Technical Data Sheet

RP50-AW Series ◊ DC-DC Converter

50W ◊ 4:1 Wide Input: 9V-36VDC / 18V-75VDC

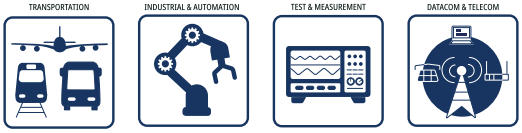
RECOM DC/DC Converter

FEATURES

- 4:1 wide input voltage range
- 2.25kVDC isolation
- Efficiency up to 93%
- Wide operating temperature range -40°C to +110°C
- Operating altitude up to 5000m
- Optional heat sink version
- 3 year warranty

Dimensions (LxWxH)	25.4 x 25.4 x 11.5mm (1.00 x 1.00 x 0.45 inch)
without heat sink:	23.3g (0.049 lbs)
Dimensions (LxWxH)	26.1 x 26.5 x 20.3mm (1.03 x 1.04 x 0.8 inch)
with heat sink:	29.45g (0.065 lbs)

APPLICATIONS



SAFETY & EMC

RoHS² compliant 10 from 10

Reach compliant

c UL us E196683

DESCRIPTION

The RP50-AW series is a high-performance 50W isolated DC/DC converter family featuring a 4:1 wide input range and up to 93% efficiency. Designed for demanding applications including transportation, industrial & automation, test & measurement, and datacom & telecom. The series offers 2.25kVDC isolation and comprehensive protection features including OVP, OLP, OTP and continuous short-circuit protection. With an operating temperature range of -40°C to +110°C, altitude capability up to 5000m, and optional heat sink versions for improved thermal performance, the RP50-AW series ensures reliable operation in harsh environments. The output voltage trimming is by ±10% for nom. V_{OUT}= 05V, 12VDC and +20/-10% for nom V_{OUT}= 15V, 24VDC. Remote ON/OFF control is available with positive or negative logic. The series meets RoHS & REACH standards.

SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	nom. Output Voltage [VDC]	Output Current max. [mA]	Efficiency typ. (1) [%]	Max. Capacitive Load (2) [µF]
RP50-2405SAW (3, 4)	9-36	05	10000	90	14400
RP50-2412SAW (3, 4)	9-36	12	4200	93	2520
RP50-2415SAW (3, 4)	9-36	15	3300	92	1630
RP50-2424SAW (3, 4)	9-36	24	2100	90.5	630
RP50-2412DAW (3, 4)	9-36	±12	±2100	90.5	±1260
RP50-2415DAW (3, 4)	9-36	±15	±1680	90.5	±816
RP50-2424DAW (3, 4)	9-36	±24	±1050	90.5	±330

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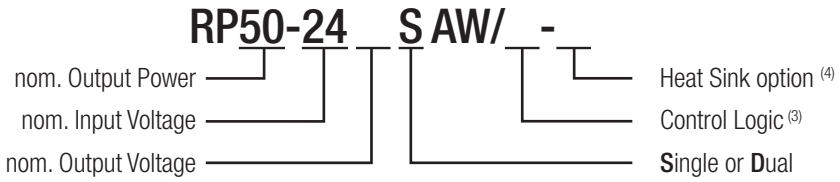
SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	nom. Output Voltage [VDC]	Output Current max. [mA]	Efficiency typ. (1) [%]	Max. Capacitive Load (2) [µF]
RP50-4805SAW (3, 4)	18-75	05	10000	90	14400
RP50-4812SAW (3, 4)	18-75	12	4200	92	2520
RP50-4815SAW (3, 4)	18-75	15	3300	92.5	1630
RP50-4824SAW (3, 4)	18-75	24	2100	90.5	630
RP50-4812DAW (3, 4)	18-75	±12	±2100	90.5	±1260
RP50-4815DAW (3, 4)	18-75	±15	±1680	90.5	±816
RP50-4824DAW (3, 4)	18-75	±24	±1050	91	±330

Note1: Efficiency is tested at nominal input and full load at +25°C ambient
Note2: Max. Cap Load is tested at nominal input and full resistive load

MODEL NUMBERING



Note3: add suffix "/N" for negative logic
add suffix "/P" for positive logic
Note4: add to suffix "/N" for negative logic "-HC" for with heat sink = "/N-HC"
add to suffix "/P" for positive logic "-HC" for with heat sink = "/P-HC"

BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition			Min.	Typ.	Max.
Internal Input Filter						Pi-Type
Input Voltage Range	nom. V_{IN}= 24VDC			9VDC	24VDC	36VDC
	nom. V_{IN}= 48VDC			18VDC	48VDC	75VDC
Input Surge Voltage	nom. V_{IN}= 24VDC	1 second max.				50VDC
	nom. V_{IN}= 48VDC					100VDC
Under Voltage Lockout (UVLO)	nom. V_{IN}= 24VDC	Start-up Voltage	DC-DC ON			9VDC
		Shutdown Voltage	DC-DC OFF	7.5VDC	8VDC	8.8VDC
	nom. V_{IN}= 48VDC	Start-up Voltage	DC-DC ON			18VDC
		Shutdown Voltage	DC-DC OFF	15.5VDC	16VDC	17.5VDC
Over Voltage Lockout (OVLO)	nom. V_{OUT}= 5VDC				6.5VDC	
	nom. V_{OUT}= 12VDC				15VDC	
	nom. V_{OUT}= 15VDC				20VDC	
	nom. V_{OUT}= 24VDC				30VDC	
Output Voltage Trimming (single outputs only)	refer to **„Output Voltage Trimming“**	nom. V_{OUT}= 15V, 24VDC		-10%		+20%
		all others		-10%		+10%
Start-up Time	Power-up				30ms	60ms
	Remote ON/OFF				30ms	60ms
ON/OFF CTRL (5)	refer to **„On/off ctrl“**	Negative Logic (standard version)	DC/DC ON	Short or 0VDC - 1.2VDC		
			DC/DC OFF	Open or 3VDC - 12VDC		
		Positive Logic	DC/DC ON	Open or 3VDC - 12VDC		
			DC/DC OFF	Short or 0VDC - 1.2VDC		
Input Current of CTRL pin				-0.5mA		+1.0mA
Standby Current	remote OFF				3mA	

Note5: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin

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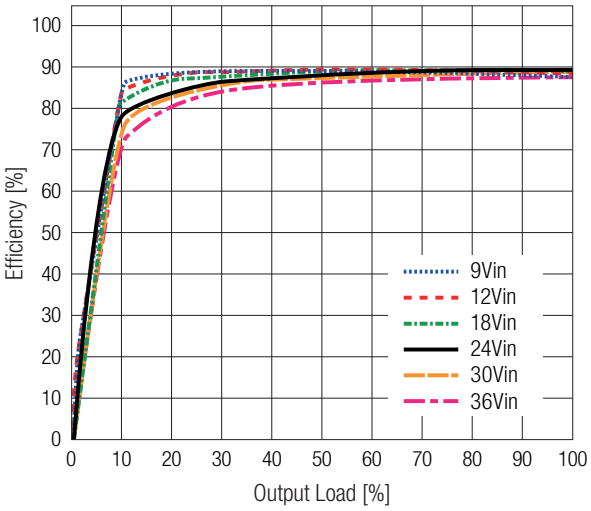
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)					
Parameter	**Condition**		**Min.**	**Typ.**	**Max.**
Internal Operating Frequency	nom. V_{OUT}= 24VDC dual types		255kHz	300kHz	345kHz
	all others		230kHz	270kHz	310kHz
Output Ripple and Noise [6]	measured at 20MHz BW and 22µF/25V X7R MLCC	nom. V_{OUT}= 5VDC single types		75mVp-p	
		nom. V_{OUT}= 12V, 15VDC single types		100mVp-p	
	measured at 20MHz BW and 4.7µF/50V X7R MLCC	nom. V_{OUT}= 24VDC single types		150mVp-p	
		nom. V_{OUT}= 12V, 15VDC dual types		100mVp-p	
		nom. V_{OUT}= 24VDC dual types		150mVp-p	

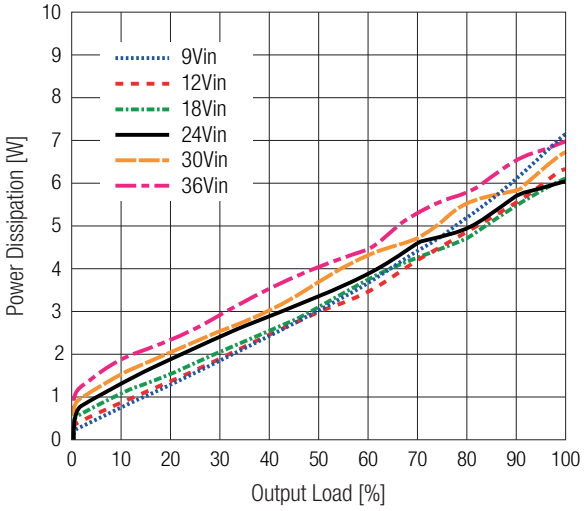
Note6: The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, its specifications, wires, PCB tracks, distances, etc.)

RP50-2424SAW/N

Efficiency vs. Output Load

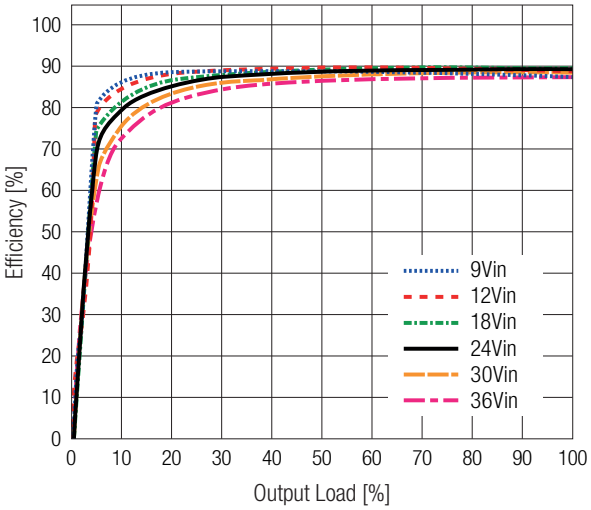


Power Dissipation vs. Output Load

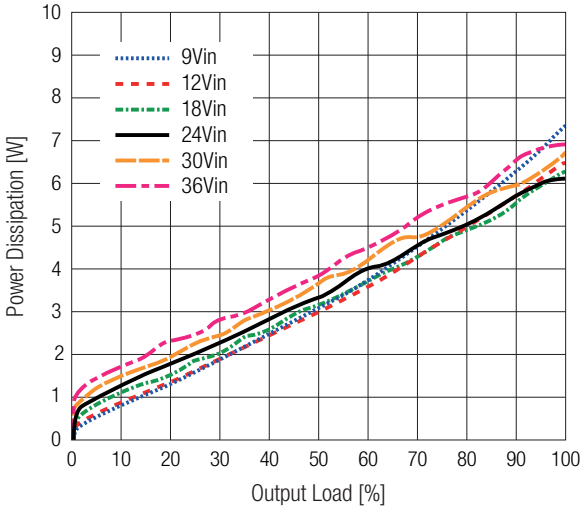


RP50-2412DAW/N

Efficiency vs. Output Load



Power Dissipation vs. Output Load



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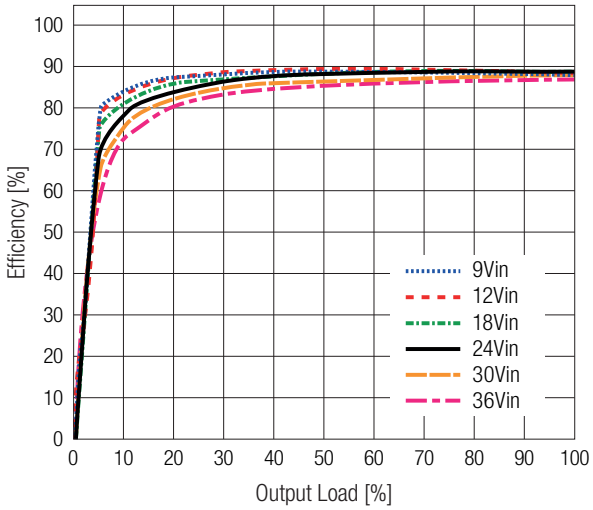
RECOM DC/DC Converter

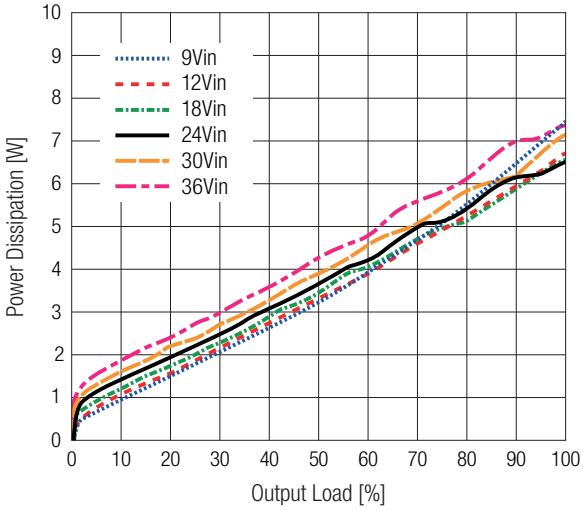
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

RP50-2415DAW/N

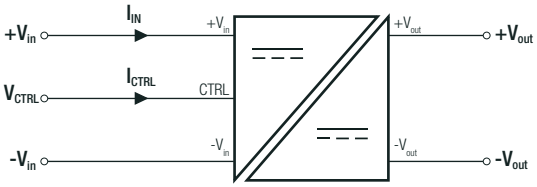
Efficiency vs. Output Load



Power Dissipation vs. Output Load



ON/OFF CTRL

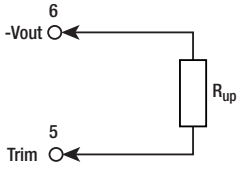


Positive Logic	DC-DC ON	Open or 3VDC - 12VDC
	DC-DC OFF	Short or 0VDC - 1.2VDC
Negative Logic	DC-DC ON	Short or 0VDC - 1.2VDC
	DC-DC OFF	Open or 3VDC - 12VDC

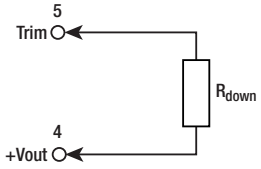
OUTPUT VOLTAGE TRIMMING

It allows the user to increase or decrease the output voltage of the module. This is accomplished by connecting an external resistor between the Trim pin and either the +Vout or -Vout pins. When a resistor is connected between the Trim and -Vout pin, the output voltage increases. When a resistor is connected between the Trim and +Vout pin, the output voltage decreases. The external trim resistor should have a minimum power rating of 1/16 W. The trim resistor values listed in the tables below correspond to standard E96 values; therefore, the actual output voltage may slightly deviate from the nominal value.

Trim up



Trim down



RP50-xx05SAW

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
$Vout_{set}$ =	5.05	5.1	5.15	5.2	5.25	5.3	5.35	5.4	5.45	5.5	[VDC]
R_{up} (E96) ≈	255k	127k	82k5	61k9	48k7	40k2	34k8	30k1	26k1	23k7	[Ω]

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	[%]
$Vout_{set}$ =	4.95	4.9	4.85	4.8	4.75	4.7	4.65	4.6	4.55	4.5	[VDC]
R_{down} (E96) ≈	249k	121k	78k7	56k2	44k2	35k7	29k4	24k9	21k	18k2	[Ω]

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OUTPUT VOLTAGE TRIMMING

RP50-xx12SAW

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
$Vout_{set}$ =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.2	[VDC]
R_{up} (E96) ≈	205k	100k	64k9	47k5	36k5	29k4	24k9	21k	17k9	15k8	[Ω]

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	[%]
$Vout_{set}$ =	11.88	11.76	11.64	11.52	11.4	11.28	11.16	11.04	10.92	10.8	[VDC]
R_{down} (E96) ≈	768k	383k	249k	182k	143k	118k	97k6	84k5	73k2	63k4	[Ω]

RP50-xx15SAW

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
$Vout_{set}$ =	15.15	15.3	15.45	15.6	15.75	15.9	16.05	16.2	16.35	16.5	[VDC]
R_{up} (E96) ≈	162k	78k7	49k9	36k5	28k	22k6	18k7	15k8	13k3	11k5	[Ω]

Trim up	11	12	13	14	15	16	17	18	19	20	[%]
$Vout_{set}$ =	16.65	16.8	16.95	17.1	17.25	17.4	17.55	17.7	17.85	18.0	[VDC]
R_{up} (E96) ≈	10k	8k87	7k68	6k81	6k04	5k36	4k64	4k12	3k65	3k24	[Ω]

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	[%]
$Vout_{set}$ =	14.85	14.7	14.55	14.4	14.25	14.1	13.95	13.8	13.65	13.5	[VDC]
R_{down} (E96) ≈	825k	402k	261k	191k	150k	124k	105k	88k7	76k8	68k1	[Ω]

RP50-xx24SAW

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
$Vout_{set}$ =	24.24	24.48	24.72	24.96	25.2	25.44	25.68	25.92	26.16	26.4	[VDC]
R_{up} (E96) ≈	576k	280k	182k	133k	105k	84k5	69k8	60k4	52k3	45k3	[Ω]

Trim up	11	12	13	14	15	16	17	18	19	20	[%]
$Vout_{set}$ =	26.64	26.88	27.12	27.36	27.6	27.84	28.08	28.32	28.56	28.8	[VDC]
R_{up} (E96) ≈	40k2	35k7	31k6	28k7	26k1	23k7	21k5	19k6	17k9	16k2	[Ω]

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	[%]
$Vout_{set}$ =	23.76	23.52	23.28	23.04	22.8	22.56	22.32	22.08	21.84	21.6	[VDC]
R_{down} (E96) ≈	4990k	2430k	1620k	1180k	931k	768k	649k	562k	487k	432k	[Ω]

REGULATIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition		Value
Output Accuracy			±1.0% max.
Line Regulation	low line to high line, full load	single output	±0.2% max.
		dual output	±0.5% max.
Load Regulation	0% to 100% load	single output	±0.2% max.
		dual output	±1.0% max.
	10% to 90% load	single output	±0.1% max.
		dual output	±0.8% max.
Cross Regulation	asymmetrical load 25%/100% load	dual output only	±5.0% max.
Transient Response	25% load step change		250µs typ.

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50W ◊ 4:1 Wide Input: 9V-36VDC / 18V-75VDC

RECOM DC/DC Converter

PROTECTIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition		Value
Short Circuit Protection (SCP)	below 100mΩ		continuous, automatic recovery
Over Voltage Protection (OVP)	zener diode clamp	nom. V_{OUT}= 5VDC	6.5VDC typ.
		nom. V_{OUT}= 12VDC	15VDC typ.
		nom. V_{OUT}= 15VDC	20VDC typ.
		nom. V_{OUT}= 24VDC	30VDC typ.
Over Load Protection (OLP)	% of rated I_{OUT}		150% typ.
Over Temperature Protection (OTP)	internal temperature sensor		116°C typ.
Isolation Voltage (7)	I/P to O/P	1 minute	2.25kVDC
	I/P (O/P) to case		1.6kVDC
Isolation Resistance	V_{ISO}= 500VDC		1GΩ min.
Isolation Capacitance			2000pF max.
Insulation Grade			functional

Note7: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

Note8: Refer to local safety regulations if input over-current protection is also required.

Note9: This power module is not internally fused. An input line fuse must always be used.
Recom suggests:
For nom. V_{IN}= 24VDC, fuse rating 10A, fast acting type
For nom. V_{IN}= 48VDC, fuse rating 5A, slow blow type

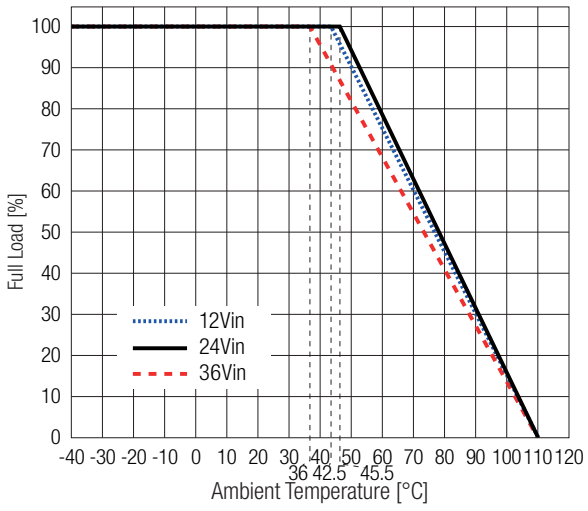
ENVIRONMENTAL (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition			Value
Operating Temperature Range	refer to **„Derating Graph“**			-40°C to +110°C
Maximum Case Temperature				+110°C
Temperature Coefficient				±0.02%/K
Thermal Impedance	@ natural convection	with 3"x3" evaluation board	without heat sink	9.8°K/W typ.
			with heat sink	7.9°K/W typ.
Operating Altitude				5000m
Operating Humidity				5%-95% RH
Pollution Degree				PD2
Shock				according to MIL-STD-810F
Thermal Shock				according to MIL-STD-810F
Vibration				according to MIL-STD-810F
MTBF	according to MIL-HDBK-217F, G.B.	@ full load	T_{AMB}= +25°C	999.5 x 10^3 hours

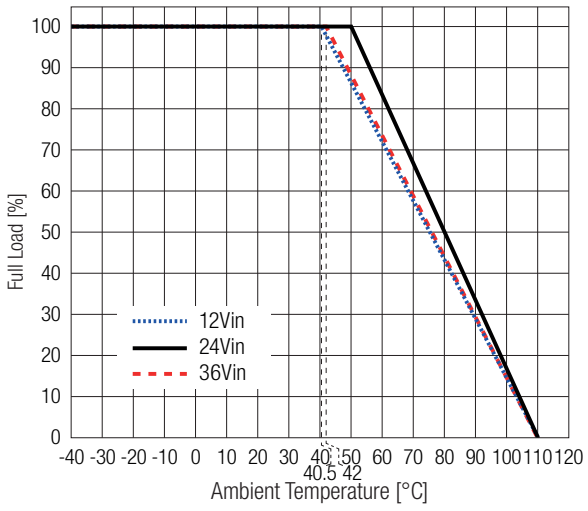
Derating Graph

(Mount on 3"x3" evaluation board**)**

RP50-2424SAW



RP50-2412DAW



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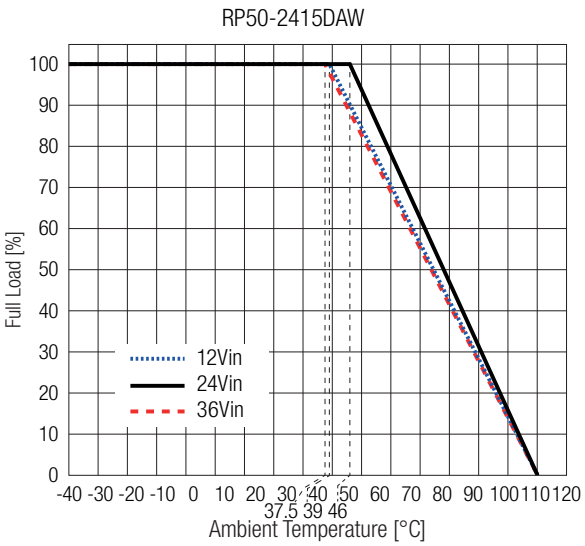
ENVIRONMENTAL (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Derating Graph
(Mount on 3"x3" evaluation board)



SAFETY AND CERTIFICATION

Certificate Type (Safety)	Report / File Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements		UL62368-1:2014 2nd Edition CAN/CSA-C22.2 No. 62368-1-14 2nd Edition
RoHS2		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external components	EN55032, Class A, Class B
Electromagnetic compatibility of multimedia equipment - Immunity requirements		EN55035
Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	Air: ±8kV, Contact: ±6kV	EN61000-4-2, Criteria A
ESD Electrostatic discharge immunity test	20V/m	EN61000-4-3, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	DC Power Port: ±2kV	EN61000-4-4, Criteria A
Fast Transient and Burst Immunity	DC Power Port: ±2kV	EN61000-4-5, Criteria A
Surge Immunity	DC Power Port: 10Vrm	EN61000-4-6, Criteria A
Power Magnetic Field Immunity	100A/m continuous, 1000A/m 1 second	EN61000-4-8, Criteria A

Note10: The power module operates to specification without external components, assuming a low-impedance source with stable voltage regulation. Highly inductive input sources may impact stability—add an external filter capacitor for real voltage sources.

DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case	copper
	potting	silicone, (UL94 V-0)
	baseplate	FR4 PCB
Dimension (LxWxH)	without heat sink	25.4 x 25.4 x 11.5mm 1.00 x 1.00 x 0.45 inch
	with heat sink ("-HC")	26.1 x 26.5 x 20.3mm 1.03 x 1.04 x 0.8 inch
Weight	without heat sink	23.3g typ 0.049 lbs
	with heat sink ("-HC")	29.45g typ 0.065 lbs

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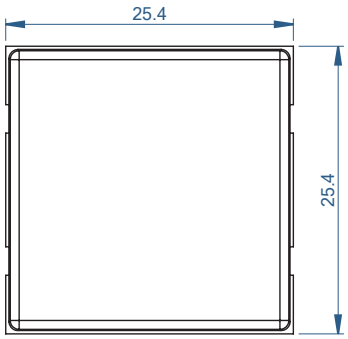
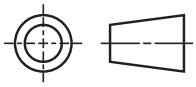
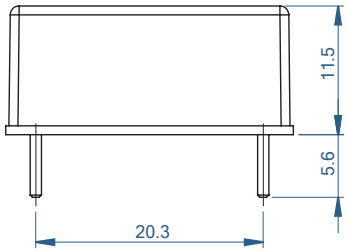
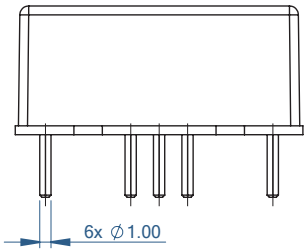
DIMENSION & PHYSICAL CHARACTERISTICS

Dimension Drawing (mm)



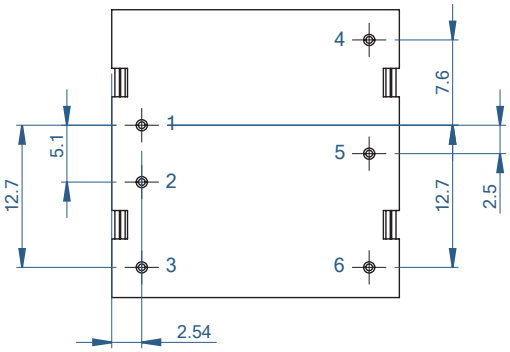




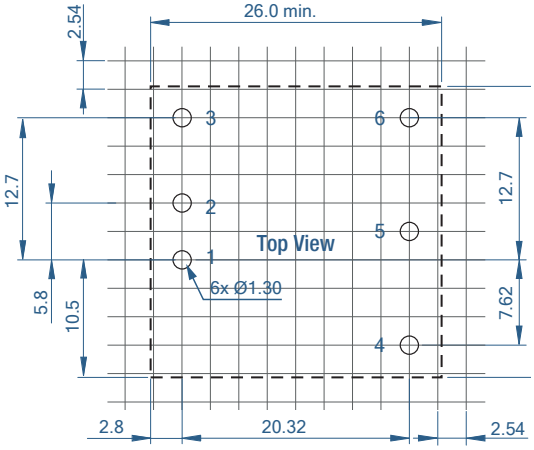


Pinning Information

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	+Vout	+Vout
5	TRIM	COM
6	-Vout	-Vout



Recommended Footprint Detail



Tolerances:
x.x= ±0.5mm
x.xx= ±0.25mm

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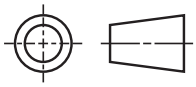
RP50-AW Series ◊ DC-DC Converter

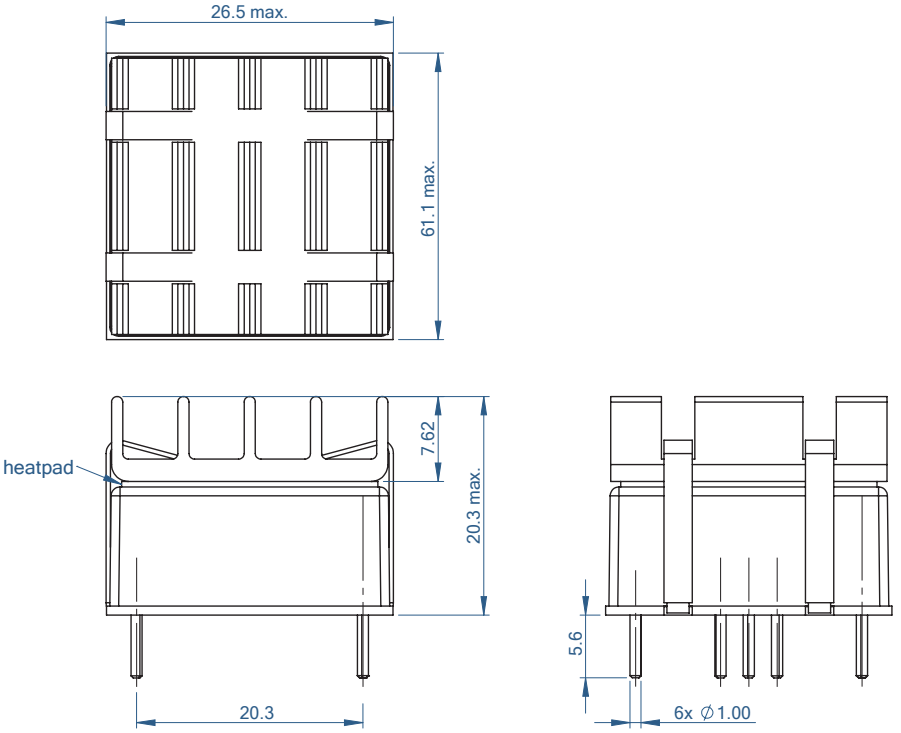
50W ◊ 4:1 Wide Input: 9V-36VDC / 18V-75VDC

RECOM DC/DC Converter

DIMENSION & PHYSICAL CHARACTERISTICS

Dimension Drawing (mm)
Heat sink version "/-HC"

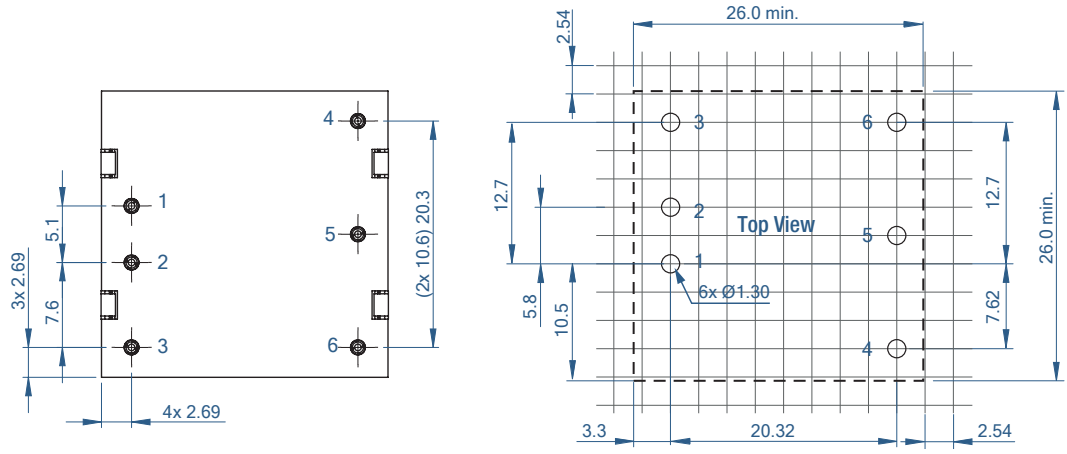




Pinning Information

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	+Vout	+Vout
5	TRIM	COM
6	-Vout	-Vout

Recommended Footprint Detail



Tolerances:
x.x= ±0.5mm
x.xx= ±0.25mm

PACKAGING INFORMATION

Parameter	Type		Value
Packaging Dimension (LxWxH)	tube	without heat sink	257.0 x 28.5 x 21.0mm
	tray	with heat sink ("-HC")	306.0 x 223.0 x 35.0mm
Packaging Quantity	tube	without heat sink	8pcs
	tray	with heat sink ("-HC")	35pcs
Storage Temperature Range			-55°C to +125°C
Storage Humidity	non-condensing		5% - 95% RH

The product information and specifications may be subject to changes even without prior written notice.The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

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