### **Features**

### ICE Technology\*

- Up to 97°C Ambient, no derating
- 120°C Maximum Case Temperature
- -45°C Minimum OperatingTemperature
- Built-in FCC/EN55022 Class B Filter
- 4:1 Wide Input Voltage Range
- Six Sided Shielded Enclosure
- Compact 40.6x25.4x11.7mm Package
- Efficiency to >89%
- **2kVDC Isolation**
- Fully Protected
- Low Quiescent Current

### **Description**

The RPP20-W series 4:1 input range DC/DC converters are ideal for high end industrial applications and COTS Military applications where a high ambient operating temperature converter is required. Although the case size is compact, the converter contains a built-in EN55022 Class B / FCC Level B EMC filter without the need for any external components.

#### Selection Guide 24V and 48V 4:1 Input Types

Part Number	Input Range VDC	Output Voltage VDC	Output Current mA	Input <sup>(1)</sup> Current mA	Efficiency <sup>(2)</sup>	Max <sup>(3)</sup> Operating Temp
RPP20-243.3SW	9-36	3.3	6000	59/955	87.2%	93°C
RPP20-2405SW	9-36	5	4000	65/946	88.1%	95°C
RPP20-2412SW	9-36	12	1666	23/946	88.1%	95°C
RPP20-2415SW	9-36	15	1333	25/931	89.5%	97°C
RPP20-483.3SW	18-75	3.3	6000	28/465	89.6%	97°C
RPP20-4805SW	18-75	5	4000	33/465	89.6%	97°C
RPP20-4812SW	18-75	12	1666	13/470	88.6%	96°C
RPP20-4815SW	18-75	15	1333	12/466	89.3%	97°C
RPP20-2405DW	9-36	±5	±2000	23/946	88.1%	95°C
RPP20-2412DW	9-36	±12	±833	28/930	89.6%	97°C
RPP20-2415DW	9-36	±15	±666	24/946	88.0%	95°C
RPP20-4805DW	18-75	±5	±2000	13/470	88.6%	96°C
RPP20-4812DW	18-75	±12	±833	16/472	88.2%	95°C
RPP20-4815DW	18-75	±15	±666	13/466	89.4%	97°C





### **20 Watt** Single & **Dual Output**

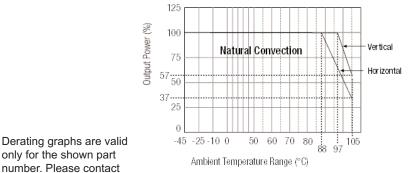


**UL-60950-1** Pending



#### **Derating Graph (Ambient Temperature)**

#### RPP20-2405SW



\* ICE Technology

ICE (Innovation in Converter Excellence) uses state-of-the-art techniques to minimise internal power dissipation and to increase the internal temperature limits to extend the ambient operating temperature range to the maximum. Refer to end of section for more details.

Technical Support for more information: info@recom-development.at

**Refer to Application Notes** 

only for the shown part

number. Please contact

## **POWERLINE+** DC/DC-Converter

### RPP20-S\_DW Series

**Specifications** (typical at nominal input and 25°C unless otherwise noted)

244 input   0.0 C.0 C (M (min.)   8.0 M)   17.5 M)   17.5 M)   17.5 M (mut.)   17.5 M (mut.	Input Voltage Range	24V nominal input	9-36VDC
May   Imput   Imput   May   Imput		48V nominal input	18-75VDC
1898   1900	Under Voltage Lockout		8.5VDC
DC-DC OFF (max )			
Pour Voltage Variation dw/dt (Complies with ETS300 132 part 4.4)   50/ms mm			17VDC
Age   Page   P	Input Filter		Common Mode EMC Filter
A8V Input   100V0   100V1	Input Voltage Variation dv/dt (Complies with ETS300 132 part 4.4)		5V/ms max
Input Reflected Ripple   nominal Vin and full load   20mAp-   Start Up Time   nominal Vin and constant resistor load   2ms typ., 5ms max   Remote ON/OFF (s)   DC-DC ON   Open or 3.0 v < v < 5.5     DC-DC OFF   Short or Ov < v < v < 7.5     Remote OFF input current   Nominal input   2ms typ., 5ms max   Durput Voltage Accuracy   Solk Load and nominal Vin   ±1.5     Voltage Adjustability   Single Output only   ±55     Voltage Adjustability   Single Output only   ±65     Voltage Adjustability   Single Inferior of Single Inferior Output sonly   ±65     Voltage Adjustability   50   50     Voltage Adjustability   50   50   50     Voltage Adjustability   50   50     Voltage Adjustability   50   50   50   50     Vo	Input Surge Voltage (100 ms max.)	24V Input	50VDC
Start Up Time		48V Input	100VDC
DC-DC ON	Input Reflected Ripple	nominal Vin and full load	20mAp-p
DC-DC OFF   Short or OV < Vr < 1.2	Start Up Time	nominal Vin and constant resistor load	2ms typ., 5ms max.
Remote OFF input current         Nominal input         2mA by           Dutput Power         20W max           Output Power         50% Load and nominal Vin         ±1.5f           Voltage Adjustability         Single Output only         ±1.5f           William Marchand         10% line, high line at full load         ±0.3f           Load Regulation         10% to 100% full load         ±0.5f           Cross Regulation (10% <> 100% Load)         Dual Outputs only         3% by./ 5% max           Ripople and Noise (20MHz bandwith limited)         3.3V         100m/by- pby           Remasured with 1µF capacitor across outputs)         40 thers         ±0.04%/°C max           Transient Response         25% load step change         800p           Over Load Protection         Current limit, automatic recover           Output Crout Protection         Current limit, automatic recover           Output Crout Protection (refer to block diagram in Application Notes)         Converter shutdown if Vout > Vout nominal + 20 cm           Solation Voltage Protection (refer to block diagram in Application Notes)         Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secons           Operating Frequency         260kHz ± 40kH           Operating Frequency         45°C to +05°C (without derating -45°C to +105°C (without derating -45°C to +105°C (without derating -45°C to +105°C (without derating -45	Remote ON/OFF (4)	DC-DC ON	Open or 3.0V < Vr < 5.5V
Output Power         20W max           Output Voltage Accuracy         50% Load and nominal Vin         ± 1.50           Voltage Adjustability         Single Output only         ± 56           Minimum Load         10% Inc. Regulation         10% Inc. Regulation         10% Inc. Regulation         ± 0.31           Load Regulation         10% to 100% full load         ± 0.55         50.55         50.56		DC-DC OFF	Short or $0V < Vr < 1.2V$
Output Voltage Accuracy         50% Load and nominal Vin         ±1.5°           Voltage Adjustability         Single Output only         ±55°           Minimum Load         0°           Line Regulation         low line, high line at full load         ±0.3°           Load Regulation         10% to 100% full load         ±0.5°           Cross Regulation (10% <> 100% Load)         Dual Outputs only         3% typ. 5% max           Ripple and Noise (20MHz bandwith limited)         3.3V         100mVp-p by           Imeasured with III-dr capacitor across outputs)         All others         40mV-75mVp-p by           Imeasured with III-dr capacitor across outputs)         All others         40mV-75mVp-p by           Imeasured with III-dr capacitor across outputs)         All others         40mV-75mVp-p by           Imeasured with III-dr capacitor across outputs         40mV-75mVp-p by         600p           Over Load Protection         % of full load at nominal Vin         120% by           Short Circuit Protection         Current limit, automatic recover           Output Devr Voltage Protection (refer to block diagram in Application Notes)         Converter shutdown if Voot > Vout nominal + 20°           Solation Capacitance (refer to block diagram in Application Notes)         1500pF max           Operating Temperature Range         Ambient, Free Convection	Remote OFF input current	Nominal input	2mA typ.
Voltage Adjustability Single Output only 5.5  Minimum Load	Output Power		20W max.
Minimum Load    Inimum Load	Output Voltage Accuracy	50% Load and nominal Vin	±1.5%
Line Regulation low line, high line at full load £0.31 Load Regulation 10% to 100% full load £0.55 Cross Regulation (10% <> 100% Load) Dual Outputs only 3% hyp. / 5% max Ripple and Noise (20MHz bandwith limited) 3.3V 100mVp-p by (measured with 1µF capacitor across outputs) All others 40mV-75mVp-p by Temperature Coefficient £0.04%°C max Transient Response 25% load step change 800µ Over Load Protection where the step of full load at nominal Vin 120% by Short Circuit Protection Current limit, automatic recover Output Over Voltage Protection (refer to block diagram in Application Notes) Converter shutdown if Vout > Vout nominal + 205 Isolation Voltage Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 second Isolation Resistance Response Protection (refer to block diagram in Application Notes) 1500pF max Operating Frequency 260kHz ± 40kH Operating Temperature Range Ambient, Free Convection 45°C to +97°C (without derating Maximum Case Temperature Range 7.55°C to +125° Cover Temperature Protection (refer to block diagram in Application Notes) 11.5°C/Wa Relative Humidity 5% to 95% R Relative Humidity 5% to 95% R Case Material (**) Weight 500 constraints (**) Weight 500 constraints (**)  Internal Impedance 10.5°C (**)  Vertical 7.5°C/Wa Relative Humidity 5% to 95% R Case Material (**)  Aluminium Potting Material 5% Silicone (UL94-Vic Weight)	Voltage Adjustability	Single Output only	±5%
Load Regulation 10% to 100% full load ±0.5° Cross Regulation (10% <> 100% Load) Dual Outputs only 3% byp. / 5% max. Ripple and Noise (20MHz bandwith limited) 3.3V 100mVp-p byr (measured with 1µF capacitor across outputs) All others 40mV-75mVp-p byr Temperature Coefficient ±0.04%/°C max. Transient Response 25% load step change 800µ Over Load Protection % of full load at nominal Vin 120% byr Short Circuit Protection Current limit, automatic recover Output Over Voltage Protection (refer to block diagram in Application Notes) Converter shutdown if Vout > Vout nominal + 20% solation Voltage Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Solation Resistance 100mQ minute, Flash tested at 2000VDC/1 secon Solation Resistance (refer to block diagram in Application Notes) 1500pF max. Operating Frequency Ambient, Free Convection 45°C to +97°C (without derating 45°C to +95°C to +125°C (without derating 45°C to +95°C to +95°	Minimum Load		0%
Cross Regulation (10% <> 100% Load)  Dual Outputs only 33 kyp. 75% max. Ripple and Noise (20MHz bandwith limited) 3.3V 100mVp-p by (measured with 1µF capacitor across outputs)  All others  40mV-75mVp-p by Temperature Coefficient  Each Output Coefficient  Each Output Coefficient  Each Output Coefficient  Each Output Over Voltage Protection  Word full load at nominal Vin 120% by Short Circuit Protection  Current limit, automatic recover Output Over Voltage Protection (refer to block diagram in Application Notes)  Solation Voltage  Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Solation Resistance  Solation Resistance  Floor Each Operating Frequency  Ambient, Free Convection  Ambient, Free Convection  Ambient, Free Convection  Assolation Resistance  Each Over Temperature Range  Ambient, Free Convection  Assolation Resistance  Floor Emperature Range  Ambient, Free Convection  Assolation Resistance  Floor Engerature Range  Floor Engeratur	Line Regulation	low line, high line at full load	±0.3%
Ripple and Noise (20MHz bandwith limited) (measured with 1μF capacitor across outputs) All others	Load Regulation	10% to 100% full load	±0.5%
All others       40mV-75mVp-p by Temperature Coefficient       ±0.04%/°C max         Transient Response       25% load step change       800μ         Over Load Protection       % of full load at nominal Vin       120% by 5         Short Circuit Protection       Current limit, automatic recover         Output Over Voltage Protection (refer to block diagram in Application Notes)       Converter shutdown if Vout > Vout nominal + 200         Isolation Voltage       Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon         Isolation Resistance       10MΩ mir         Isolation Capacitance (refer to block diagram in Application Notes)       1500pF max         Operating Frequency       260kHz ± 40kH         Operating Temperature Range       Ambient, Free Convection       -45°C to +97°C (without derating 45°C to +105°C (with deratin	Cross Regulation (10% <> 100% Load)	Dual Outputs only	3% typ. / 5% max.
Temperature Coefficient ±0.04%°C mar. Transient Response 25% load step change 800µ. Over Load Protection % of full load at nominal Vin 120% by Short Circuit Protection % of full load at nominal Vin 120% by Short Circuit Protection Current limit, automatic recover Output Over Voltage Protection (refer to block diagram in Application Notes) Converter shutdown if Vout > Vout nominal + 20% skolation Voltage Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Isolation Resistance (refer to block diagram in Application Notes) 1500pF mar. Operating Frequency 260kHz ± 40kHz Operating Temperature Range Ambient, Free Convection -45°C to +97°C (with derating Maximum Case Temperature Range +120° Storage Temperature Range -55°C to +125° Over Temperature Range Vertical 7.5°C Wa (Natural convection) 11.5°C Wa Relative Current Imit (Porting Material) 5% to 95% Relative Humidity 5% indexed to 95% Relative Humidity 5% indexed to 95% Relative Humidity 5% to 95% Relative Humidity	Ripple and Noise (20MHz bandwith limited)	3.3V	100mVp-p typ.
Transient Response 25% load step change 800u Over Load Protection % of full load at nominal Vin 120% by Short Circuit Protection Current limit, automatic recover Output Over Voltage Protection (refer to block diagram in Application Notes) Converter shutdown if Vout > Vout nominal + 20% Isolation Voltage Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Isolation Resistance Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Isolation Capacitance (refer to block diagram in Application Notes) 1500pF ma: Operating Frequency 260kHz ± 40kH Operating Temperature Range Ambient, Free Convection 45°C to +97°C (without derating Maximum Case Temperature Maximum Case Temperature Range 555°C to +125° Over Temperature Protection (refer to block diagram in Application Notes) internal thermist Thermal Impedance Vertical 7.5°CWa (Natural convection) 475°C to 95% R Relative Humidity 5% to 95% R Case Material 60  Aluminium Potting Material 58ilicone (JL94-Vt) Weight 520  **Temperature Protection (refer to block diagram in Application Notes) 58ilicone (JL94-Vt)  **Weight************************************	(measured with 1 $\mu$ F capacitor across outputs)	All others	40mV-75mVp-p typ.
Over Load Protection % of full load at nominal Vin 120% by Short Circuit Protection Current limit, automatic recover Output Over Voltage Protection (refer to block diagram in Application Notes)  Solation Voltage Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Isolation Resistance 10MΩ minute Isolation Capacitance (refer to block diagram in Application Notes)  Operating Frequency 260kHz ± 40kH Operating Temperature Range Ambient, Free Convection -45°C to +97°C (without derating -45°C to +105°C (with derating Maximum Case Temperature Range -55°C to +125° Over Temperature Protection (refer to block diagram in Application Notes)  Thermal Impedance Vertical 7.5°C/Wa (Natural convection) Horizontal 11.5°C/Wa Relative Humidity 5% to 95% R Case Material 60  Current limit, automatic recover Amount of Vout > Vout nominal + 205 Converter shutdown if Vout > Vout	Temperature Coefficient		±0.04%/°C max.
Short Circuit Protection  Output Over Voltage Protection (refer to block diagram in Application Notes)  Solation Voltage  Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Isolation Resistance  Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 secon Isolation Resistance  Solation Capacitance (refer to block diagram in Application Notes)  Operating Frequency  Operating Frequency  Operating Temperature Range  Ambient, Free Convection  Af5°C to +97°C (with derating -45°C to +105°C	Transient Response	25% load step change	800µs
Output Over Voltage Protection (refer to block diagram in Application Notes)       Converter shutdown if Vout > Vout nominal + 20%         Isolation Voltage       Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 second         Isolation Resistance       10MΩ minute, Flash tested at 2000VDC/1 second         Isolation Capacitance (refer to block diagram in Application Notes)       1500pF max         Operating Frequency       260kHz ± 40kH         Operating Temperature Range       Ambient, Free Convection       -45°C to +97°C (with out derating restriction of the convection refer to block diagram in Application Notes)       +120°         Storage Temperature Range       55°C to +125°       +125°         Over Temperature Protection (refer to block diagram in Application Notes)       internal thermistre thermistre restriction refer to block diagram in Application Notes)       11.5°C/Wa         Relative Humidity       5% to 95% R       Relative Humidity       5% to 95% R         Case Material (**)       Aluminium       Silicone (UL94-VC)         Weight       26	Over Load Protection	% of full load at nominal Vin	120% typ.
Solation Voltage Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 second solation Resistance 10MΩ minute (refer to block diagram in Application Notes) 1500pF max 260kHz ± 40kH   Operating Frequency 260kHz ± 40kH   Operating Temperature Range Ambient, Free Convection -45°C to +97°C (without derating -45°C to +105°C (with derating -45°C to +105°C (with derating -45°C to +125°C to	Short Circuit Protection		Current limit, automatic recovery
Isolation Resistance Isolation Capacitance (refer to block diagram in Application Notes)  Operating Frequency Operating Temperature Range Ambient, Free Convection Authority After Agoncy Associated And Ambient Aluminion Alumin	Output Over Voltage Protection (refer to block diagram in Application Notes)	Converter	shutdown if Vout > Vout nominal + 20%
Isolation Capacitance (refer to block diagram in Application Notes)  Operating Frequency  Operating Temperature Range  Ambient, Free Convection  -45°C to +97°C (without derating -45°C to +105°C (with derating -45°C to	Isolation Voltage	Rated at 1600VDC/1 m	inute, Flash tested at 2000VDC/1 second
Operating Frequency Operating Temperature Range Ambient, Free Convection -45°C to +97°C (without derating -45°C to +105°C (with derating -45°C to +125°C	Isolation Resistance		10MΩ min.
Operating Temperature Range Ambient, Free Convection -45°C to +97°C (without derating -45°C to +105°C (with derating -45°C t	Isolation Capacitance (refer to block diagram in Application Notes)		1500pF max.
Maximum Case Temperature	Operating Frequency		260kHz ± 40kHz
Storage Temperature Range  Over Temperature Protection (refer to block diagram in Application Notes)  Thermal Impedance (Natural convection)  Relative Humidity  Case Material (7)  Potting Material  Vertical  7.5°C/Wa  11.5°C/Wa  11.5°C/Wa  Aluminiur  Silicone (UL94-Vd  Weight	Operating Temperature Range	Ambient, Free Convection	-45°C to +97°C (without derating)
Storage Temperature Range  Over Temperature Protection (refer to block diagram in Application Notes)  Thermal Impedance (Natural convection)  Relative Humidity  Case Material (7)  Potting Material  Vertical  7.5°C/Wa  11.5°C/Wa  11.5°C/Wa  Aluminiur  Silicone (UL94-Vd  Weight	Maximum Case Temperature		+120°C
Thermal Impedance Vertical 7.5°C/Wa (Natural convection) Horizontal 11.5°C/Wa 11.5°C/Wa Relative Humidity 5% to 95% R Case Material (?) Aluminiur Potting Material Silicone (UL94-VC Weight 26	Storage Temperature Range		-55°C to +125°C
(Natural convection) Horizontal 11.5°C/Wa Relative Humidity 5% to 95% R Case Material (7) Aluminium Potting Material Silicone (UL94-VC) Weight 26	Over Temperature Protection (refer to block diagram in Application Notes)		internal thermistor
Relative Humidity  Case Material Aluminiur  Potting Material  Weight  Silicone (UL94-VC  Weight	Thermal Impedance	Vertical	7.5°C/Watt
Case Material Potting Material Silicone (UL94-VC Weight 26	(Natural convection)	Horizontal	11.5°C/Watt
Potting Material Silicone (UL94-VC Weight 26	Relative Humidity		5% to 95% RH
Weight 26	Case Material (7)		Aluminium
	Potting Material		Silicone (UL94-V0)
Dimensions 1.6" x 1" x 0.48" (40.6 x 25.4 x 11.7mn	Weight		26g
116 X 1 X 61.10 (10.10 X 20.11 X 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Dimensions	1	.6" x 1" x 0.48" (40.6 x 25.4 x 11.7mm)

PP-6 REV: 2/2009 www.recom-electronic.com

### **POWERLINE+**

### RPP20-5\_DW Series

### DC/DC-Converter

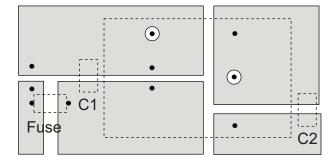
Specifications (typical at nominal input and 25°C unless otherwise noted)				
Safety Standards		UL-60950-1 Pending		
Thermal Cycling	complies with MIL-STD-810F			
Vibration		10-55Hz, 12G, 30 Min. along X, Y and Z		
Conducted Emissions	EN55022	Class B		
Radiated Emissions	EN55022	Class B		
ESD	EN61000-4-2	Perf. Criteria B		
Radiated Immunity	EN61000-4-3	Perf. Criteria A		
Fast Transient <sup>(5)</sup>	EN61000-4-4	Perf. Criteria B		
Surge <sup>(5)</sup>	EN61000-4-5	Perf. Criteria B		
Conducted Immunity	EN61000-4-6	Perf. Criteria A		
MTBF calculated according to BELLCORE TR-NWT-000332 <sup>(6)</sup>	2195 x 10 <sup>3</sup> hours			

#### Notes:

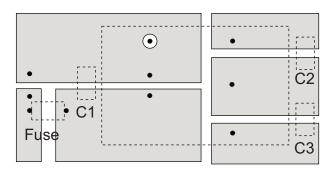
- 1. Typical values at nominal input voltage and no load/full load.
- 2. Typical values at nominal input voltage and full load.
- 3. Typical values at nominal input voltage and full load in vertical orientation and with Eurocard-sized PCB ground planes to assist in heat dissipation. For horizontal orientation, reduce the maximum temperatures by 10°C.
- 4. The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to negative input.
  - Positive logic ON/OFF is standard, no suffix (Ex. RPP20-2405SW)
  - Negative logic ON/OFF option has suffix /N (Ex. RPP20-2405SW/N)
- 5. Requires an external 100µF/100V low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
- 6. Case I: 50% Stress, Temperature at 50°C (Ground Benign).
- 7. To ensure a good all-round electrical contact, the baseplate is pressed firmly into place within the aluminium housing. The hydraulic press can leave tooling marks and deformations to both the housing and baseplate. The case is anodised aluminium, so there will be natural variations in the case colour and the aluminium is not scratch resistant. Any resultant marks, scratches and colour varations are cosmetic only and do not affect the operation or performance of the converters.

#### **Recommended PCB Layout**

### Single Output



### **Dual Output**



Input Fuse is recommended, but optional. Recommended fuse rating = double maximum input current, time delay type.

Input Capacitor, C1, is required to meet EN61000 Surge and Fast Transient, otherwise it is not required for normal operation.

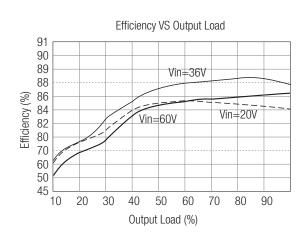
Output Capacitors C2/C3 are recommended, but not required for normal operation. Typical capacitor values are 1µF/100V MLCC

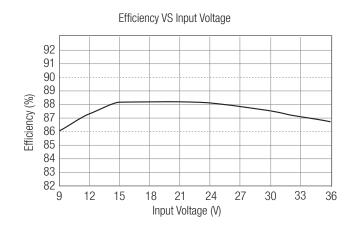
To ensure optimum thermal performance, use large areas of copper on the PCB to assist with heat dissipation and mount the converter vertically.

### RPP20-5\_DW Series

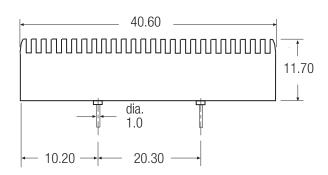
**Typical Characteristics** 

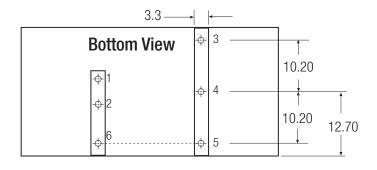
#### RPP20-2405SW

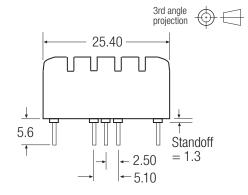




### Package Style and Pinning (mm)



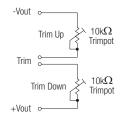


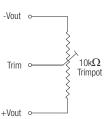


Pin Connections				
Pin#	Single	Dual		
1	+Vin	+Vin		
2	-Vin	-Vin		
2 3	+Vout	+Vout		
4	Trim	Com		
5	-Vout	-Vout		
6	CTRL	CTRL		

Pin Pitch Tolerance  $\pm 0.35$  mm

# External Output Trimming Refer To Application Notes for recommended resistor Values





RPP20-W