NON-ISOLATED DC/DC CONVERTERS
3.3V Input / 1.2V – 2.5V Output / 8A

bel POWER PRODUCTS

BP02S7DB-08C

S7DB-08C Series

- Nonisolated
- Compact, low profile surface mount package
- Fixed frequency
- High efficiency means less power dissipation
- Excellent thermal performance
- Optimized for cost
- Remote on/off
- Undervoltage lockout (UVLO)
- Over current and short circuit protection
- Remote sense



Description

The Bel S7DB-08C modules are a series of non-isolated, step down DC/DC power converters that operate from a nominal 3.3V source. These converters are available in a range of output voltages from 1.2V to 2.5V. They are packaged in a compact, low profile, surface mount DIP package for ease of layout and space savings. 8A maximum output is also provided. Standard features include remote on/off, over current and short circuit protection, UVLO and output voltage adjust. These products may be used almost anywhere low voltage silicon is employed and a 3.3V 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

Part Number Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number
2.5V	3.3V	8A	20W	92%	S7DB-08C250
1.8V	3.3V	8A	14.4W	88%	S7DB-08C180
1.5V	3.3V	8A	12W	86%	S7DB-08C150
1.2V	3.3V	8A	9.6W	83%	S7DB-08C120

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Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	Vin	-0.3		4	V
Output Enable Terminal Voltage	Vouten	-0.3		4	V
Ambient Temperature	Tamb	-40		85	°C
Storage Temperature	Tstor	-55		100	°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	3	3.3	3.6	V
Input Current	2.5V 1.8V 1.5V 1.2V	Iin			7.9 6.3 5.3 4.4	A
No Load Input Current	All				100	mA
Remote Off Input Current				10	20	mA
Input Reflected Ripple Current[1]				20	40	mA_{rms}
Input Reflected Ripple Current (P-P)[1]				60	100	mApk
I^2t Inrush Current Transient				0.05	0.1	A^2s
Turn On Voltage Threshold				2.85		V
Turn Off Voltage Threshold				2.3		V

Note: Input capacitance two 270µF/10V, ESR = 0.018 Ω max at 100kHz @ 25° C.
1. With simulated source impedance of 500nH, 5Hz to 20MHz.

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Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Output Voltage Set Point [1]	 2.5V 1.8V 1.5V 1.2V	Vout	 2.45 1.764 1.47 1.176	 2.5 1.8 1.5 1.2	 2.55 1.836 1.53 1.224	V
Load Regulation	 2.5V 1.8V 1.5V 1.2V			 7.0 7.0 6.0 6.0	 15 15 15 15	mV
Line Regulation	All			2.0	5	mV
Regulation Over Temperature	 2.5V 1.8V 1.5V 1.2V			 10 8 5 4	 25 20 15 12	mV
Total Output Voltage Regulation	 2.5V 1.8V 1.5V 1.2V				 45 40 35 32	mV
Output Ripple and Noise [2]	 2.5V 1.8V 1.5V 1.2V			 55 40 40 40	 100 75 75 75	mVp-p
Output Ripple and Noise [2]	All			10	25	mVrms
Output Current Range	All	Iout	0		8	A
Output DC Current Limit	All	Ioutlim	10.4		20	A
Short Circuit Surge	 2.5V 1.8V 1.5V 1.2V	Ioutsurge		 0.06 0.07 0.09 0.15	 0.12 0.14 0.18 0.22	A^2s
Turn on Time	All	Ton		10	20	ms
Overshoot at Turn On	All			0	3	%
Output Capacitance	All	Cout	0		3200	µF

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.
1. Vin = 3.3V, Iout = full load, Ta = 25° C.
2. 0 - 20MHz, 1µF ceramic cap and 10µF aluminum cap on output.

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Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Transient Response [3]						
ΔV 50% to 100% of Max Load	2.5V			110	150	mV
Settling Time		Ts		50	100	µs
ΔV 100% to 50% of Max Load				110	150	mV
Settling Time		Ts		50	100	µs
Transient Response [3]						
ΔV 50% to 100% of Max Load	1.8V			90	125	mV
Settling Time		Ts		50	100	µs
ΔV 100% to 50% of Max Load				90	125	mV
Settling Time		Ts		50	100	µs
Transient Response [3]						
ΔV 50% to 100% of Max Load	1.5V			90	125	mV
Settling Time		Ts		50	100	µs
ΔV 100% to 50% of Max Load				90	125	mV
Settling Time		Ts		50	100	µs
Transient Response [3]						
ΔV 50% to 100% of Max Load	1.2V			90	125	mV
Settling Time		Ts		50	100	µs
ΔV 100% to 50% of Max Load				90	125	mV
Settling Time		Ts		50	100	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 with a 470µF Tantalum cap at output.

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General Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Efficiency[1]	2.5V 1.8V 1.5V 1.2V	η	 89 85 83 80	 92 88 86 83		%
Switching Frequency	All	Fsw	250	300	340	kHz
Output Voltage Trim Range[2]	2.5V 1.8V 1.5V 1.2V		80 90 90 90		105 110 110 110	%
Remote Sense Compensation	2.5V 1.8V 1.5V 1.2V				5 10 10 10	%
Weight	All			10.5		g

1. Vin=3.3V, full load and Ta=25° C.
2. See graphs on pages 12-14.

Control Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Remote On/Off [3]	All	Vouten				V
Signal Low (Unit Off)	All		-0.3		0.8	V
Signal High (Unit On)	All		2.8		4	V

3. With remote on/off pin 8 open, the module is on.

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

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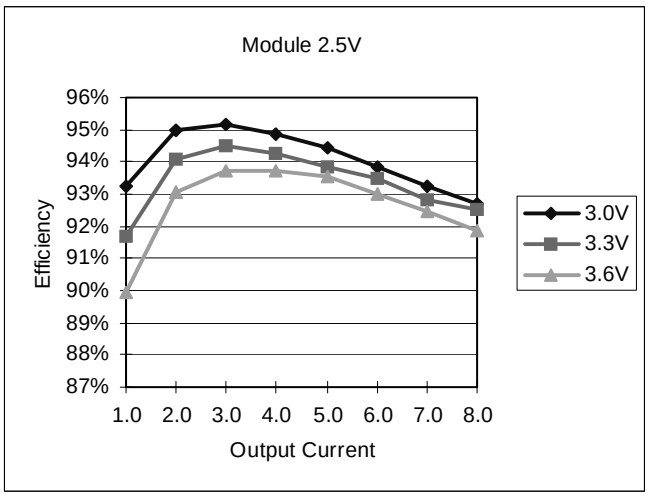
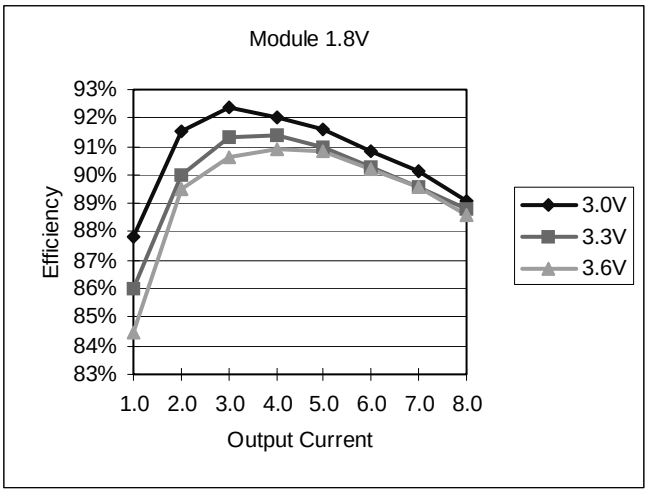
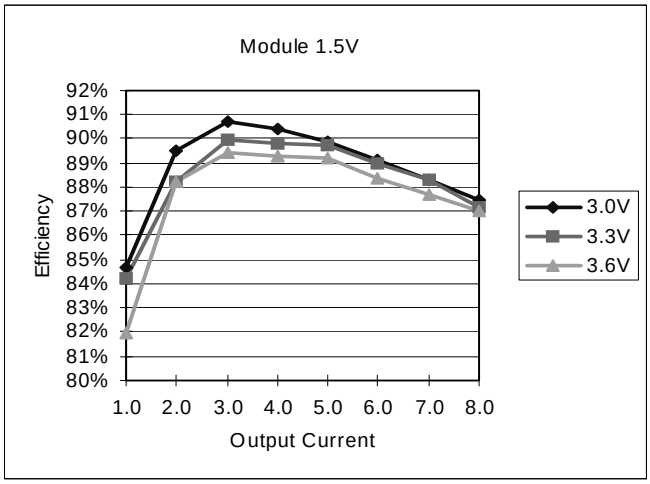
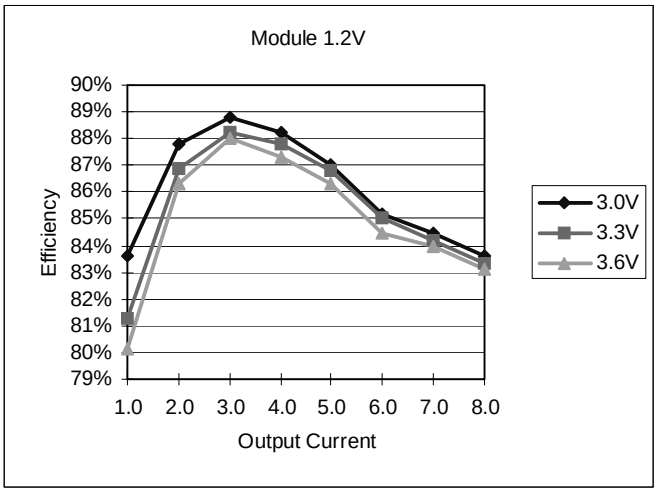
Efficiency Data









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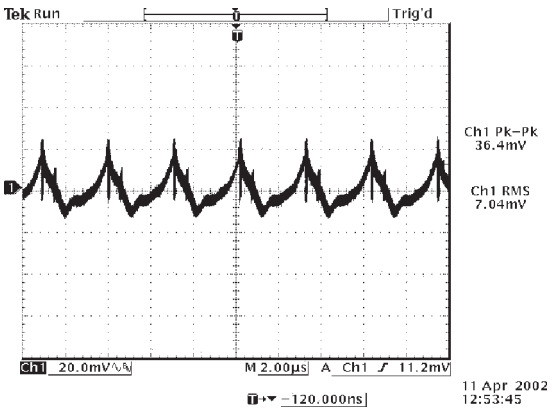
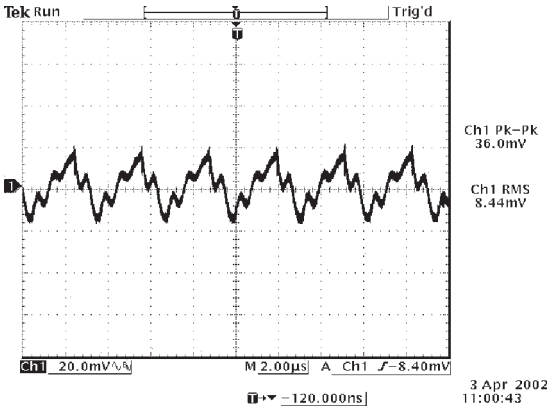
Ripple and Noise

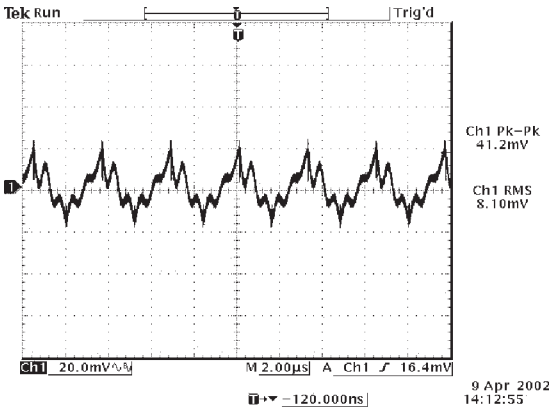
1µF ceramic cap and 10µF aluminum electrolytic cap are added at the output.



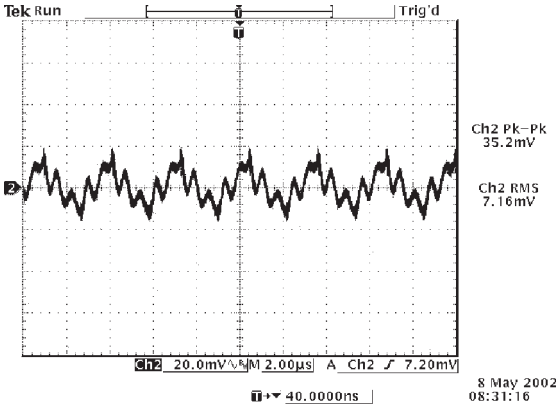
Ripple and noise at full load and 3.3Vdc input, 2.5Vdc output and Ta=25° C



Ripple and noise at full load and 3.3Vdc input, 1.8Vdc output and Ta=25° C



Ripple and noise at full load and 3.3Vdc input, 1.5Vdc output and Ta=25° C



Ripple and noise at full load and 3.3Vdc input, 1.2Vdc output and Ta=25° C

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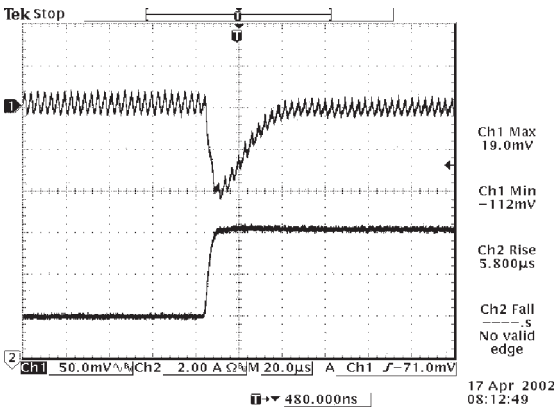
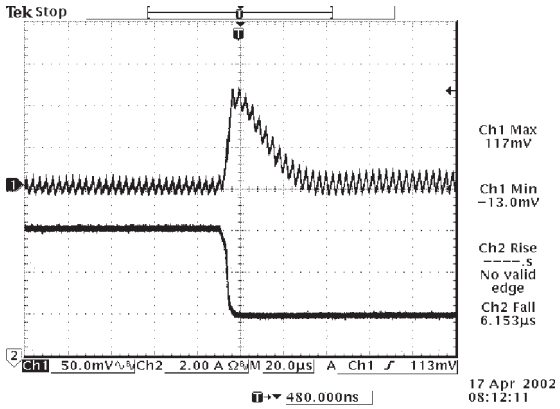
Transient Response

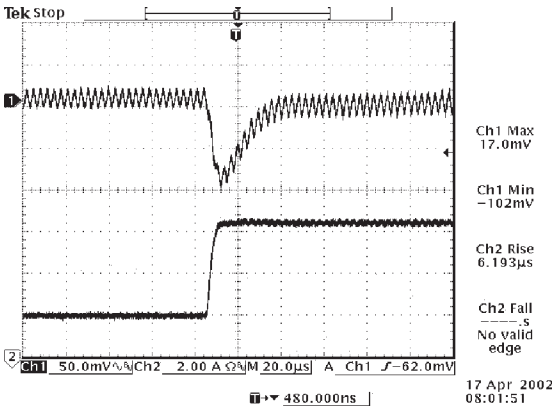
Transient response: di/dt = 0.5A/µS, external load capacitance Co=470µF (Tantalum capacitor)



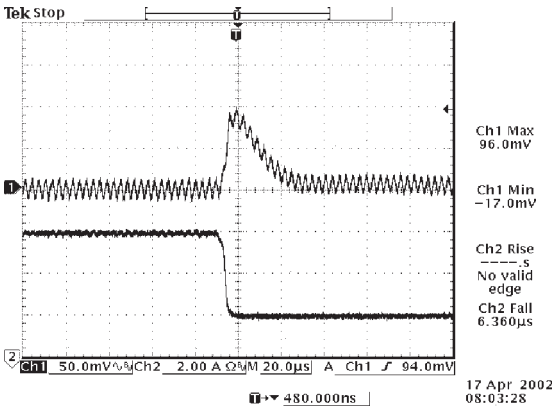
Vout=2.5V
50% to 100% load transients at 3.3V input and Ta=25° C



Vout=2.5V
100% to 50% load transients at 3.3V input and Ta=25° C



Vout=1.8V
50% to 100% load transients at 3.3V input and Ta=25° C



Vout=1.8V
100% to 50% load transients at 3.3V input and Ta=25° C

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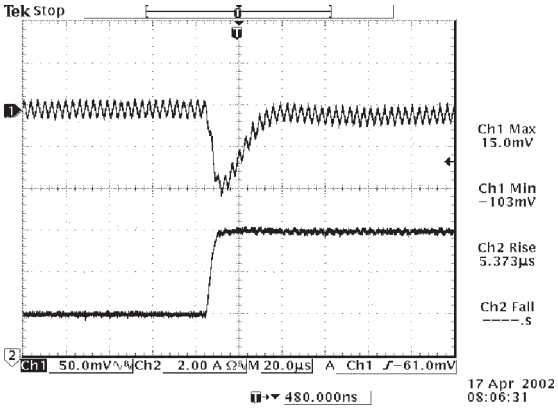
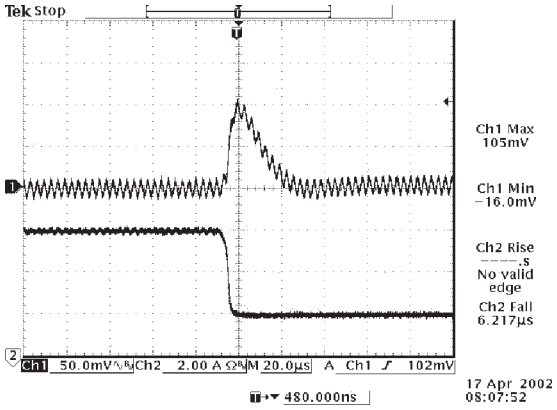
Transient Response

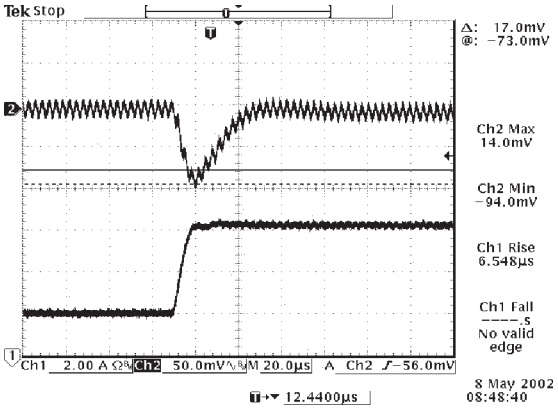
Transient response: di/dt = 0.5A/µS, external load capacitance Co=470µF (Tantalum capacitor)



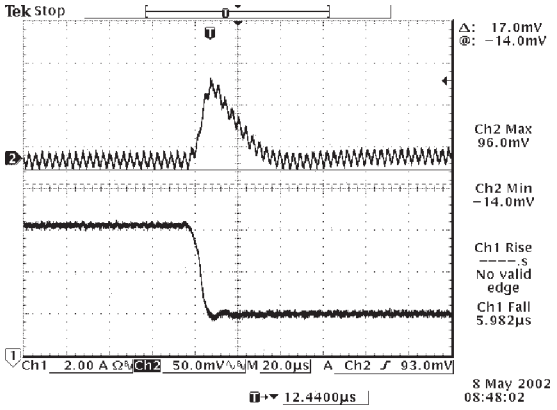
Vout=1.5V
50% to 100% load transients at 3.3V input and Ta=25° C



Vout=1.5V
100% to 50% load transients at 3.3V input and Ta=25° C



Vout=1.2V
50% to 100% load transients at 3.3V input and Ta=25° C



Vout=1.2V
100% to 50% load transients at 3.3V input and Ta=25° C

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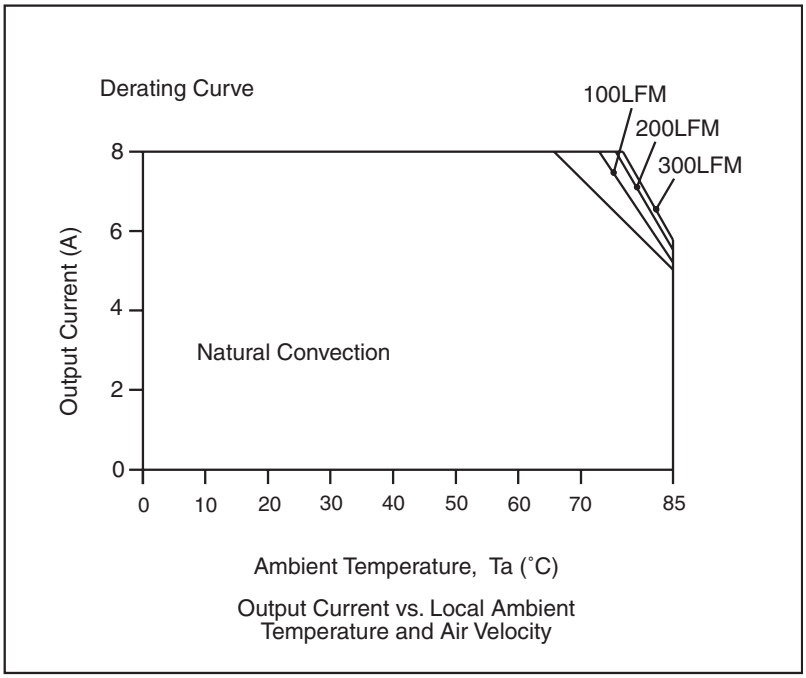
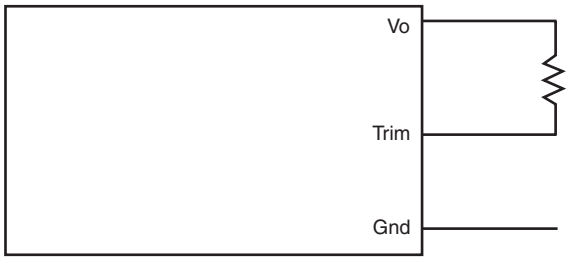
Thermal Considerations



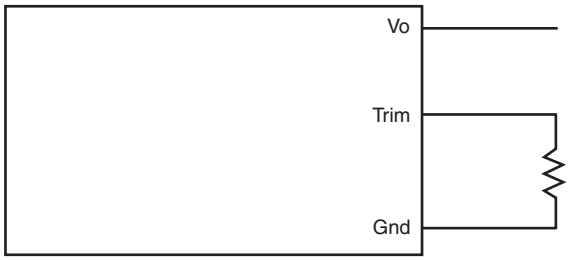
Output Current vs. Local Ambient Temperature and Air Velocity

Output Voltage Set-Point Adjustment

Trim Down Test Circuit



Trim Up Test Circuit



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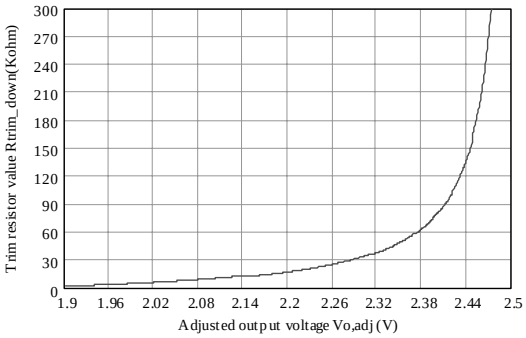
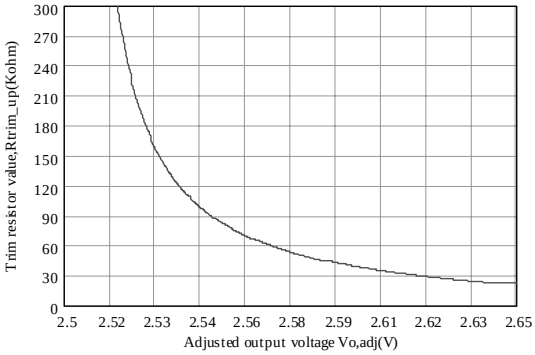
Output Voltage Set-Point Adjustment

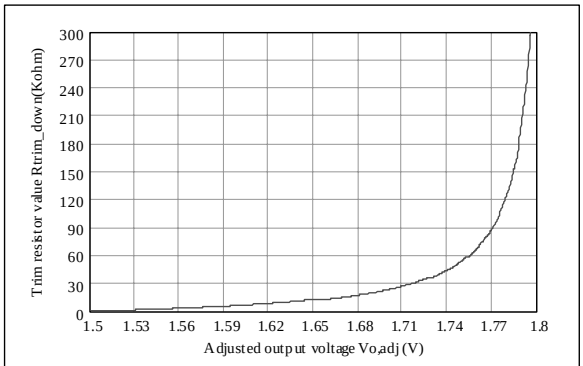
S7DB-08C250 Trim Resistor Calculation

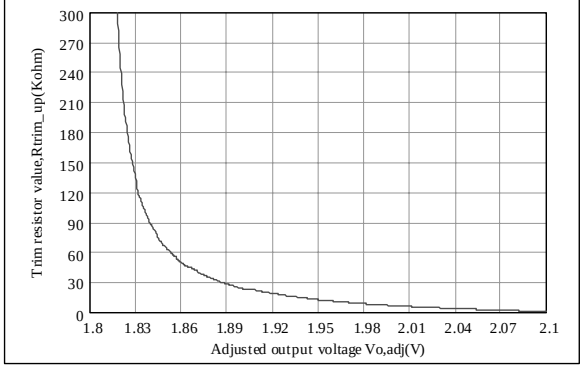
$$\text{Rtrim down} = \left(\frac{9.590}{Vo - Vo,\ adj} - 14.29\right) \text{Kohm}$$

$$\text{Rtrim up} = \left(\frac{4.504}{Vo,\ adj - Vo} - 8.66\right) \text{Kohm}$$









S7DB-08C180 Trim Resistor Calculation

$$\text{Rtrim down} = \left(\frac{3.869}{Vo - Vo,\ adj} - 12.5\right) \text{Kohm}$$

$$\text{Rtrim up} = \left(\frac{3.072}{Vo,\ adj - Vo} - 8.66\right) \text{Kohm}$$

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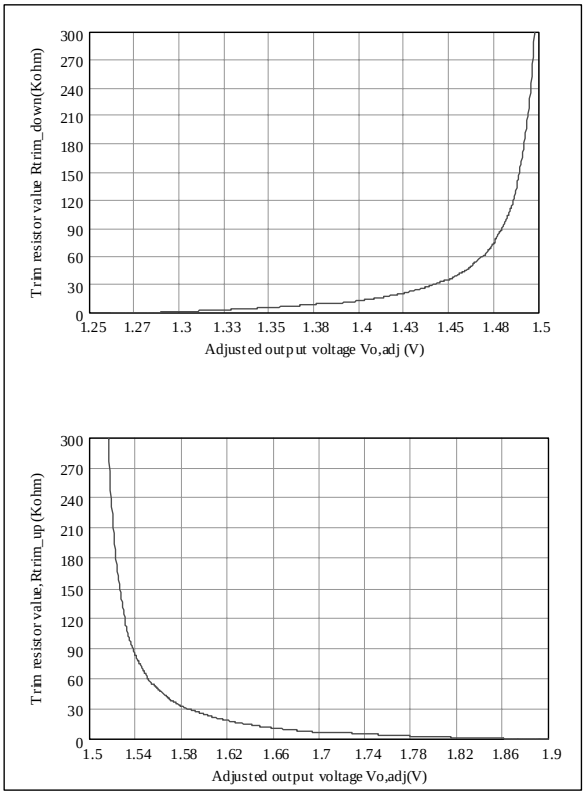
Output Voltage Set-Point Adjustment

S7DB-08C150 Trim Resistor Calculation

$$\text{Rtrim down} = \left(\frac{2.712}{\text{Vo} - \text{Vo, adj}} - 12.5\right) \text{Kohm}$$

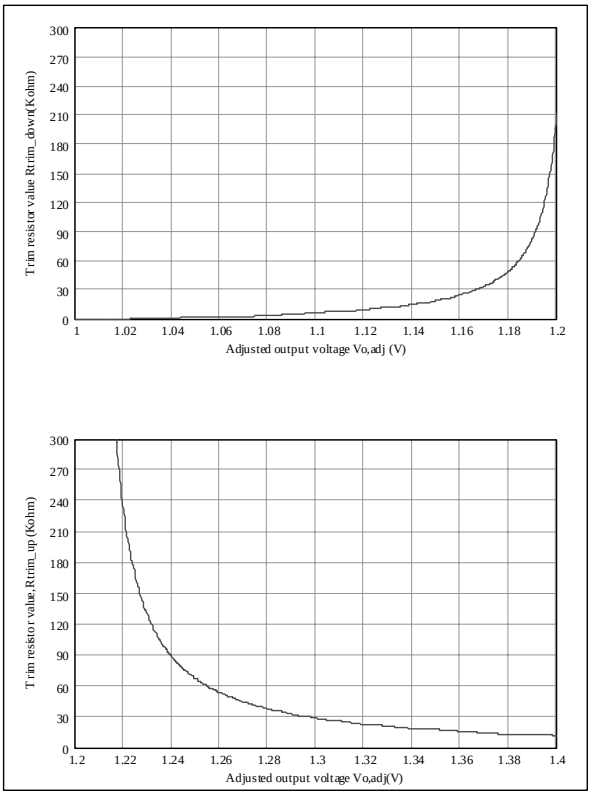
$$\text{Rtrim up} = \left(\frac{3.072}{\text{Vo, adj} - \text{Vo}} - 8.66\right) \text{Kohm}$$



S7DB-08C120 Trim Resistor Calculation

$$\text{Rtrim down} = \left(\frac{1.562}{\text{Vo} - \text{Vo, adj}} - 8.48\right) \text{Kohm}$$

$$\text{Rtrim up} = \left(\frac{3.072}{\text{Vo, adj} - \text{Vo}} - 4.64\right) \text{Kohm}$$



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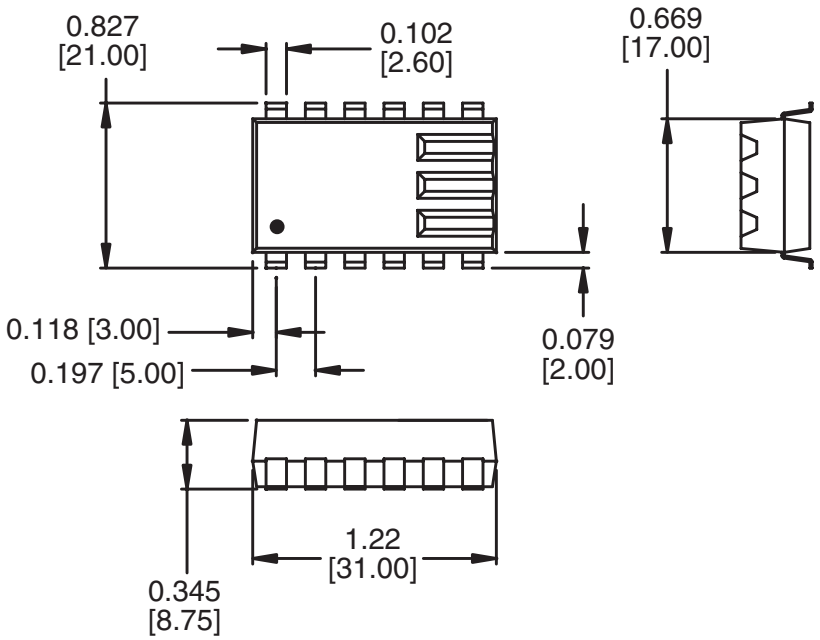
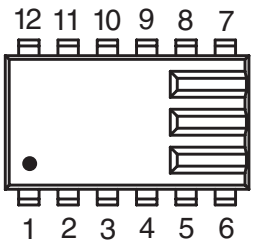
Mechanical



Pin	Function
1	Ground
2	Ground
3	Ground
4	Ground
5	+Vin
6	+Vin
7	Trim
8	Remote On/Off
9	Remote Sense (+)
10	+Vo
11	+Vo
12	+Vo



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

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