

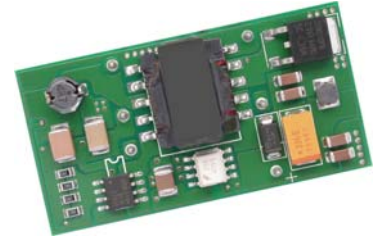
## ISOLATED DC/DC CONVERTERS

48 Vdc Input, 3.3 Vdc/2 A, 5 Vdc/2 A, 12 Vdc/1 A, 24 Vdc/0.5 A Output

**bel**  
POWER PRODUCTS

### 0RLC-10Txxx Series RoHS Compliant Rev.A

- Isolated
- Fixed Frequency
- High Power Density
- High Efficiency
- Output Over-Voltage Shutdown
- Safety Approval to UL60950-1 (Pending)
- Low Cost
- Trim
- OCP/SCP
- Remote On/Off
- Active Low/High (Option)



### Description

The 0RLC-10T Series are isolated dc/dc converters that operate from a nominal 48 Vdc source. These units will provide up to 12 W of output power from a nominal 48 Vdc input. These units are designed to be highly efficient and very low cost. Features include remote on/off, over current protection and short circuit protection. These converters are provided in an industry standard package.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High	Model Number Active Low
3.3 Vdc	36 Vdc - 75 Vdc	2 A	6.6 W	77%	0RLC-10T033	0RLC-10T03L
5.0 Vdc	36 Vdc - 75 Vdc	2 A	10 W	82%	0RLC-10T050	0RLC-10T05L
12 Vdc	36 Vdc - 75 Vdc	1 A	12 W	83%	0RLC-10T120	0RLC-10T12L
24 Vdc	36 Vdc - 75 Vdc	0.5 A	12 W	85%	0RLC-10T240	0RLC-10T24L

- 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
Continuous Input Voltage	-0.3 V	-	75 V	
Peak/Surge Input Voltage	-0.3 V	-	100 V	Transients of 100 ms or less in duration
Remote On/Off (Active Low)	-0.3 V	-	18 V	
Remote On/Off (Active High)	-0.3 V	-	7 V	
Ambient Temperature	0 °C	-	70 °C	
Storage Temperature	-40 °C	-	125 °C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	36 V	-	75 V	
Input Current (no load)	-	-	40 mA	
Input Current (full load)	-	-	0.45 A	
Remote Off Input Current (Active Low)	-	5 mA	10 mA	
Remote Off Input Current (Active High)	-	-	10 mA	
Input Reflected Ripple Current (pk-pk)	-	15 mA	30 mA	With simulated source impedance of 10 uH, 5 Hz to 20 MHz; use a 47uF/100 V electrolytic capacitor with ESR = 1 ohm max. at 200 kHz at 25 °C.
Input Reflected Ripple Current (rms)	-	5 mA	10 mA	
I <sup>2</sup> t Inrush Current Transient	-	0.039 A <sup>2</sup> s	0.062 A <sup>2</sup> s	
Turn-on Voltage Threshold	-	30 V	-	

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

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### Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Vin=48 V for all outputs
Vo=3.3 V	3.201 V	3.30 V	3.399 V	
Vo=5.0 V	4.850 V	5.00 V	5.150 V	
Vo=12 V	11.64 V	12.00 V	12.36 V	
	Vo=24 V	23.28 V	24.00 V	24.72 V
Line Regulation				
Vo=3.3 V	-	5 mV	10 mV	
Vo=5.0 V	-	10 mV	15 mV	
Vo=12 V	-	20 mV	36 mV	
Vo=24 V	-	35 mV	48 mV	
Load Regulation				
Vo=3.3 V	-	10 mV	15 mV	
Vo=5.0 V	-	15 mV	25 mV	
Vo=12 V	-	36 mV	60 mV	
Vo=24 V	-	48 mV	80 mV	
Regulation Over Temperature (0 °C to 70 °C)	-	75 mV	150mV	
Output Current				
Vo=3.3 V	0.2 A	-	2.0 A	
Vo=5.0 V	0.2 A	-	2.0 A	
Vo=12 V	0.1 A	-	1.0 A	
Vo=24 V	0.05 A	-	0.5 A	
Current Limit Threshold				
Vo=3.3 V	-	3.0 A	-	
Vo=5.0 V	-	3.0 A	-	
Vo=12 V	-	1.5 A	-	
Vo=24 V	-	0.75 A	-	
Short Circuit Surge Transient	-	TBD	-	A <sup>2</sup> s
Ripple and Noise (rms)				0 - 20 MHz BW , with 1 uF ceramic load capacitance
Vo=3.3 V	-	10 mV	15 mV	
Vo=5.0 V	-	18 mV	30 mV	
Vo=12 V	-	21 mV	40 mV	
	Vo=24 V	-	45 mV	70 mV
Ripple and Noise (pk-pk)				
Vo=3.3 V	-	40 mV	60 mV	
Vo=5.0 V	-	60 mV	100 mV	
Vo=12 V	-	80 mV	120 mV	
Vo=24 V	-	120 mV	180 mV	
Turn on Time				
Power On	-	-	200 mS	
Remote On	0.5 mS	-	40 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance				
Vo=3.3 V	0 uF	-	800 uF	
Vo=5.0 V	0 uF	-	800 uF	
Vo=12 V	0 uF	-	100 uF	
Vo=24 V	0 uF	-	20 uF	

## ISOLATED DC/DC CONVERTERS

48 Vdc Input, 3.3 Vdc/2 A, 5 Vdc/2 A, 12 Vdc/1 A, 24 Vdc/0.5 A Output



### Output Specifications (continued)

Parameter		Min	Typ	Max	Notes		
<b>Transient Response</b>							
50% ~ 100% Max Load	Overshoot	Vo=3.3 V	-	100 mV	150 mV	di/dt = 0.1 A/uS; Vin = 48 V; Ta = 25 °C and 1 uF ceramic capacitor	
	Settling Time		-	200 uS	300 uS		
100% ~ 50% Max Load	Overshoot		-	100 mV	150 mV		
	Settling Time		-	200 uS	300 uS		
50% ~ 100% Max Load	Overshoot		Vo=5.0 V	-	100 mV		150 mV
	Settling Time			-	100 uS		150 uS
100% ~ 50% Max Load	Overshoot	-		100 mV	150 mV		
	Settling Time	-		100 uS	150 uS		
50% ~ 100% Max Load	Overshoot	Vo=12 V		-	150 mV		250 mV
	Settling Time			-	150 uS		200 uS
100% ~ 50% Max Load	Overshoot		-	150 mV	250 mV		
	Settling Time		-	150 uS	200 uS		
50% ~ 100% Max Load	Overshoot		Vo=24 V	-	350 mV	500 mV	
	Settling Time			-	200 uS	250 uS	
100% ~ 50% Max Load	Overshoot	-		350 mV	500 mV		
	Settling Time	-		200 uS	250 uS		

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

### General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
	Vo=3.3 V	73%	77%	-
	Vo=5.0 V	78%	82%	-
	Vo=12 V	79%	83%	-
	Vo=24 V	81%	85%	-
Switching Frequency	200 kHz	250 kHz	300 kHz	
Output Trim Range	95%Vo	-	105%Vo	For all outputs
MTBF	TBD			Calculated Per Bell Core SR-332 (Io = Nomal; Ta = 25 °C)
Dimensions				
	Inches (L x W x H)	1.91 x 0.98 x 0.477		
	Millimeters (L x W x H)	48.51 x 24.89 x 12.12		
Weight	-	10.3 g	-	

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

### Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit On)	Active Low	-0.3 V	-	0.8 V
Signal High (Unit Off)		3.5 V	-	18 V
Signal Low (Unit Off)	Active High	-0.3 V	-	0.8 V
Signal High (Unit On)		3.5 V	-	7 V

The remote on/off pin open, Unit On.

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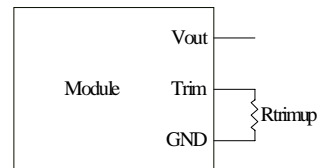
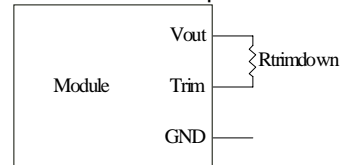


## Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage ( $V_{adj}$ ) and the nominal output voltage of the converter ( $V_{nom}$ ) are shown below. The Trim Down resistor should be connected between the Trim pin and  $V_{out}$ . The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

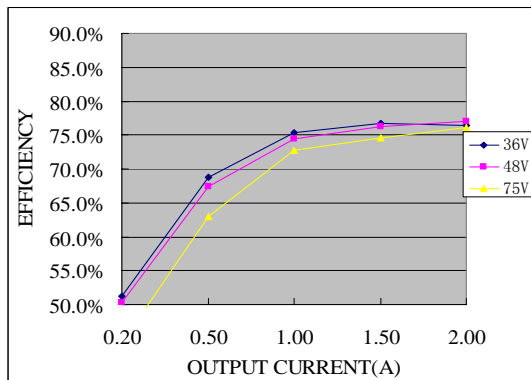
$$R_{TrimDown} = \frac{A}{V_{nom} - V_{adj}} - B$$

$$R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$

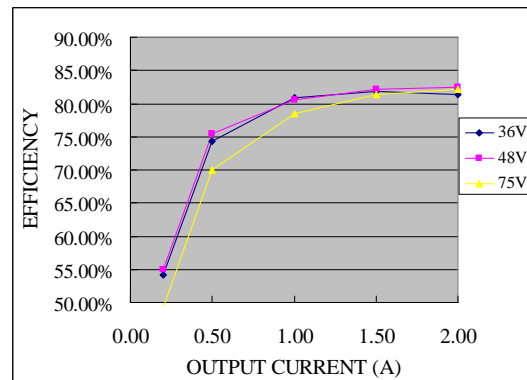


Vnom	A	B	C	D
24	489.490	28.310	26.660	6.810
12	113.550	16.990	13.020	6.490
5.0	56.410	51.200	18.228	36.500
3.3	21.628	75.400	13.020	64.900

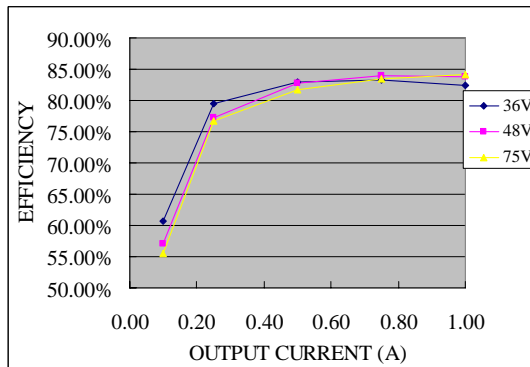
## Efficiency Data



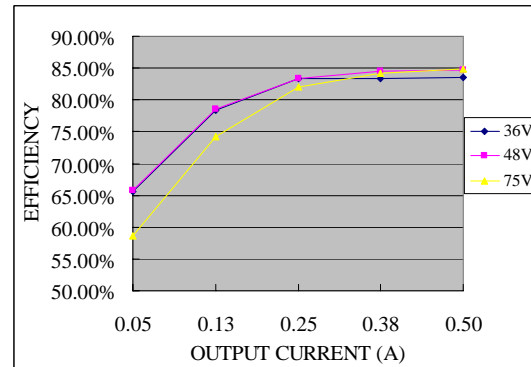
ORLC-10T033



ORLC-10T050



ORLC-10T120



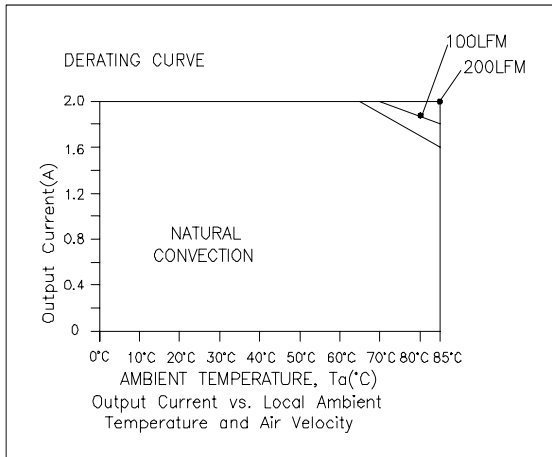
ORLC-10T240

# ISOLATED DC/DC CONVERTERS

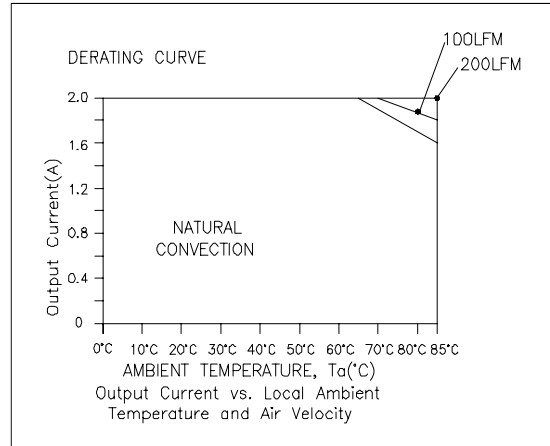
48 Vdc Input, 3.3 Vdc/2 A, 5 Vdc/2 A, 12 Vdc/1 A, 24 Vdc/0.5 A Output



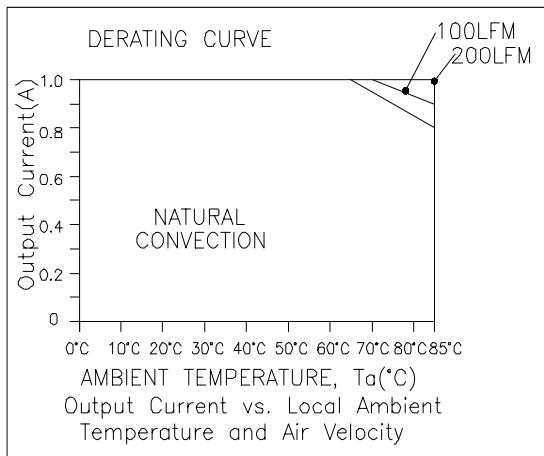
## Thermal Derating Curves



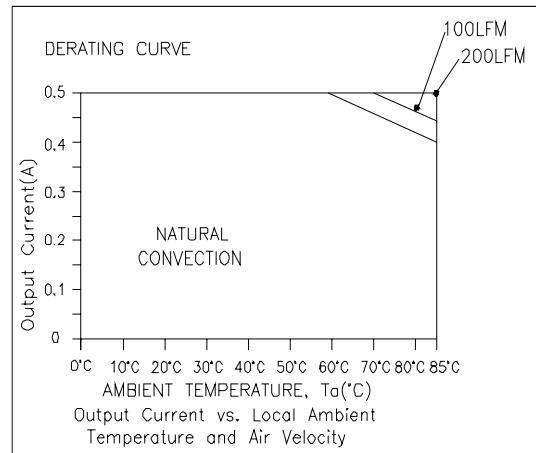
Vo=3.3 V, Io=2 A



Vo=5 V, Io=2 A



Vo=12 V, Io=1 A



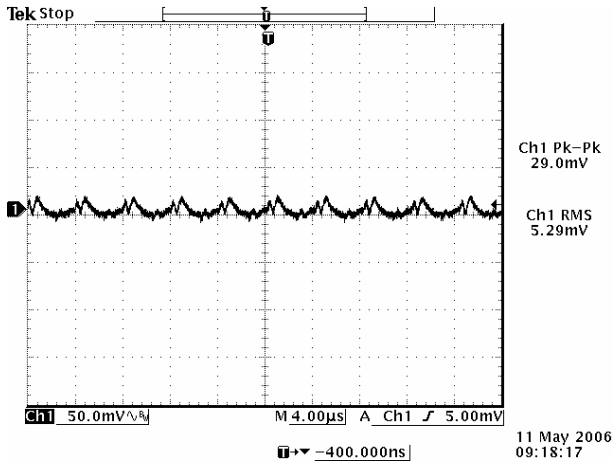
Vo=24 V, Io=0.5 A

# ISOLATED DC/DC CONVERTERS

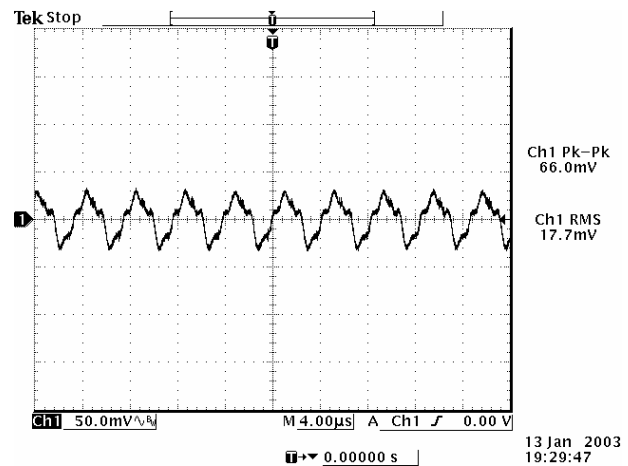
48 Vdc Input, 3.3 Vdc/2 A, 5 Vdc/2 A, 12 Vdc/1 A, 24 Vdc/0.5 A Output



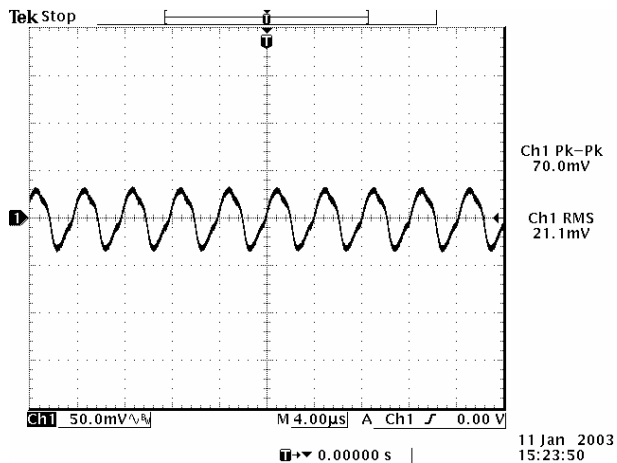
## Ripple and Noise Waveforms



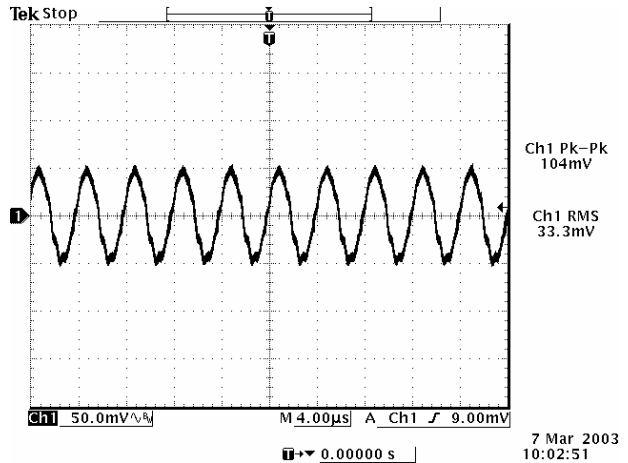
Vo=3.3 V



Vo=5.0 V



Vo=12 V



Vo=24 V

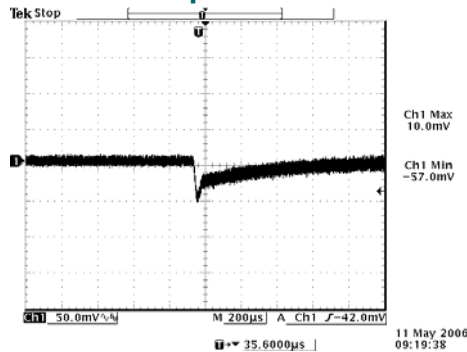
**Note:** Ripple and noise at full load, 48 Vdc input, with a 1 uF ceramic capacitor at the output, and Ta=25 deg C.

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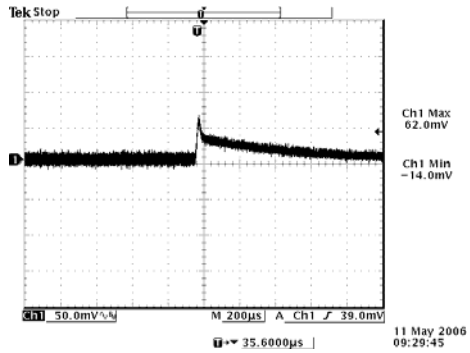
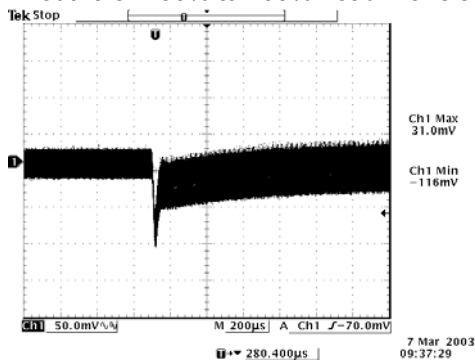
48 Vdc Input, 3.3 Vdc/2 A, 5 Vdc/2 A, 12 Vdc/1 A, 24 Vdc/0.5 A Output



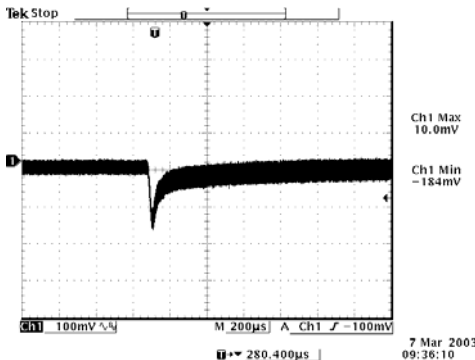
## Transient Response Waveforms



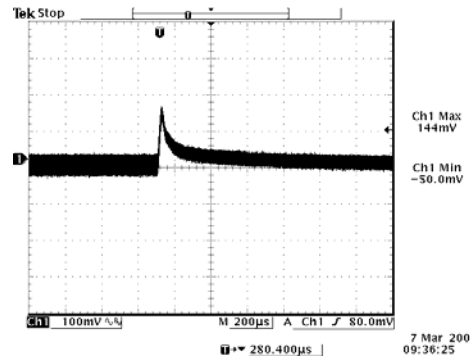
Vout=3.3 V 50% to 100% Load Transients



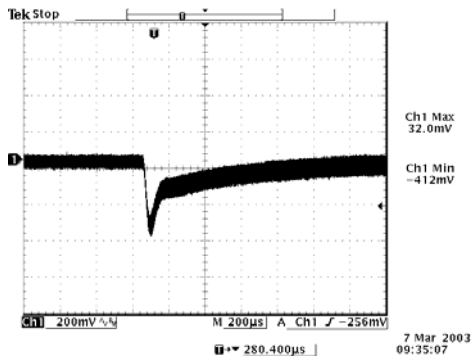
Vout=5.0 V 50% to 100% Load Transients



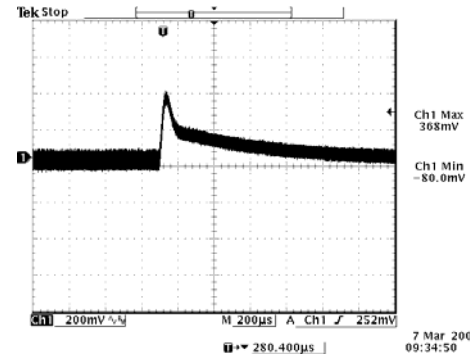
Vout=5.0 V 100% to 50% Load Transients



Vout=12 V 50% to 100% Load Transients



Vout=12 V 100% to 50% Load Transients



Vout=24 V 50% to 100% Load Transients

Vout=24 V 100% to 50% Load Transients

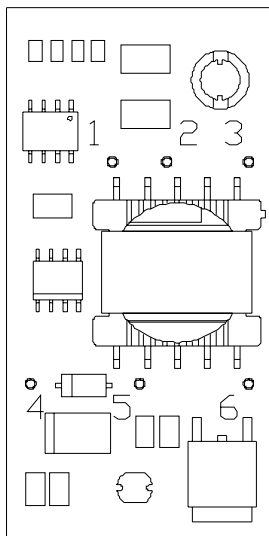
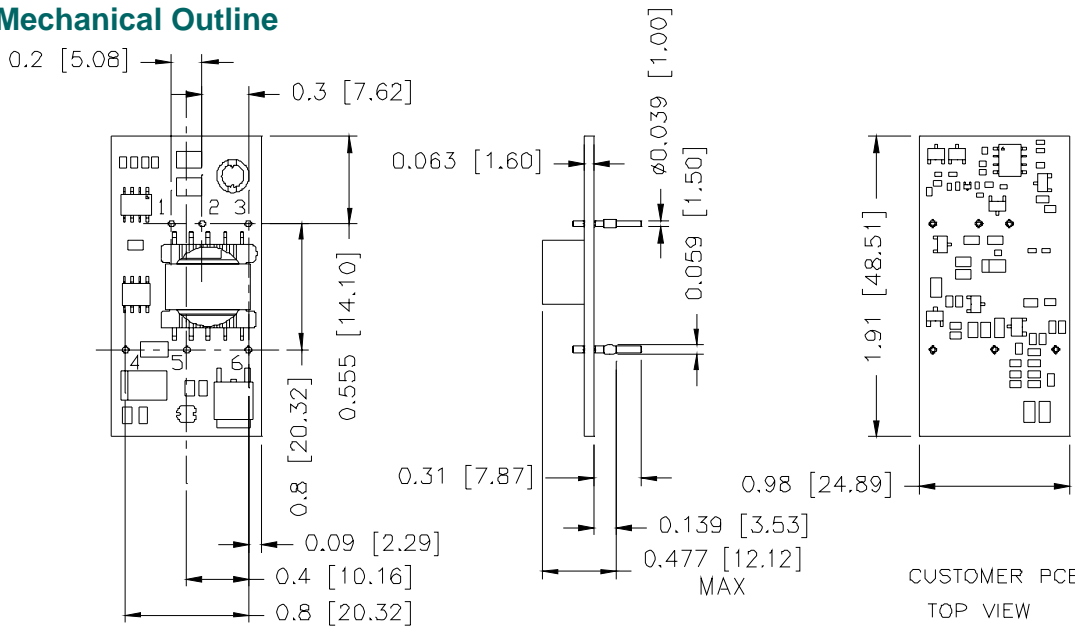
**Note:** Transient response at Vin=48 V, di/dt=0.1 A/µs, with external 1 µF ceramic capacitor, and Ta=25 deg C.

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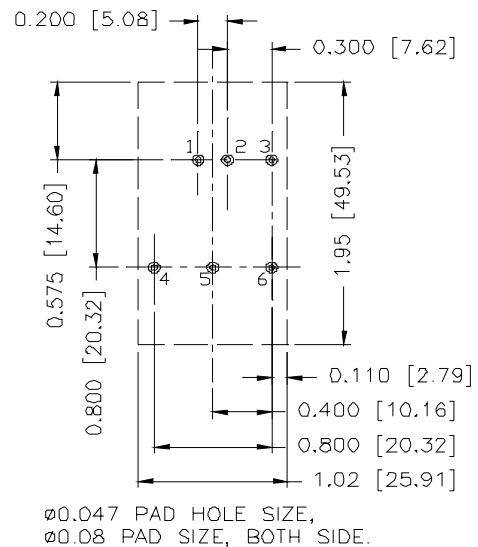


## Mechanical Outline



## Pin Connections

Pin	Function
1	Vin+
2	Vin-
3	Enable
4	Vo+
5	Trim
6	Vo-



## 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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