NON-ISOLATED DC/DC CONVERTERS

10.8 Vdc - 13.2 Vdc Input 0.6 Vdc - 5.0 Vdc/80 A Output

VRP4-80A1Ax RoHS Compliant Rev.B

- Non-Isolated
- High Efficiency
- Fixed Switching Frequency
- Low Cost
- Excellent Thermal Performance
- Output Voltage Trim
- Current Share
- Output Over-Voltage Shutdown
- OCP/SCP
- Low Output Ripple
- Power Good Signal
- Remote On/Off
- Over Temperature Protection

Description

The VRP4-80A1Ax is a non-isolated dc/dc converter that operates from a nominal 12 Vdc source. This unit can provide a precisely regulated output voltage from 0.6 Vdc to 5.0 Vdc and can deliver up to 80 A of output current. This unit is designed to be highly efficient and low cost. The converter is provided in an industry standard package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency (Vo=3.3 Vdc)	Model Number Active High	Model Number Active High
0.6 V - 5.0 V	10.8 V - 13.2 V	80 A	400 W	93%	VRP4-80A1A0	VRP4-80A1AB[1]

Notes: 1. VRP4-80A1A0 and VRP4-80A1AB are with different heatsink.
2. All part numbers above indicate RoHS 6. Change the second letter "R" to "7" for RoHS 5 part numbers.
3. Add “G” suffix at the end of the model numbers listed above to indicate “Tray Packaging”.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	15 V	
Output Enable Terminal Voltage	-0.3 V	-	15 V	
Ambient Temperature	0 °C	-	70 °C	
Storage Temperature	-55 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	10.8 V	12 V	13.2 V	
Input Current (full load)	-	-	40 A	
Input Reflected Ripple Current (pk-pk)	-	20	35	With simulated source impedance of 1 uH, 5 Hz to 20 MHz. Use a 1000 uF/16 V electrolytic capacitor with ESR=0.1 ohm max, at 100 kHz at 25°C.
Input Reflected Ripple Current (rms)	-	5	10	
I^2t Inrush Current Transient	-	-	1 A^2s	
Turn-on Voltage Threshold	-	10.2 V	10.6 V	
Under Voltage Threshold	-	9.5 V	10 V	

Note: All specifications are typical at 25 °C unless otherwise stated.

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				
Vo≥1 V	-1.5 % Vo	-	+1.5 % Vo	Vin=Vinmin, Io=Iomax
Vo<1 V	-10 mV	-	+10 mV	
Load Regulation				
Vo≥2.5 V	-	-	0.6% Vo	
Vo<2.5 V	-	-	12 mV	
Line Regulation				
Vo≥2.5 V	-	-	0.3% Vo	
Vo<2.5 V	-	-	9 mV	
Regulation Over Temperature (0 °C to +70 °C)	-	-	0.02% Vo/C	
Output Current	0 A	-	80 A	
Current Limit Threshold	90 A	110 A	150 A	
Output Ripple and Noise (pk-pk)				Test conditions: 0-20 MHz BW, with a 1 µF ceramic capacitor and a 10 uF Tantalum cap at output.
Vo=5.0 V	-	-	80 mV	
Vo=3.3 V	-	-	80 mV	
Vo=2.5 V	-	-	60 mV	
Vo=1.5 V	-	-	60 mV	
Vo=1.0 V	-	-	50 mV	
Vo=0.6 V	-	-	50 mV	
Output Ripple and Noise (rms)				
Vo=5.0 V	-	-	40 mV	
Vo=3.3 V	-	-	40 mV	
Vo=2.5 V	-	-	30 mV	
Vo=1.5 V	-	-	30 mV	
Vo=1.0 V	-	-	25 mV	
Vo=0.6 V	-	-	25 mV	
Turn On Time	-	-	10 mS	
Rise Time	-	-	3 mS	
Overshoot at Turn on and off	-	-	0.5%	
Output Capacitance ESR≥1 mΩ	0 uF	-	4700 uF	
Transient Response				
50% ~ 100% Max Load	-	-	300 mV	Test conditions: di/dt = 2.5 A/uS; Vin =12 V; Ta=25°C, Co=4700 uF.
Settling Time	-	-	100 uS	
100% ~ 50% Max Load	-	-	300 mV	
Settling Time	-	-	100 uS	

(Vo=All for the Transient Response rows)

Note: All specifications are typical at 25 °C unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=5.0 V	91%	95%	-	Measured at Vin=12 V, full load.
Vo=3.3 V	89%	93%	-	
Vo=2.5 V	88%	92%	-	
Vo=1.8 V	86%	90%	-	
Vo=1.5 V	85%	89%	-	
Vo=1.2 V	81%	86%	-	
Vo=1.0 V	79%	83%	-	
Vo=0.6 V	70%	75%	-	
Switching Frequency	-	250 kHz	-	
Output Voltage Trim Range	0.6 V	-	5 V	Trim pin is open, Vo = 0.6 V.
Over Voltage Protection	110% Vo,set	115%Vo,set	130%Vo,set	Vin=12 V, Io=full load.
Over Temperature Protection	-	105 °C	-	The temperature of heatsink.
MTBF	TBD			Calculated Per Bell Core SR-332 (Io = 80%Iomax; Vin=12 V; Ta = 25 °C)
Dimensions				
Inches (L × W × H)	2.58 x 1.25 x 0.763			VRP4-80A1A0
Millimeters (L × W × H)	65.53 x31.75 x 19.38			
Dimensions				
Inches (L × W × H)	2.58 x 1.25 x 0.608			VRP4-80A1AB
Millimeters (L × W × H)	65.53 x31.75 x 15.44			
Weight	-	TBD	-	

Note: All specifications are typical at 25 °C unless otherwise stated.

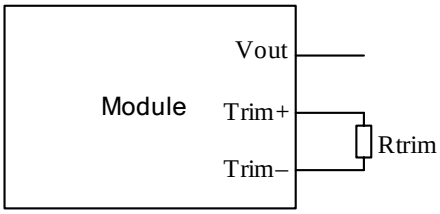
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off (Active High)				
Signal Low (Unit Off)	-0.3 V	-	0.8 V	Remote On/Off pin is open, unit is off.
Signal High (Unit On)	2 V	-	Vin,max	
Current Source/Sink	0 mA	-	3.3 mA	
PwGood (PowerGood)				
PwGood = High = Power Good	2.4 V	-	5.25 V	
	-	-	2 mA	
PwGood = Low = Power Not Good	0 V	-	0.4 V	
	-	-	4 mA	

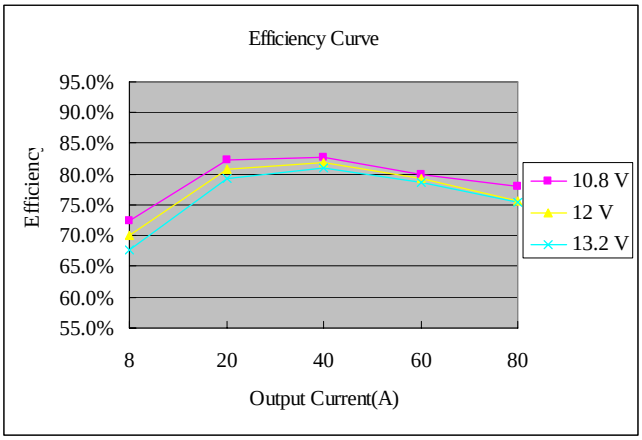
Output Trim Equation

The Trim resistor should be connected between the Trim+ pin and Trim- pin.

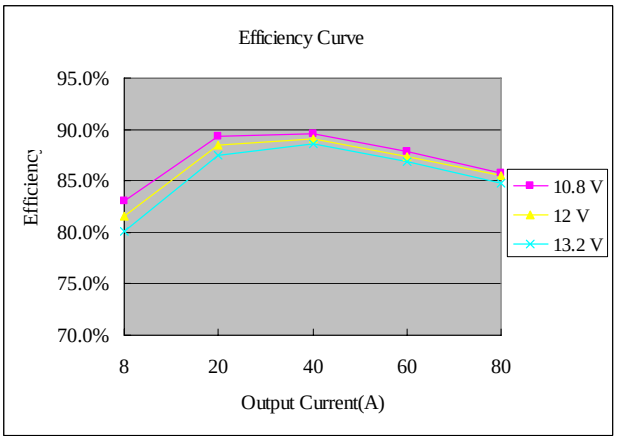
$$R_{trim} = \frac{1.2}{Vo - 0.6}(K\Omega)$$



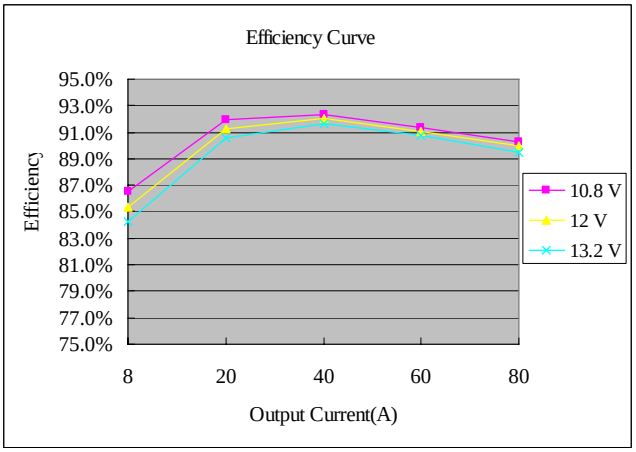
Efficiency Data



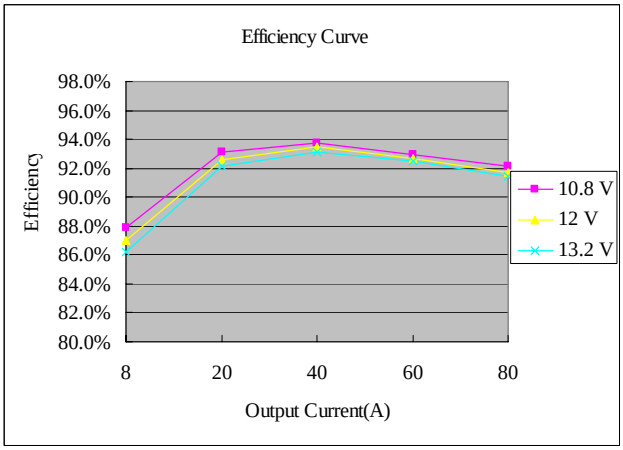
Vo=0.6 V



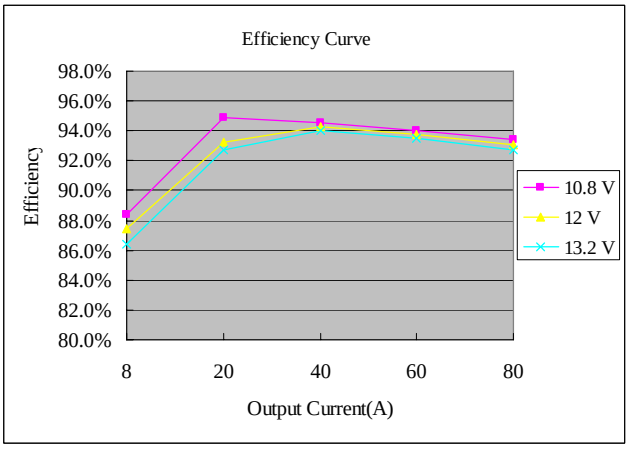
Vo=1.2 V



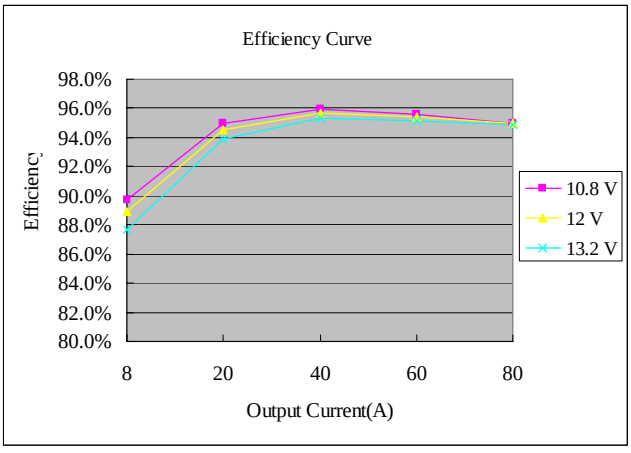
Vo=1.8 V



Vo=2.5 V



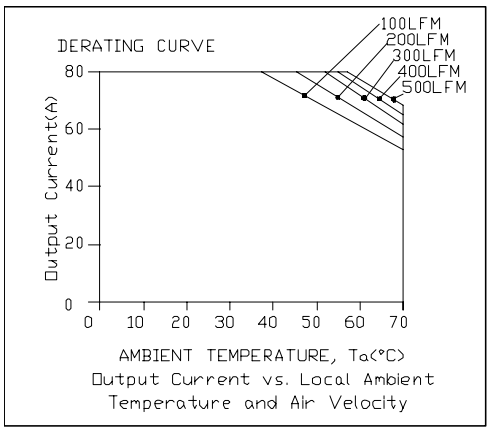
Vo=3.3 V



Vo=5.0 V

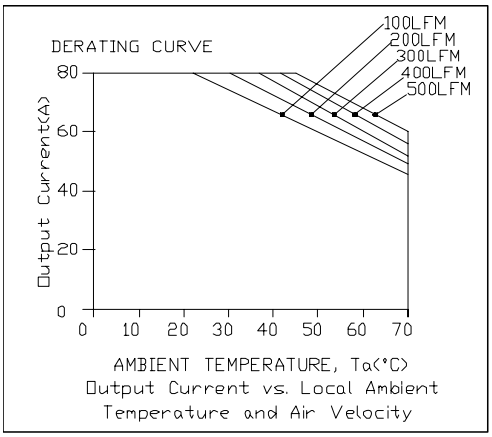
Thermal Derating Curves

VRP4-80A1A0

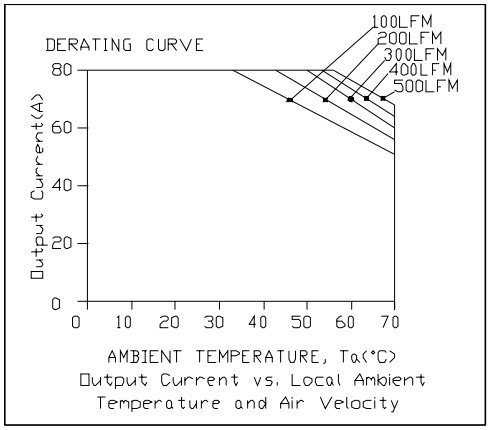


Vo=1.2 V

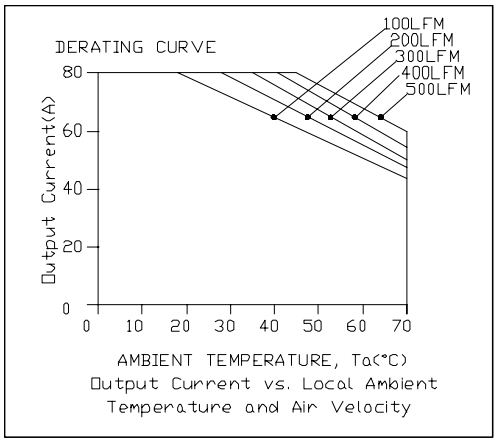
VRP4-80A1AB



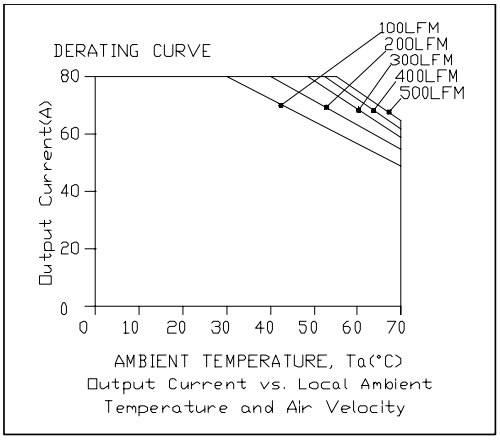
Vo=1.2 V



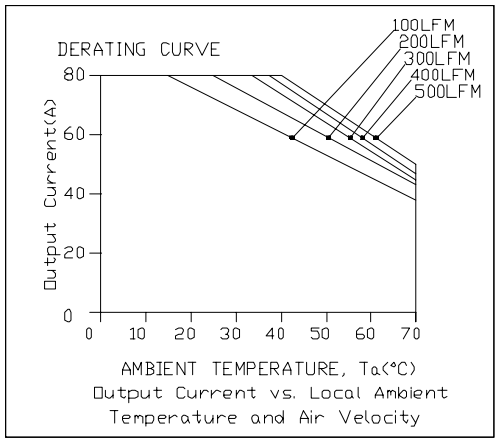
Vo=3.3 V



Vo=3.3 V

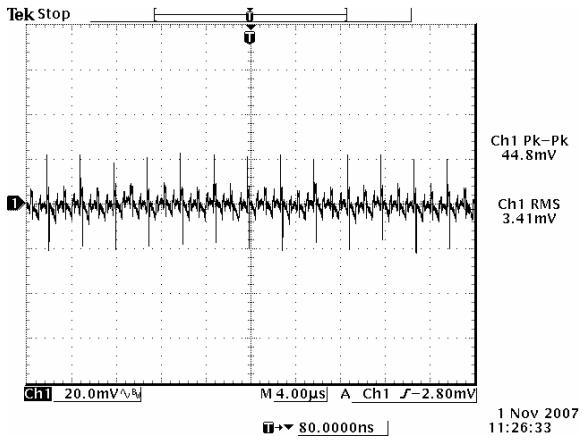


Vo=5.0 V

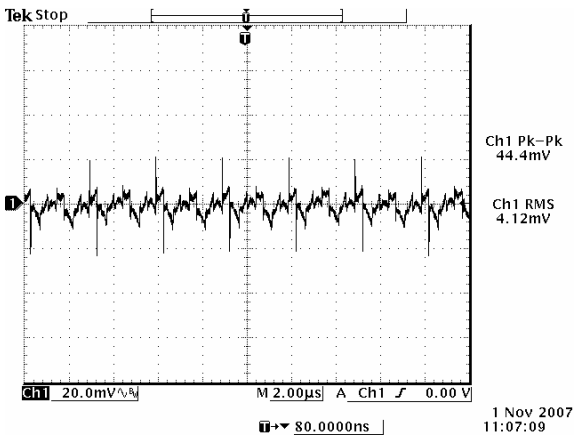


Vo=5.0 V

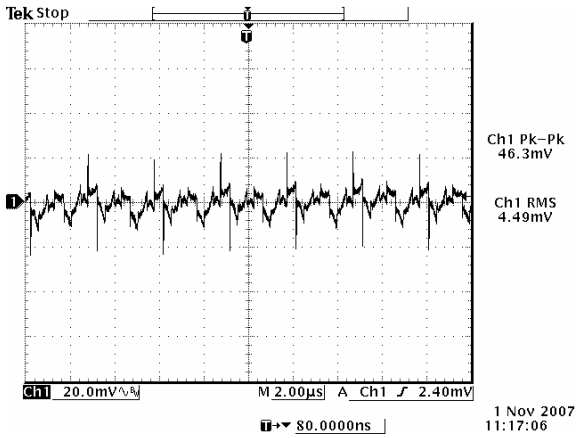
Ripple and Noise Waveforms



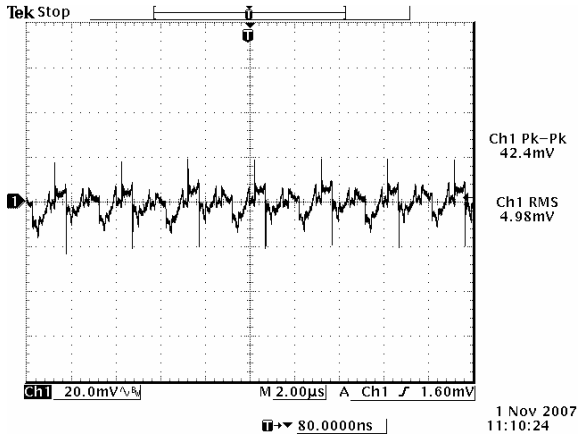
12 Vdc input, 0.6 Vdc/80 A output



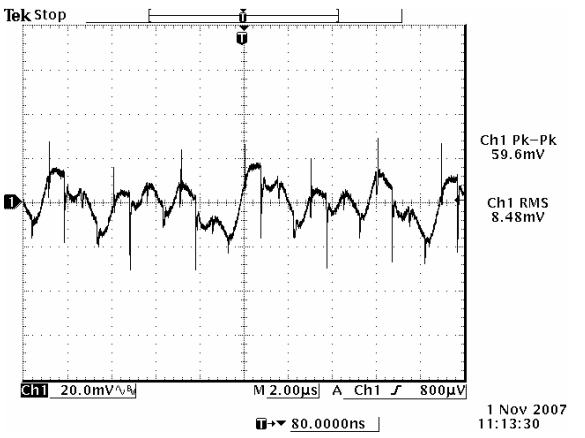
12 Vdc input, 1.2 Vdc/80 A output



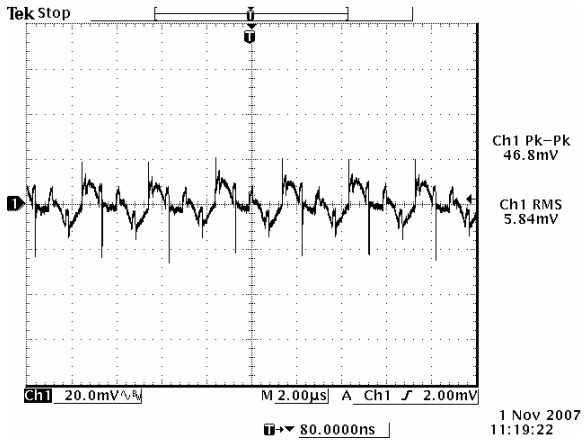
12 Vdc input, 1.5 Vdc/80 A output



12 Vdc input, 1.8 Vdc/80 A output

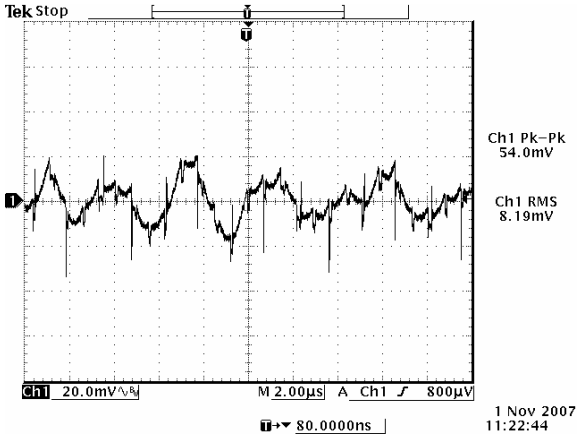


12 Vdc input, 2.5 Vdc/80 A output



12 Vdc input, 3.3 Vdc/80 A output

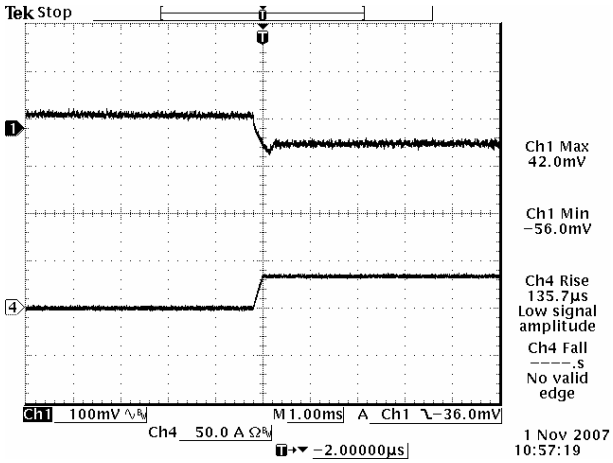
Ripple and Noise Waveforms (continued)



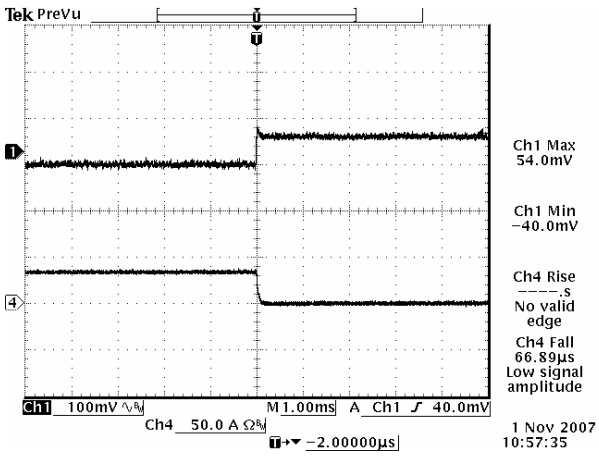
12 Vdc input, 5.0 Vdc/80 A output

Note: Ripple and noise at full load, 0-20 MHz BW, with a 10 uF tantalum cap and a 1uF ceramic cap at the output, and Ta=25 deg C.

Transient Response Waveforms

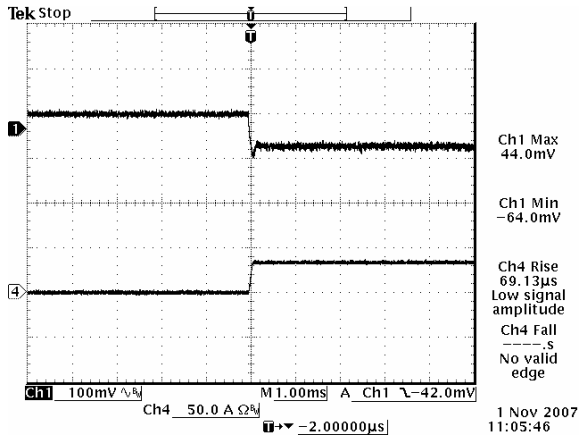


Vout= 0.6 V 0%-50% Load Transients

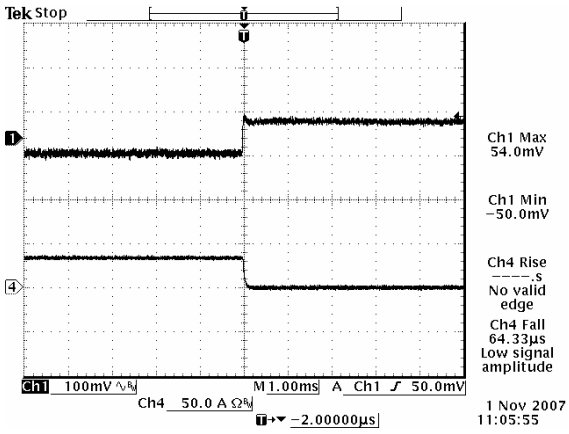


Vout=0.6 V 50%-0% Load Transients

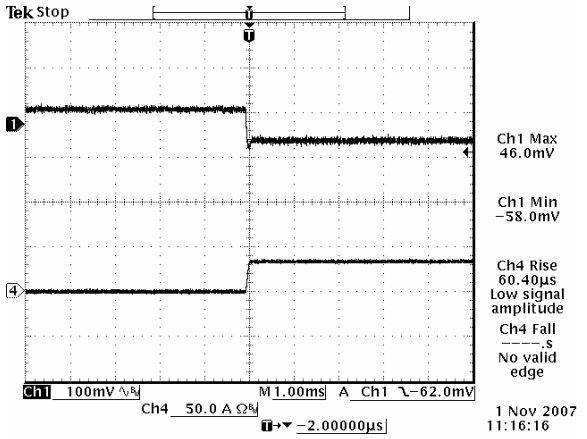
Transient Response Waveforms (continued)



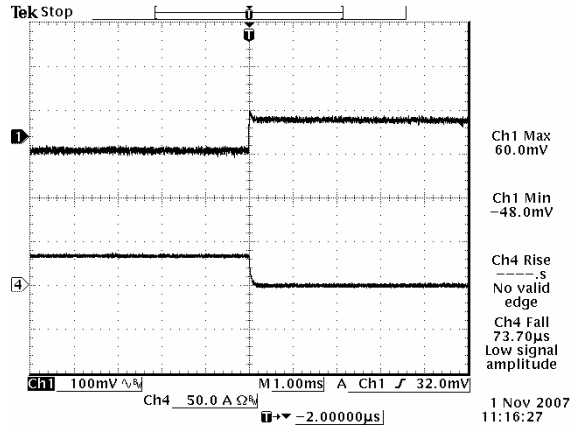
Vout=1.2 V 0%-50% Load Transients



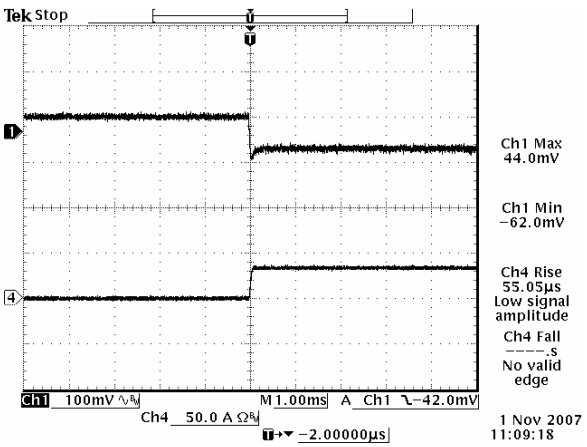
Vout=1.2 V 50%-0% Load Transients



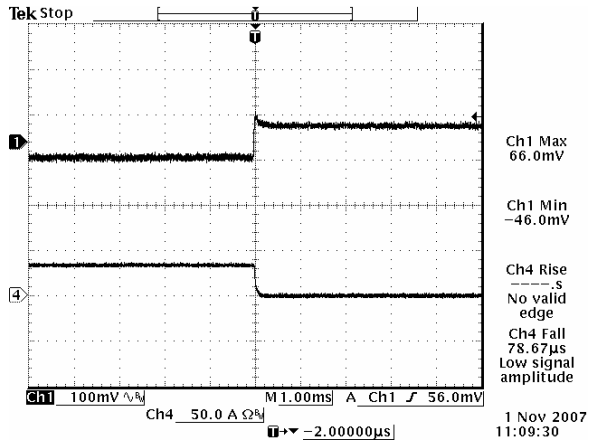
Vout=1.5 V 0%-50% Load Transients



Vout=1.5 V 50%-0% Load Transients

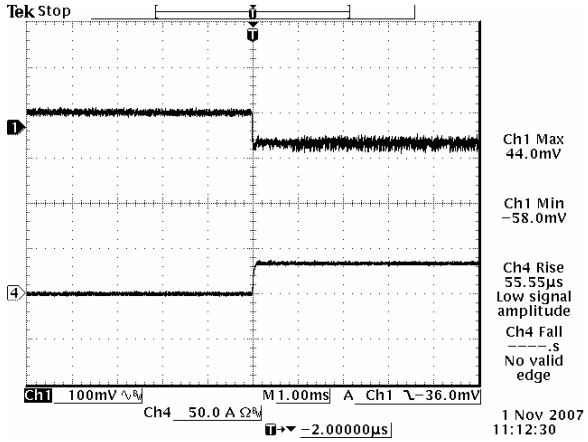


Vout= 1.8 V 0%-50% Load Transients

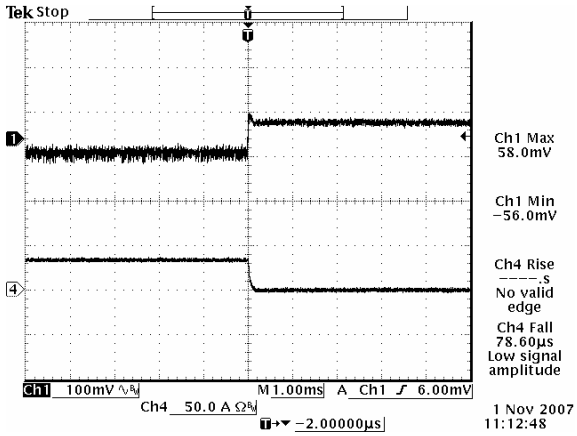


Vout=1.8 V 50%-0% Load Transients

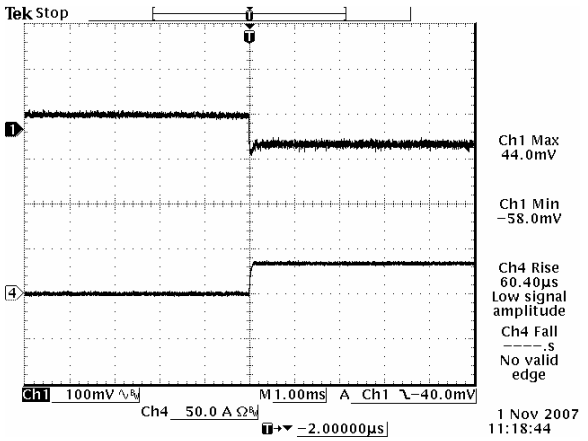
Transient Response Waveforms (continued)



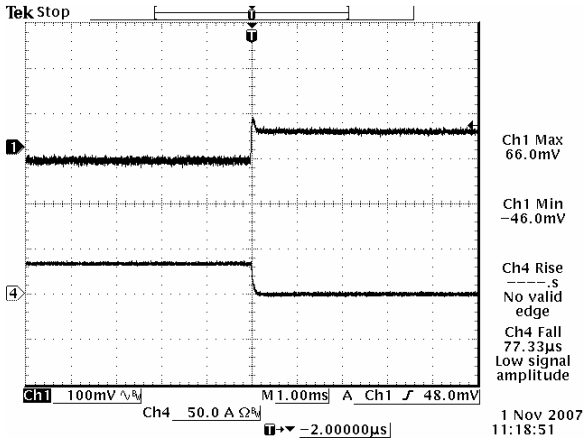
Vout=2.5 V 0%-50% Load Transients



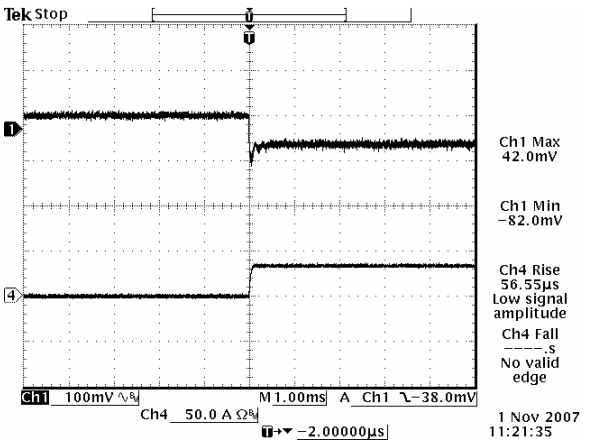
Vout=2.5 V 50%-0% Load Transients



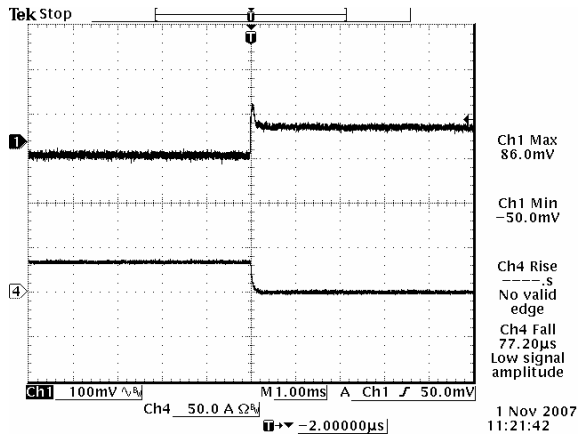
Vout=3.3 V 0%-50% Load Transients



Vout=3.3 V 50%-0% Load Transients



Vout=5 V 0%-50% Load Transients

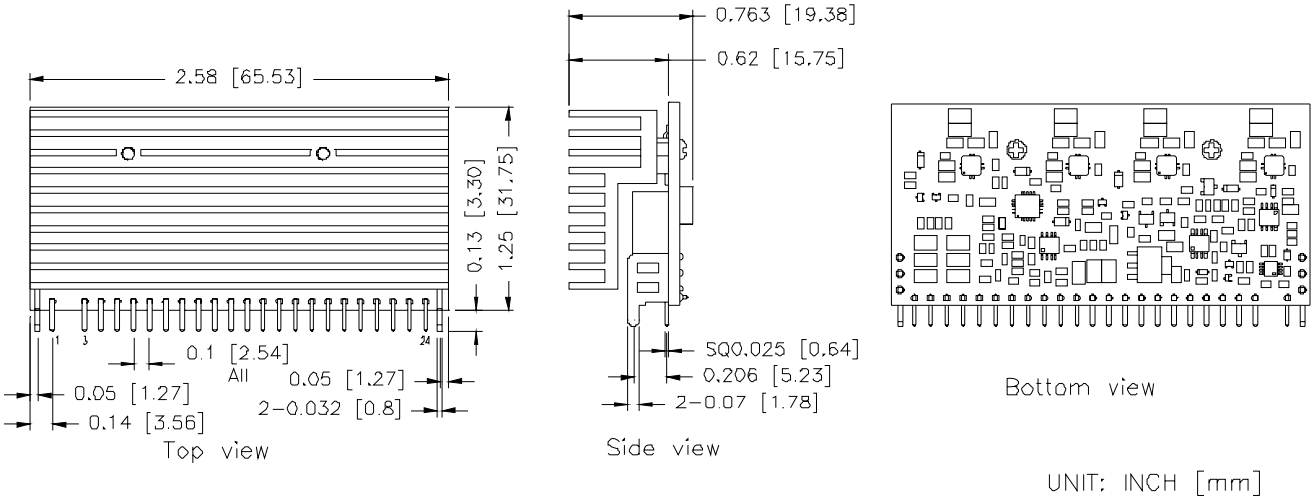


Vout=5 V 50%-0% Load Transients

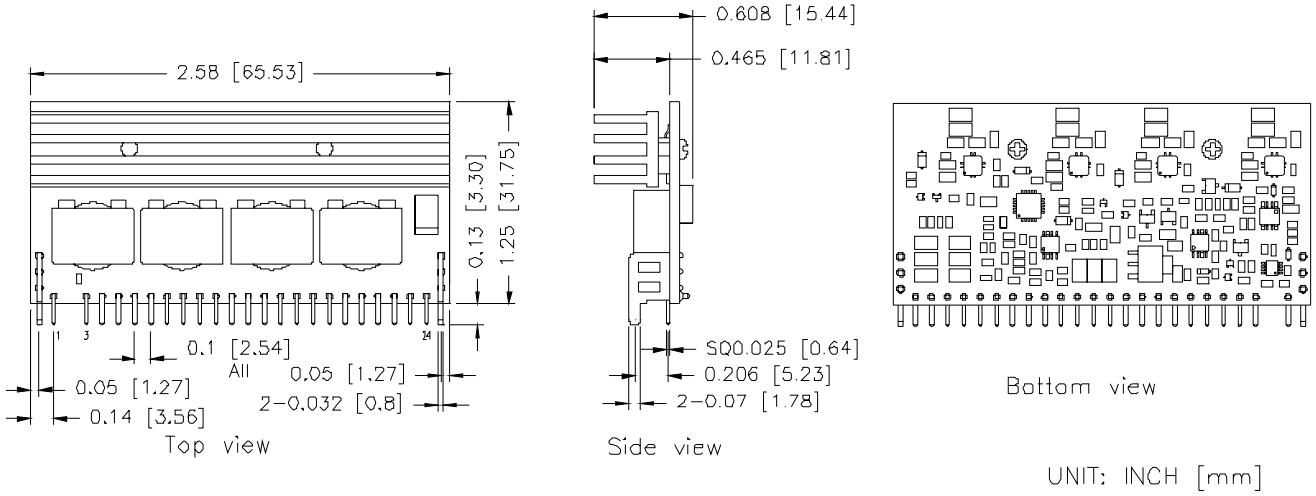
Note: Transient response at di/dt = 2.5 A/uS, with extemal electrolytic cap 4700 uF, and Ta=25 deg C.

Mechanical Outline

VRP4-80A1A0



VRP4-80A1AB



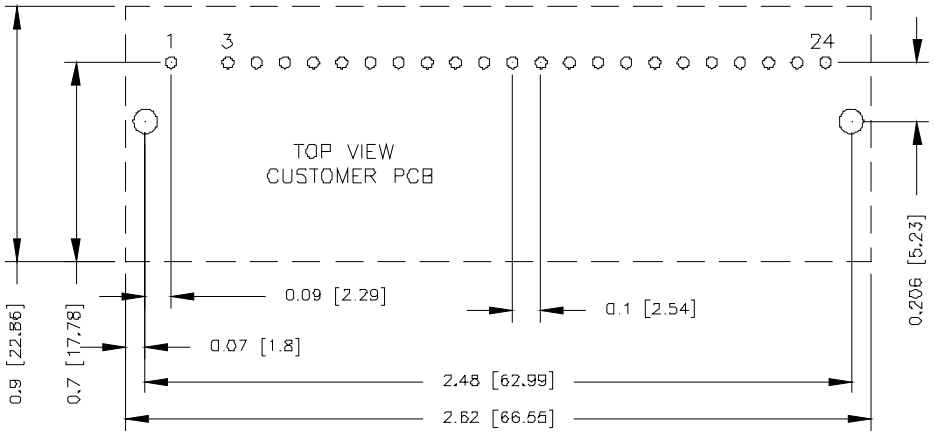
Mechanical Outline (continued)

Pin Connections

Pin	Function	Pin	Function	Pin	Function
1	Trim+	9	Enable	17	GND
2	N/A	10	Sense-	18	Vout
3	GND	11	Sense+	19	GND
4	PwGOOD	12	Vin	20	Vout
5	Trim-	13	Vin	21	GND
6	Ishare	14	Vin	22	Vout
7	GND	15	Vout	23	GND
8	GND	16	Vout	24	Vout

Note: VRP4-80A1A0 and VRP4-80A1AB are with the same pin function.

RECOMMENDED PAD LAYOUT



2 SUPPORT PAD THR. HOLES ø0.085 [ø2.2] BOTH SIDE
23 PIN PAD THR. HOLES: ø0.04 [ø1.0] BOTH SIDE

RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.

CORPORATE

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