

**FUNCTIONAL SPECIFICATIONS, OKX-T/5-D12-C**

| ABSOLUTE MAXIMUM RATINGS  | Conditions ①  | Minimum | Typical/Nominal | Maximum | Units                   |
|---|---|---------|-----------------|---------|-------------------------|
| Input Voltage, Continuous   | Full power operation  | 0       |                 | 15      | Vdc                     |
| Input Reverse Polarity  | None, install external fuse   |         | None            |         | Vdc                     |
| On/Off Remote Control   | Power on or off, referred to -Vin   | 0       |                 | 13.8    | Vdc                     |
| Output Power  |   | 0       | 25              | 25.5    | W                       |
| Output Current  | Current-limited, no damage, short-circuit protected                                 | 0       |                 | 5       | A                       |
| Storage Temperature Range   | Vin = Zero (no power)   | -55     |                 | 125     | °C                      |
| Absolute maximums are stress ratings. Exposure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied or recommended. |   |         |                 |         |                         |
| INPUT   | Conditions ① ③  |         |                 |         |                         |
| Operating voltage range   | Vin ≥ Vout + 2  | 8.3     | 12              | 13.8    | Vdc                     |
| Recommended External Fuse   | Fast blow   |         |                 | 6       | A                       |
| Turn On/Start-up threshold  | Rising input voltage, 0A load @1Vout  | 7.5     |                 | 8.3     | Vdc                     |
| Turn Off/Undervoltage lockout ⑬   | Falling input voltage, 0A load @1Vout   | 7.3     | 7.8             | 8.15    | Vdc                     |
| Reverse Polarity Protection   | None, install external fuse   |         | None            |         | Vdc                     |
| Internal Filter Type  |   |         | C-TYPE          |         |                         |
| Input current   |   |         |                 |         |                         |
| Full Load Conditions  | Vin = nominal (5Vo set)   |         | 2.24            | 2.322   | A                       |
| Low Line  | Vin @ min, 5 Vout   |         | 3.204           | 3.321   | A                       |
| Inrush Transient  |   |         |                 |         | A2-Sec.                 |
| Short Circuit Input Current   |   |         |                 |         | mA                      |
| No Load Input Current   | 5Vout, Iout @ 0   |         | 45              | 75      | mA                      |
| No Load Input Current   | 0.75V, Iout @ 0   |         | 20              | 35      | mA                      |
| Shut-Down Mode Input Current  |   |         | 5               |         | mA                      |
| Reflected (back) ripple current ②   | Measured at input with specified filter   |         | 20              |         | mA, pk-pk               |
| GENERAL and SAFETY  |   |         |                 |         |                         |
| Efficiency  | @ Vin nom, 5Vout  | 91.5    | 93              |         | %                       |
|   | @ Vin min, 5Vout  | 92.5    | 94              |         | %                       |
|   | @ Vin nom, 3.3Vout  | 89      | 91              |         | %                       |
|   | @ Vin nom, 2.5Vout  | 87      | 89              |         | %                       |
|   | @Vin nom, 1.8Vout   | 84      | 86              |         | %                       |
|   | @Vin nom, 1.5Vout   | 82      | 84              |         | %                       |
|   | @Vin nom, 1.2Vout   | 79      | 81              |         | %                       |
|   | @Vin nom, 1Vout   | 76      | 78              |         | %                       |
| Safety  | Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC/EN60950-1, 2nd edition (pending) |         | Yes             |         |                         |
| Calculated MTBF ④   | Per Telcordia SR332, issue 1 class 3, ground fixed, Tambient=+25°C                  |         | TBD             |         | Hours x 10 <sup>6</sup> |
| DYNAMIC CHARACTERISTICS   |   |         |                 |         |                         |
| Fixed Switching Frequency   |   | 290     | 320             | 350     | KHz                     |
| Startup Time  | Power On, to Vout regulation band, 100% resistive load                              |         | 8               | 10      | mS                      |
| Startup Time  | Remote ON to 10% Vout (50% resistive load)  |         | 6               |         | mS                      |
| Dynamic Load Response   | 50-100-50% load step, settling time to within ±2% of Vout di/dt = 2.5 A/μSec        |         |                 | 80      | μSec                    |
| Dynamic Load Peak Deviation   | same as above   |         |                 | ±200    | mV                      |
| FEATURES and OPTIONS  |   |         |                 |         |                         |
| Remote On/Off Control ⑤   |   |         |                 |         |                         |
| "N" suffix:   |   |         |                 |         |                         |
| Negative Logic, ON state  | Pin open=ON   | 0       |                 | 0.4     | V                       |
| Negative Logic, OFF state   |   | 1.5     |                 | +Vin    | V                       |
| Control Current   | open collector/drain  |         | 1               |         | mA                      |
| "P" suffix:   |   |         |                 |         |                         |
| Positive Logic, ON state  | Pin open=ON   | 7.8     |                 | +Vin    | V                       |
| Positive Logic, OFF state   |   | 0       |                 | 0.4     | V                       |
| Control Current   | open collector/drain  |         | 1               |         | mA                      |

**FUNCTIONAL SPECIFICATIONS, OKX-T/5-D12-C (CONT.)**

| OUTPUT  | Conditions ①   | Minimum | Typical/Nominal | Maximum | Units         |
|---|--|---------|-----------------|---------|---------------|
| <b>Total Output Power</b>                                 |  | 0       | 25              | 25.5    | W             |
| <b>Voltage</b>  |  |         |                 |         |               |
| <b>Nominal Output Voltage Range ②</b>                     | See trim formula                                     | 0.7525  |                 | 5.5     | Vdc           |
| <b>Setting Accuracy</b>                                   | At 50% load  | -2      |                 | 2       | % of Vnom.    |
| <b>Output Voltage Overshoot - Startup:</b>                |  |         |                 | 1       | %Vo nom       |
| <b>Current</b>  |  |         |                 |         |               |
| <b>Output Current Range</b>                               |  | 0       | 5               | 5       | A             |
| <b>Minimum Load</b>                                       |  |         | No minimum load |         |               |
| <b>Current Limit Inception ⑥</b>                          | 98% of Vnom., after warmup @5Vout                    | 9       | 11.5            | 14.5    | A             |
| <b>Short Circuit</b>                                      |  |         |                 |         |               |
| <b>Short Circuit Current ⑦</b>                            | Hiccup technique, autorecovery within ±1% of Vout    |         | 2               |         | A             |
| <b>Short Circuit Duration (remove short for recovery)</b> | Output shorted to ground, no damage                  |         | Continuous      |         |               |
| <b>Short circuit protection method</b>                    | Current limiting                                     |         |                 |         |               |
| <b>Regulation ⑧</b>                                       |  |         |                 |         |               |
| <b>Total Regulation Band</b>                              | Over all line, load and temp conditions              |         | 2               |         | % Vo set      |
| <b>Line Regulation</b>                                    | Vin=min. to max. Vout=nom.                           |         |                 | ±0.2    | %             |
| <b>Load Regulation</b>                                    | Iout=min. to max. Vin=48V.                           |         |                 | ±0.5    | %             |
| <b>Ripple and Noise ⑧</b>                                 | 5Vo, 12Vin   |         |                 | 70      | mV pk-pk      |
| <b>Ripple and Noise</b>                                   | 3.3Vo, 12Vin   |         |                 | 50      | mV pk-pk      |
| <b>Ripple and Noise</b>                                   | 1.8Vo, 12Vin   |         |                 | 30      | mV pk-pk      |
| <b>Ripple and Noise</b>                                   | 1Vo, 12Vin   |         |                 | 25      | mV pk-pk      |
| <b>Temperature Coefficient</b>                            | At all outputs                                       |         | ±0.02           |         | % of Vnom./°C |
| <b>Maximum Capacitive Loading ⑩</b>                       | low ESR; >0.001, <0.01 ohm                           |         | 1000            |         | uF            |
| <b>Maximum Capacitive Loading</b>                         | 0.01 ohm   |         | 3000            |         | uF            |
| <b>MECHANICAL (Through Hole Models)</b>                   |  |         |                 |         |               |
| <b>Outline Dimensions</b>                                 |  |         | 0.40x0.90x0.282 |         | Inches        |
|   |  |         | 10.2x22.9x8.85  |         | mm            |
| <b>Weight</b>   |  |         | 0.1             |         | Ounces        |
|   |  |         | 2.8             |         | Grams         |
| <b>ENVIRONMENTAL</b>                                      |  |         |                 |         |               |
| <b>Operating Ambient Temperature Range ⑨</b>              | Full power, all output voltages, see derating curves | -40     |                 | 85      | °C            |
| <b>Operating PCB Temperature ⑩</b>                        | No derating  | -40     |                 | 100     | °C            |
| <b>Storage Temperature</b>                                | Vin = Zero (no power)                                | -55     |                 | 125     | °C            |
| <b>Thermal Protection/Shutdown</b>                        | Measured in center                                   | 130     | 130             | 135     | °C            |
| <b>Electromagnetic Interference</b>                       |  |         |                 |         |               |
| <b>Conducted, EN55022/CISPR22</b>                         | External filter is required                          |         | B               |         | Class         |
| <b>Radiated, EN55022/CISPR22</b>                          |  |         | B               |         | Class         |

**Notes**

- ① Specifications are typical at +25 deg.C, Vin=nominal (+12V), Vout=nominal (+5V), full load, external caps and natural convection unless otherwise indicated. Extended tests at higher power must supply substantial forced airflow. All models are tested and specified with external 1 uF paralleled with 10 uF ceramic output capacitors and a 22 uF external input capacitor. All capacitors are low ESR types. These capacitors are necessary to accommodate our test equipment and may not be required to achieve specified performance in your applications. However, Murata Power Solutions recommends installation of these capacitors. All models are stable and regulate within spec under no-load conditions.
- ② Input Back Ripple Current is tested and specified over a 5 Hz to 20 MHz bandwidth. Input filtering is Cin=2 x 100 uF tantalum, Cbus=1000 uF electrolytic, Lbus=1 uH.
- ③ Note that Maximum Power Derating curves indicate an average current at nominal input voltage. At higher temperatures and/or lower airflow, the DC/DC converter will tolerate brief full current outputs if the total RMS current over time does not exceed the Derating curve.
- ④ Mean Time Before Failure is calculated using the Telcordia (Bellcore) SR-332 Method 1, Case 3, ISSUE 2, ground fixed controlled conditions, Tambient=+25 deg.C, full output load, natural air convection.
- ⑤ The On/Off Control Input should use either a switch or an open collector/open drain transistor referenced to -Input Common. A logic gate may also be used by applying appropriate external voltages which not exceed +Vin.
- ⑥ Short circuit shutdown begins when the output voltage degrades approximately 1% from the selected setting.
- ⑦ "Hiccup" overcurrent operation repeatedly attempts to restart the converter with a brief, full-current output. If the overcurrent condition still exists, the restart current will be removed and then tried again. This short current pulse prevents overheating and damaging the converter. Once the fault is removed, the converter immediately recovers normal operation.
- ⑧ Output noise may be further reduced by adding an external filter. At zero output current, the output may contain low frequency components which exceed the ripple specification. The output may be operated indefinitely with no load.
- ⑨ All models are fully operational and meet published specifications, including "cold start" at -40°C.
- ⑩ Regulation specifications describe the deviation as the line input voltage or output load current is varied from a nominal midpoint value to either extreme.
- ⑪ Other input or output voltage ranges will be reviewed under scheduled quantity special order.
- ⑫ Maximum PC board temperature is measured with the sensor in the center of the converter.
- ⑬ Do not exceed maximum power specifications when adjusting the output trim.
- ⑭ The maximum output capacitive loads depend on the the Equivalent Series Resistance (ESR) of the external output capacitor and, to a lesser extent, the distance and series impedance to the load. Larger caps will reduce output noise but may change the transient response. Newer ceramic caps with very low ESR may require lower capacitor values to avoid instability. Thoroughly test your capacitors in the application. Please refer to the Output Capacitive Load Application Note.
- ⑮ Do not allow the input voltage to degrade lower than the input undervoltage shutdown voltage at all times. Otherwise, you risk having the converter turn off. The undervoltage shutdown is not latching and will attempt to recover when the input is brought back into normal operating range.
- ⑯ The outputs are not intended to sink appreciable reverse current.