QKS48T21120 DC-DC Bus Converter Data Sheet
Quarter-Brick with 48VDC Input; 12VDC @ 21A Output

Applications

- Power systems utilizing Intermediate Bus Architecture
- Networking equipment
- Data/voice processing
- Wireless communications
- Computing
- ATCA

Benefits

- Simplifies power system design; reduces design time and technical risk
- Compatible with all (12Vin nom.) POLs available in the market

Features

- Loosely regulated output
- High output power of 252W
- Efficiency to 94%
- Wide-input voltage range from 36V to 75V
- 100V/100ms input voltage surge withstand
- Input-to-output isolation: 1500VDC
- Basic insulation
- Backdrive protection
- Start-up into pre-biased load
- Output overcurrent protection
- Output overvoltage protection
- Overtemperature protection
- Remote on/off (primary referenced), positive or negative logic option
- Designed to comply with NEBS GR-1089 and GR-63
- Safety: UL60950-1, CSA C22.2 No. 60950-1-03 cURus,TUV EN60950-1:2001, IEC60950-1:2001 *(Safety pending)*

Description

The QKS is a high density and highly efficient, isolated DC-DC converter that operates over an input voltage range of 36VDC to 75Vdc. It provides a 12VDC nominal, loosely regulated output voltage at up to 21ADC of current. The converter is an ideal choice for building a complete power system utilizing the Intermediate Bus Architecture (IBA). The thermally-optimized construction of the QKS allows the unit to provide high output current over a wide operating temperature range while maintaining a safe guardband for component electrical and thermal ratings. The QKS employs 100% surface-mount components for consistency and reliability in the production process.

Model Selection

Model	Input Voltage VDC	Input Current, Max ADC	Output Voltage VDC	Output Rated Current I_{rated} ADC	Output Ripple/Noise, mV p-p	Typical Eff.@ 75% I_{rated}, 40C, 48Vi %
QKS48T21120	35-75	7.5	12 (NOM.)	21	120 (NOM.)	94

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings may cause performance degradation, adversely effect long-term reliability, and cause permanent damage to the converter.

Parameter	Conditions/Description	Min	Max	Units
Input Voltage	Continuous Transient, 100 ms		75 100	VDC VDC
Operating Temperature	PC Board Temperature	-40	100	°C
Storage Temperature		-40	125	°C

Environmental and Mechanical Specifications

All specifications apply over specified input voltage, output load, and temperature range, unless otherwise noted.

Parameter	Conditions/Description	Min	Nom	Max	Units
Operating Humidity	Relative Humidity, Non-cond.			95	%
Storage Humidity	Relative Humidity, Non-cond.			95	%
Shock	(Half-sinewave, 6ms), 3 axes		50		g
Sinusoidal Vibration	GR-63-CORE, Section 5.4.2		1		g
Weight			1.2/35		Oz/g
Water Washing	Standard process		Yes		
MTBF	Per Bellcore TR-NWT-000332		1.8		MHrs

Isolation Specifications

All specifications apply over specified input voltage, output load, and temperature range, unless otherwise noted.

Parameter	Conditions/Description	Min	Nom	Max	Units
Insulation Safety Rating		Basic			
Isolation Voltage	Input to Output	1500			VDC
Isolation Resistance		10			MOhm
Isolation Capacitance			1000		pF

Input Specifications

All specifications apply over specified input voltage, output load, and temperature range, unless otherwise noted.

Parameter	Conditions/Description	Min	Nom	Max	Units
Input Voltage	Continuous	36	48	75	VDC
Input Undervoltage Lockout Turn-on Voltage Threshold Turn-off Voltage Threshold Hysteresis	Vin	 33.5 32 1.5	 34.5 33	 35.5 34	V
Power up Turn-on delay time (Time from V_{IN} @ UVLO to Vo @ 10% of Vo nominal)	All	0.5		30	ms
Enable Turn-on delay time (Time from V_{enable} @ 0.8V to Vo @ 10% of Vo nominal)	All	0.5		11	ms

Parameter	Conditions/Description	Min	Nom	Max	Units
Output Rise Time at Turn-on (Time from Vo @ 10% Vo nominal to Vo @ 90% of Vo nominal) w/ Load = resistor + 330 µF capacitor	All	0.5		30	ms
Turn-on Output Overshoot	Vo			13.2	VDC
Input Reflected Ripple Current	Full Load, 12µH source inductance			200	mA p-p
Inrush Transient	i^2t	-	-	2	A^2s

Output Specifications

All specifications apply over specified input voltage, output load, and temperature range, unless otherwise noted.

Parameter	Conditions/Description	Min	Nom	Max	Units
Output Voltage Set Point (Vin = 48V, Iout = ½ full load, 25°C)	Vo	11	11.5	13	VDC
Output Current	Io	0		21	A
Output Ripple (DC to 20MHz, 25°C)	Vo		25	70	mVp-p
Output Line regulation (Vi=36V to 75V, Iout = full load, 25°C)	Vo		3	8	mV
Output Load regulation (Iout from 0 to full load)	Vo		500		mV
Output Temperature Regulation: (Tcase =-40°C to +110°C)	Vo			± 0.03	%/°C
Transient Response (50% to 75% Load Step, Io/Δt=1A/µs, with 220µF, ESR<0.07ohm on output side) Peak Deviation Settling Time (Vo, 1% of Vo)	Vo	 11 -	 -	 13 10	 V ms
Admissible Load Capacitance	I_{rated}, Nom Vin	330		5000	µF
Output Current Limit Threshold*	Io	110	135	150	$\%I_{rated}$
Switching Frequency			350		kHz
Overvoltage Protection, Hiccup, auto recovery	Over all input voltage and load conditions	14		15	VDC

* Overcurrent protection is non-latching with auto recovery.

Feature Specifications

All specifications apply over specified input voltage, output load, and temperature range, unless otherwise noted.

Parameter		Min	Nom	Max	Units
Remote On/Off, Primary Side Positive Logic Off – State Voltage On – State Voltage Negative Logic (-N option) Off – State Voltage On – State Voltage Open Circuit Voltage (internal pull up circuit at On/Off pin) Sink Current-Logic Low		 -0.5 2.5 2.5 -0.5 	 5 	 0.3 40 40 0.3 0.50	 VDC VDC VDC VDC VDC mA
Thermal Shutdown (PCB temperature) Hysteresis (Latching Optional)		+120 20		+130	°C

* Over temperature protection is auto recovery via hysteresis loop. Optionally, latched over temperature protection can specified by adding “S1” in the special options field of the part number (see page 9).

Efficiency Curve

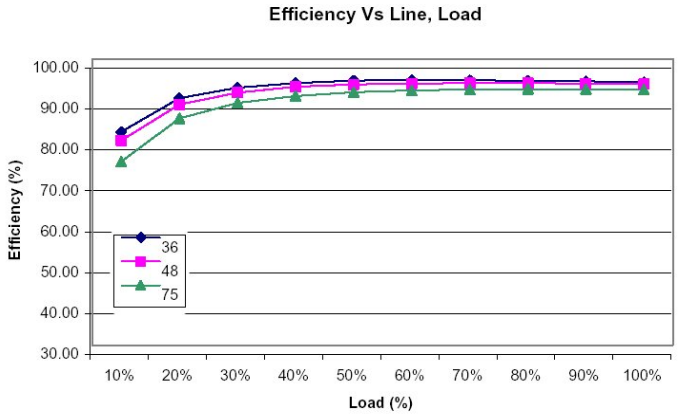


Figure 1. QKS48T21120 Efficiency vs. Output Load

Typical Application

Figure 2 shows the recommended connections for the QKS48T21120 converter.

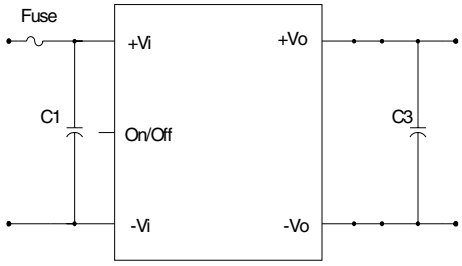


Figure 2. Typical Application of QKS48T21120

The QKS48T21120 converter does not require any external components for proper operation. However, a 100 µF low ESR input capacitor and a 330 µF output capacitor are recommended for optimal performance

Refer to the "Inrush Current Control Application Note" on www.power-one.com for suggestions on how to limit the magnitude of the inrush current.

Shutdown Feature Description

The ON/OFF pin in the QKS48T21120 converter functions as a normal soft shutdown. It is referenced to the –Vin pin (see Figure 2). With the positive logic, when the ON/OFF pin is pulled low, the output is turned off and the unit goes into a very low input power mode.

With negative logic, when the ON/OFF pin is pulled low, the unit is turned on.

An open collector switch is recommended to control the voltage between the ON/OFF pin and the -Vin pin of the converter. The ON/OFF pin is pulled up internally, so no external voltage source is required. The user should avoid connecting a resistor between the ON/OFF pin and the +Vin pin.

When the ON/OFF pin is used to achieve remote control, the user must take care to insure that the pin reference for the control is really the -Vin pin. The control signal must not be referenced ahead of EMI filtering, or remotely from the unit. Optically coupling the information and locating the optical coupler directly at the module will solve any of these problems.

Note:
If the ON/OFF pin is not used, it can be left floating (positive logic), or connected to the -Vin pin (negative logic).

Safety Considerations

The QKS48T21120 converter features 1500 Volt DC isolation from input to output. The input-to-output resistance is greater than 10MΩ. This converter is provided with basic insulation between input and output circuits according to all IEC60950 based standards. Nevertheless, if the system using the converter needs to receive safety agency approval, certain rules must be followed in the design of the system. In particular, all of the creepage and clearance requirements of the end-use safety requirements must be observed. These documents include UL60950 - CSA60950-00 and EN60950, although other or additional requirements may be needed for specific applications.

The QKS48T21120 converter has no internal fuse. The external fuse must be provided to protect the system from catastrophic failure. The fuse with a rating not greater than 10A is recommended. The user can select a lower rating fuse based upon the highest inrush transient at the maximum input voltage and the maximum input current of the converter, which occurs at the minimum input voltage. Both input traces and the chassis ground trace (if applicable) must be capable of conducting a current of 1.5 times the value of the fuse without opening. The fuse must not be placed in the grounded input line, if any.

In order for the output of the QKS48T21120 converter to be considered as SELV (Safety Extra Low Voltage) or TNV-1, according to all IEC60950 based standards, one of the following requirements must be met in the system design:

- If the voltage source feeding the module is SELV or TNV-2, the output of the converter may be grounded or ungrounded.
- If the voltage source feeding the module is ELV, the output of the converter may be considered SELV only if the output is grounded per the requirements of the standard.
- If the voltage source feeding the module is a Hazardous Voltage Secondary Circuit, the voltage source feeding the module must be provided with at least Basic insulation between the source to the converter and any hazardous voltages. The entire system, including the QKS48T21120 converter, must pass a dielectric withstand test for Reinforced insulation. Design of this type of systems requires expert engineering and understanding of the overall safety requirements and should be performed by qualified personnel.

Thermal Considerations

The QKS48T21120 converter is designed for natural or forced-convection cooling. The maximum allowable output current of the converter is determined by meeting the derating criteria for all components used in the converter. For example, the maximum semiconductor junction temperature is not allowed to exceed 125°C to ensure reliable long-term operation of the converter. Contact Power-One for the complete list of the derating criteria.

The graph in figure 3. shows the maximum output current of the QKS48T21120 converter at different ambient temperatures under both natural and forced convection.

For example, the QKS48T21120 operating at 70°C can deliver up to 15.7A reliably with 200LFM forced air.

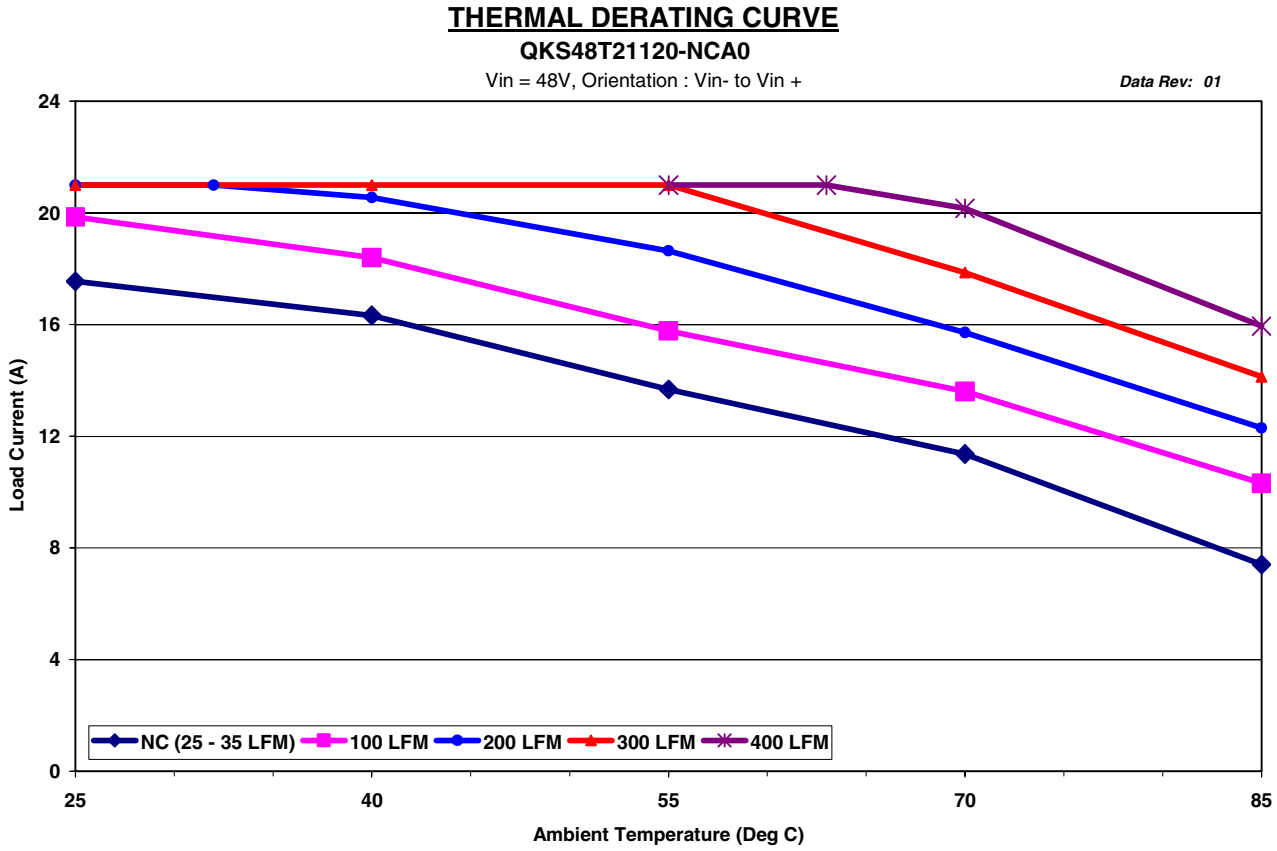
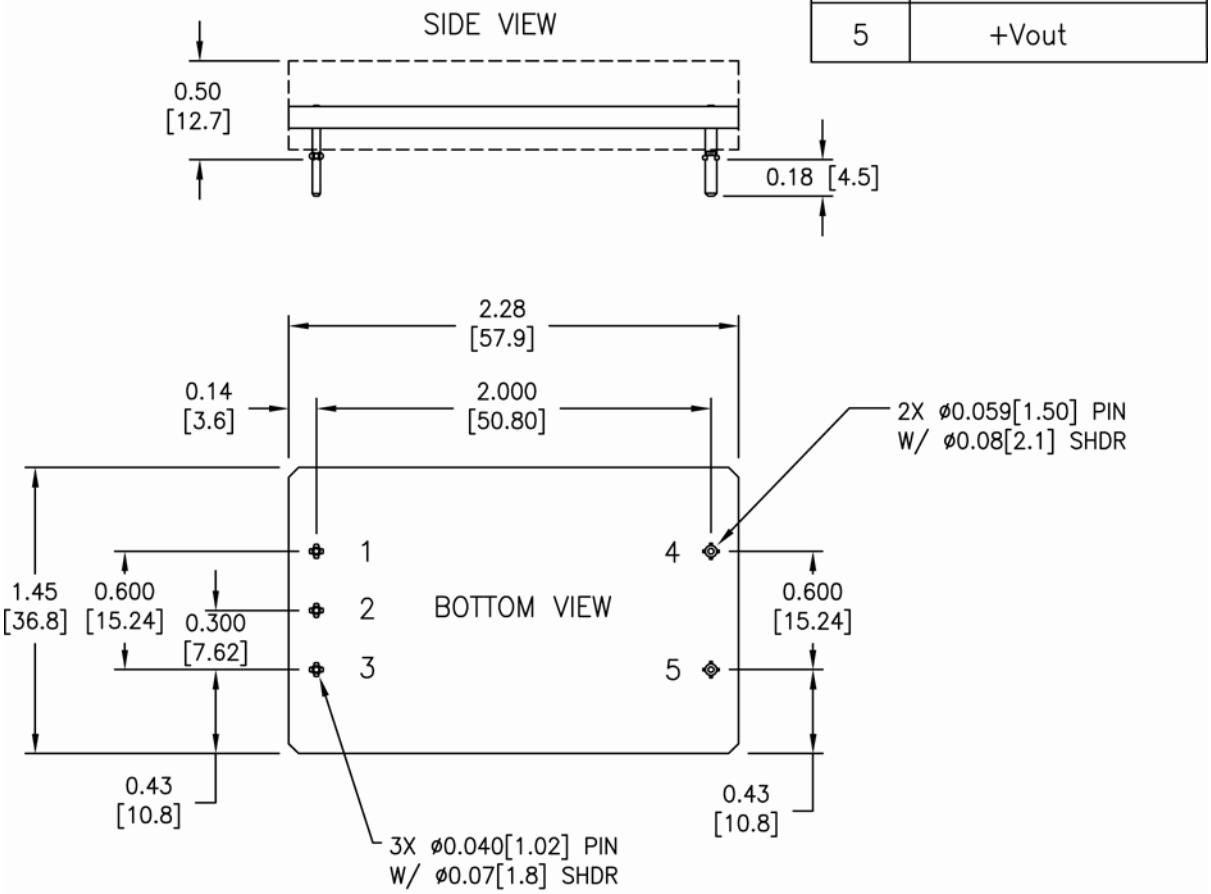


Figure 3. QKS48T21120 Derating Curves

Mechanical Drawing

PIN	FUNCTION
1	–Vin
2	Enable
3	+Vin
4	–Vout
5	+Vout



PIN DIAMETER TOLERANCE: ±.002[.05]

Unless otherwise specified, dimensions are in inches [mm].
Tolerances are .XX ±0.02 [0.5], .XXX ±0.010 [0.25]

Converter Part Numbering Ordering Information

Series	# Out	Vin nom.	I/O type	Io	Vo (nom. X 10)	-	On/Off logic	Height	Pin length	Special options
QK	**S**	48	T	21	120	-	P, N	C	A, B, C	0
1/4-Brick,	Single output	35 – 75Vdc	Thru-hole	A_{DC}	V_{DC}		See table below			

Features & Options [1]:	Descriptions:	Suffix code:
Remote ON/OFF	Positive logic	**-P**xxx
	Negative logic	**-N**xxx
Unit Height	0.50” nom. (fixed value, no alternative height)	**-xC**xx
Pin Length	0.18” (standard model length)	**-xxA**x
	0.145”	**-xxB**x
	0.110”	**-xxC**x
Special Options [1]	None (standard model, no special options)	**-xxx0**
	Latched Thermal Shutdown Protection	**-xxxS1**
	Customer-specific models	**-xxxS#**

Example:
Standard QKS with negative logic & 0.145 pin length; the resulting part number is QKS48T2112–NCB0

Notes:
1. Consult factory for the complete list of available options.

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