

## Non-ISOLATED DC/DC CONVERTERS

4.5 Vdc - 5.5 Vdc Input, 0.8 Vdc - 3.6 Vdc/6 A Output

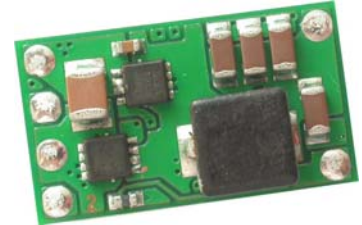
**bel**  
POWER PRODUCTS

**0RLE-06B1A0**

**RoHS Compliant**

**Rev.B**

- Non-Isolated
- Fixed Frequency
- High Efficiency
- High Power Density
- Low Cost
- Pri-Bias Startup
- Wide Operating Temperature Range (-40°C - 85°C)
- Remote On/Off
- Wide Trim
- Input Under Voltage Lockout
- SCP/OCF
- Auto-Track Sequencing
- Over Temperature Shutdown
- Point-of-Load Alliance (POLA) Compatible



### Description

The Bel 0RLE-06B1A0 is part of the non-isolated dc/dc converter Power Module series. The modules use a through hole package. These converters are available in a range of output voltages from 0.8 Vdc to 3.6 Vdc over a wide range of input voltage ( $V_{in} = 4.5 - 5.5$  Vdc). The efficiency is typically 95% @  $5V_{in}$  and  $3.3V_{out}$  at full load.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number
0.8 Vdc - 3.6 Vdc	4.5 Vdc - 5.5 Vdc	6 A	20 W	95%	0RLE-06B1A0

- Notes:** 1. Add "G" suffix at the end of the model number to indicate Tray Packaging.  
2. All part numbers above indicate RoHS 6. Change the second letter "R" to "7" for RoHS 5 part numbers.

### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	6 V	
Remote On/Off (Active High)	-0.3 V	-	6 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-40 °C	-	125 °C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	4.5 V	5.0 V	5.5 V	
Input Current	-	-	6 A	An input line fuse must always be used.
Input Current (no load)	-	55 mA	100 mA	
Remote Off Input Current	-	5 mA	-	
Input Reflected Ripple Current (rms)	-	4 mA	8 mA	With simulated source impedance of 1.5 uH, 5 Hz to 20 MHz. Use a 100 uF AL-Cap on the input with ESR=1 ohm max, at 200 kHz.
Input Reflected Ripple Current (pk-pk)	-	15 mA	30 mA	
$I^2t$ Inrush Current Transient	-	-	1 A <sup>2</sup> s	
Turn-on Input Voltage	-	4.3 V	-	
Turn-off Input Voltage	-	3.9 V	-	

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

# Non-ISOLATED DC/DC CONVERTERS

4.5 Vdc - 5.5 Vdc Input, 0.8 Vdc - 3.6 Vdc/6 A Output



## Output Specifications

Parameter	Min	Typ	Max	Notes	
Output Voltage Set Point Accuracy	-2.5%Vo, set	-	2.5%Vo, set	Vin=5 V, Io=50% full load	
Line Regulation	-	-	0.4%Vo, set		
Load Regulation	-	-	0.5%Vo, set		
Temperature Regulation (-40 °C to +85 °C)	-	-	0.5%Vo, set		
Ripple and Noise (rms)	-	5 mV	10 mV	0-20 MHz BW, 100 uF Electrolytic cap and 10 uF ceramic at the output.	
Ripple and Noise (pk-pk)	-	15 mV	30 mV		
Output Current	0 A	-	6 A		
Current Limit Threshold	-	200%Iout	-		
Short Circuit Surge Transient	-	1 A <sup>2</sup> s	3 A <sup>2</sup> s		
Turn on Time	-	5 mS	10 mS		
Overshoot at Turn On	-	-	5%		
Output Capacitance	0 uF	100 uF	3300 uF		
<b>Transient Response</b>					
0% ~ 50% Max Load	Overshoot	Vo=All	-	60 mV	di/dt=1 A/us, Vin=5 V, with a 100 uF electrolytic cap and a 10 uF ceramic at the output.
	Settling Time		-	70 uS	
50% ~ 0% Max Load	Overshoot		-	60 mV	
	Settling Time		-	70 uS	

**Note:** All specifications are typical at nominal input, full load at 25°C unless noted.

## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vo=0.8 V Vo=3.3 V	- -	83% 95%	- -	Measured at Vin=5 V, full load
Switching Frequency	-	600 kHz	-	
Output Voltage Trim Range	0.8 V	-	3.6 V	
Over Temperature Shutdown	-	125 °C	-	
MTBF	TBD			Calculated Per Bell Core SR-332 (Io = 80% Io max; Ta = 25 °C)
Dimensions Inches (L x W x H) Millimeters (L x W x H)	0.87 x 0.495 x 0.354 22.10 x 12.57 x 9.00			
Weight	-	3.5 g	-	

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

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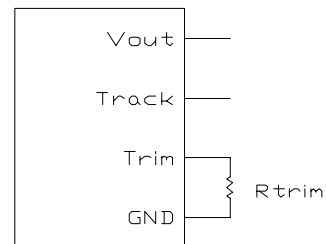
## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit Off)	-0.3 V	-	0.4 V	The remote On/Off pin open, Unit On.
Signal High (Unit On)	2.5 V	-	5.5 V	
<b>Voltage Sequencing</b>				
Sequencing Voltage	-0.3 V	-	Vin+0.3 V	
Sequencing Slew Rate Capability	-	-	1 V/msec	
Sequencing Delay time	20 msec	-	-	Delay from Vin,min to application of voltage on SEQ pin
Tracking Accuracy				
Power-Up	-	100 mV	200 mV	
Power-Down	-	200 mV	400 mV	

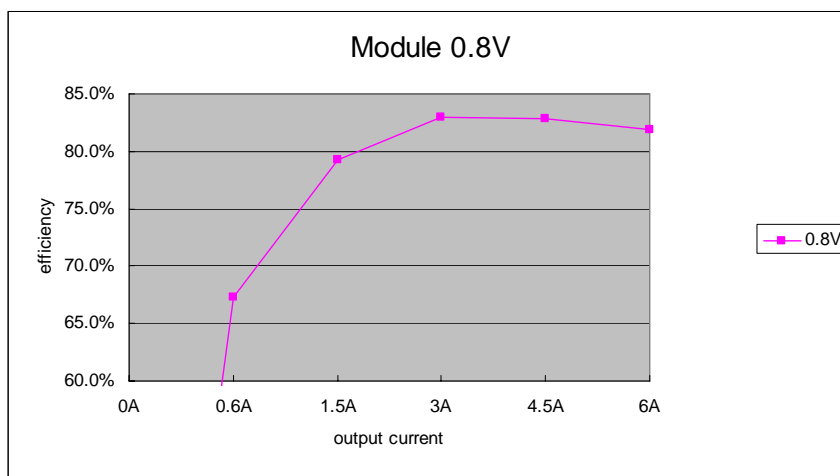
## Output Trim Equations

Equations for calculating the trim resistor is shown below. Rtrim is the required resistance between TRIM and GND, Vo is the desired output voltage.

$$R_{trim} = \frac{8}{V_o - 0.8} - 2.49 [k\Omega]$$



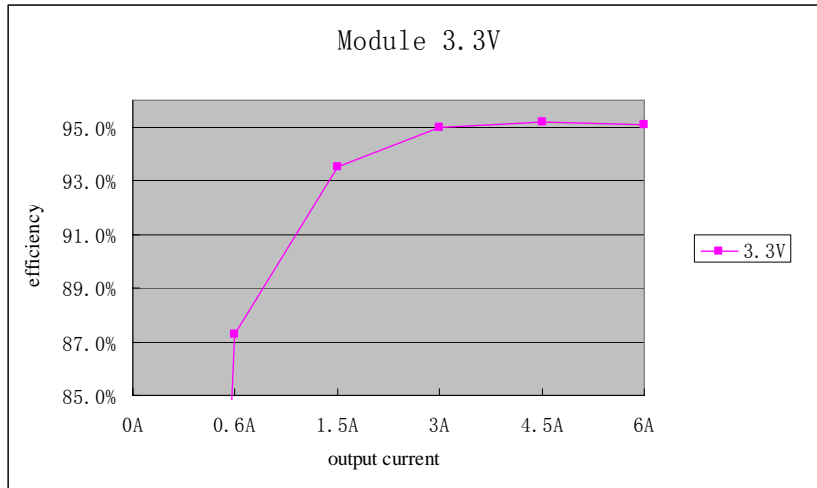
## Efficiency Data



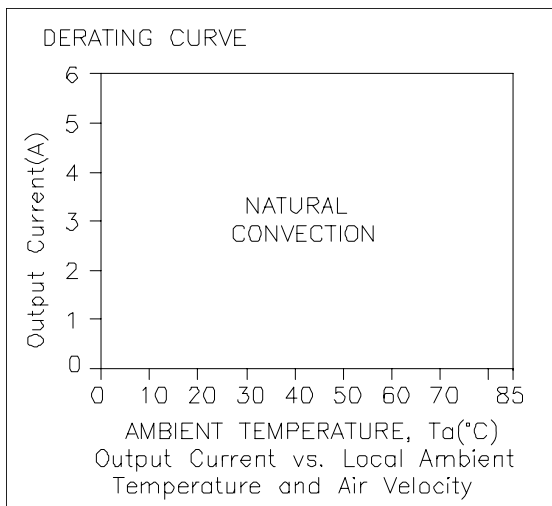
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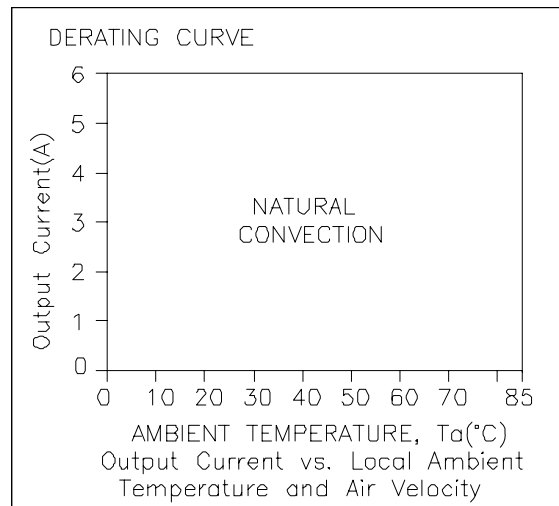
**Efficiency Data (continued)**



**Thermal Derating Curves**



$V_o=0.8$  V



$V_o=3.3$  V

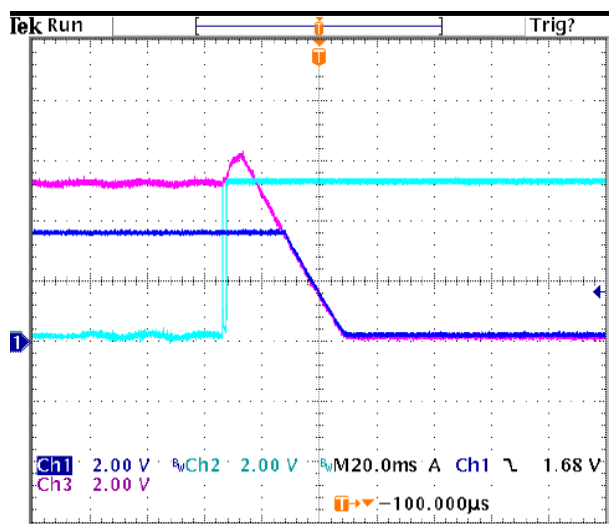
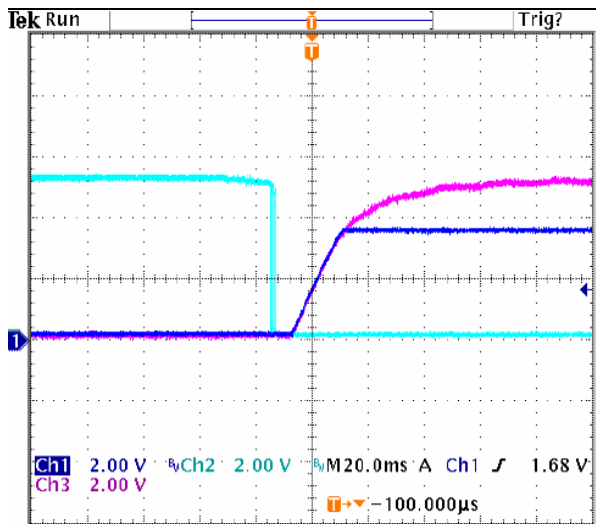
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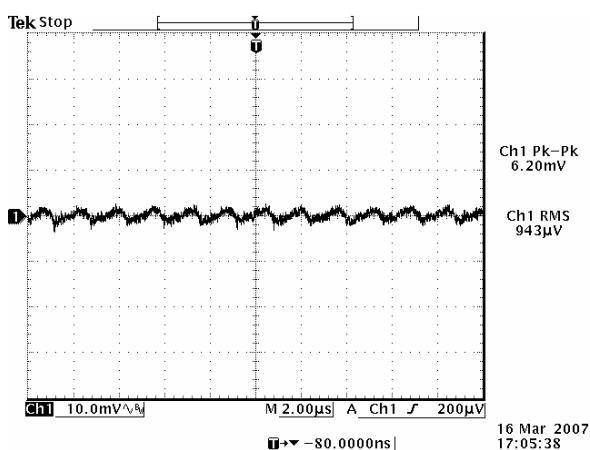
## Auto-Track Sequencing

$$dV_{track}/dt \leq 1V/mS$$

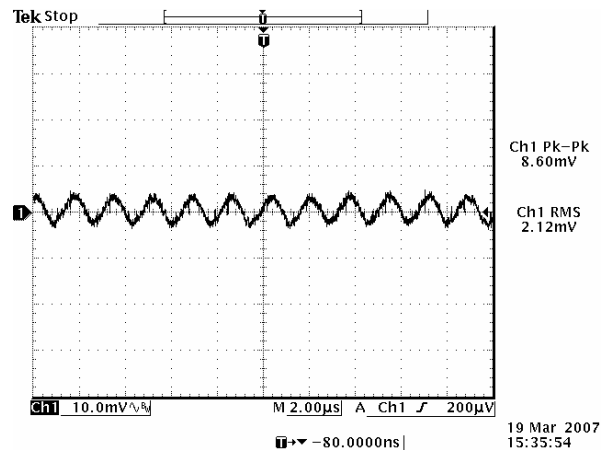


1. Green curve : on/off control
2. Blue curve : Vout
3. Red curve : Vtrack

## Ripple and Noise Waveform



5 Vdc input, 0.8 V output



5 Vdc input, 3.3 V output

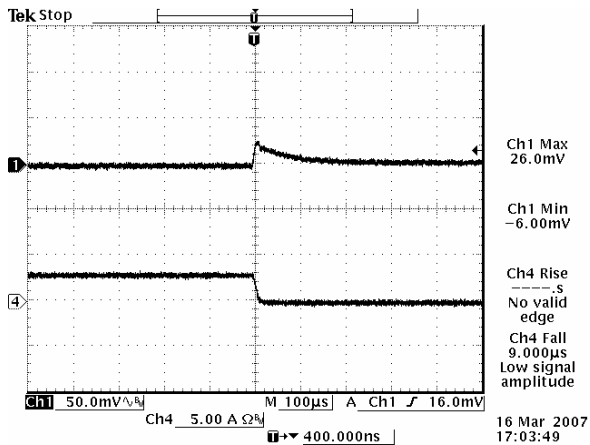
**Note:** Ripple and noise at full load, external load with 100 uF electrolytic cap and 10 uF ceramic at the output, Ta=25 deg C.

# Non-ISOLATED DC/DC CONVERTERS

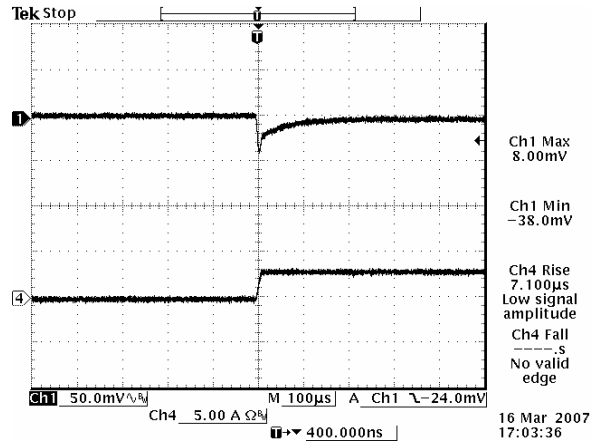
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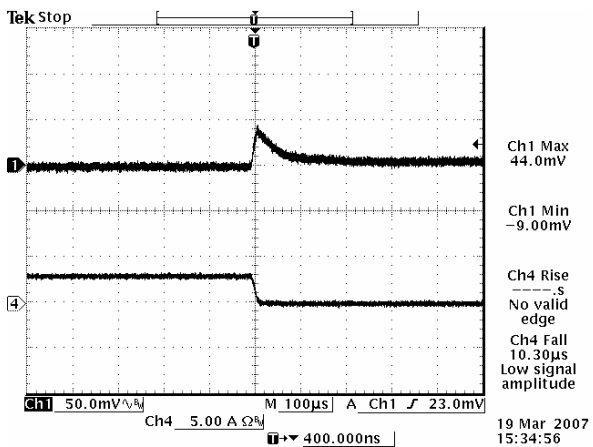
## Transient Response Waveforms



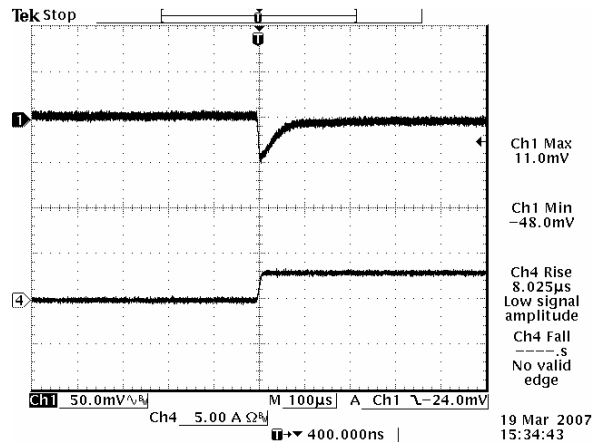
Vout=0.8 V 50% - 0% Load Transients



Vout=0.8 V 0% - 50% Load Transients



Vout=3.3 V 50% - 0% Load Transients



Vout=3.3 V 0% - 50% Load Transients

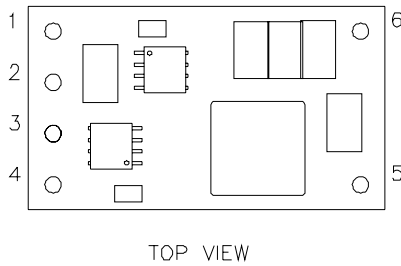
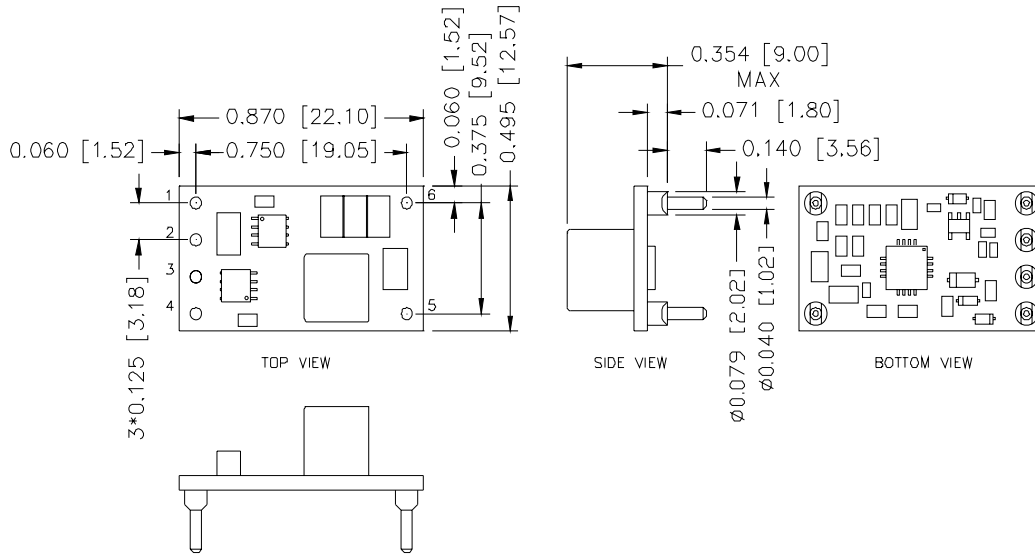
**Note:** Transient response at  $di/dt=1A/\mu S$ , with 100  $\mu F$  electrolytic cap and 10 $\mu F$  ceramic cap at the output,  $T_a=25$  deg C.

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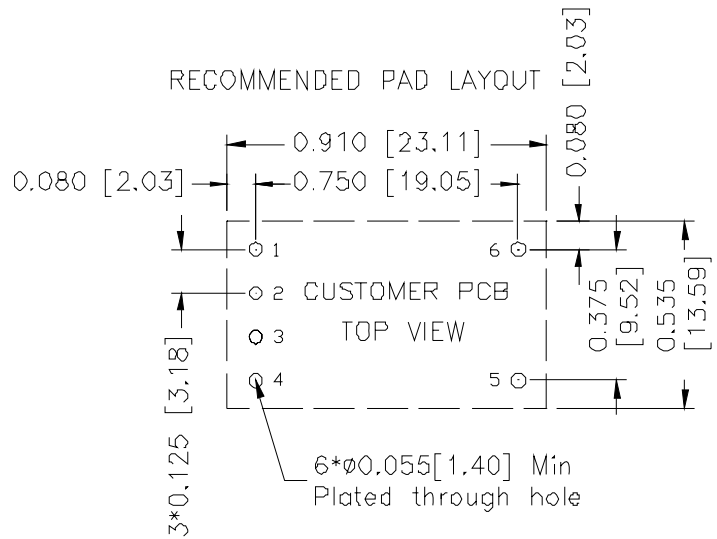
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## Mechanical Outline



### RECOMMENDED PAD LAYOUT



### Pin Connections

Pin	Function
1	GND
2	Track
3	Vin
4	Inhibit
5	Trim
6	Vout

### RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.



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