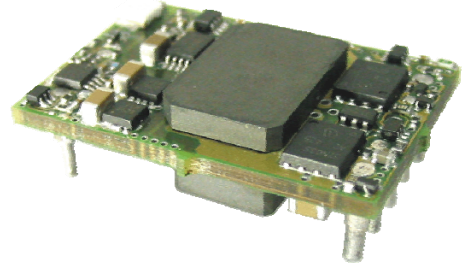


### Special Features

- High Efficiency, 85% at 1.2 V / 25 A, 90% at 3.3 V / 15 A
- Fast Transient Response
- DOSA standard sixteenth-brick footprint and pin-out configuration
- Low Output Ripple and Noise
- No Minimum Load Required
- Input Stand-by Power <50 mW
- Wide-Trim Adjustable Output Voltage
- Back Bias Start-up  $\leq 100\%$  of set point voltage
- Remote Sense
- Remote ON-OFF
- RoHS-6 Compliance (Directive 2002/95/EC)



### Applications

- ITC Equipment (IT, Telecommunication, Networking)
- Distributed Power Architecture
- Industrial and Medical Application

### Family Description

Roal's 16<sup>th</sup> Bricks are full featured, energy optimized DC to DC converters completely compatible with DOSA requirements. The unit's design is based on proprietary magnetics construction and utilizes secondary side control. This combination yields a very fast transient response, high operating efficiency and permits a wide output voltage adjustment range.

These converters possess exceptional electrical and thermal performance allowing operation under a wide range of environmental conditions. They also have built in protection against abnormal operating conditions including input under voltage, output overload, output over-voltage, and over-temperature.

#### Model List

P/N	Nominal Output (V)	Vout Wide-Trim Range (V)	Current (A)	DC Current limit inception	Ripple Typ. (mVpp)	Efficiency (%)	Line Regulation (mV)	Load Regulation (mV)
RDS50-48S1V2	1.2	0.84 to 1.32	0 to 25	30	50	85.0	±5	±5
RDS50-48S1V8	1.8	1.44 to 1.98	0 to 25	30	70	87.0	±5	±5
RDS50-48S2V5	2.5	2 to 2.75	0 to 20	25	70	88.0	±5	±5
RDS50-48S3V3	3.3	2.64 to 3.63	0 to 15	20	70	90	±5	±5
RDS50-48S05	5.0	4 to 5.5	0 to 10	15	70	90	±5	±5
RDS50-48S12	12.0	9.6 to 13.2	0 to 4.12	5.0	125	90	±10	±15

### Protection Features

Input Under Voltage	Lockout
Output Over Voltage	With auto-recovery
Output Over Current	
Output Short Circuit	Hiccup mode, auto-recovery
Over Temperature	Thermal Shutdown, auto-recovery

### Physical Specification

Case	16 <sup>th</sup> brick converters are in PTH configuration
Dimensions	33.0 mm x 22.9 mm x 9.50 mm = = 1.30 in x 0.90 in x 0.374 in
Weight	15 gr = 0.033 lb

### Model RDS50-48S1V2 \_ Electrical Specifications

PARAMETERS	NOTES and CONDITIONS	1V2 Standard Trim			Units
		Min	Typ	Max	
<b>ABSOLUTE MAXIMUM RATINGS</b>					
Input Voltage					
Continuous		0		75	Vdc
Transient	100ms			100	Vdc
Operating Temperature	Subject to airflow and derating, Tref	-40		125	°C
	Tref max	-40		125	°C
Storage Temperature		-55		125	°C
Input/Output Isolation Voltage	1 minute			1500	Vdc
Logic Remote On/Off Control	Vin= Vin,min to Vin,max,			10	Vdc
Trim Up	Short Trim to +Vo		OVP		Vdc
<b>INPUT CHARACTERISTICS</b>					
Operating Input Voltage		36	48	75	Vdc
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		28	31,5	35	Vdc
Turn-Off Voltage Threshold		26,5	29,5	32,5	Vdc
Lockout Hysteresis Voltage		0,94	2,17	3,41	Vdc
Maximum Input Current	100% Load, 36Vin			1,005	A
No-Load Input Current	Vin= Vin,min to Vin,max		40	50	mA
Off Converter Input Current	48Vin		<2	3	mA
Inrush Current (I <sup>2</sup> t)			2		A <sup>2</sup> s
Input Reflected-Ripple Current	P-P through 12µH inductor, 33µF input capacitor 5Hz to 20MHz		5		mA
Input Capacitance				0,6	µF
Input Idling Power	Io = 0A, Vin = 53V		2		W
Input Standby Power	Vi - 53, RC activated		<50		mW
<b>OUTPUT CHARACTERISTICS</b>					
Output Voltage Set Point	Vin=53V, Io=Io,max, Tc=25°C	1,188	1,2	1,212	Vdc
Output Voltage Adjust Range	Vin=53V, Io=Io,max, Tc=25°C	0,84		1,32	Vdc
Output Voltage Regulation					
Over Load	Io=Io,min to Io,max		±5	±15	mV
Over Line	Vin=36V to 75V		±5	±10	mV
Over Temperature	-40°C to 100°C		±15	±25	mV
Total Tolerance	Overall line, load and temperature conditions	1,164		1,236	Vdc
Output Voltage Ripple and Noise	48Vin, 5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 1µF ceramic, 100µF tantalum on o/p		50	70	mV
RMS	Full Load, 1µF ceramic, 100µF tantalum on o/p		15	25	mV
Operating Output Current Range	Vo = Vo Nom, Tref < Tref Max	0		25	A
Output DC Current-Limit Inception	Output Voltage 10% Low		30		A
Output Power Max	Vo = Vo Nom, Tref < Tref Max		30		W
Back drive current limit while On/Off Control is LOW				0,5	A
Back drive current limit while On/Off Control is HIGH				50	mA
<b>DYNAMIC CHARACTERISTICS</b>					
Output Voltage / Current Transient	48V, 10µF Tan & 1µF Ceramic load cap,				
Positive Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Negative Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Settling Time (within 1% Vout nominal)			100		µs
Turn-On Transient					
Start-Up Time, From On/Off Control	at 1% Vout set point			10	ms
Start-Up Time, From Input	at 100% Vout set point			25	ms
Rise Up Time	From 10% to 90% of Vout set point			15	ms
Maximum Output Capacitance	Full load			10000	µF
Pre bias start-up	% of trimmed output voltage			100	%
<b>EFFICIENCY</b>					
100% Load	48 and 53Vin	84,5	85	85,5	%
50% Load	48 and 53Vin	86	86,5	87	%
<b>ISOLATION CHARACTERISTICS</b>					
Input to Output	Basic to IEC 60950	1500			Vdc
Isolation Resistance		10			MΩ
Isolation Capacitance				4700	pF
Switching Frequency Fs	Io = 0->Iomax, Tpcb = +25°C		300		kHz
Logic LOW Remote ON/OFF Control	Logic LOW=Module On, TTL compatible	0		0,8	V
Logic HIGH Remote ON/OFF Control	Logic HIGH=Module Off, TTL compatible	2,4		5	V
Logic LOW Remote ON/OFF Current	Logic LOW=Module On, TTL compatible			1	mA
Output Voltage Trim Range	Across Pins 9 & 5, Pout <= max rated power	0,84		1,32	V
Output Voltage Remote Sense Range	Pout <= max rated power	10%			V
Output Over-Voltage Protection	Over full temp range; % of nominal Vout	1,64	1,74	1,84	V
Output Short Circuit Current	AVG, Hiccup mode			5	A
Power Dissipation	48 and 53Vin, Iomax		5,3		W
<b>GENERAL SPECIFICATIONS</b>					
MTBF	Io=80% of Io, max; Tc=40°C; Telcordia Issue 1		2000		khours
Weight			15		g
Over-Temperature Shutdown	Hotspot temperature		130		°C

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### Model RDS50-48S1V8 \_ Electrical Specifications

PARAMETERS	NOTES and CONDITIONS	1V8 Standard Trim			Units
		Min	Typ	Max	
<b>ABSOLUTE MAXIMUM RATINGS</b>					
Input Voltage					
Continuous		0		75	Vdc
Transient	100ms			100	Vdc
Operating Temperature	Subject to airflow and derating, Tref	-40		125	°C
	Tref max	-40		125	°C
Storage Temperature		-55		125	°C
Input/Output Isolation Voltage	1 minute			1500	Vdc
Logic Remote On/Off Control	Vin= Vin,min to Vin,max,			10	Vdc
Trim Up	Short Trim to +Vo		OVP		Vdc
<b>INPUT CHARACTERISTICS</b>					
Operating Input Voltage		36	48	75	Vdc
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		28	31,5	35	Vdc
Turn-Off Voltage Threshold		26,5	29,5	32,5	Vdc
Lockout Hysteresis Voltage		0,94	2,17	3,41	Vdc
Maximum Input Current	100% Load, 36Vin			1,475	A
No-Load Input Current	Vin= Vin,min to Vin,max		40	50	mA
Off Converter Input Current	48Vin		<2	3	mA
Inrush Current (I <sup>2</sup> t)			2		A <sup>2</sup> s
Input Reflected-Ripple Current	P-P thru 12µH inductor, 33µF input capacitor 5Hz to 20MHz		5		mA
Input Capacitance				0,6	µF
Input Idling Power	Io = 0A, Vin = 53 V		2		W
Input Standby Power	Vi - 53, RC activated		<50		mW
<b>OUTPUT CHARACTERISTICS</b>					
Output Voltage Set Point	Vin=53V, Io=Io,max, Tc=25°C	1,785	1,8	1,821	Vdc
Output Voltage Adjust Range	Vin=53V, Io=Io,max, Tc=25°C	1,44		1,98	Vdc
Output Voltage Regulation					
Over Load	Io=Io,min to Io,max		±5	±15	mV
Over Line	Vin=36V to 75V		±5	±10	mV
Over Temperature	-40°C to 100°C		±15	±25	mV
Total Tolerance	Overall line, load and temperature conditions	1,746		1,854	Vdc
Output Voltage Ripple and Noise	48Vin, 5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 1µF ceramic, 100µF tantalum on o/p		70	100	mV
RMS	Full Load, 1µF ceramic, 100µF tantalum on o/p		20	30	mV
Operating Output Current Range	Vo = Vo Nom, Tref < Tref Max	0		25	A
Output DC Current-Limit Inception	Output Voltage 10% Low		30		A
Output Power Max	Vo = Vo Nom, Tref < Tref Max		45		W
Back drive current limit while On/Off Control is LOW				0,5	A
Back drive current limit while On/Off Control is HIGH				50	mA
<b>DYNAMIC CHARACTERISTICS</b>					
Output Voltage / Current Transient	48V, 10µF Tan & 1µF Ceramic load cap,				
Positive Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Negative Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Settling Time (within 1% Vout nominal)			100		us
Turn-On Transient					
Start-Up Time, From On/Off Control	at 1% Vout set point			10	ms
Start-Up Time, From Input	at 100% Vout set point			25	ms
Rise Up Time	From 10% to 90% of Vout set point			15	ms
Maximum Output Capacitance	Full load			10000	µF
Pre bias start-up	% of trimmed output voltage			100	%
<b>EFFICIENCY</b>					
100% Load	48 and 53Vin	86,5	87	87,5	%
50% Load	48 and 53Vin	87,5	88,5	89	%
<b>ISOLATION CHARACTERISTICS</b>					
Input to Output	Basic to IEC 60950	1500			Vdc
Isolation Resistance		10			MΩ
Isolation Capacitance				4700	pF
<b>FEATURE CHARACTERISTICS</b>					
Switching Frequency Fs	Io = 0->Iomax, Tpcb = +25°C		300		kHz
Logic LOW Remote ON/OFF Control	Logic LOW=Module On, TTL compatible	0		0,8	V
Logic HIGH Remote ON/OFF Control	Logic HIGH=Module Off, TTL compatible	2,4		5	V
Logic LOW Remote ON/OFF Current	Logic LOW=Module On, TTL compatible			1	mA
Output Voltage Trim Range	Across Pins 9 & 5, Pout <= max rated power	1,44		1,98	V
Output Voltage Remote Sense Range	Pout <= max rated power	10%			V
Output Over-Voltage Protection	Over full temp range; % of nominal Vout	2,60	2,75	2,90	V
Output Short Circuit Current	AVG, Hiccup mode			5	A
Power Dissipation	48 and 53Vin, Iomax		6,7		W
<b>GENERAL SPECIFICATIONS</b>					
MTBF	Io=80% of Io, max; Tc=40°C; Telcordia Issue 1		2000		khours
Weight			15		g
Over-Temperature Shutdown	Hotspot temperature		130		°C

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### Model RDS50-48S2V5 \_ Electrical Specifications

PARAMETERS	NOTES and CONDITIONS	2V5 Standard Trim			Units
		Min	Typ	Max	
<b>ABSOLUTE MAXIMUM RATINGS</b>					
Input Voltage					
Continuous		0		75	Vdc
Transient	100ms			100	Vdc
Operating Temperature	Subject to airflow and derating, Tref	-40		125	°C
	Tref max	-40		125	°C
Storage Temperature		-55		125	°C
Input/Output Isolation Voltage	1 minute			1500	Vdc
Logic Remote On/Off Control	Vin= Vin,min to Vin,max,			10	Vdc
Trim Up	Short Trim to +Vo		OVP		Vdc
<b>INPUT CHARACTERISTICS</b>					
Operating Input Voltage		36	48	75	Vdc
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		28	31,5	35	Vdc
Turn-Off Voltage Threshold		26,5	29,5	32,5	Vdc
Lockout Hysteresis Voltage		0,94	2,17	3,41	Vdc
Maximum Input Current	100% Load, 36Vin			1,615	A
No-Load Input Current	Vin= Vin,min to Vin,max		40	50	mA
Off Converter Input Current	48Vin		<2	3	mA
Inrush Current (I <sup>2</sup> t)			2		A <sup>2</sup> s
Input Reflected-Ripple Current	P-P thru 12µH inductor, 33µF input capacitor 5Hz to 20MHz		5		mA
Input Capacitance				0,6	µF
Input Idling Power	Io = 0A, Vin = 53V		2		W
Input Standby Power	Vi - 53, RC activated		<50		mW
<b>OUTPUT CHARACTERISTICS</b>					
Output Voltage Set Point	Vin=53V, Io=Io,max, Tc=25°C	2,475	2.5	2,525	Vdc
Output Voltage Adjust Range	Vin=53V, Io=Io,max, Tc=25°C	2		2,75	Vdc
Output Voltage Regulation					
Over Load	Io=Io,min to Io,max		±5	±15	mV
Over Line	Vin=36V to 75V		±5	±10	mV
Over Temperature	-40°C to 100°C		±15	±25	mV
Total Tolerance	Overall line, load and temperature conditions	2,425		2,575	Vdc
Output Voltage Ripple and Noise	48Vin, 5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 1µF ceramic, 100µF tantalum on o/p		70	100	mV
RMS	Full Load, 1µF ceramic, 100µF tantalum on o/p		20	30	mV
Operating Output Current Range	Vo = Vo Nom, Tref < Tref Max	0		20	A
Output DC Current-Limit Inception	Output Voltage 10% Low		25		A
Output Power Max	Vo = Vo Nom, Tref < Tref Max		50		W
Back drive current limit while On/Off Control is LOW				0,5	A
Back drive current limit while On/Off Control is HIGH				50	mA
<b>DYNAMIC CHARACTERISTICS</b>					
Output Voltage / Current Transient	48V, 10µF Tan & 1µF Ceramic load cap,				
Positive Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Negative Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Settling Time (within 1% Vout nominal)			100		us
Turn-On Transient					
Start-Up Time, From On/Off Control	at 1% Vout set point			10	ms
Start-Up Time, From Input	at 100% Vout set point			25	ms
Rise Up Time	From 10% to 90% of Vout set point			15	ms
Maximum Output Capacitance	Full load			10000	µF
Pre bias start-up	% of trimmed output voltage			100	%
<b>EFFICIENCY</b>					
100% Load	48 and 53Vin	87,5	88	88,5	%
50% Load	48 and 53Vin	89,5	90	90.5	%
<b>ISOLATION CHARACTERISTICS</b>					
Input to Output	Basic to IEC 60950	1500			Vdc
Isolation Resistance		10			MΩ
Isolation Capacitance				4700	pF
<b>FEATURE CHARACTERISTICS</b>					
Switching Frequency Fs	Io = 0->Iomax, Tpcb = +25°C		300		kHz
Logic LOW Remote ON/OFF Control	Logic LOW=Module On, TTL compatible	0		0,8	V
Logic HIGH Remote ON/OFF Control	Logic HIGH=Module Off, TTL compatible	2,4		5	V
Logic LOW Remote ON/OFF Current	Logic LOW=Module On, TTL compatible			1	mA
Output Voltage Trim Range	Across Pins 9 & 5, Pout <= max rated power	2		2,75	V
Output Voltage Remote Sense Range	Pout <= max rated power	10%			V
Output Over-Voltage Protection	Over full temp range; % of nominal Vout	3,20	3,4	3,60	V
Output Short Circuit Current	AVG, Hiccup mode			5	A
Power Dissipation	48 and 53Vin, Iomax		6,8		W
<b>GENERAL SPECIFICATIONS</b>					
MTBF	Io=80% of Io, max; Tc=40°C; Telcordia Issue 1		2000		khours
Weight			15		g
Over-Temperature Shutdown	Hotspot temperature		130		°C

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### Model RDS50-48S3V3 \_ Electrical Specifications

PARAMETERS	NOTES and CONDITIONS	3V3 Standard Trim			Units
		Min	Typ	Max	
<b>ABSOLUTE MAXIMUM RATINGS</b>					
Input Voltage					
Continuous		0		75	Vdc
Transient	100ms			100	Vdc
Operating Temperature	Subject to airflow and derating, Tref	-40		125	°C
	Tref max	-40		125	°C
Storage Temperature		-55		125	°C
Input/Output Isolation Voltage	1 minute			1500	Vdc
Logic Remote On/Off Control	Vin= Vin,min to Vin,max,			10	Vdc
Trim Up	Short Trim to +Vo		OVP		Vdc
<b>INPUT CHARACTERISTICS</b>					
Operating Input Voltage		36	48	75	Vdc
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		28	31,5	35	Vdc
Turn-Off Voltage Threshold		26,5	29,5	32,5	Vdc
Lockout Hysteresis Voltage		0,94	2,17	3,41	Vdc
Maximum Input Current	100% Load, 36Vin			1,59	A
No-Load Input Current	Vin= Vin,min to Vin,max		40	50	mA
Off Converter Input Current	48Vin		<2	3	mA
Inrush Current (I <sup>2</sup> t)			2		A <sup>2</sup> s
Input Reflected-Ripple Current	P-P thru 12µH inductor, 33µF input capacitor 5Hz to 20MHz		5		mA
Input Capacitance				0,6	µF
Input Idling Power	Io = 0A, Vin = 53V		2		W
Input Standby Power	Vi - 53, RC activated		<50		mW
<b>OUTPUT CHARACTERISTICS</b>					
Output Voltage Set Point	Vin=53V, Io=Io,max, Tc=25°C	3,265	3,3	3,32	Vdc
Output Voltage Adjust Range	Vin=53V, Io=Io,max, Tc=25°C	2,64		3,63	Vdc
Output Voltage Regulation					
Over Load	Io=Io,min to Io,max		±5	±15	mV
Over Line	Vin=36V to 75V		±5	±10	mV
Over Temperature	-40°C to 100°C		±30	±50	mV
Total Tolerance	Overall line, load and temperature conditions	3,201		3,399	Vdc
Output Voltage Ripple and Noise	48Vin, 5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 1µF ceramic, 100µF tantalum on o/p		70	100	mV
RMS	Full Load, 1µF ceramic, 100µF tantalum on o/p		20	30	mV
Operating Output Current Range	Vo = Vo Nom, Tref < Tref Max	0		15	A
Output DC Current-Limit Inception	Output Voltage 10% Low		20		A
Output Power Max	Vo = Vo Nom, Tref < Tref Max		49,5		W
Back drive current limit while On/Off Control is LOW				0,5	A
Back drive current limit while On/Off Control is HIGH				50	mA
<b>DYNAMIC CHARACTERISTICS</b>					
Output Voltage / Current Transient	48V, 10µF Tan & 1µF Ceramic load cap,				
Positive Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Negative Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		200	300	mV
Settling Time (within 1% Vout nominal)			100		us
Turn-On Transient					
Start-Up Time, From On/Off Control	at 1% Vout set point			10	ms
Start-Up Time, From Input	at 100% Vout set point			25	ms
Rise Up Time	From 10% to 90% of Vout set point			15	ms
Maximum Output Capacitance	Full load			10000	µF
Pre bias start-up	% of trimmed output voltage			100	%
<b>EFFICIENCY</b>					
100% Load	48 and 53Vin	88	89	90	%
50% Load	48 and 53Vin	89	90	91	%
<b>ISOLATION CHARACTERISTICS</b>					
Input to Output	Basic to IEC 60950	1500			Vdc
Isolation Resistance		10			MΩ
Isolation Capacitance				2200	pF
<b>FEATURE CHARACTERISTICS</b>					
Switching Frequency Fs	Io = 0->Iomax, Tpcb = +25°C		300		kHz
Logic LOW Remote ON/OFF Control	Logic LOW=Module On, TTL compatible	0		0,8	V
Logic HIGH Remote ON/OFF Control	Logic HIGH=Module Off, TTL compatible	2,4		5	V
Logic LOW Remote ON/OFF Current	Logic LOW=Module On, TTL compatible			1	mA
Output Voltage Trim Range	Across Pins 9 & 5, Pout <= max rated power	2,64		3,63	V
Output Voltage Remote Sense Range	Pout <= max rated power	10%			V
Output Over-Voltage Protection	Over full temp range; % of nominal Vout	4,2	4,4	4,5	V
Output Short Circuit Current	AVG, Hiccup mode			3	A
Power Dissipation	48 and 53Vin, Iomax		7		W
<b>GENERAL SPECIFICATIONS</b>					
MTBF	Io=80% of Io, max; Tc=40°C; Telcordia Issue 1		2000		khours
Weight			15		g
Over-Temperature Shutdown	Hotspot temperature		130		°C

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### Model RDS50-48S05 \_ Electrical Specifications

PARAMETERS	NOTES and CONDITIONS	5V Standard Trim			Units
		Min	Typ	Max	
<b>ABSOLUTE MAXIMUM RATINGS</b>					
Input Voltage					
Continuous		0		75	Vdc
Transient	100ms			100	Vdc
Operating Temperature	Subject to airflow and derating, Tref	-40		125	°C
	Tref max	-40		125	°C
Storage Temperature		-55		125	°C
Input/Output Isolation Voltage	1 minute			1500	Vdc
Logic Remote On/Off Control	Vin = Vin,min to Vin,max,			10	Vdc
Trim Up	Short Trim to +Vo		OVP		Vdc
<b>INPUT CHARACTERISTICS</b>					
Operating Input Voltage		36	48	75	Vdc
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		28	31,5	35	Vdc
Turn-Off Voltage Threshold		26,5	29,5	32,5	Vdc
Lockout Hysteresis Voltage		0,94	2,17	3,41	Vdc
Maximum Input Current	100% Load, 36Vin			1,57	A
No-Load Input Current	Vin = Vin,min to Vin,max		40	50	mA
Off Converter Input Current	48Vin		<2	3	mA
Inrush Current (I <sup>2</sup> t)			2		A <sup>2</sup> s
Input Reflected-Ripple Current	P-P thru 12µH inductor, 33µF input capacitor 5Hz to 20MHz		5		mA
Input Capacitance				0,6	µF
Input Idling Power	Io = 0A, Vin = 53V		2		W
Input Standby Power	Vi - 53, RC activated		<50		mW
<b>OUTPUT CHARACTERISTICS</b>					
Output Voltage Set Point	Vin=53V, Io=Io,max, Tc=25°C	4,95	5	5,05	Vdc
Output Voltage Adjust Range	Vin=53V, Io=Io,max, Tc=25°C	4		5,5	Vdc
Output Voltage Regulation					
Over Load	Io=Io,min to Io,max		±5	±20	mV
Over Line	Vin=36V to 75V		±5	±10	mV
Over Temperature	-40°C to 100°C		±50	±100	mV
Total Tolerance	Overall line, load and temperature conditions	4,85		5,15	Vdc
Output Voltage Ripple and Noise	48Vin, 5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 1µF ceramic, 100µF tantalum on o/p		70	100	mV
RMS	Full Load, 1µF ceramic, 100µF tantalum on o/p		30	40	mV
Operating Output Current Range	Vo = Vo Nom, Tref < Tref Max	0		10	A
Output DC Current-Limit Inception	Output Voltage 10% Low		15		A
Output Power Max	Vo = Vo Nom, Tref < Tref Max		50		W
Back drive current limit while On/Off Control is LOW				0,5	A
Back drive current limit while On/Off Control is HIGH				50	mA
<b>DYNAMIC CHARACTERISTICS</b>					
Output Voltage / Current Transient	48V, 10µF Tan & 1µF Ceramic load cap,				
Positive Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		250	400	mV
Negative Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		250	300	mV
Settling Time (within 1% Vout nominal)			100		µs
Turn-On Transient					
Start-Up Time, From On/Off Control	at 1% Vout set point			10	ms
Start-Up Time, From Input	at 100% Vout set point			25	ms
Rise Up Time	From 10% to 90% of Vout set point			15	ms
Maximum Output Capacitance	Full load			10000	µF
Pre bias start-up	% of trimmed output voltage			100	%
<b>EFFICIENCY</b>					
100% Load	48 and 53Vin	89	90	91	%
50% Load	48 and 53Vin	90	91	92	%
<b>ISOLATION CHARACTERISTICS</b>					
Input to Output	Basic to IEC 60950	1500			Vdc
Isolation Resistance		10			MΩ
Isolation Capacitance				2200	pF
<b>FEATURE CHARACTERISTICS</b>					
Switching Frequency Fs	Io = 0->Iomax, Tpcb = +25°C		300		kHz
Logic LOW Remote ON/OFF Control	Logic LOW=Module On, TTL compatible	0		0,8	V
Logic HIGH Remote ON/OFF Control	Logic HIGH=Module Off, TTL compatible	2,4		5	V
Logic LOW Remote ON/OFF Current	Logic LOW=Module On, TTL compatible			1	mA
Output Voltage Trim Range	Across Pins 9 & 5, Pout <= max rated power	4,0		5,5	V
Output Voltage Remote Sense Range	Pout <= max rated power	10%			V
Output Over-Voltage Protection	Over full temp range; % of nominal Vout	6,5	6,8	7,2	V
Output Short Circuit Current	AVG, Hiccup mode			2	A
Power Dissipation	48 and 53Vin, Iomax		5,5		W
<b>GENERAL SPECIFICATIONS</b>					
MTBF	Io=80% of Io, max; Tc=40°C; Telcordia Issue 1		2000		khours
Weight			15		g
Over-Temperature Shutdown	Hotspot temperature		130		°C

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### Model RDS50-48S12 \_ Electrical Specifications

PARAMETERS	NOTES and CONDITIONS	12V Standard Trim			Units
		Min	Typ	Max	
<b>ABSOLUTE MAXIMUM RATINGS</b>					
Input Voltage					
Continuous		0		75	Vdc
Transient	100ms			100	Vdc
Operating Temperature	Subject to airflow and derating, Tref	-40		125	°C
	Tref max	-40		125	°C
Storage Temperature		-55		125	°C
Input/Output Isolation Voltage	1 minute			1500	Vdc
Logic Remote On/Off Control	Vin= Vin,min to Vin,max,			10	Vdc
Trim Up	Short Trim to +Vo		OVP		Vdc
<b>INPUT CHARACTERISTICS</b>					
Operating Input Voltage		36	48	75	Vdc
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		28	31,5	35	Vdc
Turn-Off Voltage Threshold		26,5	29,5	32,5	Vdc
Lockout Hysteresis Voltage		0,94	2,17	3,41	Vdc
Maximum Input Current	100% Load, 36Vin			1,59	A
No-Load Input Current	Vin= Vin,min to Vin,max		40	50	mA
Off Converter Input Current	48Vin		<2	3	mA
Inrush Current (I <sup>2</sup> t)			2		A <sup>2</sup> s
Input Reflected-Ripple Current	P-P thru 12µH inductor, 33µF input capacitor 5Hz to 20MHz		5		mA
Input Capacitance				0,6	µF
Input Idling Power	Io = 0A, Vin = 53A		2		W
Input Standby Power	Vi - 53, RC activated		<50		mW
<b>OUTPUT CHARACTERISTICS</b>					
Output Voltage Set Point	Vin=53V, Io=Io,max, Tc=25°C	11,77	12	12,23	Vdc
Output Voltage Adjust Range	Vin=53V, Io=Io,max, Tc=25°C	9,6		13,2	Vdc
Output Voltage Regulation					
Over Load	Io=Io,min to Io,max		±15	±30	mV
Over Line	Vin=36V to 75V		±5	±15	mV
Over Temperature	-40°C to 100°C		±50	±85	mV
Total Tolerance	Overall line, load and temperature conditions	11,64		12,36	Vdc
Output Voltage Ripple and Noise	48Vin, 5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 1µF ceramic, 100µF tantalum on o/p		125	250	mV
RMS	Full Load, 1µF ceramic, 100µF tantalum on o/p		35	70	mV
Operating Output Current Range	Vo = Vo Nom, Tref < Tref Max	0		4,166	A
Output DC Current-Limit Inception	Output Voltage 10% Low		5		A
Output Power Max	Vo = Vo Nom, Tref < Tref Max		50		W
Back drive current limit while On/Off Control is LOW				0,5	A
Back drive current limit while On/Off Control is HIGH				50	mA
<b>DYNAMIC CHARACTERISTICS</b>					
Output Voltage / Current Transient	48V, 10µF Tan & 1µF Ceramic load cap,				
Positive Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		0,5	1	V
Negative Step Change in Output Current	50% of Io Max , Io=0.1...1.0Iomax 5A/µs		0,5	1	V
Settling Time (within 1% Vout nominal)			100		us
Turn-On Transient					
Start-Up Time, From On/Off Control	at 1% Vout set point			10	ms
Start-Up Time, From Input	at 100% Vout set point			65	ms
Rise Up Time	From 10% to 90% of Vout set point			40	ms
Maximum Output Capacitance	Full load			10000	µF
Pre bias start-up	% of trimmed output voltage			50	%
<b>EFFICIENCY</b>					
100% Load	48 and 53Vin	89	90	91	%
50% Load	48 and 53Vin	90	91	92	%
<b>ISOLATION CHARACTERISTICS</b>					
Input to Output	Basic to IEC 60950	1500			Vdc
Isolation Resistance		10			MΩ
Isolation Capacitance			1500		pF
<b>FEATURE CHARACTERISTICS</b>					
Switching Frequency Fs	Io = 0->Iomax, Tpcb = +25°C		300		kHz
Logic LOW Remote ON/OFF Control	Logic LOW=Module On, TTL compatible	0		0,8	V
Logic HIGH Remote ON/OFF Control	Logic HIGH=Module Off, TTL compatible	2,4		5	V
Logic LOW Remote ON/OFF Current	Logic LOW=Module On, TTL compatible			1	mA
Output Voltage Trim Range	Across Pins 9 & 5, Pout <= max rated power	9,6		13,2	V
Output Voltage Remote Sense Range	Pout <= max rated power	10%			V
Output Over-Voltage Protection	Over full temp range; % of nominal Vout	14	14,75	15,55	V
Output Short Circuit Current	AVG, Hiccup mode			2.08	A
Power Dissipation	48 and 53Vin, Iomax		5,5		W
<b>GENERAL SPECIFICATIONS</b>					
MTBF	Io=80% of Io, max; Tc=40°C; Telcordia Issue 1		2000		khours
Weight			15		g
Over-Temperature Shutdown	Hotspot temperature		130		°C

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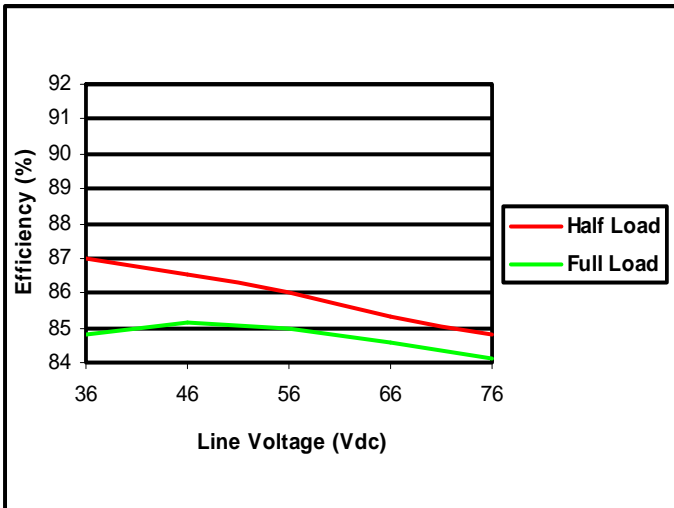
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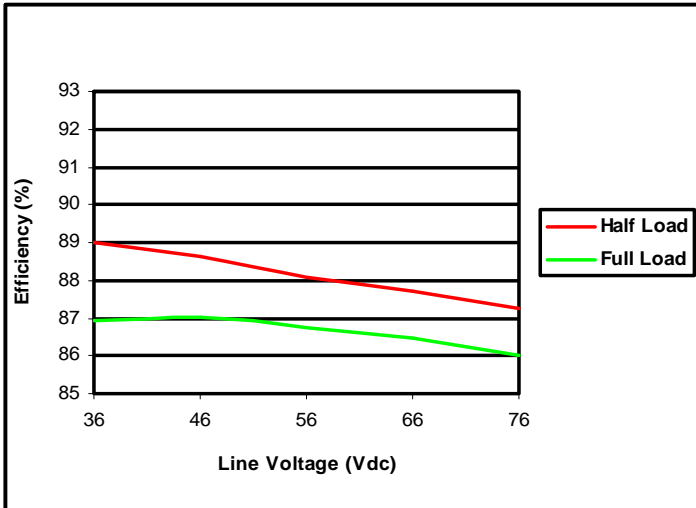
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Efficiency vs Line \_ All versions

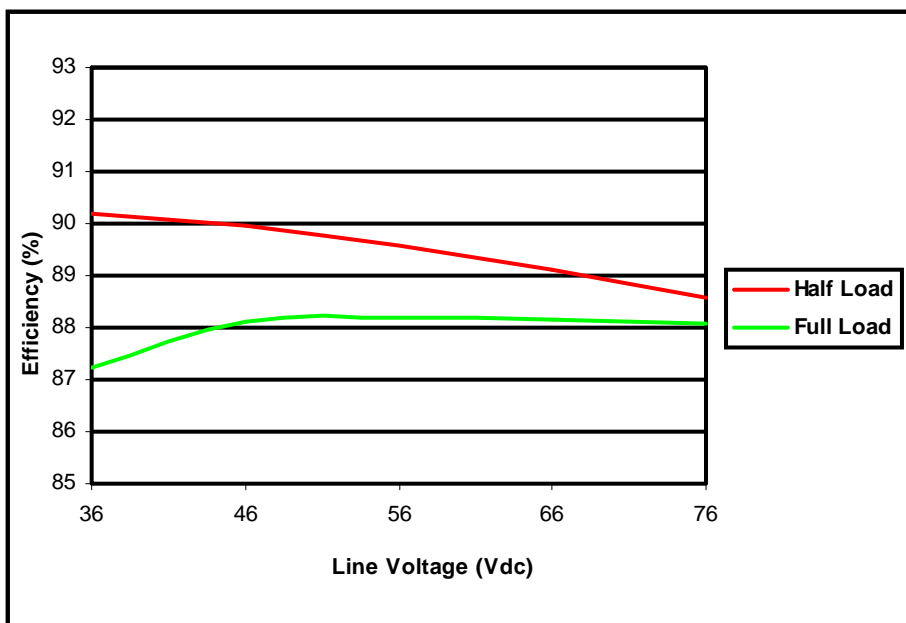
1.2 V Efficiency Vs Line (typ.)



1.8 V Efficiency Vs Line (typ.)



2.5V Efficiency Vs Line (typ.)



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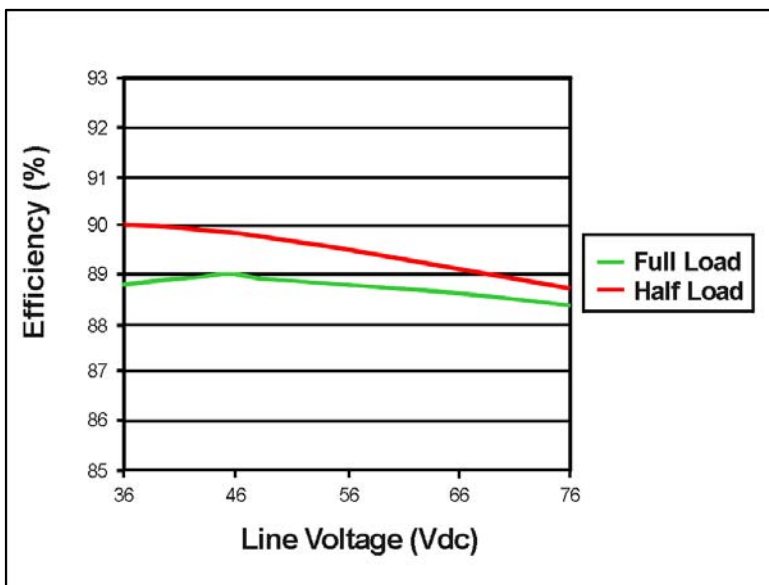
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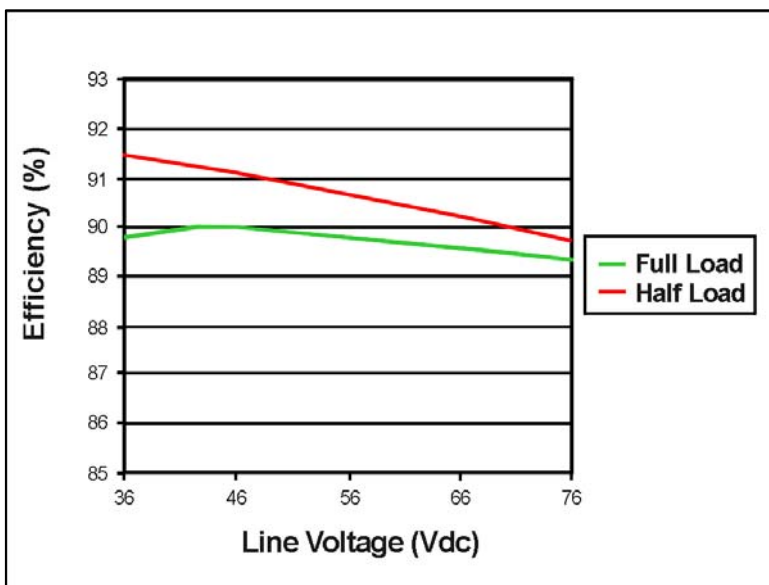


## Efficiency vs Line \_ All versions

3.3V Efficiency Vs Line (typ.)



5V, 12V Efficiency Vs Line (typ.)



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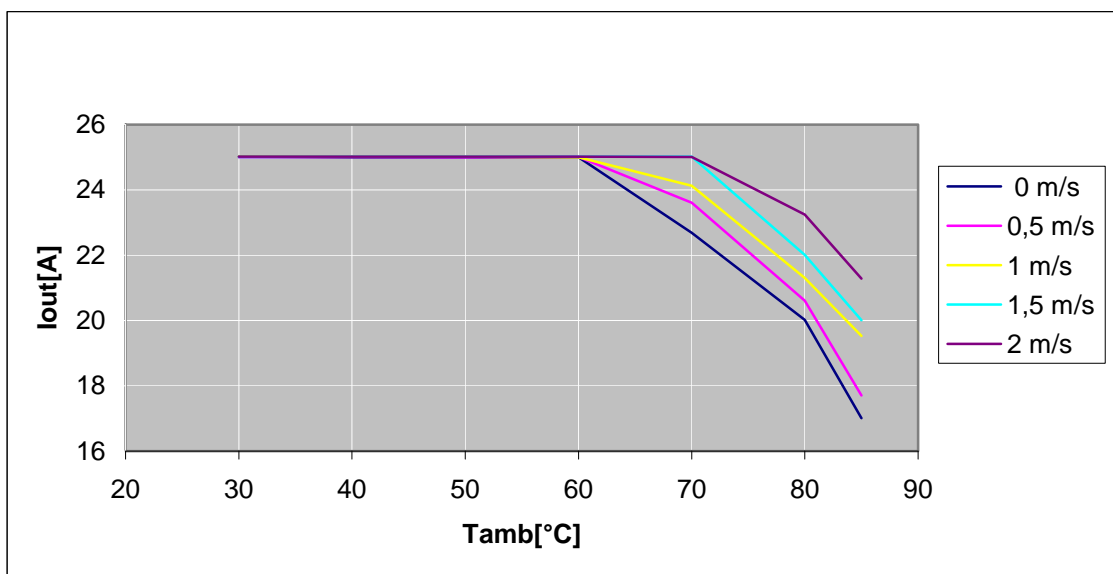
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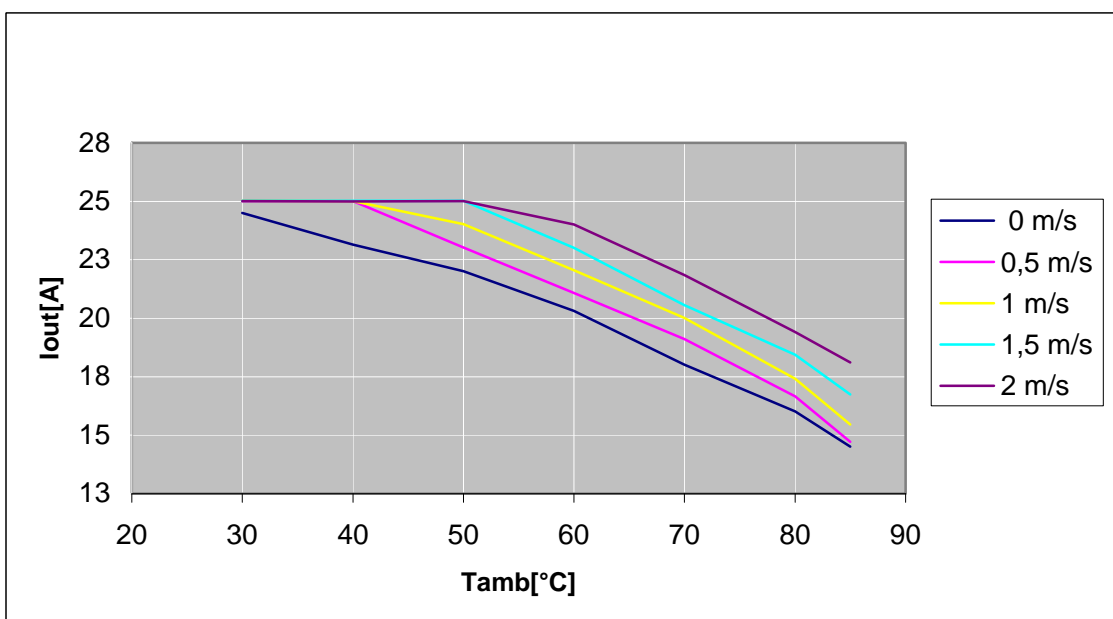
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## Output Power Derating \_ All versions

1.2V Output Current Vs Tamb (typ.)

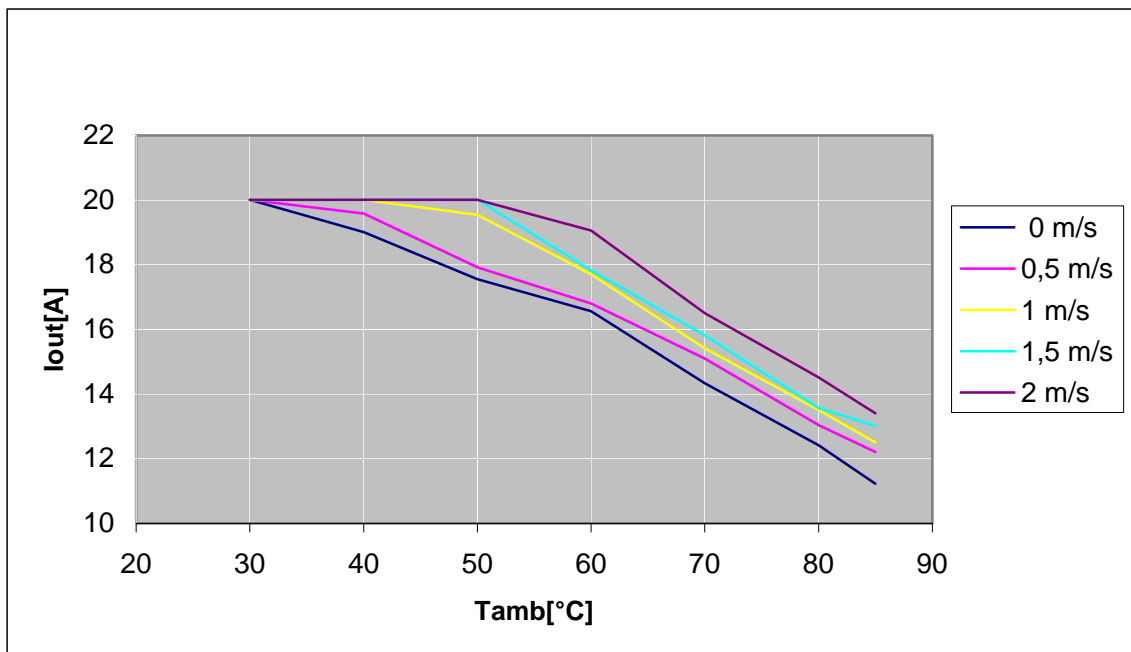


1.8V Output Current Vs Tamb (typ.)

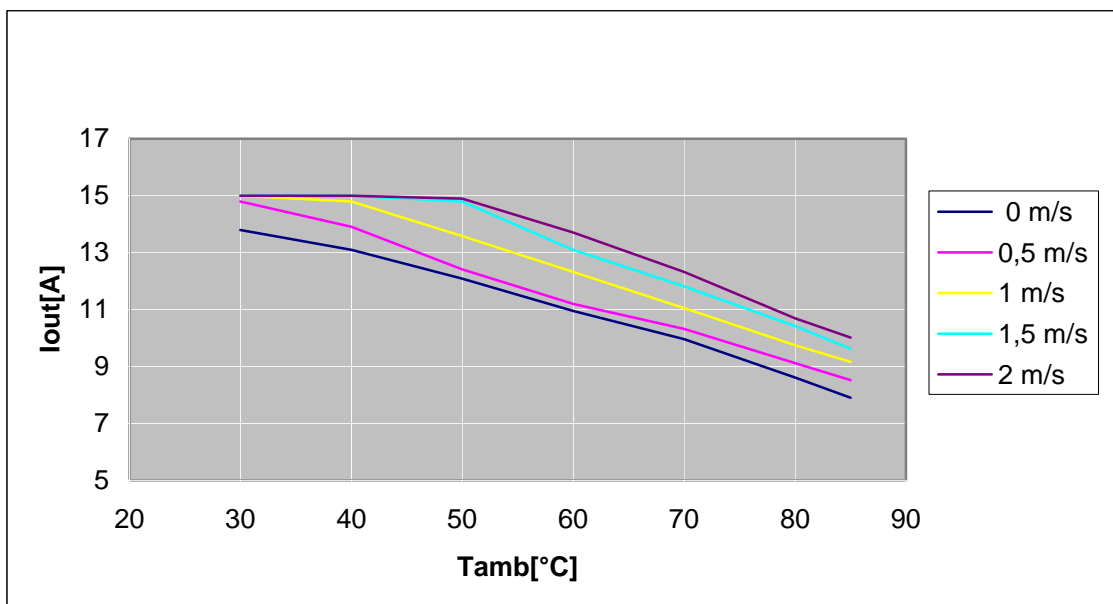


## Output Power Derating \_ All versions

2.5V Output Current Vs Tamb (typ.)

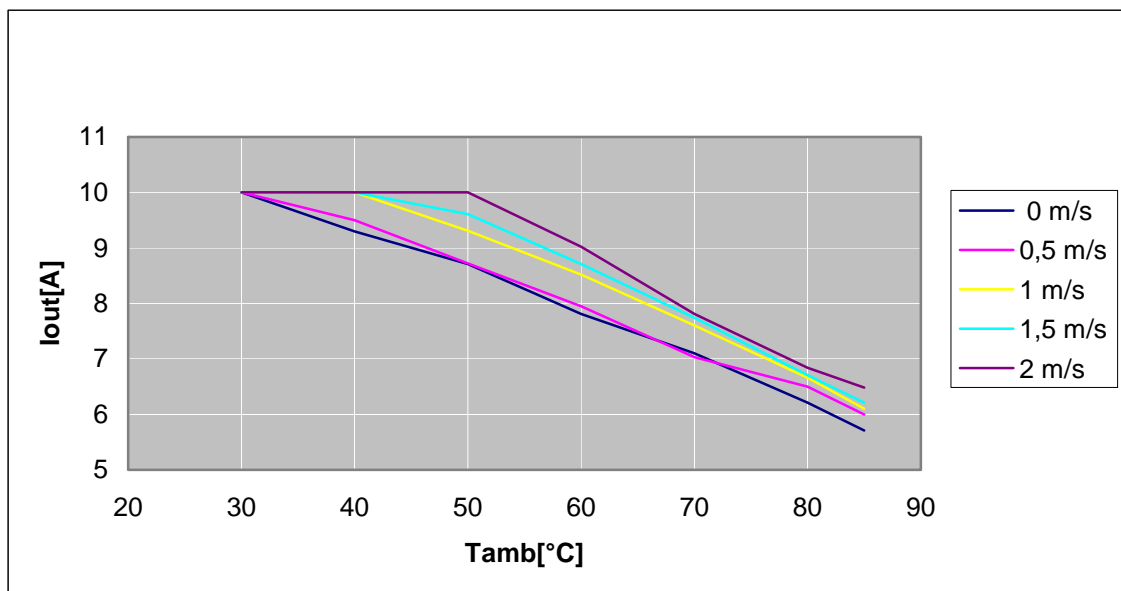


3.3V Output Current Vs Tamb (typ.)

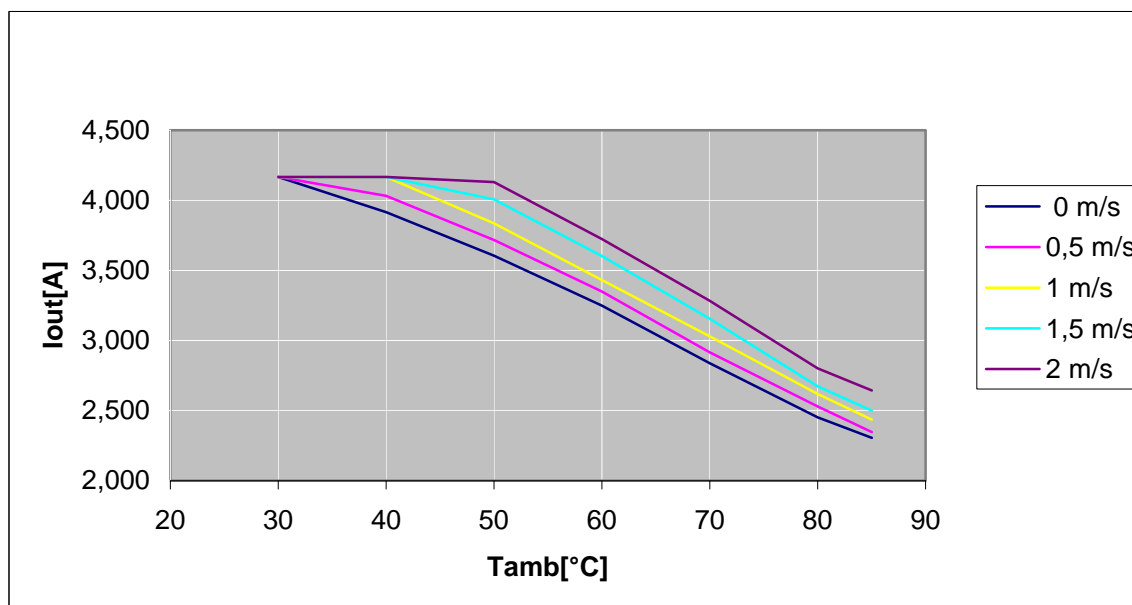


Output Power Derating \_ All versions

5V Output Current Vs Tamb (typ.)



12 V Output Current Vs Tamb (typ.)



Note: The output derating test is performed assembling the regulator in a 8 layers, 1 Oz Fr4 Board, positioned inside a wind tunnel.

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## Control Features \_ All versions

### Output Voltage Adjustment

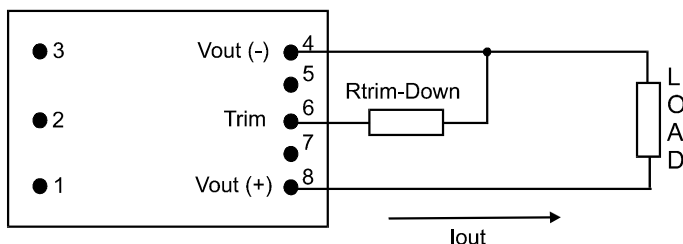
The trim input permits the user to adjust the output voltage across the sense leads up or down according to the trim range specifications.

To decrease the output voltage the user should connect a resistor between Pin6 (Trim) and Pin4 (Vout (-)). For a desired decrease of the nominal output voltage the value of the resistor should be :

$$R_{\text{trim-down}} = \left( \frac{511}{\Delta\%} \right) \cdot 10.22 \text{ (k}\Omega\text{)}$$

where

$$\Delta\% = \left( \frac{V_{\text{nominal}} - V_{\text{desired}}}{V_{\text{nominal}}} \right) \times 100\%$$

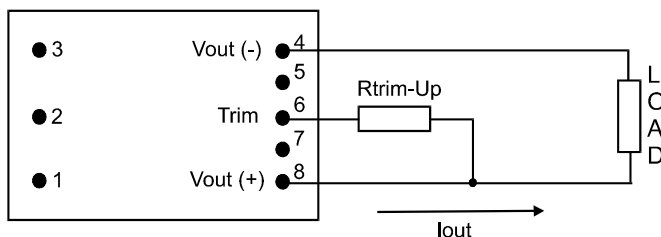


To increase the output voltage the user should connect a resistor between Pin6 (Trim) and Pin8 (Vout(+)). For a desired increase of the nominal output voltage the value of the resistor should be:

$$R_{\text{trim-up}} = \left( \frac{5.11V_{\text{OUT}}(100+\Delta\%)}{1.225\Delta\%} - \frac{511}{\Delta\%} - 10.22 \right) \text{ (k}\Omega\text{)}$$

where

$$V_{\text{OUT}} = \text{Nominal Output Voltage}$$



**Note:** The Trim feature does not affect the voltage at which the output over-voltage circuit is triggered. Trimming the output voltage too high may cause the over-voltage protection circuit to engage, particularly during transients.

It is not necessary for the user to add capacitance at the Trim pin. The node is internally bypassed to eliminate noise.

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### Control Features \_ All versions

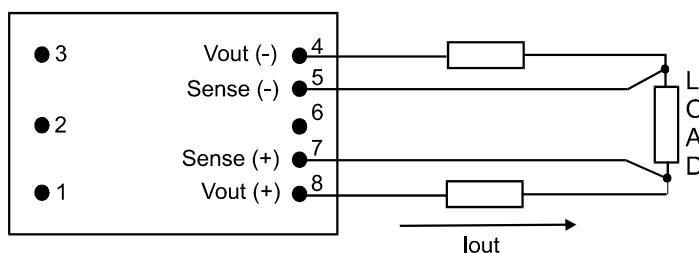
#### Remote Sense

Remote sense minimizes the effects of distribution losses by regulating the voltage at the remote sense connections. Pin 7 (Sense(+)) should be connected to Vout(+) and Pin5 (Sense(-)) should be connected to Vout(-) at the point on the board where regulation is desired.

The voltage between the remote-sense pins and the output terminals must not exceed the output voltage sense range:  $\leq 0.5V$ .

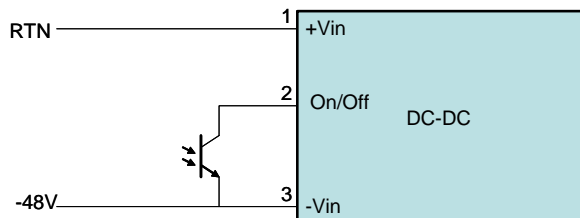
If not using the remote-sense feature to regulate the output voltage at the point of load, connect Sense(+) to Vout(+) and Sense(-) to Vout(-) at the module.

**Note:** The output over voltage protection circuit senses the voltage across the output (Pins8 and 4) to determine when it should trigger, not the voltage across the converter's sense leads (pins 7 and 5). Therefore the resistive drop on the board should be small enough so that output over voltage protection does not trigger, even during load transients.



#### Remote On/Off Control

The module is equipped with a Remote On/Off input (pin 2). The module is enabled whenever this input is connected to  $-V_{in}$ . This can be accomplished by using a transistor or opto-coupler as depicted in the schematic below.



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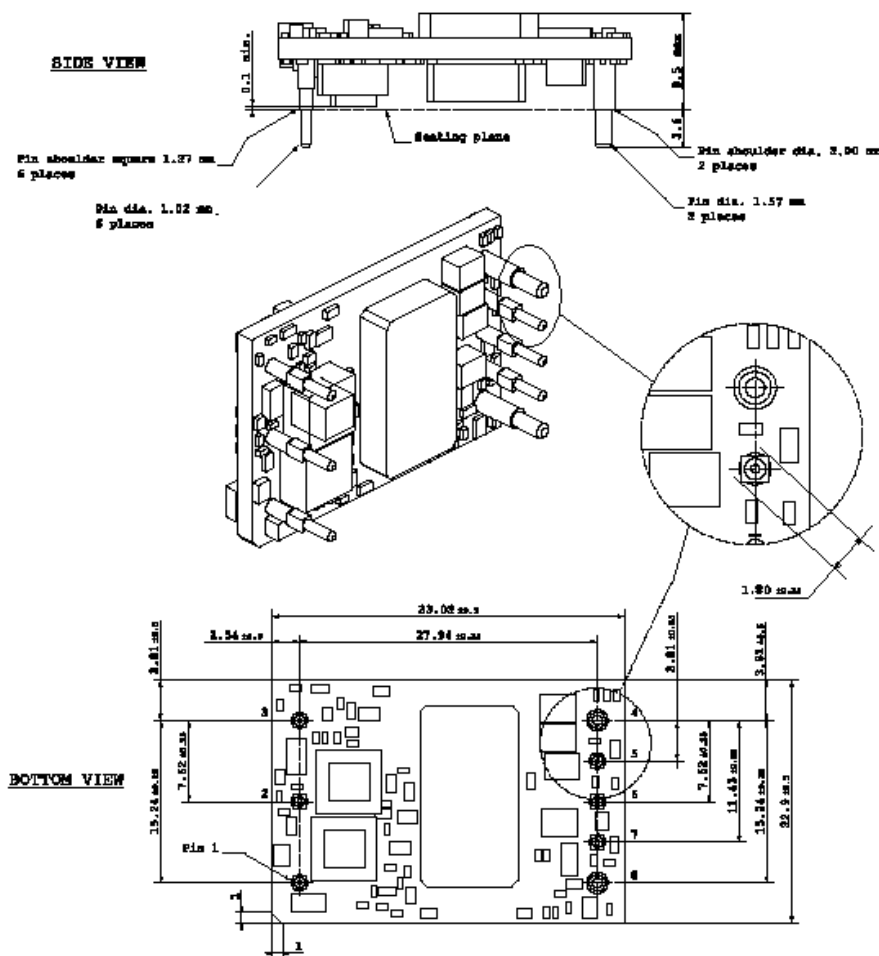
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### Physical Specification \_ All Versions

Case Through-hole module  
 Dimensions 33.0 mm x 22.9 mm x 9.50 mm = 1.30 in x 0.90 in x 0.37 in  
 Weight 15 g = 0.03 lb

#### Outline drawing



#### PIN Designation:

Pin 1	Vin (+)
Pin 2	On/Off
Pin 3	Vin (-)
Pin 4	Vout (-)
Pin 5	Sense (-)
Pin 6	Trim
Pin 7	Sense (+)
Pin 8	Vout (+)

#### PIN Dimensions:

Pins 4 and 8 are 0.062 in (1.57 mm) diameter, with 0.078 in (2 mm) diameter standoff shoulders.

Pins 1-3, 5-7 are 0.040 in (1.02 mm) diameter, with 0.071 in (1.80 mm) square diagonal standoff shoulders.

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