ISOLATED DC/DC CONVERTERS

48 Vdc Input 3.3 Vdc - 24 Vdc/7 A - 1.25 A Output

0RLC-25T Series RoHS Compliant Rev.A

- Fixed Frequency (230 kHz)
- Output Over Voltage Shut Down
- Isolated
- High Efficiency
- High Power Density
- Low Cost
- Safety Approval to UL60950-1 (Pending)
- Remote On/Off
- Output Voltage Trim
- Input Under Voltage Lockout
- SCP/OCP
- Over Temperature Protection
- Remote On/Off Logic (Option)

Description

The 0RLC-25T series are isolated dc/dc converters that operate from a nominal 48 Vdc source. These units will provide up to 30 W of output power. These units are designed to be high efficient and very low cost. Features include remote on/off, over current protection, and under voltage lockout. 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	7 A	23 W	88%	0RLC-25T033	0RLC-25T03L
5.0 Vdc	36 Vdc - 75 Vdc	5 A	25 W	90%	0RLC-25T050	0RLC-25T05L
12.0 Vdc	36 Vdc - 75 Vdc	2.5 A	30 W	90%	0RLC-25T120	0RLC-25T12L
15.0 Vdc	36 Vdc - 75 Vdc	2.0 A	30 W	90%	0RLC-25T150	0RLC-25T15L
24.0 Vdc	36 Vdc - 75 Vdc	1.25 A	30 W	91%	0RLC-25T240	0RLC-25T24L

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	-	80 V	100 V for 100 mS Max
Remote On/Off	-0.3 V	-	12 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	36 V	-	75 V	
Input Current	-	-	1.1 A	
Input Current (no load)	-	25 mA	40 mA	
Remote Off Input Current	-	3 mA	10 mA	
Input Reflected Ripple Current (rms)	-	10 mA	20 mA	With simulated source impedance of 10 uH, 5 Hz to 20 MHz. And use a 100 uF/ 100 V electrolytic capacitor with ESR=1 ohm max, at 200 kHz.
Input Reflected Ripple Current (pk-pk)	-	40 mA	60 mA	
I^2t Inrush Current Transient	-	0.012 A^2s	0.024 A^2s	
Turn-on Input Voltage	31 V	34 V	36 V	
Turn-off Input Voltage	30 V	33 V	35 V	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				
Vo=3.3 V	3.234 V	3.3 V	3.366 V	Test condition: V_{in}=48 V, I_O=50% full load at the output.
Vo=5.0 V	4.900 V	5.0 V	5.100 V	
Vo=12.0 V	11.76 V	12.0 V	12.240 V	
Vo=15.0 V	14.70 V	15.0 V	15.300 V	
Vo=24.0 V	23.52 V	24.0 V	24.480 V	
Line Regulation				
Vo=3.3 V	-	±1 mV	±3 mV	
Vo=5.0 V	-	±2 mV	±5 mV	
Vo=12.0 V	-	±5 mV	±10 mV	
Vo=15.0 V	-	±8 mV	±15 mV	
Vo=24.0 V	-	±10 mV	±20 mV	
Load Regulation				
Vo=3.3 V	-	±2 mV	±5 mV	
Vo=5.0 V	-	±4 mV	±8 mV	
Vo=12.0 V	-	±9 mV	±18 mV	
Vo=15.0 V	-	±10 mV	±20 mV	
Vo=24.0 V	-	±15 mV	±30 mV	
Temperature Regulation (-40 °C to +85 °C)				
Vo=3.3 V	-	30 mV	50 mV	
Vo=5.0 V	-	40 mV	70 mV	
Vo=12.0 V	-	100 mV	170 mV	
Vo=15.0 V	-	120 mV	200 mV	
Vo=24.0 V	-	150 mV	240 mV	
Ripple and Noise (rms)				
Vo=3.3 V	-	10 mV	20 mV	Test condition of the output ripple and noise: 0-20 MHz BW, with a 1 µF ceramic capacitor and a 220 uF /35 V at the output.
Vo=5.0 V	-	10 mV	20 mV	
Vo=12.0 V	-	10 mV	20 mV	
Vo=15.0 V	-	15 mV	30 mV	
Vo=24.0 V	-	20 mV	40 mV	
Ripple and Noise (pk-pk)				
Vo=3.3 V	-	40 mV	75 mV	
Vo=5.0 V	-	40 mV	75 mV	
Vo=12.0 V	-	40 mV	75 mV	
Vo=15.0 V	-	80 mV	120 mV	
Vo=24.0 V	-	85 mV	150 mV	
Output Current				
Vo=3.3 V	0 A	-	7.0 A	
Vo=5.0 V	0 A	-	5.0 A	
Vo=12.0 V	0 A	-	2.5 A	
Vo=15.0 V	0 A	-	2.0 A	
Vo=24.0 V	0 A	-	1.25 A	
Current Limit Threshold				
Vo=3.3 V	7.7 A	-	12.0 A	
Vo=5.0 V	5.5 A	-	8.0 A	
Vo=12.0 V	3.0 A	-	4.2 A	
Vo=15.0 V	2.2 A	-	3.4 A	
Vo=24.0 V	1.5 A	-	2.2 A	
Short Circuit Surge Transient	-	0.5 A^2s	1 A^2s	
Turn on Time	-	10 mS	25 mS	
Overshoot at Turn On	-	0%	5%	
Output Capacitance				
Vo=3.3 V	0 uF	-	3300 uF	
Vo=5.0 V	0 uF	-	2200 uF	
Vo=12.0 V	0 uF	-	330 uF	
Vo=15.0 V	0 uF	-	330 uF	
Vo=24.0 V	0 uF	-	330 uF	

Output Specifications (continued)

Parameter			Min	Typ	Max	Notes
Transient Response						
50% ~ 75% Max Load	Overshoot	Vo=3.3 V	-	75 mV	100 mV	Test condition of the transient response: di/dt=0.1 A/us, Vin=48 V, with a 220 uF/35 V electrolytic capacitor at the output.
	Settling Time		-	150 uS	200 uS	
25% ~ 50% Max Load	Overshoot		-	75 mV	100 mV	
	Settling Time		-	150 uS	200 uS	
50% ~ 75% Max Load	Overshoot	Vo=5.0 V	-	100 mV	150 mV	
	Settling Time		-	150 uS	200 uS	
25% ~ 50% Max Load	Overshoot		-	100 mV	150 mV	
	Settling Time		-	150 uS	200 uS	
50% ~ 75% Max Load	Overshoot	Vo=12.0 V	-	150 mV	200 mV	
	Settling Time		-	150 uS	200 uS	
25% ~ 50% Max Load	Overshoot		-	150 mV	200 mV	
	Settling Time		-	150 uS	200 uS	
50% ~ 75% Max Load	Overshoot	Vo=15.0 V	-	100 mV	200 mV	
	Settling Time		-	200 uS	300 uS	
25% ~ 50% Max Load	Overshoot		-	100 mV	200 mV	
	Settling Time		-	200 uS	300 uS	
50% ~ 75% Max Load	Overshoot	Vo=24.0 V	-	150 mV	300 mV	
	Settling Time		-	300 uS	500 uS	
25% ~ 50% Max Load	Overshoot		-	150 mV	300 mV	
	Settling Time		-	300 uS	500 uS	

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at V_{in}=48 V, I_O=Io, max
Vo=3.3 V	85%	88%	-	
Vo=5.0 V	87%	90%	-	
Vo=12.0 V	87%	90%	-	
Vo=15.0 V	87%	90%	-	
Vo=24.0 V	86%	89%	-	
Switching Frequency	200 kHz	230 kHz	260 kHz	
Output Trim Range	90% Vo	-	110% Vo	
I/O Isolation Voltage	1500 V	-	-	
Isolation Capacitance	-	1500 pF	-	
Output Voltage Trim Range	90%	-	110%	
Over Temperature Protection	-	110 °C	-	
Over Voltage Protection				Test condition of Over Voltage Protection: Vin=48 V, Io=100% load at 25 °C ambient.
Vo=3.3 V	3.9 V	-	5.0 V	
Vo=5.0 V	5.7 V	-	7.0 V	
Vo=12.0 V	13.6 V	-	14.2 V	
Vo=15.0 V	18.0 V	-	22.5 V	
Vo=24.0 V	28.8 V	-	36.0 V	
MTBF	2,602,427 hours			Calculated Per Bell Core SR-332 (I_O = 80% load; Vin=48 V; Vo=3.3 V; T_a = 25 °C)
Dimensions				
Inches (L × W × H)	2.0 x 1.0 x 0.438			
Millimeters (L × W × H)	50.8 x 25.4 x 11.14			
Weight	-	20 g	-	

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

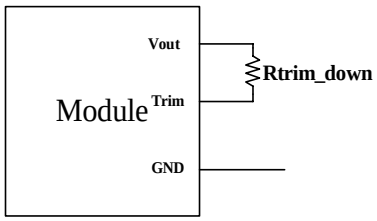
Control Specifications

Parameter		Min	Typ	Max	Notes
Remote On/Off					
Signal Low (Unit On)	Active Low	-0.3 V	-	0.8 V	The remote On/Off pin open, Unit On.
Signal High (Unit Off)		3.5 V	-	12 V	
Signal Low (Unit Off)	Active High	-0.3 V	-	0.8 V	
Signal High (Unit On)		3.5 V	-	12 V	
Current Sink		0.3 mA	-	0.75 mA	

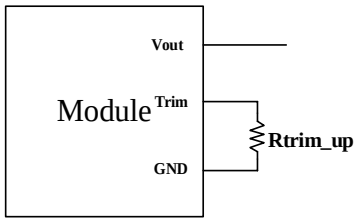
Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) and the nominal output voltage of the converter (Vnom) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. 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.

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

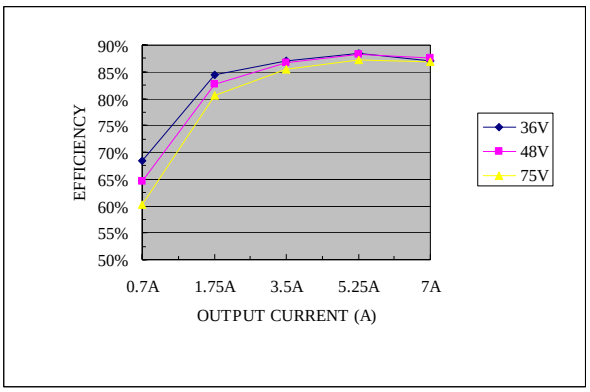


$$R_{trim\_up} = \frac{C}{V_{adj} - V_{nom}} - D$$

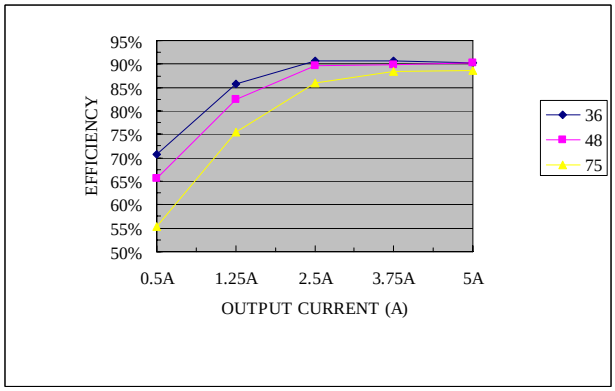


Vnom	A	B	C	D
24.0	272.305	15.664	31.634	3.010
15.0	92.125	9.360	18.400	2.000
12.0	53.320	9.260	14.025	3.650
5.0	19.300	15.120	6.350	10.000
3.3	21.711	40.610	13.032	30.100

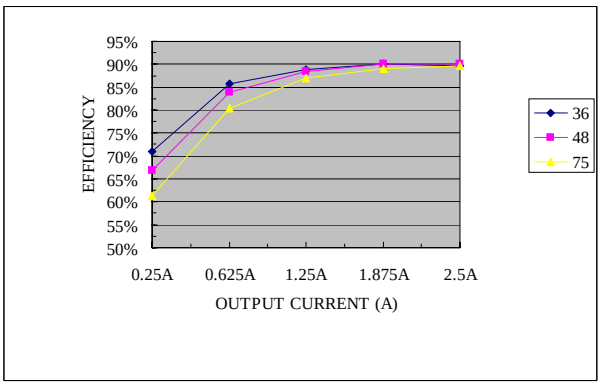
Efficiency Data



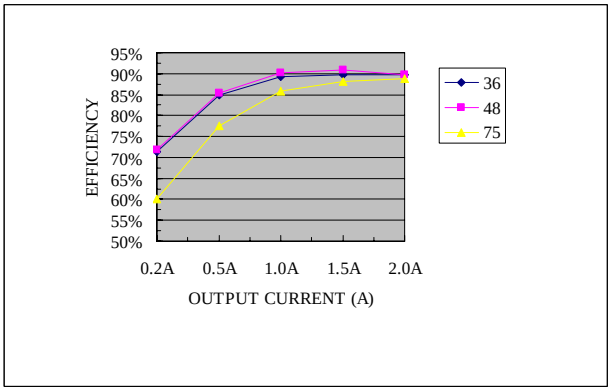
0RLC-25T033



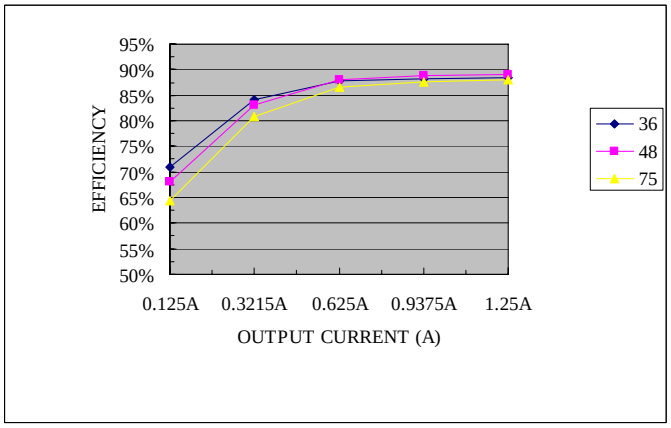
0RLC-25T050



0RLC-25T120

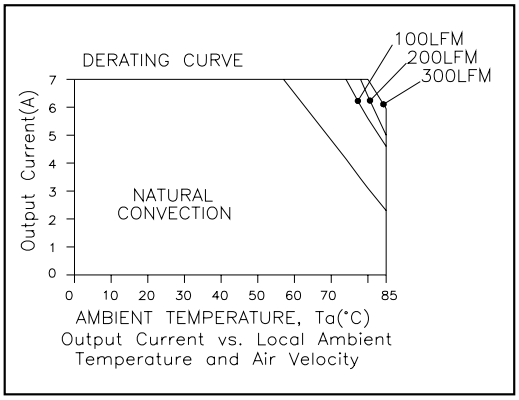


0RLC-25T150



0RLC-25T240

Thermal Derating Curves



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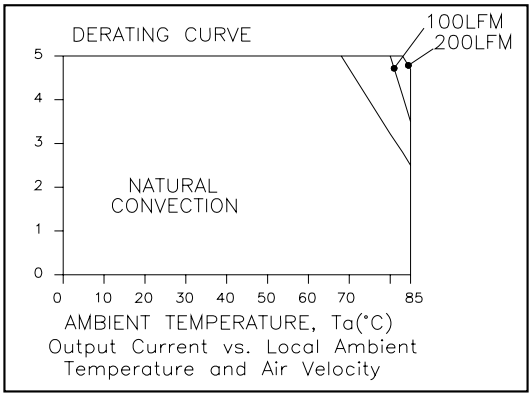

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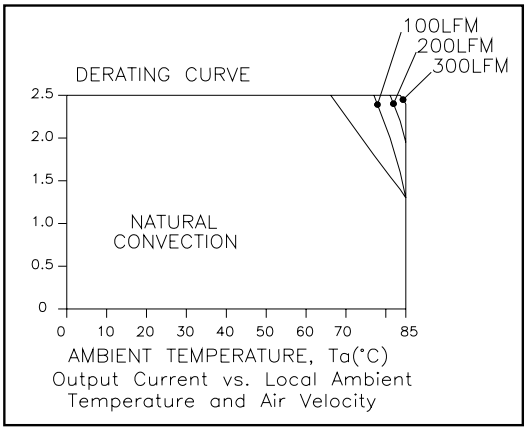
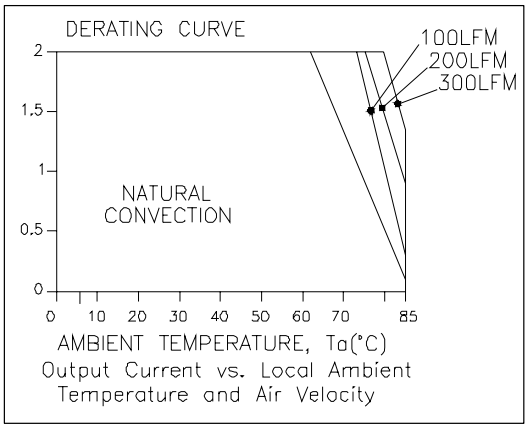
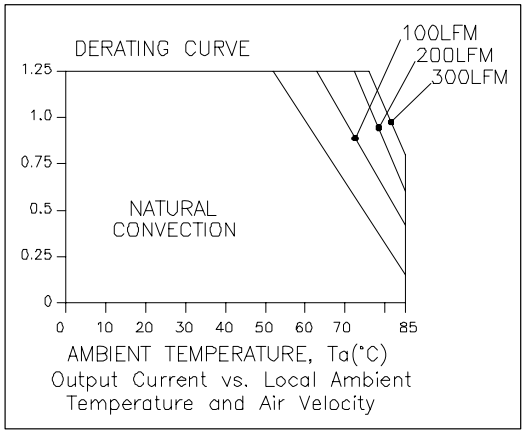


0RLC-25T120

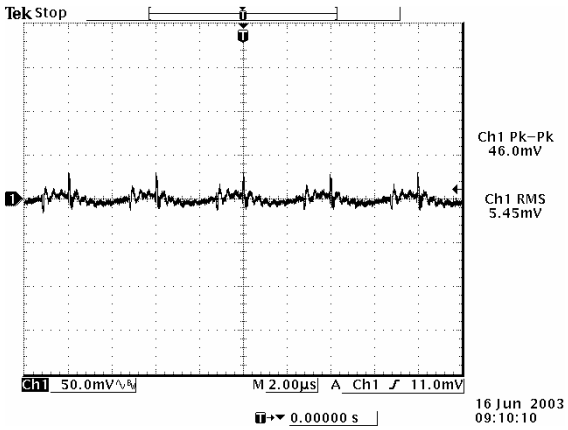


0RLC-25T150

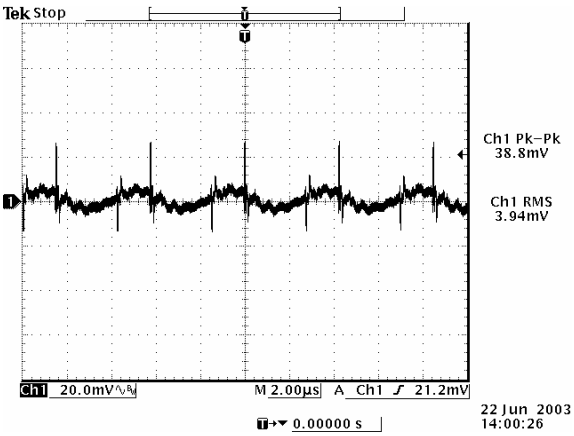


0RLC-25T240

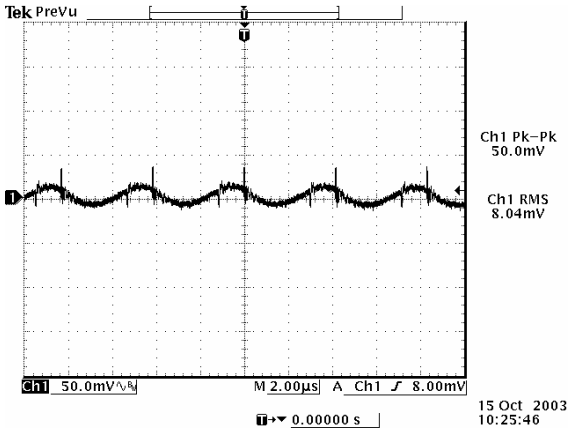
Ripple and Noise Waveforms



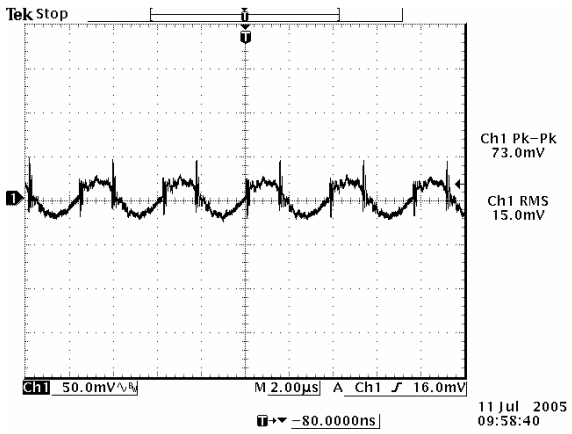
Ripple and noise at full load, 3.3 Vdc/7 A output



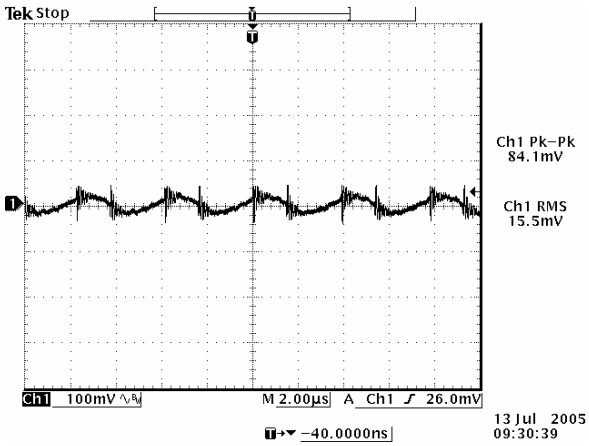
Ripple and noise at full load, 5.0 Vdc/5 A output



Ripple and noise at full load, 12 Vdc/2.5 A output



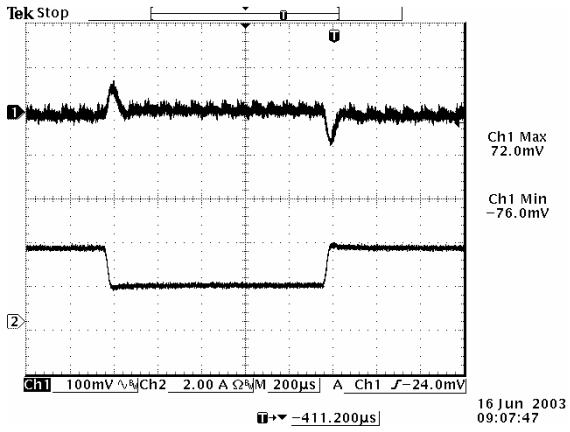
Ripple and noise at full load, 15 Vdc/2 A output



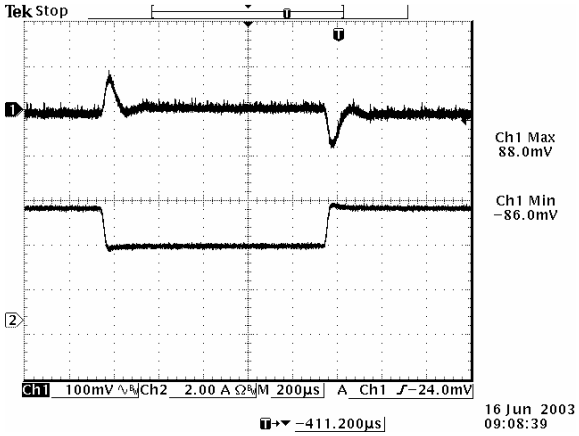
Ripple and noise at full load, 24 Vdc/1.25 A output

Note: Ripple and noise at 48 Vdc input, with a 0.47 uF ceramic cap at the output, Ta=25 deg C.

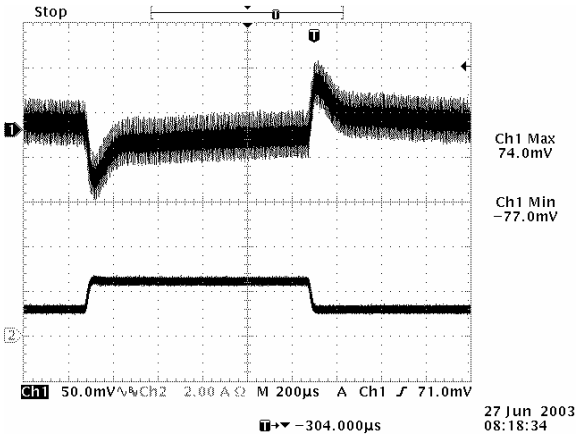
Transient Response Waveforms



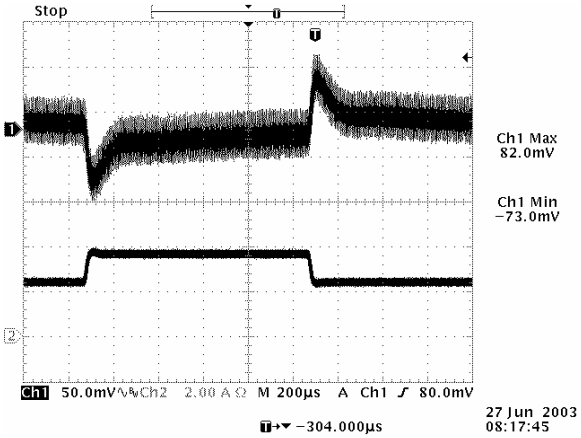
Transients 25% to 50% load 3.3 Vdc output



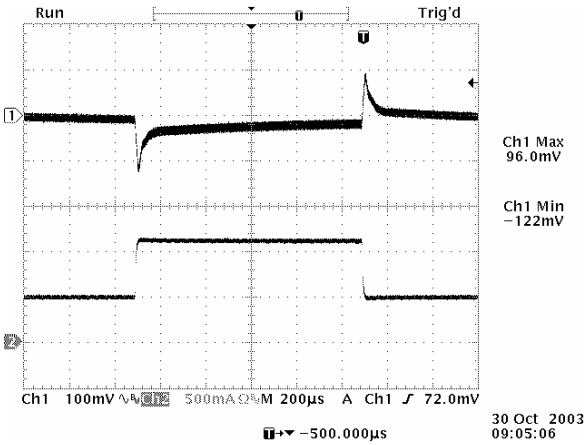
Transients 50% to 75% load 3.3 Vdc output



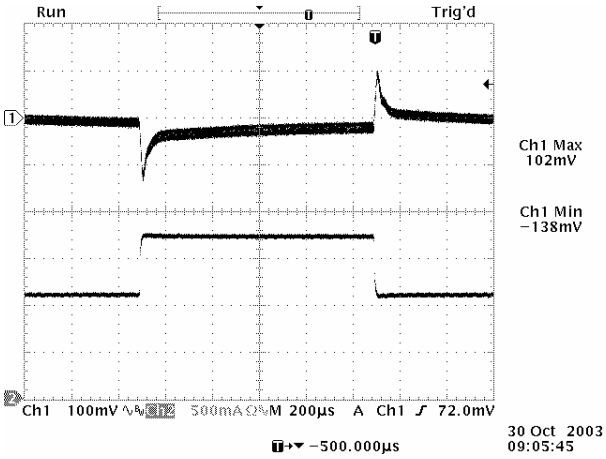
Transients 25% to 50% load 5.0 Vdc output



Transients 50% to 75% load 5.0 Vdc output

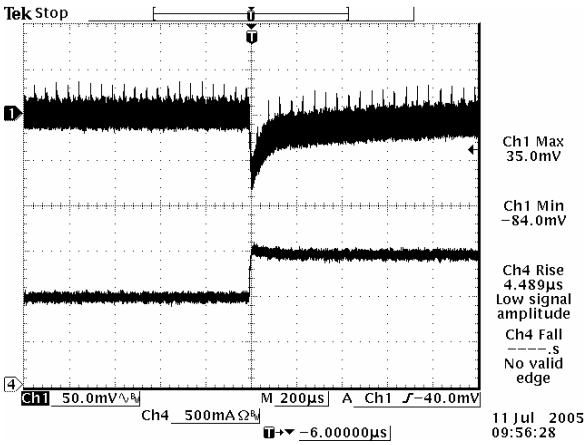


Transients 25% to 50% load 12 Vdc output

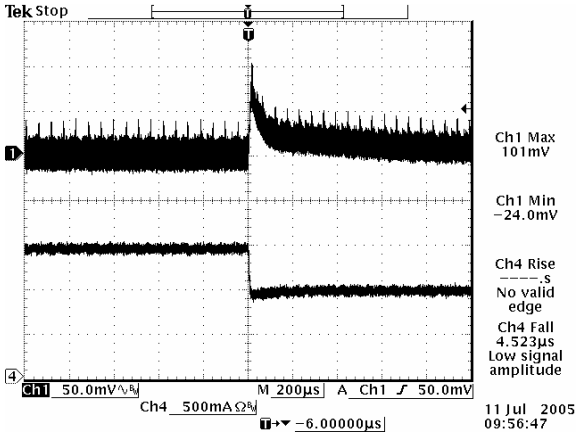


Transients 50% to 75% load 12 Vdc output

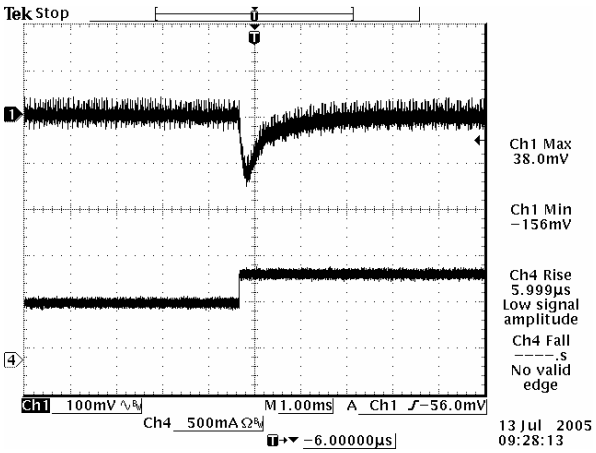
Transient Response Waveforms (continued)



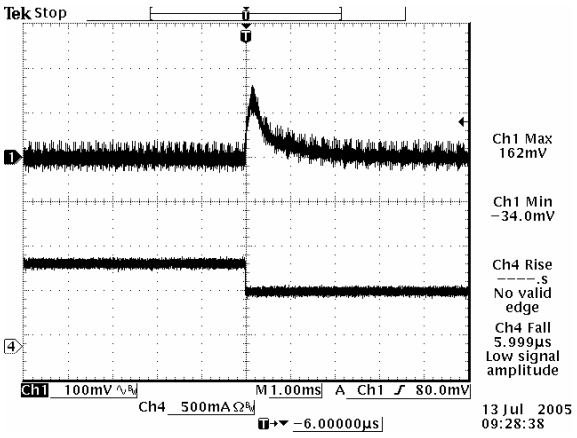
Transients 25% to 50% load 15 Vdc output



Transients 50% to 75% load 15 Vdc output



Transients 25% to 50% load 24 Vdc output



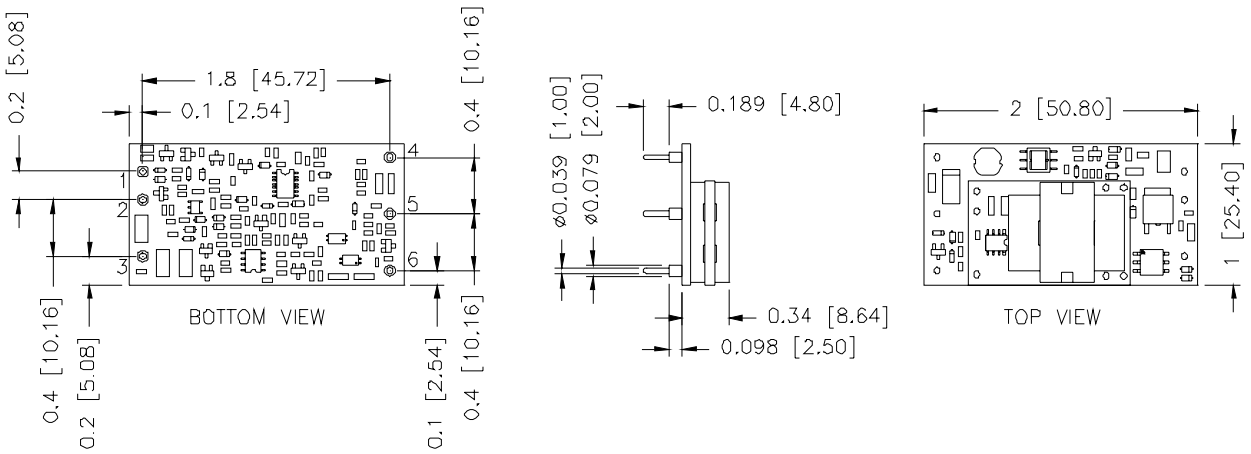
Transients 50% to 75% load 24 Vdc output

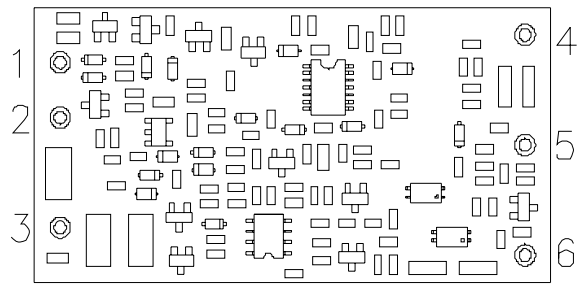
Note: Transient response at 48 Vdc input, di/dt=0.1 A/uS, with external 220 uF electrolytic cap and 0.47 uF ceramic cap at the output, and Ta=25 deg C.

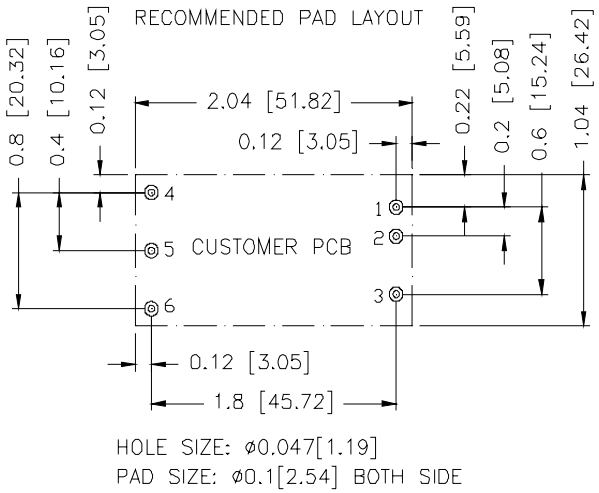
ISOLATED DC/DC CONVERTERS

48 Vdc Input 3.3 Vdc - 24 Vdc/7 A - 1.25 A Output

Mechanical Outline







Pin Connections

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

RoHS Compliance

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

CORPORATE

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