

The new **25A 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 **25A SQM48 Series** converters of the **SemiQ™ Family** provide thermal performance in high temperature environments that exceeds most competitors' 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 heatsinks minimize airflow shadowing, thus enhancing cooling for downstream devices. The use of 100% automation for assembly, coupled with advanced electric and thermal design, results in a product with extremely high reliability.

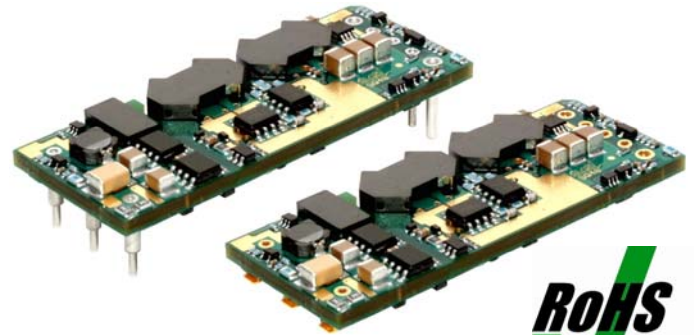
Operating from a 36-75 V input, the **25A SQM48 Series** converters provide any standard output voltage from 2.5 V down to 1.2 V. Outputs can be trimmed from -20% to +10% of the nominal output voltage ( $\pm 10\%$  for output voltage 1.2 V), thus providing outstanding design flexibility.

With a standard pinout and trim equations, the **SQM48 Series** converters are perfect drop-in replacements for existing 25 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.

## Applications

- Telecommunications
- Data communications
- Wireless
- Servers



**SQM48T and SQM48S Converters**

## Features

- RoHS lead-free solder and lead-solder-exempted products are available
- Delivers up to 25 A (62.5 W)
- Industry-standard quarter-brick pinout
- Extremely small footprint: 0.896" x 2.30" (2.06 in<sup>2</sup>), 40% smaller than conventional quarter-bricks
- Higher current capability at elevated temperatures than most competitors' 25 A quarter-bricks
- On-board input differential LC-filter for the lowest input ripple current in industry
- Outputs available in 2.5, 2.0, 1.8, 1.5, and 1.2 V
- High efficiency – no heatsink required
- Start-up into pre-biased output
- No minimum load required
- Available in through-hole and SM packages
- Low profile: 0.28" (7.1 mm)
- Light weight: 0.66 oz (18.5 g)
- Meets Basic Insulation requirements of EN60950
- Withstands 100 V input transient for 100 ms
- Fixed-frequency operation
- Fully protected
- Remote output sense
- Output voltage trim range: +10%/-20% with Industry-standard trim equations (except 1.2 V output)
- High reliability: MTBF of 3.4 million hours, calculated per Telcordia TR-332, Method I Case 1
- Positive or negative logic ON/OFF option
- UL 60950 recognized in US and Canada and DEMKO certified per IEC/EN 60950 (pending)
- Meets conducted emissions requirements of FCC Class B and EN 55022 Class B with external filter
- All materials meet UL94, V-0 flammability rating

## Electrical Specifications (common to all versions)

Conditions:  $T_A=25^{\circ}\text{C}$ , 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                    |                                       |      | 435 |     | kHz                |
| Output Voltage Trim Range <sup>1</sup> | Industry-std. equations (2.5 - 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                          | 117  | 122 | 127 | %                  |
| Over-Temperature Shutdown (PCB)        | Non-latching                          |      | 125 |     | $^{\circ}\text{C}$ |
| Auto-Restart Period                    | Applies to all protection features    |      | 100 |     | ms                 |
| Turn-On Time                           |                                       |      | 3   |     | ms                 |
| ON/OFF Control (Positive Logic)        |                                       |      |     |     |                    |
| Converter Off                          |                                       | -20  |     | 0.8 | Vdc                |
| Converter On                           |                                       | 2.4  |     | 20  | Vdc                |
| ON/OFF Control (Negative Logic)        |                                       |      |     |     |                    |
| Converter Off                          |                                       | 2.4  |     | 20  | Vdc                |

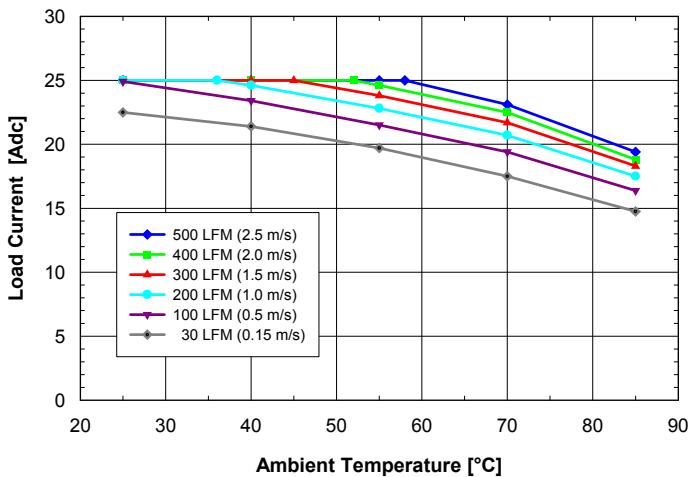
**Additional Notes:**

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

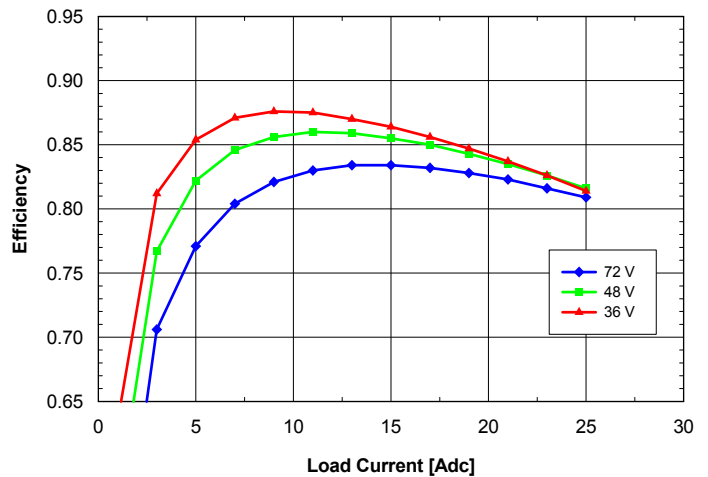
**Electrical Specifications: SQM48T/S25015 (1.5 Volts Out)**

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

| PARAMETER  | NOTES   | MIN   | TYP   | MAX    | UNITS                      |
|--|---|-------|-------|--------|----------------------------|
| <b>INPUT CHARACTERISTICS</b>   |   |       |       |        |                            |
| Maximum Input Current  | 25 Adc, 1.5 Vdc Out @ 36 Vdc In                                 |       |       | 1.25   | 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                      |       | 26    |        | 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)   | -40°C to 85°C   | 1.485 | 1.500 | 1.515  | Vdc                        |
| Output Regulation  |   |       |       |        |                            |
| Over Line  |   |       | ±2    | ±4     | mV                         |
| Over Load  |   |       | ±2    | ±4     | mV                         |
| Output Voltage Range   | Over line, load and temperature                                 | 1.477 |       | 1.523  | 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     |       | 25     | Adc                        |
| Current Limit Inception  | Non-latching  | 26.5  | 30    | 32     | Adc                        |
| Peak Short-Circuit Current   | Non-latching. Short=10m $\Omega$ .                              |       | 35    | 46     | A                          |
| RMS Short-Circuit Current  | Non-latching  |       |       | 6.7    | Arms                       |
| <b>DYNAMIC RESPONSE</b>  |   |       |       |        |                            |
| Load Change 20% of $I_{out\text{ Max}}$ , $di/dt = 0.1\text{ A}/\mu\text{S}$ | $C_o = 1\text{ }\mu\text{F}$ ceramic                            |       | 80    |        | mV                         |
| $di/dt = 5\text{ A}/\mu\text{S}$   | $C_o = 450\text{ }\mu\text{F}$ tant. + 1 $\mu\text{F}$ ceramic  |       | 140   |        | mV                         |
| Setting Time to 1%   |   |       | 100   |        | $\mu\text{s}$              |
| <b>EFFICIENCY</b>  |   |       |       |        |                            |
| 100% Load  |   |       | 81.5  |        | %                          |
| 50% Load   |   |       | 86    |        | %                          |

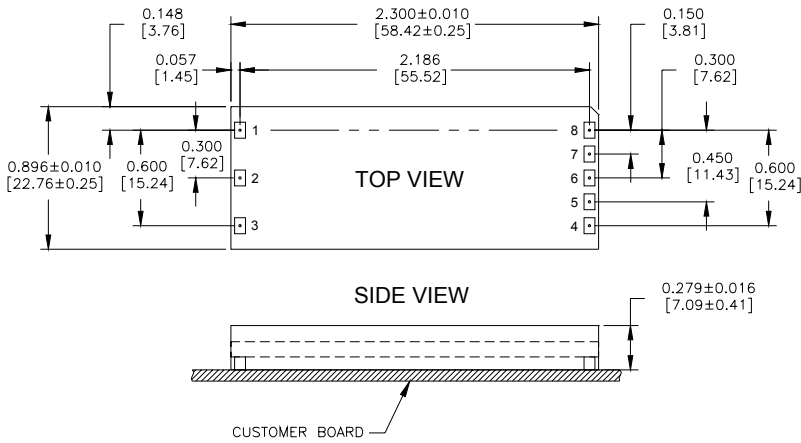


**Fig. 1.5V.1:** Available load current vs. ambient air temperature and airflow rates for **SQM48T25015** converter with D height pins mounted vertically with air flowing from pin 3 to pin 1, MOSFET temperature  $\leq 120^\circ\text{C}$ ,  $V_{in} = 48\text{ V}$ .



**Fig. 1.5V.2:** Efficiency vs. load current and input voltage for **SQM48T/S25015** converter mounted vertically with air flowing from pin 3 to pin 1 at a rate of 300 LFM (1.5 m/s) and  $T_a = 25^\circ\text{C}$ .

**Physical Information**

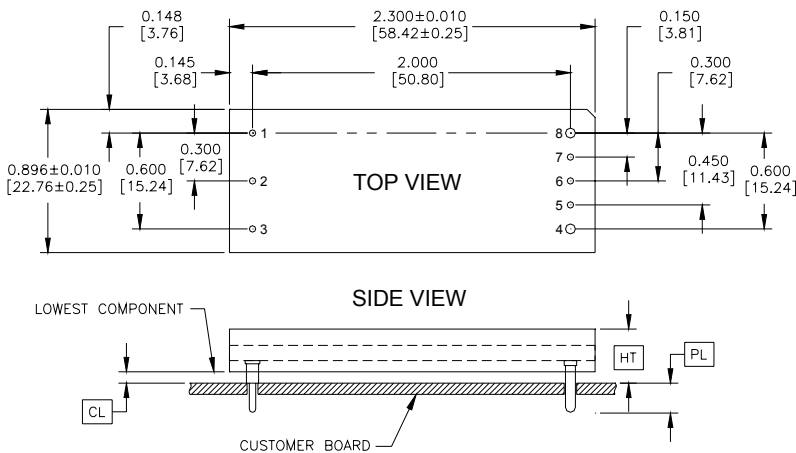


**SQM48S Pinout (Surface Mount)**

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]

| Height Option | HT (Max. Height)                  | CL (Min. Clearance)               |
|---------------|-----------------------------------|-----------------------------------|
|               | +0.000 [+0.00]<br>-0.038 [- 0.97] | +0.016 [+0.41]<br>-0.000 [- 0.00] |
| A             | 0.325 [8.26]                      | 0.030 [0.77]                      |
| B             | 0.358 [9.09]                      | 0.063 [1.60]                      |
| C             | 0.522 [13.26]                     | 0.227 [5.77]                      |
| D             | 0.422 [10.72]                     | 0.127 [3.23]                      |
| E             | 0.304 [7.72]                      | 0.009 [0.23]                      |



**SQM48T Pinout (Through-hole)**

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

| Pin Option | PL Pin Length  |
|------------|----------------|
|            | ±0.005 [±0.13] |
| A          | 0.188 [4.77]   |
| B          | 0.145 [3.68]   |
| C          | 0.110 [2.79]   |

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]

**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 | Environmental   |
|--------------------------------|---------------|-------------------|-----------------------|--|----------------------------------|--------------------------|-------------------------|------------------|---|
| <b>SQM</b>                     | <b>48</b>     | <b>S</b>          | <b>25</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 | 25 A<br>(1.2 – 2.5 V) | 012 ⇒ 1.2 V<br>015 ⇒ 1.5 V<br>018 ⇒ 1.8 V<br><b>020 ⇒ 2.0 V</b><br>025 ⇒ 2.5 V | N ⇒ Negative<br><br>P ⇒ Positive | <u>SMT</u><br>S ⇒ 0.295" | <u>SMT</u><br>0 ⇒ 0.00" | 0 ⇒ STD          | No Suffix Character<br>⇒ RoHS lead-solder-exempt compliant<br>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 | Environmental   |
|--------------------------------|---------------|------------------|-----------------------|---|----------------------------------|---|---|------------------|---|
| <b>SQM</b>                     | <b>48</b>     | <b>T</b>         | <b>25</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 | 25 A<br>(1.2 – 2.5 V) | 012 ⇒ 1.2 V<br>015 ⇒ 1.5 V<br>018 ⇒ 1.8 V<br>020 ⇒ 2.0 V<br>025 ⇒ 2.5 V | N ⇒ Negative<br><br>P ⇒ Positive | <u>Through hole</u><br>A ⇒ 0.325"<br>B ⇒ 0.358"<br>C ⇒ 0.522"<br>D ⇒ 0.422"<br>E ⇒ 0.304" | <u>Through hole</u><br>A ⇒ 0.188"<br>B ⇒ 0.145"<br>C ⇒ 0.110" | 0 ⇒ STD          | No Suffix Character<br>⇒ RoHS lead-solder-exempt compliant<br>G ⇒ RoHS compliant for all six substances |

The example above describes P/N SQM48T25018-NBA0: 36-75 V input, through-hole mounting, 25 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-exempt compliancy. Please consult factory regarding availability of a specific version.

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