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SM Series

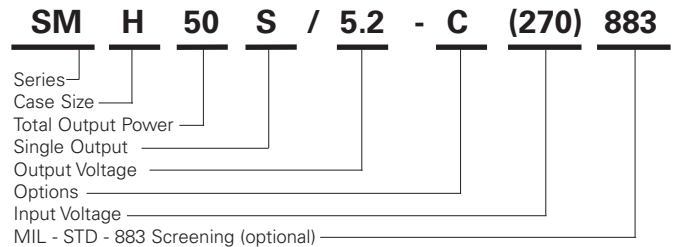
High Density DC / DC Converter 28 / 270 Vdc Input 50 Watt Single Output



FEATURES

- No Derating From -55 to +100°C
- Synchronization
- Fixed Frequency Power Conversion
- MIL - STD - 883C Screening Available
- Meets MIL - Standards:
 - MIL - STD - 454
 - P4855 - 1A
 - MIL - STD - 704D
 - MIL - STD - 810E
 - MIL - S - 901C

HOW TO ORDER



Options: **A** - pins out baseplate of unit Case Size: **H** designates the half size unit.
C - thru hole inserts (0.140 DIA) Omit the H for the larger case.
I - metric inserts (M3)

Standard unit is 28Vdc nominal input with pins out the top written as: SMH50S/5.2

ACCESSORY PRODUCTS

- SM1275: Input Transient Suppression Module (for 28 Vdc input only) for conformance to MIL - STD - 704A & MIL - STD - 1275.
- SMF200: EMI Filter to meet MIL - STD - 461C.
- SMR: AC Front End Rectifier (for 270 Vdc input).

SELECTION CHART

Nominal Output (Vdc)	Output Current(Amps)	Model Number
2.0	10	SMH50S/2.0
3.3	10	SMH50S/3.3
5.0	10	SMH50S/5.0
5.2	9.6	SMH50S/5.2
12	4.2	SMH50S/12
15	3.3	SMH50S/15
24	2.1	SMH50S/24
28	1.8	SMH50S/28
48	1.0	SMH50S/48

Specifications

SMH50S

INPUT CHARACTERISTICS 28VDC INPUT

	Min	Typ	Max	Units
Input Voltage	18	28	36	Vdc
Brown Out (75%) Full Load	17			Vdc
No Load Power Dissipation		2	3	Watt
Inrush Charge		2		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		1.0	1.5	mA
Logic Disable Power In		0.35	0.75	W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	37		50	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (50 Vdc for 0.1 second)			

INPUT CHARACTERISTICS 270VDC INPUT

	Min	Typ	Max	Units
Input Voltage	200	270	400	Vdc
Brown Out (75%) Full Load	175			Vdc
No Load Power Dissipation		3	5	Watt
Inrush Charge		1.5		mc
Reflected Ripple Current Logic		15		%
Logic Disable Current (Sink)		0.8		mA
Logic Disable Power In		3.0		W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	400		500	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (500 Vdc for 0.1 second)			

OUTPUT CHARACTERISTICS

	Per Channel			Units
	Min	Typ	Max	
Set Point Accuracy			1*	%V _{out}
Load Regulation		0.02	0.2	%V _{out}
Line Regulation		0.02	0.1	%V _{out}
Ripple P-P (25MHz)		1.0	3.0	%V _{out}
Trim Range (5V, 5.2V min=85%)	60		115	%V _{out}
Trim Range (2V, 3.3V)	100		115	%V _{out}
Remote Sense Compensation		0.5		Vdc
Overvoltage Protection		115	125	%V _{out}
Current Sharing		N / A		
Transient Response (V _{out} 1%)	Time / Overshoot			
20 - 80% Load		400/400		µS/mV
Low Line - High Line		400/400		µS/mV
50 - 100%		400/400		µS/mV
Temperature Drift		0.01	0.02	%/°C
Long Term Drift		0.01	0.02	%/1KHrs
Current Limit	105		150	%I _{out}
Short Circuit Current		180		%I _{out}
Turn On Time		25		mS
Logic Turn On Time		25		mS
Tracking Accuracy		N / A		

* 1% or 50mV, whichever is greater

ISOLATION CHARACTERISTICS

	Min	Typ	Max	Units
Isolation: Input to Output (28Vdc in)	500			Vdc
Input to Output (270Vdc in)	1000			Vdc
Output to Base	500			Vdc
Input to Base (28 Vdc in)	500			Vdc
Input to Base (270 Vdc in)	1000			Vdc
Input to Output Capacitance	0.01		0.03	µF
Insulation Resistance (@ 50 Vdc)	50			MOhm

MECHANICAL CHARACTERISTICS

Weight	4.5	oz
	130	grams
Size	2.4 x 2.3 x 0.5	inch
	61 x 59 x 13	mm
Volume	2.76	inch ³
	47	cm ³

TEMPERATURE CHARACTERISTICS

	Min	Typ	Max	Units
Operating (Baseplate)	-55		+100	°C
Storage (Ambient)	-55		+125	°C
Over Temperature Shutdown		+105		°C
Thermal Resistance Case(Ambient)		5		°C/W

MIL - STD - 883 SCREENING (OPTIONAL)

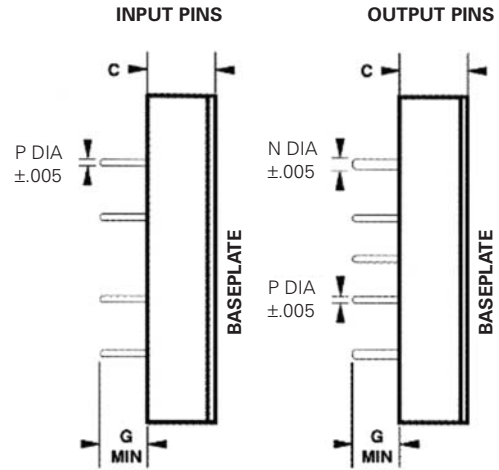
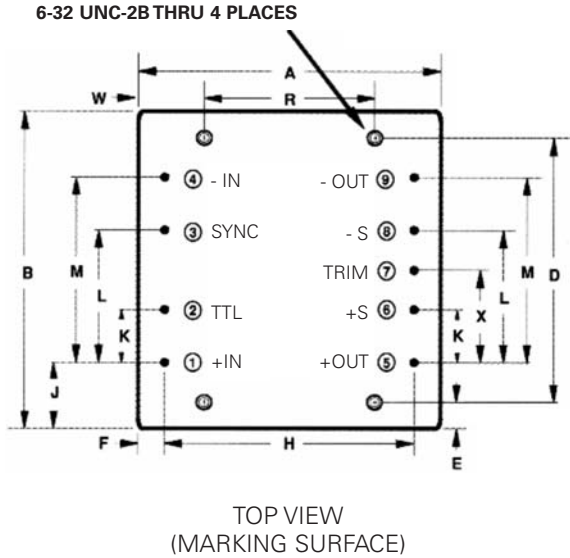
Stabilization Bake:	+125°C for 24 hours per M1008.2, Condition B
Temperature Cycling:	10 cycles at -55°C to +125°C (transition period 36 minutes) per M1010, Condition B
Burn-in:	160 hours at +100°C
Final Testing	

Case Drawings

SMH50S

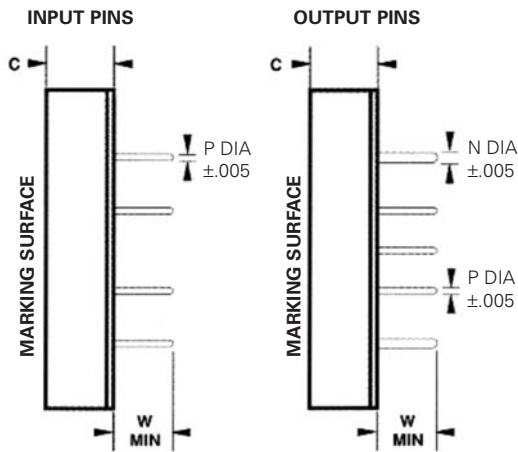
Standard Model

Pin placement on top of unit.
Model number written as SMH50S/5.2



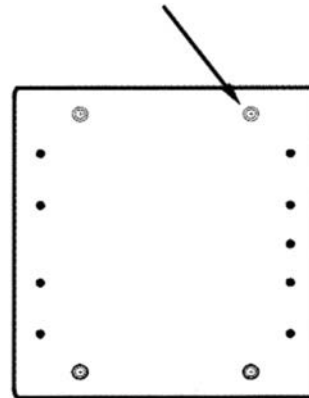
A Option

Pin placement on baseplate of unit.
Model number written as SMH50S/5.2-A



C Option

Thru hole inserts (0.140 DIA).
Model number written as SMH50S/5.2-C



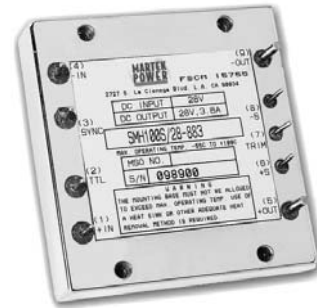
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	W	X
inch	2.30	2.40	.50	2.100	.15	.20	.30	1.900	.50	.400	1.000	1.400	.080	.040	1.300	.50	.700
mm	58.4	61.0	12.7	53.34	3.8	5.1	7.6	48.26	12.7	10.20	25.40	35.56	2.03	1.02	33.02	12.7	17.8

Tolerances: Inches x.xx = ±0.03
x.xxx = ±0.015
mm x.xx = ±0.4
x.x = ±0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 5052-H32, Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

SM Series

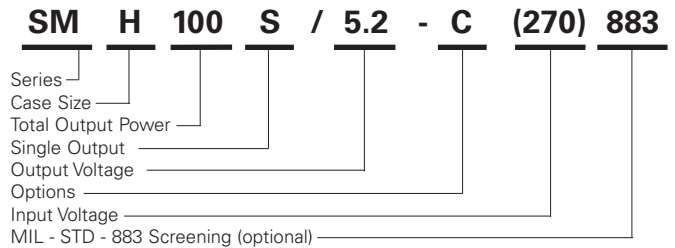
High Density DC / DC Converter 28 / 270 Vdc Input 100 Watt Single Output



FEATURES

- No Derating From -55 to +100°C
- Synchronization
- Fixed Frequency Power Conversion
- MIL - STD - 883C Screening Available
- Meets MIL - Standards:
 - MIL - STD - 454
 - P4855 - 1A
 - MIL - STD - 704D
 - MIL - STD - 810E
 - MIL - S - 901C

HOW TO ORDER



Options: **A** - pins out baseplate of unit Case Size: H designates the half size unit.
C - thru hole inserts (0.140 DIA) Omit the H for the larger case.
I - metric inserts (M3)

Standard unit is 28Vdc nominal input with pins out the top written as SMH100S/5.2

ACCESSORY PRODUCTS

- SM1275: Input Transient Suppression Module (for 28 Vdc input only) for conformance to MIL - STD - 704A & MIL - STD - 1275.
- SMF200: EMI Filter to meet MIL - STD - 461C.
- SMR: AC Front End Rectifier (for 270 Vdc input).

SELECTION CHART

Nominal Output(Vdc)	Output Current(Amps)	Model Number
2.0	20	SMH100S/2.0
3.3	20	SMH100S/3.3
5.0	20	SMH100S/5.0
5.2	19	SMH100S/5.2
12	8.3	SMH100S/12
15	6.7	SMH100S/15
24	4.2	SMH100S/24
28	3.6	SMH100S/28
48	2.0	SMH100S/48

Specifications

SMH100S

INPUT CHARACTERISTICS 28 VDC INPUT

	Min	Typ	Max	Units
Input Voltage	18	28	36	Vdc
Brown Out (75%) Full Load	17			Vdc
No Load Power Dissipation		2	3	Watt
Inrush Charge		2		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		1.0	1.5	mA
Logic Disable Power In		0.35	0.75	W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	37		50	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (50 Vdc for 0.1 second)			

INPUT CHARACTERISTICS 270VDC INPUT

	Min	Typ	Max	Units
Input Voltage	200	270	400	Vdc
Brown Out (75%) Full Load	175			Vdc
No Load Power Dissipation		3	5	Watt
Inrush Charge		1.5		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		0.8		mA
Logic Disable Power In		3.0		W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	400		500	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (500 Vdc for 0.1 second)			

OUTPUT CHARACTERISTICS

	Per Channel			Units
	Min	Typ	Max	
Set Point Accuracy			1*	%V _{out}
Load Regulation		0.02	0.2	%V _{out}
Line Regulation		0.02	0.1	%V _{out}
Ripple P-P (25MHz)		1.0	3.0	%V _{out}
Trim Range (5V, 5.2V min=85%)	60		115	%V _{out}
Trim Range (2V, 3.3V)	100		115	%V _{out}
Remote Sense Compensation		0.5		Vdc
Overvoltage Protection		115	125	%V _{out}
Current Sharing	N / A			
Transient Response (V _{out} 1%)	Time/	Overshoot		
	20 - 80% Load	400/400		µS/mV
	Low Line - High Line	400/400		µS/mV
	50 - 100%	400/400		µS/mV
Temperature Drift		0.01	0.02	%/°C
Long Term Drift		0.01	0.02	%/1Khrs
Current Limit	105		150	%I _{out}
Short Circuit Current		180		%I _{out}
Turn On Time		25		mS
Logic Turn On Time		25		mS
Tracking Accuracy	N / A			

* 1% or 50mV, whichever is greater

ISOLATION CHARACTERISTICS

	Min	Typ	Max	Units
Isolation: Input to Output (28Vdc in)	500			Vdc
Input to Output (270Vdc in)	1000			Vdc
Output to Base	500			Vdc
Input to Base (28 Vdc in)	500			Vdc
Input to Base (270 Vdc in)	1000			Vdc
Input to Output Capacitance	0.01		0.03	µF
Insulation Resistance (@ 50 Vdc)	50			MOhm

MECHANICAL CHARACTERISTICS

Weight	4.5		oz
	130		grams
Size	2.4 x 2.3 x 0.5		inch
	61 x 59 x 13		mm
Volume	2.76		inch ³
	47		cm ³

TEMPERATURE CHARACTERISTICS

	Min	Typ	Max	Units
Operating (Baseplate)	-55		+100	°C
Storage (Ambient)	-55		+125	°C
Over Temperature Shutdown		+105		°C
Thermal Resistance Case(Ambient)		5		°C/W

MIL - STD - 883 SCREENING (OPTIONAL)

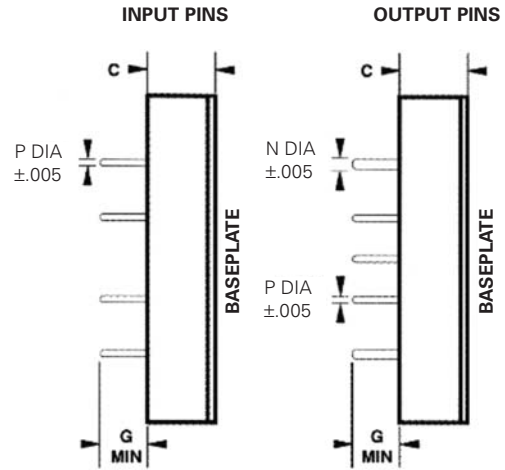
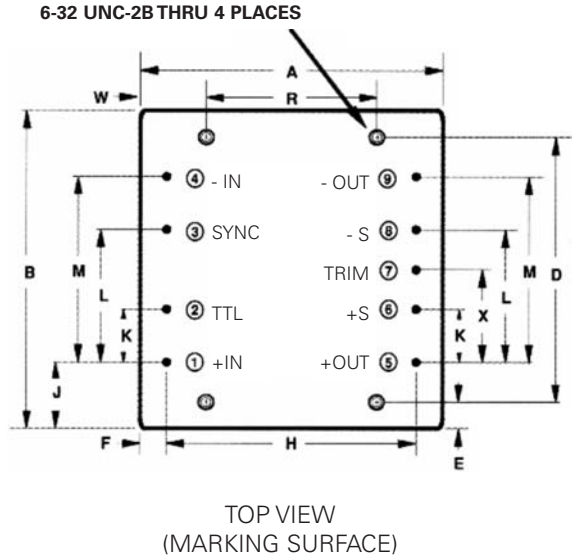
Stabilization Bake:	+125°C for 24 hours per M1008.2, Condition B
Temperature Cycling:	10 cycles at -55°C to +125°C (transition period 36 minutes) per M1010, Condition B
Burn-in:	160 hours at +100°C
Final Testing	

Case Drawings

SMH100S

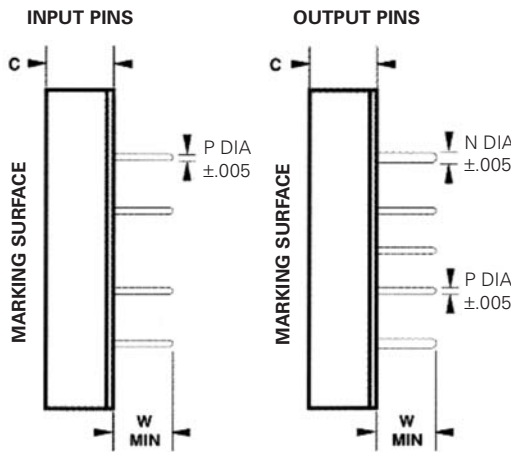
Standard Model

Pin placement on top of unit.
 Model number written as SMH100S/5.2



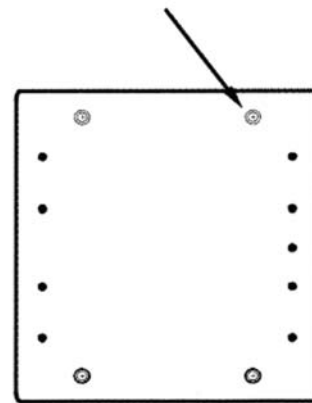
A Option

Pin placement on baseplate of unit.
 Model number written as SMH100S/5.2-A



C Option

Thru hole inserts (0.140 DIA).
 Model number written as SMH100S/5.2-C



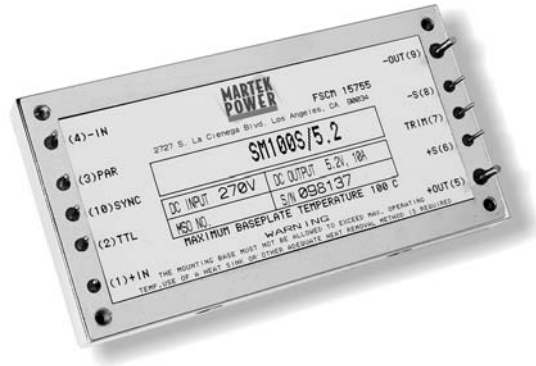
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	W	X
inch	2.30	2.40	.50	2.100	.15	.20	.30	1.900	.50	.400	1.000	1.400	.080	.040	1.300	.50	.700
mm	58.4	61.0	12.7	53.34	3.8	5.1	7.6	48.26	12.7	10.20	25.40	35.56	2.03	1.02	33.02	12.7	17.80

Tolerances: Inches x.xx = ±0.03
 x.xxx = ±0.015
 mm x.xx = ±0.4
 x.x = ±0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 5052-H32,
 Case - Steel.
 Finish: Nickel Plating.
 Mounting: 6-32 THD inserts are provided in baseplate.
 Metric: M3 inserts.

SM Series

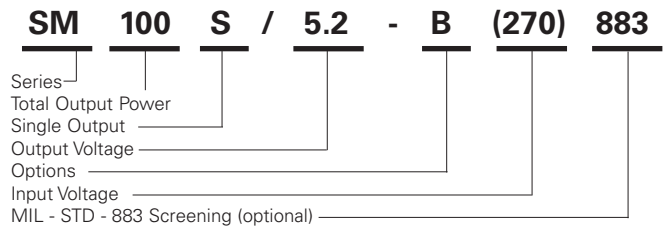
Full Featured DC / DC Converter 28 / 270 Vdc Input 100 Watt Single Output



FEATURES

- No Derating From -55 to +100°C
- Parallelable Operation
- Synchronization
- Fixed Frequency Power Conversion
- MIL - STD - 883C Screening Available
- Meets MIL - Standards:
 - MIL - STD - 454
 - P4855 - 1A
 - MIL - STD - 704D
 - MIL - STD - 810E
 - MIL - S - 901C

HOW TO ORDER



- Options: **A** - pins out baseplate of unit
B - relocating of mounting holes
C - thru hole inserts (0.140 DIA)
I - metric inserts (M3)

Standard unit is 28 Vdc nominal input with pins out the top written as SM100S/5.2

ACCESSORY PRODUCTS

- SM1275: Input Transient Suppression Module (for 28 Vdc input only) for conformance to MIL - STD - 704A & MIL - STD - 1275.
- SMF200: EMI Filter to meet MIL - STD - 461C.
- SMR: AC Front End Rectifier (for 270 Vdc input).
- SMRA: Ripple Attenuator Module to reduce ripple to < 20 mV P-P.

SELECTION CHART

Nominal Output(Vdc)	Output Current(Amps)	Model Number
2.0	20	SM100S/2.0
3.3	20	SM100S/3.3
5.0	20	SM100S/5.0
5.2	19	SM100S/5.2
12	8.3	SM100S/12
15	6.7	SM100S/15
24	4.2	SM100S/24
28	3.6	SM100S/28
48	2.0	SM100S/48

Specifications

SM100S

INPUT CHARACTERISTICS 28 VDC INPUT

	Min	Typ	Max	Units
Input Voltage	16	28	36	Vdc
Brown Out (75%) Full Load	15			Vdc
No Load Power Dissipation		2	3	Watt
Inrush Charge		2		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		1.0	1.5	mA
Logic Disable Power In		0.35	0.75	W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	37		50	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (50 Vdc for 0.1 second)			

INPUT CHARACTERISTICS 270VDC INPUT

	Min	Typ	Max	Units
Input Voltage	175	270	400	Vdc
Brown Out (75%) Full Load	165			Vdc
No Load Power Dissipation		6	8	Watt
Inrush Charge		1.5		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		0.8		mA
Logic Disable Power In		3.0		W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	400		500	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (500 Vdc for 0.1 second)			

OUTPUT CHARACTERISTICS

	Per Channel			Units
	Min	Typ	Max	
Set Point Accuracy			1*	%Vout
Load Regulation		0.02	0.2	%Vout
Line Regulation		0.02	0.1	%Vout
Ripple P-P (25MHz)		1.0	3.0	%Vout
Trim Range (5V, 5.2V min=85%)	60		115	%Vout
Trim Range (2V, 3.3V)	100		115	%Vout
Remote Sense Compensation		0.5		Vdc
Overvoltage Protection		115	125	%Vout
Current Sharing		± 10		%Iout
Transient Response (Vout 1%)	Time / Overshoot			
20 - 80% Load		400/400		µS/mV
Low Line - High Line		400/400		µS/mV
50 - 100%		400/400		µS/mV
Temperature Drift		0.01	0.02	%/°C
Long Term Drift		0.01	0.02	%/1KHrs
Current Limit	105		150	%Iout
Short Circuit Current		150		%Iout
Turn On Time		100		mS
Logic Turn On Time		100		mS
Tracking Accuracy		N / A		

* 1% or 50mV, whichever is greater

ISOLATION CHARACTERISTICS

	Min	Typ	Max	Units
Isolation: Input to Output (28 Vdc in)	500			Vdc
Input to Output (270Vdc in)	1000			Vdc
Output to Base	500			Vdc
Input to Base (28 Vdc in)	500			Vdc
Input to Base (270Vdc in)	1000			Vdc
Input to Output Capacitance	0.01		0.03	µF
Insulation Resistance (@ 50 Vdc)	50			MOhm

MECHANICAL CHARACTERISTICS

Weight	9.75	oz
	276.4	grams
Size	2.4 x 4.6 x 0.5	inch
	61 x 117 x 13	mm
Volume	5.5	inch ³
	93	cm ³

TEMPERATURE CHARACTERISTICS

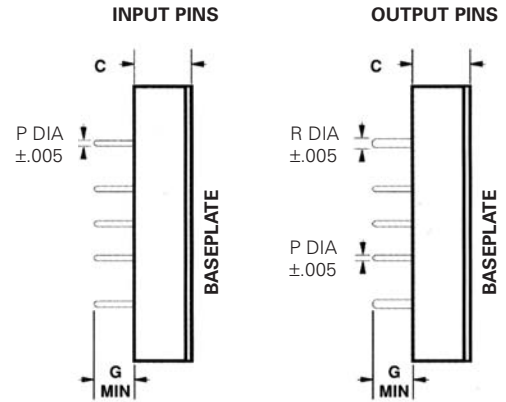
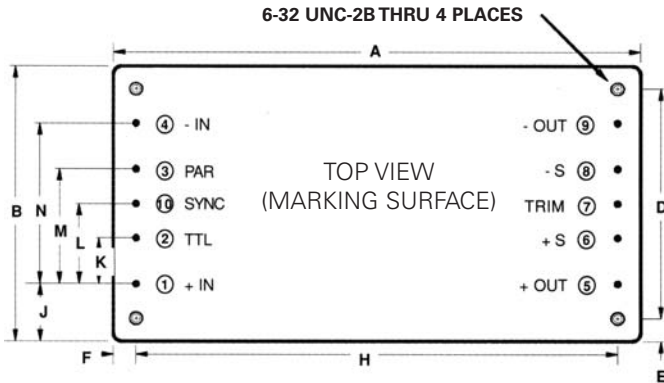
	Min	Typ	Max	Units
Operating (Baseplate)	-55		+100	°C
Storage (Ambient)	-55		+125	°C
Over Temperature Shutdown		+105		°C
Thermal Resistance Case(Ambient)		5		°C/W

MIL - STD - 883 SCREENING (OPTIONAL)

Stabilization Bake:	+125°C for 24 hours per M1008.2, Condition B
Temperature Cycling:	10 cycles at -55°C to +125°C (transition period 36 minutes) per M1010, Condition B
Burn-in:	160 hours at +100°C
Final Testing	

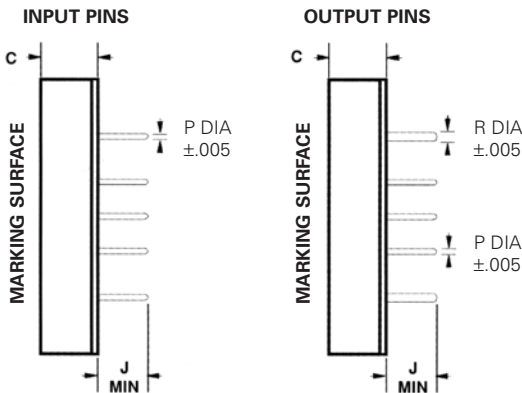
Standard Model

Pin placement on top of unit.
Model number written as SM100S/5.2



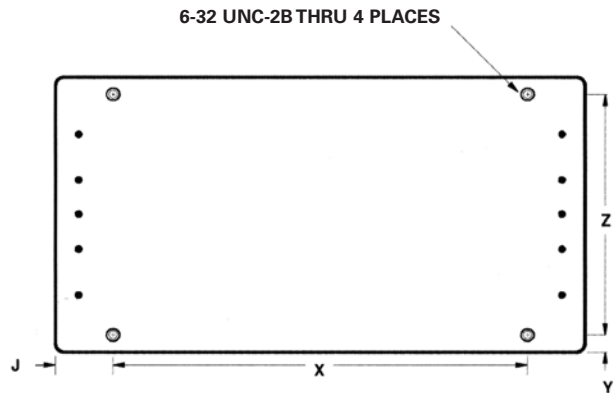
A Option

Pin placement on baseplate of unit.
Model number written as SM100S/5.2-A



B Option

Relocating of mounting holes.
Model number written as SM100S/5.2-B



C Option

Thru hole inserts (0.140 DIA).
Model number written as SM100S/5.2-C

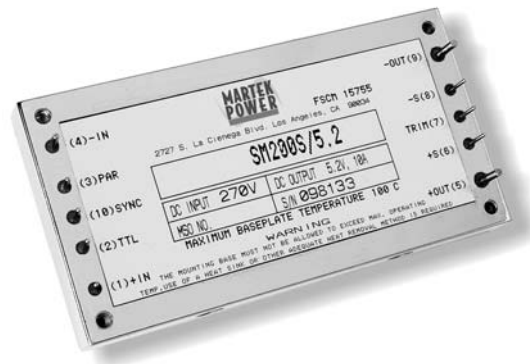
Tolerances: Inches x.xx = ± 0.03
x.xxx = ± 0.015
mm x.xx = ± 0.4
x.x = ± 0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 5052-H32, Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	X	Y	Z
inch	4.60	2.40	.50	2.000	.20	.20	.30	4.200	.50	.400	.700	1.000	1.400	.040	.080	3.600	.15	2.100
mm	116.9	61.0	12.7	50.80	5.1	5.1	7.6	106.68	12.7	10.20	17.80	25.40	35.60	1.02	2.03	91.44	3.8	53.34

SM Series

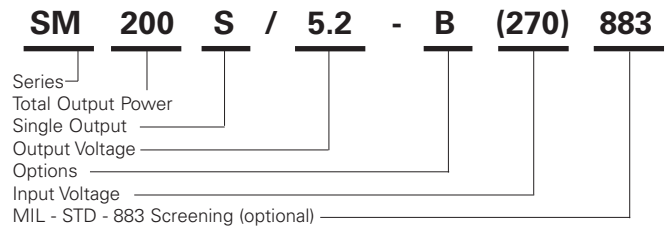
Full Featured DC / DC Converter 28 / 270 Vdc Input 200 Watt Single Output



FEATURES

- No Derating From -55 to +100°C
- Parallelable Operation
- Synchronization
- Fixed Frequency Power Conversion
- MIL - STD - 883C Screening Available
- Meets MIL - Standards:
 - MIL - STD - 454
 - P4855 - 1A
 - MIL - STD - 704D
 - MIL - STD - 810E
 - MIL - S - 901C

HOW TO ORDER



- Options: **A** - pins out baseplate of unit
B - relocating of mounting holes
C - thru hole inserts (0.140 DIA)
I - metric inserts (M3)

Standard unit is 28Vdc nominal input with pins out the top written as SM200S/5.2

ACCESSORY PRODUCTS

- SM1275: Input Transient Suppression Module (for 28 Vdc input only) for conformance to MIL - STD - 704A & MIL - STD - 1275.
- SMF200: EMI Filter to meet MIL - STD - 461C.
- SMR: AC Front End Rectifier (for 270 Vdc input).
- SMRA: Ripple Attenuator Module to reduce ripple to < 20 mV P-P.

SELECTION CHART

Nominal Output(Vdc)	Output Current(Amps)	Model Number
2.0	40	SM200S/2.0
3.3	40	SM200S/3.3
5.0	40	SM200S/5.0
5.2	38	SM200S/5.2
12	20	SM200S/12
15	16	SM200S/15
24	11	SM200S/24
28	10	SM200S/28
48	5.0	SM200S/48

Specifications

SM200S

INPUT CHARACTERISTICS 28 VDC INPUT

	Min	Typ	Max	Units
Input Voltage	18	28	36	Vdc
Brown Out (75%) Full Load	17			Vdc
No Load Power Dissipation		2	3	Watt
Inrush Charge [fig VII]		2		mc
Reflected Ripple Current Logic [fig VIII]		15		%
Disable Current (Sink)		1.0	1.5	mA
Logic Disable Power In		0.35	0.75	W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	37		50	Vdc
Efficiency [fig II]		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (50 Vdc for 0.1 second)			

INPUT CHARACTERISTICS 270 VDC INPUT

	Min	Typ	Max	Units
Input Voltage	200	270	400	Vdc
Brown Out (75%) Full Load	175			Vdc
No Load Power Dissipation		6	8	Watt
Inrush Charge [fig VII]		1.5		mc
Reflected Ripple Current [fig VIII]		15		%
Logic Disable Current (Sink)		0.8		mA
Logic Disable Power In		3.0		W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	400		500	Vdc
Efficiency [fig II]		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (500 Vdc for 0.1 second)			

OUTPUT CHARACTERISTICS

	Min	Typ	Max	Units
Set Point Accuracy			1*	%Vout
Load Regulation		0.02	0.2	%Vout
Line Regulation		0.02	0.1	%Vout
Ripple P-P (25MHz) [fig IV]		1.0	3.0	%Vout
Trim Range (5V, 5.2V min=85%)	60		115	%Vout
Trim Range (2V, 3.3V)	100		115	%Vout
Remote Sense Compensation		0.5		Vdc
Overvoltage Protection		115	125	%Vout
Current Sharing		± 10		%Iout
Transient Response (Vout 1%) Time/ Overshoot [fig V & VI]				
20 - 80% Load		400/400		µS/mV
Low Line - High Line		400/400		µS/mV
50 - 100%		400/400		µS/mV
Temperature Drift		0.01	0.02	%/°C
Long Term Drift		0.01	0.02	%/1KHrs
Current Limit	105		150	%Iout
Short Circuit Current		150		%Iout
Turn On Time [fig X]		100		mS
Logic Turn On Time [fig IX]		100		mS
Tracking Accuracy		N / A		

* 1% or 50mV, whichever is greater

ISOLATION CHARACTERISTICS

	Min	Typ	Max	Units
Isolation: Input to Output (28 Vdc in)	500			Vdc
Input to Output(270Vdc in)	1000			Vdc
Output to Base	500			Vdc
Input to Base (28 Vdc in)	500			Vdc
Input to Base (270 Vdc in)	1000			Vdc
Input to Output Capacitance	0.01		0.03	µF
Insulation Resistance (@ 50 Vdc)	50			MOhm

MECHANICAL CHARACTERISTICS

	Typ	Units
Weight	9.75	oz
	276.4	grams
Size	2.4 x 4.6 x 0.5	inch
	61 x 117 x 13	mm
Volume	5.5	inch ³
	93	cm ³

TEMPERATURE CHARACTERISTICS

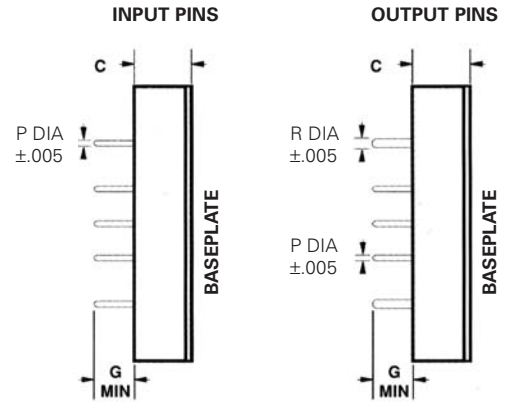
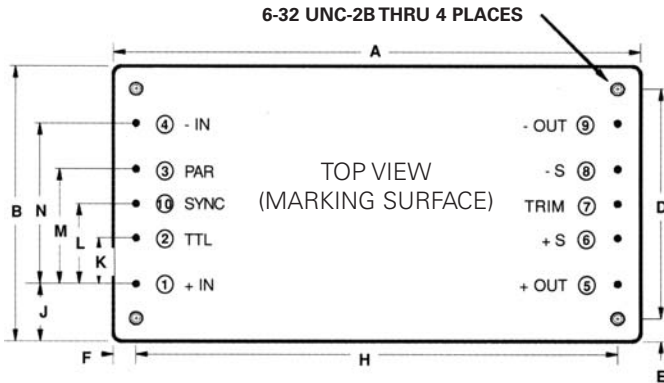
	Min	Typ	Max	Units
Operating (Baseplate)	-55		+100	°C
Storage (Ambient)	-55		+125	°C
Over Temperature Shutdown		+105		°C
Thermal Resistance Case(Ambient)		5		°C/W

MIL - STD - 883 SCREENING (OPTIONAL)

Stabilization Bake:	+125°C for 24 hours per M1008.2, Condition B
Temperature Cycling:	10 cycles at -55°C to +125°C (transition period 36 minutes) per M1010, Condition B
Burn-in:	160 hours at +100°C
Final Testing	

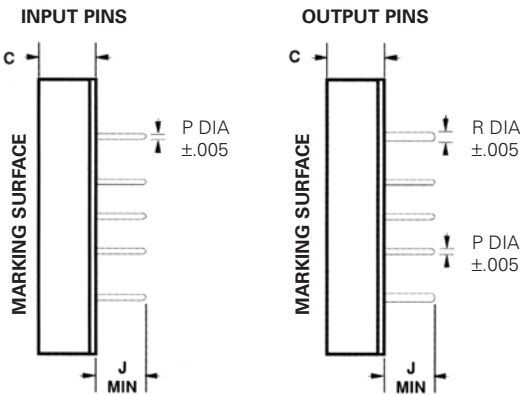
Standard Model

Pin placement on top of unit.
Model number written as SM200S/5.2



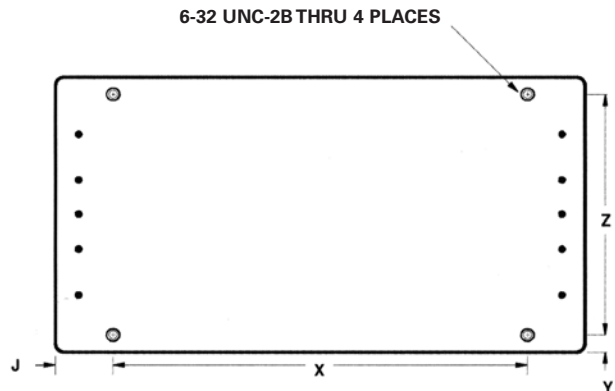
A Option

Pin placement on baseplate of unit.
Model number written as SM200S/5.2-A



B Option

Relocating of mounting holes.
Model number written as SM200S/5.2-B



Tolerances: Inches x.xx = ±0.03
x.xxx = ±0.015
mm x.xx = ±0.4
x.x = ±0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 5052-H32, Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

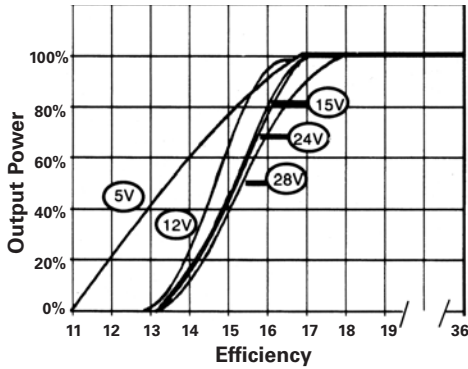
C Option

Thru hole inserts (0.140 DIA).
Model number written as SM200S/5.2-C

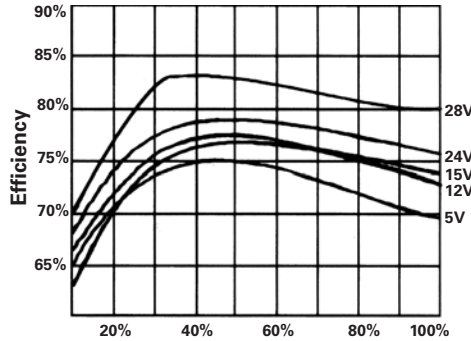
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	X	Y	Z
inch	4.60	2.40	.50	2.000	.20	.20	.30	4.200	.50	.400	.700	1.000	1.400	.040	.080	3.600	.15	2.100
mm	116.9	61.0	12.7	50.80	5.1	5.1	7.6	106.68	12.7	10.20	17.8	25.40	35.60	1.02	2.03	91.44	3.8	53.34

28 Vdc Input

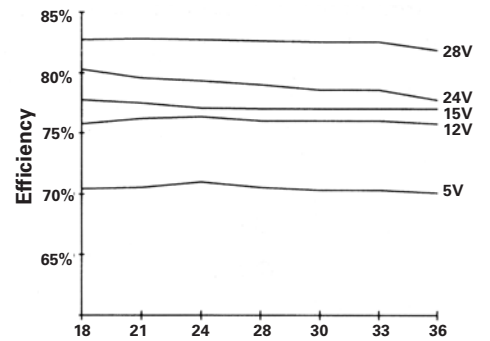
I. Input Voltage vs. Output Power



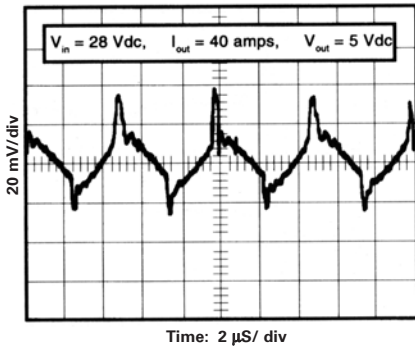
II. Efficiency vs. Output Power



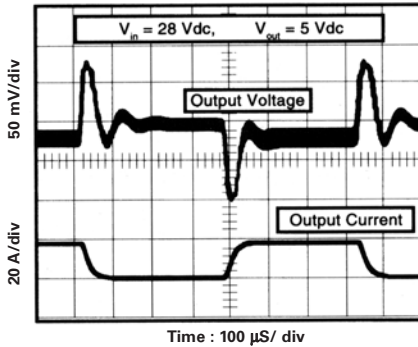
III. Efficiency vs. Input Voltage



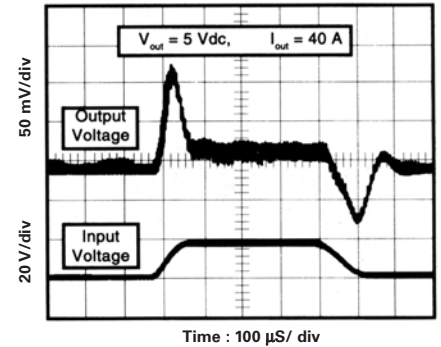
IV. Output Voltage Ripple



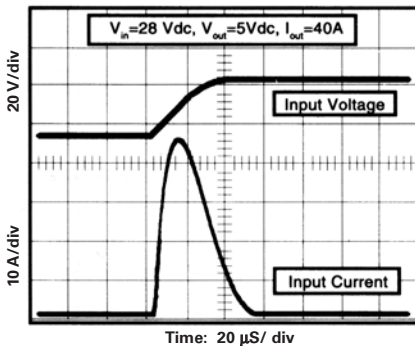
V. Load Transient Response



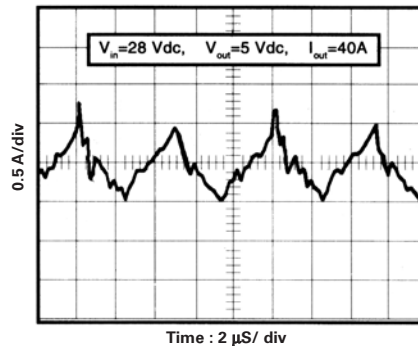
VI. Input Transient Response



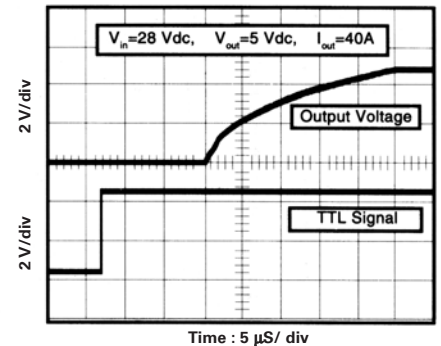
VII. Input Inrush Current



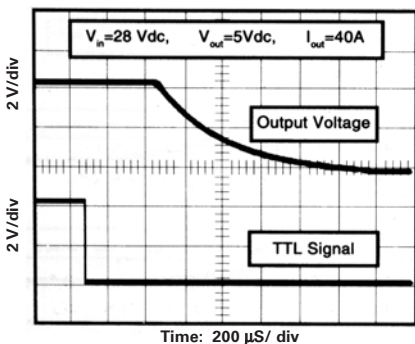
VIII. Input Current Ripple



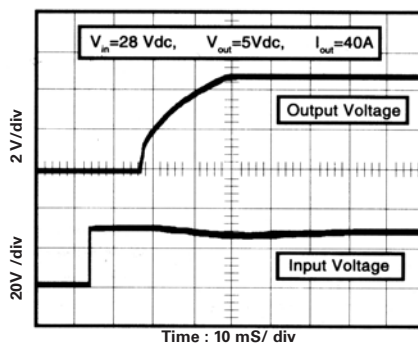
IX. TTL Turn On



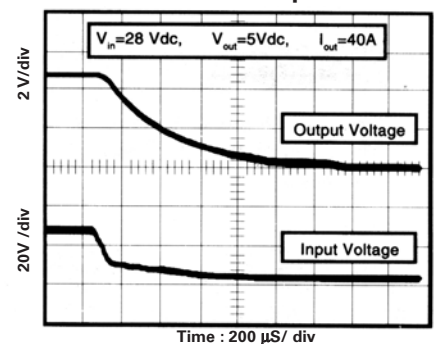
X. TTL Turn-off



XI. Turn On

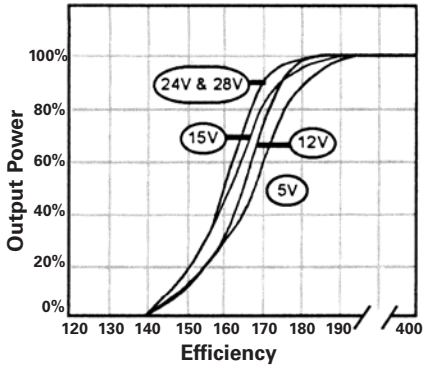


XII. Turn Off / Hold-up Time

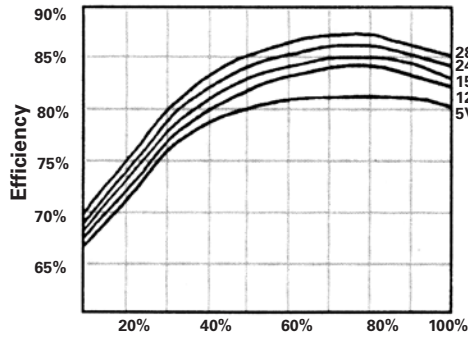


270 Vdc Input

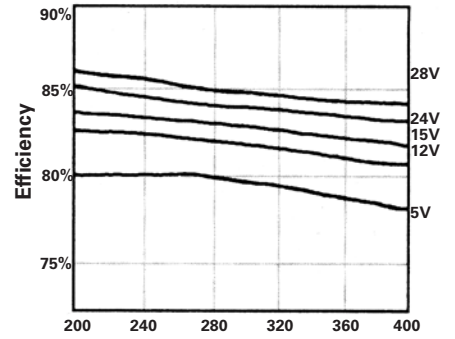
I. Input Voltage vs. Output Power



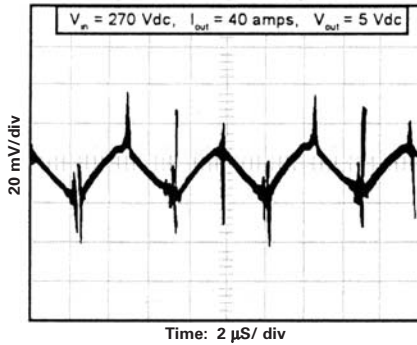
II. Efficiency vs. Output Power



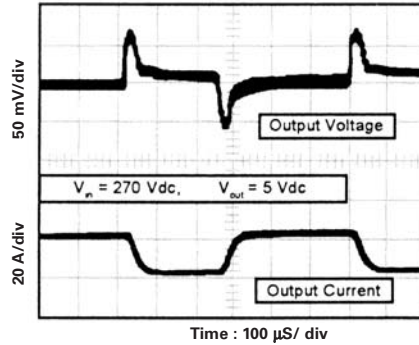
III. Efficiency vs. Input Voltage



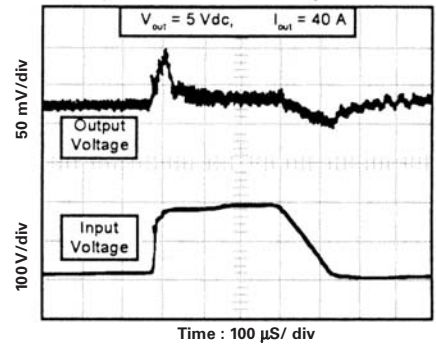
IV. Output Voltage Ripple



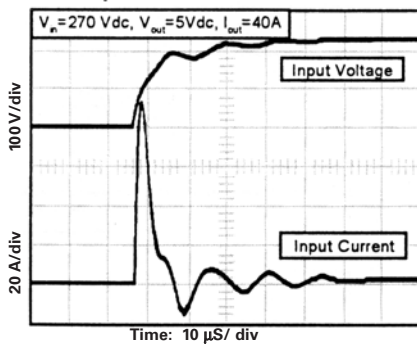
V. Load Transient Response



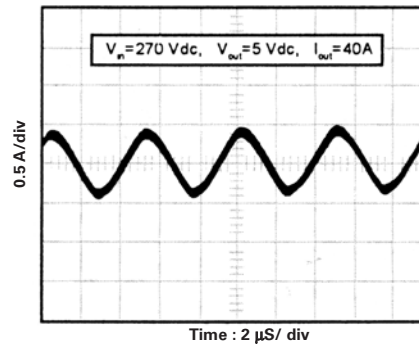
IV. Input Transient Response



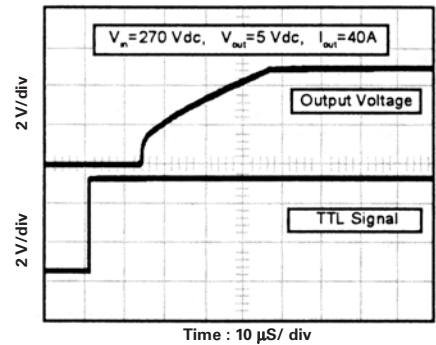
VII. Input Inrush Current



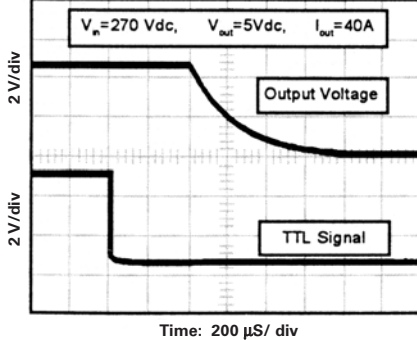
VIII. Input Current Ripple



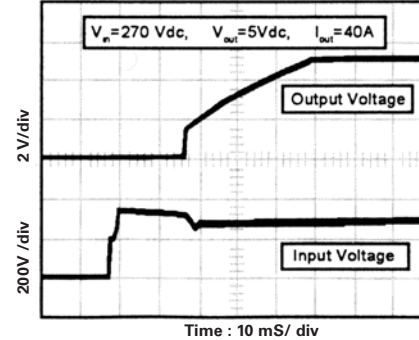
IX. TTL Turn On



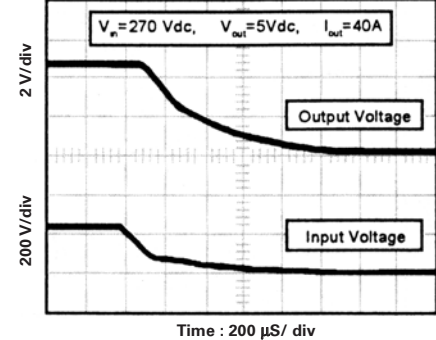
X. TTL Turn-off



XI. Turn On

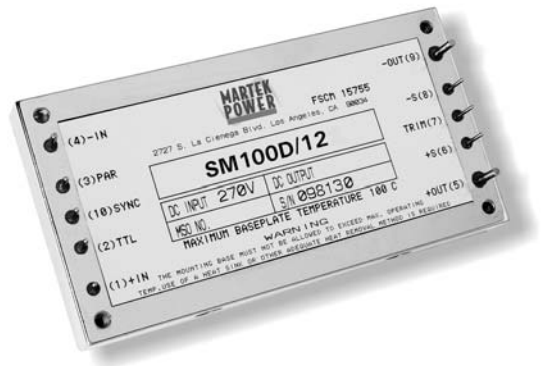


XII. Turn Off / Hold-up Time



SM Series

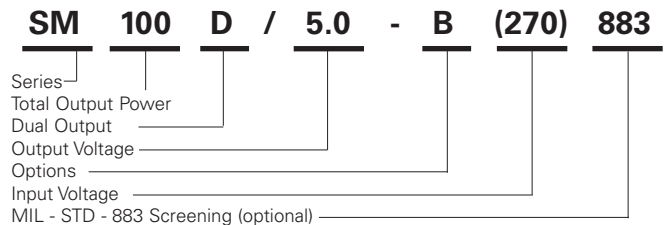
Full Featured DC / DC Converter 28 / 270 Vdc Input 100 Watt Dual Output



FEATURES

- No Derating From -55 to +100°C
- Synchronization
- Fixed Frequency Power Conversion
- MIL - STD - 883C Screening Available
- Meets MIL - Standards:
 - MIL - STD - 454
 - P4855 - 1A
 - MIL - STD - 704D
 - MIL - STD - 810E
 - MIL - S - 901C

HOW TO ORDER



- Options: **A** - pins out baseplate of unit
B - relocating of mounting holes
C - thru hole inserts (0.140 DIA)
I - metric inserts (M3)

Standard unit is 28Vdc nominal input with pins out the top written as SM100D/5.0

ACCESSORY PRODUCTS

- SM1275: Input Transient Suppression Module (for 28 Vdc input only) for conformance to MIL - STD - 704A & MIL - STD - 1275.
- SMF200: EMI Filter to meet MIL - STD - 461C.
- SMR: AC Front End Rectifier (for 270 Vdc input).
- SMRA: Ripple Attenuator Module to reduce ripple to < 20 mV P-P.

SELECTION CHART

Nominal Output(Vdc)	Output Current(Amps)	Model Number
5.0	± 10	SM100D/5.0
12	± 4.2	SM100D/12
15	± 3.3	SM100D/15

Specifications

SM100D

INPUT CHARACTERISTICS 28 VDC INPUT

	Min	Typ	Max	Units
Input Voltage	18	28	36	Vdc
Brown Out (75%) Full Load	17			Vdc
No Load Power Dissipation		3		Watt
Inrush Charge		4		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		1.0	1.5	mA
Logic Disable Power In		0.35	0.75	W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	37		50	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (50 Vdc for 0.1 second)			

INPUT CHARACTERISTICS 270VDC INPUT

	Min	Typ	Max	Units
Input Voltage	200	270	400	Vdc
Brown Out (75%) Full Load	175			Vdc
No Load Power Dissipation		5		Watt
Inrush Charge		3		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		0.8		mA
Logic Disable Power In		3.0		W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	400		500	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (500 Vdc for 0.1 second)			

OUTPUT CHARACTERISTICS

	Per Channel			Units
	Min	Typ	Max	
Set Point Accuracy			1*	%V _{out}
Load Regulation		0.02	0.2	%V _{out}
Line Regulation		0.02	0.1	%V _{out}
Ripple P-P (25MHz)		1.0	3.0	%V _{out}
Trim Range (5V, 5.2V min=85%)	60		115	%V _{out}
Trim Range (2V, 3.3V)	100		115	%V _{out}
Remote Sense Compensation		0.5		Vdc
Overvoltage Protection		115	125	%V _{out}
Current Sharing	N / A			
Transient Response (V _{out} 1%)	Time / Overshoot			
20 - 80% Load		400/400		µS/mV
Low Line - High Line		400/400		µS/mV
50 - 100%		400/400		µS/mV
Temperature Drift		0.01	0.02	%/°C
Long Term Drift		0.01	0.02	%/1KHrs
Current Limit		150		%I _{out}
Short Circuit Current (28Vdc)		150		%I _{out}
Short Circuit Current (270Vdc)		50		%I _{out}
Turn On Time		100		mS
Logic Turn On Time		100		mS
Tracking Accuracy		0.1		%V _{out}

* 1% or 50mV, whichever is greater

ISOLATION CHARACTERISTICS

	Min	Typ	Max	Units
Isolation: Input to Output (28Vdc in)	500			Vdc
Input to Output (270Vdc in)	1000			Vdc
Output to Base	500			Vdc
Input to Base (28Vdc in)	500			Vdc
Input to Base (270Vdc in)	1000			Vdc
Input to Output Capacitance	0.01		0.03	µF
Insulation Resistance (@ 50 Vdc)	50			MOhm

MECHANICAL CHARACTERISTICS

Weight	9.3	oz
	260	grams
Size	2.4 x 4.6 x 0.5	inch
	61 x 117 x 13	mm
Volume	5.5	inch ³
	93	cm ³

TEMPERATURE CHARACTERISTICS

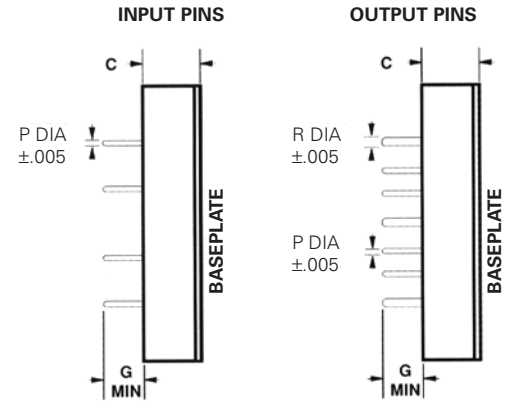
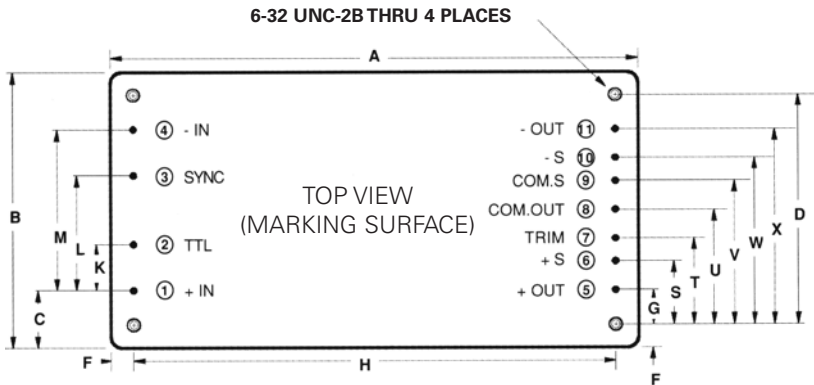
	Min	Typ	Max	Units
Operating (Baseplate)	-55		+100	°C
Storage (Ambient)	-55		+125	°C
Over Temperature Shutdown		+105		°C
Thermal Resistance Case- Ambient		5		°C/W

MIL - STD - 883 SCREENING (OPTIONAL)

Stabilization Bake:	+125°C for 24 hours per M1008.2, Condition B
Temperature Cycling:	10 cycles at -55°C to +125°C (transition period 36 minutes) per M1010, Condition B
Burn-in:	160 hours at +100°C
Final Testing	

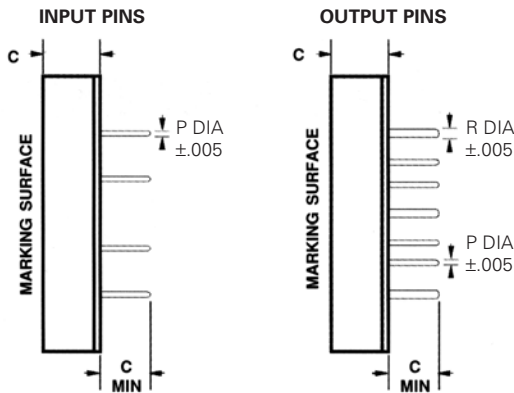
Standard Model

Pin placement on top of unit.
Model number written as SM100D/5.0



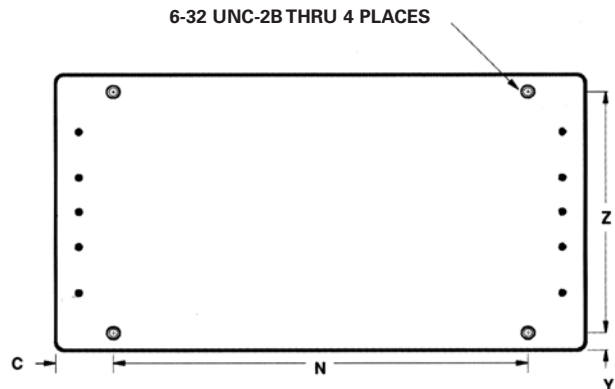
A Option

Pin placement on baseplate of unit.
Model number written as SM100D/5.0-A



B Option

Relocating of mounting holes.
Model number written as SM100D/5.0-B



C Option

Thru hole inserts (0.140 DIA).
Model number written as SM100D/5.0-C

Tolerances: Inches x.xx = ±0.03
x.xxx = ±0.015
mm x.xx = ±0.4
x.x = ±0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 6061-T6,
Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

	A	B	C	D	F	G	H	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z
inch	4.60	2.40	.50	2.000	.20	.30	4.200	.400	1.000	1.400	3.600	.040	.080	.550	.750	1.000	1.250	1.450	1.700	.15	2.100
mm	116.9	61.0	12.7	50.80	5.1	7.6	106.68	10.20	25.40	35.56	91.44	1.02	2.03	13.97	19.05	25.40	31.75	36.83	43.20	3.8	53.34

SM Series

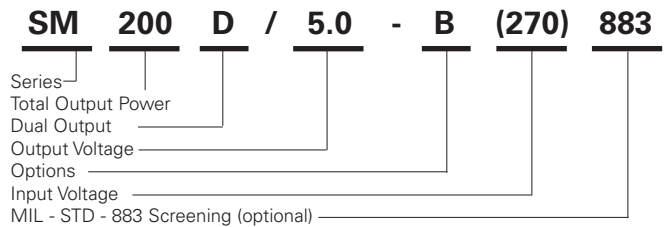
Full Featured DC / DC Converter 28 / 270 Vdc Input 200 Watt Dual Output



FEATURES

- No Derating From -55 to +100°C
- Synchronization
- Fixed Frequency Power Conversion
- MIL - STD - 883C Screening Available
- Meets MIL - Standards:
 - MIL - STD - 454
 - P4855 - 1A
 - MIL - STD - 704D
 - MIL - STD - 810E
 - MIL - S - 901C

HOW TO ORDER



- Options: **A** - pins out baseplate of unit
B - relocating of mounting holes
C - thru hole inserts (0.140 DIA)
I - metric inserts (M3)

Standard unit is 28 Vdc nominal input with pins out the top written as SM200D/5.0

ACCESSORY PRODUCTS

- SM1275: Input Transient Suppression Module (for 28 Vdc input only) for conformance to MIL - STD - 704A & MIL - STD - 1275.
- SMF200: EMI Filter to meet MIL - STD - 461C.
- SMR: AC Front End Rectifier (for 270 Vdc input).
- SMRA: Ripple Attenuator Module to reduce ripple to < 20 mV P-P.

SELECTION CHART

Nominal Output(Vdc)	Output Current(Amps)	Model Number
5.0	± 15	SM200D/5.0
12	± 8.3	SM200D/12
15	± 6.7	SM200D/15

Specifications

SM200D

INPUT CHARACTERISTICS 28 VDC INPUT

	Min	Typ	Max	Units
Input Voltage	18	28	36	Vdc
Brown Out (75%) Full Load	17			Vdc
No Load Power Dissipation		3		Watt
Inrush Charge		4		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		1.0	1.5	mA
Logic Disable Power In		0.35	0.75	W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	37		50	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (50 Vdc for 0.1 second)			

INPUT CHARACTERISTICS 270 VDC INPUT

	Min	Typ	Max	Units
Input Voltage	200	270	400	Vdc
Brown Out (75%) Full Load	175			Vdc
No Load Power Dissipation		4		Watt
Inrush Charge		3		mc
Reflected Ripple Current		15		%
Logic Disable Current (Sink)		0.8		mA
Logic Disable Power In		3.0		W
Input Ripple Rejection (120Hz)		60		dB
Input Overvoltage (No Damage)	400		500	Vdc
Efficiency		70 - 75		%
Efficiency (2V & 3.3V)		50 - 60		%
EMI	Units conform to MIL-STD-461C (on the input leads) with companion filter			
Input Transient	Units conform to MIL-STD-704D (500 Vdc for 0.1 second)			

OUTPUT CHARACTERISTICS

	Per Channel			Units
	Min	Typ	Max	
Set Point Accuracy			1*	%V _{out}
Load Regulation		0.02	0.2	%V _{out}
Line Regulation		0.02	0.1	%V _{out}
Ripple P-P (25MHz)		1.0	3.0	%V _{out}
Trim Range (5V, 5.2V min=85%)	60		115	%V _{out}
Trim Range (2V, 3.3V)	100		115	%V _{out}
Remote Sense Compensation		0.5		Vdc
Overvoltage Protection		115	125	%V _{out}
Current Sharing	N / A			
Transient Response (V _{out} 1%)	Time / Overshoot			
20 - 80% Load		400/400		µS/mV
Low Line - High Line		400/400		µS/mV
50 - 100%		400/400		µS/mV
Temperature Drift		0.01	0.02	%/°C
Long Term Drift		0.01	0.02	%/1KHrs
Current Limit		150		%I _{out}
Short Circuit Current (28Vdc)		150		%I _{out}
Short Circuit Current (270Vdc)		50		%I _{out}
Turn On Time		100		mS
Logic Turn On time		100		mS
Tracking Accuracy		0.1		%V _{out}

* 1% or 50mV, whichever is greater

ISOLATION CHARACTERISTICS

	Min	Typ	Max	Units
Isolation: Input to Output (28 Vdc in)	500			Vdc
Input to Output (270 Vdc in)	1000			Vdc
Output to Base	500			Vdc
Input to Base (28 Vdc in)	500			Vdc
Input to Base (270 Vdc in)	1000			Vdc
Input to Output Capacitance	0.01		0.03	µF
Insulation Resistance (@ 50 Vdc)	50			MOhm

MECHANICAL CHARACTERISTICS

Weight	9.3		oz
	260		grams
Size	2.4 x 4.6 x 0.5		inch
	61 x 117 x 13		mm
Volume	5.5		inch ³
	93		cm ³

TEMPERATURE CHARACTERISTICS

	Min	Typ	Max	Units
Operating (Baseplate)	-55		+100	°C
Storage (Ambient)	-55		+125	°C
Over Temperature Shutdown		+105		°C
Thermal Resistance Case- Ambient		5		°C/W

MIL - STD - 883 SCREENING (OPTIONAL)

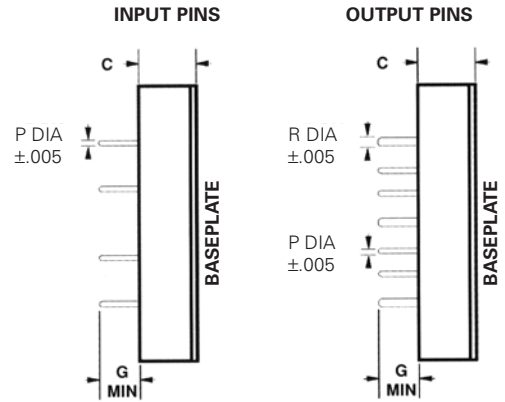
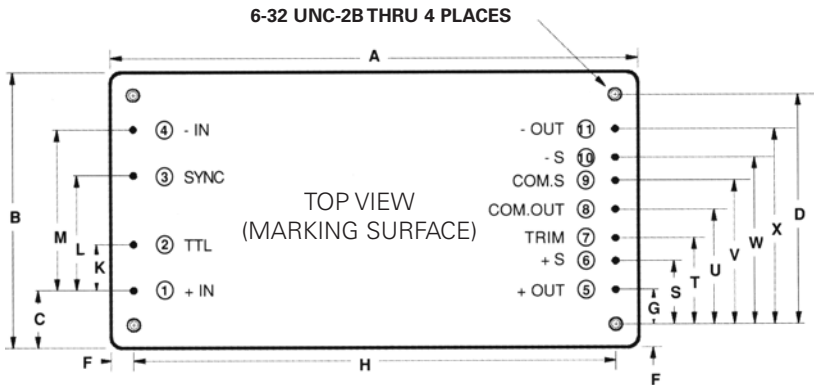
Stabilization Bake:	+125°C for 24 hours per M1008.2, Condition B
Temperature Cycling:	10 cycles at -55°C to +125°C (transition period 36 minutes) per M1010, Condition B
Burn-in:	160 hours at +100°C
Final Testing	

Case Drawings

SM200D

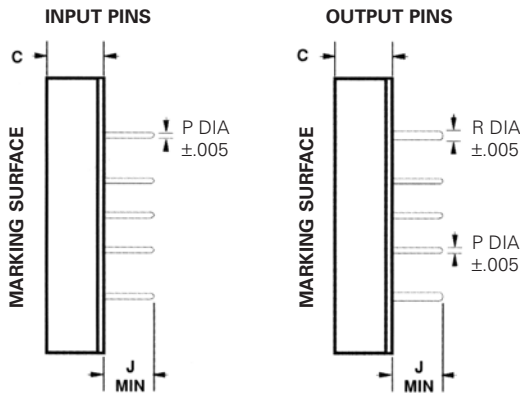
Standard Model

Pin placement on top of unit.
Model number written as SM200D/5.0



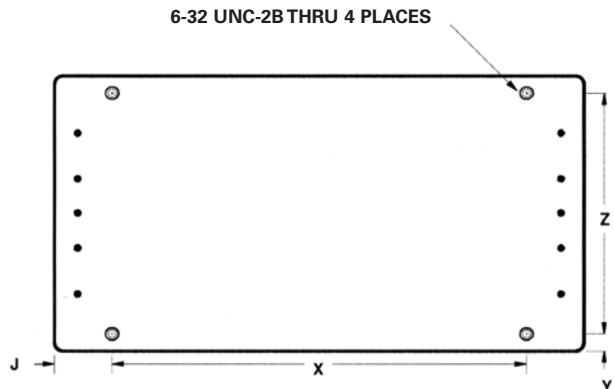
A Option

Pin placement on baseplate of unit.
Model number written as SM200D/5.0-A



B Option

Relocating of mounting holes.
Model number written as SM200D/5.0-B



Tolerances: Inches x.xx = ± 0.03
x.xxx = ± 0.015
mm x.xx = ± 0.4
x.x = ± 0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 5052-H32, Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

C Option

Thru hole inserts (0.140 DIA).
Model number written as SM200D/5.0-C

	A	B	C	D	F	G	H	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z
inch	4.60	2.40	.50	2.000	.20	.30	4.200	.400	1.000	1.400	3.600	.040	.080	.550	.750	1.000	1.250	1.450	1.700	.15	2.100
mm	116.9	61.0	12.7	50.80	5.1	7.6	106.68	10.20	25.40	35.56	91.44	1.02	2.03	13.97	19.05	25.40	31.75	36.83	43.20	3.8	53.34

SM Series

Accessory Products

EMI Filter



FEATURES

- Does Not Require External Components For Operation
- MIL - STD - 461C Part 2, Class A1b Compliance
- Less Than 1.0 Volt Drop Across The SMF200
Less Than 1.0 Volt Drop Across The SMF200 (270)
- Thermally Non-Dissipative Device
- Environment: MIL - STD - 810E, MIL - STD - 901C

SPECIFICATIONS

28 Vdc Input

	Min	Typ	Max	Units
Input Voltage			50	Vdc
Rated Output Current			20	A
Isolation: Input/output to Case	500			Vdc
Operating Temperature	-55		+100	°C
Storage Temperature	-55		+125	°C
Insulation Resistance(@50 Vdc)	50			MOhm
Size	2.4 x 2.3 x 0.5			inch
	61 x 59 x13			mm
Weight	5.0			oz
	140			grams

HOW TO ORDER

SMF **200** - **C** **(270)**



Options: **A** - pins out baseplate of unit **I** - metric inserts (M3)
C - thru hole inserts (0.140 DIA)

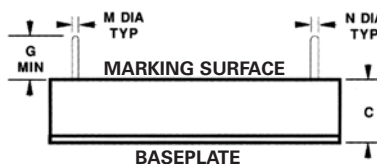
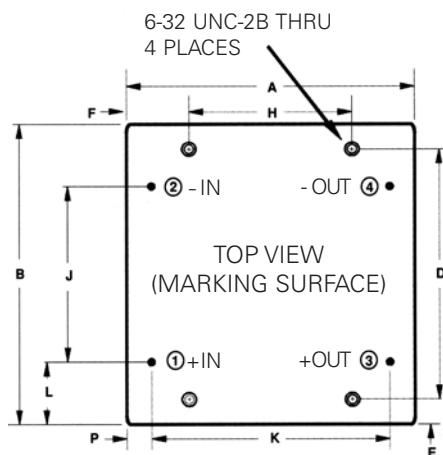
Standard unit is 28 Vdc nominal input with pins out the top written as SMF200

SPECIFICATIONS

270 Vdc Input

	Min	Typ	Max	Units
Input Voltage			500	Vdc
Rated Output Current			2	A
Isolation: Input/output to Case	1000			Vdc
Operating Temperature	-55		+100	°C
Storage Temperature	-55		+125	°C
Insulation Resistance(@50 Vdc)	50			MOhm
Size	2.4 x 2.3 x 0.5			inch
	61 x 59 x13			mm
Weight	5.0			oz
	140			grams

CASE DRAWINGS



Standard Pins - Pin Placement: top.
Model number written as SMF200

A Option - Pin Placement: baseplate.
Model number written as SMF200 - A

C Option - Thru hole inserts (0.140 DIA).
Model number written as SMF200 - C

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
inch	2.30	2.40	.50	2.100	.15	.50	.30	1.300	1.400	1.900	.50	.040	.080	.20
mm	58.4	61.0	12.7	53.34	3.8	12.7	76	33.02	35.56	48.26	12.7	1.02	2.03	5.1

Tolerances: Inches x.xx = ±0.03
 x.xxx = ±0.015
 mm x.xx = ±0.4
 x.x = ±0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 5052-H32, Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

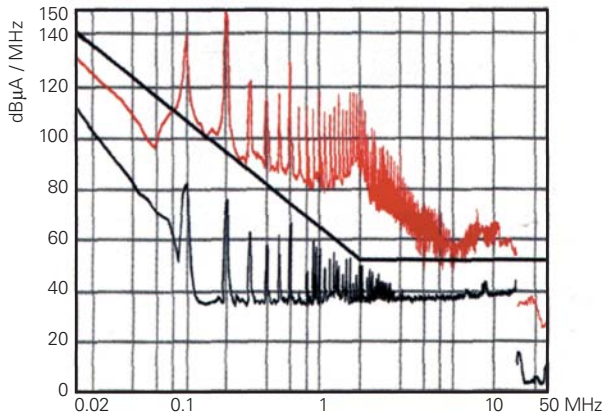
Characteristics

SMF200

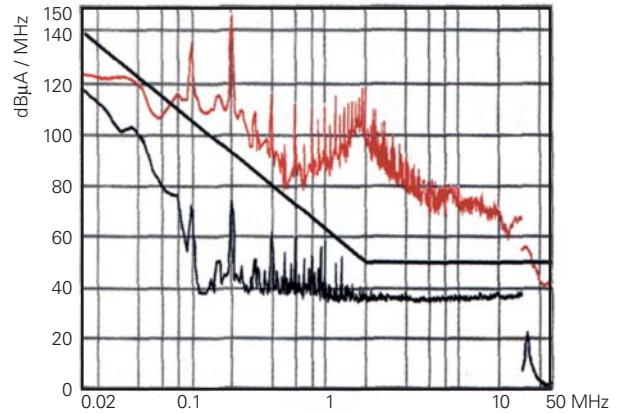
5 V_{out} - 200 Watts Power Supply

28 V_{out} - 280 Watts Power Supply

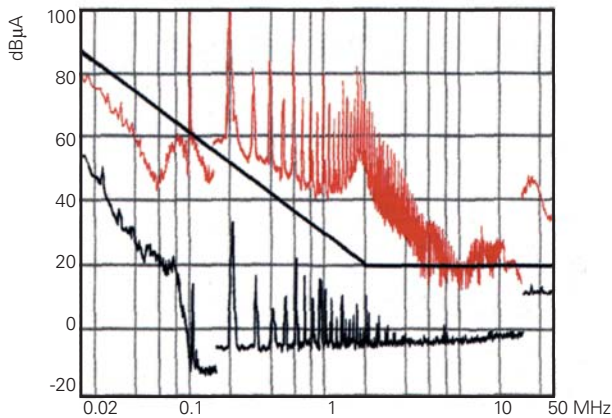
MIL-STD-461C CE03 - Broadband Part 2, Fig 3 - 3



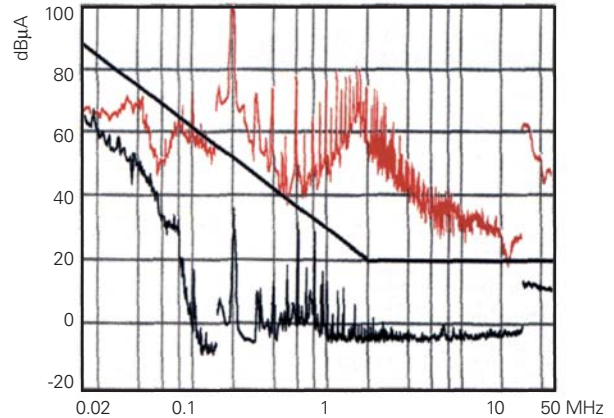
MIL-STD-461C CE03 - Broadband Part 2, Fig 3 - 3



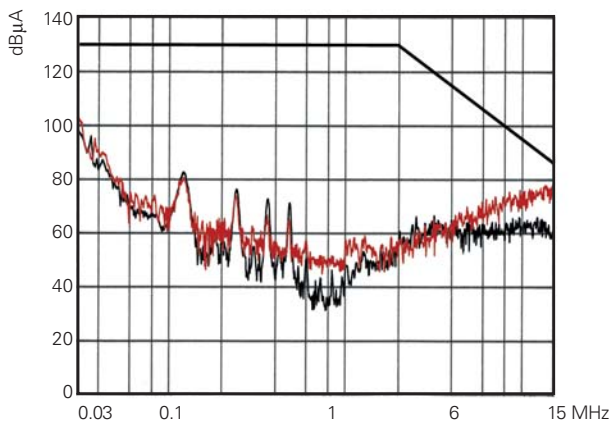
MIL-STD-461C CE03 - Narrowband Part 2, Fig 3 - 2



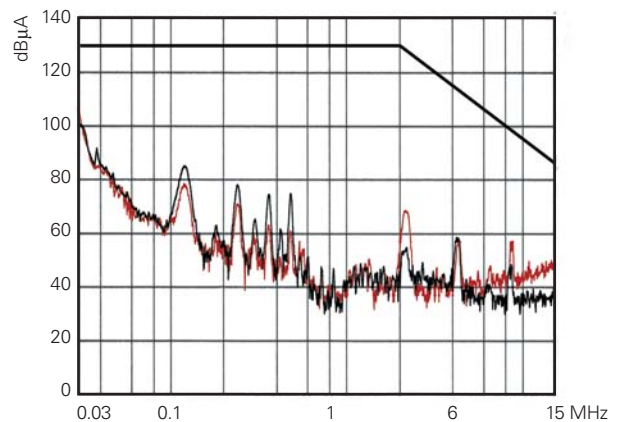
MIL-STD-461C CE03 - Narrowband Part 2, Fig 3 - 2



MIL-STD-461C CE01 Part 2, Fig 3 - 1



MIL-STD-461C CE01 Part 2, Fig 3 - 1



LEGEND:

■ without SMF200EMI filter

■ with SMF200 EMI filter

SM Series

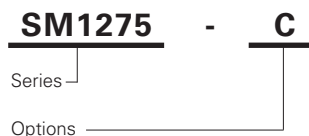
Accessory Products Transient Suppression Module



FEATURES

- Meets DC Input Transient Limits For MIL - STD - 704A
Transient: 80 Vdc for 0.1 second
Spike: 600 Vdc for 10 μ S
- Meets DC Input Transient Limits For MIL - STD - 1275A
Transient: 100 Vdc for 100 mS
Spike: \pm 250 Vdc for 50 μ S

HOW TO ORDER



Options: **A** - pins out baseplate of unit **I** - metric inserts (M3)
C - thru hole inserts (0.140 DIA)
 Standard unit is 28 Vdc nominal input with pins out the top written as SM1275

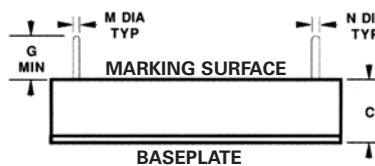
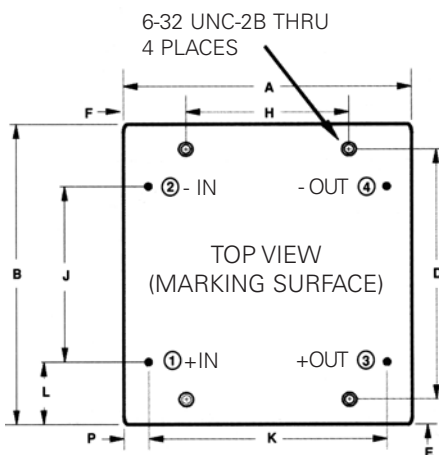
SPECIFICATIONS

For 28 Vdc Input Converters Only

	Min	Typ	Max	Units
Steady State Input	14		40	Vdc
Output Current			20	A
Output Voltage (clamp)			50	Vdc
Fuse (recommended - slow blow)		22		A
Insertion Loss (@ 20 A and 25°C)			1	Vdc
Input Surge Limit (for 0.1 sec, 0.5 Ω)			100	Vdc
Input Spike Limit (for 50 μ S, 15 mJ)			\pm 250	Vdc
Input Spike Limit (for 10 μ S, 50 Ω)			600	Vdc
Reverse Polarity Protection		Shunt Diode (input fuse required)		
No load Power Dissipation			2.5	Watt

	Min	Typ	Max	Units
Efficiency	90		97	%
Operating Temperature	-55		+100	°C
Storage Temperature	-55		+125	°C
Isolation: Input / Output to Case	500			Vdc
Insulation Resistance (@ 50 Vdc)	50			MOhm
Size	2.4 x 2.3 x 0.5			inch
	61 x 59 x 13			mm
Weight	4.5			oz
	130			grams
Environmental	MIL - STD - 810C			

CASE DRAWINGS



Standard Pins - Pin Placement: top.
Model number written as SM1275

A Option - Pin Placement: baseplate.
Model number written as SM1275 - A

C Option - Thru hole inserts (0.140 DIA).
Model number written as SM1275 - C

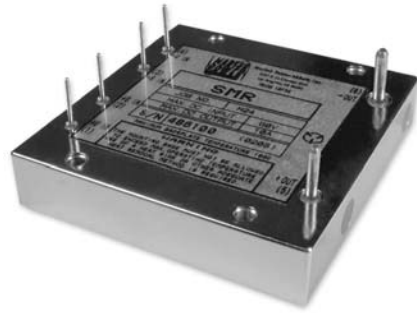
	A	B	C	D	E	F	G	H	J	K	L	M	N	P
inch	2.30	2.40	.50	2.100	.15	.50	.30	1.300	1.400	1.900	.50	.040	.080	.20
mm	58.4	61.0	12.7	53.34	3.8	12.7	76	33.02	35.56	48.26	12.7	1.02	2.03	5.1

Tolerances: Inches x.xx = \pm 0.03
 x.xxx = \pm 0.015
 mm x.xx = \pm 0.4
 x.x = \pm 0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 5052-H32, Case - Steel.
 Finish: Nickel Plating.
 Mounting: 6-32 THD inserts are provided in baseplate.
 Metric: M3 inserts.

SM Series

Accessory Products AC Front-End Rectifier



FEATURES

- AC Front End For 270 Vdc Input SM Series
- Compatible With All SM Series Accessory Products

HOW TO ORDER



Options: **A** - pins out baseplate of unit **I** - metric inserts (M3)
C - thru hole inserts (0.140 DIA)

Standard unit has pins out the top written as SMR

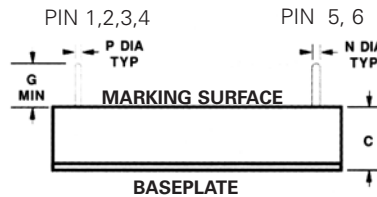
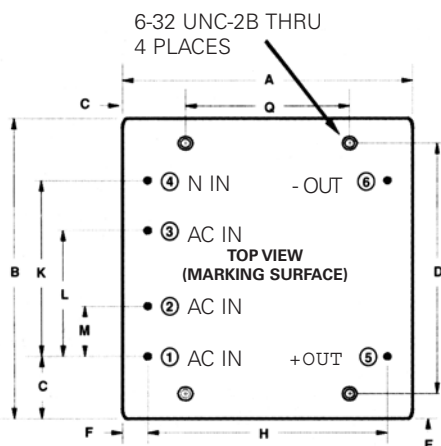
SPECIFICATIONS

For 270 Vdc Input Converters Only

	Min	Typ	Max	Units
Input Voltage:				
1 Ø, 47 - 440 Hz	85		130	Vac
1 Ø, 47 - 440 Hz	170		264	Vac
3 Ø WYE, 47 - 440 Hz	85		130	Vac
3 Ø Delta WYE, 47 - 440 Hz	170		264	Vac
Rated Output Voltage		300		Vdc
Rated Output Current			3.3	A
Rated Output Power			1000	Watt

	Min	Typ	Max	Units
Isolation:				
Input / Output to Case	1000			Vdc
Operating Temperature (baseplate)	- 55		+100	°C
Storage Temperature	- 55		+125	°C
Size	2.4 x 2.3 x 0.5			inch
	61 x 59 x 13			mm
Weight		5.0		oz
		140		grams

CASE DRAWINGS



Standard Pins - Pin Placement: top.
Model number written as SMR

A Option - Pin Placement: baseplate.
Model number written as SMR - A

C Option - Thru hole inserts (0.140 DIA).
Model number written as SMR - C

	A	B	C	D	E	F	G	H	K	L	M	N	P	Q
inch	2.30	2.40	.50	2.100	.15	.20	.30	1.900	1.400	1.000	.400	.080	.040	1.300
mm	58.4	61.0	12.7	53.34	3.8	5.1	76	48.26	35.56	25.40	10.20	2.03	1.02	33.02

Tolerances: Inches x.xx = ±0.03
x.xxx = ±0.015
mm x.xx = ±0.4
x.x = ±0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 6061-T6, Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

SM Series

Accessory Products Ripple Attenuator Module



FEATURES

- Reduce Output Ripple to <20 mV p-p
- Compatible With Any SM200S, SM100S and NB Series Based Products
- Full Attenuation Up to 10 Amps
- No Adjustments Required
- Efficiency 93 - 99%
- Converter Sense, Trim, Overvoltage and Overcurrent Retained

HOW TO ORDER

SMRA - **C**



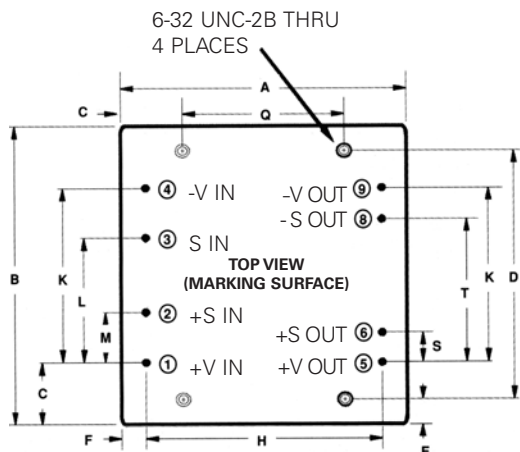
- Options: **A** - pins out baseplate of unit
I - metric inserts (M3)
C - thru hole inserts (0.140 DIA)

Standard unit has pins out the top written as SMRA

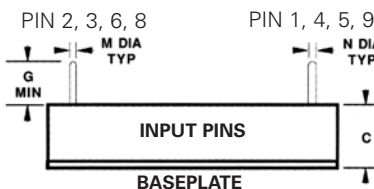
SPECIFICATIONS

	Min	Typ	Max	Units
Output Noise and Ripple			20	mV p-p
Input Voltage	2		48	Vdc
Output Voltage Deviation		0.5		%
DC Voltage Drop			0.4	Vdc
Isolation: Input / Output to baseplate	500			Vdc
Operating Temperature (baseplate)	- 55		+100	°C
Storage Temperature	- 55		+125	°C
Size	2.4 x 2.3 x 0.5			inch
	61 x 59 x 13			mm
Weight		5.0		oz
		140		grams

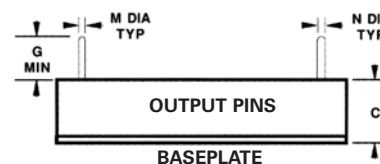
CASE DRAWINGS



Standard Pins - Pin Placement: top.
Model number written as SMRA



A Option - Pin Placement: baseplate.
Model number written as SMRA - A
C Option - Thru hole inserts (0.140 DIA).
Model number written as SMRA - C



	A	B	C	D	E	F	G	H	K	L	M	N	P	Q	S	T
inch	2.30	2.40	.50	2.100	.15	.20	.30	1.900	1.400	1.000	.400	.080	.040	1.300	.250	1.150
mm	58.4	61.0	12.7	53.34	3.8	5.1	76	48.26	35.56	25.40	10.20	2.03	1.02	33.02	6.36	29.24

Tolerances: Inches x.xx = ±0.03
x.xxx = ±0.015
mm x.xx = ±0.4
x.x = ±0.8

Material: Pin - Brass (Solder Plating), Baseplate - Aluminum 6061-T6, Case - Steel.
Finish: Nickel Plating.
Mounting: 6-32 THD inserts are provided in baseplate.
Metric: M3 inserts.

Application Notes

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SM Series

General Application Notes

The SM family of power converters were designed as military grade stand alone power converters which can also be used as components in complex power systems. The SM Series is a DC to DC, 200 kHz fixed frequency, pulse width modulated, push-pull forward, or single ended forward converters, which employs a current mode control scheme. The SM unit is supplied in a five sided metal case to minimize radiated noise. Sufficient capacitance on the input and output, internal to the unit, allows for simple use and operation with no external components in most applications. High efficiency is achieved with conventional switching techniques by utilizing unique switch snubber circuits which minimize normally large switching losses. A number of protection features, as well as electrical and thermal derating of internal components per NAVMAT P-4855-1 guidelines and the use of proven topologies allow for high reliability throughout an operating range of -55°C to $+100^{\circ}\text{C}$. In applications where even greater reliability is required the converter can be screened to MIL - STD - 883 upon request.

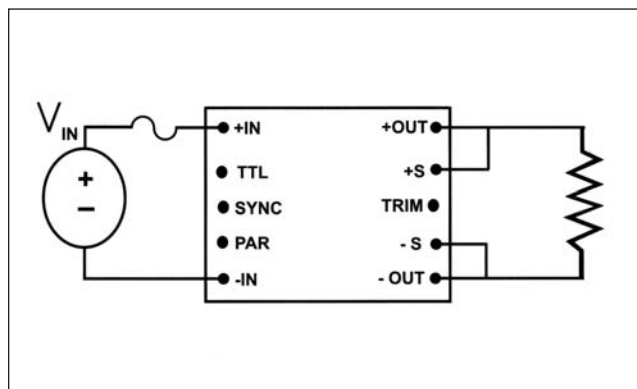


Figure 1

The most basic use of the power converter is shown in Figure 1. An input fuse is always recommended to protect both the source and the power supply in the event of failures. Bus fuse type MDX or equivalent slow-blow is recommended with a current rating approximately

200% of the full load input current to the converter. Having a slow-blow type fuse will allow for the converter's inrush charge at turn-on. The sense pins of the converters must be connected to their corresponding output bus. Inherently, power converters will have some internal energy loss, which is dissipated in the form of heat through an aluminum mounting surface. This surface must be cooled to maintain a temperature below the maximum operating temperature.

Wire Gage & Distance to Load

If the resistance of the wire, printed circuit board runs or connectors used to connect a converter to system components is too high, excessive voltage drop will result between the converter and system components, degrading overall system performance.

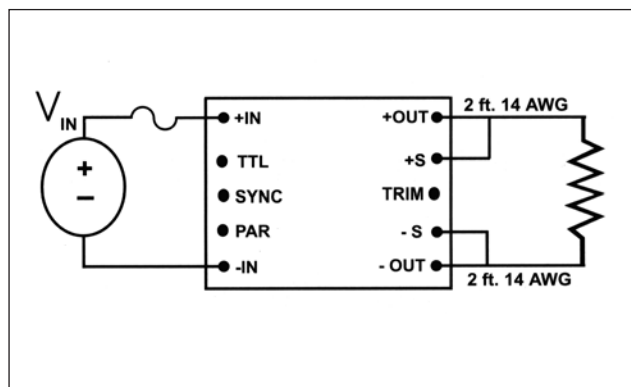


Figure 1a

For example, if the DC/DC converter in Figure 1a is a 50W unit (5 VDC @ 10 Amps) with output load regulation specified at 0.2%; the connection as shown will degrade load regulation by a factor of 10. In this example, the 4 feet of #14 AWG wire used to connect the converter output to the load, has a total line resistance of 10mW (ignoring any contact resistance.) For a 50W, 5 VDC output converter, the drop across the lead resistance will be 100 mV ($10\text{A} \times 0.010\text{W}$) or 2% of the output. Thus, the converter is selected for 0.2% regulation, but the power system layout achieves only 2.2%.

Application Notes

This can be corrected by decreasing the distance between the converter output and load. If that is not possible, using larger diameter wire (see Table 1), or PCB runs that have a larger cross sectional area and shorter length will also reduce conductor resistance. The use of the converter's remote sense capability will also work (see remote sense for more information on this option).

Note: High IR drops between the converter and load may cause converter parameters such as output voltage accuracy, trim range, etc. to appear to be out of specification. High IR drops on input lines may cause start up problems (voltage at the input pins below the input range of the converter).

Obviously, any connections made to the power distribution bus present a similar problem. Poor connections (such as microcracking around solder joints) can cause serious problems such as arcing. Contact resistance must be minimized. Proper workmanship standards must be followed to insure reliable solder joints for board mount converters. Terminal strips, spade lugs and edge connectors must be free of any corrosion, dust or dirt. If parallel lines or connections are available for routing converter output currents, they should be utilized.

# AWG	Current Resistance (mΩ / Foot)	# AWG	Current Resistance (mΩ / Foot)
9	0.792	21	12.77
10	0.998	22	16.20
11	1.261	23	20.30
12	1.588	24	25.67
13	2.001	25	32.37
14	2.524	26	41.02
15	3.181	27	51.44
16	4.020	28	65.31
17	5.054	29	81.21
18	6.386	30	103.7
19	8.046	31	130.9
20	10.13	32	162.0

Table 1

Remote Sense

Remote sense pins, +S, -S and COM.S (when applicable), have been provided on the SM series converters for applications where precise load regulation is required at a distance from where the converter is physically located. If remote sensing is NOT required, these pins **MUST** be tied to their respective output pins (+S to +OUT, -S to -OUT and COM.S to COM.OUT). If one or more of these sense pins are not connected to their respective output pins, the output(s) of the unit will not regulate to within specification and may cause high output voltage condition.

Remote Sense - Single Output

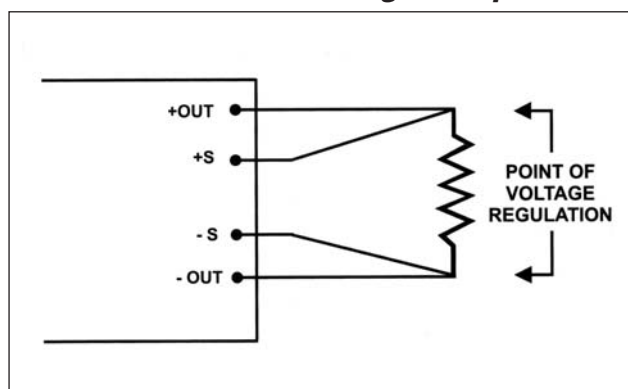


Figure 2a

DO NOT connect sense pins to any pin other than their respective output pins or permanent damage will occur.

DO NOT connect sense pins to any load other than the same load the output pins are connected to or permanent damage may occur.

The internal remote sense circuit is designed to compensate for a maximum of 0.5V difference (0.25V in each output lead) in voltage between the load and the power converter. Longer output leads or traces are required to be of sufficient gauge or width to maintain the voltage drop across them of 0.5V maximum at rated load current.

Application Notes

Remote Sense - Dual Output

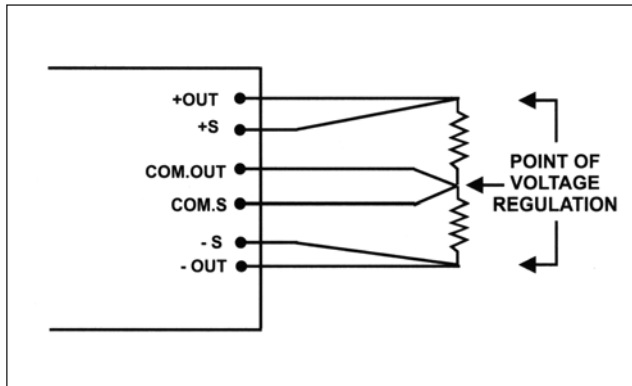


Figure 2b

Remote Turn On/Off

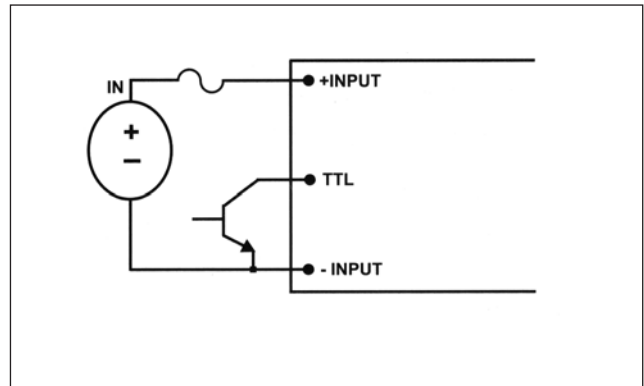


Figure 3

Remote On / Off

Remote turn ON/ turn OFF feature (TTL) is an additional feature to the SM Series. This feature is especially useful in portable/mobile applications where battery power conservation is critical or in applications involving high power pulsed loads where inrush currents are high.

The SM Series employs a typical TTL open collector with positive logic control pin. The voltage level at the TTL pin is referenced with respect to the converter -VIN input. When the TTL circuit is pulled to less than 0.8V ('logic 0') with respect to the -VIN pin, via either an open collector (see Figure 3), or totem-pole driver, or a mechanical switch, with a 1.5mA capability, the converter shuts down. An optocoupler can also be used if the TTL signal needs to be referenced from the output side. If the TTL pin is left floating or is pulled up to a 5V ('logic 1') level the unit will remain on. Many more devices can be used to activate the TTL pin shutdown function, consult the factory for your specific requirements.

Output Trim

The output trim pin has been supplied on the SM family to provide output voltages other than the nominal fixed voltages. The TRIM pin may be used to implement a number of different trimming techniques. Figure 4a shows the most basic, where a fixed voltage is required. The addition of R1 from the TRIM pin to the +S pin will adjust the output voltage down as far as 60% of nominal output voltage. The addition of R2 from the TRIM pin to the -S pin on single output or to the COM.S pin on dual output will adjust the output voltage up as high as 115% of nominal output voltage (voltages higher than this will activate the overvoltage protection circuitry).

NOTE: On Dual output power converts, Figure 4b, only the positive output needs to be trimmed, the negative output will automatically track the positive output voltage.

Figure 4c shows a scheme for continuously variable output from 60% to 115% of nominal output voltage. Figure 4d shows how to construct a voltage controlled output voltage. Many more variations of these scheme are possible, please consult the factory for your specific requirements. **When trimming up or down, the maximum output current and/or maximum output power cannot be exceeded.**

Application Notes

Basic Trim - Single Output

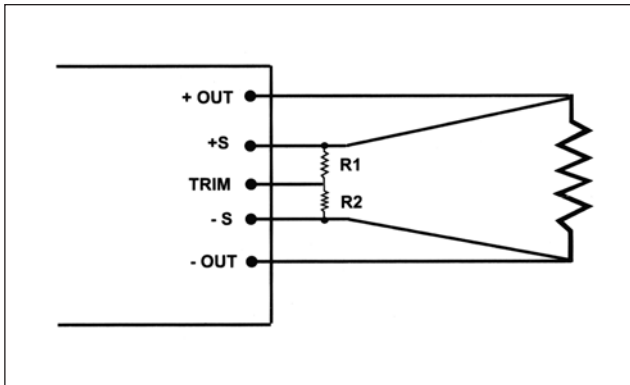


Figure 4a

Voltage Controlled Trimming

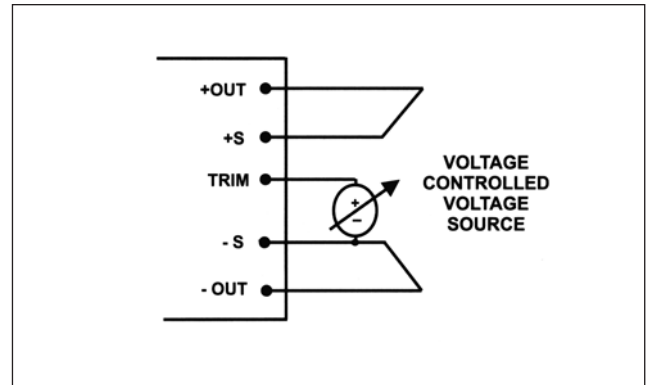


Figure 4d

Basic Trim - Dual Output

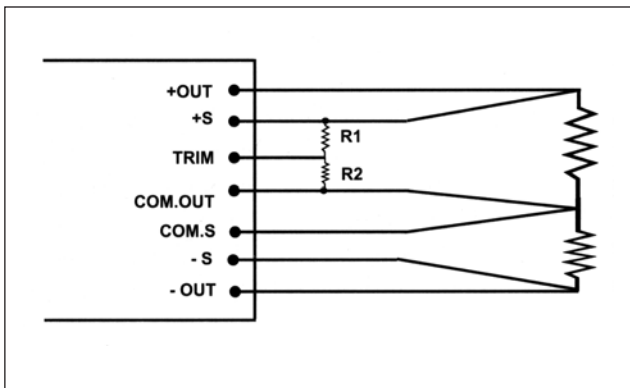


Figure 4b

The trim resistor values for the trimming of the output can be calculated using the following equations. The schematic showing the different variables is in Figure 4e.

For trimming to a lower voltage:

$$V_{OUT} < V_{NOMINAL} ; R_2 = \text{not used}$$

$$R_T = \frac{(V_{OUT} - 4V) 2K}{4V}$$

$$R_1 = \frac{R_T (R_3 + R_4) - R_3 R_4}{R_3 - R_T}$$

Variable Trimming

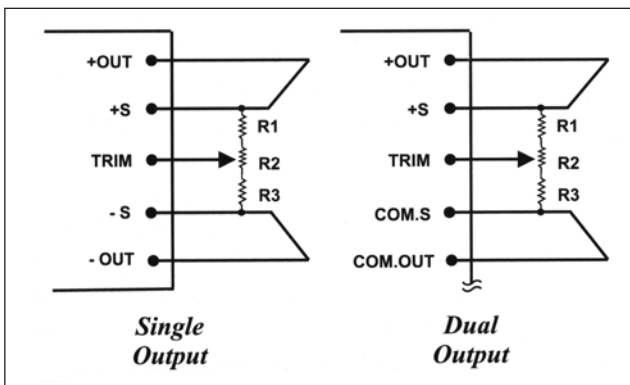


Figure 4c

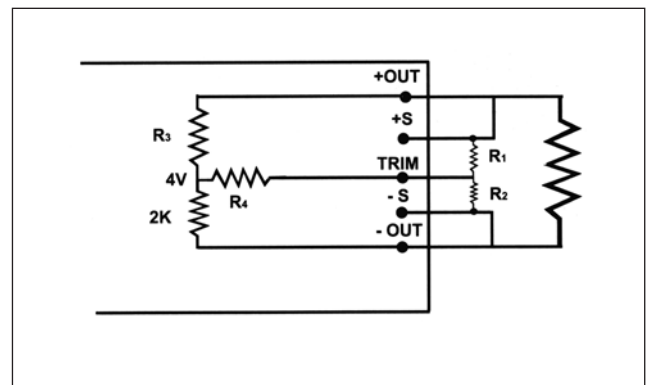


Figure 4e

Application Notes

For trimming to a higher voltage:

$$V_{OUT} > V_{NOMINAL} ; R_1 = \text{not used}$$

$$R_a = \frac{R_3(4V)}{V_{OUT} - 4V}$$

$$R_2 = \frac{(2K)R_4 + R_a(-2K - R_4)}{R_a - 2K}$$

$$R_a = \frac{(10K)(4V)}{25.5V - 4V}$$

$$R_2 = \frac{(2K)(2K) + (1.86K)(-2K - 2K)}{1.86K - 2K}$$

By using a 24.5K resistor for R_2 , the output voltage will be 25.5 Vdc.

The values for R_3 and R_4 are output voltage dependent. These values are:

$V_{NOMINAL}$	R_3	R_4
5V	500Ω	100Ω
12V	4K	2K
15V	5.5K	2K
24V	10K	2K
28V	12K	2K
48V	22K	2K

Example 1:

We have a 24 Volt output but need trimming down to 23 Vdc. The equation would be as follows:

$$R_T = \frac{(23V - 4V) 2K}{4V}$$

$$R_1 = \frac{(9.5K)(10K + 2K) - (10K)(2K)}{10K - 9.5K}$$

By using a 1.88K resistor for R_1 , the output voltage will be 23 Vdc.

Example 2:

We have a 24 Volt output but need trimming up to 25.5 Vdc. The equation would be as follows:

Series Operation

The SM200 family of power converters may be arranged in a series operating mode to supply higher output voltages when required (see Figure 5). In this configuration D1 and D2 are added to protect against the application of a negative across the outputs of the power converters during power up and power down. The two (or more) units need not have the same output voltage, but the output current supplied in this configuration will be limited to the lowest maximum output current of the modules used.

Series Operation

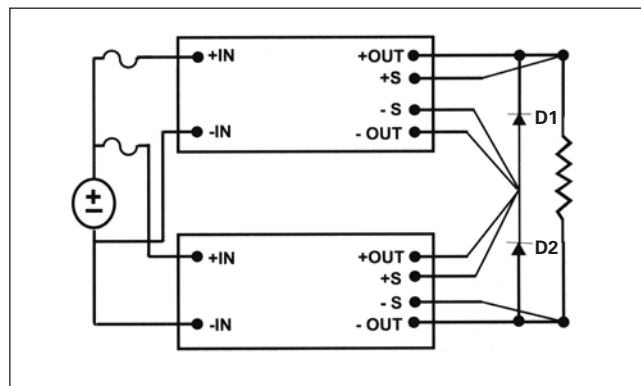


Figure 5

Application Notes

Parallel Operation

The SM200 converter family has the capability of being paralleled to drive loads of higher power than a single SM200 unit can handle. The PAR pin is supplied on the unit for this function. If parallel operation of two or more units is required, the following precautions must be followed.

- Corresponding input and output leads or traces on each unit should be as equal in length and size as practical. The more equivalent the leads are the closer the current sharing.
- The leads connecting the PAR, +S and - S pins may need to be shielded to avoid high frequency noise interference in very high power applications.
- The PAR pins of all units should be tied together.

The units do not have to be synchronized for parallel operation but may be if required (see synchronization application note). Or'ing diodes may be included in the positive output leads for true N + 1 redundant systems, but are not necessary. Local sensing should be used whenever possible to minimize noise on +S and - S pins in parallel applications. In some applications, especially in those where it is difficult to keep output and input leads of equal size and length, a series resistance may be inserted in the +S lead. This will give the converter the ability to compensate for greater lead imbalance. Note: this will also result in a slightly higher output voltage.

Parallel Operation

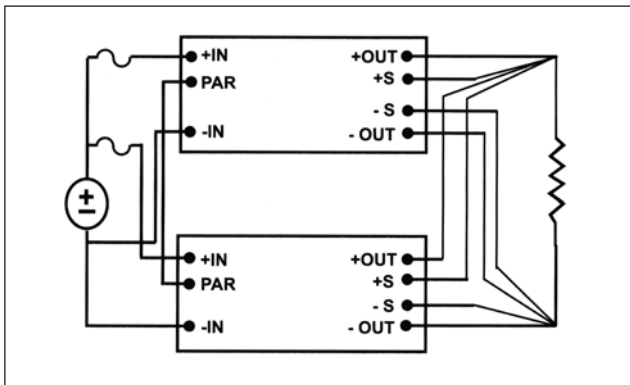


Figure 6

Synchronization

Synchronization of multiple units to each other or to a central clock frequency is essential in noise sensitive systems. The SM Series is capable of being synchronized to other units by tying the SYNC pins together which will synchronize all the units together. Synchronization can be accomplished when the switching frequency is from 180 to 240 kHz. The voltage level at the SYNC pin is referenced with respect to the -SENSE pin. The input is capacitively coupled with a 10 kOhm termination resistor. The number of units that can be synchronized together WITHOUT AN EXTERNAL CLOCK drive is limited to 6 units.

The SM Series can be tied to the central clock (see Figure 7a) by inputting a square wave clock signal (standard TTL levels of '0V' and '5V' are acceptable) which has a frequency of 200 kHz or greater (a period of 5μS or lower) and a duty cycle of no less than 10% (a pulse width of greater than 0.5μS). The SM Series converter's internal synchronization circuit is triggered by the rising edge of this clock waveform. It should be noted that increasing the frequency much higher than the 200kHz is achievable but a degradation in efficiency will be the result. Higher frequencies also make the unit less noise tolerant and care should be taken in how the SYNC pin line is connected between units and/or system clock. In some cases shielding the SYNC pin line will help eliminate the noise; a series resistance of 100 Ohms or less will also increase the noise immunity of the SYNC pin if required. DO NOT add any capacitance from the SYNC pin line to Ground.

Synchronization to External Clock

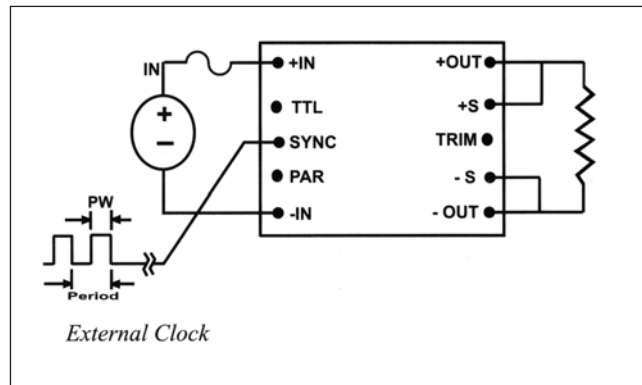


Figure 7a

Application Notes

Synchronization to Other Units

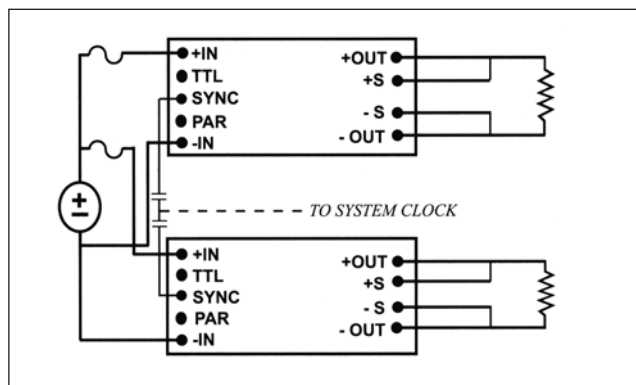


Figure 7b

Power Good Signal

A power Good Signal (typically a visible LED) indicates the DC output of a converter is still present. External circuitry similar to the window detector shown in Figure 8 may be utilized to generate a power good signal.

Power Good Signal

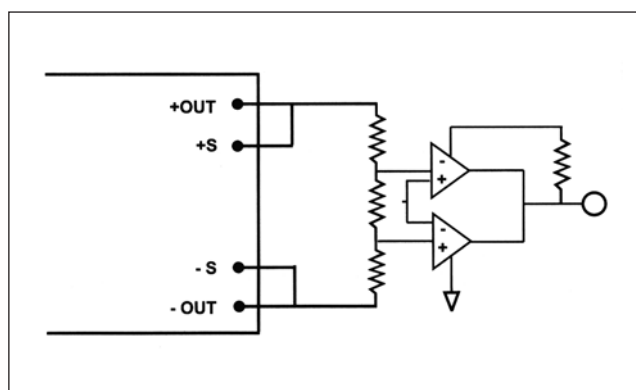


Figure 8

Electro Magnetic Filter (EMI) SMF200

For applications where Electromagnetic Interference is a concern, the SMF200, a passive input line filter, may be installed at the input of the SM Series converters (see Figure 9). One or multiple SM units may be connected to a single SMF200 filter as long as the maximum power required from the combined outputs of these units is less than or equal to 300W. If greater than 300 watts is required multiple SMF200 units will be necessary. For more details consult factory.

SMF200 Connection

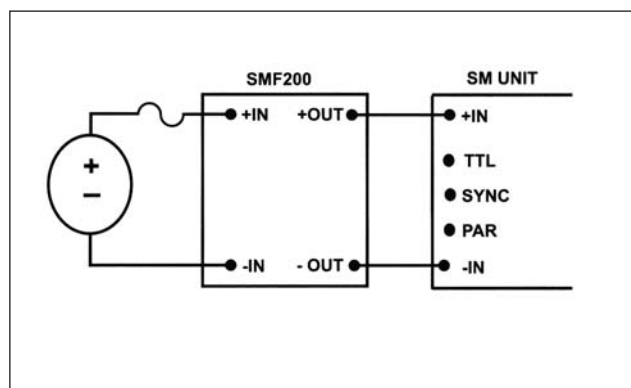


Figure 9

Input Transient Suppression Filter SM1275

Extreme input transients can cause damage to the SM Series converters. The power supply was designed to withstand an input surge of 50 V peak (for 100mS maximum operation).

To protect the power supply during higher input transients, the SM1275 Input Transient Suppression module can be used with the SM converter. The input connection would be the same as described under the 'Input Circuit' section. Consult factory for further information.

Application Notes

SM1275 Connection

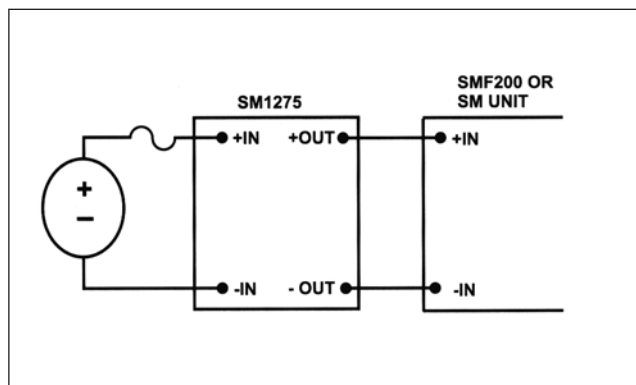


Figure 10

Output Filtering

The output filtering in the SMRA will reduce the output noise in the SM Series converters sufficiently for most applications. The maximum ripple for the SM Series is 3% peak-to-peak at 25 MHz bandwidth. For applications where low noise is critical, the addition of the SMRA, the Ripple Attenuator, will lower the output ripple to a maximum of 20 mV peak-to-peak.

Consult factory for further information.

MILITARY SPECIFICATIONS

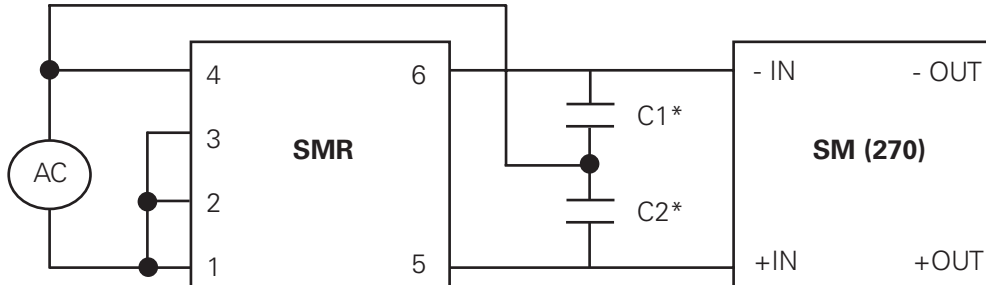
Specification	Condition	Method	Procedure	Test Condition
MIL - STD - 704D	Input Transient			Transients up to 50 V for 0.1 sec (28 Vdc input) Transients up to 500 V for 0.1 sec (270 Vdc input)
MIL - STD - 810E	Vibration	514.4	1	Up to 30 gs, each axis for 1 hour
MIL - STD - 810E	Humidity	507.3	1	95% humidity, non condensing for 10 days
MIL - STD - 810E	Temperature/Altitude	520.1	3	40 hours from - 55°C to +71°C
MIL - STD - 810E	Acceleration	513.4	3	14 gs each axis
MIL - STD - 810E	Temperature Shock	503.3		- 55°C to + 100°C (non-operating, one hour each cycle)
MIL - S - 901C	High Impact Shock			5 foot hammer drop

Application Notes - SMR

Single-Phase, 47 - 400Hz, 85 - 130 Vac

(Pins 1, 2, 3 are high and Pin 4 is low)

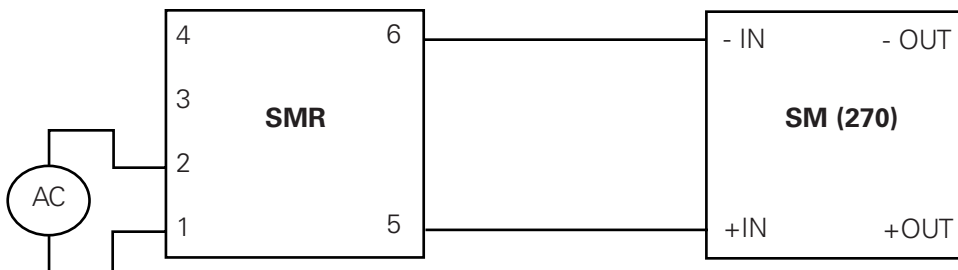
Voltage-Doubler Configuration



*C1 and C2 are selected for a rated voltage of 250V each and appropriate RMS current ratings. Consult factory for technical assistance.

Single-Phase, 47 - 440Hz, 170 - 264 Vac

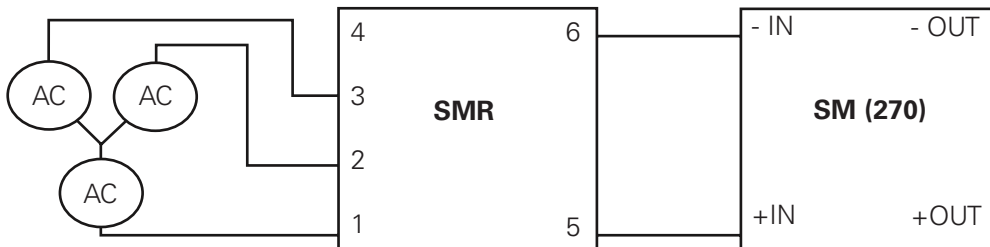
(Pin 1 is high and Pin 2 is low)



Three-Phase, WYE Configuration, 47 - 440Hz, 85 - 130 Vac

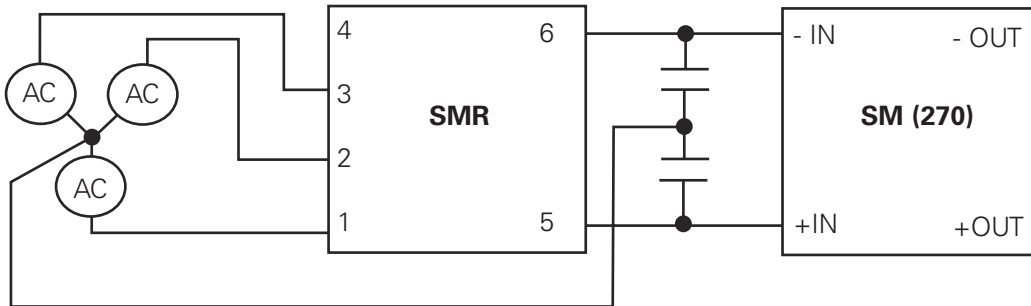
(Three Wire Connection)

Leaving the neutral floating yields a higher power factor.

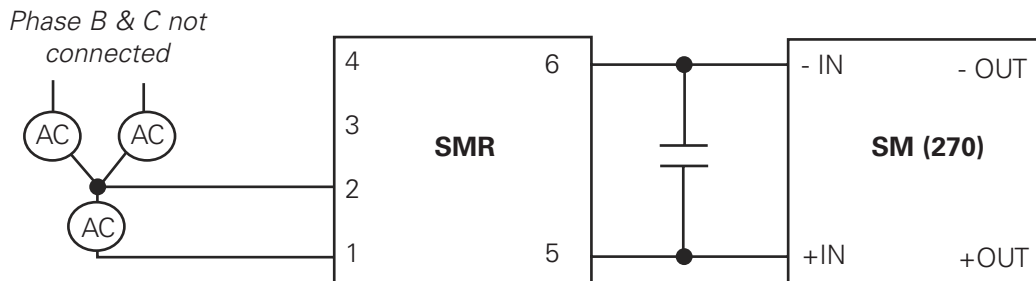


Application Notes

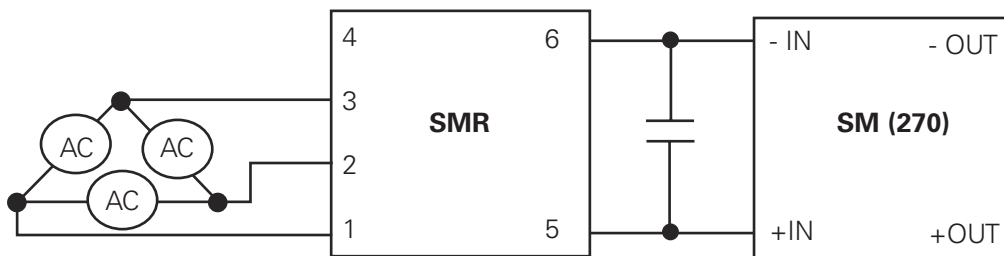
Three-Phase, WYE Configuration, 47 - 440Hz, 85 - 130 Vac (Four-Wire Connection)



Three-Phase, WYE Configuration, 47 - 440Hz, 170 - 264 Vac (Pin 1 is high and Pin 2 is low)

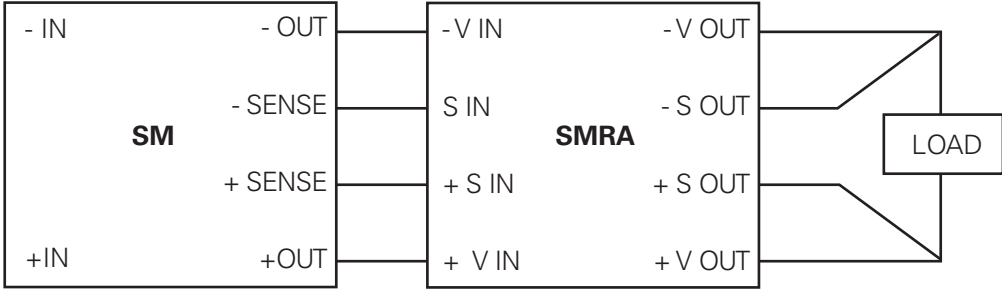


Three-Phase, Delta Configuration, 47 - 440Hz, 170 - 264 Vac



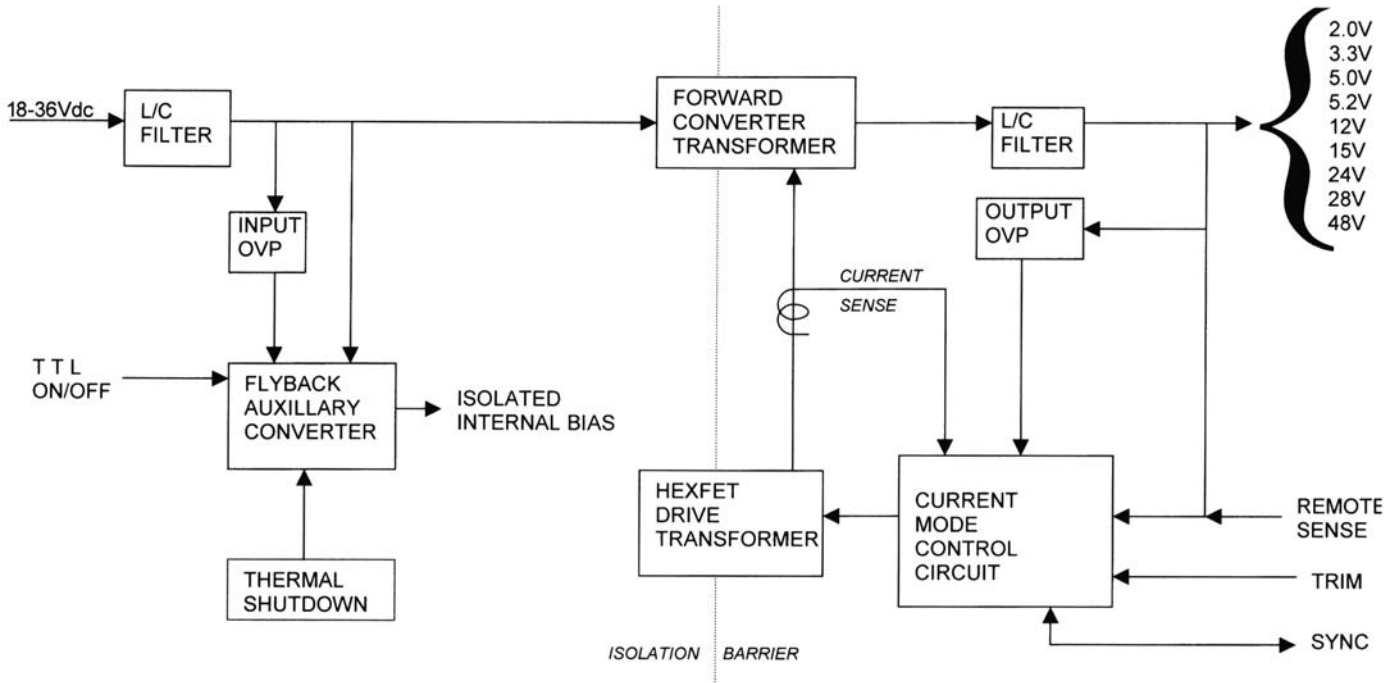
Application Notes - SMRA

Input & Output Connections

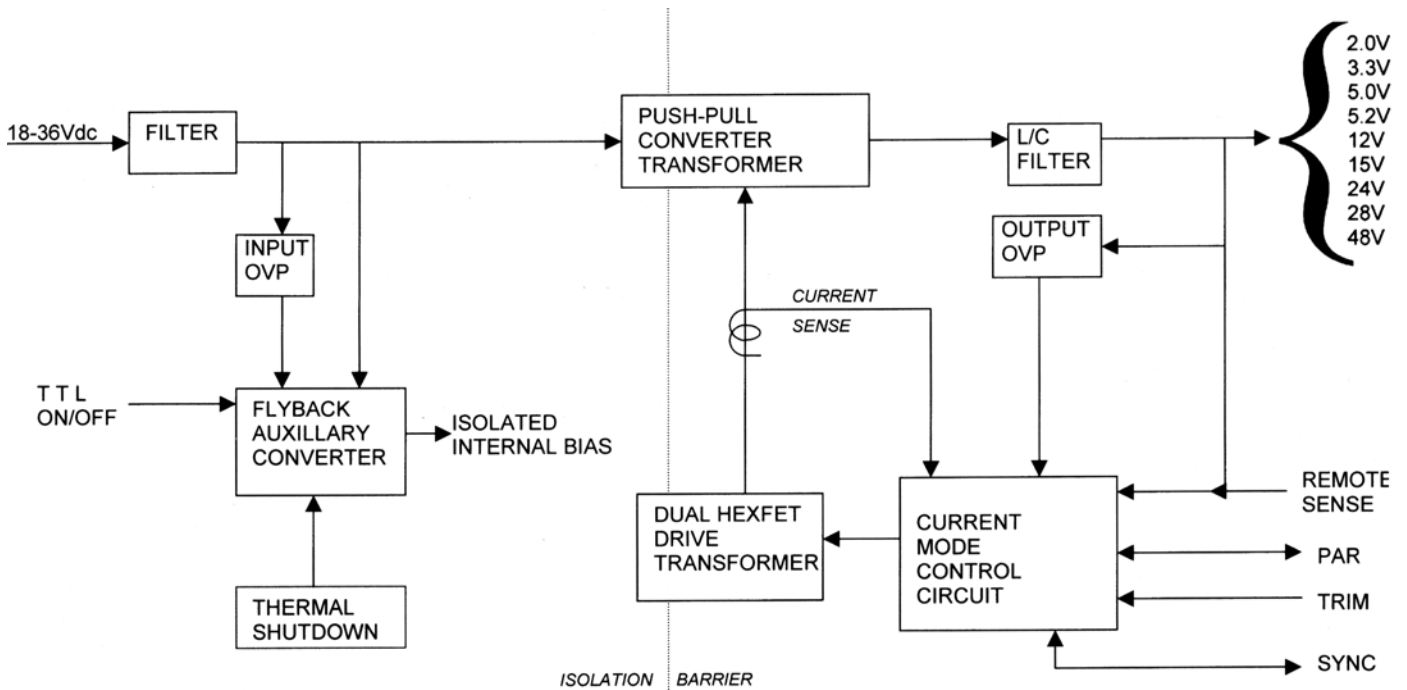


Block Diagrams

SMH100S

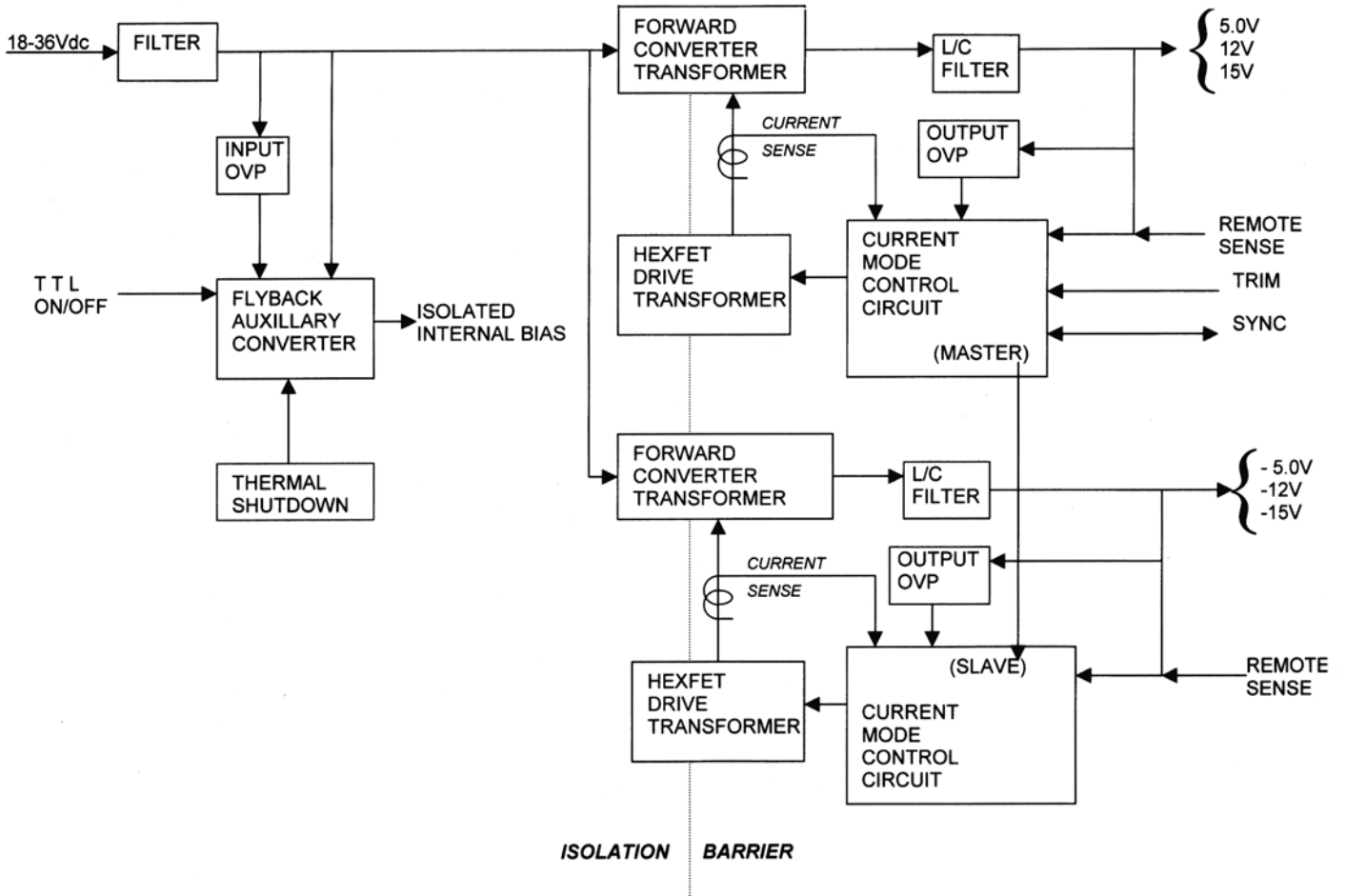


SM200S



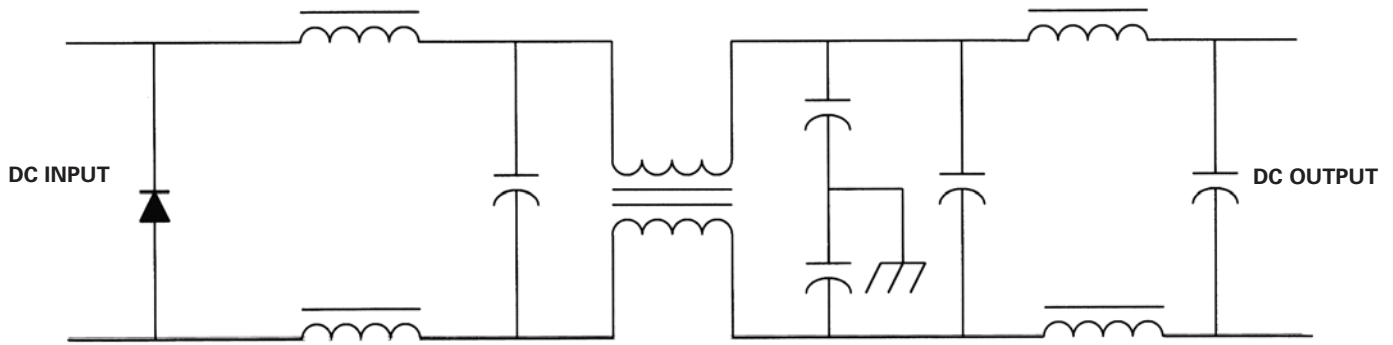
Block Diagrams

SM200D

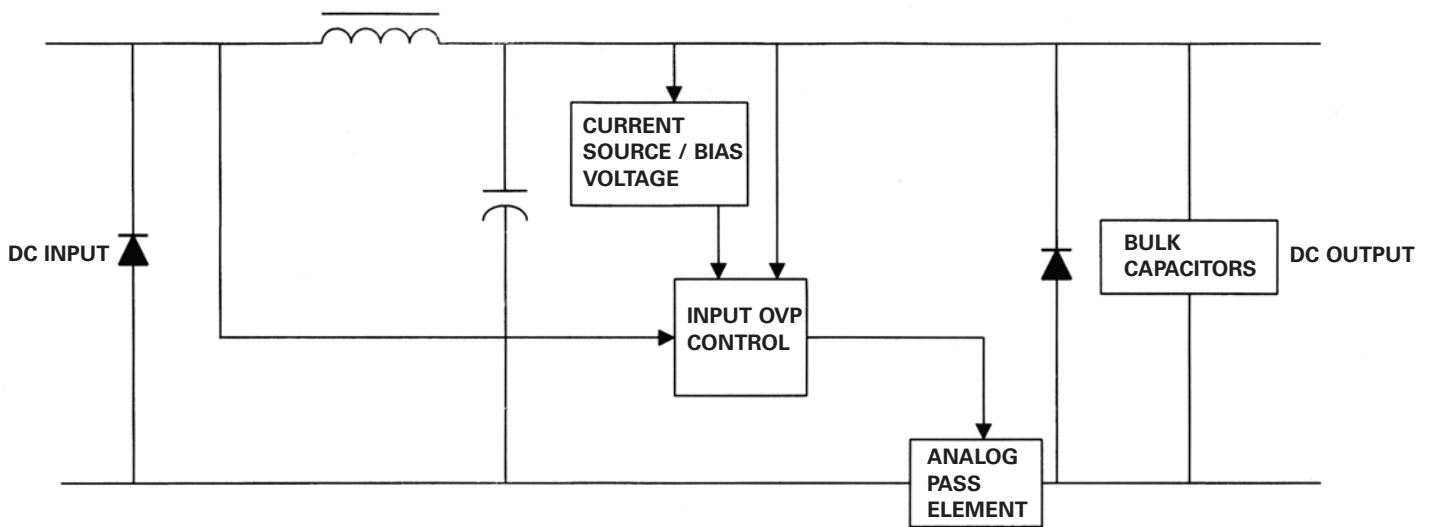


Block Diagrams

SMF200



SM1275



WARRANTY & REPAIR

Martek Power Abbott's converters and power supplies are built to exacting standards to assure customer satisfaction. Should you ever experience a problem with one of our products please contact your local sales representative to assist in a solution. The terms of the warranty and the length of warranty period* will vary between product lines. Please consult your local sales representative for terms and length of the warranty for any specific model or purchase.

The Company warrants that all of its Products will be free from defects in material and workmanship for twelve months. The Company shall, at its option, and as the Customer's and user's sole and exclusive remedy, issue a credit in the amount of the then-applicable price of such Product, or repair or replace any such Product which is defective under the terms of the foregoing warranty, free of charge.

ALL OTHER EXPRESS, STATUTORY AND IMPLIED WARRANTIES, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED. IN NO EVENT WILL THE COMPANY BE LIABLE FOR ANY INDIRECT, PUNITIVE, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGE IN CONNECTION WITH OR RELATED TO THE SALE OF PRODUCTS.

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Warranty Period*

- I. A, B, C, M, NW, PFC, W and LV Series: One (1) year warranty.
- II. CB, HM, NB, NL and SM Series: Three (3) years warranty.

***Repairs**

- I. A, B, C, M, NW, PFC, W and LV Series: Martek Power Abbott will repair products covered by our warranty. To return products a Return Material Authorization Number is required. Products beyond the warranty will be repaired only after the customer has authorized quoted repair charges. Any Martek Power Abbott product over seven(7) years old from the date of original shipment will not be serviced or repaired.
- II. CB, HM, NB, NL and SM Series: During warranty period, Martek Power Abbott will repair or replace (at Martek Power Abbott's discretion) products found to be defective. Martek Power Abbott will not repair products that are out of warranty.

***After Repair Warranty**

- I. A, B, C, M, NW, PFC, W and LV Series: Upon completion of repair, the products will be under warranty for a period of one year. Regardless of the date of repair, no product will be serviced or warranted beyond seven (7) years from the date of original shipment.
- II. CB, NL, NB and SM Series: Upon completion of repair, the products will be under warranty for a period of one year. Regardless of the date of repair, no product from the CB, NL, NH, NB and SM Series will be serviced or warranted beyond three (3) years from the date of original shipment.

Return Material Authorization Numbers

All returning goods must be accompanied by a Return Material Authorization (RMA) number. The RMA number must be clearly marked on the outside of the shipping carton. To receive and RMA number contact Martek Power Abbott at (310) 202-8820, extension 276. Please be prepared with the correct model and serial number of the product to be returned. For out of warranty products a company purchase order will be required for processing.

Evaluation Charges

All out of warranty products returned to Martek Power Abbott are subject to a \$50.00 evaluation charge. If the returned product is found to be in need of repair, and these repairs are authorized, the \$50.00 evaluation fee will be waived.

Repair Charges

Repair charges for all models are quoted per Martek Power Abbott published repair price list RPL97-07D. The repair charges do not include any additional processing or testing fees (i.e. ESS testing).

Shipping Instructions

All returning goods must have a RMA number marked on the carton. The number should be marked on a minimum of 2 sides of the carton, 3 inches (76mm) high, 6 inches (152mm) long. All goods must be shipped prepaid. Martek Power Abbott reserves the right to refuse all shipments received without a RMA number.