

NON-ISOLATED DC/DC CONVERTERS

12V Input / Programmable Output / 30A VRM



VRNB-30A07A PRELIMINARY

- High efficiency means less power dissipation
- Remote on/off
- 2-Wire Remote sense
- 5 bit voltage programming scheme
- Adaptive voltage positioning (Load Line)



Description

The V7NB-30A07A is a non-isolated step down DC/DC converter capable of supplying up to 30A of average output current with output voltage selection via a 5-bit VID code. Standard features include remote on/off, over current protection, remote sense and a power good signal. This product also makes use of adaptive positioning to improve transient response performance. This model number can support multiple VID schemes by terminating Pin 9 with specific resistor and reference combinations. Typical applications include file servers, work stations and other computing applications.

Input Specifications

| Parameter | Min | Typ | Max | Notes |
|---------------------------|----------|------|-----------|---|
| Input Voltage Range | 10.8 VDC | | 13.2 VDC | |
| Input Current (disabled) | | 30mA | | |
| Input Current (full load) | | | 8A | |
| Reflected Ripple Current | | | 150mA rms | With 100uF, 25mOhm capacitor and 200nH of input inductance. |

Output Specifications

| Parameter | Min | Typ | Max | Notes |
|--|-------|---------------|---------|--|
| Output Current | 0A | | 30A | |
| Set Point Accuracy | 1.62V | 1.65 | 1.68V | no load, excluding adaptive positioning, VID 01000 (08h), pin 9 terminated to ground through a 4.77K resistor. |
| Load Line Impedance | | 1.65 mOhm | | 50mV droop from 0 to 30A |
| Ripple and Noise | | 25mV | | pk-pk, 0 to 20MHz Bandwidth Full load with external 6 x 470uF 7mOhm Polymer capacitors and 6 x 10uF X5R ceramic capacitors. |
| Turn on Time | | 8mS | 16mS | |
| Transient Response Deviation Settling Time | | 50mV 175uS | | di/dt = 2.5A/uS Load step =50% of max load. External C _{out} as specified for ripple and noise. Includes Load Line |
| Remote Sense Compensation | | ±0.3VDC | | |
| Output Capacitance | 800uF | | 5,000uF | For applications requiring higher or lower output capacitance please consult factory. |

Note 1: Feedback compensation optimized for external 6 x 470uF, 7mOhm, polymer capacitors and 6 x 10uF X5R ceramic capacitors.

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General Specifications

| Parameter | Specification |
|---------------------------|--|
| Switching Frequency | 1.2 MHz typical (fixed) |
| Dimensions | inches 3.8 x 1.0 x .81 mm 96.5 x 25.4 x 20.6 |
| Operating Temperature | 0°C to 70°C |
| Non-Operating Temperature | -40°C to 100°C |
| Protection Features | Over current 120% to 175% max Io Undervoltage UVLO Vin < 9.5V |
| Remote On/Off | Active High |
| Efficiency (full load) | 1.25V output 82.5% |

Voltage Identification (VID) Code

| VID4 | VID3 | VID2 | VID1 | VID0 | Vo (VDC) |
|------|------|------|------|------|------------|
| 1 | 1 | 1 | 1 | 1 | Output Off |
| 1 | 1 | 1 | 1 | 0 | 1.1 |
| 1 | 1 | 1 | 0 | 1 | 1.125 |
| 1 | 1 | 1 | 0 | 0 | 1.15 |
| 1 | 1 | 0 | 1 | 1 | 1.175 |
| 1 | 1 | 0 | 1 | 0 | 1.2 |
| 1 | 1 | 0 | 0 | 1 | 1.225 |
| 1 | 1 | 0 | 0 | 0 | 1.25 |
| 1 | 0 | 1 | 1 | 1 | 1.275 |
| 1 | 0 | 1 | 1 | 0 | 1.3 |
| 1 | 0 | 1 | 0 | 1 | 1.325 |
| 1 | 0 | 1 | 0 | 0 | 1.35 |
| 1 | 0 | 0 | 1 | 1 | 1.375 |
| 1 | 0 | 0 | 1 | 0 | 1.4 |
| 1 | 0 | 0 | 0 | 1 | 1.425 |
| 1 | 0 | 0 | 0 | 0 | 1.45 |
| 0 | 1 | 1 | 1 | 1 | 1.475 |
| 0 | 1 | 1 | 1 | 0 | 1.5 |
| 0 | 1 | 1 | 0 | 1 | 1.525 |
| 0 | 1 | 1 | 0 | 0 | 1.55 |
| 0 | 1 | 0 | 1 | 1 | 1.575 |
| 0 | 1 | 0 | 1 | 0 | 1.6 |
| 0 | 1 | 0 | 0 | 1 | 1.625 |
| 0 | 1 | 0 | 0 | 0 | 1.65 |
| 0 | 0 | 1 | 1 | 1 | 1.675 |
| 0 | 0 | 1 | 1 | 0 | 1.7 |
| 0 | 0 | 1 | 0 | 1 | 1.725 |
| 0 | 0 | 1 | 0 | 0 | 1.75 |
| 0 | 0 | 0 | 1 | 1 | 1.775 |
| 0 | 0 | 0 | 1 | 0 | 1.8 |
| 0 | 0 | 0 | 0 | 1 | 1.825 |
| 0 | 0 | 0 | 0 | 0 | 1.85 |

See Note 2.

Pin Connections

| Pin | Row A | Pin | Row B |
|-----|-------------|-----|----------|
| | Function | | Function |
| 1 | VIN+ | 62 | VIN- |
| 2 | VIN+ | 61 | VIN- |
| 3 | VIN+ | 60 | VIN- |
| 4 | VIN+ | 59 | VIN- |
| 5 | Reserved | 58 | VRM-pres |
| 6 | No pin | 57 | VID4 |
| 7 | VID3 | 56 | VID2 |
| 8 | VID1 | 55 | VID0 |
| 9 | Analog Trim | 54 | NC |
| 10 | PWRGD | 53 | OUTEN |
| 11 | VO-sen- | 52 | VO-sen+ |
| 12 | UVLO_SET | 51 | Reserved |
| 13 | VO- | 50 | VO+ |
| 14 | VO+ | 49 | VO+ |
| 15 | VO- | 48 | VO- |
| 16 | VO+ | 47 | VO+ |
| 17 | VO- | 46 | VO- |
| 18 | VO+ | 45 | VO+ |
| 19 | VO- | 44 | VO- |
| 20 | VO+ | 43 | VO+ |
| 21 | VO- | 42 | VO- |
| 22 | VO+ | 41 | VO+ |
| 23 | VO- | 40 | VO- |
| 24 | VO+ | 39 | VO+ |
| 25 | VO- | 38 | VO- |
| 26 | VO+ | 37 | VO+ |
| 27 | VO- | 36 | VO- |
| 28 | VO+ | 35 | VO+ |
| 29 | VO- | 34 | VO- |
| 30 | VO+ | 33 | VO+ |
| 31 | VO- | 32 | VO- |

Note 2: VRM 9 VID Codes are achieved by terminating pin 9 to ground with an equivalent resistance of 4.77K.

Note 3: Output voltage Vs. VID can be modified by minus 400mV at each VID by applying a reference to pin 9. Applied reference should have a Thevenin Equivalent Voltage of 400mV and Thevenin Equivalent Resistance of 4.77K. Application of this offset reference must be synchronized with enabling the VRM. See Application Circuit 1.

Note 4: If pin 9 is floating the resulting output Voltage will be 50% of the values in the VID table at each VID setting.

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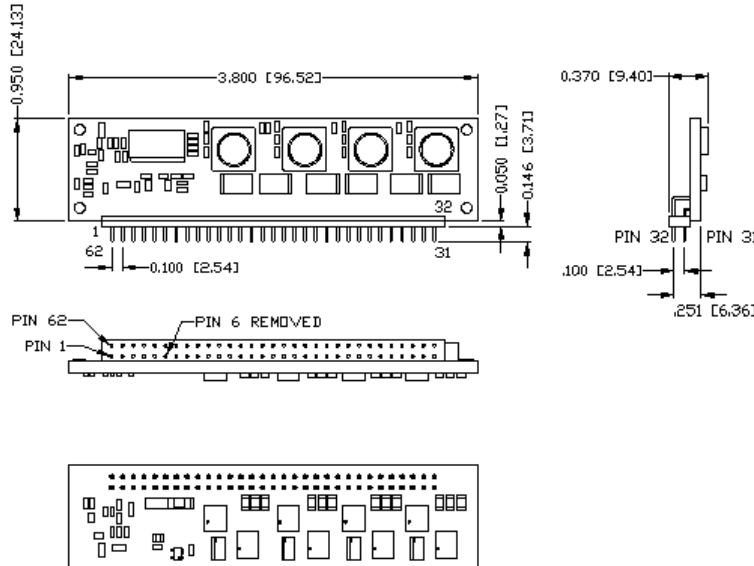
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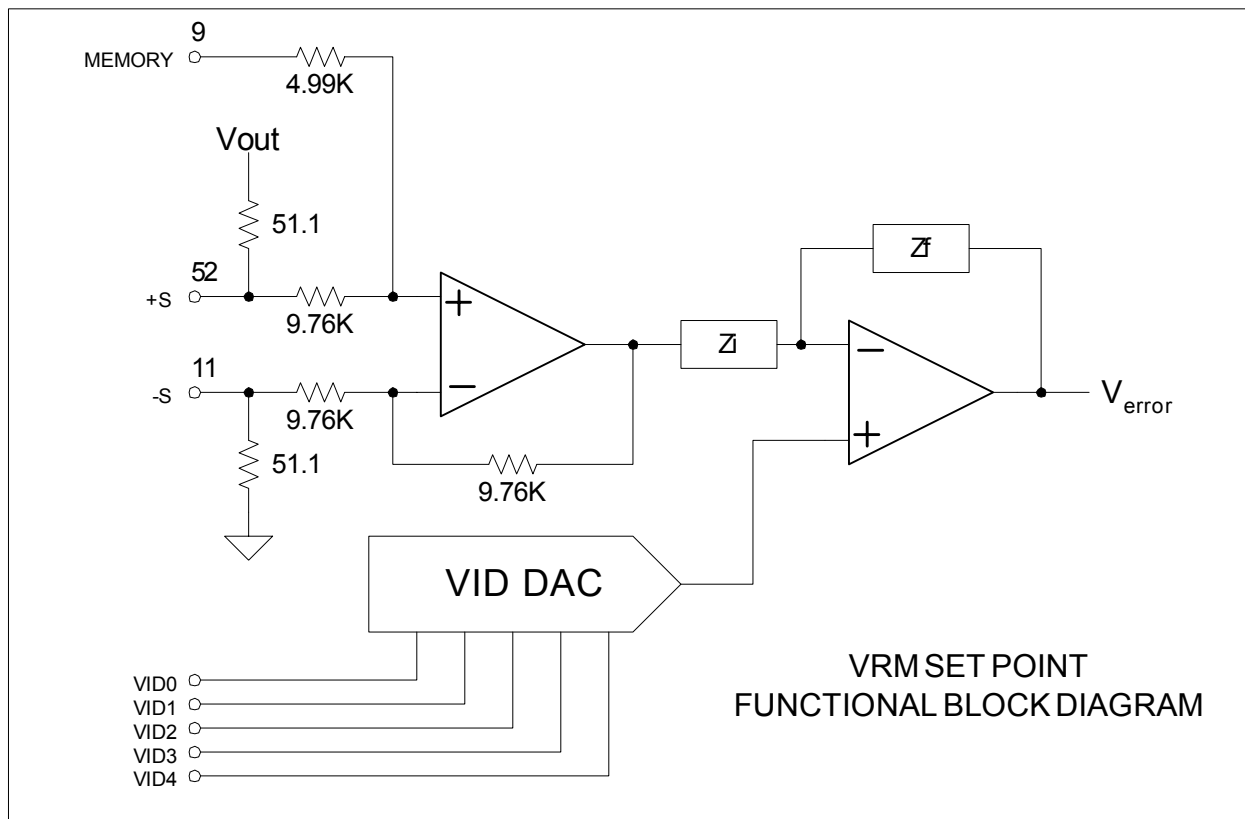


Mechanical Drawing



| PIN | FUNCTION | PIN | FUNCTION |
|-----|----------|-----|----------|
| 1 | +VIN | 32 | GND |
| 2 | +VIN | 33 | +VOUT |
| 3 | +VIN | 34 | GND |
| 4 | +VIN | 35 | +VOUT |
| 5 | NC | 36 | GND |
| 6 | | 37 | +VOUT |
| 7 | VID3 | 38 | GND |
| 8 | VIDL | 39 | +VOUT |
| 9 | MEMORY_L | 40 | GND |
| 10 | PWRGD | 41 | +VOUT |
| 11 | -SENSE | 42 | GND |
| 12 | N/C | 43 | +VOUT |
| 13 | GND | 44 | GND |
| 14 | +VOUT | 45 | +VOUT |
| 15 | GND | 46 | GND |
| 16 | +VOUT | 47 | +VOUT |
| 17 | GND | 48 | GND |
| 18 | +VOUT | 49 | +VOUT |
| 19 | GND | 50 | +VOUT |
| 20 | +VOUT | 51 | |
| 21 | GND | 52 | +SENSE |
| 22 | +VOUT | 53 | DUTEN |
| 23 | GND | 54 | ISHARE |
| 24 | +VOUT | 55 | VID0 |
| 25 | GND | 56 | VID2 |
| 26 | +VOUT | 57 | VID4 |
| 27 | GND | 58 | GND |
| 28 | +VOUT | 59 | GND |
| 29 | GND | 60 | GND |
| 30 | +VOUT | 61 | GND |
| 31 | GND | 62 | GND |

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Internal Circuit 1.

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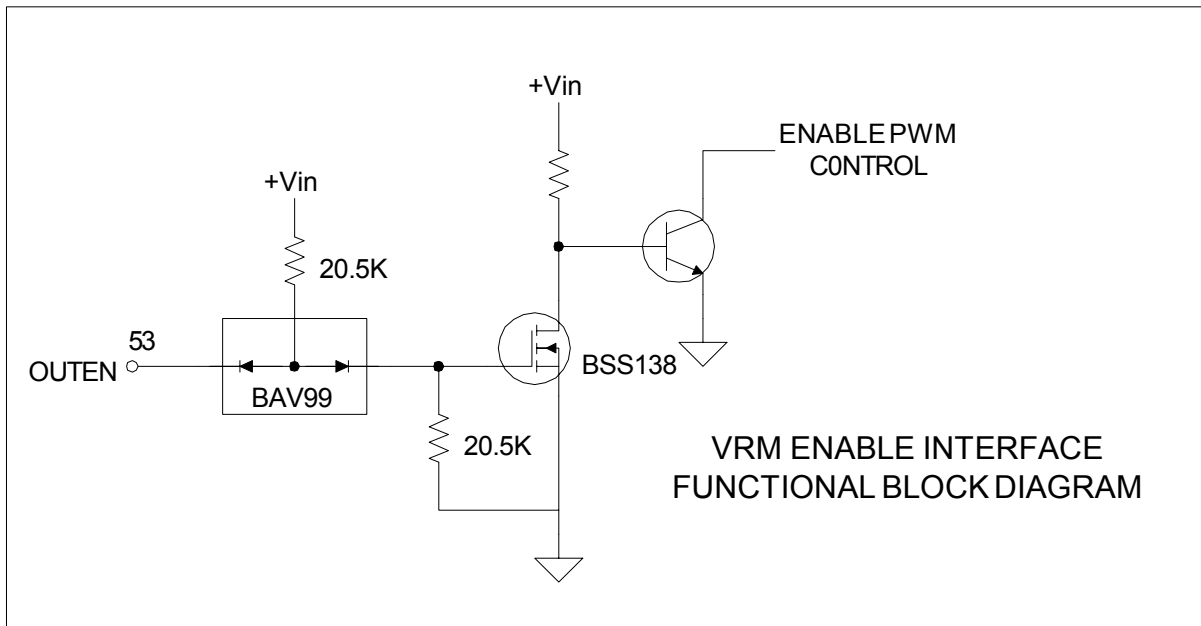
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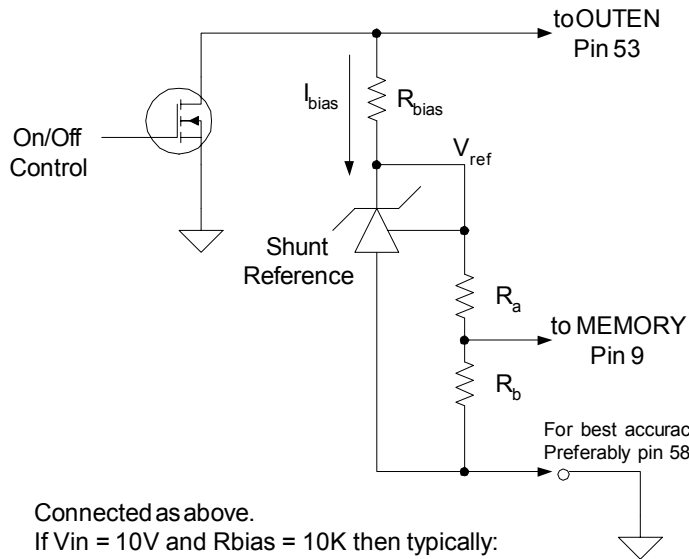
Internal Circuit 2.

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Recommended circuit to establish a fixed negative offset to the VID values in the VID Table



$$R_b = \frac{4,770 * V_{ref}}{V_{ref} - V_{offset}}$$

$$R_a = \frac{V_{ref} - V_{offset}}{V_{offset}} * R_b$$

V_{offset} is the fixed offset that will be subtracted from each of the nominal Vout Vs. VID values shown in the VID Table.

Connected as above.

If $V_{in} = 10V$ and $R_{bias} = 10K$ then typically:

If $V_{ref} = 1.24V$, $I_{bias} = 170\mu A$, $V_{OUTEN}(on) = 2.95V$.

If $V_{ref} = 2.048V$, $I_{bias} = 132\mu A$, $V_{OUTEN}(on) = 3.36V$.

Reference Circuit 1.

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