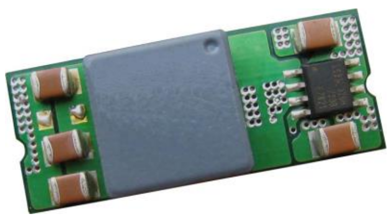
THE DATASHEET OF

SRBC-10A2A0G

SRBC-10A2A
Non-Isolated DC-DC Converter

The Bel SRBC-10A2A modules are a series of non-isolated dc/dc converters that deliver up to 10 A of output current with full load efficiency of 93% at 3.3 VDC output. These modules provide precisely regulated voltage programmable via external resistor from 0.75 to 5.0 VDC over a wide range of input voltage (8.3 - 14 VDC).

These modules have a sequencing feature that enables designers to implement various types of output voltage sequencing when powering multiple voltages on a board. The open-frame construction and small footprint enable designers to develop cost and space-efficient solutions. Standard features include remote on/off, over current protection, short current protection, wide input, and programmable output voltage.



RoHS Compliant

Key Features & Benefits

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Flexible Output Voltage Sequencing
- Remote Sense
- Able to Sink/Source Current
- Under-voltage Lockout (UVLO)
- Over Temperature Protection
- OCP/SCP
- Wide Input
- Wide Trim
- Remote On/Off
- Active Low/High (option)
- Industrial Temperature Range
- Approved to IEC/EN 62368-1
- Approved to CSA/UL 62368-1

Applications

- Networking
- Computers and Peripherals
- Telecommunications

1. MODEL SELECTION

MODEL NUMBER	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
SRBC-10A2ALG SRBC-10A2A0G SRBC-10A2ALR SRBC-10A2A0R	0.75 - 5.0 V	8.3 - 14 V	10 A	50 W	95%

PART NUMBER EXPLANATION

S	R	BC	-	10	A	2A	x	y
Mounting Type	RoHS Status	Series Name		Output Current	Input Range	Output Voltage	Active Logic	Package Type
Surface Mount	RoHS	Bobcat		10 A	8.3 - 14 V	0.75 - 5.0 V	L – Active Low 0 – Active High	G - Tray Package R - Tape & Reel Package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Voltage (Continuous)		-0.3	-	15	V
Output Enable Terminal Voltage		-0.3	-	15	V
Sequencing Voltage [1]		-0.3		Vin	V
Ambient Temperature		-40	-	85	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	2000	m

NOTE: Ratings used beyond the maximum ratings may cause a reliability degradation of the converter or may permanently damage the device.

[1] SRBC-10A2A series of modules include a sequencing feature that enables users to implement various types of output voltage sequencing in their applications. This is accomplished via an additional sequencing pin. When the sequencing feature is not used, tie the SEQ pin to Vin or leave it unconnected.

3. INPUT SPECIFICATIONS

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

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Input Voltage	Vo, set ≤ 3.63 V	8.3	12	14	V
	Vo, set > 3.63 V	8.3	12	13.2	V
Input Current (full load)	An input line fuse must always be used.	-	-	6.5	A
Input Current (no load)		-	50	-	mA
Remote Off Input Current		-	2	-	mA
Input Reflected Ripple Current (pk-pk)	Tested with one 1000 µF/25 V AL input capacitor with ESR = 0.03 ohm max and 4 × 47 µF/16 V tan capacitors with ESR = 0.013 ohm max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.	-	-	400	mA
Input Reflected Ripple Current (rms)		-	-	150	mA
I^2t Inrush Current Transient		-	0.04	0.08	A^2s
Turn-on Voltage Threshold		-	8.2	-	V
Turn-off Voltage Threshold		-	7.9	-	V

4. OUTPUT SPECIFICATIONS

All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

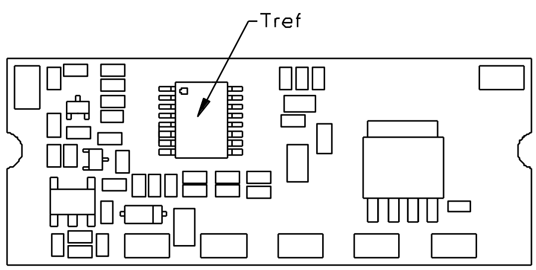
PARAMETER	DESCRIPTION		MIN	TYP	MAX	UNIT
Output Voltage Set Point	Vin = 12 V, full load		-2%	-	2%	Vo,set
Load Regulation			-	0.1%	-	Vo,set
Line Regulation			-	0.1%	-	Vo,set
Regulation Over Temperature (-40 °C to +85 °C)	Tref = Ta min to Ta max		-	0.3%	-	Vo,set
Output Current Range			0	-	10	A
Current Limit Threshold			-	200% Io	-	A
Short Circuit Surge Transient			-	1	3	A^2s
Ripple and Noise (Pk-Pk)	Tested with 0-20 MHz, with 10 µF tantalum capacitor & 1 µF ceramic capacitor		-	50	100	mV
Ripple and Noise (RMS)			-	20	40	mV
Turn on Time			-	6	10	ms
Overshoot at Turn on			-	-	1%	Vo,set
Output Capacitance			-	-	5000	µF
Transient Response						
△V 50%~100% of Max Load	Vo = 0.75 - 5 V	di/dt = 2.5 A/µs; Vin = 12 V; and with 2 × 150 µF polymer capacitors at the output	-	100	-	mV
Settling Time			-	50	-	µs
△V 100%~50% of Max Load			-	100	-	mV
Settling Time			-	50	-	µs

5. GENERAL SPECIFICATIONS

All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Vo = 5.0 V	Measured at Vin = 12 V, full load	-	95%	-	-
	Vo = 3.3 V		-	93%	-	
	Vo = 2.5 V		-	92%	-	
	Vo = 1.8 V		-	90%	-	
	Vo = 1.5 V		-	89%	-	
	Vo = 1.2 V		-	87.5%	-	
	Vo = 0.75 V		-	81%	-	
Switching Frequency			265	300	335	kHz
Over Temperature Shutdown [1]			-	130	-	°C
Output Voltage Trim Range			0.7525	-	5.0	V
Remote Sense Compensation			-	-	0.5	V
MTBF		Calculated Per Bell Core SR-332 (Io = 80% load; Vo = 5 V; Vin = 12 V; Ta = 25°C)	-	4,982,651	-	hour
Weight			-	8	-	g
Dimensions (L × W × H)				1.30 x 0.53 x 0.315		inch
				33.02 x 13.46 x 8.00		mm

NOTE: [1] The Tref temperature measurement location:



6. CONTROL SPECIFICATIONS

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Remote on/off						
Signal Low (Unit Off)		SRBC-10A2A0; Remote On/Off pin open, Unit on	-0.2	-	0.3	V
Signal High (Unit On)			-	-	Vin, max	V
Signal Low (Unit On)		SRBC-10A2AL; Remote On/Off pin open, Unit on.	-0.2	-	0.3	V
Signal High (Unit Off)			2.5	-	Vin, max	V
Voltage Sequencing						
Sequencing Delay Time		Delay from Vin, min to application of voltage on SEQ pin	10	-	-	ms
Sequencing Slew Rate Capability		Vinmin to Vinmax; Iomin to Iomax; Vseq < Vo	-	-	2	V/ms
Tracking Accuracy	Power-Up		-	100	200	mV
	Power-Down		-	300	500	mV

7. EFFICIENCY DATA

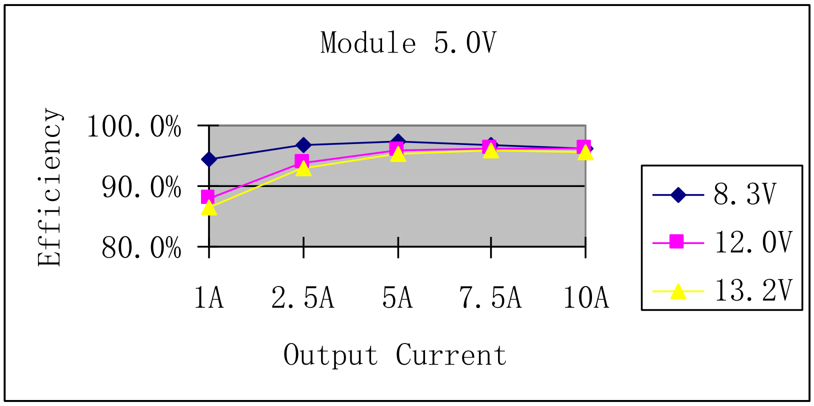


Figure 1. Vo = 5.0 V

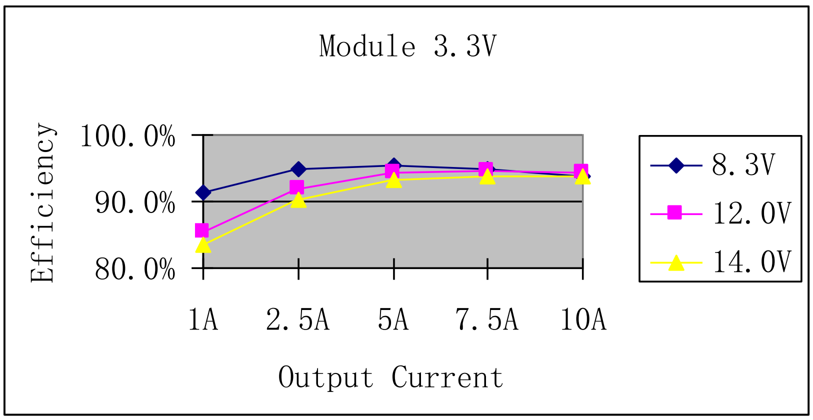


Figure 2. Vo = 3.3 V

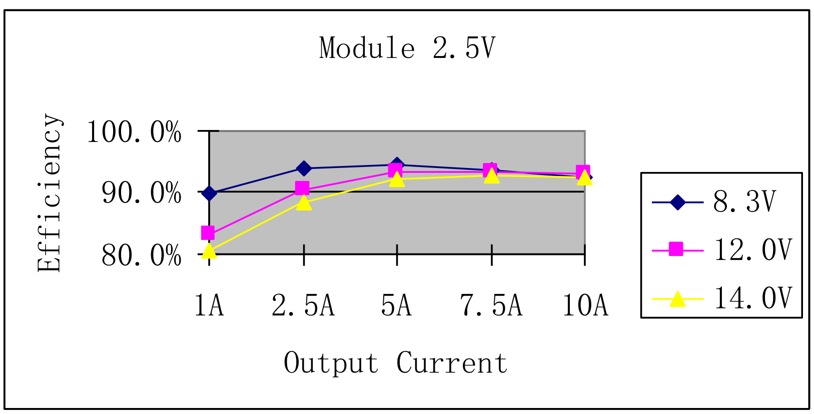


Figure 3. Vo = 2.5 V

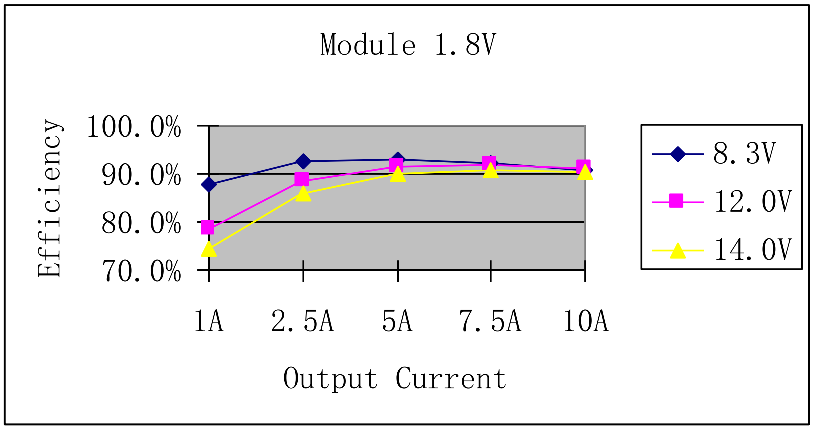


Figure 4. Vo = 1.8 V

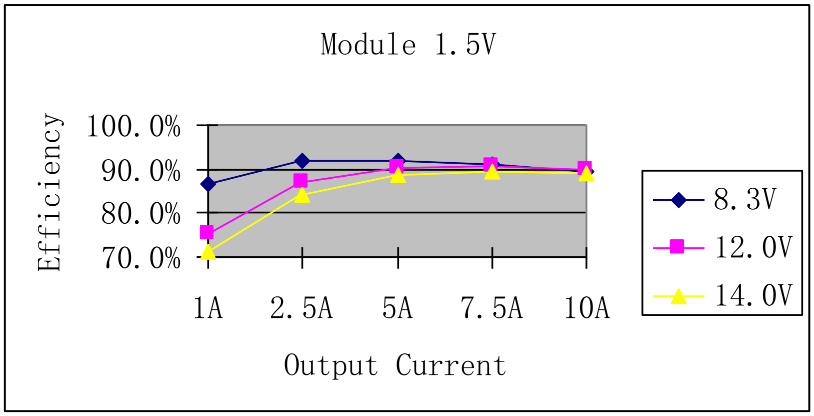


Figure 5. Vo = 1.5 V

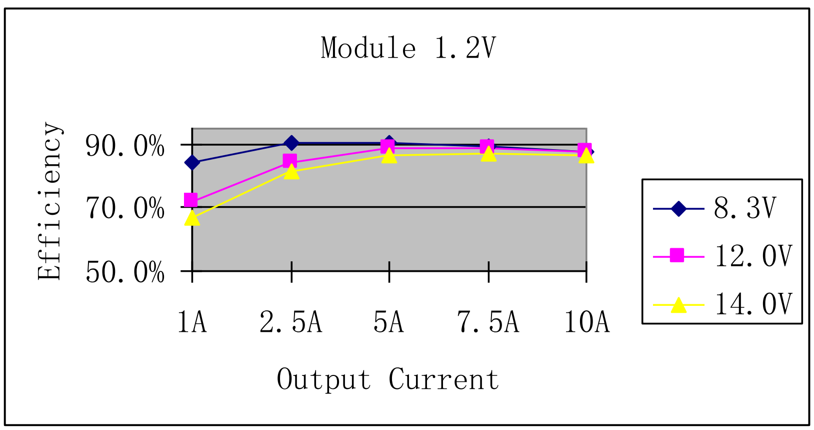


Figure 6. Vo = 1.2 V

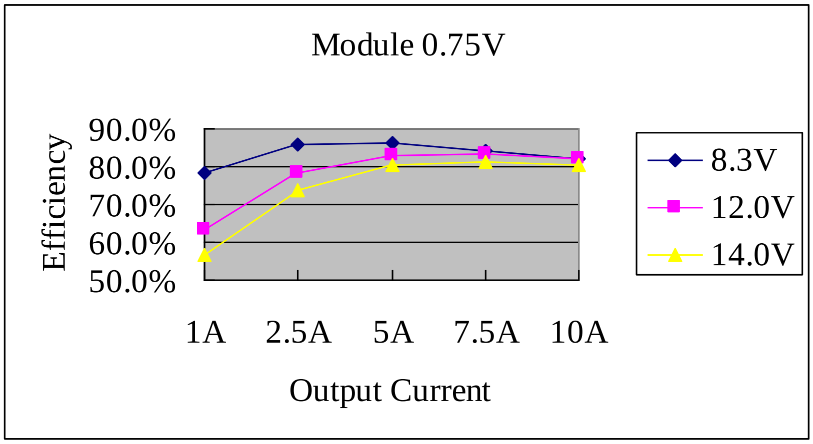


Figure 7. Vo = 0.75 V

8. OUTPUT TRIM EQUATIONS

Equation for calculating the trim resistor (in Ω) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trimup} = \frac{10500}{V_{adj} - 0.7525} - 1000$$

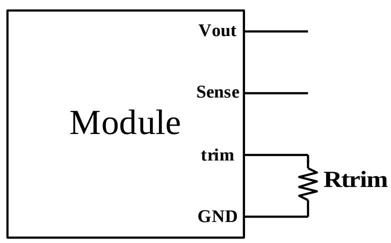


Figure 8. Trim up circuit-1

Equation for calculating the trim voltage (in V) given the desired adjusted voltage (Vadj) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

$$V_{trimup} = 0.7 - 0.0667 \times (V_{adj} - 0.7525)$$

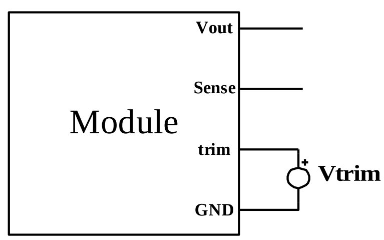


Figure 9. Trim up circuit-2

9. RIPPLE AND NOISE WAVEFORMS

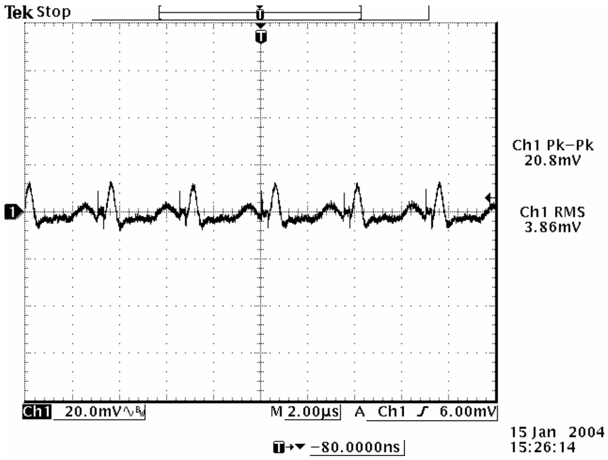


Figure 10. Ripple and noise at max load 0.75 VDC output

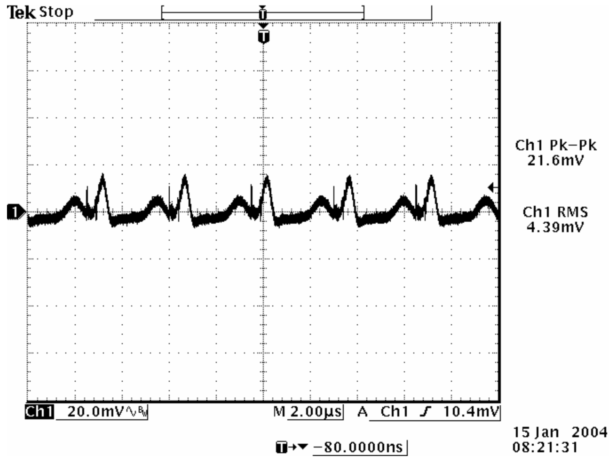


Figure 11. Ripple and noise at max load 1.2 VDC output

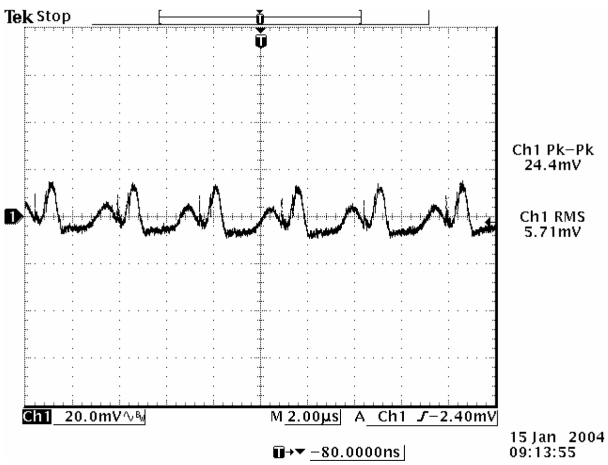


Figure 12. Ripple and noise at max load 1.5 VDC output

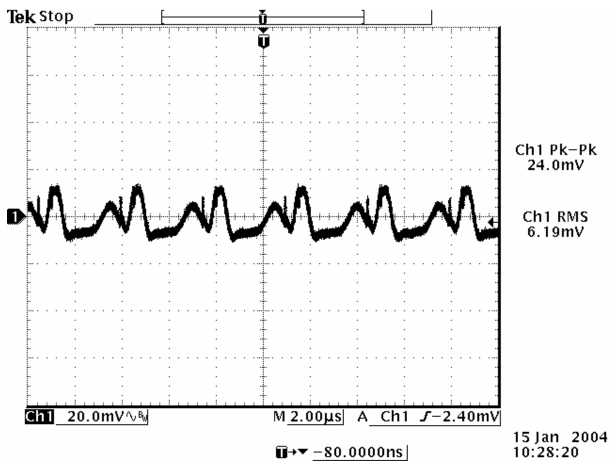


Figure 13. Ripple and noise at max load 1.8 VDC output

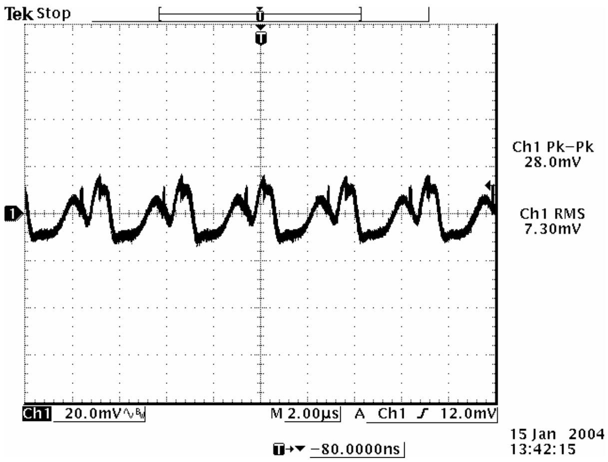


Figure 14. Ripple and noise at max load 2.5 VDC output

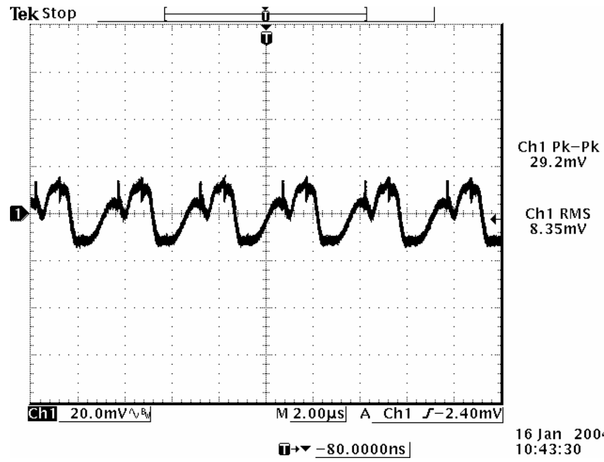


Figure 15. Ripple and noise at max load 3.3 VDC output

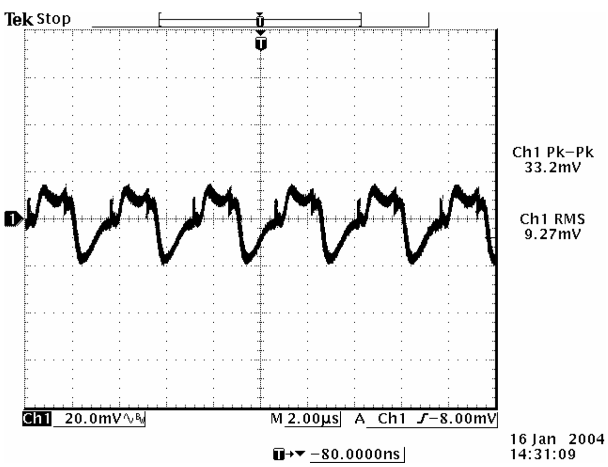


Figure 16. Ripple and noise at max load 5.0 VDC output

Note: Ripple and Noise at 12 V input, with 10 µF tantalum capacitor and 1 µF ceramic capacitor at the output, and Ta = 25°C.

10. TRANSIENT RESPONSE WAVEFORMS

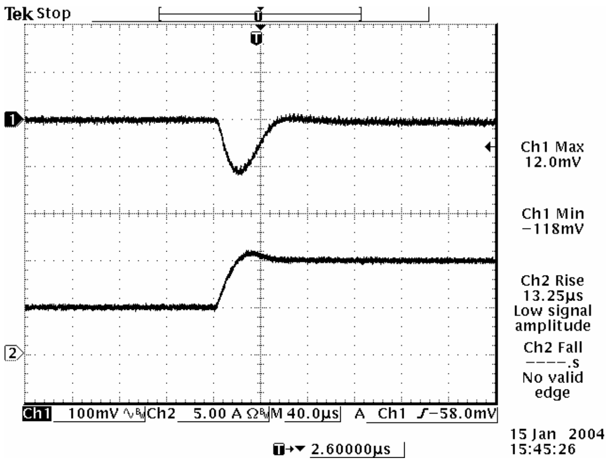


Figure 17. Transients 50% to 100% load 0.75 VDC output

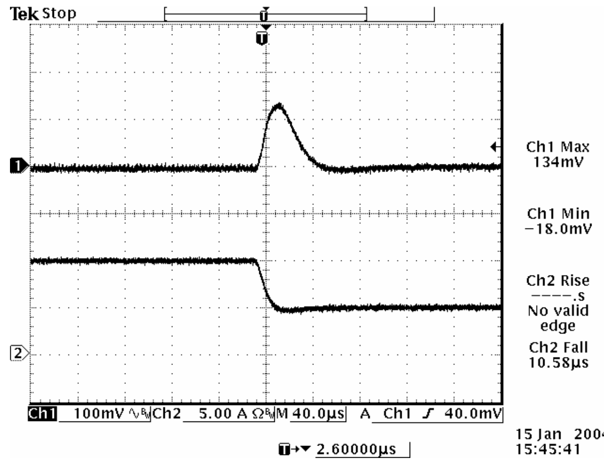


Figure 18. Transients 100% to 50% load 0.75 VDC output

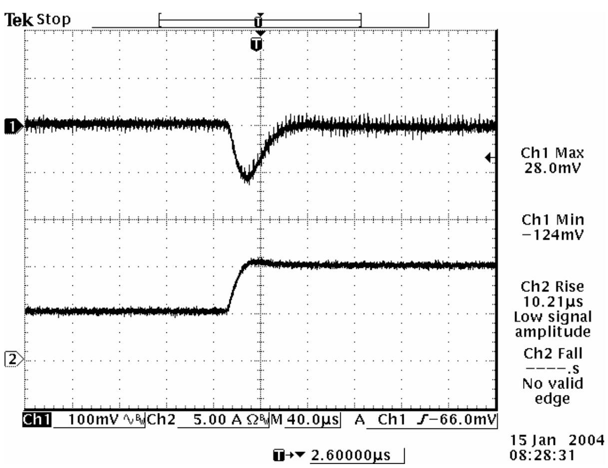


Figure 19. Transients 50% to 100% load 1.2 VDC output

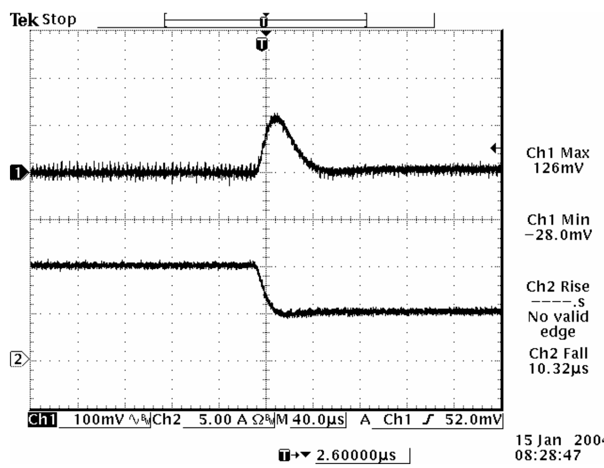


Figure 20. Transients 100% to 50% load 1.2 VDC output

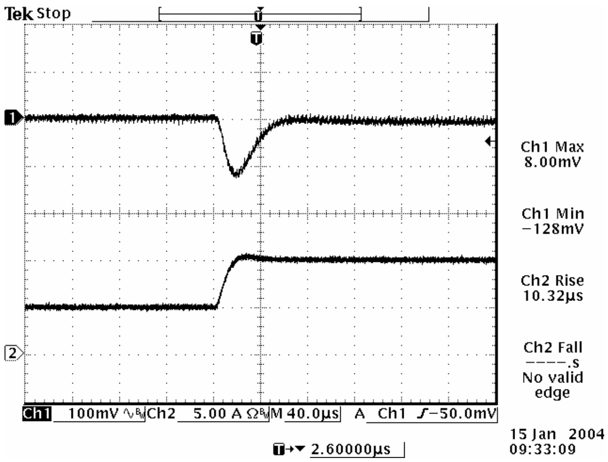


Figure 21. Transients 50% to 100% load 1.5 VDC output

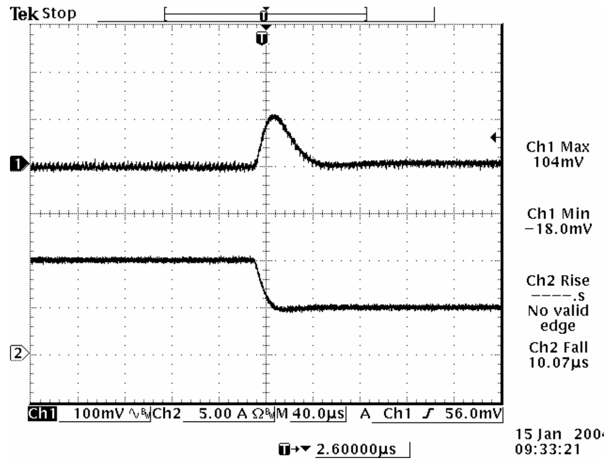


Figure 22. Transients 100% to 50% load 1.5 VDC output

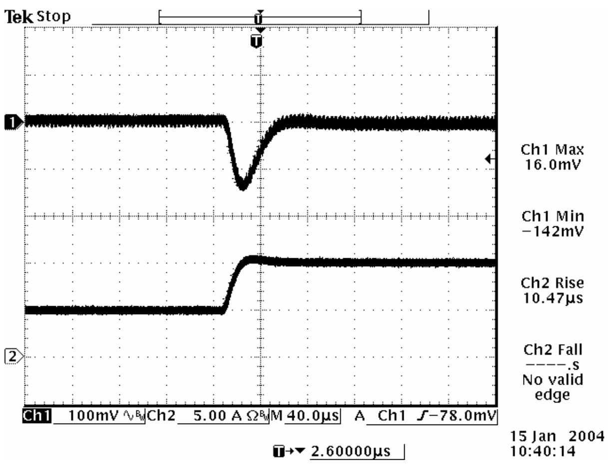


Figure 23. Transients 50% to 100% load 1.8 VDC output

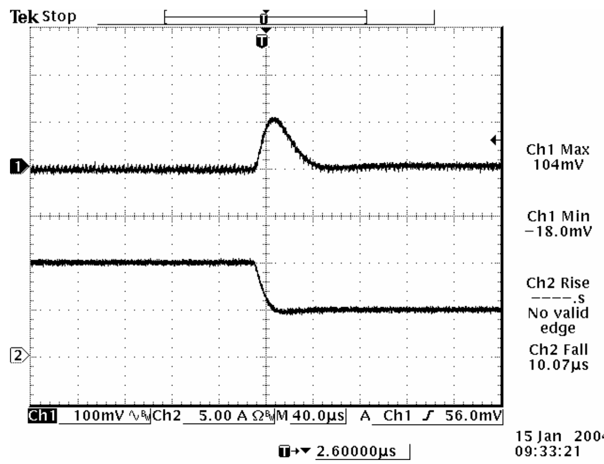


Figure 24. Transients 100% to 50% load 1.8 VDC output

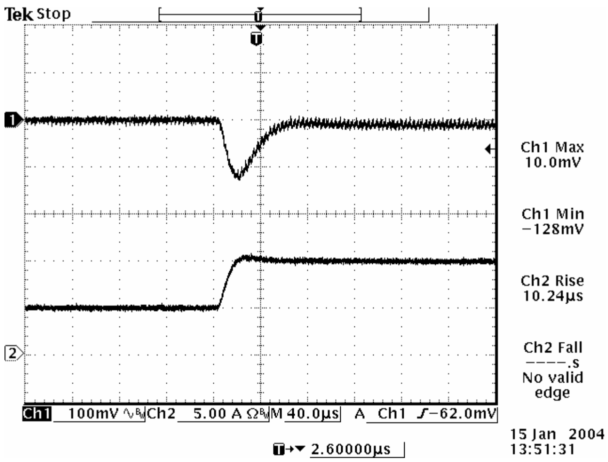


Figure 25. Transients 50% to 100% load 2.5 VDC output

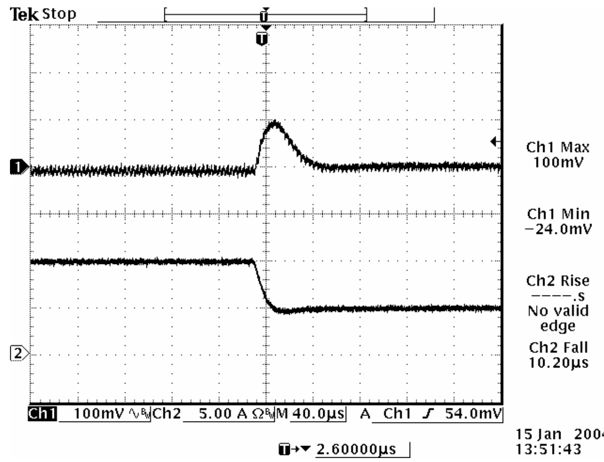


Figure 26. Transients 100% to 50% load 2.5 VDC output

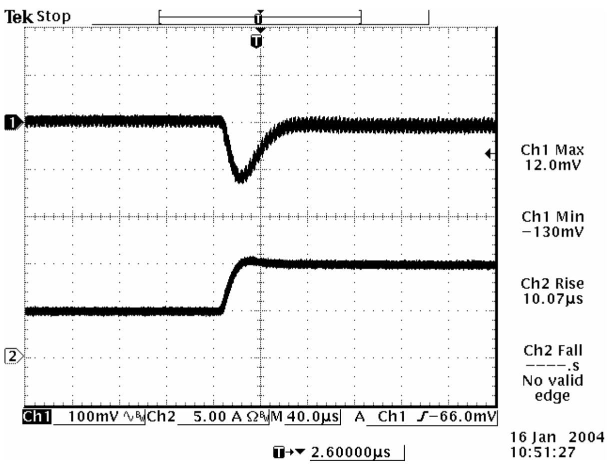


Figure 27. Transients 50% to 100% load 3.3 VDC output

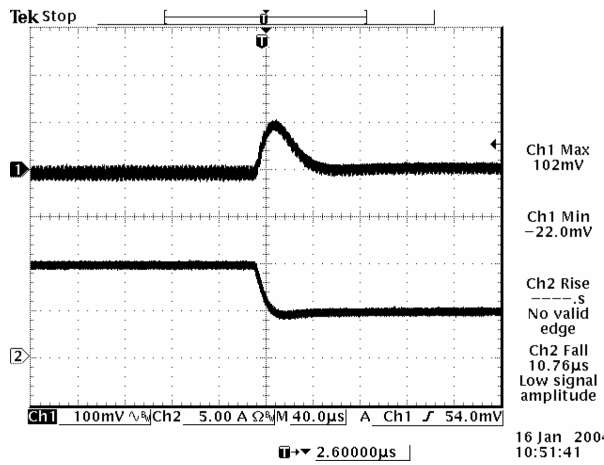


Figure 28. Transients 100% to 50% load 3.3 VDC output

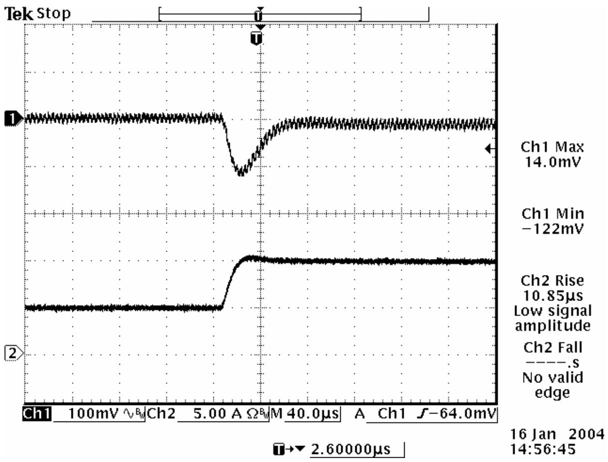


Figure 29. Transients 50% to 100% load 5.0 VDC output

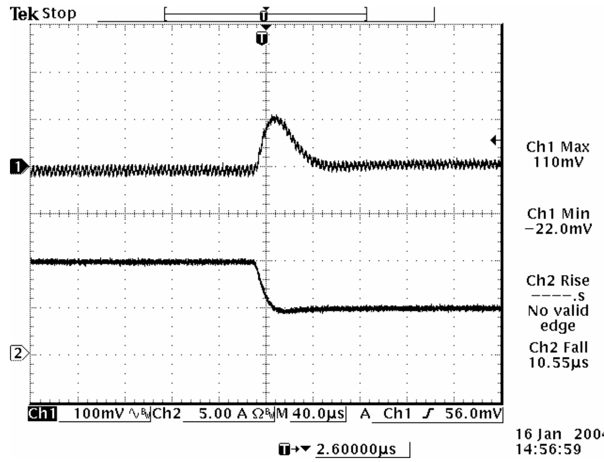


Figure 30. Transients 100% to 50% load 5.0 VDC output

Note: Transient response at 12 V input, di/dt = 2.5 A/µs, with external 2 x 150 µF polymer capacitor at the output, Ta = 25°C.

11. THERMAL DERATING CURVE

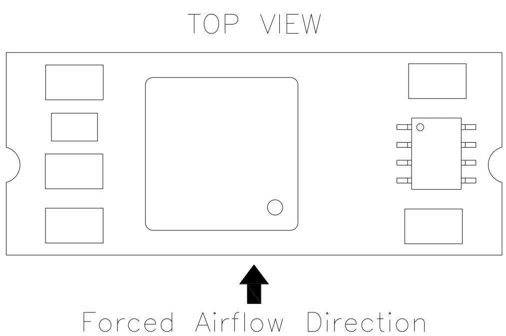


Figure 31. Airflow direction

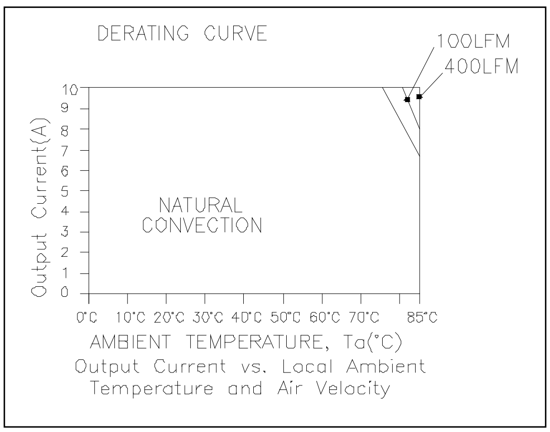


Figure 32. Vo = 0.75 V

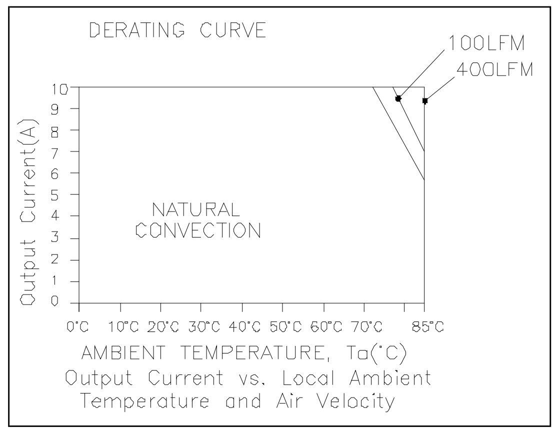


Figure 33. Vo = 1.8 V

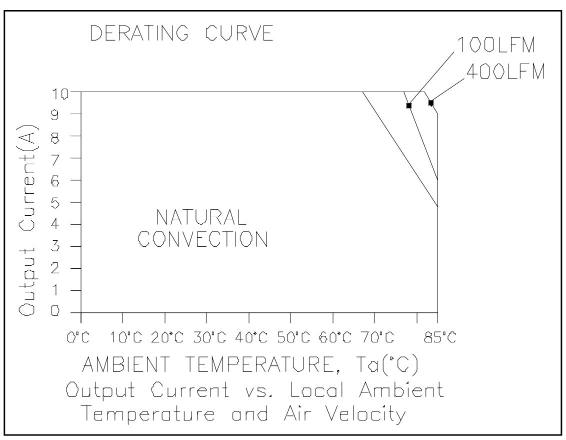


Figure 34. Vo = 3.3 V

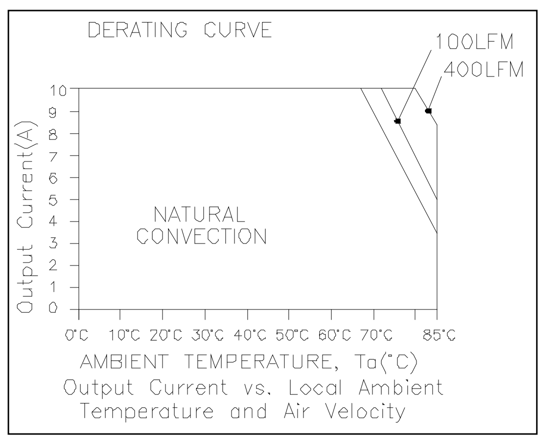


Figure 35. Vo = 5.0 V

12. MECHANICAL DIMENSIONS

OUTLINE

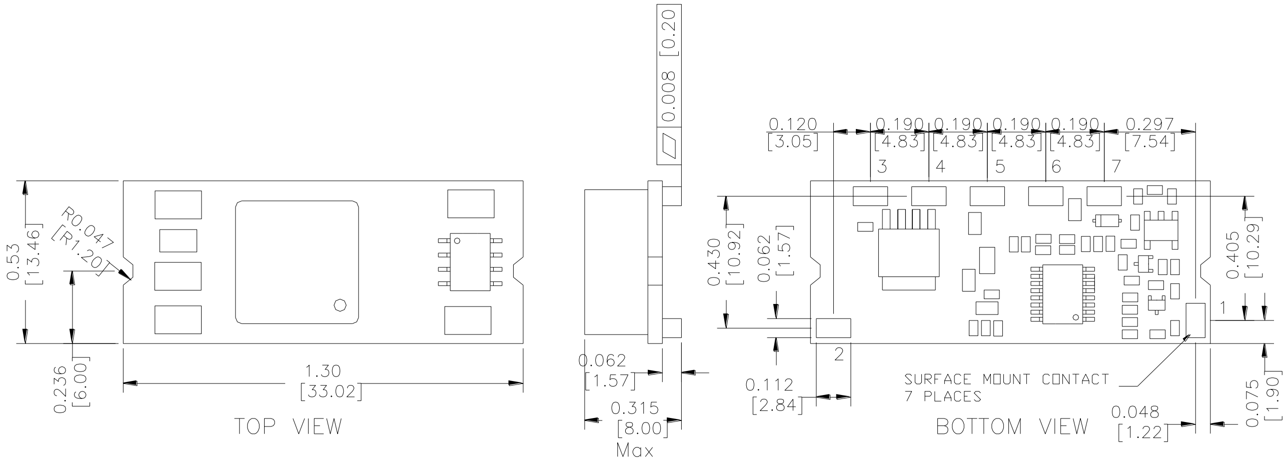


Figure 36. Outline

Note: These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 245 °C.

Notes:

1) All Pins: Material - Copper Alloy;
   Finish - Gold plated.
2) Un-dimensioned components are shown for visual reference only.
3) All dimensions in inch [mm]; Tolerances: x.xx +/-0.02 inch [0.51 mm]. x.xxx +/-0.010 inch [0.25 mm].

PIN DEFINITIONS

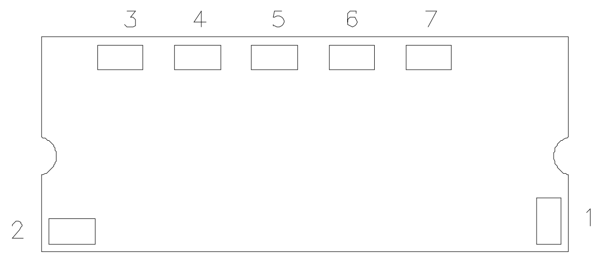
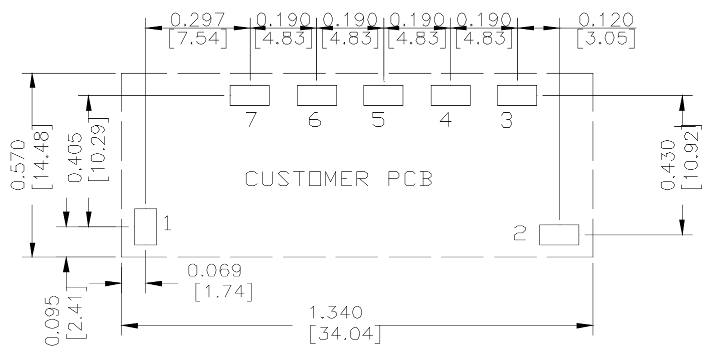


Figure 37. Pins

PIN	FUNCTION	PIN	FUNCTION
1	Remote On/Off	5	Vout (+)
2	Vin (+)	6	Trim
3	SEQ	7	Remote Sense
4	Ground		

RECOMMENDED PAD LAYOUT



PAD SIZE:
MIN: 0.14"* 0.095" (3.56mm * 2.41mm)
MAX: 0.165"* 0.11" (4.19mm * 2.79mm)

Figure 38. Recommended pad layout

13. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2007-01-16	AA	First release.	Lynn
2011-08-25	AB	Update the reflow solder temperature.	HL.Lu
2013-01-25	AC	Update UL.	HL.Lu
2015-01-06	AD	Update MD.	XF.Jiang
2021-07-29	AE	Add object ID and thermal test airflow direction. Update to new form. Update safety certificate.	XF.Jiang

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.
TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.

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