Performance and Functional Specifications

See Note 1

Input	
Input Voltage Range	See Ordering Guide and Note 7.
Start-Up Voltage	2.05V
Undervoltage Shutdown (see Note 15)	1.90V
Overvoltage Shutdown	None
Reflected (Back) Ripple Current (Note 2)	20 mA pk-pk
Internal Input Filter Type	Capacitive
Recommended External Fuse	15A fast blow
Reverse Polarity Protection	N/A. See fuse information
Input Current:	
Full Load Conditions	See Ordering Guide
Inrush Transient	0.4 A^2Sec.
Shutdown Mode (Off, UV, OT)	5 mA
Output in Short Circuit	60 mA
No Load	80 mA
Low Line (Vin=Vmin, Vout=Vnom)	9.05A (T/10), 14.63A (T/16)
Remote On/Off Control (Note 5)	
Negative Logic ("N" model suffix)	ON = Open pin or ground to +0.4V. max. OFF =+1.5V min. to + Vin (max)
Positive Logic ("P" model suffix)	ON = Open pin (internally pulled up) or +1.5V to +Vin max. OFF = Ground pin to +0.4V. max.
Current	1 mA max.
Tracking/Sequencing (OKX "2" models)	
Slew Rate	2 Volts per millisecond, max.
Tracking accuracy, rising input	Vout = ±200 mV max. of Sequence In
Tracking accuracy, falling input	Vout = ±400 mV max. of Sequence In

General and Safety	
Efficiency	See Ordering Guide
Switching Frequency	300 KHz
Start-Up Time (Vin on to Vout regulated) (On/Off to Vout regulated)	8 mSec for Vout=nominal 6 mSec for Vout=nominal
Isolation	Not isolated
Safety	Certified to UL/cUL 60950-1, CSA-C22.2 No. 60950-1, IEC/EN 60950-1
Calculated MTBF per Telcordia SR-232 (4a)	TBC
Calculated MTBF per MIL-HDBK-217F (4b)	TBC

Output	
Minimum Loading	No minimum load
Accuracy (50% load, untrimmed)	±2 % of Vnominal
Voltage Output Range (Note 13)	See Ordering Guide
Overvoltage Protection (Note 16)	None
Temperature Coefficient	±0.02% per °C of Vout range
Ripple/Noise (20 MHz bandwidth)	See Ordering Guide and note 8
Line/Load Regulation	See Ordering Guide and note 10
Maximum Capacitive Loading (Note 14)	
Cap-ESR=0.001 to 0.01 Ohms	1,000 µF
Cap-ESR >0.01 Ohms	5,000 µF (min. cap. load 0 µF)
Current Limit Inception (Note 6) (98% of Vout setting, after warm up)	34 Amps (OKX2-T/16-W5) 29 Amps (OKX2-T/10-W5)
Short Circuit Mode	
Short Circuit Current Output	1 A
Protection Method	Hiccup autorecovery upon overload removal. (Note 7)
Short Circuit Duration	Continuous, no damage (output shorted to ground)
Prebias Startup	Converter will start up if the external output voltage is less than Vset
Dynamic Load Response (50-100% load step, di/dt=2.5A/µSec)	100 µSec max. to within ±2% of final value with 2 x 150 µF polymer external caps.

Environmental	
Operating Temperature Range (Ambient) See derating curves	-40 to +85 deg. C. with derating (Note 9)
Operating PC Board Temperature	-40 to +100 deg. Celsius max., no derating (12)
Storage Temperature Range	-55 to +125 deg. C.
Thermal Protection/Shutdown	+130 deg. Celsius
Relative Humidity	to 85%RH/+85 deg. C., non-condensing

Physical	
Outline Dimensions	See Mechanical Specifications
Weight	0.2 ounces (5.6 grams)
Restriction of Hazardous Substances	RoHS-6 (does not claim EU RoHS exemption 7b–lead in solder)

Absolute Maximum Ratings	
Input Voltage (Continuous or transient)	0 V.to +5.8 Volts max.
On/Off Control	0 V. min. to +Vin max.
Input Reverse Polarity Protection	See Fuse section
Output Current (Note 7)	Current-limited. Devices can withstand a sustained short circuit without damage. The outputs are not intended to accept appreciable reverse current.
Storage Temperature	-55 to +125 deg. C.
Lead Temperature	See soldering specifications

Absolute maximums are stress ratings. Exposure of devices to greater than any of 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 nor recommended.

Specification Notes:

(1) Specifications are typical at +25 deg.C, Vin=nominal (+5V.), Vout=nominal (+3.3V), 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 µF paralleled with 10 µF ceramic output capacitors and a 22 µF 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 µF tantalum, Cbus=1000 µF electrolytic, Lbus=1 µH.

(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.

(4a) Mean Time Before Failure is calculated using the Telcordia (Belcore) SR-332 Method 1, Case 3, ISSUE 2, ground fixed controlled conditions, Tambient=+25 deg.C, full output load, natural air convection.

(4b) Mean Time Before Failure is calculated using MIL-HDBK-217F, GB ground benign, 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 2% 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.

Output Voltage Adjustment

The output voltage may be adjusted over a limited range by connecting an external trim resistor (Rtrim) between the Trim pin and Ground. The Rtrim resistor must be a 1/10 Watt precision metal film type, ±1% accuracy or better with low temperature coefficient, ±100 ppm/°C. or better. Mount the resistor close to the converter with very short leads or use a surface mount trim resistor.

In the tables opposite, the calculated resistance is given. Do not exceed the specified limits of the output voltage or the converter's maximum power rating when applying these resistors. Also, avoid high noise at the Trim input. However, to prevent instability, you should never connect any capacitors to Trim.

Soldering Guidelines

Murata Power Solutions recommends the specifications below when installing these converters. These specifications vary depending on the solder type. Exceeding these specifications may cause damage to the product. Your production environment may differ; therefore please thoroughly review these guidelines with your process engineers.

Wave Solder Operations for through-hole mounted products (THMT)	
For Sn/Ag/Cu based solders:	
Maximum Preheat Temperature	115° C.
Maximum Pot Temperature	270° C.
Maximum Solder Dwell Time	7 seconds
For Sn/Pb based solders:	
Maximum Preheat Temperature	105° C.
Maximum Pot Temperature	250° C.
Maximum Solder Dwell Time	6 seconds

OKX2-T/10-W5, -T/16-W5

Output Voltage	Calculated Rtrim (KΩ)
3.3 V.	3.160
2.5 V.	6.947
2.0 V.	11.780
1.8 V.	15.004
1.5 V.	23.077
1.2 V.	41.973
1.0 V.	80.021
0.7525 V.	∞ (open)

Resistor Trim Equation, W5 models:

$$R_{TRIM}\ (\Omega) = \frac{21070}{V_{OUT} - 0.7525V} - 5110$$

Product Label

Because of the small size of these products, the product label contains a character-reduced code to indicate the model number and manufacturing date code. Not all items on the label are always used. Please note that the label differs from the product photograph on page 1. Here is the layout of the label:

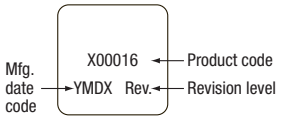

Figure 2. Label Artwork Layout

The label contains two rows of information:

First row – Model number product code (see table)
Second row – Manufacturing date code and revision level

Model Number	Product Code
OKX-T/16-W5N-C	X00016
OKX-T/16-W5P-C	X01016
OKX2-T/16-W5N-C	X20016
OKX2-T/16-W5P-C	X21016
OKX-T/10-W5N-C	X00010
OKX-T/10-W5P-C	X01010
OKX2-T/10-W5P-C	X20010
OKX2-T/10-W5P-C	X21010

The manufacturing date code is four characters:
First character – Last digit of manufacturing year, example 200**9**
Second character – Month code (1 through 9 = Jan-Sep;
O, N, D = Oct, Nov, Dec)
Third character – Day code (1 through 9 = 1 to 9, 10 = 0 and 11 through 31 = A through Z)
Fourth character – Manufacturing information