

## DC/DC CONVERTERS

### LOW-COST, 2:1 WIDE INPUT RANGE

#### FEATURES

- LOW-COST
- SMALL DIP PACKAGE SIZE
- FULL POWER TO +85°C
- EXTENDED TEMPERATURE RANGE:  
-40°C TO +85°C
- INDUSTRY STANDARD PINOUTS

#### DESCRIPTION

The WP02R Series is a family of low-cost, high performance DC/DC converters that offer regulated outputs over a wide temperature range of -40°C to +85°C without any power derating. No external heatsink is required.

A self-oscillating design with isolated feedback is used to give stability over the wide input range and continuous short circuit protection. A rugged MOSPOWER transistor is used in a flyback topology to provide enhanced reliability.

For units with inputs of 15VDC or less no external components are required, although they are recommended for enhanced performance on both the input and outputs. For units of 24VDC or 48VDC inputs a capacitor of at least 10μF must be used across the input.

#### ABSOLUTE MAXIMUM RATINGS

Short Circuit Protection .....	Continuous
Internal Power Dissipation .....	1.5W
Lead Temperature (soldering 10seconds, max) .....	+300°C

#### APPLICATIONS

- TELECOMMUNICATION APPLICATIONS
- BATTERY POWERED SYSTEMS
- PORTABLE INSTRUMENTS
- PROCESS CONTROL EQUIPMENT
- TRANSPORTATION EQUIPMENT
- DISTRIBUTED POWER SYSTEMS

By not including these capacitors internally in the DC/DC converter, the unit cost is significantly reduced. It also allows the customers to incur the additional costs only when necessary. The capacitors to be chosen externally are usually physically larger and much less expensive than those mandated by internal design considerations. Because most customers add external decoupling capacitors, the total system cost is lower if duplication is eliminated by not including them internally. The customer specifies and pays only for his external needs.

The plastic package of the WP02R Series is rated UL94V-0. The plastic eliminates the layout precautions required by metal enclosed devices. The encapsulant material is rated UL94V-0 for flammability and offers excellent heat transfer characteristics.

#### ORDERING INFORMATION

WP02R		xx	yy	zz	E	/H
Device Family _____						
Indicates Wide Input Power 2 Watt Regulated Unit						
Model Number _____						
Selected from Table of Electrical Characteristics						
Where:						
xx = Input Voltage						
yy = Number of Outputs (Single "S", Dual "D")						
zz = Output Voltage						
Package Option _____						
Choose from E or L						
Screening Option _____						

# ELECTRICAL SPECIFICATIONS

Specifications typical at  $T_A = +25^{\circ}\text{C}$ , nominal input voltage, rated output current unless otherwise specified.

MODEL	NOMINAL INPUT VOLTAGE (VDC)	RATED OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT		INPUT CURRENT		EFFICIENCY (%)
			MIN LOAD (mA)	RATED LOAD (mA)	MIN LOAD (mA)	RATED LOAD (mA)	
WP02R05S05	5	5	100	400	150	615	65
WP02R05D05	5	$\pm 5$	$\pm 50$	$\pm 200$	150	580	69
WP02R05D15	5	$\pm 15$	$\pm 20$	$\pm 67$	195	570	70
WP02R12S05	12	5	100	400	65	230	73
WP02R12D05	12	$\pm 5$	$\pm 50$	$\pm 200$	65	225	75
WP02R12D12	12	$\pm 12$	$\pm 21$	$\pm 83$	85	220	76
WP02R12D15	12	$\pm 15$	$\pm 20$	$\pm 67$	85	220	76
WP02R15S05	15	5	100	400	50	180	75
WP02R15D05	15	$\pm 5$	$\pm 50$	$\pm 200$	50	175	76
WP02R15D15	15	$\pm 15$	$\pm 20$	$\pm 67$	65	175	77
WP02R24S05	24	5	100	400	40	120	69
WP02R24D05	24	$\pm 5$	$\pm 50$	$\pm 200$	40	120	69
WP02R24D15	24	$\pm 15$	$\pm 20$	$\pm 67$	40	120	70
WP02R48S05	48	5	100	400	20	60	69
WP02R48D05	48	$\pm 5$	$\pm 50$	$\pm 200$	20	60	69
WP02R48D15	48	$\pm 15$	$\pm 20$	$\pm 67$	20	60	70

NOTE: Other input to output voltages may be available. Please consult factory.

## COMMON SPECIFICATIONS

Specifications typical at  $T_A = +25^{\circ}\text{C}$ , nominal input voltage, rated output current unless otherwise specified.

Parameter	Conditions	Min	Typ	Max	Units
<b>INPUT</b>					
Voltage Range		4	5	8	VDC
		7	12	15	VDC
		10	15	20	VDC
		18	24	36	VDC
		36	48	72	VDC
Reflected Ripple Current	5, 12, 15VDC Input Models With 100 $\mu\text{F}$ cap. across input		130	200	mAp-p
Reflected Ripple Current	Without 100 $\mu\text{F}$ cap. across input		200	300	mAp-p
	24, 48VDC Input Models With 10 $\mu\text{F}$ cap. across input		130	200	mAp-p
<b>ISOLATION</b>					
Rated Voltage		500			VDC
Test Voltage	60 Hz, 10 Seconds	500			VpK
Resistance			10		G $\Omega$
Capacitance			80		pF
Leakage Current	$V_{iso} = 240\text{VAC}$ , 60Hz		30		$\mu\text{Arms}$
<b>OUTPUT</b>					
Rated Power			2		W
Voltage Setpoint Accuracy			$\pm 3$	$\pm 5$	%
Temperature Coefficient			$\pm 0.02$		%/ $^{\circ}\text{C}$
Line Regulation	Low Line to High Line			0.5	%
Load Regulation					
(Single Output Models)	Min Load to Rated Load			1.0	%
(Positive Output, Duals)	Min Load to Rated Load			1.0	%
(Negative Output, Duals)	Min Load to Rated Load			1.5	%
Ripple & Noise	With 100 $\mu\text{F}$ cap. across output				
	BW = DC to 100 MHz		100	150	mVp-p
	BW = 20 Hz to 300 KHz		5	10	mVrms
Ripple & Noise	Without 100 $\mu\text{F}$ cap. across output				
	BW = DC to 10 MHz		1.7	3.5	Vp-p
	BW = 20 Hz to 300 KHz		60	175	mVrms
<b>GENERAL</b>					
Switching Frequency			200		kHz
MTTF per MIL-HDBK-217, Rev. E*	Circuit Stress Method		650		kHr
Ground Benign	$T_A = +25^{\circ}\text{C}$		155		kHr
	$T_A = +85^{\circ}\text{C}$		12		g
Package Weight					
<b>TEMPERATURE</b>					
Specification		-40		+85	$^{\circ}\text{C}$
Operation		-40		+100	$^{\circ}\text{C}$
Storage		-55		+110	$^{\circ}\text{C}$

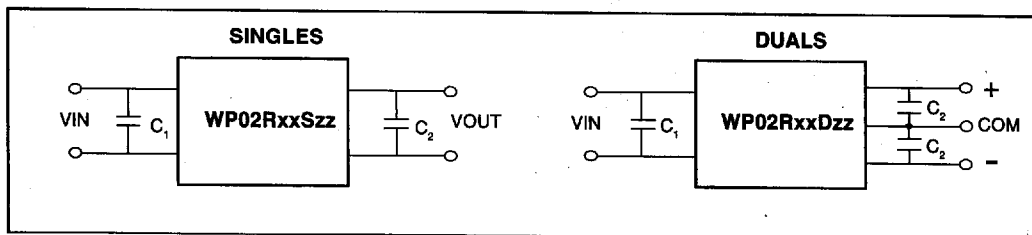
\* For demonstrated MTTF results reference Power Convertibles' Reliability Report WP02R

## APPLICATION NOTES

For ease of design, performance data has been included with and without the optional external capacitors. For models with 5, 12, or 15VDC inputs, performance is described with and without any external capacitors. For models with 24 and

48VDC inputs, performance is described with and without external **output** capacitors. See also Power Convertibles' application note on Noise and Filtering of DC/DC Converters, AN162.

## RECOMMENDED EXTERNAL COMPONENTS



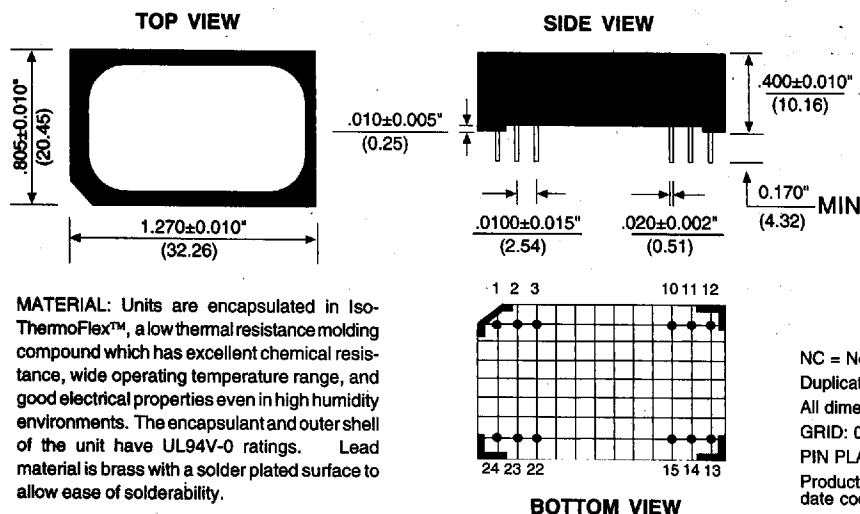
C<sub>1</sub>: For 5, 12, 15VDC Input Models = Sprague 515D107M025AA6A, 100μF 25V

For 24, 48VDC Input Models = Sprague 515D106M100AA6A, 10μF 100V

C<sub>2</sub>: Sprague 515D107M025AA6A, 100μF 25V

## MECHANICAL

### Package/Pinout "E"



### PIN CONNECTIONS

PIN #	SINGLES	DUALS
1	+VIN	+VIN
2	NC	-VOUT
3	NC	Common
10	-VOUT	Common
11	+VOUT	+VOUT
12	-VIN	-VIN
13	-VIN	-VIN
14	+VOUT	+VOUT
15	-VOUT	Common
22	NC	Common
23	NC	-VOUT
24	+VIN	+VIN

NC = No Internal Connection.

Duplicate pin functions are internally connected.

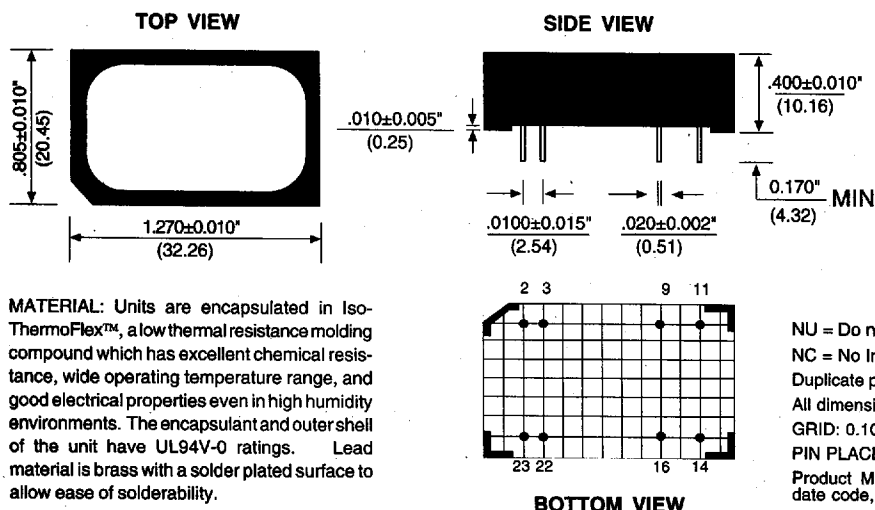
All dimensions are in inches (millimeters).

GRID: 0.100 inches (2.54 millimeters)

PIN PLACEMENT TOLERANCE: ± 0.015"

Product Marked with: specific model ordered, date code, and job code.

### Package/Pinout "L"



PIN #	SINGLES	DUALS
2	-VIN	-VIN
3	-VIN	-VIN
9	NU	Common
11	NC	-VOUT
14	+VOUT	+VOUT
16	-VOUT	Common
22	+VIN	+VIN
23	+VIN	+VIN

NU = Do not use.

NC = No Internal Connection.

Duplicate pin functions are internally connected.

All dimensions are in inches (millimeters).

GRID: 0.100 inches (2.54 millimeters)

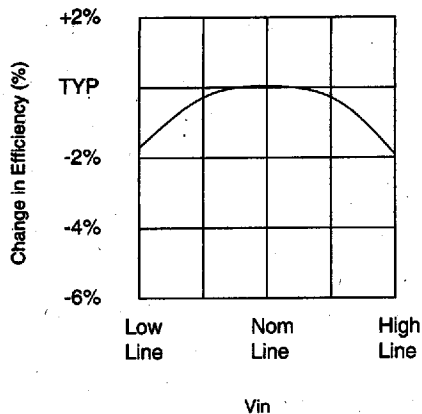
PIN PLACEMENT TOLERANCE: ± 0.015"

Product Marked with: specific model ordered, date code, and job code.

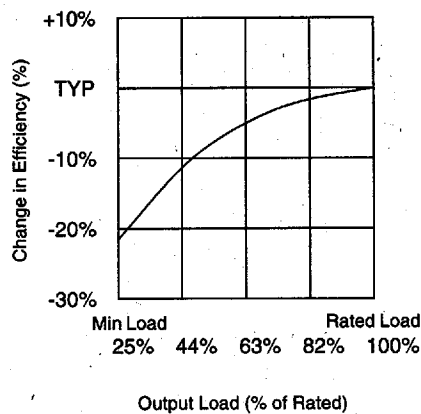
# TYPICAL PERFORMANCE CURVES

$T_A = +25^\circ\text{C}$ , nominal input voltage, rated load, recommended external components applied, unless otherwise specified.

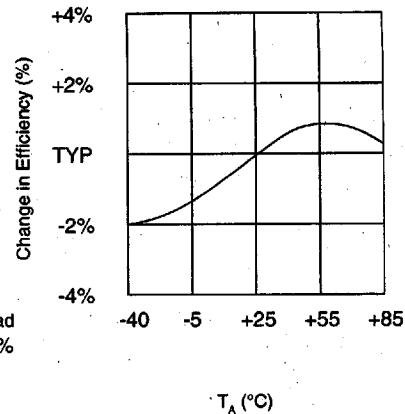
EFFICIENCY vs INPUT VOLTAGE



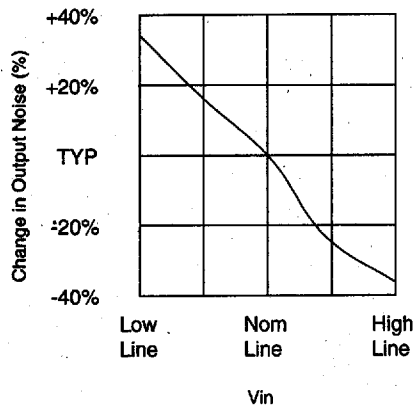
EFFICIENCY vs OUTPUT LOAD



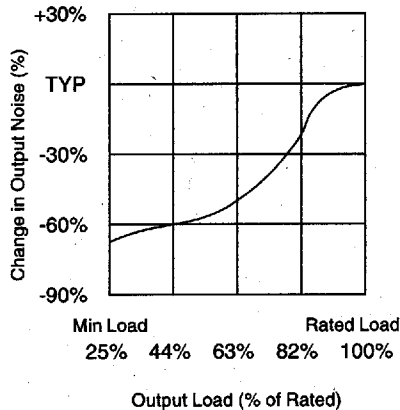
EFFICIENCY vs TEMPERATURE



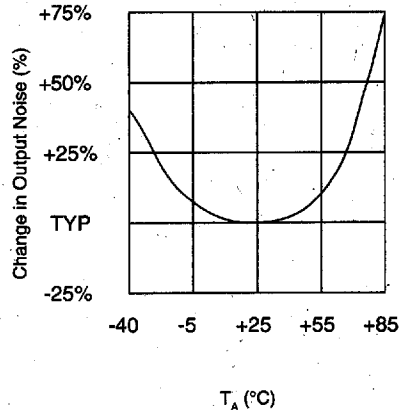
OUTPUT NOISE vs INPUT VOLTAGE



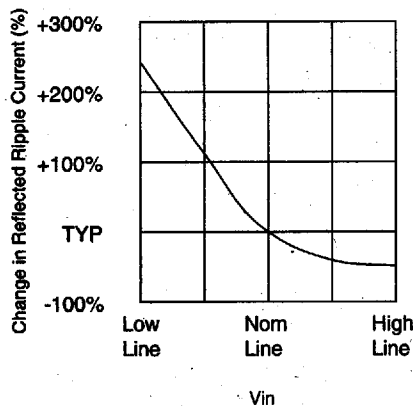
OUTPUT NOISE vs OUTPUT LOAD



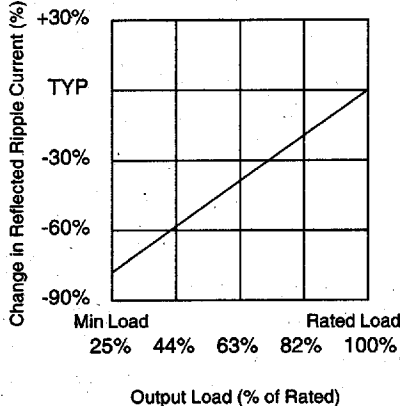
OUTPUT NOISE vs TEMPERATURE



REFLECTED RIPPLE CURRENT vs INPUT VOLTAGE



REFLECTED RIPPLE CURRENT vs OUTPUT LOAD



REFLECTED RIPPLE CURRENT vs TEMPERATURE

