

## SR20 & SRA40

## 20W & 40W STEP-UP SWITCHING REGULATORS

 $5V_{IN}$  to  $17V_{IN}$ 

## Key Features

- Efficiency up to 96%
- Wide input range (5–17V)
- Input under/overvoltage protection
- Output overvoltage protection
- 300kHz constant frequency
- 50W/in<sup>3</sup> power density
- Six-sided shielding
- Thermal protection



*Beta Dyne is protected under various patents, including but not limited to U.S. Patent numbers: 5,777,519; 6,188,276; 6,262,901; 6,452,818; 6,473,3171.*

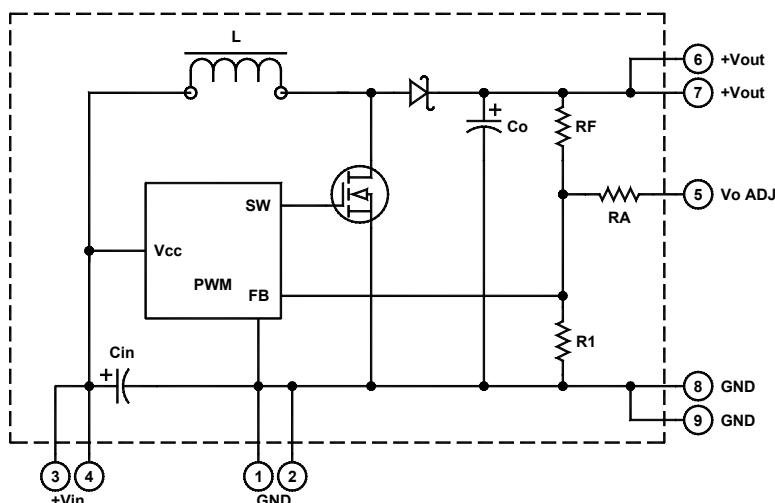
## Applications

- Battery Chargers/Backup
- External Modems
- xDSL Power Supply
- Telecom Hardware
- LAN and Network Systems
- Point-of-Sale (POS) Systems

### Functional Description

The SR20 & SRA40 are 20W and 40W constant frequency, current mode step-up switching regulators with excellent line and load regulation that accept  $5V_{IN}$  to  $17V_{IN}$  and provide 9, 12, 15, 18 and  $24V_{OUT}$ . High switching frequency and SMD technology makes achieving high power density, low cost and high reliability possible. The SR20 & SRA40 require a low impedance power source or minimum 1000 $\mu$ F input and output capacitors for proper operation. Both models come in a 2 $\times$ 1 $\times$ 0.39-inch package size.

**NOTE: These converters DO NOT feature short circuit protection, you must use an external fuse to provide short circuit protection.**



### Typical Block Diagram of SR20 & SRA40

## Electrical Specifications

### INPUT SPECIFICATIONS

Unless otherwise specified, all parameters are given under typical +25°C with nominal input voltage and under full output load conditions.

| PARAMETER                 | CONDITION / NOTE                   | MIN | TYP | MAX | UNIT             |
|---------------------------|------------------------------------|-----|-----|-----|------------------|
| Input Voltage Range       | See Model Selection Guide          |     |     |     | Vdc              |
| Input Current             | NL, See Model Selection Guide      |     |     |     | mA               |
| Input Reflected Ripple    | With 2000µF, See Figure 1          |     | 20  |     | mA <sub>pp</sub> |
| Turn On Delay             | Including Soft Start, See Figure 2 |     | 5   | 8   | mS               |
| Undervoltage Lockout, 5V  |                                    | 4   | 4.5 |     | Vdc              |
| Undervoltage Lockout, 10V |                                    | 8   |     |     | Vdc              |

### OUTPUT SPECIFICATIONS

| PARAMETER               | CONDITION / NOTE                    | MIN | TYP  | MAX  | UNIT                  |
|-------------------------|-------------------------------------|-----|------|------|-----------------------|
| Output Voltage          | See Model Selection Guide           |     |      |      | Vdc                   |
| Output Voltage Accuracy |                                     |     | 0.5  | 1    | %                     |
| Line Regulation         |                                     |     | ±1   | ±2   | % of V <sub>OUT</sub> |
| Load Regulation         |                                     |     | ±1   | ±2   | % of V <sub>OUT</sub> |
| Ripple and Noise        | With C=1000µF minimum, See Figure 1 |     | 1    | 2    | OUTPP                 |
| Temperature Coefficient |                                     |     | 0.01 | 0.02 | %                     |
| Transient Response      | See Figures 3 & 4                   |     | 100  |      | µS                    |
| Short Circuit Current   | Input Fuse                          |     |      |      |                       |
| V Adjust Range          |                                     |     | 5    | 10   | %                     |

### GENERAL SPECIFICATIONS

| PARAMETER                                 | CONDITION / NOTE                         | MIN | TYP                 | MAX | UNIT  |
|-------------------------------------------|------------------------------------------|-----|---------------------|-----|-------|
| Efficiency                                | See Model Selection Guide                |     |                     |     |       |
| Switching Frequency                       | Fixed                                    | 300 | 330                 | 360 | kHz   |
| Isolation                                 | None                                     |     |                     |     |       |
| Thermal Resistance                        |                                          |     | 5                   |     | °C/W  |
| Thermal Hysteresis                        |                                          |     | 10                  |     | °C    |
| Thermal Turn Off Temperature <sup>1</sup> | Case Temperature                         | 105 | 110                 | 115 | °C    |
| MTBF                                      | per MIL-HNBK-217F (Ground benign, +25°C) |     | 2.1×10 <sup>6</sup> |     | hours |

### ENVIRONMENTAL / PHYSICAL SPECIFICATIONS

| PARAMETER                         | CONDITION / NOTE                        | MIN | TYP | MAX  | UNIT |
|-----------------------------------|-----------------------------------------|-----|-----|------|------|
| Humidity                          | Non-condensing                          |     |     | 95   | %    |
| Storage Temperature               |                                         | -55 |     | +125 | °C   |
| Operating Temperature, Commercial | (Contact factory for -40°C)             | -25 |     | +70  | °C   |
| Dimensions (L×W×H)                | 2.00×1.00×0.39 in. (50.80×25.40×9.90mm) |     |     |      |      |
| Weight                            | 1.09 oz. (31g)                          |     |     |      |      |
| Shielding Connection              | -V/-V                                   |     |     |      |      |

### Model Selection Guide

| MODEL NUMBER | INPUT         |       |              |           |                                                      | OUTPUT           |                 |                             |
|--------------|---------------|-------|--------------|-----------|------------------------------------------------------|------------------|-----------------|-----------------------------|
|              | Voltage (Vdc) |       | Current (mA) |           | Reflected Ripple <sup>2</sup><br>(mA <sub>pp</sub> ) | Voltage<br>(Vdc) | Current<br>(mA) | Efficiency<br>Full Load (%) |
|              | Nominal       | Range | No Load      | Full Load |                                                      |                  |                 |                             |
| SR20S9/5     | 5             | 5–8   | 10           | 4301      | 30                                                   | 9                | 2222            | 93                          |
| SR20S12/5    | 5             | 5–8   | 30           | 4301      | 30                                                   | 12               | 1666            | 93                          |
| SR20S15/5    | 5             | 5–8   | 30           | 4301      | 30                                                   | 15               | 1333            | 93                          |
| SR20S18/5    | 5             | 5–8   | 30           | 4301      | 30                                                   | 18               | 1111            | 93                          |
| SR20S24/5    | 5             | 5–8   | 50           | 4444      | 30                                                   | 24               | 833             | 90                          |
|              |               |       |              |           |                                                      |                  |                 |                             |
| SRA40S15/12  | 12            | 10–14 | 10           | 3472      | 20                                                   | 15               | 2666            | 96                          |
| SRA40S18/12  | 12            | 10–17 | 10           | 3508      | 20                                                   | 18               | 2222            | 95                          |
| SRA40S24/12  | 12            | 10–17 | 10           | 3584      | 20                                                   | 24               | 1666            | 93                          |

<sup>1</sup> After thermal turn off, V<sub>OUT</sub> ≅ V<sub>IN</sub> – 0.7V.

<sup>2</sup> Measured with 1000µF input capacitor. See C<sub>IN</sub> in Figure 6.

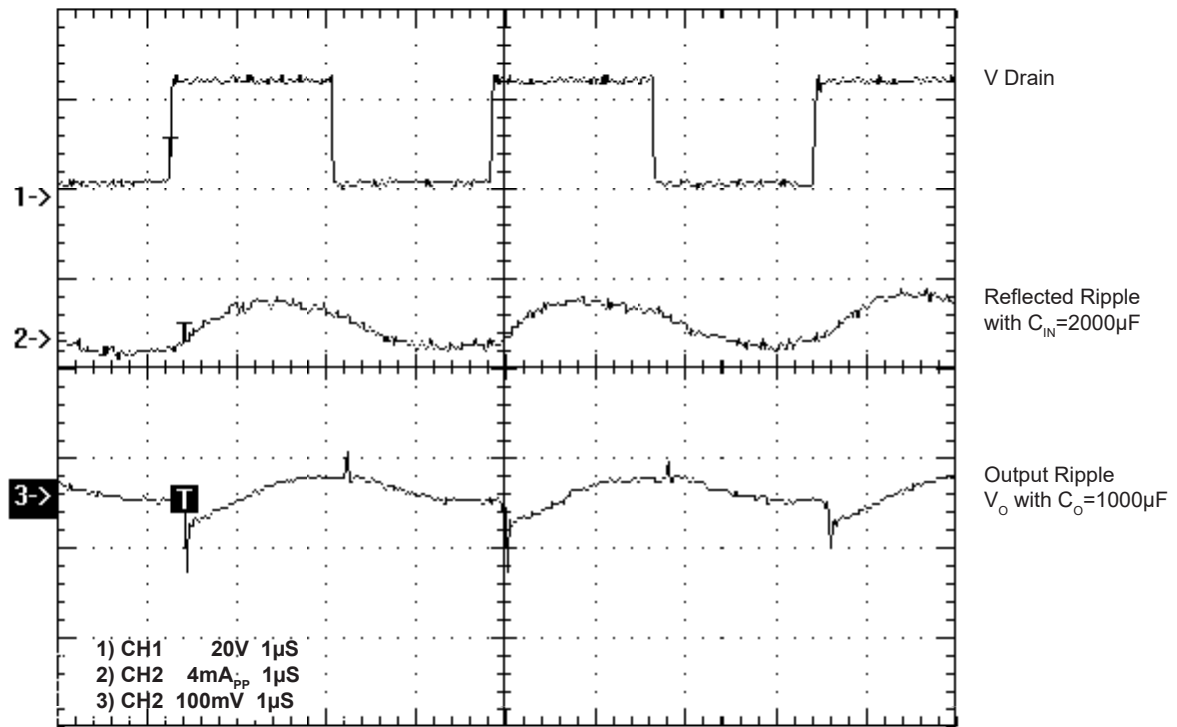


FIGURE 1. Reflected ripple and output ripple

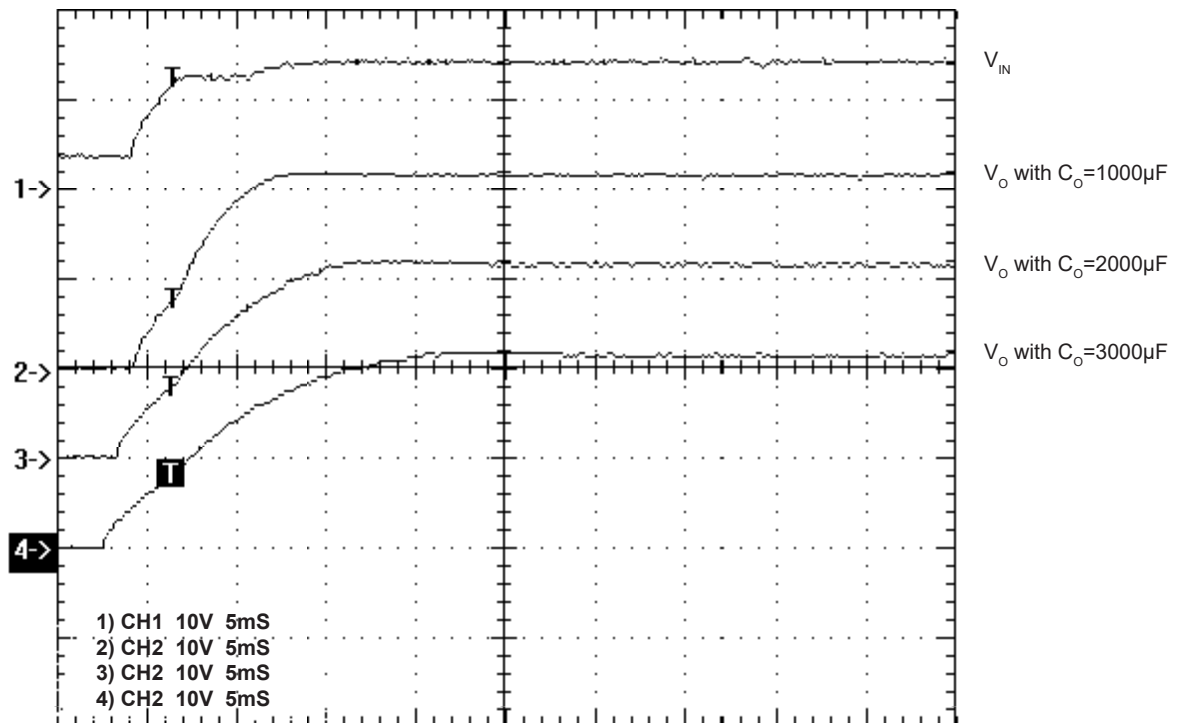


FIGURE 2. Soft start (SRA40S24/12)

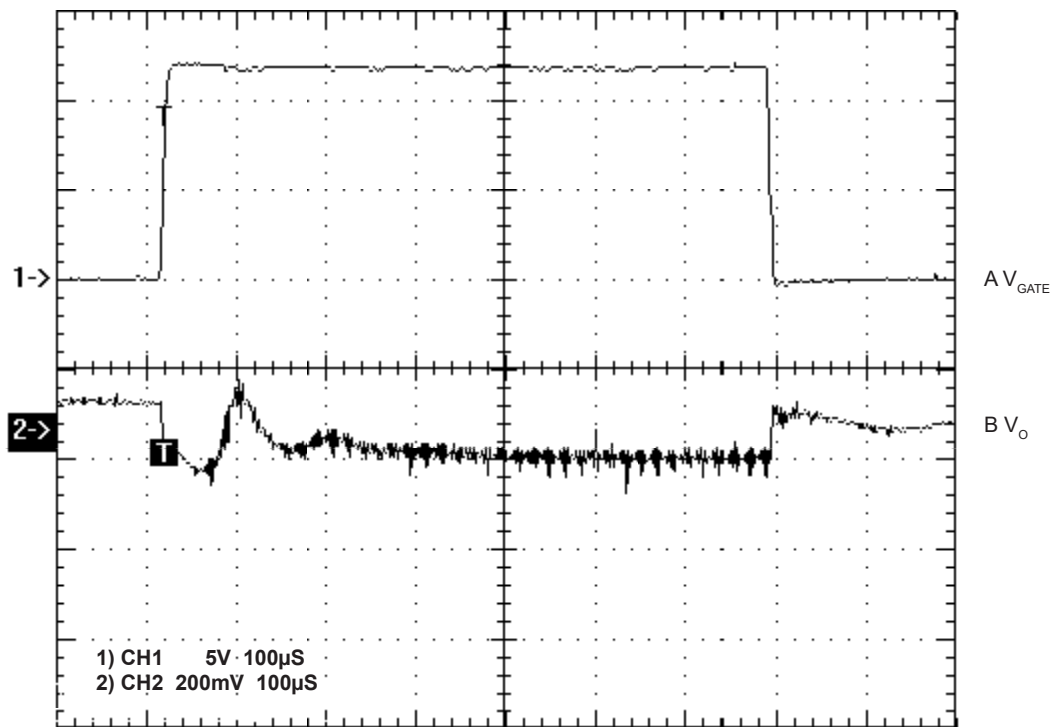


FIGURE 3. Transient response (SRA40S24/12),  $V_{IN}=12V$ , 40%FL to 80% FL to 40%FL,  $C_{IN}=1000\mu F$

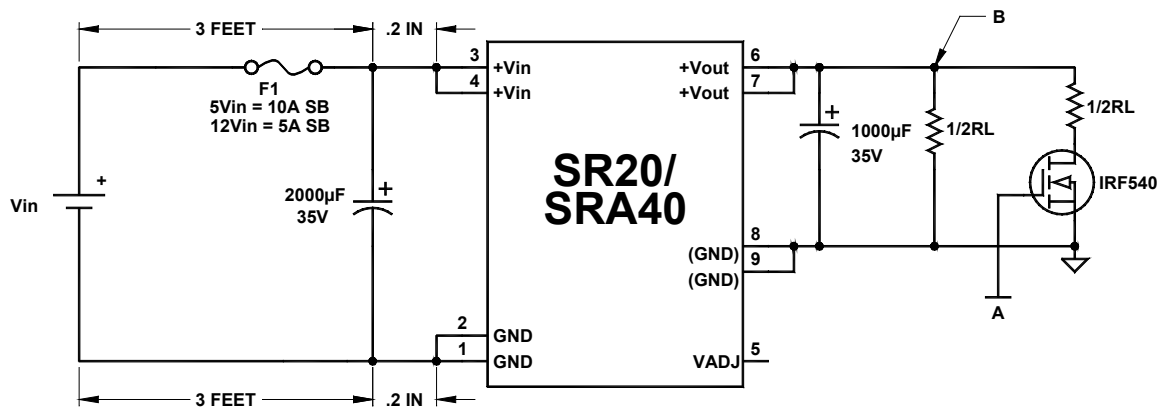


FIGURE 4. Transient response setup

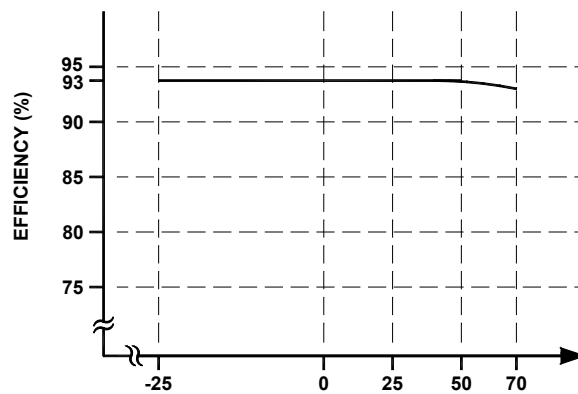


FIGURE 5. Efficiency vs. Temperature

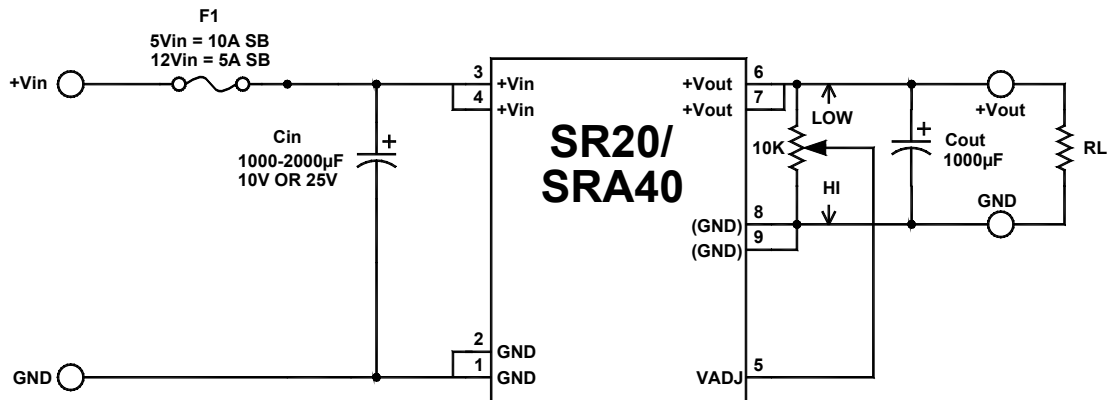
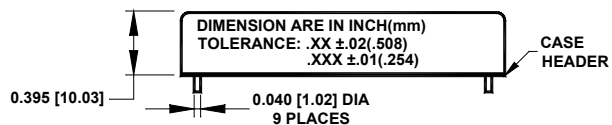


FIGURE 6. Typical connection diagram

### MECHANICAL SPECIFICATIONS



| Pin | Function          |
|-----|-------------------|
| 1   | GND (INPUT)       |
| 2   | GND (INPUT)       |
| 3   | +V <sub>IN</sub>  |
| 4   | +V <sub>IN</sub>  |
| 5   | V <sub>ADJ</sub>  |
| 6   | +V <sub>OUT</sub> |
| 7   | +V <sub>OUT</sub> |
| 8   | GND (OUTPUT)      |
| 9   | GND (OUTPUT)      |

