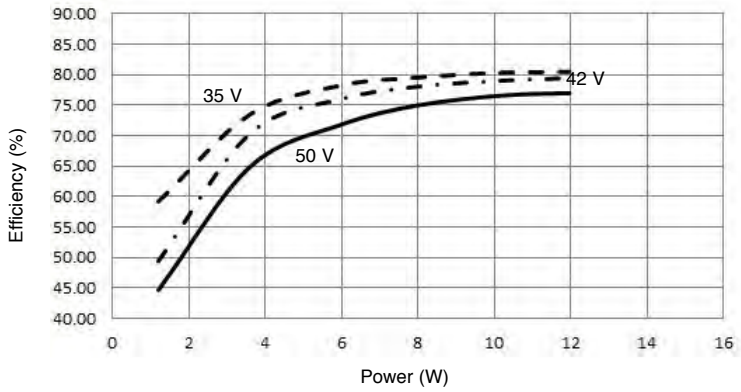
UNITS ARE PER DIVISION
SMHF4215D START-UP DELAY
FIGURE 16

SMHF42 Single and Dual DC-DC Converters

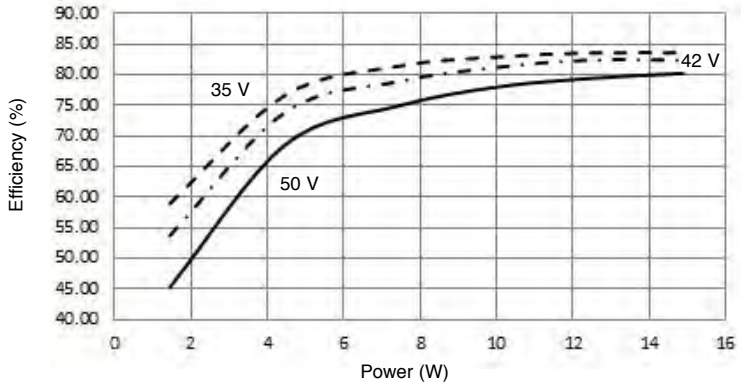
PRELIMINARY 35-55 VOLT INPUT – 15 WATT

TYPICAL PERFORMANCE PLOTS: 25°C CASE, 42 V_{IN}, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.

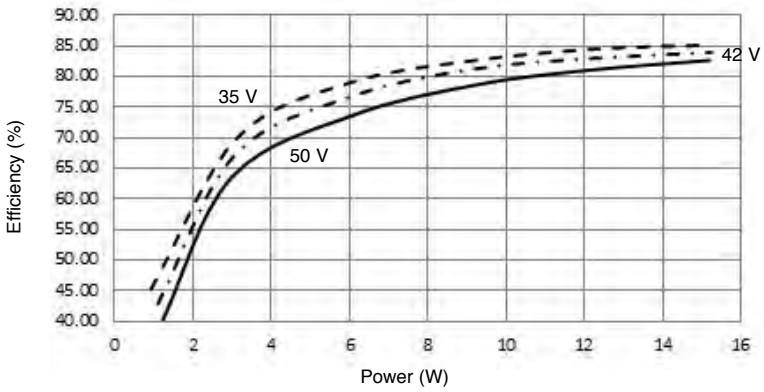
SMHF4205D EFFICIENCY
FIGURE 17



SMHF4212D EFFICIENCY
FIGURE 18



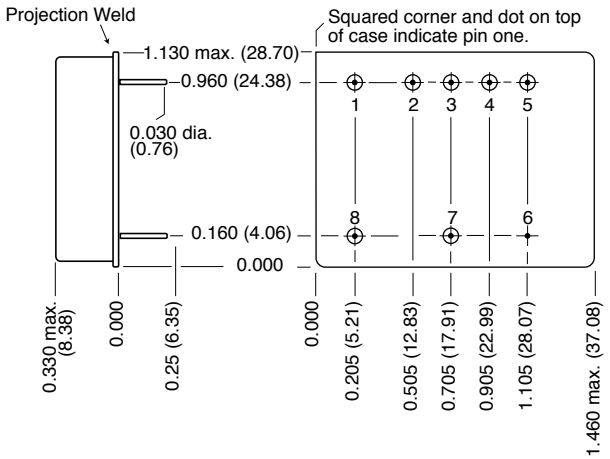
SMHF4215S EFFICIENCY
FIGURE 19



SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

BOTTOM VIEW CASE E1



Weight: 30 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/Gold
Cover	Kovar/Nickel
Pins	#52 alloy/Gold compression glass seal. Gold plating of 50 - 150 microinches included in pin diameter Seal Hole: 0.080 ±0.002 (2.03 ±0.05)

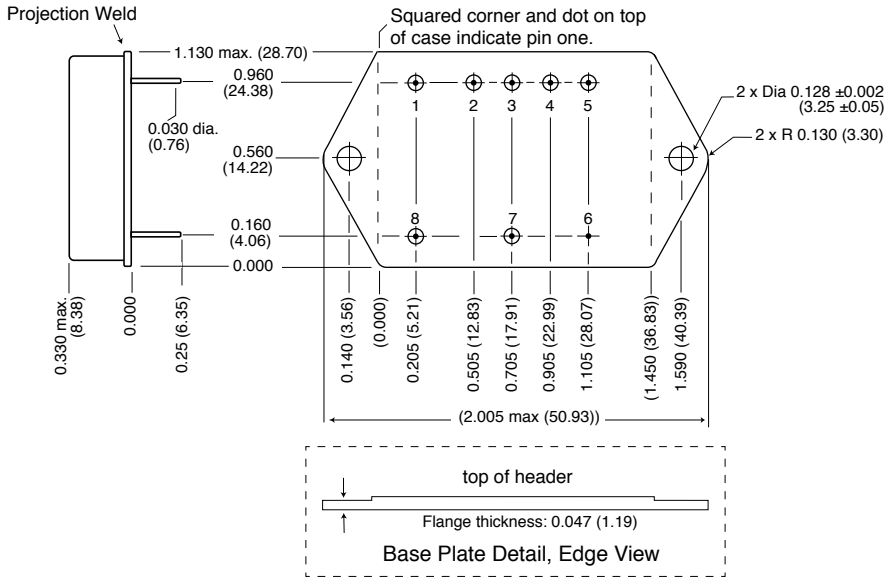
Please refer to the numerical dimensions for accuracy.

FIGURE 20: CASE E1

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

BOTTOM VIEW CASE G1
Flanged cases: Designator "F" required in Case Option position of model number



Weight: 30 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/Gold
Cover	Kovar/Nickel
Pins	#52 alloy/Gold compression glass seal
	Gold plating of 50 - 150 microinches included in pin diameter
	Seal Hole: 0.080 ±0.002 (2.03 ±0.05)

Please refer to the numerical dimensions for accuracy.

FIGURE 21: CASE G1

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

ELEMENT EVALUATION SPACE DC-DC CONVERTERS PROTOTYPE, CLASS H AND CLASS K

	NON-QML [1]	QML [2]			
	PROTOTYPE	CLASS H		CLASS K	
	/O	/H		/K	
COMPONENT-LEVEL TEST PERFORMED	M/S [3]	M/S [3]	P [4]	M/S [3]	P [4]
Element Electrical	■	■	■	■	■
Visual		■	■	■	■
Internal Visual		■		■	
Temperature Cycling				■	■
Constant Acceleration				■	■
Interim Electrical				■	
Burn-in				■	
Post Burn-in Electrical				■	
Steady State Life				■	
Voltage Conditioning Aging					■
Visual Inspection					■
Final Electrical		■	■	■	■
Wire Bond Evaluation		■	■	■	■
SEM				■	
C-SAM: Input capacitors only [5]			■		■

Notes
1. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
2. Screened to MIL-PRF-38534. Class H and K are pending product validation.
3. M/S = Active components (microcircuit and semiconductor die)
4. P = Passive components, Class H and K element evaluation. Not applicable to space prototype (“O”) element evaluation.
5. Additional test not required by H or K.

Definitions
Element Evaluation: Component testing/screening per MIL-STD-883 as determined by MIL-PRF-38534
SEM: scanning electron microscopy
C-SAM: C – Mode Scanning Acoustic Microscopy

TABLE 9: ELEMENT EVALUATION–DC-DC CONVERTERS PROTOTYPE, CLASS H AND CLASS K

SMHF42 Single and Dual DC-DC Converters

PRELIMINARY 35-55 VOLT INPUT – 15 WATT

ENVIRONMENTAL SCREENING SPACE DC-DC CONVERTERS PROTOTYPE, CLASS H AND CLASS K, RHA [1] L AND R

	NON-QML [2]	QML [3, 4]			
	PROTOTYPE	CLASS H		CLASS K	
TEST PERFORMED	/OO [5]	/HL	/HR	/KL	/KR
Non-destruct wire bond pull, Method 2023		■ [6]	■ [6]	■	■
Pre-cap Inspection, Method 2017, 2032	■	■	■	■	■
Temperature Cycle (10 times)					
Method 1010, Cond. C, -65°C to +150°C, ambient	■	■	■	■	■
Constant Acceleration					
Method 2001, 3000 g	■	■	■	■	■
PIND, Test Method 2020, Cond. A		■ [6]	■ [6]	■	■
Pre burn-in test, Group A, Subgroups 1 and 4	■	■ [6]	■ [6]	■	■
Burn-in Method 1015, +125°C case, typical [7]					
96 hours	■				
160 hours		■	■		
2 x 160 hours (includes mid-BI test)				■	■
Final Electrical Test, MIL-PRF-38534, Group A,					
Subgroups 1 and 4: +25°C case	■				
Subgroups 1 through 6, -55°C, +25°C, +125°C case		■	■	■	■
Hermeticity Test, Method 1014					
Gross Leak, Cond. B_2, Kr85				■	■
Gross Leak, Cond. C_1, fluorocarbon	■	■	■		
Fine Leak, Cond. B_1, Kr85				■	■
Fine Leak, Cond. A_2, helium	■	■	■		
Radiography, Method 2012				■	■
Post Radiography Electrical Test, +25°C case				■ [6]	■ [6]
Final visual inspection, Method 2009	■	■	■	■	■
RHA L: 50 krad(Si) total dose [8]		■		■	
RHA R: 100 krad(Si) total dose [8]			■		■

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

Notes
1. Our Redmond facility has a DLA approved RHA plan for Interpoint power products. Our SMD products with RHA "L" or "R" code meet DLA requirements.
2. Non-QML prototype products may not meet all of the requirements of MIL-PRF-38534.
3. All processes are QML qualified and performed by certified operators.
4. Screened to MIL-PRF-38534. Class H and K and RHA L and R are pending product validation.
5. "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA.
6. Not required by DLA but performed to assure product quality.
7. Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.
8. Pending product validation.

TABLE 10: ENVIRONMENTAL SCREENING AND RHA–DC-DC CONVERTERS PROTOTYPE, CLASS H AND CLASS K, RHA L OR R

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