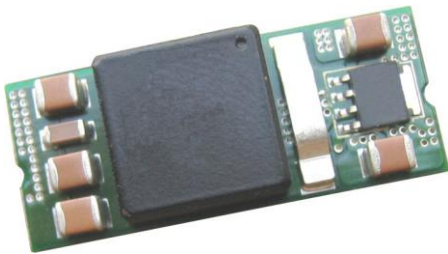


SRBC-16A1A

Non-Isolated DC-DC Converter

The Bel SRBC-16A1A modules are a series of non-isolated DC/DC converters that deliver up to 16 A of output current with full load efficiency of 92% at 3.3 VDC output. These modules provide precisely regulated voltage programmable via external resistor from 0.75 VDC to 5.0 VDC over a wide range of input voltage (8.4 -14 VDC).

The open-frame construction and small footprint enable designers to develop cost and space-efficient solutions. Standard features include remote on/off, remote sense, over current protection, short current protection, and programmable output voltage.



Key Features & Benefits

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Flexible Output Voltage
- 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-16A1ALG	0.75 - 5.0 V	8.3 - 14 V	16 A	80 W	94%
SRBC-16A1A0G					
SRBC-16A1ALR					
SRBC-16A1A0R					

PART NUMBER EXPLANATION

S	R	BC	-	16	A	1A	x	y
Mounting Type	RoHS Status	Series Name		Output Current	Input Range	Output Voltage	Active Logic	Package Type
Surface Mount	RoHS	Bobcat		16 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
Ambient Temperature		-40	-	85	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	2000	m

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

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)	This power module is not internally fused. An input line fuse must always be used.	-	-	11	A
Input Current (no load)		-	100	-	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 Ω max and 6 × 47 µF/16 V tantalum capacitors with ESR = 0.013 Ω max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.	-	70	200	mA
Input Reflected Ripple Current (rms)		-	-	150	mA
I ² t Inrush Current Transient		-	0.2	0.4	A²s
Turn-on Voltage Threshold		-	8.0	-	V
Turn-off Voltage Threshold		-	7.5	-	V

4. OUTPUT SPECIFICATIONS

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

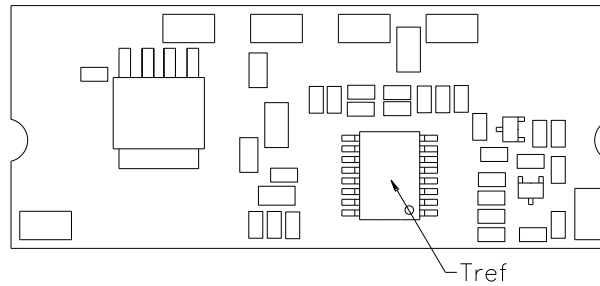
PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT	
Output Voltage Set Point	$V_{in} = 12\text{ V}$, full load.	-2%	-	2%	$V_{o,set}$	
Output Voltage Set Point	Over entire operating input voltage range, resistive load, and temperature conditions.	-3%	-	3%	$V_{o,set}$	
Load Regulation	$I_o = I_o$, min to I_o , max	-	0.1%	-	$V_{o,set}$	
Line Regulation	$V_{in} = V_{in}$, min to V_{in} , max	-	0.1%	-	$V_{o,set}$	
Regulation Over Temperature (-40 °C to +85 °C)	$T_{ref} = T_a$,min to T_a ,max	-	0.3%	-	$V_{o,set}$	
Output Current Range		0	-	16	A	
Current Limit Threshold		-	180% I_o	-	A	
Short Circuit Surge Transient		-	1	3	A ² s	
Ripple and Noise (Pk-Pk)	Tested with 0-20 MHz, 10 μF tantalum capacitor & 1 μF TDK ceramic capacitor at the output	-	75	100	mV	
Ripple and Noise (RMS)		-	30	45	mV	
Turn on Time		-	6	10	ms	
Overshoot at Turn on		-	-	1%	$V_{o,set}$	
Output Capacitance	$ESR \geq 10\text{ m}\Omega$	0	-	5000	μF	
<i>Transient Response</i>						
ΔV 50%~100% of Max Load	$V_o = 0.75 - 5\text{ V}$	$di/dt = 2.5\text{ A}/\mu\text{s}$; $V_{in} = 12\text{ V}$; and with $2 \times 150\text{ }\mu\text{F}$ polymer capacitors at the output	-	100	-	mV
Settling Time			-	50	-	μs
ΔV 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	-	94%	-	
	Vo = 3.3 V	-	92%	-	
	Vo = 2.5 V	-	90%	-	
	Vo = 1.8 V	-	88%	-	-
	Vo = 1.5 V	-	87%	-	
	Vo = 1.2 V	-	85%	-	
	Vo = 0.75 V	-	79%	-	
Switching Frequency		265	300	335	kHz
Over Temperature Shutdown ¹		-	130	-	°C
Output Trim Range (Wide Trim)		0.7525	-	5.0	V
Remote Sense Compensation		-	-	0.5	V
MTBF		-	2,666,488	-	hour
Weight		-	8	-	g
Dimensions (L x W x 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
<i>Remote on/off</i>					
Signal Low (Unit Off)	SRBC-16A1A0; Remote On/Off pin open, Unit on.	-0.2	-	0.3	V
Signal High (Unit On)		1.0	-	Vin, max	V
Signal Low (Unit On)	SRBC-16A1AL; Remote On/Off pin open, Unit on.	-0.2	-	0.3	V
Signal High (Unit Off)		2.5	-	Vin, max	V

7. REMOTE ENABLE SPECIFICATIONS

The SRBC-16A1AL modules feature an enable pin with negative logic. If not using the enable pin, leave the pin open (the module will be on). During logic_high, the module is turned off, during logic_low, the module is turned on. Its inner circuit impedance is showed as figure.

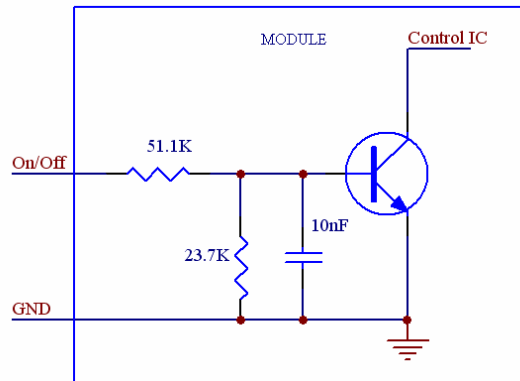


Figure 1. SRBC-16A1AL

The SRBC-16A1A0 modules feature an enable pin with Positive logic. If not using the enable pin, leave the pin open (the module will be on). During logic_high, the module is turned on, during logic_low, the module is turned off. Its inner circuit impedance is showed as figure.

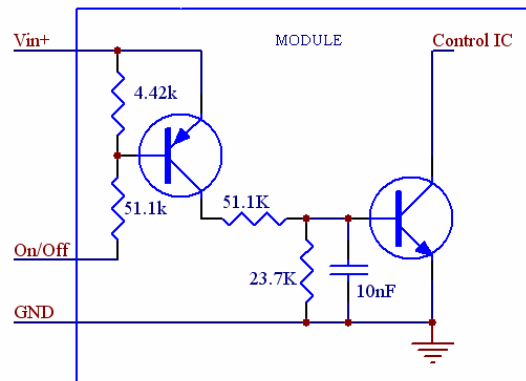


Figure 2. SRBC-16A1A0

8. EFFICIENCY DATA

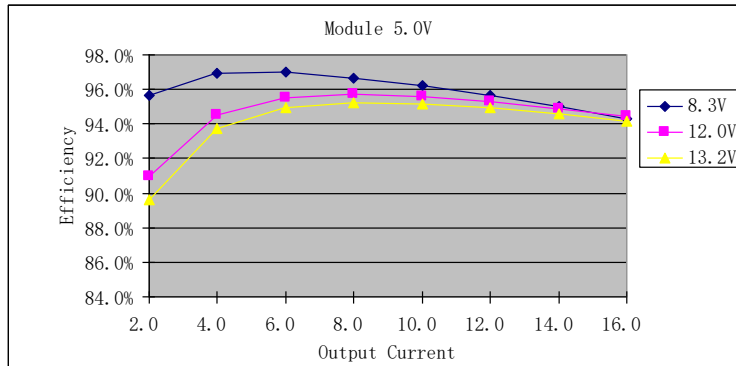


Figure 3. $V_o = 5.0\text{ V}$

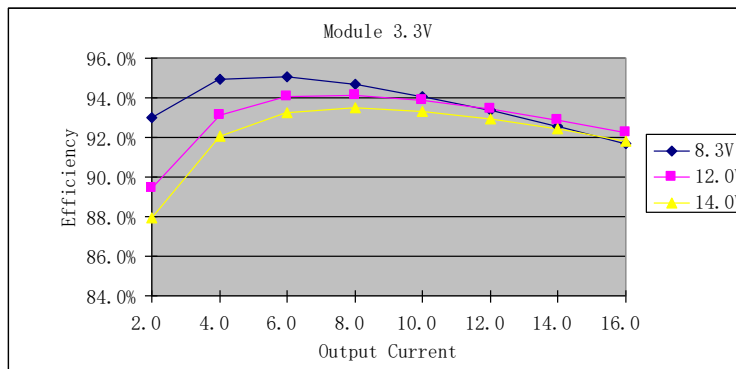


Figure 4. $V_o = 3.3\text{ V}$

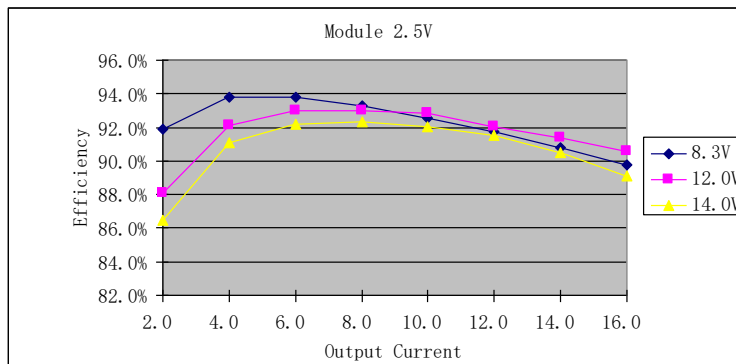
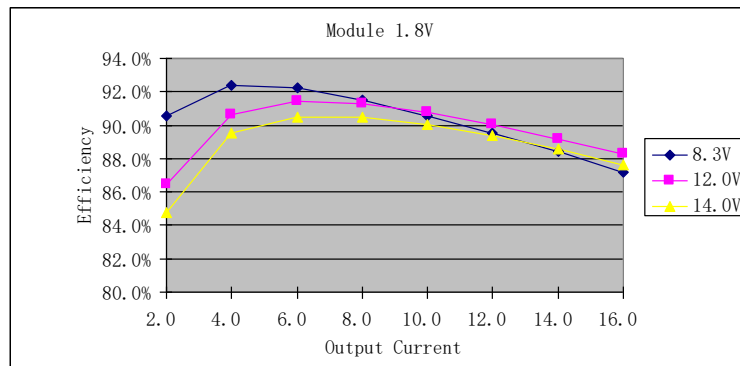
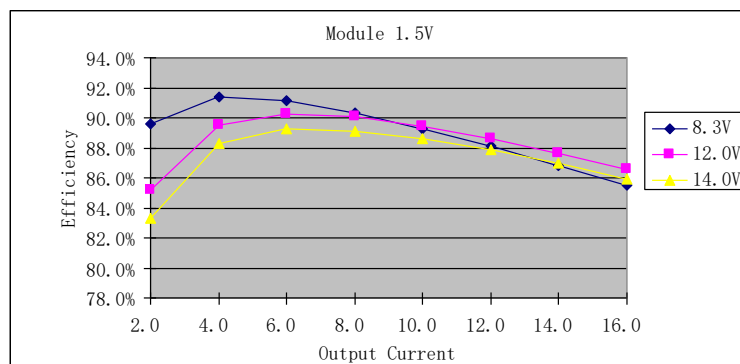
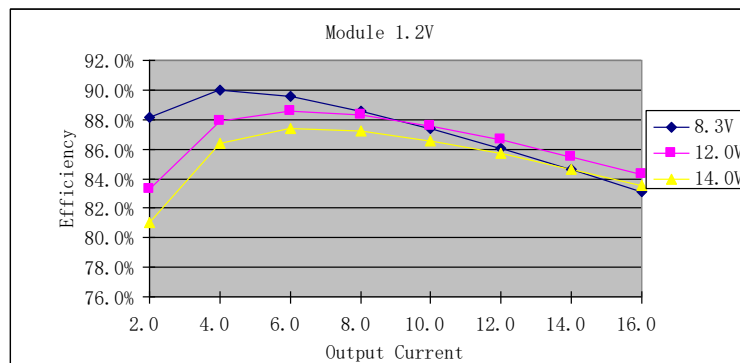
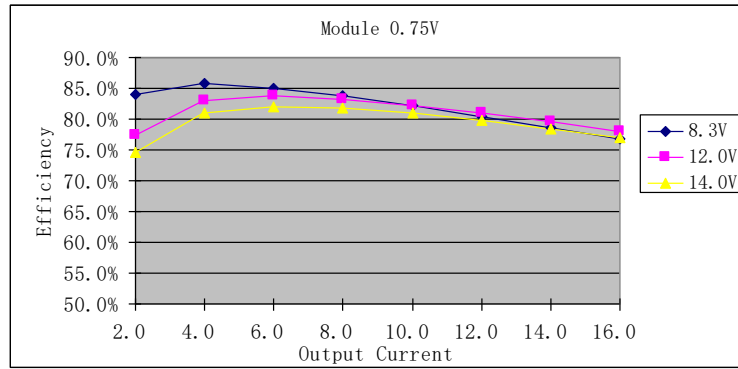


Figure 5. $V_o = 2.5\text{ V}$

Figure 6. $V_o = 1.8\text{ V}$ Figure 7. $V_o = 1.5\text{ V}$ Figure 8. $V_o = 1.2\text{ V}$

Figure 9. $V_o = 0.75\text{ V}$

9. OUTPUT TRIM EQUATIONS

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

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

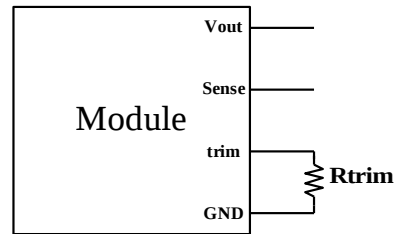


Figure 10. Trim up circuit-1

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

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

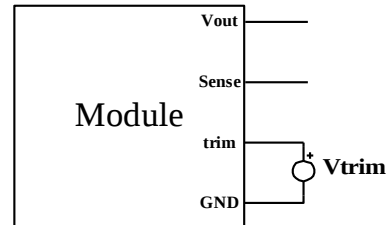


Figure 11. Trim up circuit-2

10. RIPPLE AND NOISE WAVEFORMS

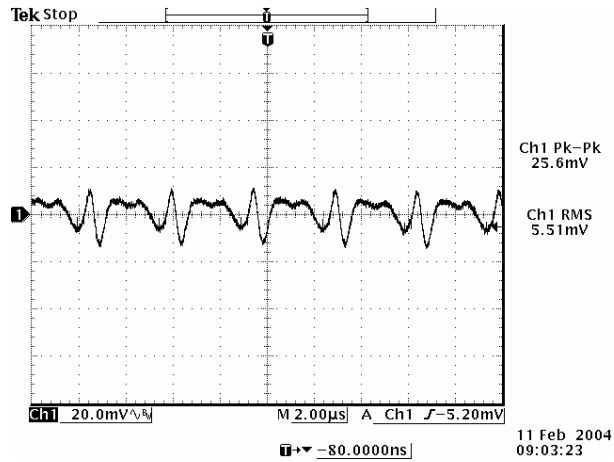


Figure 12. Ripple and noise at max load 0.75 VDC output

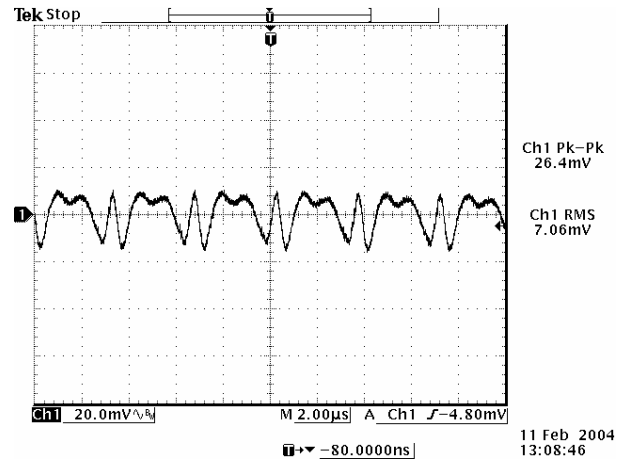


Figure 13. Ripple and noise at max load 1.2 VDC output

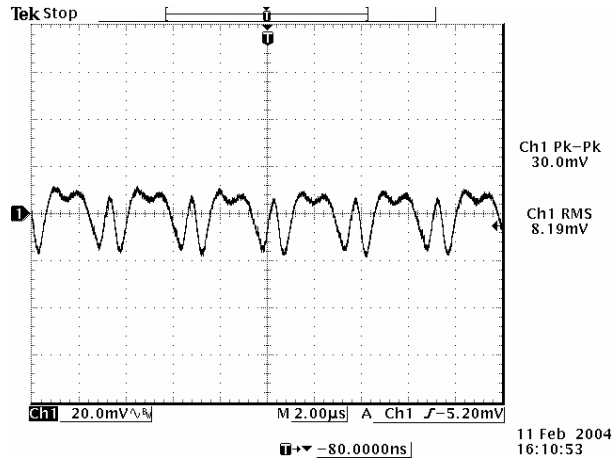


Figure 14. Ripple and noise at max load 1.5 VDC output

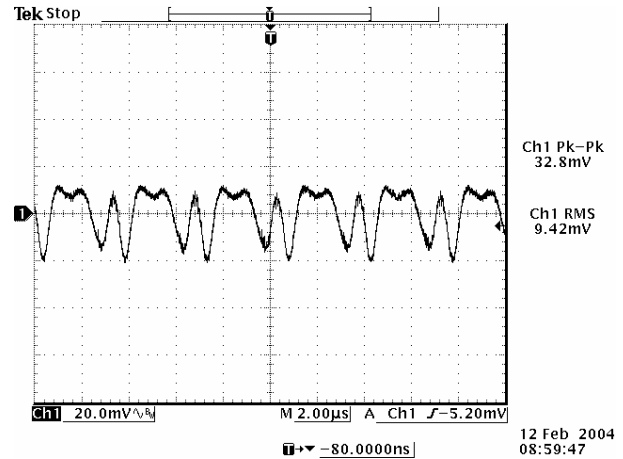


Figure 15. Ripple and noise at max load 1.8 VDC output

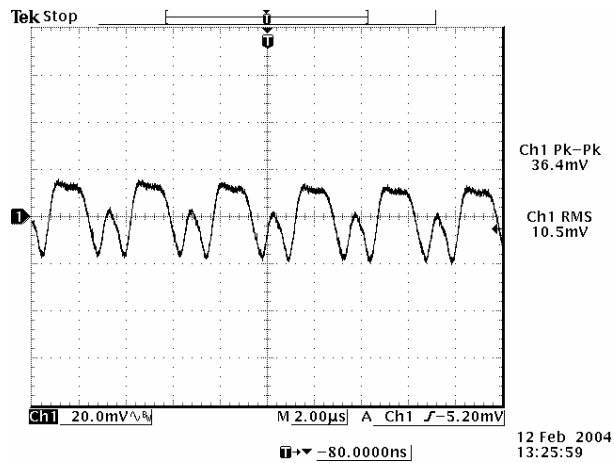


Figure 16. Ripple and noise at max load 2.5 VDC output

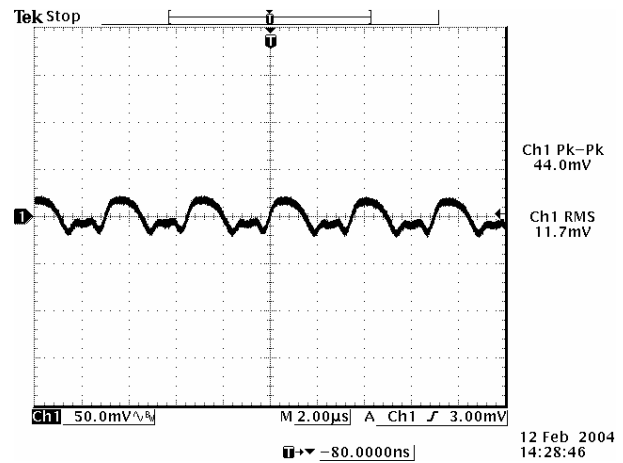


Figure 17. Ripple and noise at max load 3.3 VDC output

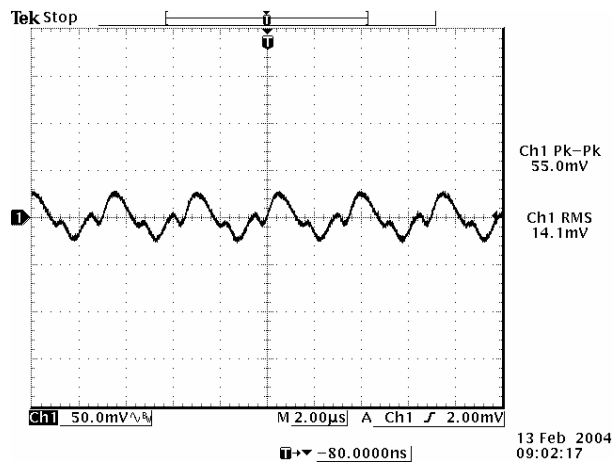


Figure 18. Ripple and noise at max load 5.0 VDC output

Note: Ripple and Noise at 12 V input, with 10 μ F tantalum capacitor and 1 μ F ceramic capacitor at the output, and $T_a = 25^\circ\text{C}$.

11. TRANSIENT RESPONSE WAVEFORMS

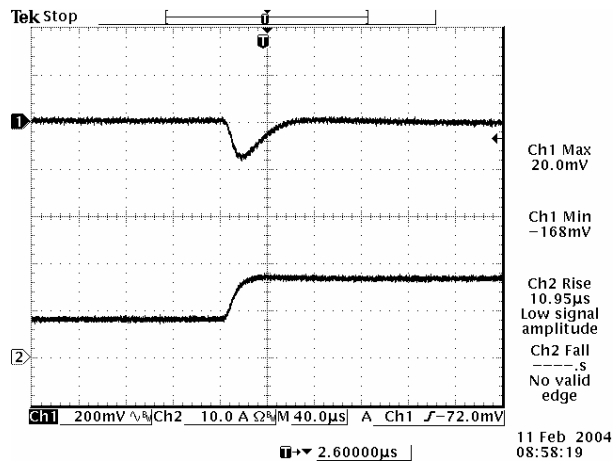


Figure 19. Transients 50% to 100% load 0.75 VDC output

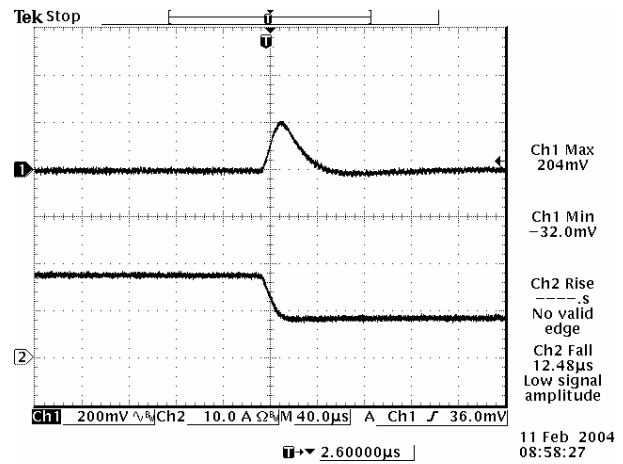


Figure 20. Transients 100% to 50% load 0.75 VDC output

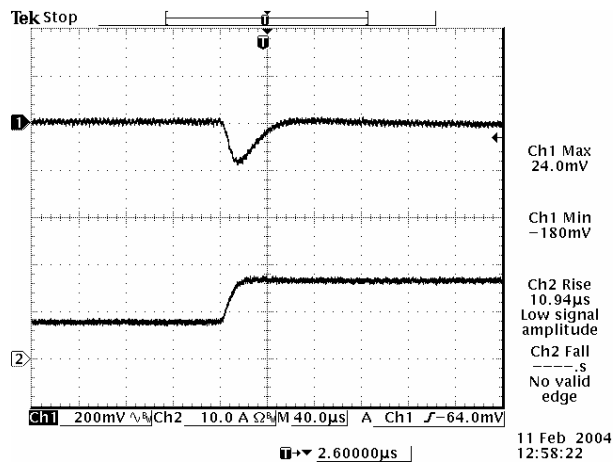


Figure 21. Transients 50% to 100% load 1.2 VDC output

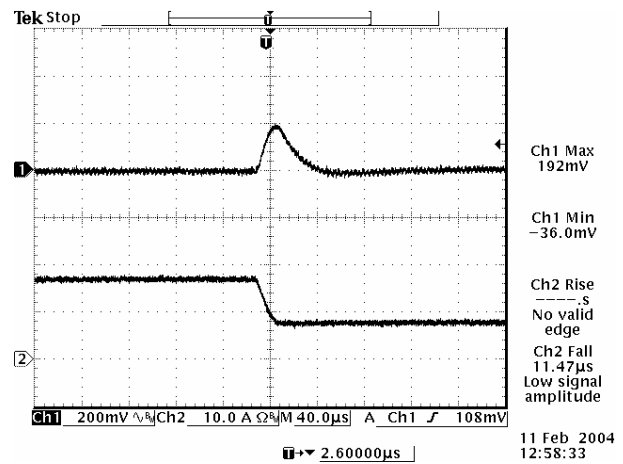


Figure 22. Transients 100% to 50% load 1.2 VDC output

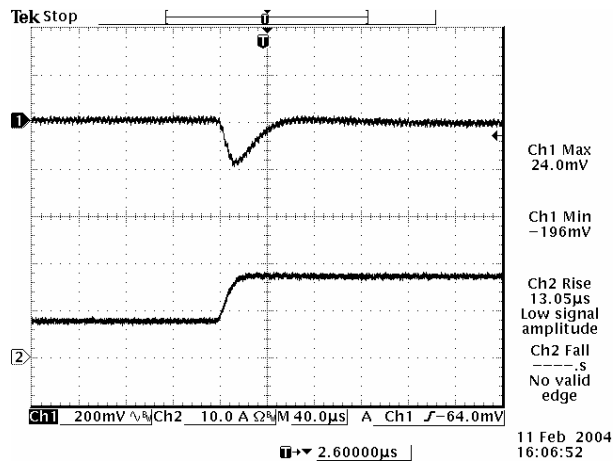


Figure 23. Transients 50% to 100% load 1.5 VDC output

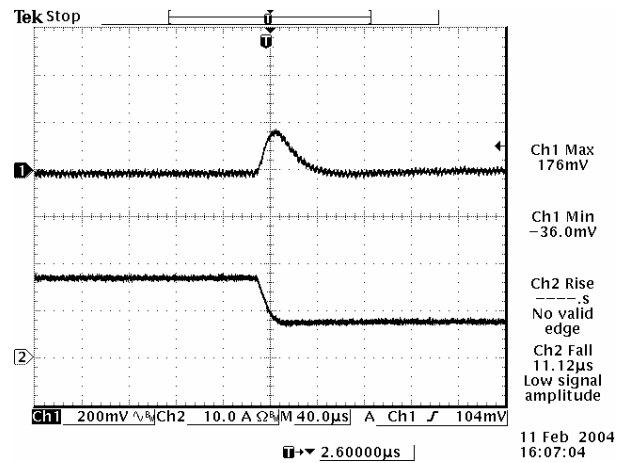


Figure 24. Transients 100% to 50% load 1.5 VDC output

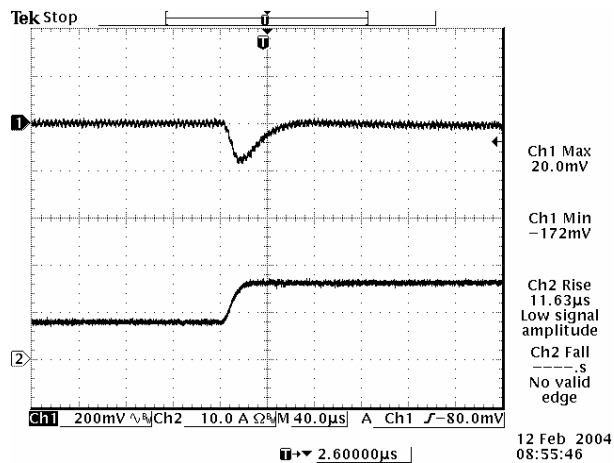


Figure 25. Transients 50% to 100% load 1.8 VDC output

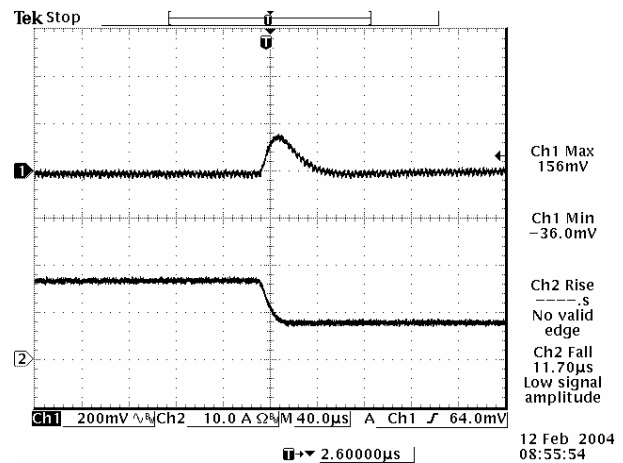


Figure 26. Transients 100% to 50% load 1.8 VDC output

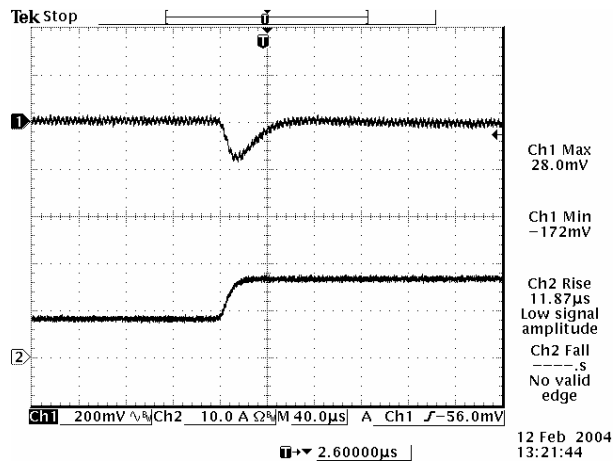


Figure 27. Transients 50% to 100% load 2.5 VDC output

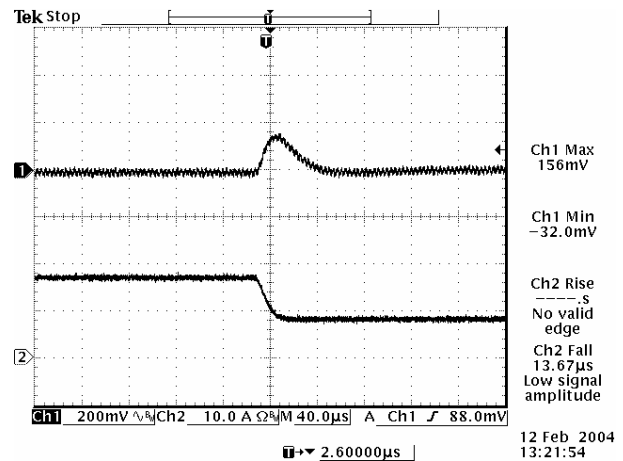


Figure 28. Transients 100% to 50% load 2.5 VDC output

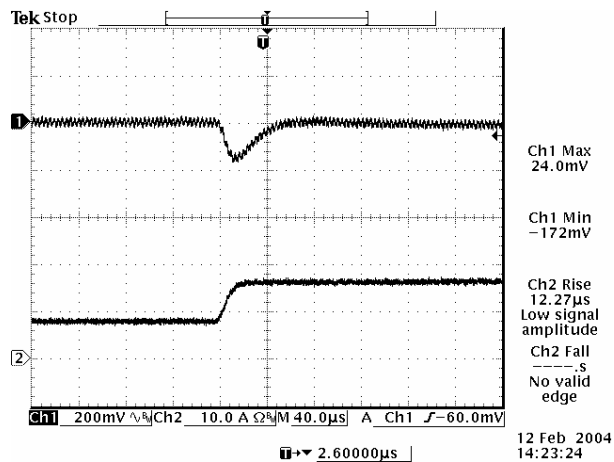


Figure 29. Transients 50% to 100% load 3.3 VDC output

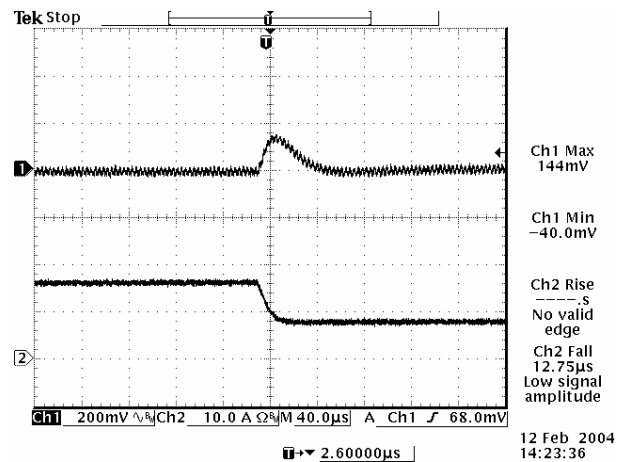


Figure 30. Transients 100% to 50% load 3.3 VDC output

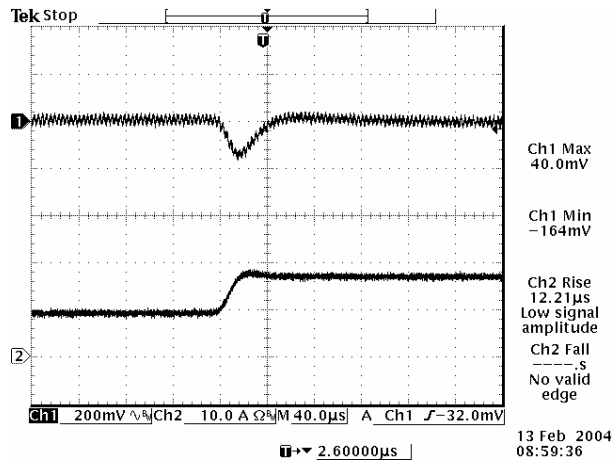


Figure 31. Transients 50% to 100% load 5.0 VDC output

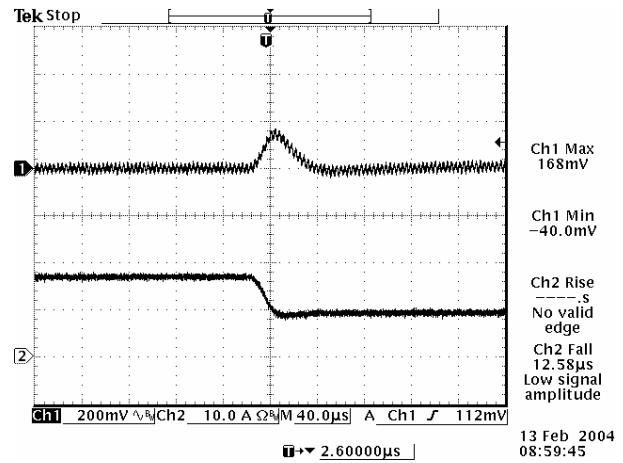


Figure 32. Transients 100% to 50% load 5.0 VDC output

Note: Transient response at 12 V input, $di/dt = 2.5 \text{ A}/\mu\text{s}$, with external $2 \times 150 \mu\text{F}$ polymer capacitor at the output, $T_a = 25^\circ\text{C}$.

12. THERMAL DERATING CURVE

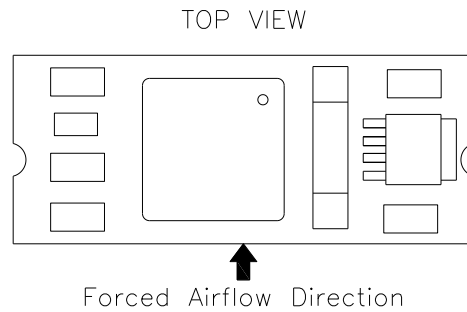


Figure 33. Airflow direction

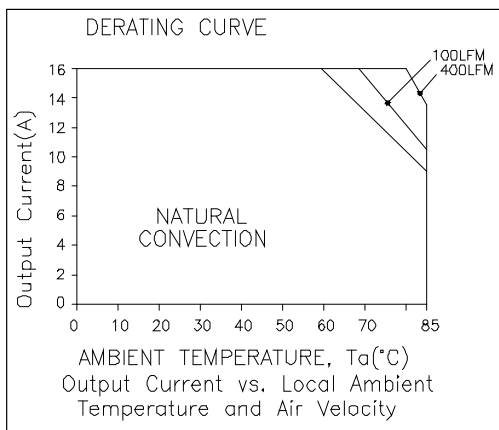


Figure 34. $V_o = 0.75\text{ V}$

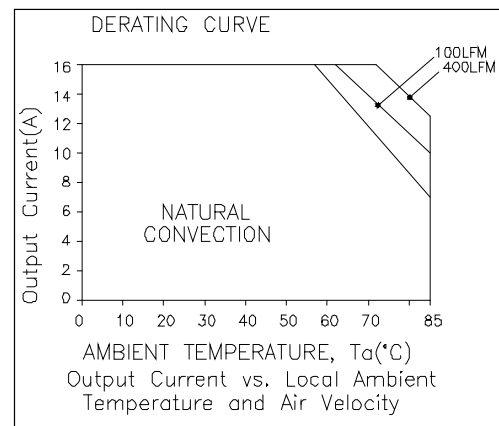


Figure 35. $V_o = 1.8\text{ V}$

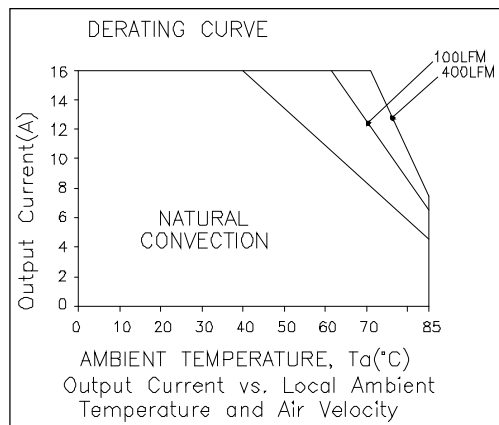


Figure 36. $V_o = 3.3\text{ V}$

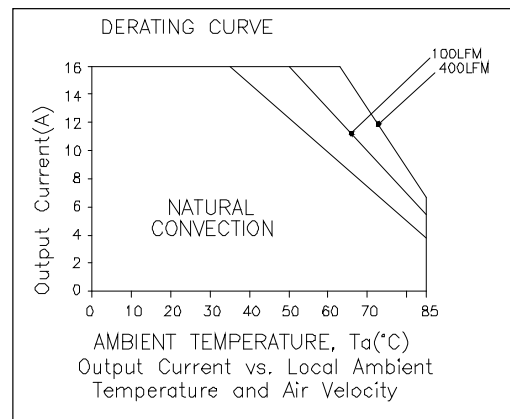


Figure 37. $V_o = 5.0\text{ V}$

13. MECHANICAL DIMENSIONS

OUTLINE

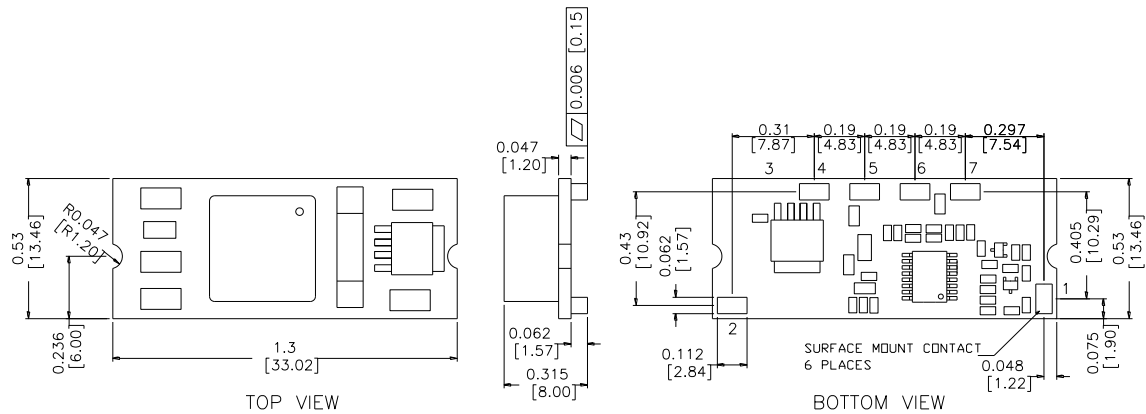


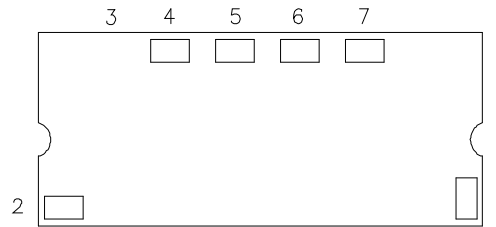
Figure 38. Outline

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

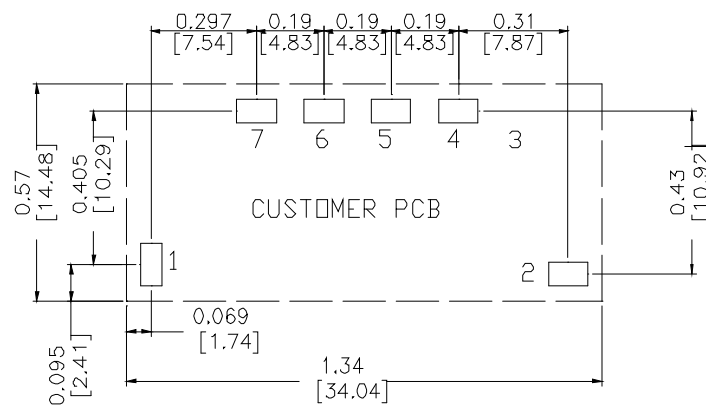


BOTTOM VIEW

Figure 39. Pins

PIN	FUNCTION	PIN	FUNCTION
1	Remote On/Off	5	Vout (+)
2	Vin (+)	6	Trim
3	N/A	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 40. Recommended pad layout

14. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2007-01-05	AA	First release.	Lynn
2007-12-13	AB	Add Total Regulation.	XP.Chen / HL.Lu
2011-08-25	AC	Update the reflow solder temperature.	HL.Lu
2013-01-25	AD	Update UL.	HL.Lu
2015-05-11	AE	Update Package.	XF.Jiang
2021-07-30	AF	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

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