

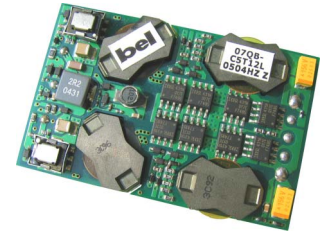
ISOLATED DC/DC CONVERTERS

48V Input 12V/12A, 3.3V/45A, 5V/30A, 1.2V-2.5V/50A Outputs

bel
POWER PRODUCTS

07QB-C5T Series PRELIMINARY

- Isolated
- High Efficiency
- High Power Density
- Low Cost
- Input Under Voltage Lockout
- Fixed Frequency (330KHz)
- Active Low/High (Option)
- Output Over Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Output Voltage Trim
- Positive/Negative Remote Sense



Description

The 07QB-C5T Series are isolated DC/DC converters that operate from a nominal 48V source. These units will provide up to 150W of output power from a nominal 48V input. These units are designed to be highly efficient and low cost. Typical efficiency of 12V output at 48V input at full load is 93%. Features include remote on/off, over current protection and under-voltage lockout. These converters are provided in an industry standard quarter brick package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High	Model Number Active Low
12V	48V	12A	144W	93%	07QB-C5T120	07QB-C5T12L
5.0V	48V	30A	150W	91%	07QB-C5T050	07QB-C5T05L
3.3V	48V	45A	150W	91%	07QB-C5T033	07QB-C5T03L
2.5V	48V	50A	125W	89%	07QB-C5T025	07QB-C5T02L
1.8V	48V	50A	120W	87%	07QB-C5TV80	07QB-C5TV8L
1.5V	48V	50A	75W	85%	07QB-C5TV50	07QB-C5TV5L
1.2V	48V	50A	60W	83%	07QB-C5TV20	07QB-C5TV2L

Note: Add "G" suffix at the end of the model number to indicate Tray Packaging.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	80V	
Remote On/Off	-0.3V	-	18V	
I/O Isolation Voltage	-	-	2000V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

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

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Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	36V	48V	75V	
Input Current (full load)				
Vo=12V	-	-	4.5A	
Vo=5.0V	-	-	4.9A	
Vo=3.3V	-	-	4.9A	
Vo=2.5V	-	-	4.1A	
Vo=1.8V	-	-	3.0A	
Vo=1.5V	-	-	2.6A	
Vo=1.2V	-	-	2.1A	
Input Current (no load)	-	120mA	180mA	
Remote Off Input Current		10mA	15mA	
Input Reflected Ripple Current (pk-pk)	-	10mA	20mA	Tested with simulated source impedance of 10uH, 5Hz to 20MHz; use a 100uF/100V electrolytic capacitor with ESR = 1 ohm max. at 200KHz at 25°C.
Input Reflected Ripple Current (RMS)	-	3mA	8mA	
I ² t Inrush Current Transient	-	0.05A ² s	0.1A ² s	
Turn-on Voltage Threshold	32V	34V	35V	
Turn-off Voltage Threshold	30V	32V	34V	

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Vin=48V, Io=50% full load
Vo=12V	11.820V	12V	12.180V	
Vo=5.0V	4.925V	5V	5.075V	
Vo=3.3V	3.250V	3.3V	3.350V	
Vo=2.5V	2.463V	2.5V	2.538V	
Vo=1.8V	1.773V	1.8V	1.827V	
Vo=1.5V	1.477V	1.5V	1.523V	
Vo=1.2V	1.182V	1.2V	1.218V	
Line Regulation				
Vo=12V	-	±12mV	±24mV	
Vo=5.0V	-	±5mV	±10mV	
Vo=3.3V	-	±3mV	±7mV	
Vo=1.2V-2.5V	-	±3mV	±6mV	
Load Regulation				
Vo=12V	-	±30mV	±60mV	
Vo=5.0V	-	±10mV	±20mV	
Vo=3.3V	-	±7mV	±15mV	
Vo=2.5V	-	±6mV	±13mV	
Vo=1.8V	-	±5mV	±9mV	
Vo=1.5V	-	±4mV	±8mV	
Vo=1.2V	-	±3mV	±6mV	
Regulation Over Temperature (-40°C to +85°C)				
Vo=12V	-	±60mV	±100mV	
Vo=5.0V	-	±45mV	±75mV	
Vo=3.3V	-	±30mV	±50mV	
Vo=2.5V	-	±25mV	±45mV	
Vo=1.8V	-	±20mV	±40mV	
Vo=1.5V	-	±20mV	±35mV	
Vo=1.2V	-	±15mV	±30mV	

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48V Input 12V/12A, 3.3V/45A, 5V/30A, 1.2V-2.5V/50A Outputs



Output Specifications (continued)

Parameter		Min	Typ	Max	Notes	
Output Current	Vo=12V	0A	-	12A		
	Vo=5.0V	0A	-	30A		
	Vo=3.3V	0A	-	45A		
	Vo=1.2V-2.5V	0A	-	50A		
Current Limit Threshold	Vo=12V	14A	15.5A	18A		
	Vo=5.0V	36A	43A	50A		
	Vo=3.3V	55A	62A	70A		
	Vo=1.2V-2.5V	58A	63A	70A		
Short Circuit Surge Transient		-	3A ² s	5A ² s		
Ripple and Noise (RMS)	Vo=12V	-	30mV	50mV	Test conditions: 0-20MHz BW, with a 1uF ceramic capacitor and a 10uF Tantalum capacitor at the output.	
	Vo=5.0V	-	25mV	50mV		
	Vo=3.3V	-	20mV	40mV		
	Vo=1.2V-2.5V	-	15mV	30mV		
Ripple and Noise (pk-pk)	Vo=12V	-	100mV	150mV		
	Vo=5.0V	-	100mV	150mV		
	Vo=3.3V	-	55mV	100mV		
	Vo=1.2V-2.5V	-	40mV	80mV		
Turn on Time		20mS	-	100mS		
Overshoot at Turn on		-	0%	5%		
Output Capacitance	Vo=12.0V	0uF	-	2200uF		
	Vo=5.0V	0uF	-	10000uF		
	Vo=1.2V-3.3V	0uF	-	20000uF		
Transient Response						
50% ~ 75% Max Load	Overshoot	Vo=12.0V	-	600mV	800mV	Test conditions: di/dt = 0.1A/uS, Vin=48V, with a 1uF ceramic capacitor and a 10uF Tantalum capacitor at the output.
	Settling Time		-	200uS	300uS	
75% ~ 50% Max Load	Overshoot	Vo=12.0V	-	600mV	800mV	
	Settling Time		-	200uS	300uS	
50% ~ 75% Max Load	Overshoot	Vo=5.0V	-	150mV	300mV	
	Settling Time		-	200uS	300uS	
75% ~ 50% Max Load	Overshoot	Vo=5.0V	-	150mV	300mV	
	Settling Time		-	200uS	300uS	
50% ~ 75% Max Load	Overshoot	Vo=1.2V-3.3V	-	100mV	200mV	
	Settling Time		-	200uS	300uS	
75% ~ 50% Max Load	Overshoot	Vo=1.2V-3.3V	-	100mV	200mV	
	Settling Time		-	200uS	300uS	

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

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General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=12V	90%	93%	-	Vin=48V, full load , Ta=25°C
Vo=5.0V	88%	91%	-	
Vo=3.3V	88%	91%	-	
Vo=2.5V	86%	89%	-	
Vo=1.8V	84%	87%	-	
Vo=1.5V	82%	85%	-	
Vo=1.2V	80%	83%	-	
Switching Frequency	280KHz	330KHz	380KHz	
Isolation capacitance	-	1500pF	-	
Output Voltage Trim Range	80%Vo	-	110%Vo	
Over Temperature Protection	-	125°C	-	
Over Voltage Protection	115%Vo	122%Vo	127%Vo	
MTBF	TBD			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions				
Inches	2.30 x 1.45 x 0.395			
millimeters	58.42 x 36.83 x 10.03			
Weight	-	41g	-	

Control Specifications

Parameter	Min	Typ	Max	Notes	
Remote On/Off					
Signal Low (Unit On)	-0.3V	-	0.8V	07QB-C5TxxL. The remote on/off pin open, Unit off.	
Signal High (Unit Off)					
Signal Low (Unit Off)	-0.3V	-	0.8V		07QB-C5Txx0. The remote on/off pin open, Unit on.
Signal High (Unit On)					
Current Sink	0mA	-	0.75mA		

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POWER PRODUCTS

Output Trim Equations

Equations for calculating the trim resistor are shown below (Unit: kΩ). The Trim Down resistor should be connected between the Trim pin and Ground pin. The Trim Up resistor should be connected between the Trim pin and the Vout. Only one of the resistors should be used for any given application.

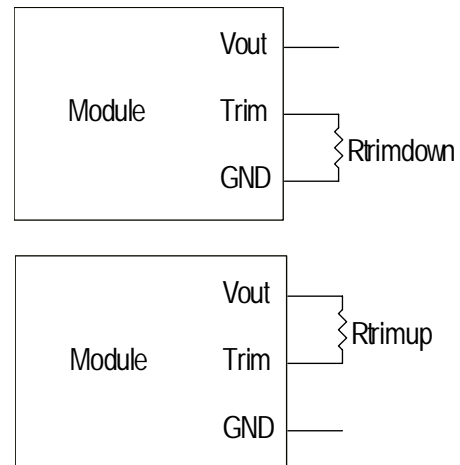
1) For $V_o=1.5V - 12V$:

$$R_{trimdown} = \frac{511}{|\delta|} - 10.22$$

$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11 - 626}{1.225 \cdot \delta} - 10.22$$

Notes:

$$\delta = \frac{(V_{o_req} - V_o)}{V_o} \times 100[\%]$$



V_{o_req} =Desired (trimmed) output voltage [V]; V_o =output voltage

$V_o=12.006V$ for 12V output; $V_o=5V$ for 5.0V output;; $V_o=3.308V$ for 3.3V output; $V_o=2.505V$ for 2.5V output;

$V_o=1.804V$ for 1.8V output; $V_o=1.503V$ for 1.5V output

2) For $V_o=1.2V$:

$$R_{trimdown} = \frac{511}{|\delta|} - 10.22$$

$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11 - 313}{0.6125 \cdot \delta} - 10.22$$

Notes:

$$\delta = \frac{(V_{o_req} - V_o)}{V_o} \times 100[\%]$$

V_{o_req} =Desired (trimmed) output voltage [V]; V_o =output voltage

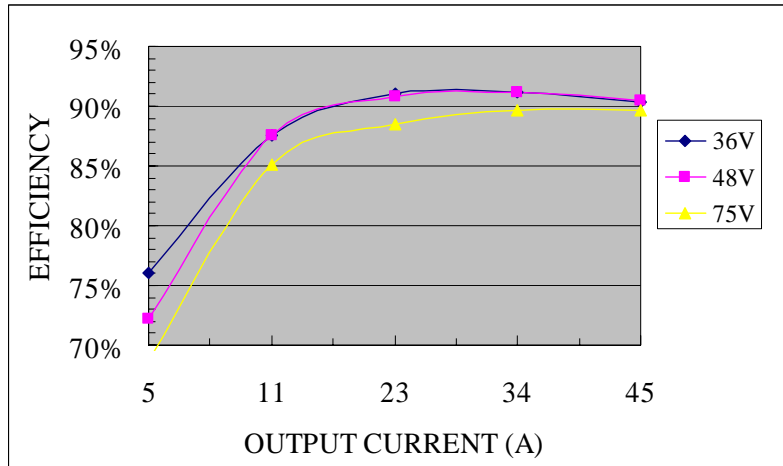
$V_o=1.202V$ for 1.2V output

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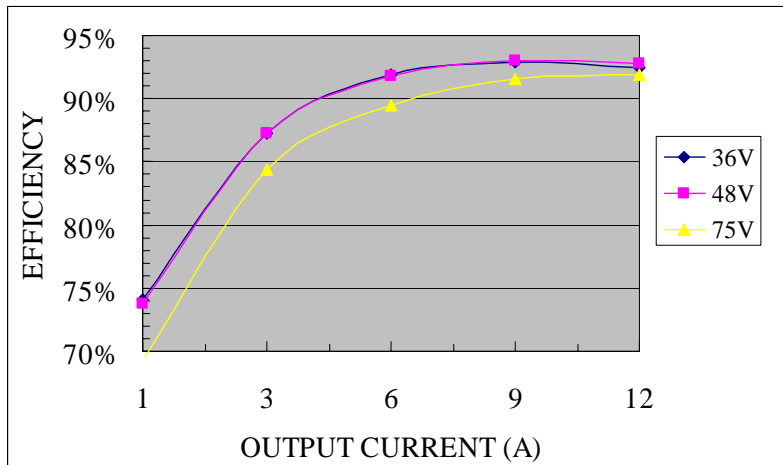
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Efficiency Data



07QB-C5T03x



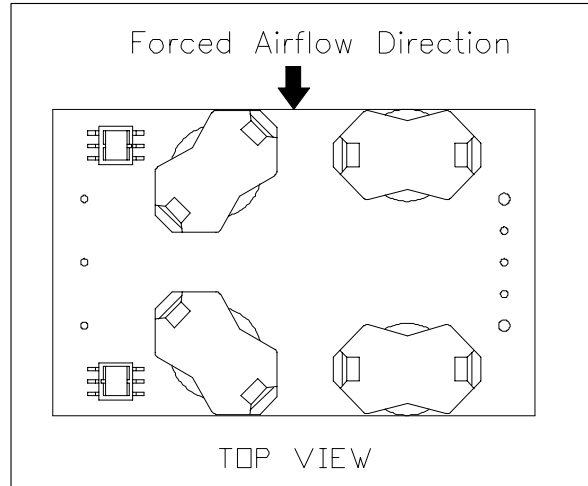
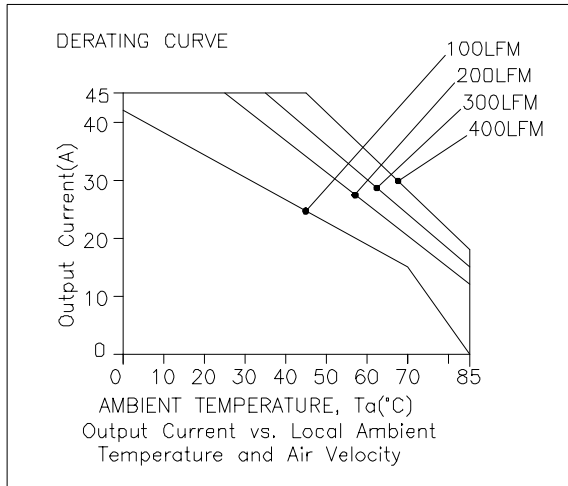
07QB-C5T12x

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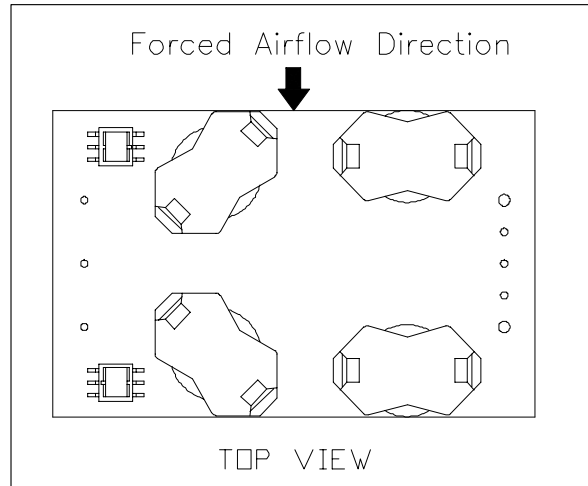
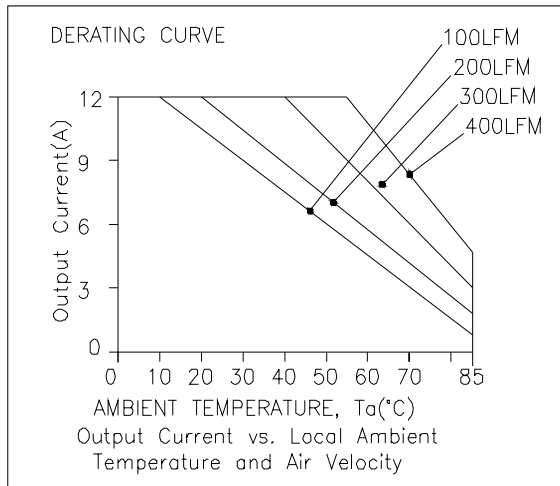
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Thermal Derating Curves



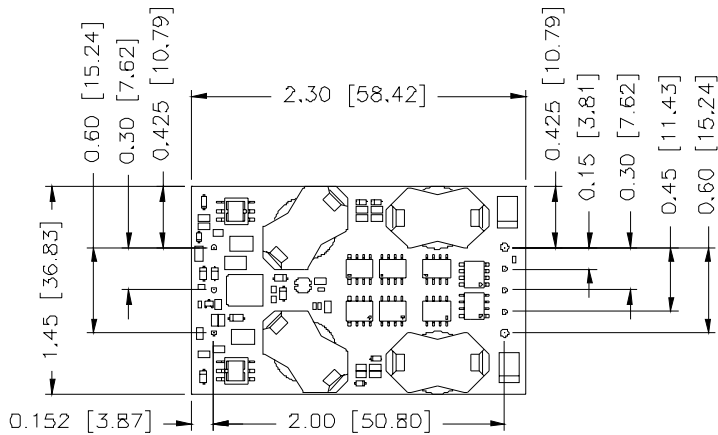
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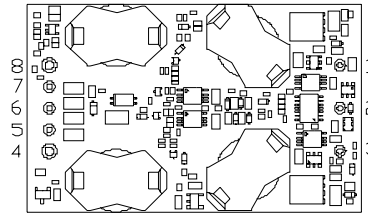
07QB-C5T12x

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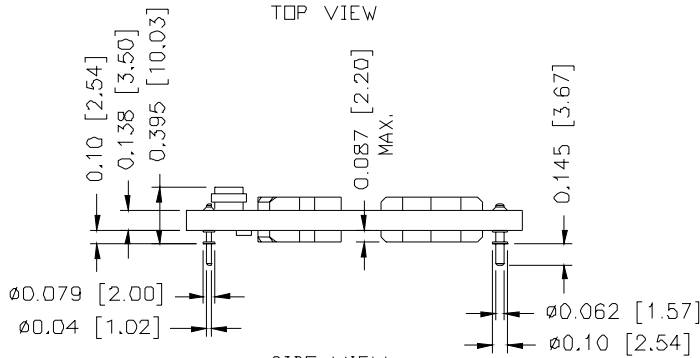
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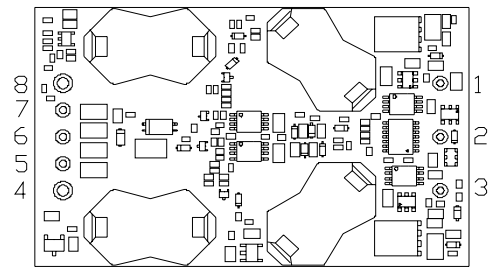
TOP VIEW



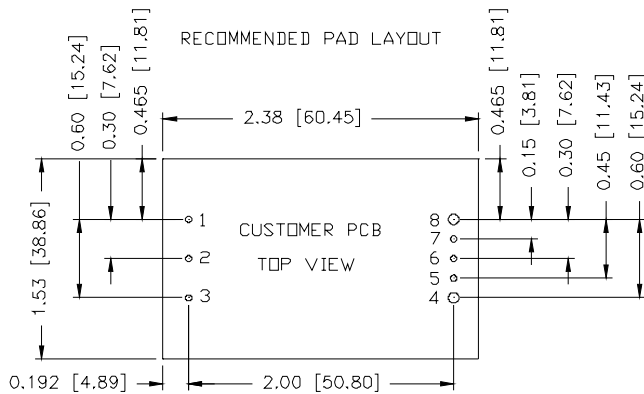
BOTTOM VIEW



SIDE VIEW



BOTTOM VIEW



1,2,3,5,6,7 ϕ 0.047 HOLE SIZE, ϕ 0.08 min PAD SIZE
4,8 ϕ 0.07 HOLE SIZE, ϕ 0.10 min PAD SIZE

Pin Connections

Pin	Function	Pin Size
1	Vin (+)	0.04"
2	Remote On/Off	0.04"
3	Vin (-)	0.04"
4	Vout (-)	0.062"
5	Remote Sense (-)	0.04"
6	Trim	0.04"
7	Remote Sense (+)	0.04"
8	Vout (+)	0.062"

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