

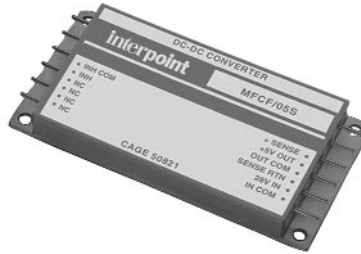
FEATURES

- EMI input filter meets MIL-STD-461C, CE03
- Output filter reduces ripple
- -55° to +100°C operation
- 17 to 40 VDC input, typical
- Fully Isolated
- 50 V for up to 50 ms transient protection
- Inhibit function
- Sync function available on select modules
- Sense available on select single output modules
- Indefinite short circuit protection

MULTIPLE OUTPUT (1-8) 28 VIN, FILTERED, FACTORY CONFIGURABLE DC/DC CONVERTERS

MFC SERIES UP TO 30 WATTS

VDC OUTPUT
Mix or match volt-ages and power to configure from one to eight outputs.



Size (max): MFCG-H 3.005 x 1.505 x 0.400 inches (76.33 x 38.23 x 10.16 mm)
 MFCA-F 3.005 x 2.260 x 0.400 inches (76.33 x 57.40 x 10.16 mm)
 Weight: MFCG-H 100 grams maximum
 MFCA-F 150 grams maximum
 Screening: Standard or ES

DESCRIPTION

Interpoint's MFC Series™ of converters offers one, two, or three individual converters combined with an EMI filter which is designed to meet the requirements of MIL-STD-461C CE03. Many combinations are available with choices from six different output voltages and four different power levels resulting in one package with from one to eight output voltages.

The MFC Series of converters uses Interpoint proprietary modules as building blocks for creating single package optimized solutions with proven reliability and short lead times.

All converters have an inhibit function which disables the outputs and places the unit in a low quiescent current mode. Remote sense and margining up are available on the 30 watt single modules. The 15 watt and 30 watt choices have synchronization.

<u>Power</u>	<u>Vout</u>	<u>Features</u>	<u>Power</u>	<u>Vout</u>	<u>Features</u>
30 Watt	3.3	Inhibit &	5 Watt	5	Inhibit
	5	Sync &		5.2	
	12	Sense/		12	
	15	Trim up		15	
	18			±5	
	±5	Inhibit &		±12	
	±12	Sync		±15	
15 Watt	±15		1.5 Watt	3.3	Inhibit
	3.3	Inhibit &		5	
	5	Sync		5.2	
	5.2			12	
	12			15	
	15			±5	
	28			±12	
	±5			±15	
	±12				
	±15				

**MFC SERIES
UP TO 30 WATTS**

FILTERED CONFIGURABLE DC/DC CONVERTERS

Table 2: Configurations

Case Size: 3.005 x 2.250 x 0.400 inches (76.33 x 57.15 x 10.16 mm)

Configuration Selection Letter ¹	Resulting Output Power (W)	Module Power (Watts) - Number of Modules			
		30	15	5	1.5
A	30	0	2	0	0
B	20	0	1	1	0
C	18	0	1	0	2
D	11	0	0	2	1
E	7	0	0	0	4

1. Case has eighteen pins which may limit the number of output voltages available.

Case Size: 3.005 x 1.505 x 0.400 inches (76.33 x 38.23 x 10.16 mm)

Configuration Selection Letter ²	Resulting Output Power (W)	Module Power (Watts) - Number of Modules			
		30	15	5	1.5
F	30	1	0	0	0
J	15	0	1	0	0
G	6	0	0	1	1
H	4	0	0	0	3

2. Case has twelve pins which may limit the number of output voltages available.

Selecting a configuration:

Begin with the base model letters - MFC. Add a configuration letter from “Table 2: Configurations” that matches the number of outputs and power level you require. Using “Table 1: Modules” from page 1, choose from the available voltages in the power levels determined by the configuration letter. Add the chosen voltages to the model and configuration letters beginning with the highest wattage down to the lowest.

As an example: To configure a four output, 20 watt converter, begin with MFCB. Choose the output voltages for the 15 watt and 5 watt modules in Table 2. For this example a 15 watt 5 volt dual output and a 5 watt 15 volt dual output were selected. The resulting configuration is MFCB/05D/15D.

More Examples:

MFCA/15D/12D

30 watt total, four outputs:

15 watt dual 15 volt, 15 watt dual 12 volt

MFCD/5D/12D/5S

11 watt total, five outputs:

5 watt dual 5 volt, 5 watt dual 12 volt, 1.5 watt single 5 volt

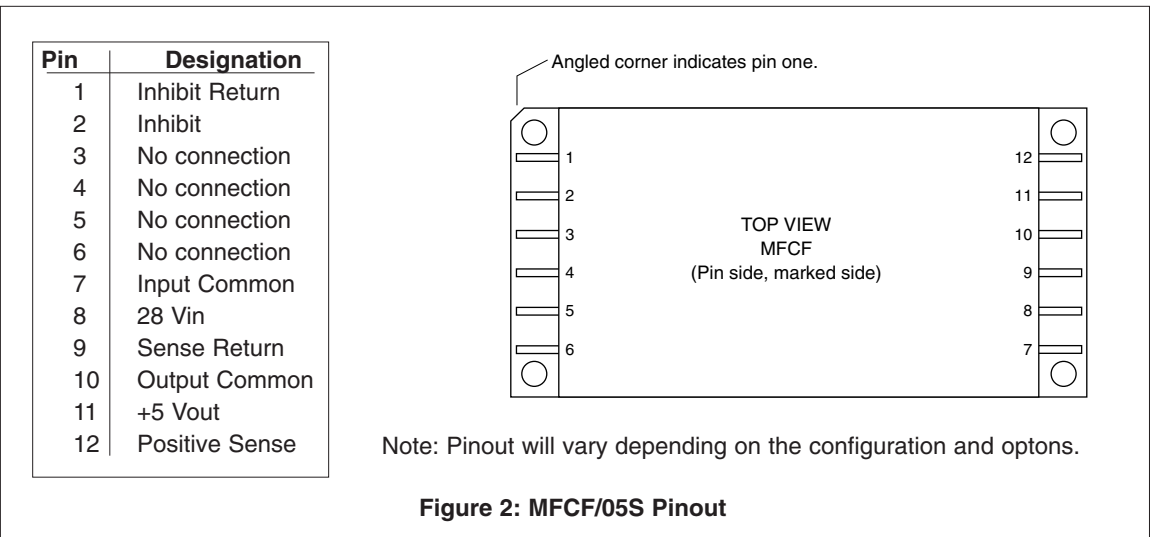
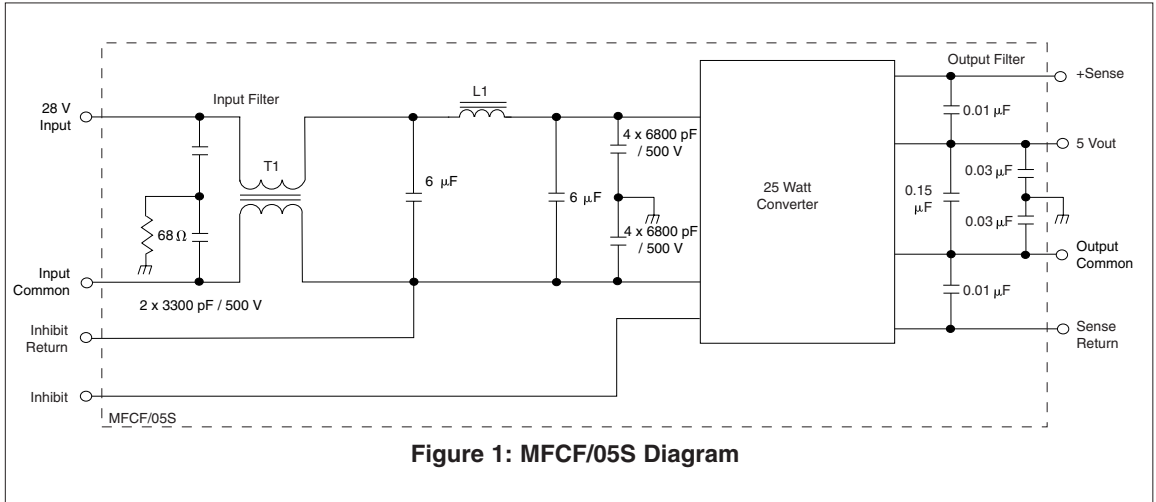
MFCG/5D/12D

6 watt total, four outputs:

5 watt dual 5 volt, 1.5 watt dual 12 volt

Note: The specifications on the following pages are for the individual modules. The specifications/performance of the configured converter may vary from the specifications in the “Electrical Characteristics” tables. Please contact the factory for details.

Configuration Example: MFCF/05S



MFC SERIES UP TO 30 WATTS

FILTERED CONFIGURABLE DC/DC CONVERTERS

30 Watt Single Output Modules

ABSOLUTE MAXIMUM RATINGS

- Input Voltage**
- 16 to 40 VDC
- Output Power**
- 25 to 30 watts depending on model
- Lead Soldering Temperature (10 sec per pin)**
- 300°C
- Storage Temperature Range (Case)**
- -65°C to +135°C

RECOMMENDED OPERATING CONDITIONS

- Input Voltage Range**
- 16 to 40 VDC continuous
 - 50 V for 50 msec transient
- Case Operating Temperature (Tc)**
- -55°C to +100°C full power
 - -55°C to +115°C absolute
- Derating Output Power/Current**
- Linearly from 100% at 100°C to 0% at 115°C

SYNC AND INHIBIT

- Sync (500 to 675 kHz)**
- Duty cycle 40% min, 60% max
 - Logic low 0.8 V max
 - Logic high 4.5 V min, 5 V max
 - Referenced to input common
 - If not used, connect to input common
- Inhibit TTL Open Collector**
- Logic low (output disabled)
Voltage ≤ 0.8 V
 - Inhibit pin current 8.0 mA max
 - Referenced to input common
 - Logic high (output enabled)
Open collector

TYPICAL CHARACTERISTICS

- Output Voltage Temperature Coefficient**
- 100 ppm/°C typical single and dual outputs
 - 200 ppm/°C main, 300 ppm/°C aux triple output
- Input to Output Capacitance**
- 50 pF typ. (100 pF typ triple outputs)
- Current Limit**
- 115% of full load typical
- Isolation**
- 100 megohm minimum at 500 V
- Audio Rejection**
- 40 dB typ (50 dB typ triple output)
- Conversion Frequency**
- Free run 550 min, 600 typ, 650 max kHz
 - External sync 500 to 675 kHz
- Inhibit Pin Voltage (unit enabled)**
- 9 to 11 V

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

SINGLE OUTPUT MODULES		3R3S			05S			12S			15S			18S			UNITS
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		3.27	3.30	3.33	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	17.82	18.00	18.18	VDC
OUTPUT CURRENT ¹	V _{IN} = 16 to 40 VDC	0	—	6.06	0	—	5.0	0	—	2.5	0	—	2.0	0	—	1.67	A
OUTPUT POWER ¹	V _{IN} = 16 to 40 VDC	0	—	20	0	—	25	0	—	30	0	—	30	0	—	30	W
OUTPUT RIPPLE VOLTAGE	10 kHz – 2 MHz Tc = -55°C TO +125°C	—	15	40	—	35	50	—	25	50	—	25	50	—	—	40	mV p-p
LINE REGULATION ²	V _{in} = 16 to 40 VDC Tc = -55°C TO +125°C	—	5	10	—	10	30	—	10	30	—	10	30	—	—	30	mV
LOAD REGULATION	NO LOAD TO FULL Tc = -55°C TO +125°C	—	2	10	—	5	30	—	5	30	—	5	30	—	—	30	mV
INPUT VOLTAGE ¹	CONTINUOUS	16	28	40	16	28	40	16	28	40	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	—	—	50	—	—	50	V
INPUT CURRENT ¹	NO LOAD	—	30	75	—	35	75	—	35	75	—	35	75	—	—	50	mA
	FULL LOAD	—	0.94	—	—	1.15	—	—	1.30	—	—	1.25	—	—	1.33	—	A
	INHIBITED	—	7	8	—	3	8	—	3	8	—	3	8	—	—	8	mA
INPUT RIPPLE CURRENT	10 kHz – 10 MHz Tc = -55°C TO +125°C	—	25	50	—	20	50	—	20	50	—	20	50	—	—	50	mA p-p
EFFICIENCY		74	76	—	76	78	—	80	83	—	81	84	—	81	—	—	%
LOAD FAULT ³	SHORT CIRCUIT POWER DISSIPATION RECOVERY ^{1, 4}	—	—	10	—	—	10	—	—	10	—	—	10	—	—	10	W
		—	1.4	6	—	1.4	5	—	1.4	5	—	1.4	5	—	1.4	—	ms
STEP LOAD RESP.	50% – 100% – 50% TRANSIENT RECOVERY ⁴	—	±125	±250	—	±200	±300	—	±250	±400	—	±350	±500	—	—	±600	mV pk
		—	—	200	—	60	200	—	60	200	—	60	200	—	60	—	µs
STEP LINE RESP.	16 – 40 – 16 VDC TRANSIENT ⁵ RECOVERY ⁴	—	—	±300	—	±200	±300	—	±400	±500	—	±500	±600	—	±500	—	mV pk
		—	—	300	—	—	300	—	—	300	—	—	300	—	300	—	µs
START-UP ¹	DELAY	—	1.4	5	—	1.4	5	—	1.4	5	—	1.4	5	—	—	5	ms
	OVERSHOOT FULL LOAD	—	0	50	—	0	50	—	0	120	—	0	150	—	0	—	mV pk
	NO LOAD	—	33	150	—	50	250	—	120	600	—	150	750	—	—	—	

Notes

1. Tc = -55°C to +100°C
2. Operation is limited below 16V.
3. Indefinite short circuit protection not guaranteed above 100°C case.
4. Recovery time is measured from application of the transient to point at which Vout is within 1% of final value.
5. Transition time ≥ 10 µs.

FILTERED CONFIGURABLE DC/DC CONVERTERS

30 Watt Dual Output Modules

MFC SERIES
UP TO 30 WATTS

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

DUAL OUTPUT MODULES		05D			12D			15D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	+V _{OUT}	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	VDC
	-V _{OUT}	4.92	5.00	5.07	11.82	12.00	12.18	14.77	15.00	15.23	
OUTPUT CURRENT ^{1, 2}	V _{IN} = 16 TO 40 VDC	0	2.5	4.5	0	1.25	2.25	0	1.0	1.8	A
OUTPUT POWER ^{1, 2}	V _{IN} = 16 TO 40 VDC	0	—	25	0	—	30	0	—	30	W
OUTPUT RIPPLE VOLTAGE	10 kHz - 2 MHz	—	20	50	—	30	80	—	25	80	mV p-p
	Tc = -55°C TO +125°C	—	40	80	—	40	120	—	40	120	
LINE REGULATION ³ V _{IN} = 16 TO 40 VDC	+V _{OUT}	—	10	50	—	10	30	—	10	30	mV
	-V _{OUT}	—	50	100	—	50	120	—	50	150	
	+V _{OUT}	—	10	50	—	10	50	—	10	50	
	-V _{OUT}	—	50	100	—	50	150	—	50	180	
LOAD REGULATION NO LOAD TO FULL	+V _{OUT}	—	5	30	—	15	30	—	15	30	mV
	-V _{OUT}	—	25	50	—	30	120	—	30	150	
	+V _{OUT}	—	5	50	—	15	50	—	15	50	
	-V _{OUT}	—	25	100	—	30	180	—	30	180	
CROSS REGULATION	SEE NOTE 4	—	7	12	—	4	8.3	—	3	8	%
EFFECT ON -V _{OUT}	SEE NOTE 5	—	4	6	—	4	6	—	4	6	
INPUT VOLTAGE ¹ NO LOAD TO FULL	CONTINUOUS	16	28	40	16	28	40	16	28	40	VDC
	TRANSIENT 50 ms	0	—	50	0	—	50	0	—	50	V
INPUT CURRENT	NO LOAD	—	35	75	—	50	75	—	50	75	mA
	FULL LOAD	—	1.10	—	—	1.34	—	—	1.29	—	A
	INHIBITED	—	3	8	—	3	8	—	3	8	mA
INPUT RIPPLE CURRENT ¹	10 kHz - 10 MHz	—	15	50	—	20	50	—	20	50	mA p-p
EFFICIENCY		76	78	—	78	81	—	80	83	—	%
LOAD FAULT ⁶	POWER DISSIPATION										
	SHORT CIRCUIT ¹	—	—	10	—	—	10	—	—	10	W
	RECOVERY	—	1.4	5.0	—	1.4	5.0	—	1.4	5.0	ms
STEP LOAD RESPONSE ± V _{OUT}	50 – 100 – 50% BALANCED										
	TRANSIENT	—	±200	±300	—	±150	±300	—	±200	±400	mV pk
	RECOVERY ⁷	—	100	200	—	100	200	—	100	200	µs
STEP LINE RESPONSE ± V _{OUT}	16 – 40 – 16 V _{IN}										
	TRANSIENT ⁸	—	±200	±400	—	±200	±400	—	±400	±500	mV pk
	RECOVERY ⁷	—	—	300	—	—	300	—	—	300	µs
START-UP ¹	DELAY	—	1.4	5	—	1.4	5	—	1.4	5	ms
	OVERSHOOT										
	FULL LOAD	—	0	50	—	0	120	—	0	150	mV pk
	NO LOAD	—	50	250	—	120	600	—	150	750	

Notes

- Tc = -55°C to +100°C.
- Up to 90% of the total output current/power is available from either output providing the positive output is carrying at least 10% of the total output power.
- Operation is limited below 16 V (see Figure 21).
+P_{out} 20% to 80%; -P_{out} 80% to 20%
- Effect on the negative output under the following conditions:
+P_{out} 50%; -P_{out} 10% to 50%
- Indefinite short circuit protection not guaranteed above 100°C case.
- Recovery time is measured from application of the transient to point at which V_{out} is within 1% of final value.
- Transition time ≥ 10 µs.

MFC SERIES UP TO 30 WATTS

FILTERED CONFIGURABLE DC/DC CONVERTERS 15 Watt Single Output Modules

ABSOLUTE MAXIMUM RATINGS

- Input Voltage**
- 16 to 40 VDC
- Power Dissipation (Pd)**
- 6 W
- Output Power**
- 12 to 15 watts depending on model
- Lead Soldering Temperature (10 sec per lead)**
- 300°C
- Storage Temperature Range (Case)**
- -65°C to +150°C

RECOMMENDED OPERATING CONDITIONS

- Input Voltage Range**
- 16 to 40 VDC continuous
 - 0 V for up to 50 msec transient
- Case Operating Temperature (Tc)**
- -55°C to +100°C full power
 - -55°C to +115°C absolute
- Derating Output Power/Current (Tc)**
- Linearly from 100% at 100°C to 0% at 115°C

SYNC AND INHIBIT

- Sync In (500 to 600 kHz)**
- Duty cycle 40% to 60%
 - Logic low 0.8 V max
 - Logic high 4.5 V min, 5 V max
 - Referenced to input common
 - If not used, connect to input common
- Inhibit TTL Open Collector**
- Logic low (output disabled)
Logic low voltage ≤ 0.8 V
Inhibit pin current 4.0 mA max
 - Referenced to input common
 - Logic high (output enabled)
Open collector or unconnected

TYPICAL CHARACTERISTICS

- Output Voltage Temperature Coefficient**
- 100 ppm/°C typical
 - 150 ppm/°C maximum
- Input to Output Capacitance**
- 60 pF typical
- Undervoltage Lockout**
- 12 V input typical
- Current Limit**
- 115% of full load typical
- Isolation**
- 100 megohm minimum at 500 V
- Audio Rejection**
- 50 dB typical
- Conversion Frequency (°55°C to +100°C Tc)**
- Free run 550 kHz typical
480 kHz min, 620 kHz max
- Inhibit Pin Voltage (unit enabled)**
- 8.5 to 12 V

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

SINGLE OUTPUT MODULES		3R3S			05S			5R2S			UNITS
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		3.27	3.30	3.33	4.95	5.00	5.05	5.16	5.20	5.24	VDC
OUTPUT CURRENT	V _{IN} = 16 to 40 VDC	0	—	2.4	0	—	2.4	0	—	2.4	A
OUTPUT POWER	V _{IN} = 16 to 40 VDC	0	—	8	0	—	12	0	—	12.48	W
OUTPUT RIPPLE	10 kHz - 2 MHz	—	30	80	—	30	80	—	30	50	mV p-p
VOLTAGE	Tc = -55°C to +100°C	—	50	120	—	60	100	—	60	100	mV p-p
LINE REGULATION	V _{in} = 16 to 40 VDC	—	5	100	—	5	50	—	5	35	mV
LOAD REGULATION	NO LOAD TO FULL	—	20	50	—	20	50	—	20	35	mV
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD	—	25	65	—	25	40	—	25	42	mA
	FULL LOAD	—	—	397	—	560	624	—	560	605	
	INHIBITED	—	5	12	—	5	12	—	5	12	
INPUT RIPPLE	10 kHz - 10 MHz	—	45	80	—	35	80	—	35	100	mA pp
CURRENT	Tc = -55°C to +100°C	—	—	120	—	—	100	—	—	120	
EFFICIENCY		72	75	—	75	77	—	75	77	—	%
LOAD FAULT ¹	SHORT CIRCUIT										
	POWER DISSIPATION	—	5	8	—	3.5	6	—	.35	6	W
STEP LOAD RESP.	RECOVERY ²	—	7.5	30	—	7.5	30	—	7.5	30	ms
	TRANSIENT	-400	150	500	-400	150	400	-400	150	400	mV pk
	RECOVERY ²	—	150	300	—	150	300	—	150	300	μs
STEP LINE RESP.	16 - 40 - 40 VDC										
	TRANSIENT ³	-800	550	800	-800	550	800	-800	550	800	mV pk
	RECOVERY ²	—	0.8	1.2	—	0.8	1.2	—	0.8	1.2	ms
START-UP	DELAY	—	10	25	0	10	25	0	10	18	ms
	OVERSHOOT ⁴	0	200	300	0	100	600	0	100	300	mV pk

Notes

1. Indefinite short circuit protection not guaranteed above 100°C (case)
2. Recovery time is measured from application of the transient to point at which Vout is within regulation.
3. Input step transition time >10μs.
4. Input step transition time <100μs.

FILTERED CONFIGURABLE DC/DC CONVERTERS

15 Watt Single Output Modules

MFC SERIES
UP TO 30 WATTS

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

SINGLE OUTPUT MODULES		12S			15S			28S			UNITS
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		11.88	12.00	12.12	14.85	15.00	15.15	27.72	28.00	28.28	VDC
OUTPUT CURRENT	V _{IN} = 16 to 40 VDC	0	—	1.25	0	—	1.00	0	—	0.54	A
OUTPUT POWER	V _{IN} = 16 to 40 VDC	0	—	15	0	—	15	0	—	15	W
OUTPUT RIPPLE VOLTAGE	10 kHz - 2 MHz	—	30	80	—	30	80	—	60	120	mV p-p
	Tc = -55°C to +100°C	—	50	120	—	50	120	—	100	180	
LINE REGULATION	V _{in} = 16 to 40 VDC	—	5	50	—	5	50	—	50	150	mV
LOAD REGULATION	NO LOAD TO FULL	—	20	50	—	20	50	—	50	150	mV
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD	—	25	50	—	25	62	—	25	60	mA
	FULL LOAD	—	680	752	—	670	752	—	640	760	
	INHIBITED	—	5	12	—	5	12	—	5	12	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	35	80	—	35	80	—	35	80	mA pp
	Tc = -55°C to +100°C	—	—	120	—	—	120	—	—	120	
EFFICIENCY		78	79	—	78	80	—	82	84	—	%
LOAD FAULT ¹	SHORT CIRCUIT										
	POWER DISSIPATION	—	3.5	6	—	3.5	6	—	3.5	6	W
	RECOVERY ²	—	7.5	30	—	7.5	30	—	7.5	30	ms
STEP LOAD RESP.	50% - 100% - 50%										
	TRANSIENT	-500	150	500	-600	200	600	-800	600	800	mV pk
	RECOVERY ²	—	150	300	—	150	300	—	200	400	μs
STEP LINE RESP.	16 - 40 - 40 VDC										
	TRANSIENT ³	-800	550	800	-800	550	800	-1200	1100	1200	mV pk
	RECOVERY ²	—	0.8	1.2	—	0.8	1.2	—	0.8	1.2	ms
START-UP	DELAY	0	10	25	0	10	25	0	10	25	ms
	OVERSHOOT ⁴	0	200	1200	0	200	1500	0	200	280	mV pk

Notes

1. Indefinite short circuit protection not guaranteed above 100°C (case)
2. Recovery time is measured from application of the transient to point at which Vout is within regulation.
3. Input step transition time >10μs.
4. Input step transition time <100μs.

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

DUAL OUTPUT MODULES		05D			12D			15D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	+V _{OUT}	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	VDC
	-V _{OUT}	4.92	5.00	5.08	11.82	12.00	12.18	14.78	15.00	15.23	
OUTPUT CURRENT ¹	V _{IN} = 16 to 40 VDC	—	±1.2	1.92	—	±0.625	1.125	—	±0.500	0.900	A
OUTPUT POWER ¹	V _{IN} = 16 to 40 VDC	—	—	12	—	—	15	—	—	15	W
OUTPUT RIPPLE VOLTAGE ±V _{OUT}	10 kHz - 2 MHz	—	30	80	—	30	80	—	30	80	mV p-p
	Tc = -55°C to +100°C	—	60	120	—	60	120	—	50	120	
LINE REGULATION Vin = 16 to 40 VDC	BALANCED +V _{OUT}	—	5	50	—	5	50	—	5	50	mV
	LOAD -V _{OUT}	—	—	80	—	—	100	—	—	100	
LOAD REGULATION	BALANCED +V _{OUT}	—	20	50	—	20	50	—	20	50	mV
	LOAD -V _{OUT}	—	—	100	—	—	100	—	—	100	
GROSS REGULATION ²	NEGATIVE V _{OUT}	—	6	7.5	—	3	6	—	3	6	%
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 50 msec	—	—	50	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD	—	20	40	—	25	50	—	25	50	mA
	FULL LOAD	—	540	600	—	645	754	—	638	754	
	INHIBITED	—	6	12	—	5	12	—	5	12	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	20	50	—	35	60	—	35	60	mA p-p
	Tc = -55°C to +100°C	—	40	80	—	50	100	—	50	100	
EFFICIENCY		77	79	—	76	83	—	76	84	—	%
LOAD FAULT	SHORT CIRCUIT ³										
	POWER DISSIPATION	—	3	6	—	3	6	—	3	6	W
	RECOVERY ⁴	—	7.5	30	—	7.5	50	—	7.5	50	ms
STEP LOAD RESP. ⁵	50% - 100% - 50%										
	TRANSIENT +V _{OUT}	-600	200	600	-600	300	600	-600	300	600	mV pk
	-V _{OUT}	-600	150	600	-600	100	500	-600	100	600	
RECOVERY ⁴	—	150	500	—	200	400	—	200	500	µs	
STEP LINE RESP. ±V _{OUT}	16 - 40 - 40 VDC										
	TRANSIENT ⁶	-800	600	800	-750	550	750	-750	550	750	mV pk
	RECOVERY ⁴	—	0.8	1.2	—	0.8	1.2	—	0.8	1.2	ms
START-UP	DELAY	—	12	20	—	12	25	—	12	25	ms
	OVERSHOOT ⁷	0	100	250	0	200	750	0	200	750	mV pk

Notes

- Up to 13.5 watts, 90% (9.6W, 80% for 2805D) of the total output power is available from either output providing the opposite output is simultaneously carrying 10% (20% for 2805D) of the total output power. Each output must carry a minimum of 10% (20% for 2805D) of the total output power in order to maintain regulation on the negative outputs.
- Effect on -V_{out} for the following conditions:
+P_o = 50% to 10% and -P_o = 50%
+P_o = 50% and -P_o = 50% to 10%
- Indefinite short circuit protection not guaranteed above 100°C (case)
- Recovery time is measured from application of the transient to point at which V_{out} is within regulation.
- Response of either output with the opposite output held at half of the total output power.
- Input step transition time >10µs.
- Input step transition time <100µs.

FILTERED CONFIGURABLE DC/DC CONVERTERS

5 Watt Single Output Modules

MFC SERIES
UP TO 30 WATTS

ABSOLUTE MAXIMUM RATINGS

- Input Voltage**
 - 16 to 40 V
- Output Power**
 - 5 watts
- Lead Soldering Temperature (10 sec per lead)**
 - 300°C
- Storage Temperature Range (Case)**
 - -65°C to +135°C

INHIBIT

- Inhibit TTL Open Collector**
 - Logic low (output disabled)
 - Logic low voltage ≤ 0.8 V
 - Inhibit pin current 4 mA max
- Referenced to input common
- Logic high (output enabled)
- Open collector

RECOMMENDED OPERATING CONDITIONS

- Input Voltage Range**
 - 16 to 40 VDC continuous
 - 50 V for up to 50 msec transient
- Case Operating Temperature (Tc)**
 - -55°C to +100°C full power
 - -55°C to +115°C absolute
- Derating Output Power/Current (Tc)**
 - Linearly from 100% at 100°C to 0% at 115°C

TYPICAL CHARACTERISTICS

- Output Voltage Temperature Coefficient**
 - 100 ppm/°C typical
- Input to Output Capacitance**
 - 50 pF typical
- Isolation**
 - 100 megohm minimum at 500 V
- Audio Rejection**
 - 50 dB typical
- Conversion Frequency**
 - 550 kHz typical (400 kHz 60 V model)
 - 450 kHz min, 600 kHz max
 - 350 kHz min, 450 kHz max 60 V model
- Inhibit Pin Voltage (unit enabled)**
 - 9 to 11 V

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

SINGLE OUTPUT MODULES		5S			5R2S			12S			15S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	Tc = -55°C TO +100°C	4.95	5.00	5.05	5.15	5.20	5.25	11.88	12.00	12.12	14.85	15.00	15.15	VDC
OUTPUT CURRENT	Tc = -55°C TO +100°C VIN = 16 TO 40 VDC	0	—	1000	0	—	962	0	—	417	0	—	333	mA
OUTPUT POWER	Tc = -55°C TO +100°C VIN = 16 TO 40 VDC	—	—	5	—	—	5	—	—	5	—	—	5	W
OUTPUT RIPPLE VOLTAGE	10 kHz - 2 MHz	—	125	350	—	110	335	—	50	200	—	50	170	mV p-p
LINE REGULATION	Tc = -55°C TO +100°C VIN = 16 TO 40 VDC	—	10	50 ¹	—	10	50	—	10	50	—	10	50	mV
LOAD REGULATION	NO LOAD TO FULL Tc = -55°C TO +100°C	—	10	50	—	10	50	—	10	50	—	10	50	mV
INPUT VOLTAGE NO LOAD TO FULL	Tc = -55°C TO +100°C CONTINUOUS	16	28	40	16	28	40	16	28	40	16	28	40	VDC
	TRANSIENT 50 ms	0	—	50	0	—	50	0	—	50	0	—	50	V
INPUT CURRENT	Tc = -55°C TO +100°C	—	27	40	—	28	40	—	29	42	—	31	44	mA
	NO LOAD	—	250	—	—	250	—	—	235	—	—	235	—	
	INHIBITED	—	3	4	—	3	4	—	3	4	—	3	4	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz Tc = -55°C TO +100°C	—	25	100	—	25	100	—	25	100	—	25	100	mA p-p
EFFICIENCY		66	71	—	66	71	—	70	76	—	71	76	—	%
LOAD FAULT ^{2, 3}	POWER DISSIPATION	—	1.5	2.0	—	1.5	2.0	—	1.2	1.9	—	1.2	1.8	W
SHORT CIRCUIT	RECOVERY	—	12.5	25	—	1.5	25	—	1	10	—	1	10	ms
STEP LOAD RESPONSE ^{3, 4}	50% - 100% - 50% TRANSIENT	—	100	250	—	100	250	—	150	375	—	200	500	mV pk
	RECOVERY	—	100	250	—	100	250	—	200	500	—	200	500	μs
STEP LINE RESPONSE ^{3, 4}	TRANSIENT 16 TO 40 VIN	—	50	150	—	50	150	—	80	200	—	50	125	mV pk
	40 TO 16 VIN	—	50	150	—	50	150	—	100	250	—	50	125	
	RECOVERY 16 TO 40 VIN	—	100	250	—	100	250	—	250	625	—	250	625	μs
	40 TO 16 VIN	—	200	500	—	200	500	—	250	625	—	250	625	
START-UP	DELAY	—	10	25	—	10	25	—	3	10	—	3	10	ms
	OVERSHOOT	—	0	50	—	0	50	—	0	120	—	0	150	mV pk

Notes

- Line regulation for /ES and non /ES 2805S models at 16 to 17 VIN and 85°C to 100°C (case) is 5% (max).
- Indefinite short circuit protection not guaranteed above 100°C (case).
- Recovery time is measured from application of the transient to point at which VOUT is within 1% of VOUT at final value.
- Transition time >10μs.

MFC SERIES UP TO 30 WATTS

FILTERED CONFIGURABLE DC/DC CONVERTERS

5 Watt Dual Output Modules

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

DUAL OUTPUT MODULES		05D			12D			15D			UNITS	
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
OUTPUT VOLTAGE	+V _{OUT}	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	VDC	
	-V _{OUT}	4.9	5.0	5.1	11.76	12.00	12.24	14.70	15.00	15.30		
OUTPUT CURRENT ¹	V _{IN} = 16 to 40 VDC Tc = -55°C to +125°C	—	±500	800	—	±208	333	—	±167	267	mA	
OUTPUT POWER ¹	V _{IN} = 16 to 40 VDC Tc = -55°C to +125°C	—	—	5	—	—	5	—	—	5	W	
OUTPUT RIPPLE VOLT.	10 kHz - 2 MHz	—	—	150	—	40	140	—	60	150	mV p-p	
LINE REGULATION Vin = 16 to 40 VDC	Tc = -55°C to +125°C +V _{OUT}	—	10	25	—	10	50	—	10	50	mV	
	-V _{OUT}	—	40	75	—	40	180	—	40	180		
LOAD REGULATION NO LOAD TO FULL	Tc = -55°C to +125°C +V _{OUT}	—	10	50	—	10	50	—	10	50	mV	
	-V _{OUT}	—	50	200	—	50	200	—	50	200		
CROSS REGULATION ²	+P _O = 20 - 80 %, -P _O = 80 - 20% -P _O = 20 - 80 %, +P _O = 80 - 20%	—	10	20	—	8	15	—	7	15	%	
	+P _O = 50 - 10 %, -P _O = 50% -P _O = 50 - 10 %, +P _O = 50%	—	5	8	—	3.7	6	—	3	6		
INPUT VOLTAGE Tc = -55°C to +125°	NO LOAD TO FULL CONTINUOUS	16	28	40	16	28	40	16	28	40	VDC	
	TRANSIENT 50 msec	—	—	50	—	—	50	—	—	50	V	
INPUT CURRENT Tc = -55°C to +125°C	NO LOAD	—	30	35	—	33	58	—	38	60	mA	
	FULL LOAD	—	248	—	—	235	—	—	235	—		
	INHIBITED	—	3	5	—	3	4	—	3	4		
INPUT RIPPLE CURRENT	10 kHz TO 10 MHz	—	25	80	—	25	100	—	25	100	mA p-p	
	Tc = -55°C to +125°C	—	30	160	—	30	150	—	30	150		
EFFICIENCY		68	72	—	69	75	—	70	75	—	%	
LOAD FAULT ^{3, 4}	POWER DISSIPATION SHORT CIRCUIT	—	1.3	1.8	—	1.3	1.7	—	1.3	1.6	W	
	RECOVERY	—	—	50	—	1	10	—	1	10	ms	
STEP LOAD RESPONSE ^{4, 5}	50% - 100% - 50% BALANCED TRANSIENT	—	—	±150	—	±300	±750	—	±300	±750	mV	
	RECOVERY	—	—	100	—	200	500	—	500	1250	µs	
STEP LINE RESP. ^{4, 5}	TRANSIENT	16 TO 40 VDC	—	—	±750	—	±50	±125	—	±150	±375	mV pk
		40 TO 16 VDC	—	—	±500	—	±50	±125	—	±100	±250	
	RECOVERY	16 TO 40 VDC	—	—	1200	—	150	375	—	250	625	µs
		40 TO 16 VDC	—	—	1200	—	400	1000	—	800	2000	
START-UP	DELAY	—	—	25	—	3	10	—	3	10	ms	
	OVERSHOOT	—	—	500	—	0	120	—	0	150	mV pk	

Notes

- Up to 4 watts (80% full power) is available from either output providing the opposite output is carrying 20% of total power.
- Shows regulation effect on the minus output during the defined cross loading conditions. See Figures 15 and 16.
- Indefinite short circuit protection not guaranteed above 100°C (case).
- Recovery time is measured from application of the transient to point at which V_{OUT} is within 1% of V_{OUT} at final value.
- Transition time >10µs.

FILTERED CONFIGURABLE DC/DC CONVERTERS

1.5 Watt Single Output Modules

MFC SERIES

UP TO 30 WATTS

ABSOLUTE MAXIMUM RATINGS	
Input Voltage	• 12 to 50 VDC
Output Power	• 1.5 W
Capacitive Load	• Single output models 200 μ F • Dual output models 100 μ F
Lead Soldering Temperature (10 sec per lead)	• 300°C
Storage Temperature Range (Case)	• -65°C to +150°C

INHIBIT	
Inhibit – TTL Open Collector	• Logic low (output disabled) 0.8 V max Inhibit pin current 1 mA max
	• Referenced to input common
	• Logic high (output enabled) open collector

RECOMMENDED OPERATING CONDITIONS	
Input Voltage Range	• 12 to 50 VDC continuous • 80 V for 120 msec transient (70 V for 15 V single and dual models)
Case Operating Temperature (Tc)	• -55°C to +100°C full power • -55°C to +115°C absolute
Derating Output Power/Current (Tc)	• Linearly from 100% at 100°C to 0% at 115°C

TYPICAL CHARACTERISTICS	
Output Voltage Temperature Coefficient	• 100 ppm/°C typical
Input to Output Capacitance	• 100 to 170 pF typical
Undervoltage Lockout	• 8 V input typical
Current Limit	• 125% of full load typical
Isolation	• 100 megohm minimum at 500 V
Audio Rejection 40 dB, typical Conversion Frequency (kHz)	• 25°C, 300 min, 370 typ, 450 max • -55°C to +100°C 270 min, 370 typ, 470 max
Inhibit Pin Voltage (unit enabled)	• 7 to 12 V

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

SINGLE OUTPUT MODULES		3R3S			05S			5R2S			12S			15S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE ¹	Tc = 25°C	4.95	5	5.05	5.15	5.2	5.25	11.88	12	12.12	14.85	15	15.15				VDC
	Tc = -55°C TO +100°C	4.80	5	5.20	5.00	5.2	5.40	11.52	12	12.48	14.40	15	15.60				
OUTPUT CURRENT	V _{IN} = 12 to 50 VDC	0	—	300	0	—	288	0	—	125	0	—	100				mA
OUTPUT POWER	V _{IN} = 12 to 50 VDC	0	—	1.5	0	—	1.5	0	—	1.5	0	—	1.5				W
OUTPUT RIPPLE VOLTAGE	10 kHz - 2 MHz	—	45	150	—	45	150	—	50	200	—	35	150				mV p-p
	Tc = -55°C TO +100°C	—	65	300	—	65	300	—	70	300	—	50	250				
LINE REGULATION	V _{IN} = 12 TO 50 VDC	—	35	100	—	35	100	—	60	200	—	70	300				mV
	Tc = -55°C TO +100°C	—	40	120	—	40	120	—	70	250	—	80	350				
LOAD REGULATION	10% TO FULL LOAD	—	350	700	—	350	700	—	600	1300	—	700	1500				mV
	Tc = -55°C TO +100°C	—	380	800	—	380	800	—	640	1400	—	760	1600				
	50% TO FULL	—	100	200	—	100	200	—	145	300	—	165	350				
INPUT VOLTAGE NO LOAD TO FULL INPUT CURRENT	CONTINUOUS	12	28	50	12	28	50	12	28	50	12	28	50				VDC
	TRANSIENT 120 ms	0	—	80	0	—	80	0	—	80	0	—	70				V
INPUT RIPPLE CURRENT ²	NO LOAD	—	5.5	10	—	5.5	10	—	6	10	—	6.0	11				mA
	Tc = -55°C TO +100°C	—	6.0	11	—	6.0	11	—	6.5	12	—	6.5	12				
	FULL LOAD	—	70	74	—	70	74	—	68	72	—	68	72				
	Tc = -55°C TO +100°C	—	73	78	—	73	78	—	70	74	—	70	74				
INPUT RIPPLE CURRENT ²	INHIBITED	—	2.3	3.2	—	2.3	3.2	—	2.3	3.2	—	2.3	3.2				mA p-p
	Tc = -55°C TO +100°C	—	2.4	3.5	—	2.4	3.5	—	2.4	3.5	—	2.4	3.5				
EFFICIENCY	10k Hz - 10 MHz	—	100	200	—	100	200	—	100	200	—	100	200				%
	Tc = -55°C TO +100°C	—	130	250	—	130	250	—	150	250	—	150	250				
LOAD FAULT ^{3, 4}	POWER DISSIPATION	—	1.3	2.0	—	1.3	2.0	—	2.0	3.2	—	2.3	3.7				W
	Tc = -55°C TO +100°C	—	1.4	2.3	—	1.4	2.3	—	2.2	3.5	—	2.5	4.0				
	RECOVERY	—	3.0	12	—	3.0	12	—	3.5	15	—	4.0	18				
Tc = -55°C TO +100°C	—	3.5	15	—	3.5	15	—	3.5	20	—	4.0	20					
STEP LOAD RESPONSE ⁵	50 %-100%- 50% LOAD TRANSIENT	-400	185	400	-400	185	400	-700	350	700	-700	350	700				mV pk
	Tc = -55°C TO +100°C	-500	185	500	500	185	500	-800	380	800	-800	380	800				
	RECOVERY	—	125	500	—	125	500	—	130	500	—	140	600				
Tc = -55°C TO +100°C	—	125	600	—	125	600	—	130	600	—	180	750					
STEP LINE RESPONSE ⁵	12 TO 50 TO 12 V _{IN} TRANSIENT	-400	170	400	-400	170	400	-900	400	900	-750	400	750				mV pk
	Tc = -55°C TO +100°C	-500	180	500	-500	180	500	-1000	400	1000	-850	450	850				
	RECOVERY	—	0.75	3.0	—	0.75	3.0	—	0.6	2.5	—	0.47	2.0				
Tc = -55°C TO +100°C	—	0.75	4.0	—	0.75	4.0	—	0.6	3.0	—	0.5	2.5					
START-UP 0 TO 28 VDC	DELAY	—	7	20	—	7	20	—	7	20	—	7	20				ms
	Tc = -55°C TO +100°C	—	10	40	—	10	40	—	10	40	—	10	40				
	OVERSHOOT	—	0	100	—	0	100	—	0	250	—	0	300				
Tc = -55°C TO +100°C	—	0	150	—	0	150	—	0	350	—	0	450					

AVAILABLE
SOON, ASK
YOUR
INTERPOINT
REP FOR
INFORMATION

See notes 1, 2, 3, 4, 5, and 6 on the following page.

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

DUAL OUTPUT MODULES		5D			12D			15D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE ¹	Tc = 25°C	±4.95	±5	±5.05	±11.88	±12	±12.12	±14.85	±15	±15.15	VDC
	Tc = -55°C TO +100°C	±4.80	±5	±5.20	±11.52	±12	±12.48	±14.40	±15	±15.60	
OUTPUT CURRENT ⁶	V _{IN} = 12 TO 50 VDC	0	±150	240	0	±62.5	100	0	±50	80	mA
OUTPUT POWER	V _{IN} = 12 TO 50 VDC	0	—	1.5	0	—	1.5	0	—	1.5	W
OUTPUT RIPPLE VOLTAGE +V _{OUT}	10 kHz - 2 MHz	—	35	150	—	35	150	—	30	150	mV p-p
	Tc = -55°C TO +100°C	—	50	250	—	40	250	—	35	250	
-V _{OUT}	10 kHz - 2 MHz	—	35	150	—	35	150	—	30	150	mV p-p
	Tc = -55°C TO +100°C	—	50	250	—	40	250	—	35	250	
LINE REGULATION ⁷	V _{IN} = 12 TO 50 VDC	—	10	50	—	100	300	—	165	500	mV
	Tc = -55°C TO +100°C	—	20	100	—	110	400	—	180	650	
LOAD REGULATION ⁸ ±V _{OUT}	10% TO FULL	—	300	600	—	550	1100	—	600	1300	mV
	-55°C TO +100°C	—	350	700	—	570	1200	—	630	1400	
	50% TO FULL	—	80	200	—	115	250	—	125	300	
	-55°C TO +100°C	—	100	300	—	130	350	—	135	400	
INPUT VOLTAGE NO LOAD TO FULL	CONTINUOUS	12	28	50	12	28	50	12	28	50	VDC
	TRANSIENT 120 ms	0	—	80	0	—	80	0	—	70	V
INPUT CURRENT	NO LOAD	—	5.0	10	—	7.5	13	—	7.5	13	mA
	Tc = -55°C TO +100°C	—	6.0	12	—	8.0	14	—	8.0	14	
	FULL LOAD	—	69	73	—	70	73	—	71	74	
	Tc = -55°C TO +100°C	—	72	77	—	71	77	—	72	78	
	INHIBITED	—	2.3	3.2	—	2.3	3.2	—	2.3	3.2	
	Tc = -55°C TO +100°C	—	2.4	3.5	—	2.4	3.5	—	2.4	3.5	
INPUT RIPPLE ² CURRENT	10 kHz - 10 MHz	—	100	200	—	115	200	—	90	200	mA p-p
Tc = -55°C TO +100°C	—	130	250	—	150	250	—	120	250		
EFFICIENCY	Tc = 25°C	73	77	—	73	77	—	72	76	—	%
	Tc = -55°C TO +100°C	70	75	—	70	75	—	69	74	—	
LOAD FAULT ^{3,4}	POWER DISSIPATION	—	1.4	2.2	—	2.5	3.8	—	2.7	4.1	W
	Tc = -55°C TO +100°C	—	1.6	2.5	—	2.7	4.2	—	3.0	4.5	
	RECOVERY	—	3.7	15	—	3.2	15	—	4.0	15	ms
	Tc = -55°C TO +100°C	—	3.8	20	—	3.2	20	—	4.0	20	
STEP LOAD RESPONSE ⁵ ± V _{OUT}	50%–100%–50% LOAD TRANSIENT	-300	130	300	-600	250	600	-600	250	600	mV pk
	Tc = -55°C TO +100°C	-400	140	400	-700	260	700	-700	270	700	
	RECOVERY	—	100	400	—	165	700	—	50	200	µs
-55°C TO +100°C	—	100	500	—	165	800	—	50	300		
STEP LINE RESPONSE ⁵ ± V _{OUT}	12 TO 50 TO 12 V _{IN} TRANSIENT	-250	125	250	-500	240	500	-500	220	500	mV pk
	Tc = -55°C TO +100°C	-300	130	300	-600	250	600	-600	230	600	
	RECOVERY	—	0.6	2.5	—	0.9	3.0	—	0.6	3.0	ms
	Tc = -55°C TO +100°C	—	0.6	3.0	—	0.9	4.0	—	0.7	4.0	
START-UP 0 TO 28 VDC, ± V _{OUT}	DELAY	—	8	25	—	8	25	—	8	25	ms
	Tc = -55°C TO +100°C	—	10	45	—	10	45	—	10	45	
	OVERSHOOT	—	0	100	—	0	250	—	0	750	mV pk
Tc = -55°C TO +100°C	—	0	150	—	0	350	—	0	900		

Notes:

- Specified at 50% load.
- Lin = 2 µH.
- Maximum duration of short circuit: 25°C—90 seconds, 100°C—30 seconds.
- Load fault is a short circuit (<50 mohms). Recovery is into resistive full load.
- Transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.
- Max. spec indicates 80% of the converter's total power, available from either output.
- Specification applies to both + and - Vout.
- Although no minimum load is required, at no load the output voltage may increase up to 15%.

Case Outline Drawings
Pinouts will vary depending on customer choices.

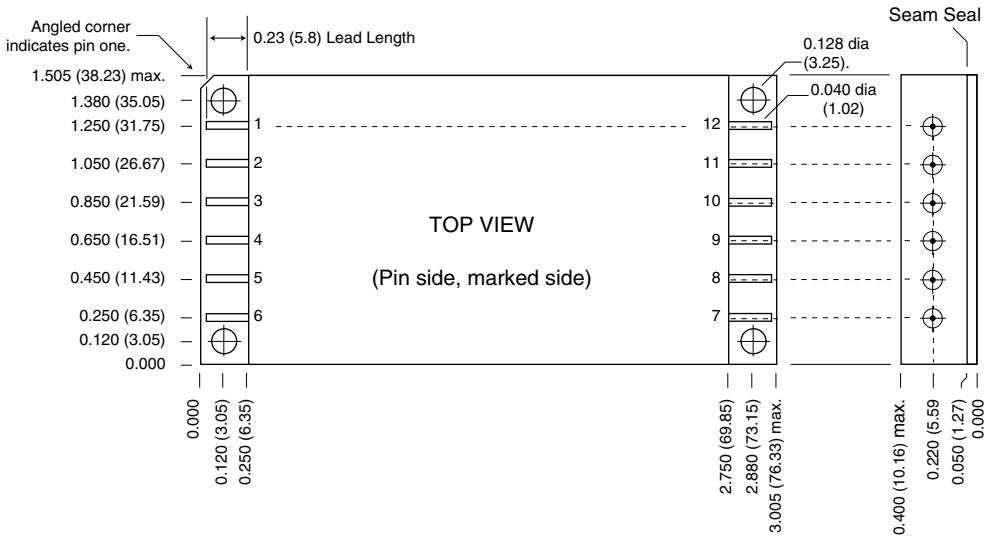


Figure 4: Case for F through H Options
Case size 3.005 x 1.500 x 0.400 inches, 76.33 x 38.23 x 10.16 mm

Table 4: ENVIRONMENTAL SCREENING

TEST	STANDARD	/ES
PRE-CAP INSPECTION Method 2017, 2032	no	yes
TEMPERATURE CYCLE (10 times) Method 1010, Cond. B, -55°C to 125°C	no	yes
CONSTANT ACCELERATION Method 2001, 500 g	no	yes
BURN-IN Method 1015, 96 hours at 100°C case	no	yes
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case	yes	yes
HERMETICITY TESTING Fine Leak, Method 1014, Cond. A	no	yes
Gross Leak, Method 1014, Cond. C	no	yes
Gross Leak, Dip (1 x 10 ⁻³)	yes	no
FINAL VISUAL INSPECTION Method 2009	yes	yes

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

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