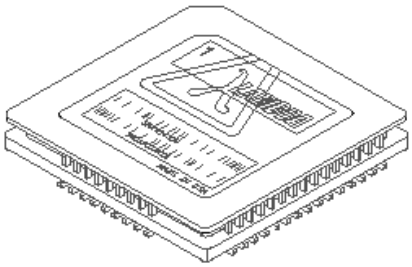

Lambda's new SM Series of Power Modules are ideally designed for Telecommunications and Network applications.

Product Specifications

SM10 Series Power Modules

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REVISION HISTORY

Revision	Date	Description	Program Manager	Quality Manager	Marketing Manager
A	4/30/98	Initial Release	Peter Brune	David Wandrey	Mike Wagner
B	8/11/99	Drawings Update	Peter Brune	David Wandrey	Mike Wagner

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1. COMMON PRODUCT SPECIFICATIONS

1.1. Regulated Outputs

PRELOAD: 10% required on all outputs.

a. Line Regulation, Single Output ..... 0.2% (From Low line to High Line)

b. Line Regulation, Dual Output..... 0.2% -V to +V (From Low line to High Line)
0.4% -V or +V to common

c. Load Regulation, Single Output ..... 1.0% Max for output current changes between 10% and 100% of full load.

d. Load Regulation, Dual Output..... 1.0% Max -V to +V for output current changes between 10% and 100% of full load.
2.0% -V or +V to common for output current changes between 10% and 100% of full load.

e. Cross Regulation..... Dual output models: Current change from 10% to 100% of full load on positive output will result in less than 3.0% (Max.) change in the negative output voltage.

(**Note**: ***Ripple and noise specifications are differential mode, and measured at the output terminals of the converter utilizing the EIAJ method. All specifications reflect a 20 Mhz. measurement bandwidth***.)

f. Ripple and Noise, Single Output ..... 3.3, 5.0 volt outputs: 75 mVp-p
12 volt outputs: 100 mVp-p
15 volt outputs: 100 mVp-p

g. Ripple and Noise, Dual Output..... 100 mVp-p

h. Remote Resistance Programming ..... "TRIM" pin is available which allows ± 10% adjustment of main output voltage via addition of external resistor referenced to either +V or -V terminal.

i. Remote Voltage Programming ..... All units can be remotely programmed from an external voltage source by utilizing the "Trim" pin

j. Temperature Coefficient..... ± 0.015% per oC, maximum. (measured on center of case)

k. Output Voltage Drift ..... 0.3% maximum over 8 hour period on main output (after thermal equilibrium is reached)

l. Initial Set Point, Single Output..... ± 1.0%

m. Initial Set Point, Dual Output..... ± 1.0% -V to +V
Output voltage balance at full load: The difference between +V to common and -V to common should be less then ±2% of +V to -V.

n. Start-Up Time/Capacitive Loading ..... The table below describes the maximum capacitive load for a 10 ms start-up under all input line conditions with a 100% resistive load. And It also states the maximum output capacitance allowed.

	Single Output				Dual Output	
Output Capacitance Condition	**3.3V**	**5.0V**	**12V**	**15V**	**±12**	**±15**
Max Capacitance for 10 mS Start up	1,000 µF	1,000 µF	110 µF	110 µF	22 µF	22 µF
Max Capacitance allowed	69OOµF	10,000 µF	240 µF	240 µF	22 µF	22 µF

o. Transient Response..... After the application of 25% step load change in output current, output voltage will stay within 2% of preset value, recovering to within 1% in less than 1 millisecond after application of transient (typical).

p. Operating Modes ..... Units can be operated in series

1.2. DC Input Range

a. 24 Volt Nominal DC Input..... 18.0 - 36.0 Vdc, at 1 Vp-p ripple

b. 48 Volt Nominal DC Input..... 36.0 - 75.0 Vdc, at 1 Vp-p ripple

1.3. Input Voltage Ripple Rejection

f = 100 Hz Sinewave, 1 Vp-p, Vi = Nominal Input
IVR = Min 45 db, typical 60 db

1.4. Inrush Current

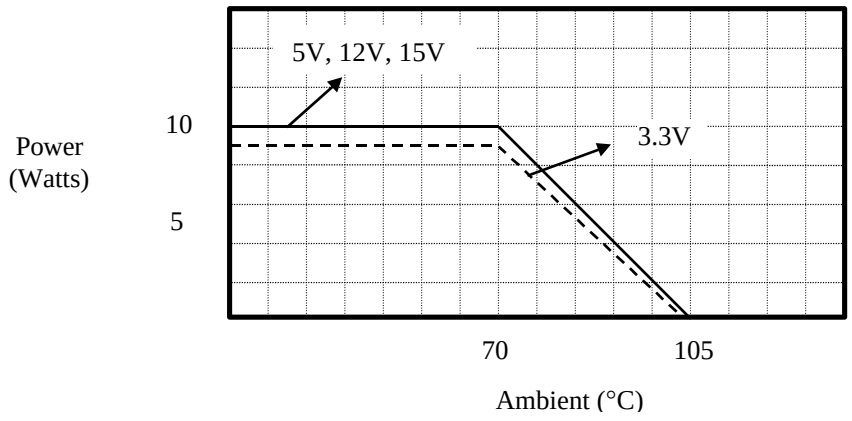
All modules meet the requirements for inrush current as specified by ETSI -300-132. Max surge current as defined by ETSI-300-132 is 48 Amps.

1.5. Overshoot

No output overshoots at turn on, turn off, or power failure.

1.6. Operating Temperature Range

a. Ambient..... -40 to +70°C (Natural Convection)



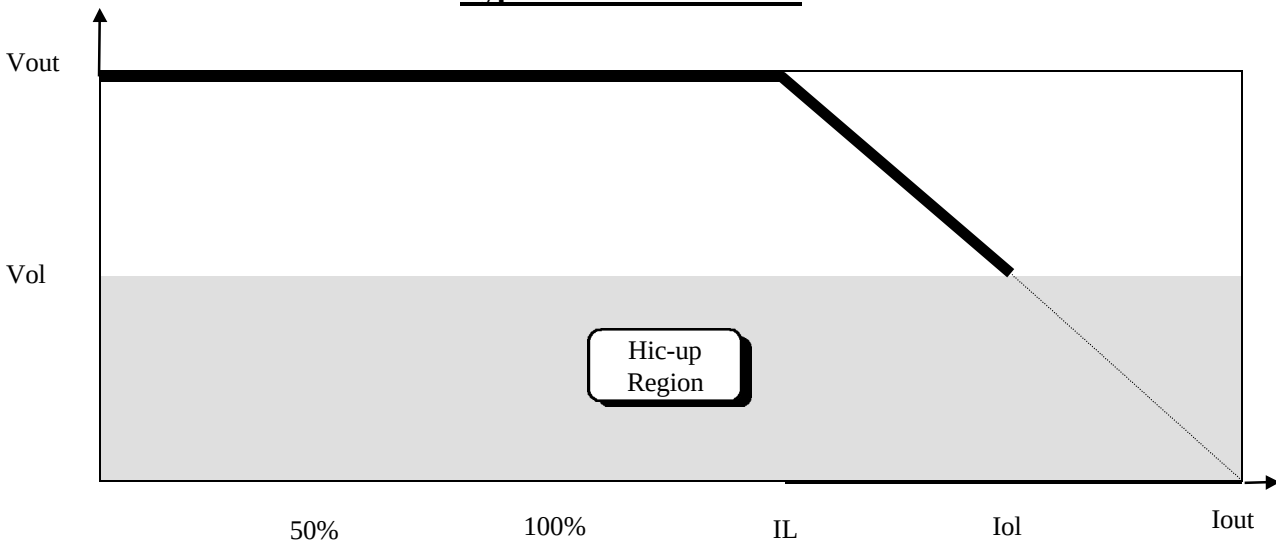
b. Case Temperature……-40 to +105^{O}C

c. Storage Temperature ..... -55 to +125 ^{O}C

1.7. Overload Protection

a. An overload or a short circuit condition **cannot** exceed 30 seconds (@ Nominal Input, +25°C).

Typical Fold Back Curve



	24V Input Model					
	Single Output				***Dual Output***	
Output Voltage	3V	5V	12V	15V	±12V	±15V
Output Current (100%)	2.55	2.0	.83	.67	.42	.33
IL (Current Limit)	5.1A	4.8A	1.66A	1.71A	.904	.715A
Vol (Over Load)	1.6V	3.2V	8.5V	11.5V	17.53V	21.95V
Iol (Over Load)	6.5A	5.6A	2.12A	1.6A	1.041A	.824A
Vsc (Short Circuit)	78.10mV	54.5mV	23.82 mV	18 mV	10.37mV	8.75mV
Isc (Short Circuit)	7.20A	4.921A	2.173A	1.65A	.943A	.801A

	48V Input Model					
	Single Output				Dual Output	
Output Voltage	3V	5V	12V	15V	±12V	±15V
Output Current (100%)	2.55	2.0	.83	.67	.42	.33
IL (Current Limit)	5.2A	4.88A	2.25A	1.75A	1.131A	.698A
Vol (Over Load)	2.4V	3.3V	10V	11.0V	16.42V	24.84V
Iol (Over Load)	5.7A	5.67A	2.4A	2.25A	1.27A	.821A
Vsc (Short Circuit)	42.4mV	43.23mV	27.73mV	24.06mV	12.85mV	12.30mV
Isc (Short Circuit)	3.968A	4.045A	2.60A	2.305A	1.230A	1.17A

b. Fusing:..... External Fusing is recommended.
24 V model 1.0 Amp
48 V model 0.5 Amp

1.8. Input Line Disturbances

24 Volt Input Models 50 volts for 100 ms

48 Volt Input Models ..... 100 volts for 100 ms.
100 volt, 10joule pulse per ETSI ETS 300 132 requirements with external filter.

1.9. Overvoltage Protection

Single and Dual Output Models: Overvoltage protection clamps output at predetermined level in the event of an internal sensing circuit or feedback loop failure.

Overvoltage Protection Levels:

Vo(nom)	**OV Clamp Point Range**
3.3 volts	4.0-4.8 volts
5.0 volts	6.0-7.25 volts
12.0 volts	13.4-16.35 volts
15.0 volts	17.0-19.20 volts
± 12 volts	26.8-30.21volts
± 15 volts	32.30-40.20 volts

1.10. Cooling

Natural Convection

1.11. Input, Output, and Mounting Configuration

Input/output pin configuration. (See SM Instruction Manual.)
All units are designed for printed circuit board mounting via reflow. (See SM Instruction Manual.)

1.12. Remote Functions

a. Sensing ..... Remote sensing not available

b. Turn On/Turn Off ..... Remote on/off pin referenced to negative input terminal. Open enables operation of converter, a closed circuit shuts operation down.

Input current with converter inhibited: 5 mA, maximum

c. Remote Monitoring ..... None

1.13. Fungus Proofing

No fungus nutrient materials utilized.

1.14. Shock, Vibration, and Temperature

a. Vibration..... 2.5 G-rms, 10 Hz - 500 Hz sweep vibration, 1 hour per axis.

b. Mechanical Shock IEC68-2-27

c. Drop Test GR63-CORE

d. Relative Humidity ..... 5% to 95%, non-condensing

e. Altitude..... 10,000 feet maximum operating 45,000 feet storage.

f. Thermal Cycle..... One hour at -20°C. (case temperature).
One hour at +20°C. (case temperature).
One hour at +100°C. (case temperature)
Repeat for minimum of 10 cycles with no damage to unit.
(Ramped at 5°C/minute, maximum with load derated as required).

g. Max Solder Temp/Time ..... See Instruction Manual.

1.15. Turn ON/OFF Voltages

24V Input..... Turn on 16.5 to 18 Volts
Turn off 15 to 17 Volts
Hysteresis .5 Volts min

48V Input..... Turn on 34.5 to 36 Volts
Turn off 30 to 33.5 Volts

Hysteresis .5 Volts min

1.16. EMI

Radiated and Conducted input EMI spectra meet the following requirements. (See Instruction Manual for further information.)

	EMI Specification
Conducted EMI (external input filter required)..	EN55022 (Level B), FCC Part 15 (Level B), ANSI 63.12-1987 (as called out in Bellcore TA-NWT-001089, issue 2)
Radiated EMI.....	Bellcore GR 1089. Electro-Magnetic fields > 30 Mhz Frequency range 1 - 12 Ghz Voltage level - 10Vrms/m 30 - 230 Mhz - 30dB uV/M 230 - 1,000 Mhz - 35dB uV/M 1Mhz - 10 Ghz - 46dB uV/M
ESD	All SM modules, when installed per recommended methods, are not ESD sensitive devices and meet the requirements of ENC61000-4-2, severity levels 3 and 4.

1.17. Isolation Voltages

a. Input to Output (48 Volt Input) ..... 900 VAC
1500 VDC

b. Input to Output (24 Volt Input) ..... 500 VAC
700 VDC

c. Isolation Resistance..... 10^6 Ohms, minimum

1.18. Warranty

2 years, parts and labor.

1.19. Regulatory Agency Compliance

All converters will meet the requirements of the following standards, assuming a line isolated, ELV or SELV, front end input voltage. UL1950 (Telecommunication Network Voltage) CSA 22.2-234 VDE0805 with the exception of EN60950 TNV Circuit isolation requirements.

1.20. Maximum Surface Distortion for Machine Placement

Coplanarity..... 0.006 inches

1.21. Package, Voltage, and Current Ratings

(Models Available)

Model	Package Size (inches)	Nom. Input Voltage (volts)	Nom. Output Voltage (volts)	Max. Output Current @ 105°C Case (amps)
SM10-24S03	1.40 x 1.40 x 0.4	24	3.3	2.55
SM10-24S05	1.40 x 1.40 x 0.4	24	5.0	2.00
SM10-24S12	1.40 x 1.40 x 0.4	24	12.0	0.83
SM10-24S15	1.40 x 1.40 x 0.4	24	15.0	0.67
SM10-24D12	1.40 x 1.40 x 0.4	24	± 12	0.42
SM10-24D15	1.40 x 1.40 x 0.4	24	± 15	0.33
SM10-48S03	1.40 x 1.40 x 0.4	48	3.3	2.55
SM10-48S05	1.40 x 1.40 x 0.4	48	5.0	2.0
SM10-48S12	1.40 x 1.40 x 0.4	48	12.0	0.83
SM10-48S15	1.40 x 1.40 x 0.4	48	15.0	0.67
SM10-48D12	1.40 x 1.40 x 0.4	48	±12	0.42
SM10-48D15	1.40 x 1.40 x 0.4	48	±15	0.33

1.22. Efficiency

Minimum Efficiency Measured at +25 °C ambient Temperature and at nominal input voltage with a full load.

a. SM10 Models..... 76% for 3.3 volt single output models
78% for 5.0 volt single output models
80% for 12.0 or 15.0 volt single output models
80% for dual output models

b. Worst Case..... min. Load, max. input voltage
60% for 3.3 volt single output models
60% for 5.0 volt single output models
60% for 12.0 or 15.0 volt single output models
60% for dual output models

c. Max. Input Ratings:

Max. Input Power ..... 13.1 watts
Max. Input Current ..... 0.4 amp (SM10-48 models)
0.75 amp (SM10-24 models)
Max. Input Power at No Load..... 0.4 watts

1.23. Physical Data

Model	Size (inches)	Weight (net)
SM10	1.40 x 1.40 x 0.4	14 grams

1.24. MTBF

2,000,000 hr. using: BELLCORE TR-NWT-000322 method I (parts count method).