

MA300MRUR14

EN 60601 Approved 4:1 Input, 3W DIP, DC/DC Converters



Key Features:

- EN 60601 3RD Ed. Approved
- 3W Output Power
- 4,000 VAC I/O Isolation
- Reinforced Insulation
- EN 60601-1 3RD Edition
- 2 x MOOP
- 2 μ A Leakage Current Max
- Wide 4:1 Input Range
- Compact 24 Pin DIP Case
- 110 VDC Input Models
- 1.0 MH MTBF

Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Input Start Voltage	24 VDC Input	8.0	8.5	9.0	VDC	
	48 VDC Input	13.0	15.0	17.0		
	110 VDC Input	26.0	30.0	34.0		
Under Voltage Shutdown	24 VDC Input			8.5	VDC	
	48 VDC Input			16.0		
	110 VDC Input			32.0		
Input Filter	π (Pi) Filter					
Short Circuit Input Power				2,000	mW	
Output						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Output Voltage Accuracy				± 1.0	%	
Output Voltage Balance	Dual Output , Balanced Loads		± 0.5	± 2.0	%	
Line Regulation	$V_{IN} = \text{Min to Max}$		± 0.3	± 0.5	%	
Load Regulation	$I_{OUT} = 25\% \text{ to } 100\%$		± 0.5	± 1.0	%	
Ripple & Noise (20 MHz), See Note 2	5V Output Models		75	100	mV P - P	
	All Other Models		100	150		
Output Power Protection		120	150		%	
Transient Recovery Time, See Note 3	25% Load Step Change		150	500	μ Sec	
Transient Response Deviation			± 3.0	± 6.0	%	
Temperature Coefficient			± 0.02	± 0.05	%/°C	
Output Short Circuit	Continuous (Autorecovery)					
General						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Isolation Voltage	60 Seconds	4,000			Vrms	
Reinforced Insulation Working Voltage	1,000 Vrms					
Leakage Current	240 VAC, 60 Hz			2	μ A	
Isolation Resistance	500 VDC	10			GV	
Isolation Capacitance	100 kHz, 1V		7	13	pF	
Switching Frequency			150		kHz	
EMI Characteristics						
Parameter	Standard	Criteria		Level		
EMI	Complies With EN 55022 Class A					
Environmental						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Operating Temperature Range	Ambient	-40	+25	+85	°C	
	Case			+100		
Storage Temperature Range		-50		+125		
Cooling	Free Air Convection					
Humidity	RH, Non-condensing			95	%	
Physical						
Case Size	See Mechanical Diagram (Page 3)					
Case Material	Non-Conductive Black Plastic (UL94-V0)					
Weight	0.58 Oz (16.6g)					
Reliability Specifications						
Parameter	Conditions	Min.	Typ.	Max.	Units	
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours	
Safety Standards	IEC/EN 60601-1 3 RD Edition, 1XMOPP & 2xMOOP ANSI/AAMI ES 60601-1 1xMOPP & 2xMOOP Recognition (UL Certificate)					
Absolute Maximum Ratings						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Input Voltage Surge (1.0 Sec)	24 VDC Input			50.0	VDC	
	48 VDC Input			100.0		
	110 VDC Input			180.0		
Lead Temperature	1.5 mm From Case For 10 Sec			260	°C	

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.



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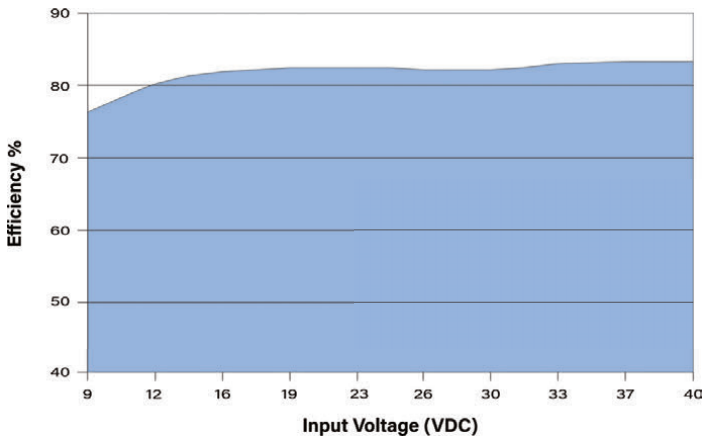
Model Number	Input				Output			Efficiency (% Typ)	Capacitive Load (µF Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MA324SMRU-05RI4	24	9.0 - 40.0	160	20	5.0	600	90.0	78	1,000	1,000
MA324SMRU-12RI4	24	9.0 - 40.0	151	20	12.0	250	37.5	83	470	1,000
MA324DMRU-12RI4	24	9.0 - 40.0	151	20	±12.0	±125	±18.8	83	220	1,000
MA324DMRU-15RI4	24	9.0 - 40.0	151	29	±15.0	±100	±15.0	83	220	1,000
MA348SMRU-05RI4	48	18.0 - 80.0	80	10	5.0	600	90.0	78	1,000	500
MA348SMRU-12RI4	48	18.0 - 80.0	75	10	12.0	250	37.5	83	470	500
MA348DMRU-12RI4	48	18.0 - 80.0	75	10	±12.0	±125	±18.8	83	220	500
MA348DMRU-15RI4	48	18.0 - 80.0	75	10	±15.0	±100	±15.0	83	220	500
MA3110SMRU-05RI4	110	36.0 - 160.0	35	5	5.0	600	90.0	78	1,000	300
MA3110SMRU-12RI4	110	36.0 - 160.0	33	5	12.0	250	37.5	83	470	300
MA3110DMRU-12RI4	110	36.0 - 160.0	33	5	±12.0	±125	±18.8	83	220	300
MA3110DMRU-15RI4	110	36.0 - 160.0	33	5	±15.0	±100	±15.0	83	220	300

Notes:

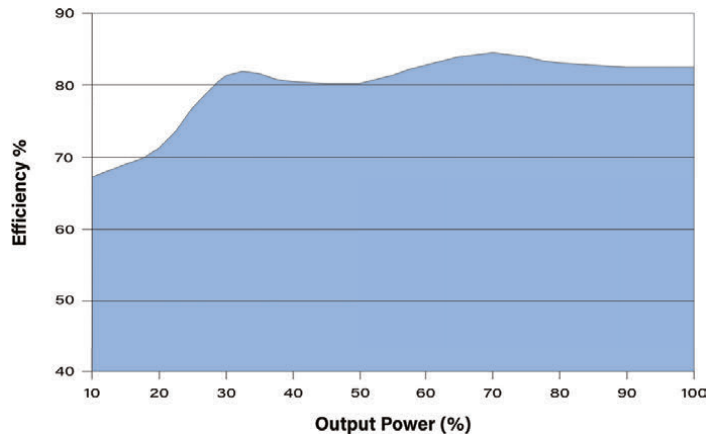
1. The specified maximum capacitive load is for each output.
2. When measuring output ripple, it is recommended that an external 0.47 µF ceramic capacitor be placed from the +V_{OUT} pin to the -V_{OUT} pin for single output units and from each output to common for dual output units.
3. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
4. Dual output units may be connected to provide a 24 VDC or 30 VDC output. To do this, connect the load across the positive (+V_{OUT}) and negative (-V_{OUT}) outputs and float the output common.

5. The converter should be connected to a low ac-impedance source. An input source with a highly inductive impedance may affect the stability of the converter. In applications where the converter output loading is high and input power is supplied over long lines, it may be necessary to use a capacitor on the input to insure start-up. The size of the recommended capacitor is given below.
6. It is recommended that a fuse be used on the input of a power supply for protection. See the table above for the correct rating.

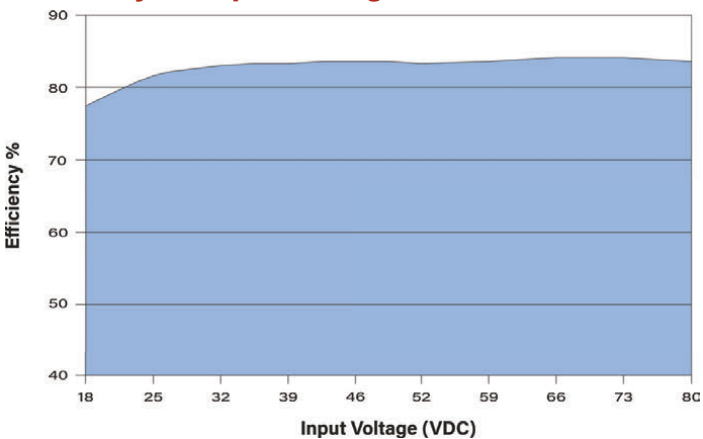
Efficiency Vs Input Voltage, MA324SMRU-12RI4



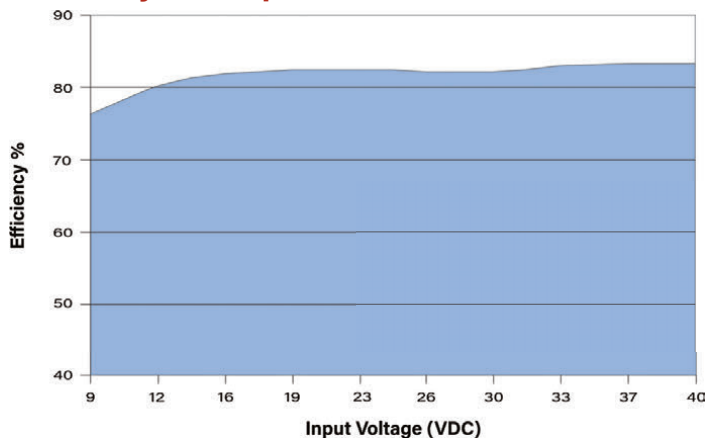
Efficiency Vs Output Power, MA324SMRU-12RI4



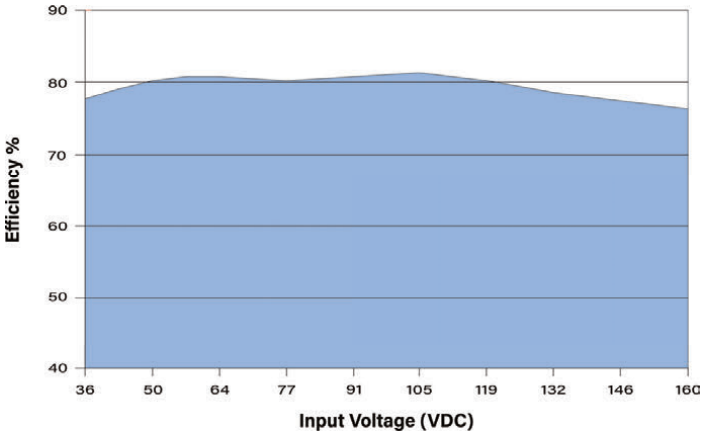
Efficiency Vs Input Voltage, MA348SMRU-12RI4



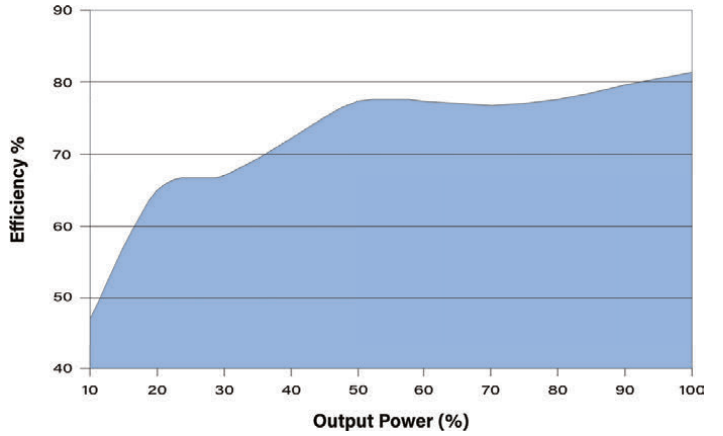
Efficiency Vs Output Power, MA348SMRU-12RI4



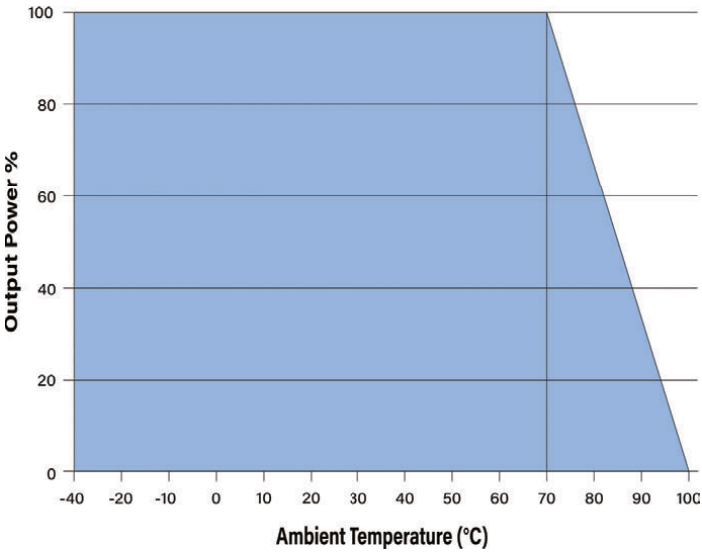
Efficiency Vs Input Voltage, MA3110SMRU-12RI4



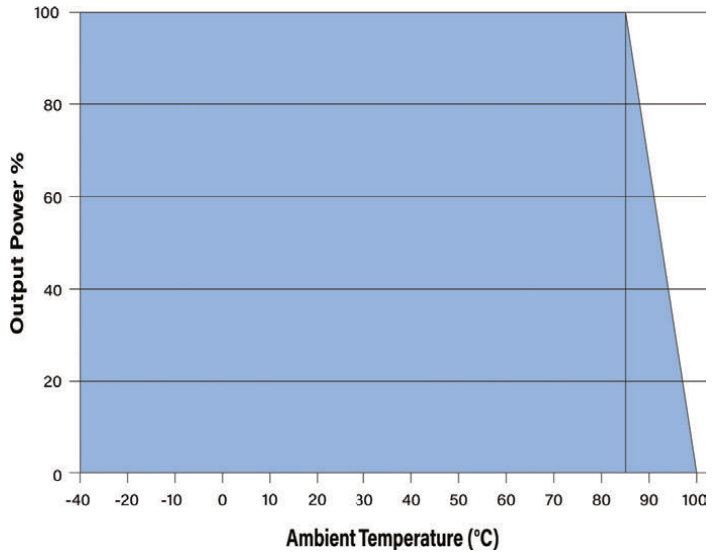
Efficiency Vs Output Power, MA3110SMRU-12RI4



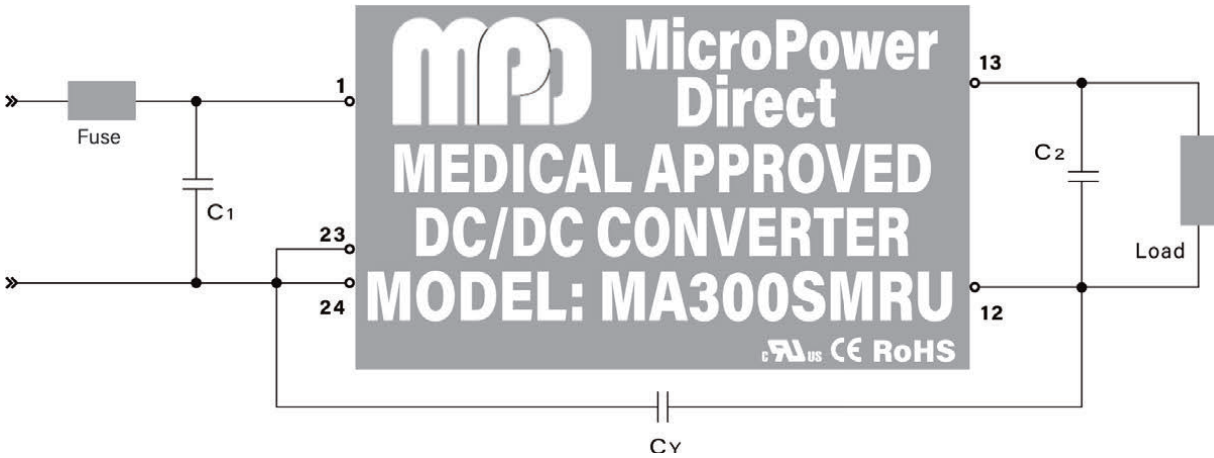
Temperature Derating, 20LFM (Ambient Air)



Temperature Derating, 400 LFM



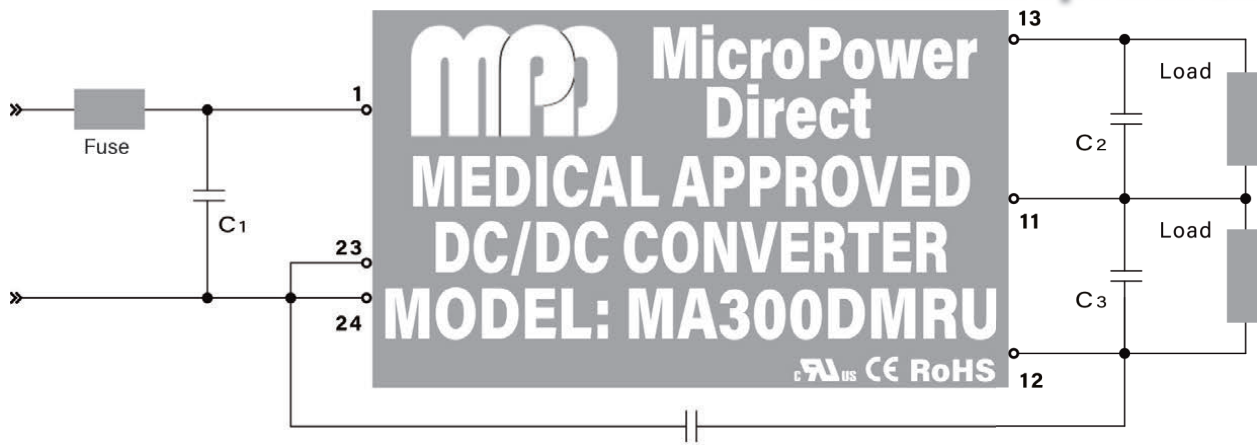
Typical Connection: Single Output



The diagram above illustrates a typical connection of the single output version of the MA300MRU. These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors, as shown in the diagram above, will enhance stability and reduce output ripple. This simple connection includes a low ESR (<1Ω at 100 kHz) capacitor connected across the input (C1) and to improve output ripple, a small capacitor (C2) connected across the output.

The addition of C1 and CY will typically allow these units to comply with EN 55022 Class B. Component values are given in the table below. Contact the factory for more information.

VIN	C1	C2	CY
24 VDC	4.7 μF	3.3 μF	100 pF/6 kV
48 VDC	2.2 μF	3.3 μF	100 pF/6 kV
110 VDC	1.0 μF	3.3 μF	100 pF/6 kV

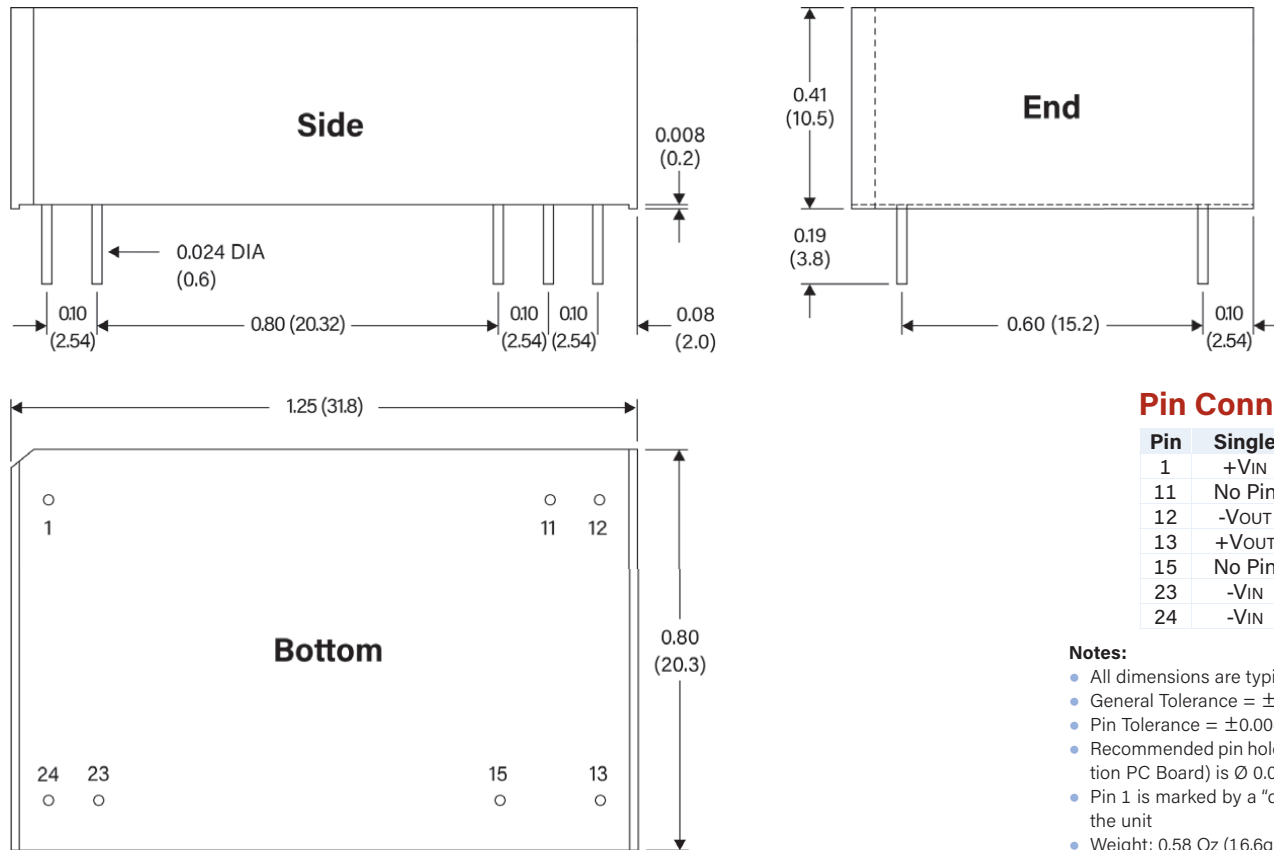


The diagram above illustrates a typical connection of the dual output version of the MA300MRU. These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors, as shown in the diagram above, will enhance stability and reduce output ripple. This simple connection includes a low ESR (<math><1\Omega</math> at 100 kHz) capacitor connected across the input (C1) and to improve output ripple, a small capacitor (C2) connected across the output.

The addition of C1 and C2 will typically allow these units to comply with EN 55022 Class B. Component values are given in the table below. Contact the factory for more information.

VIN	C1	C2/C3	CY
24 VDC	4.7 μ F	3.3 μ F	100 pF/6 kV
48 VDC	2.2 μ F	3.3 μ F	100 pF/6 kV
110 VDC	1.0 μ F	3.3 μ F	100 pF/6 kV

Mechanical Dimensions



- Notes:**
- All dimensions are typical in inches (mm)
 - General Tolerance = ± 0.010 (± 0.25)
 - Pin Tolerance = ± 0.004 (± 0.10)
 - Recommended pin hole size (on the application PC Board) is $\varnothing 0.039$ ($\varnothing 1.00$)
 - Pin 1 is marked by a "dot" or indentation on the unit
 - Weight: 0.58 Oz (16.6g)

Medical Approved Power Products

Thousands of standard power products ranging from 0.5W to 500W are available from MPD in a wide variety of packages and pin-outs. This includes many more DC/DC and AC/DC product families with EN 60601 medical approval. Go to micropowerdirect.com for full information.

