

### 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	°C
Storage Temperature		-55		125	°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			MΩ
<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:

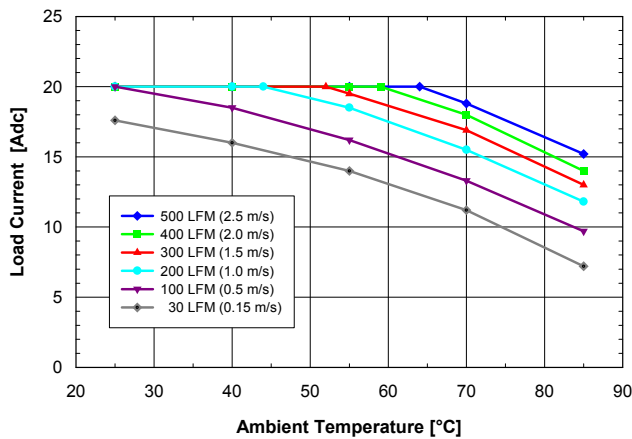
- Vout can be increased up to 10% via the sense leads or up to 10% via the trim function. However, the total output voltage trim from all sources should not exceed 10% of  $V_{OUT(NOM)}$ , in order to insure specified operation of overvoltage protection circuitry.

### Electrical Specifications: SQM48T/S20033 (3.3 Volt Out)

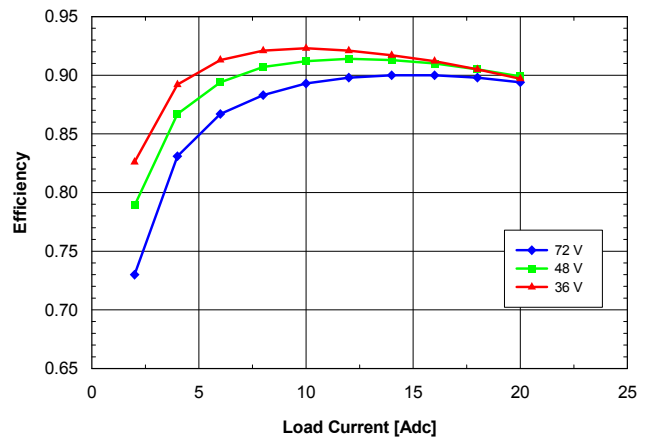
Conditions:  $T_A=25\text{ }^\circ\text{C}$ , Airflow=300 LFM (1.5 m/s),  $V_{in}=48\text{ VDC}$ ,  $V_{out}=3.3\text{ VDC}$ , unless otherwise specified.

Parameter	Notes	Min	Typ	Max	Units
<b>Input Characteristics</b>					
Maximum Input Current	20 ADC, 3.3 VDC Out @ 36 VDC In			2.1	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		45		mADC
Input Reflected-Ripple Current	25MHz bandwidth		6		$\text{mA}_{\text{PK-PK}}$
Input Voltage Ripple Rejection	120Hz		TBD		dB
<b>Output Characteristics</b>					
Output Voltage Set Point (no load)		3.267	3.300	3.333	VDC
Output Regulation					
Over Line			$\pm 2$	$\pm 5$	mV
Over Load			$\pm 2$	$\pm 5$	mV
Output Voltage Range	Over line, load and temperature <sup>2</sup>	3.250		3.350	VDC
Output Ripple and Noise - 25MHz 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 Iout Max, di/dt = 0.1A/ $\mu\text{s}$	$C_o = 1\text{ }\mu\text{F}$ ceramic		80		mV
	di/dt = 5A/ $\mu\text{s}$ $C_o = 450\text{ }\mu\text{F}$ POS + 1 $\mu\text{F}$ ceramic		140		mV
Settling Time to 1%			100		$\mu\text{s}$
<b>Efficiency</b>					
100% Load			90		%
50% Load			91		%

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



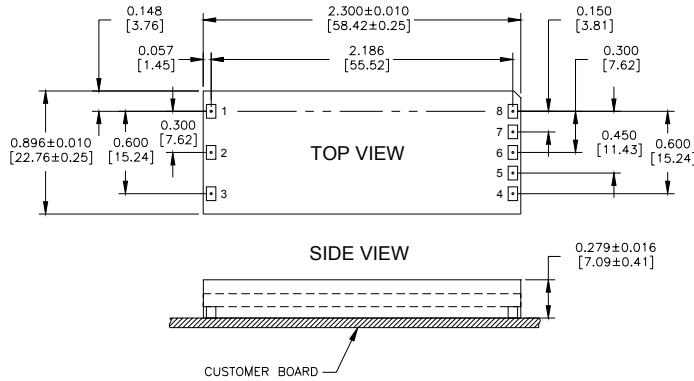
**Fig. 3.3V.1:** Available load current vs. ambient air temperature and airflow rates for SQM48T20033 converter with D height pins mounted vertically with air flowing from pin 3 to pin 1, MOSFET temperature  $\leq 120\text{ }^\circ\text{C}$ ,  $V_{in} = 48$



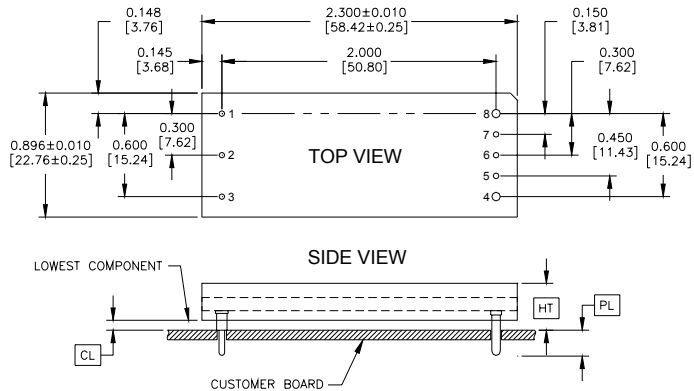
**Fig. 3.3V.2:** Efficiency vs. load current and input voltage for SQM48T/S20033 converter mounted vertically with air flowing from pin 3 to pin 1 at a rate of 300 LFM (1.5 m/s) and  $T_a = 25\text{ }^\circ\text{C}$ .



**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.

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