

### FEATURES

- Up to 89% Efficiency
- Single Output, 20 watt converter
- Available in 12, 24 and 48 VDC Inputs 2 - 1 Input Range
- Industry Standard 1.0" X 2.0" X 0.4" Package
- Remote On/Off, Short Circuit Protection
- 6 sided Continuous Shielding
- EMI complies with EN55022 Class A

### DESCRIPTIONS

Delivering up to 20 watts in an industry standard 1" X 2" X 0.4" package this broad line of high density converters provide up to 25 watts/in<sup>3</sup> saving valuable board space. Key to providing this high a power level in a 1" X 2" footprint is the outstanding thermal performance with efficiencies up to 89%. The 2000WFR series are available in 12Vdc, 24Vdc and 48Vdc input, with a 2 to 1 input range, and with single output modules of 3.3Vdc, 5Vdc, 12Vdc, 15Vdc making them one of the most versatile product lines available today in the market. They are ideally suited to data communications applications, mobile battery driven equipment, telecommunications equipment, mixed analog/digital subsystems and process/control systems.

### OUTPUT CHARACTERISTICS

	Min	Typ	Max	Unit/Comments
Output Voltage Set Point			±1	% Output voltage at nominal line & FL
Line Regulation			±0.3	% Output voltage measured from min. input line to maximum
Load Regulation			±0.5	% Output voltage measured from FL to 10% load (Balanced Loads)
Temperature Coefficient			±0.02	% per degree C
Ripple/Noise		60	100	mV p-p measured at 20 MHz bandwidth with external 1 µf capacitor
Load Transient Response			±4	% deviation of Vout voltage for a 25% load change for 300µS
Short Circuit Protection				Indefinite, Automatic Recovery

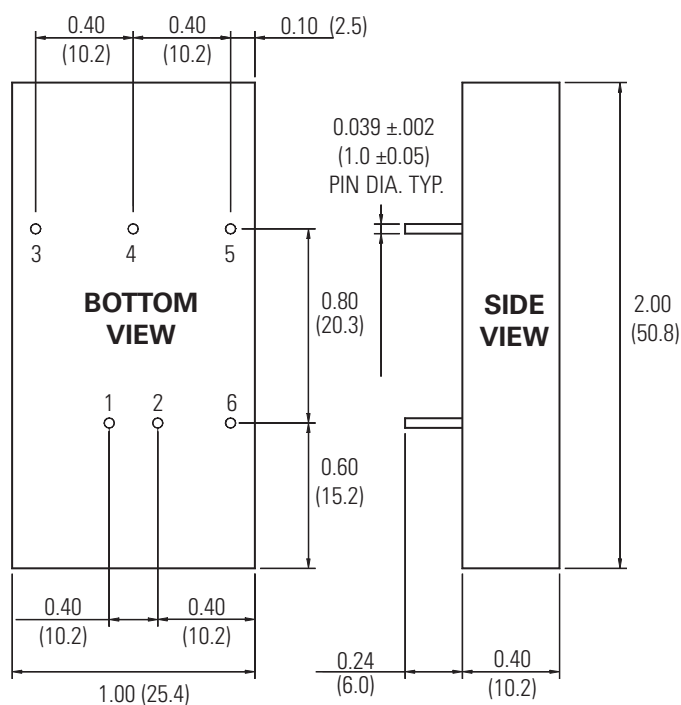
### INPUT CHARACTERISTICS

	Min	Typ	Max	Units/Comments
Switching Frequency	290	330	360	kHz; Factory set
Remote Shut Down	Off	-1	+1	VDC;Ref. to input (-)
	On	2.5		VDC or open;Referenced to input (-)
Input - Output Capacitance		1200		pF
Input Filter				Pi type
Isolation Voltage	1500			VDC
Isolation Resistance	1000			MOhms @ 500 Vdc

**GENERAL CHARACTERISTICS**

	Min	Typ	Max	Unit/Comments
Operating Temp. Range	-40		+50	°C; measured at ambient
Operating Temp. Range	-40		+105	°C; measured at case
Storage Temp. Range	-55		+125	° C
Material Flammability				UL94V-0
Relative Humidity				% Humidity, non-condensing
	5		95	
Weight				30 Grams
Size				1.0" X 2.0" X 0.4"
Case Material				Metal with non-conductive baseplate

**OUTLINE DRAWING**



**PIN OUT CHART**

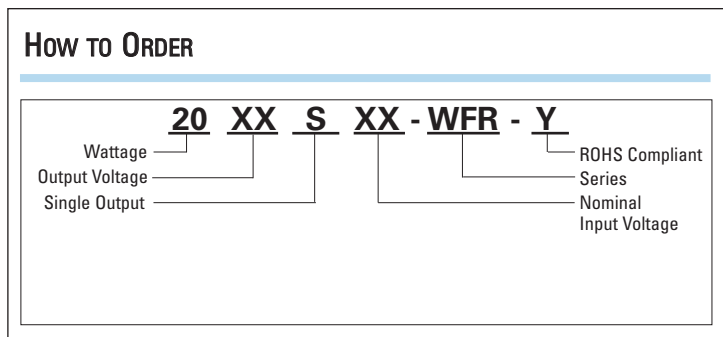
Pins	FUNCTION
1	+ Vin
2	- Vin
3	+ Vout
4	NO PIN
5	- Vout
6	REMOTE ON/OFF

Notes:

- Unless otherwise specified dimensions are in inches (mm).  
 Tolerances      Inches              mm  
 X.XX = ±0.02      X.X = ±0.5  
 X.XXX = ±0.010      X.XX = ±0.25

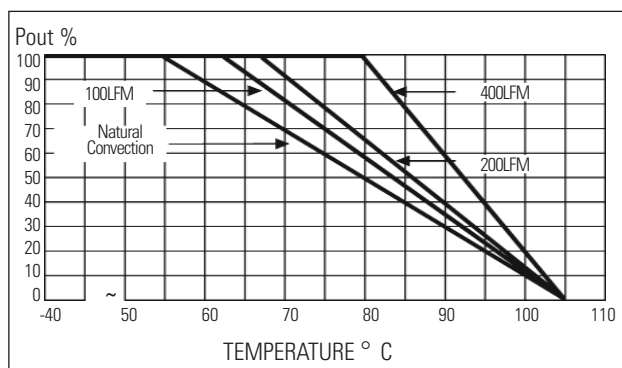
All specifications are typical at nominal input, nominal load and 25° C unless otherwise specified.  
 External, low ESR, 10 microfarad (minimum) capacitor across output is recommended for operation.

How To ORDER



DERATING CURVES

MODEL 2000WFR Single



MODEL SELECTION CHART

Model	Nominal Input Voltage (VDC)	Input Voltage Range (VDC)	Under Voltage Shut Down (VDC)	No Load Input Current (mA)	Full Load Input Current (mA)	Output Voltage (VDC)	Full Load Output Current (mA)	Input Fuse Slow Blow Type (A)	Efficiency @ FL (%)
2003S12WFR	12	9 - 18	8.1 - 8.8	30	1358	3.3	4.00	4	81
2005S12WFR	12	9 - 18	8.1 - 8.8	30	1984	5.0	4.00	4	84
2012S12WFR	12	9 - 18	8.1 - 8.8	30	1898	12.0	1.67	4	88
2015S12WFR	12	9 - 18	8.1 - 8.8	30	1903	15.0	1.34	4	88
2003S24WFR	24	18 - 36	16 - 17.5	17	671	3.3	4.00	2	82
2005S24WFR	24	18 - 36	16 - 17.5	17	980	5.0	4.00	2	85
2012S24WFR	24	18 - 36	16 - 17.5	17	938	12.0	1.67	2	89
2015S24WFR	24	18 - 36	16 - 17.5	17	941	15.0	1.34	2	89
2003S48WFR	48	36 - 75	32 - 34	10	335	3.3	4.00	1	82
2005S48WFR	48	36 - 75	32 - 34	10	490	5.0	4.00	1	85
2012S48WFR	48	36 - 75	32 - 34	10	469	12.0	1.67	1	89
2015S48WFR	48	36 - 75	32 - 34	10	471	15.0	1.34	1	89

# Make-Ps®

## DC/DC CONVERTER

# 2000WFR series

## NEW Dual Output DC/DC Converter

### FEATURES

- Up to 89% Efficiency
- Dual Output, 20 watt converter
- Available in 12, 24 and 48 VDC Inputs *2-1 Input Range*
- Industry Standard 1.0" X 2.0" X 0.4" Package
- Remote On/Off, Short Circuit Protection
- 6 sided Continuous Shielding
- EMI complies with EN55022 Level A

### DESCRIPTIONS

Delivering up to 20 watts in an industry standard 1" X 2" X 0.4" package this broad line of high density converters provide up to 25 watts/in<sup>3</sup> saving valuable board space. Key to providing this high a power level in a 1" X 2" footprint is the outstanding thermal performance with efficiencies up to 89%. The 2000WFR series are available in 12Vdc, 24Vdc and 48Vdc input, with a 2 to 1 input range, and with dual output modules of +/-12Vdc, +/-15Vdc making them one of the most versatile product lines available today in the market. They are ideally suited to data communications applications, mobile battery driven equipment, telecommunications equipment, mixed analog/ digital subsystems and process/control systems.

### OUTPUT CHARACTERISTICS

	Min	Typ	Max	Unit/Comments
Output Voltage Set Point			±1	% Output voltage at nominal line & FL
Line Regulation			±0.3	% Output voltage measured from min. input line to maximum
Load Regulation			±0.5	% Output voltage measured from FL to 10% load (Balanced Loads)
Temperature Coefficient			±0.02	% per degree C
Ripple/Noise		60	100	mV p-p measured at 20 MHz bandwidth with external 1 µf capacitor
Short Circuit Protection				Indefinite, Automatic Recovery
Output Voltage Balance			±2	%, Balanced Load

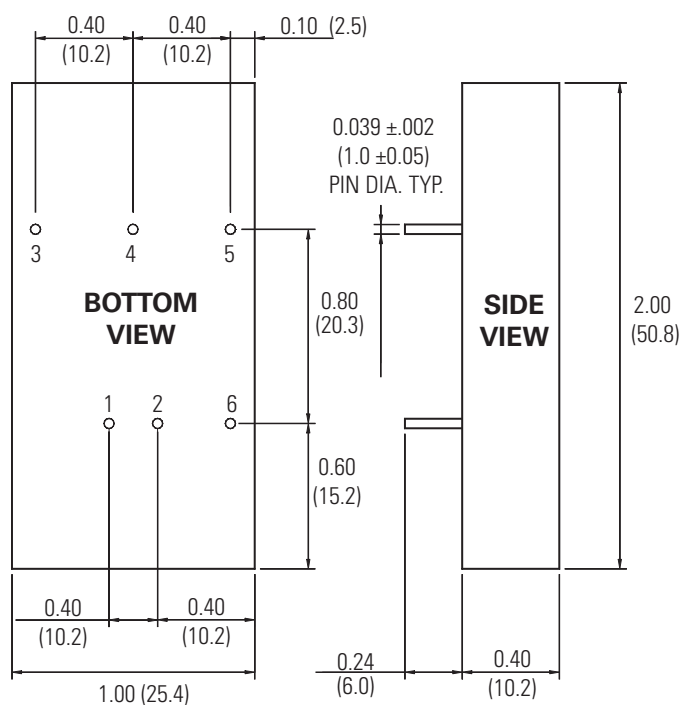
### INPUT CHARACTERISTICS

	Min	Typ	Max	Units/Comments
Switching Frequency	290	330	360	kHz; Factory set
Remote Shut Down	Off	-1	+1	VDC;Ref. to input (-)
	On	2.5		VDC or open;Referenced to input (-)
Input - Output Capacitance		1200		pF
Input Filter				Pi type
Isolation Voltage	1500			VDC
Isolation Resistance	1000			MOhms @ 500 Vdc

## GENERAL CHARACTERISTICS

	Min	Typ	Max	Unit/Comments
Operating Temp. Range	-40		+50	°C; measured at ambient
Operating Temp. Range	-40		+105	°C; measure at case
Storage Temp. Range	-55		+125	°C;
Material Flammability				UL94V-0
Relative Humidity	5		95	% Humidity, non-condensing
Weight				30 Grams
Size				1.0" X 2.0" X 0.4"
Case Material				Metal with non-conductive baseplate

## OUTLINE DRAWING



## PIN OUT CHART

Pins	FUNCTION
1	+ Vin
2	- Vin
3	+ Vout
4	COMMON
5	- Vout
6	REMOTE ON/OFF

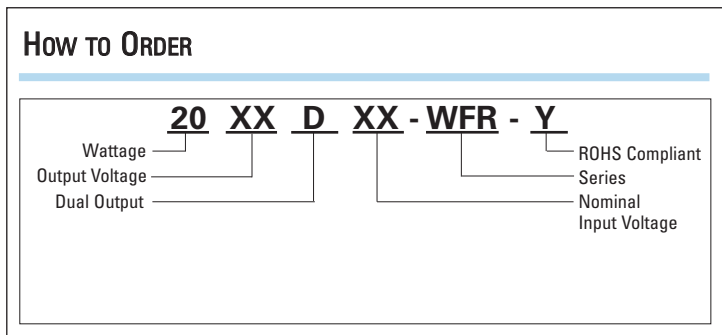
### Notes:

1. Unless otherwise specified dimensions are in inches (mm).

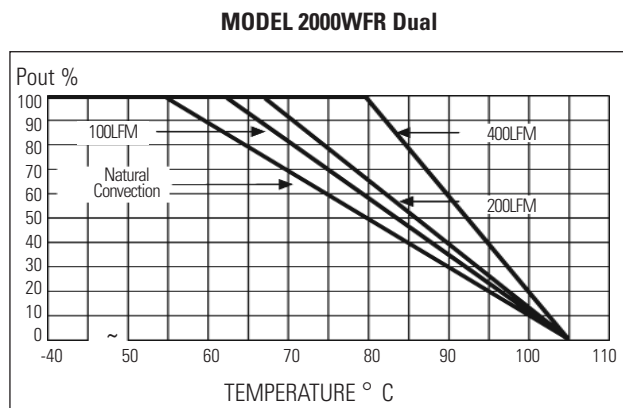
Tolerances	Inches	mm
X.XX	±0.02	X.X = ±0.5
X.XXX	±0.010	X.XX = ±0.25

All specifications are typical at nominal input, nominal load and 25° C unless otherwise specified.  
External, low ESR, 10 microfarad (minimum) capacitor across output is recommended for operation.

### HOW TO ORDER



### DERATING CURVES



### MODEL SELECTION CHART

Model	Nominal Input Voltage (VDC)	Input Voltage Range (VDC)	Under Voltage Shut Down (VDC)	No Load Input Current (mA)	Full Load Input Current (mA)	Output Voltage (VDC)	Full Load Output Current (mA)	Input Fuse Slow Blow Type (A)	Efficiency @ FL (%)
2012D12WFR	12	9 - 18	8.1 - 8.8	30	1.92	±12.0	±0.835	4	88
2015D12WFR	12	9 - 18	8.1 - 8.8	30	1.92	±15.0	±0.670	4	88
2012D24WFR	24	18 - 36	16 - 17.5	17	0.96	±12.0	±0.835	2	89
2015D24WFR	24	18 - 36	16 - 17.5	17	0.96	±15.0	±0.670	2	89
2012D48WFR	48	36 - 75	32 - 34	10	0.47	±12.0	±0.835	1	89
2015D48WFR	48	36 - 75	32 - 34	10	0.47	±15.0	±0.670	1	89