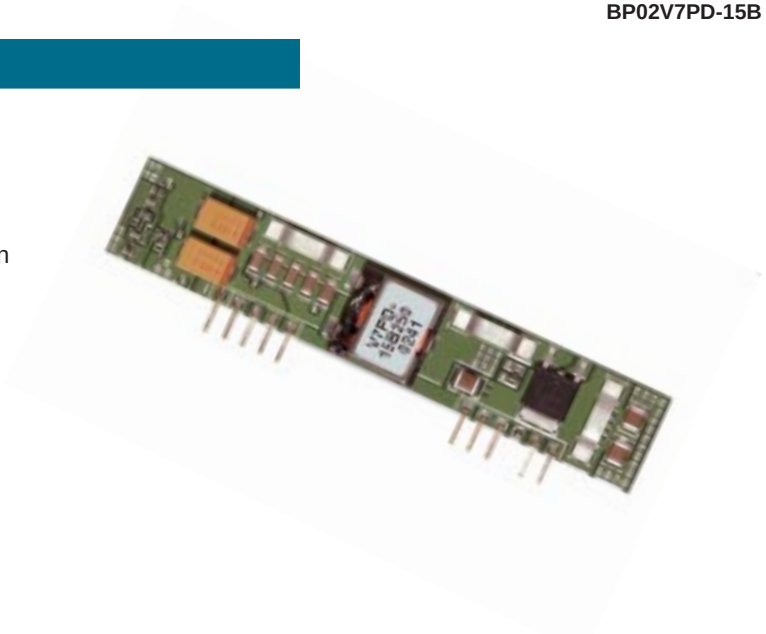
NON-ISOLATED DC/DC CONVERTERS
5V Input / 1.2V – 3.3V Output / 15A

bel POWER PRODUCTS

BP02V7PD-15B

V7PD-15B Series

- Nonisolated
- Industry standard pinout
- Fixed frequency
- High efficiency means less power dissipation
- Optimized for cost
- Remote on/off
- Undervoltage lockout (UVLO)
- Over current and short circuit protection
- Remote sense
- Over temperature shutdown protection



Description

The Bel V7PD-15B modules are a series of non-isolated, step down DC/DC power converters that operate from a nominal 5V source. These converters are available in a range of output voltages from 1.2V to 3.3V. They are packaged in an industry standard, single-in-line footprint and provide a maximum 15A output. Standard features include remote on/off, over current and short circuit protection, output voltage adjust and remote sense. These products may be used almost anywhere low voltage silicon is employed and a 5V source is available. Typical applications include file servers, routers, line cards and other computing and communications equipment.

Applications

- Distributed power architectures
- Data networking equipment
- Telecommunications
- Computers and peripherals

Options

- Reverse remote on/off logic

Part Number Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Active High	Part Number Active Low
3.3V	5V	15A	49.5W	93%	V7PD-15B330	V7PD-15B33L
2.5V	5V	15A	37.5W	91%	V7PD-15B250	V7PD-15B25L
1.8V	5V	15A	27.0W	89%	V7PD-15B180	V7PD-15B18L
1.5V	5V	15A	22.5W	86%	V7PD-15B150	V7PD-15B15L
1.2V	5V	15A	18.0W	83%	V7PD-15B120	V7PD-15B12L

Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	Vin	-0.3		6	V
Output Enable Terminal Voltage	Vouten	-0.3		6	V
Ambient Temperature	Tamb	0		70	°C
Storage Temperature	Tstor	-55		105	°C

Note: Use beyond the maximum ratings may cause a reliability degradation of the DC/DC converter or may permanently damage the device.

Input Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Operating Input Voltage	All	Vin	4.5	5	5.5	V
Input Current	3.3V 2.5V 1.8V 1.5V 1.2V	Iin			13.5 10.5 7.6 6.5 5.3	A
No Load Input Current	All			70	100	mA
Remote Off Input Current	All			6	10	mA
Input Reflected Ripple Current[1]	All			50	80	mA_{rms}
Input Reflected Ripple Current (P-P)[1]	All			135	160	mApk
I^2t Inrush Current Transient	All			0.18		A^2s
Turn On Voltage Threshold	All			4.25		V
Turn Off Voltage Threshold	All			3.85		V

Note: Input capacitance a 680µF/6.3V and a 270µF/16V Oscon caps
1. With simulated source impedance of 500nH, 5Hz to 20MHz.

BP02V7PD-15B

Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Output Voltage Set Point [1]	3.3V 2.5V 1.8V 1.5V 1.2V	Vout	3.234 2.450 1.764 1.470 1.176	3.3 2.5 1.8 1.5 1.2	3.366 2.550 1.836 1.530 1.224	V
Load Regulation	3.3V 2.5V 1.8V 1.5V 1.2V			8 6 6 5 5	16.5 12.5 11.0 10.5 10.5	mV
Line Regulation	3.3V 2.5V 1.8V 1.5V 1.2V			5 3 3 2 2	10 7.5 6.0 4.5 4.5	mV
Regulation Over Temperature	3.3V 2.5V 1.8V 1.5V 1.2V			15 10 7 5 5	35 25 20 15 15	mV
Total Output Voltage Regulation	3.3V 2.5V 1.8V 1.5V 1.2V			28 19 16 12 12	61.5 45 37 30 30	mV
Output Ripple and Noise [2]	3.3V 2.5V 1.8V 1.5V 1.2V			50 50 48 45 38	100 100 90 80 70	mVp-p
Output Ripple and Noise [2]	3.3V 2.5V 1.8V 1.5V 1.2V			25 20 18 15 12	30 25 23 20 17	mVrms
Output Current Range	All	Iout	0		15	A
Output DC Current Limit	All	Ioutlim	19.5		37.5	A
Short Circuit Surge	3.3V 2.5V 1.8V 1.5V 1.2V	Ioutsurge		0.041 0.048 0.070 0.081 0.095		A^2s
Turn on Time	All	Ton		11	20	ms
Overshoot at Turn On	All			0	3	%
Output Capacitance	All	Cout	0		6800	µF

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.
1. Vin = 5V, Iout = full load, Ta = 25° C.
2. 0 - 20MHz, 0.1µF ceramic cap on output.

Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Transient Response [3]						
ΔV 50% to 100% of Max Load	3.3V			88	150	mV
Settling Time		Ts		20	50	µs
ΔV 100% to 50% of Max Load				85	150	mV
Settling Time		Ts		20	50	µs
Transient Response [3]						
ΔV 50% to 100% of Max Load	2.5V			95	150	mV
Settling Time		Ts		20	50	µs
ΔV 100% to 50% of Max Load				95	150	mV
Settling Time		Ts		20	50	µs
Transient Response [3]						
ΔV 50% to 100% of Max Load	1.8V			94	150	mV
Settling Time		Ts		20	50	µs
ΔV 100% to 50% of Max Load				92	150	mV
Settling Time		Ts		20	50	µs
Transient Response [3]						
ΔV 50% to 100% of Max Load	1.5V			95	150	mV
Settling Time		Ts		20	50	µs
ΔV 100% to 50% of Max Load				95	150	mV
Settling Time		Ts		20	50	µs
Transient Response [3]						
ΔV 50% to 100% of Max Load	1.2V			80	150	mV
Settling Time		Ts		20	50	µs
ΔV 100% to 50% of Max Load				75	150	mV
Settling Time		Ts		20	50	µs

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.
3. di/dt = 0.5A/1µS, Ta = 25° C without external load capacitance.

General Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Efficiency[1]	3.3V 2.5V 1.8V 1.5V 1.2V	η	91 89 87 84 81	93 91 89 86 83		%
Switching Frequency	All	Fsw	230	300	340	kHz
Overtemperature Shutdown	All	Tc		120		°C
Output Voltage Trim Range[2]	All		90		110	%
Weight	All			15		g

1. Vin=5V, full load and Ta=25° C.
2. See graphs on pages 11-13.

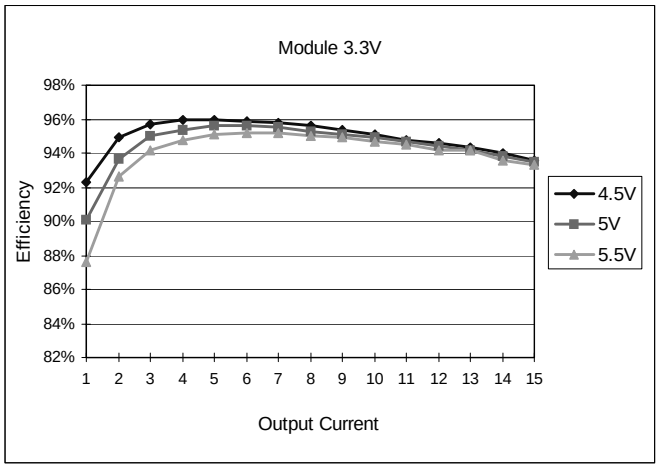
Control Specifications

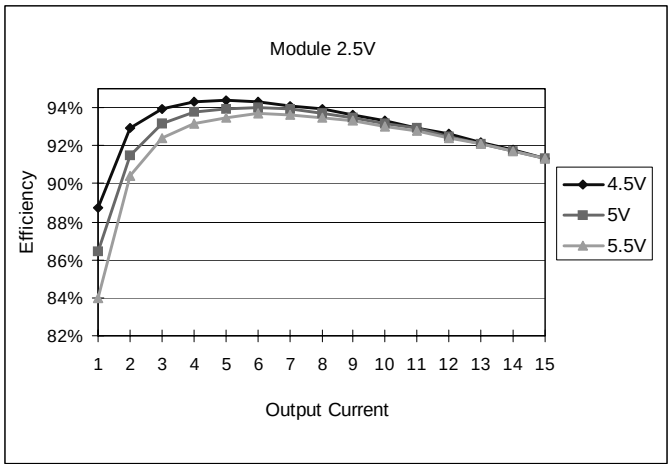
Parameter	Module	Symbol	Min	Typical	Max	Units
Remote On/Off [3]		Vouten				V
Signal Low (Unit Off)	V7PD-15Bxx0		-0.3		0.8	V
Signal High (Unit On)			2.5		5.5	V
Signal Low (Unit On)	V7PD-15BxxL		-0.3		0.8	V
Signal High (Unit Off)			2.5		5.5	V

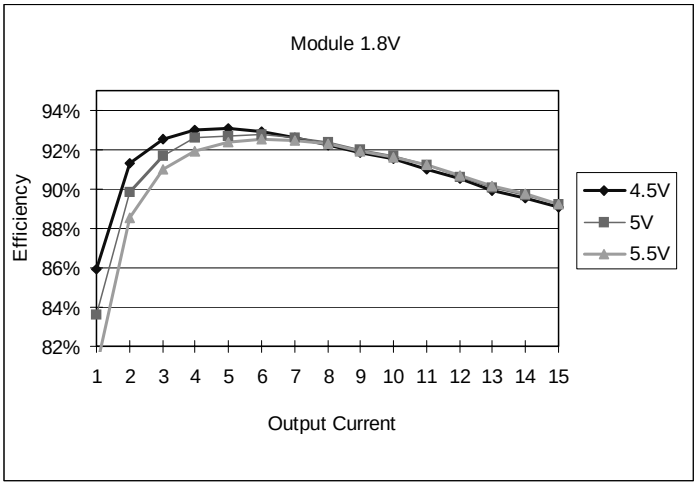
3. With remote on/off pin 11 open, the module is on.

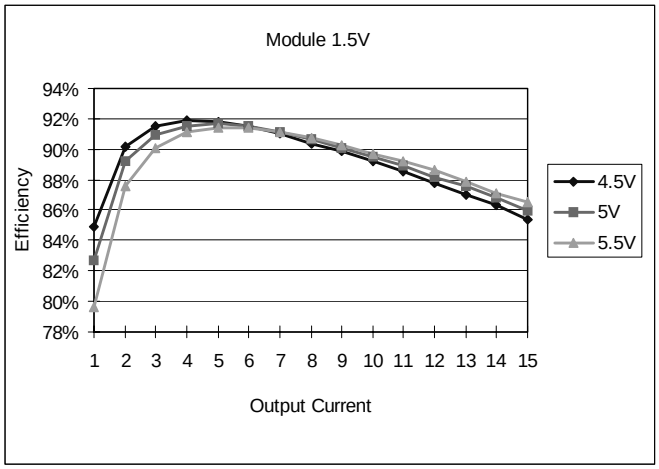
Note: On/off pin designed to work with an open collector/drain switch.

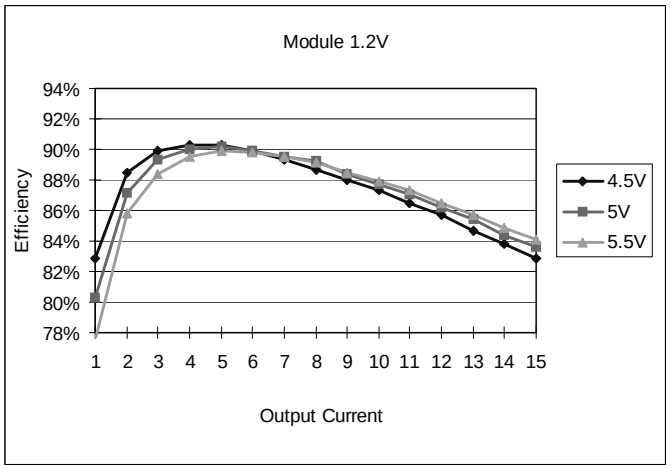
Efficiency Data





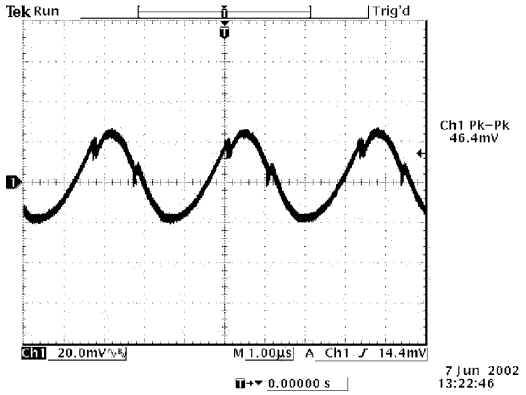




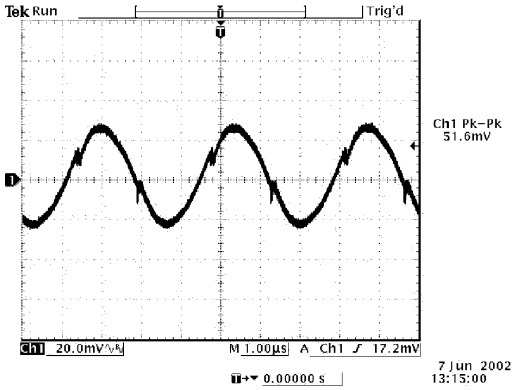


Ripple and Noise

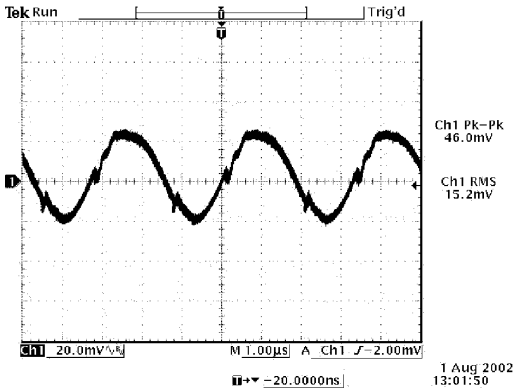
0.1µF ceramic cap added at the output.



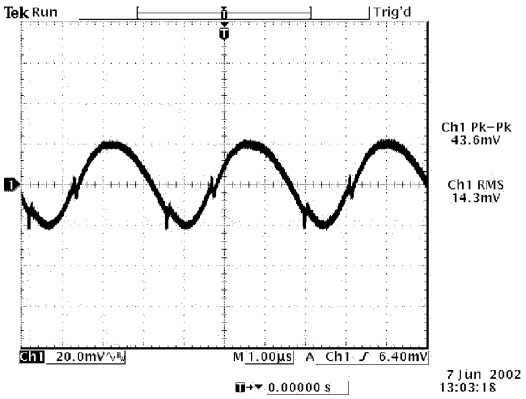
Ripple and noise at full load and 5Vdc input, 3.3Vdc output and Ta=25° C



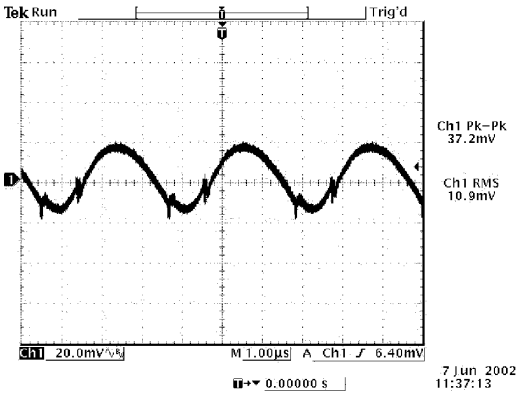
Ripple and noise at full load and 5Vdc input, 2.5Vdc output and Ta=25° C



Ripple and noise at full load and 5Vdc input, 1.8Vdc output and Ta=25° C



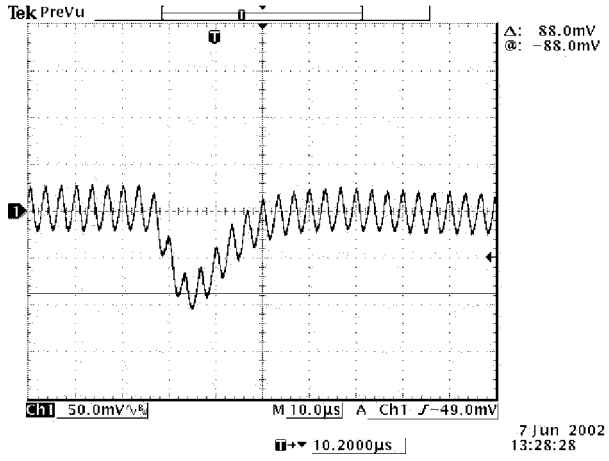
Ripple and noise at full load and 5Vdc input, 1.5Vdc output and Ta=25° C



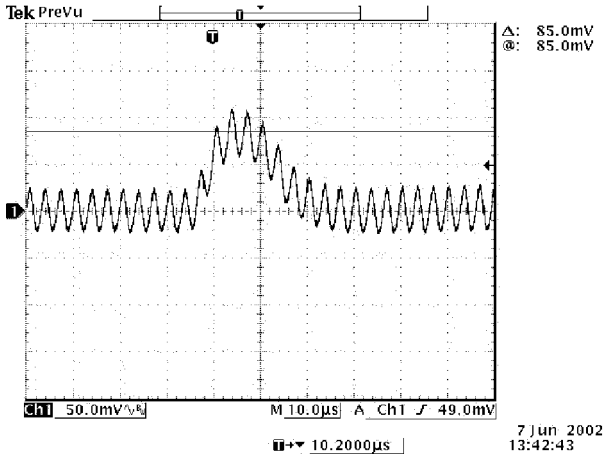
Ripple and noise at full load and 5Vdc input, 1.2Vdc output and Ta=25° C

Transient Response

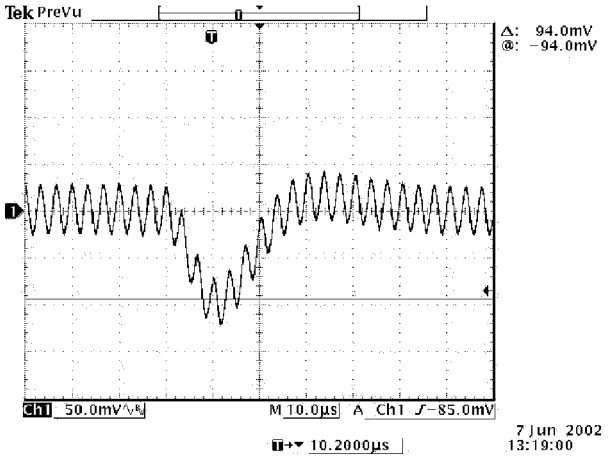
Transient response: di/dt = 0.5A/µS, no external load capacitance



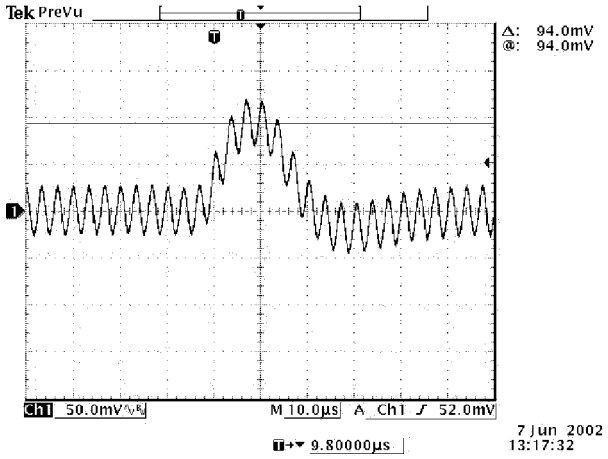
Vout=3.3V
50% to 100% load transients at 5V input and Ta=25° C



Vout=3.3V
100% to 50% load transients at 5V input and Ta=25° C



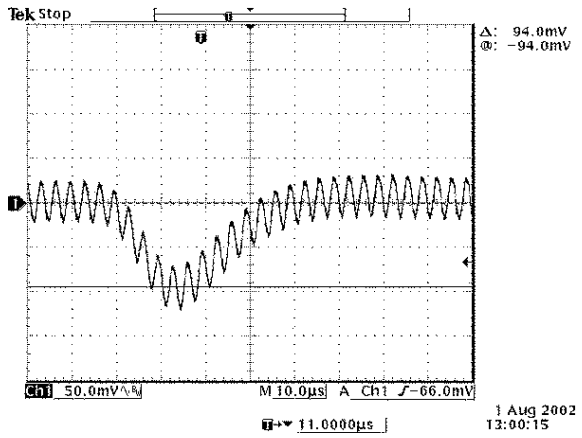
Vout=2.5V
50% to 100% load transients at 5V input and Ta=25° C



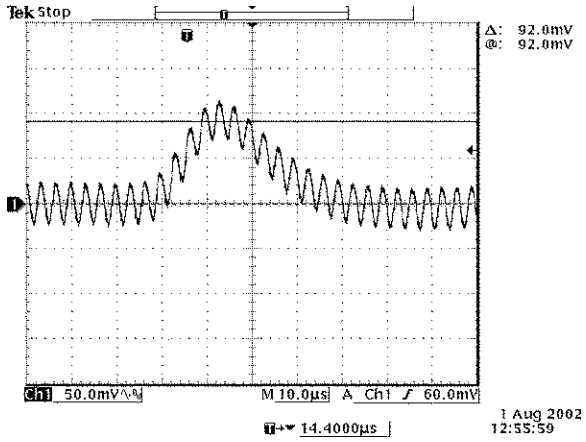
Vout=2.5V
100% to 50% load transients at 5V input and Ta=25° C

Transient Response

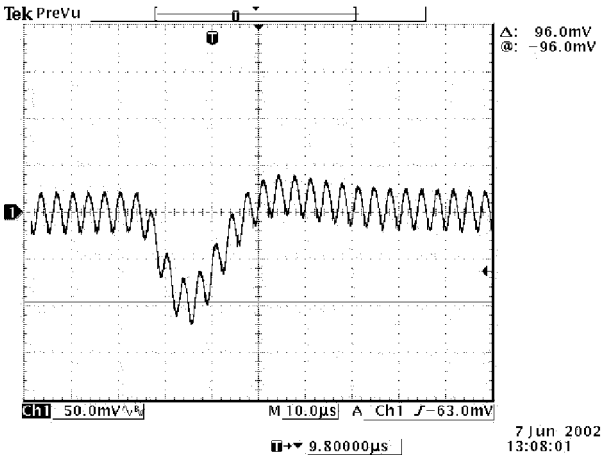
Transient response: di/dt = 0.5A/µS, no external load capacitance



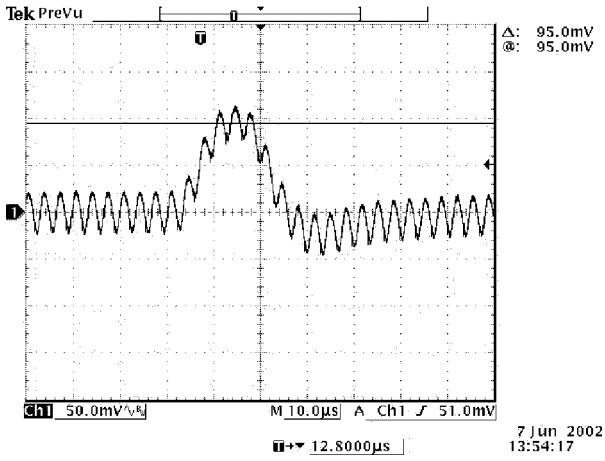
Vout=1.8V
50% to 100% load transients at 5V input and Ta=25° C



Vout=1.8V
100% to 50% load transients at 5V input and Ta=25° C



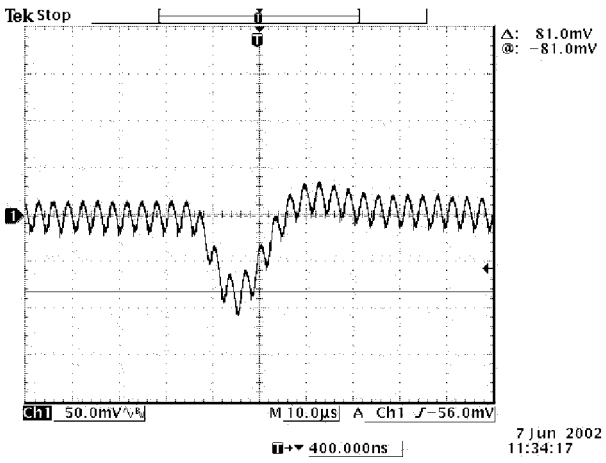
Vout=1.5V
50% to 100% load transients at 5V input and Ta=25° C



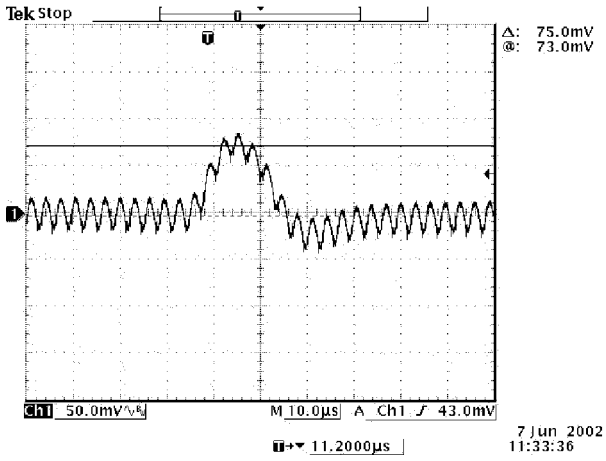
Vout=1.5V
100% to 50% load transients at 5V input and Ta=25° C

Transient Response

Transient response: di/dt = 0.5A/µS, no external load capacitance



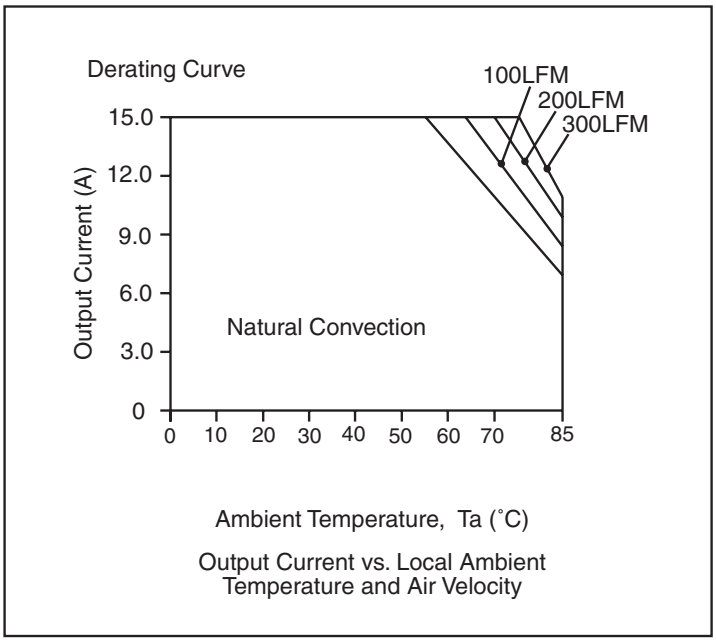
Vout=1.2V
50% to 100% load transients at 5V input and Ta=25° C



Vout=1.2V
100% to 50% load transients at 5V input and Ta=25° C

Thermal Considerations

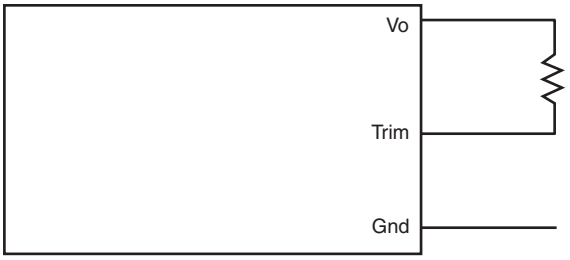
V7PD-15B



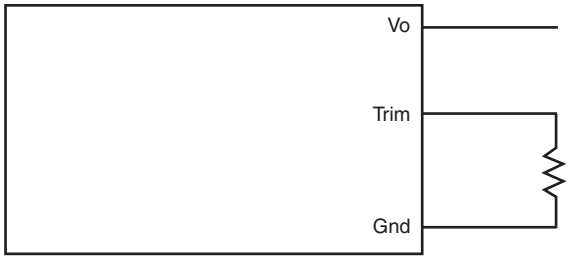
Output Current vs. Local Ambient Temperature and Air Velocity

Output Voltage Set-Point Adjustment

Trim Down Test Circuit



Trim Up Test Circuit

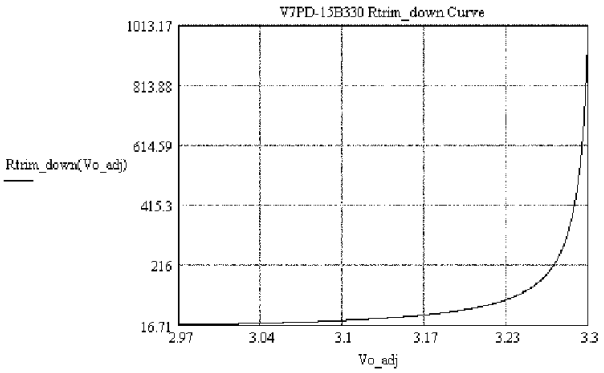


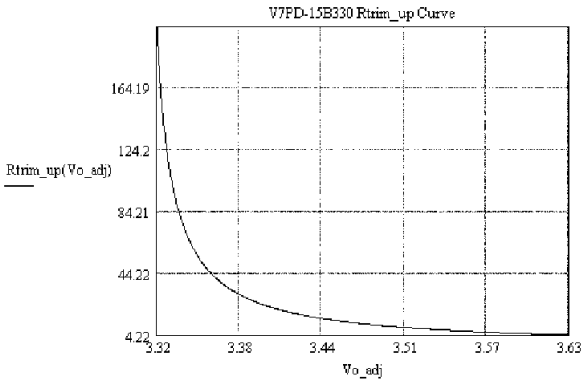
Output Voltage Set-Point Adjustment

V7PD-15B33x Trim Resistor Calculation

$$\text{Rtrim down} = \left(\frac{3.17\ \text{Vo adj} - 0.767\ \text{Vo nom}}{\text{Vo nom} - \text{Vo, adj}} - 3.65\right)\ \text{Kohm}$$

$$\text{Rtrim up} = \left(\frac{0.767\ \text{Vo nom}}{\text{Vo, adj} - \text{Vo nom}} - 3.65\right)\ \text{Kohm}$$

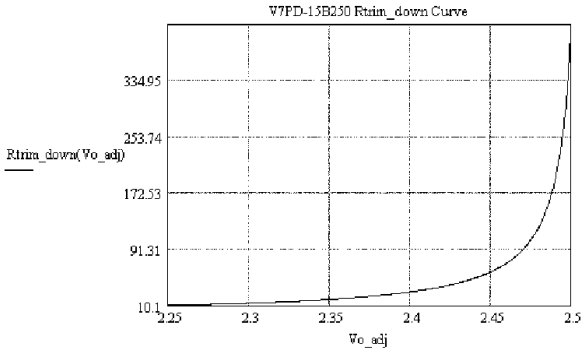




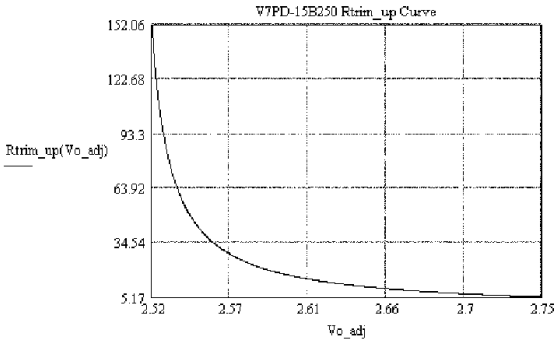
Output Voltage Set-Point Adjustment

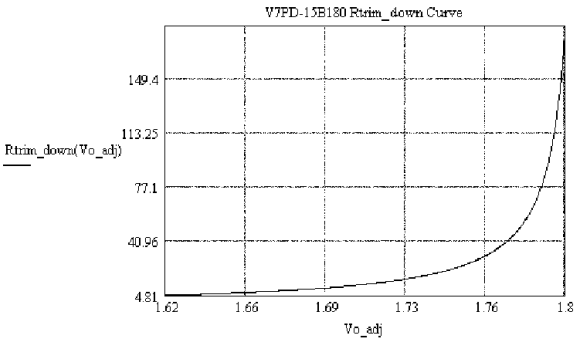
V7PD-15B25x Trim Resistor Calculation

$$\text{Rtrim down} = \left(\frac{2.16\ \text{Vo adj} - 0.689\ \text{Vo nom}}{\text{Vo nom} - \text{Vo, adj}} - 2\right)\ \text{Kohm}$$



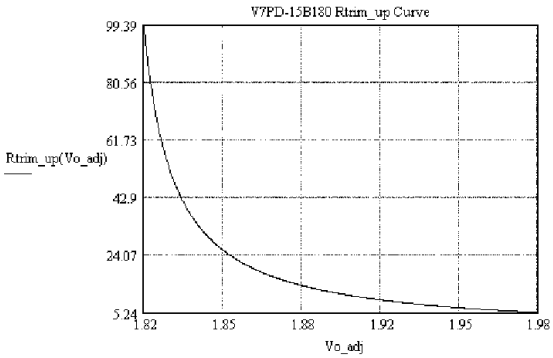
$$\text{Rtrim up} = \left(\frac{0.689\ \text{Vo nom}}{\text{Vo, adj} - \text{Vo nom}} - 2\right)\ \text{Kohm}$$





V7PD-15B18x Trim Resistor Calculation

$$\text{Rtrim down} = \left(\frac{1.51\ \text{Vo adj} - 0.668\ \text{Vo nom}}{\text{Vo nom} - \text{Vo, adj}} - 1.78\right)\ \text{Kohm}$$

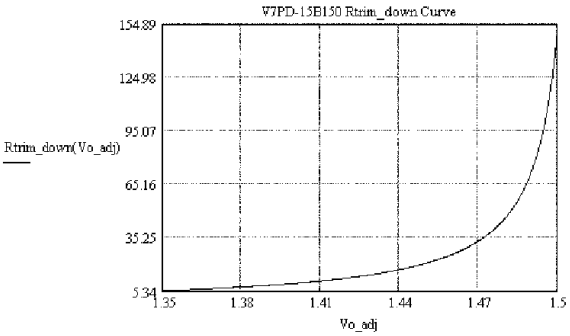


$$\text{Rtrim up} = \left(\frac{0.668\ \text{Vo nom}}{\text{Vo, adj} - \text{Vo nom}} - 1.78\right)\ \text{Kohm}$$

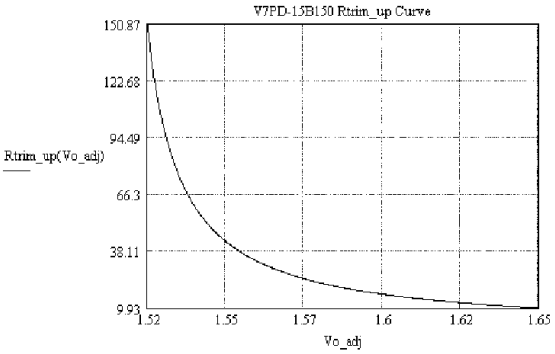
Output Voltage Set-Point Adjustment

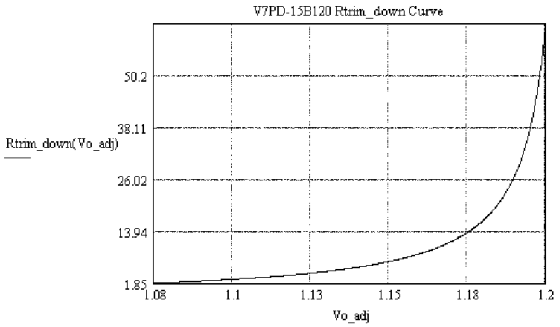
V7PD-15B15x Trim Resistor Calculation

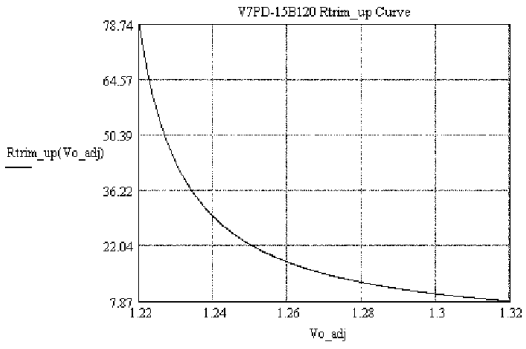
$$\text{Rtrim down} = \left(\frac{2.06\ \text{Vo adj} - 1.092\ \text{Vo nom}}{\text{Vo nom} - \text{Vo, adj}} - 1.78 \right) \text{Kohm}$$



$$\text{Rtrim up} = \left(\frac{1.092\ \text{Vo nom}}{\text{Vo, adj} - \text{Vo nom}} - 1.78 \right) \text{Kohm}$$







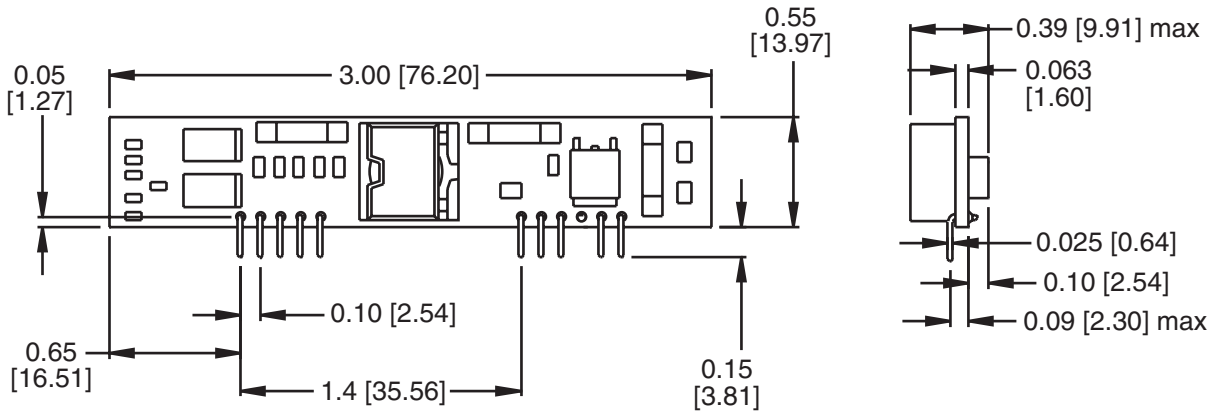
V7PD-15B12x Trim Resistor Calculation

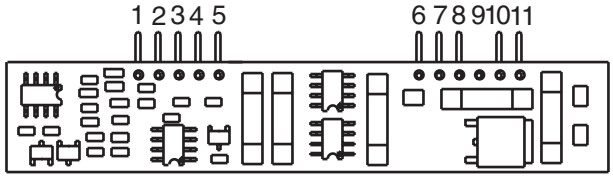
$$\text{Rtrim down} = \left(\frac{1.22\ \text{Vo adj} - 0.808\ \text{Vo nom}}{\text{Vo nom} - \text{Vo, adj}} - 0.825 \right) \text{Kohm}$$

$$\text{Rtrim up} = \left(\frac{0.808\ \text{Vo nom}}{\text{Vo, adj} - \text{Vo nom}} - 0.825 \right) \text{Kohm}$$

Mechanical

V7PD-15B





Dimensions are in inches [millimeters].
Standard dimension tolerance is ±0.005 [0.13] unless otherwise noted.

Pin	Function
1	+Vo
2	+Vo
3	Remote Sense
4	+Vo
5	Ground
6	Ground
7	+Vin
8	+Vin
9	Not Used
10	Trim
11	Remote On/Off

CORPORATE

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