

### Applications

- Telecommunications
- Data communications
- Wireless communications
- Servers

### Benefits

- High efficiency – no heat sink required
- Higher current capability at elevated temperatures than most competitors' 20-25 A quarter-bricks
- Extremely small footprint: 0.896" x 2.30" (2.06 in<sup>2</sup>), 38% smaller than conventional quarter-bricks

### Description

The **20A SemiQ™ Family** of DC-DC converters provide a high efficiency single output in a size that is only 60% of industry-standard quarter bricks, while preserving the same pinout and functionality.

The **20A SQM48 Series** converters of the **SemiQ™ Family** provide thermal performance in high temperature environments that exceeds most competitors' 20-25 A quarter-bricks. This is accomplished through the use of patent pending circuit, packaging and processing techniques to achieve ultra-high efficiency, excellent thermal management, and a very low body profile.

Low body profile and the preclusion of heat sinks minimize airflow shadowing, thus enhancing cooling for downstream devices. The use of 100% automation for assembly, coupled with advanced electronic circuits and thermal design, results in a product with extremely high reliability.

Operating from a 36-75 V input, the **20A SQM48 Series** converters provide any standard output voltage from 3.3 V down to 1.2 V. Outputs can be trimmed from -20% to +10% of the nominal output voltage ( $\pm 10\%$  for output voltage 1.2 V), thus providing outstanding design flexibility.

With a standard pinout and trim equations, the **SQM48 Series** converters are perfect drop-in replacements for existing 20 A quarter brick designs. Inclusion of this converter in new designs can result in significant board space and cost savings. The device is also available in a surface mount package.

In both cases the designer can expect reliability improvement over other available converters because of the **SQM48 Series'** optimized thermal efficiency.

### Features

- RoHS lead-free solder and lead-solder-exempted products are available
- Delivers up to 20 A
- Industry-standard, quarter-brick pinout
- Outputs available in 3.3, 2.5, 2.0, 1.8, 1.5, and 1.2 V
- Available in through-hole and SM packages
- Low profile: 0.28" (7.1 mm)
- Low weight: 0.66 oz (18.5 g)
- Onboard input differential LC-filter for the low input ripple current
- Start-up into pre-biased output
- No minimum load required
- Meets Basic insulation requirements of EN60950
- Withstands 100 V input transient for 100 ms
- Fixed-frequency operation
- Fully protected
- Remote output sense
- Positive or negative logic ON/OFF option
- Output voltage trim range: +10%/-20% with industry-standard trim equations (except 1.2 V output)
- High reliability: MTBF = 3.4 million hours, calculated per Telcordia TR-332, Method I Case 1
- UL60950 recognized in US and Canada and DEMKO certified per IEC/EN60950
- Designed to meet Class B conducted emissions per FCC and EN55022 when used with external filter
- All materials meet UL94, V-0 flammability rating

**Electrical Specifications (common for all versions)**

Conditions:  $T_A=25\text{ }^\circ\text{C}$ , Airflow=300 LFM (1.5 m/s),  $V_{in}=48\text{ VDC}$ , All output voltages, unless otherwise specified.

Parameter	Notes	Min	Typ	Max	Units
<b>Absolute Maximum Ratings</b>					
Input Voltage	Continuous	0		80	VDC
Operating Ambient Temperature		-40		85	$^\circ\text{C}$
Storage Temperature		-55		125	$^\circ\text{C}$
<b>Input Characteristics</b>					
Operating Input Voltage Range		36	48	75	VDC
Input Under Voltage Lockout	Non-latching				
Turn-on Threshold		33	34	35	VDC
Turn-off Threshold		31	32	33	VDC
Input Voltage Transient	100 ms			100	VDC
<b>Isolation Characteristics</b>					
I/O Isolation		2000			VDC
Isolation Capacitance			160		pF
Isolation Resistance		10			M $\Omega$
<b>Feature Characteristics</b>					
Switching Frequency			415		kHz
Output Voltage Trim Range <sup>1</sup>	Industry-std. equations (3.3 - 1.5 V)	-20		+10	%
	Use trim equation on Page 4 (1.2 V)	-10		+10	%
Remote Sense Compensation <sup>1</sup>	Percent of $V_{OUT(NOM)}$			+10	%
Output Over-Voltage Protection	Non-latching (3.3 – 1.5 V)	117	122	127	%
	Non-latching (1.2 V)	124	132	140	%
Auto-Restart Period	Applies to all protection features		100		ms
Turn-On Time	See Figs. F, G and H		3		ms
<b>ON/OFF Control (Positive Logic)</b>					
Converter Off (logic low)		-20		0.8	VDC
Converter On (logic high)		2.4		20	VDC
<b>ON/OFF Control (Negative Logic)</b>					
Converter Off (logic high)		2.4		20	VDC
Converter On (logic low)		-20		0.8	VDC

Additional Notes:

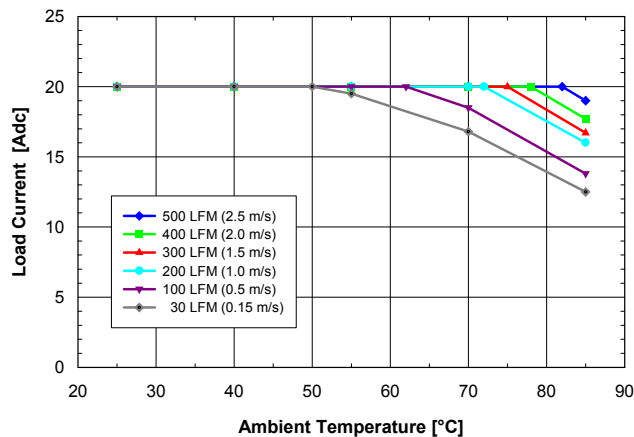
- Vout can be increased up to 10% via the sense leads or up to 10% via the trim function. However, the total output voltage trim from all sources should not exceed 10% of  $V_{OUT(NOM)}$ , in order to insure specified operation of overvoltage protection circuitry.

### Electrical Specifications: SQM48T/S20012 (1.2 Volt Out)

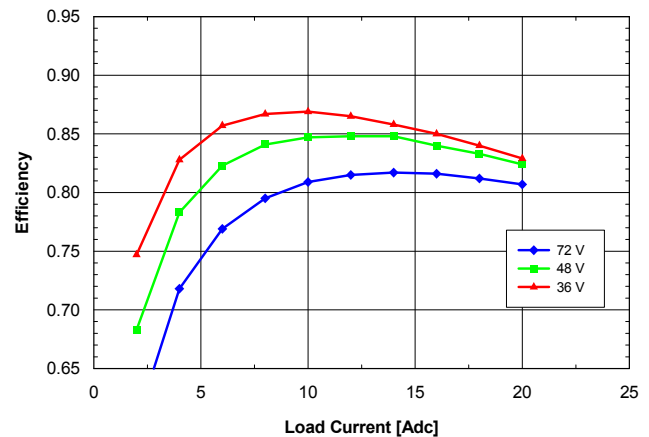
Conditions:  $T_A=25\text{ }^\circ\text{C}$ , Airflow=300 LFM (1.5 m/s),  $V_{in}=48\text{ VDC}$ ,  $V_{out}=1.2\text{ VDC}$ , unless otherwise specified.

Parameter	Notes	Min	Typ	Max	Units
<b>Input Characteristics</b>					
Maximum Input Current	20 ADC, 1.2 VDC Out @ 36 VDC In			0.85	ADC
Input Stand-by Current	$V_{in} = 48\text{ V}$ , converter disabled		3		mADC
Input No Load Current (0 load on the output)	$V_{in} = 48\text{ V}$ , converter enabled		24		mADC
Input Reflected-Ripple Current	25 MHz bandwidth		6		$\text{mA}_{\text{PK-PK}}$
Input Voltage Ripple Rejection	120 Hz		TBD		dB
<b>Output Characteristics</b>					
Output Voltage Set Point (no load)	$-40\text{ }^\circ\text{C}$ to $85\text{ }^\circ\text{C}$	1.188	1.200	1.212	VDC
Output Regulation					
Over Line			$\pm 1$	$\pm 3$	mV
Over Load			$\pm 1$	$\pm 3$	mV
Output Voltage Range	Over line, load and temperature <sup>2</sup>	1.182		1.218	VDC
Output Ripple and Noise - 25 MHz bandwidth	Full load + 10 $\mu\text{F}$ tantalum + 1 $\mu\text{F}$ ceramic		30	50	$\text{mV}_{\text{PK-PK}}$
External Load Capacitance	Plus full load (resistive)			20,000	$\mu\text{F}$
Output Current Range		0		20	ADC
Current Limit Inception	Non-latching	21	24	27.5	ADC
Peak Short-Circuit Current	Non-latching. Short=10m $\Omega$ .		30	44	A
RMS Short-Circuit Current	Non-latching			6.7	Arms
<b>Dynamic Response</b>					
Load Change 25% of $I_{out\text{ Max}}$ , $di/dt = 0.1\text{ A}/\mu\text{s}$	$C_o = 1\text{ } \mu\text{F}$ ceramic		80		mV
$di/dt = 5\text{ A}/\mu\text{s}$	$C_o = 450\text{ } \mu\text{F}$ POS + 1 $\mu\text{F}$ ceramic		140		mV
Settling Time to 1%			100		$\mu\text{s}$
<b>Efficiency</b>					
100% Load			82.5		%
50% Load			84.5		%

Additional Notes: 2.  $-40\text{ }^\circ\text{C}$  to  $85\text{ }^\circ\text{C}$ .



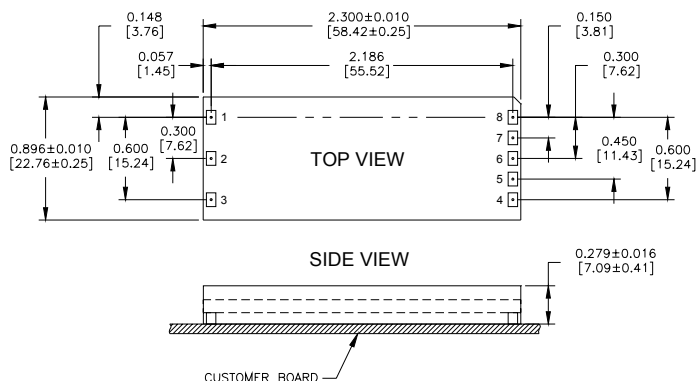
**Fig. 1.2V.1:** Available load current vs. ambient air temperature and airflow rates for **SQM48T20012** converter with D height pins mounted vertically with air flowing from pin 3 to pin 1, MOSFET temperature  $\leq 120\text{ }^\circ\text{C}$ ,  $V_{in} = 48\text{ V}$ .



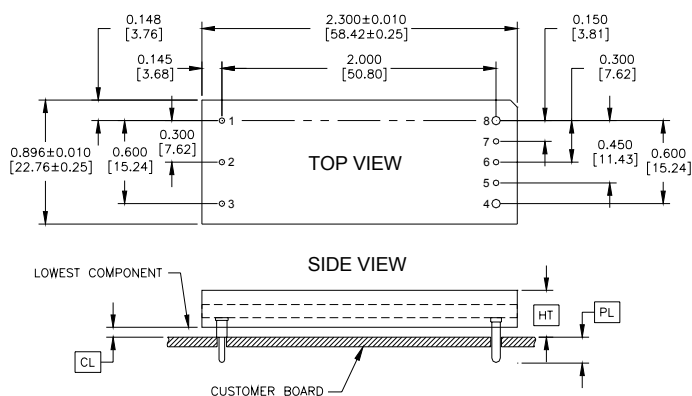
**Fig. 1.2V.2:** Efficiency vs. load current and input voltage for **SQM48T/S20012** converter mounted vertically with air flowing from pin 3 to pin 1 at a rate of 300 LFM (1.5 m/s) and  $T_a = 25\text{ }^\circ\text{C}$ .



### Physical Information



**SQM48S Pinout (Surface Mount)**



**SQM48T Pinout (Through-hole)**

### SQM48S Platform Notes

- All dimensions are in inches [mm]
- Connector Material: Copper
- Connector Finish: Gold over Nickel
- Converter Weight: 0.66 oz [18.5 g]
- Recommended Surface-Mount Pads:
  - Min. 0.080" X 0.112" [2.03 x 2.84]
  - Max. 0.092" X 0.124" [2.34 x 3.15]

Pad/Pin Connections	
Pad/Pin #	Function
1	Vin (+)
2	ON/OFF
3	Vin (-)
4	Vout (-)
5	SENSE(-)
6	TRIM
7	SENSE(+)
8	Vout (+)

### SQM48T Platform Notes

- All dimensions are in inches [mm]
- Pins 1-3 and 5-7 are Ø 0.040" [1.02] with Ø 0.078" [1.98] shoulder
- Pins 4 and 8 are Ø 0.062" [1.57] without shoulder
- Pin material: Brass
- Pin Finish: Tin/Lead over Nickel
- Converter Weight: 0.66 oz [18.5 g]

Height Option	HT (Max. Height)	CL (Min. Clearance)	Pin Option	PL Pin Length
	+0.000 [+0.00] -0.038 [- 0.97]	+0.016 [+0.41] -0.000 [- 0.00]		±0.005 [±0.13]
A	0.325 [8.26]	0.030 [0.77]	A	0.188 [4.77]
B	0.358 [9.09]	0.063 [1.60]	B	0.145 [3.68]
C	0.522 [13.26]	0.227 [5.77]	C	0.110 [2.79]
D	0.422 [10.72]	0.127 [3.23]		
E	0.304 [7.72]	0.09 [0.237]		

# SQM48T/S20 DC-DC Converter Data Sheet

## 36-75 VDC Input; 1.2-3.3 VDC @ 20A Outputs



### Converter Part Numbering Ordering Information

Product Series	Input Voltage	Mounting Scheme	Rated Load Current	Output Voltage		ON/OFF Logic	Maximum Height [HT]	Pin Length [PL]	Special Features	RoHS
<b>SQM</b>	<b>48</b>	<b>S</b>	<b>20</b>	<b>018</b>	-	<b>N</b>	<b>B</b>	<b>A</b>	<b>0</b>	
1/8 <sup>th</sup> Brick Format	36-75 V	S ⇒ Surface Mount	20A	012 ⇒ 1.2V 015 ⇒ 1.5V 018 ⇒ 1.8V 020 ⇒ 2.0V 025 ⇒ 2.5V 033 ⇒ 3.3V		N ⇒ Negative  P ⇒ Positive	<u>SMT</u> S ⇒ 0.295"	<u>SMT</u> 0 ⇒ 0.00"	0 ⇒ STD  T ⇒ Alternative Trim Option (For 1.2V)	No Suffix ⇒ RoHS lead-solder-exemption compliant  G ⇒ RoHS compliant for all six substances

Product Series	Input Voltage	Mounting Scheme	Rated Load Current	Output Voltage		ON/OFF Logic	Maximum Height [HT]	Pin Length [PL]	Special Features	RoHS
<b>SQM</b>	<b>48</b>	<b>T</b>	<b>20</b>	<b>018</b>	-	<b>N</b>	<b>B</b>	<b>A</b>	<b>0</b>	
1/8 <sup>th</sup> Brick Format	36-75 V	T ⇒ Through-hole	20A	012 ⇒ 1.2V 015 ⇒ 1.5V 018 ⇒ 1.8V 020 ⇒ 2.0V 025 ⇒ 2.5V 033 ⇒ 3.3V		N ⇒ Negative  P ⇒ Positive	<u>Through hole</u> A ⇒ 0.325" B ⇒ 0.358" C ⇒ 0.522" D ⇒ 0.422" E ⇒ 0.304"	<u>Through hole</u> A ⇒ 0.188" B ⇒ 0.145" C ⇒ 0.110"	0 ⇒ STD  T ⇒ Alternative Trim Option (For 1.2V)	No Suffix ⇒ RoHS lead-solder-exemption compliant  G ⇒ RoHS compliant for all six substances

The example above describes P/N SQM48T20018-NBA0: 36-75 V input, through-hole mounting, 20 A @ 1.8 V output, negative ON/OFF logic, a maximum height of 0.358", a through the board pin length of 0.188", and RoHS lead-solder-exemption compliancy.

Model numbers highlighted in yellow or shaded are not recommended for new designs.

**NUCLEAR AND MEDICAL APPLICATIONS** - Power-One products are not designed, intended for use in, or authorized for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems without the express written consent of the respective divisional president of Power-One, Inc.

**TECHNICAL REVISIONS** - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.