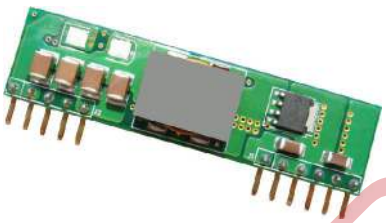
VRBC-16A2Ax

NON-Isolated DC-DC Converter

The Bel VRBC-16A2Ax is part of the non-isolated dc/dc converter series. The modules use a SIP package. These converters are available in a range of output voltages from 0.75 Vdc to 5.5 Vdc over a wide range of input voltage (Vin = 8.3 Vdc - 14 Vdc).

The Bel VRBC-16A2Ax has a sequencing feature that enables designers to implement various types of output voltage sequencing when powering.
The efficiency is typically 92% at 3.3 Vdc output and 12 Vdc input at full load.



RoHS Compliant

Key Features & Benefits

- 8.3-14 VDC Input / 0.75-5.5 VDC @ 16 A Output / SIP POL
- Excellent Thermal Performance
- Non-Isolated
- High Efficiency
- High Power Density
- Low Cost
- Under- voltage Lockout (UVLO)
- Over Temperature Protection
- Wide Input Range
- Wide Trim Range
- OCP/SCP
- Flexible Output Voltage Sequencing (option)
- Able to Sink & Source Current
- Vout Prebias
- Remote On/Off
- Remote Sense
- Industrial Temperature Range
- Active Low/High (Option)
- Class 2, Category 2, Non-Isolated DC/DC Converter (refer to IPC-9592B)
- Approved to UL/CSA60950-1,2nd+A2 version

Applications

- Networking
- Computers and peripherals
- Telecommunications

1. MODEL SELECTION

MODEL NUMBER ACTIVE LOW	MODEL NUMBER ACTIVE HIGH	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
VRBC-16A2AL	VRBC-16A2A0	0.75 V - 5.5 V	8.3 V - 14 V	16 A	80 W	94 %

NOTE: Add "G" suffix at the end of the model number to indicate packaging

PART NUMBER EXPLANATION

V	R	BC	-	16	A	2A	x	G
Mounting Type	RoHS Status	Series Name		Output Current	Input Range	Output Voltage	Active Logic	Package Type
Vertical mount	RoHS	Bobcat Series		16 A	8.3 – 14 V	0.75-5.5 V	0-active High L- active Low	G – Tray package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Voltage		-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: All specifications are typical at 25 °C unless otherwise stated.

1.VRBC-16A2Ax 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 not using the sequencing feature, either, tie the SEQ pin to Vin or leave it unconnected.

3. INPUT SPECIFICATIONS

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)			-	-	11	A
Input Current (no load)			-	100	-	mA
Remote Off Input Current			-	2	-	mA
Input Reflected Ripple Current is (pk-pk)		Tested with one 1000 uF/25 V AL input capacitor with ESR=0.03 ohm max and 6 × 47uF/16 V tan capacitors with ESR=0.013 ohm max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.	-	30	-	mA
I^2t Inrush Current Transient			-	0.2	0.4	A^2s
Turn-on Voltage Threshold			-	7.8	-	V
Turn-off Voltage Threshold			-	7.3	-	V

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

4. OUTPUT SPECIFICATIONS

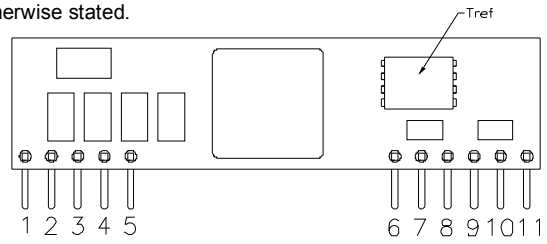
PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	Vin=12 V, Io=Iomax	-2	-	2	%Vo,set
Load Regulation	Io=Io, min to Io, max	-	0.4		%Vo,set
Line Regulation	Vin=Vin, min to Vin, max	-	0.3		%Vo,set
Regulation Over Temperature (-40 °C to +85 °C)	Tref=Tamin to Tamax	-	0.4	-	%Vo,set
Output Current		0	-	16	A
Current Limit Threshold		-	180	-	% Io
Short Circuit Surge Transient		-	1	3	A^2s
Output Ripple and Noise (pk-pk)	Tested with 0-20 MHz, 10 uF Tantalum capacitor &1 uF ceramic capacitor at the output	-	50	100	mV
Output Ripple and Noise (rms)		-	30	45	mV
Turn on Time		-	8	20	ms
Overshoot at Turn on		-	-	1	%Vo.set
Output Capacitance	ESR＞10 mohm	0	-	5000	uF
	ESR ≥ 1 mohm	0	-	1000	uF
Transient Response					
ΔV 50%~100% of Max Load	di/dt=2.5 A/uS; Vin=12 V; and with 330uF Tantalum capacitors at the output	-	100	-	mV
Settling Time		-	80	-	us
ΔV 100%~50% of Max Load		-	100	-	mV
Settling Time		-	80	-	us

Note: All specifications are typical at nominal input（Vin=12V）, full load at 25°C unless otherwise stated.

5. GENERAL SPECIFICATIONS

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Vo=5.0V	Measured at Vin=12 V, full load	-	94	-	%
	Vo=3.3V		-	92	-	%
	Vo=2.5V		-	90	-	%
	Vo=1.8V		-	88	-	%
	Vo=1.5V		-	87	-	%
	Vo=1.2V		-	85	-	%
	Vo=0.75V		-	78	-	%
Switching Frequency			250	280	310	kHz
Over Temperature Shutdown			-	130	-	°C
Output Trim Range (wide trim)			0.7525	-	5.5	V
MTBF		Calculated Per Bell Core SR-332 (Io = 80% Io,max; Vin=12 V; Vo=3.3 V; Ta = 25 °C)		4,619,490		hours
Weight			-	7.1	-	g
Dimensions Inches (L × W × H) Millimeters (L × W × H)				2.0x 0.5 x 0.32 50.8 x 12.7 x 8.13		INCH mm

Notes: All specifications are typical at 25 °C unless otherwise stated.
The Tref temperature measurement location:



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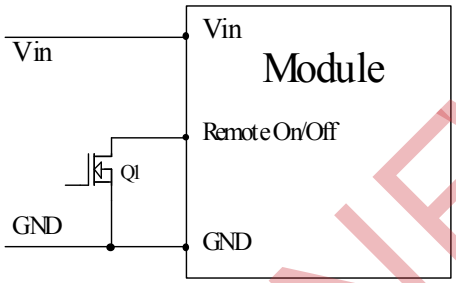
6. CONTROL SPECIFICATIONS

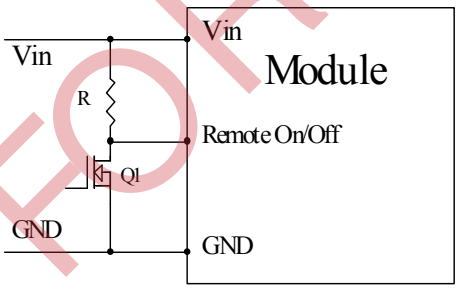
PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Signal Low (Unit Off)		VRBC-16A2A0; Remote On/Off pin open, Unit on.	-0.2	-	0.3	V
Signal High (Unit On)			-	-	Vin, max	V
Signal Low (Unit On)		VRBC-16A2AL; Remote On/Off pin open, Unit on.	-0.2	-	0.3	V
Signal High (Unit Off)			2.5	-	Vin, max	V
Sequencing Slew Rate Capability			-	-	2	V/ms
Sequencing Delay Time		Delay from Vin, min to application of voltage on SEQ pin	10	-	-	ms
Tracking Accuracy	Power-Up	Vin min to Vin max; Io min to Io max; Vseq<Vo	-	100	200	mV
	Power-Down		-	300	500	mV

7. REMOTE ON/OFF

For Active High Modules (Positive Logic)
When the transistor Q1 is in the Off state, the power module is ON.
When the transistor Q1 is turned On, the power module is OFF.



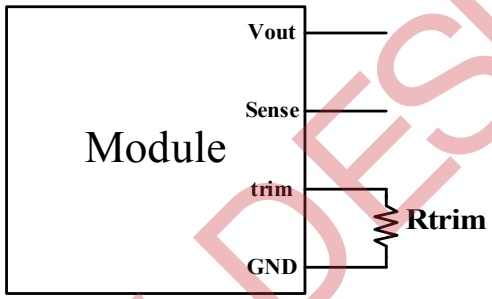
For Active Low Modules (Negative Logic)
When the transistor Q1 is in the Off state, the power module is OFF.
When the transistor Q1 is turned On, the power module is ON.



8. OUTPUT TRIM EQUATIONS

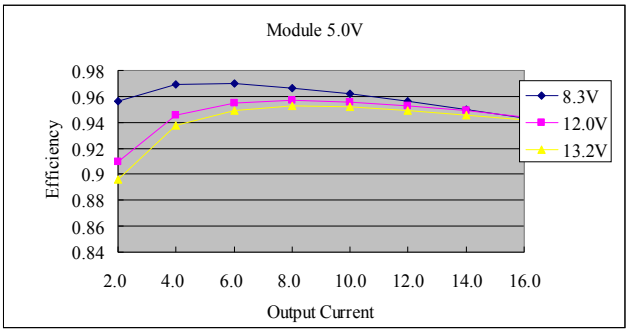
Equation for calculating the trim resistor given the desired output voltage (Vo) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

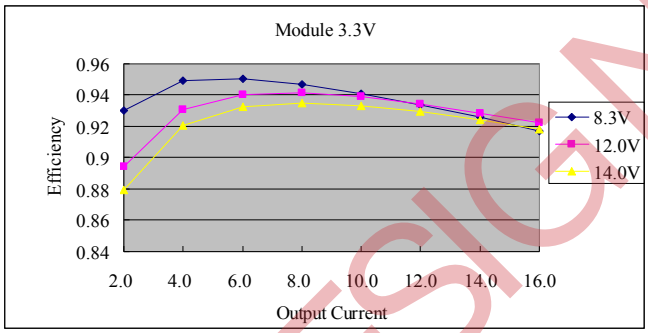
$$R_{trim} = \frac{10500}{Vo - 0.7525} - 1000(\Omega)$$

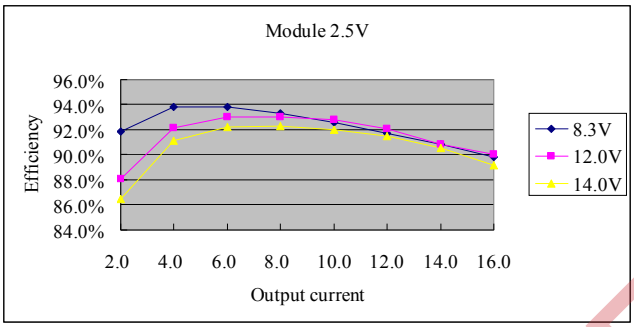


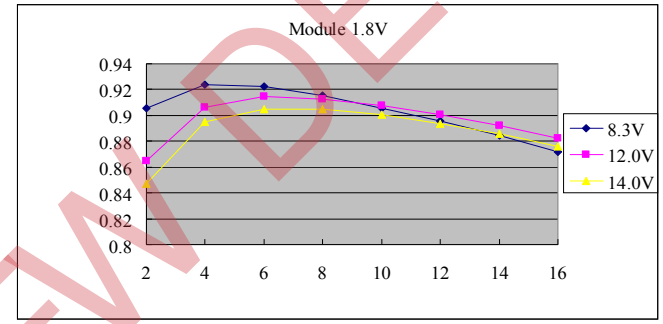
Vo(V)	Rtrim(KΩ)
0.7525	Open
1.2	22.46
1.5	13.05
1.8	9.024
2.5	5.009
3.3	3.122
5.0	1.472

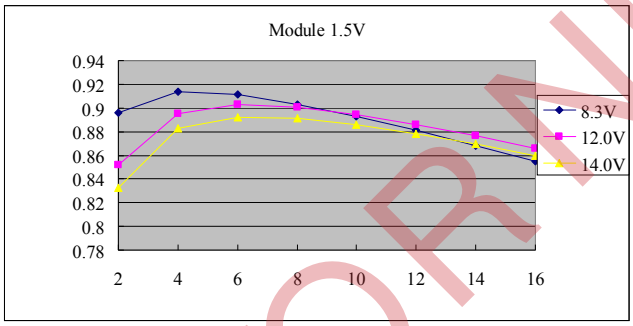
9. EFFICIENCY DATA

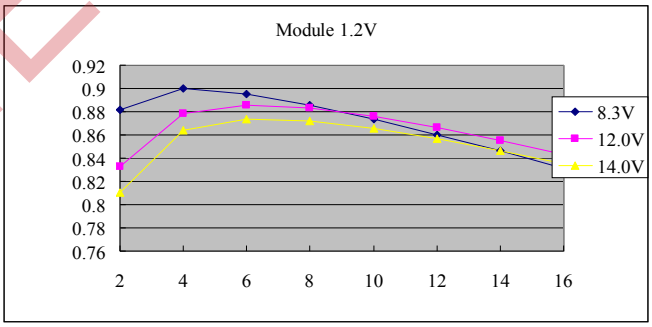


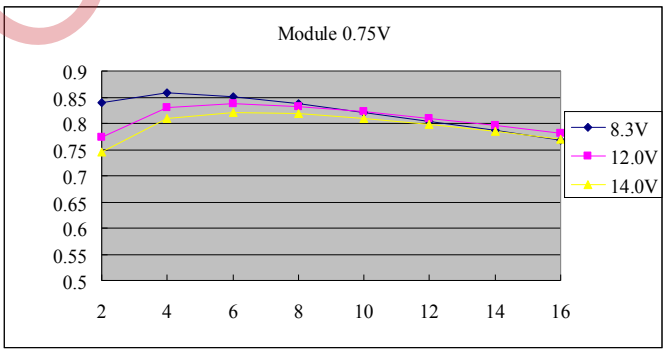




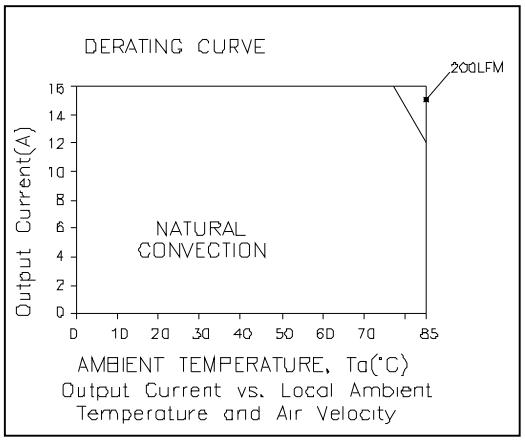




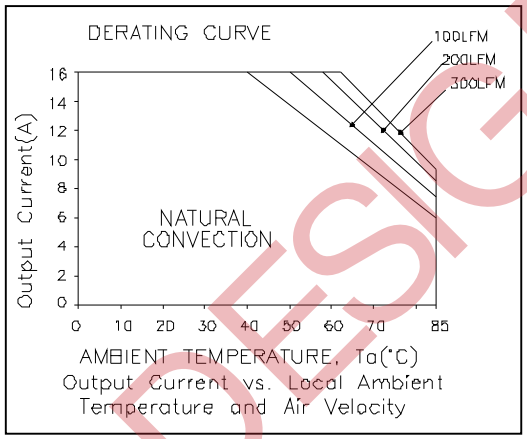




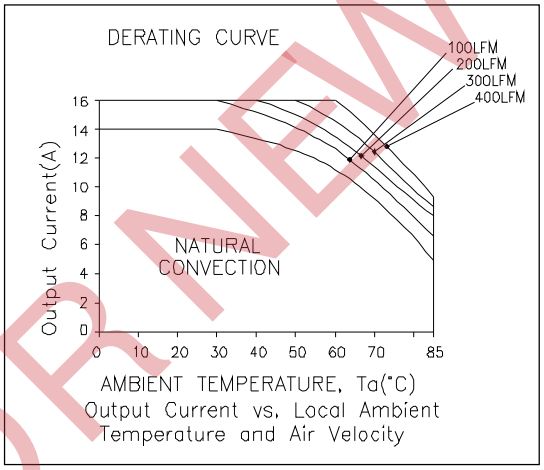
10. THERMAL DERATING CURVES



Vo=0.75 V; Vin=12.0 V

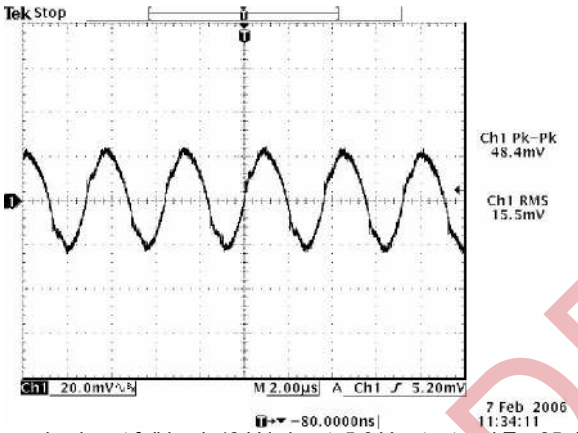


Vo=1.8 V; Vin=12.0 V

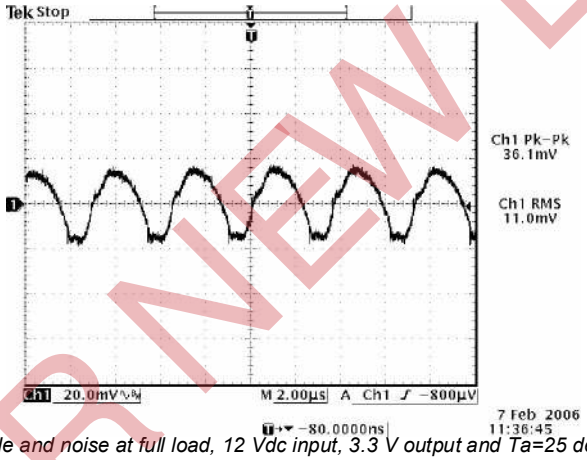


Vo=3.3 V; Vin=12.0 V

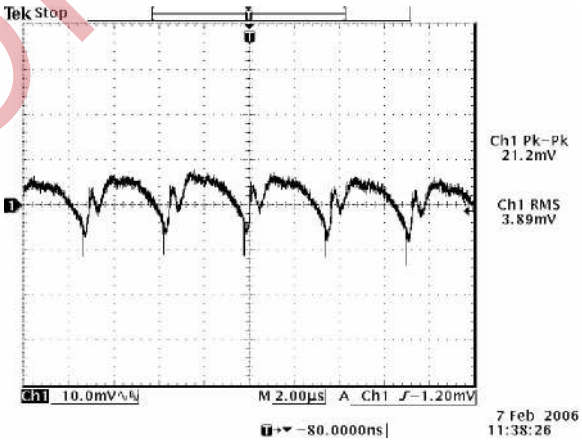
11. RIPPLE AND NOISE WAVEFORM



Ripple and noise at full load, 12 Vdc input, 5.0 V output and Ta=25 deg C



Ripple and noise at full load, 12 Vdc input, 3.3 V output and Ta=25 deg C

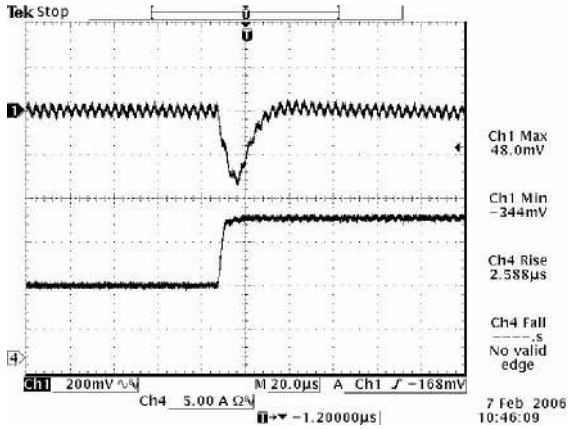


Ripple and noise at full load, 12 Vdc input, 0.75 V output and Ta=25 deg C

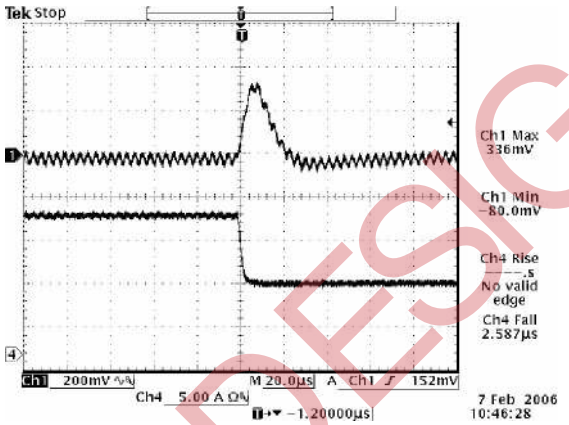
Note: *External load with 10 uF tantalum capacitor and 1 uF ceramic at the output.*

12. TRANSIENT RESPONSE WAVEFORMS

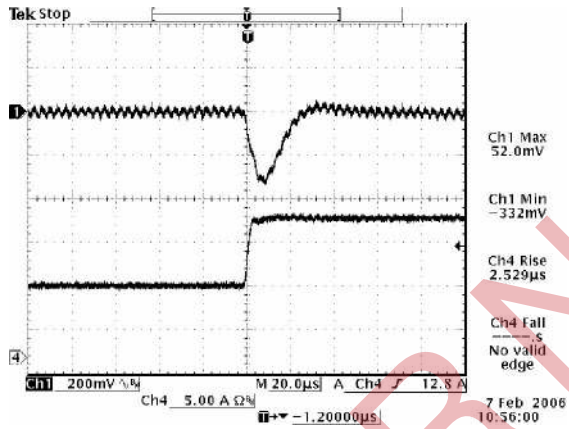
External load capacitor Cext=0 uF, di/dt=2.5 A/us



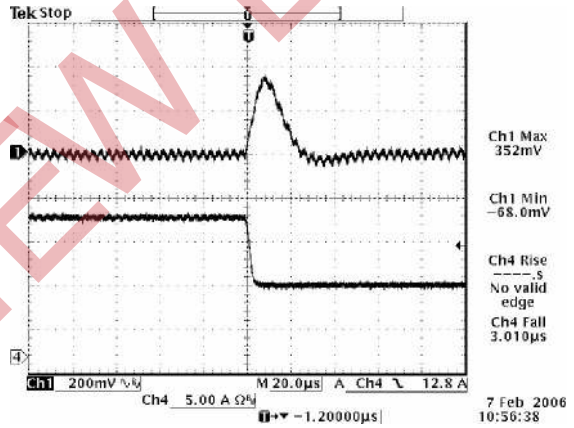
50% to 100% load Transient at 5.0 Vdc output



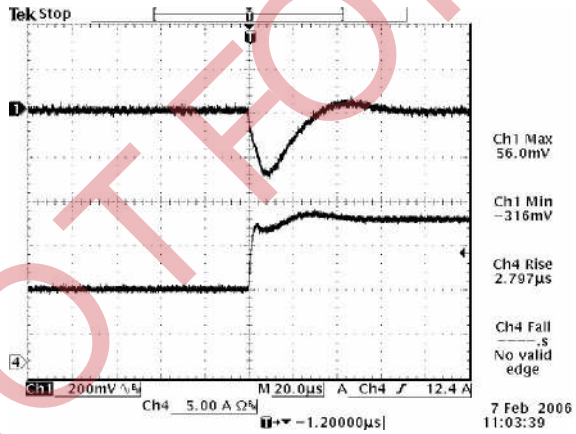
100% to 50% load Transient at 5.0 Vdc output



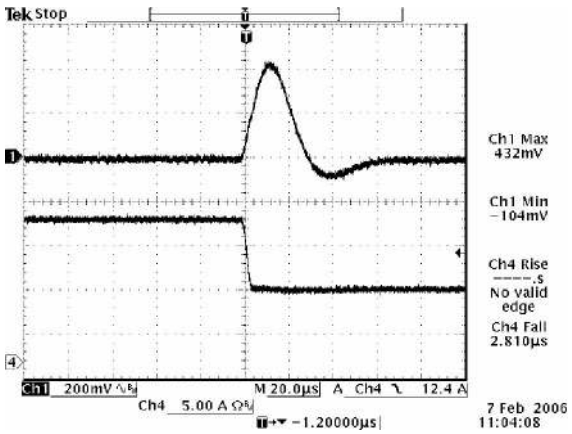
50% to 100% load Transient at 3.3 Vdc output



100% to 50% load Transient at 3.3 Vdc output



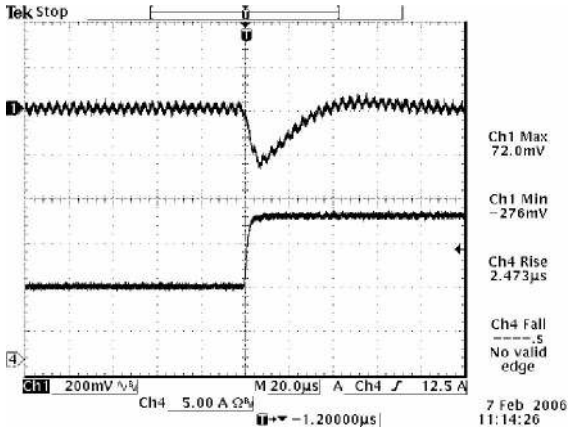
50% to 100% load Transient 0.75 Vdc output



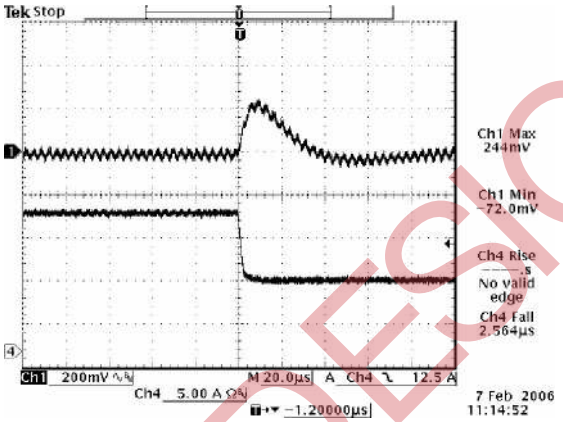
100% to 50% load Transient at 0.75 Vdc output

TRANSIENT RESPONSE WAVEFORMS(CONTINUED)

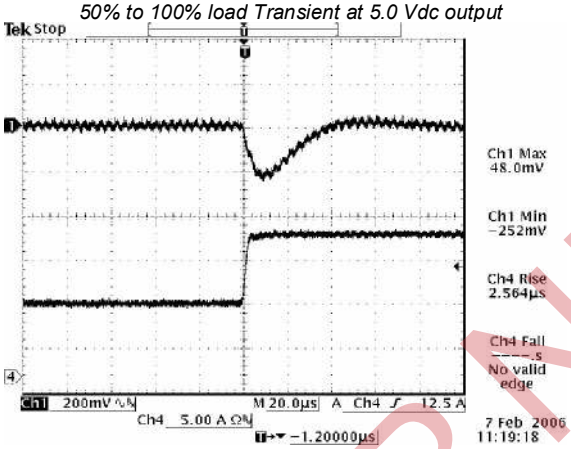
External load capacitor Cext=330 uF Tantalum capacitor, di/dt=2.5 A/us



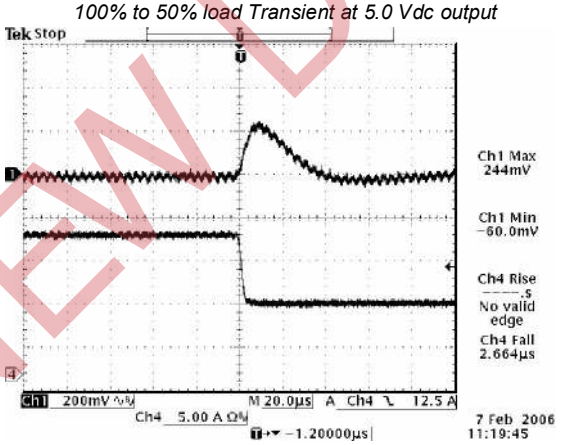
50% to 100% load Transient at 5.0 Vdc output



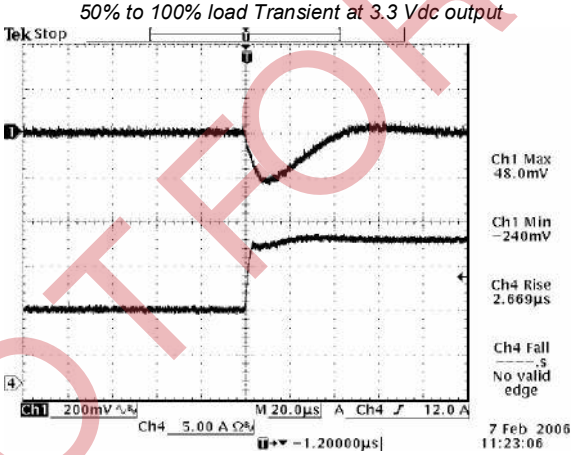
100% to 50% load Transient at 5.0 Vdc output



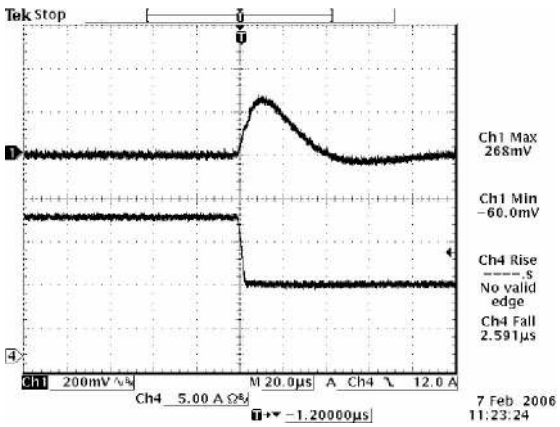
50% to 100% load Transient at 3.3 Vdc output



100% to 50% load Transient at 3.3 Vdc output



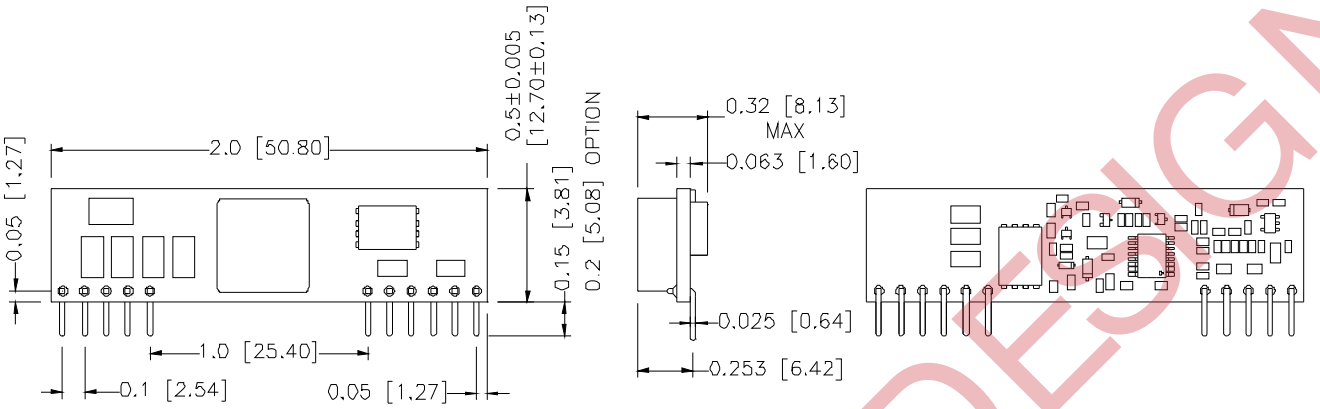
50% to 100% load Transient 0.75 Vdc output

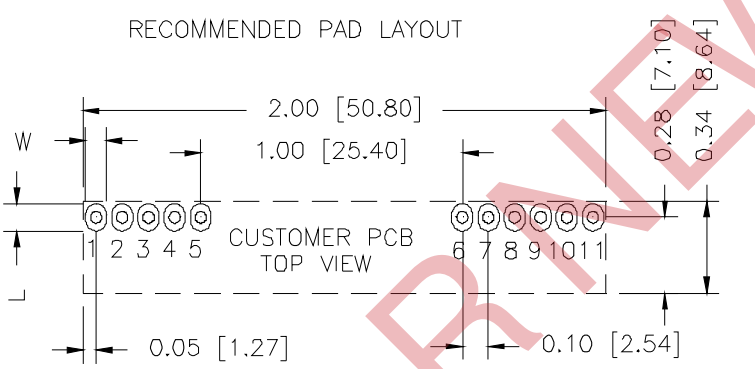


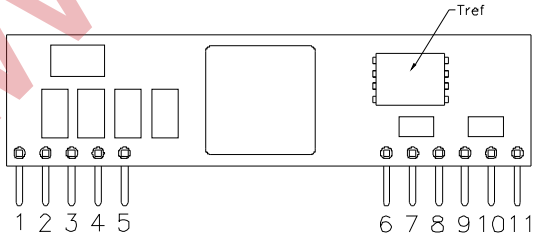
100% to 50% load Transient at 0.75 Vdc output

Note: *All specifications are typical at 12 Vdc input and Ta=25 deg C.*

13. MECHANICAL DIMENSIONS







PIN CONNECTIONS

PIN	FUNCTIO	PIN	FUNCTIO
1	Vo	7	Vin
2	Vo	8	Vin
3	Sense+	9	SEQ
4	Vo	10	Trim
5	Ground	11	On/Off
6	Ground		

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.

Note:

1) All Pins: Material - Copper Alloy;
   Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.
2) Undimensioned components are shown for visual reference only.
3) All dimensions in inches (mm); Tolerances: x.xx +/-0.02 in. (x.x +/-0.5mm) x.xxx +/-0.010 in. (x.xx +/0.25mm)

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.