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## DESCRIPTION

The SC1150 voltage mode controller contains most of the circuitry necessary to implement a DC/DC converter for powering the Intel Pentium® Pro microprocessor, both in single and multiple processor configurations.

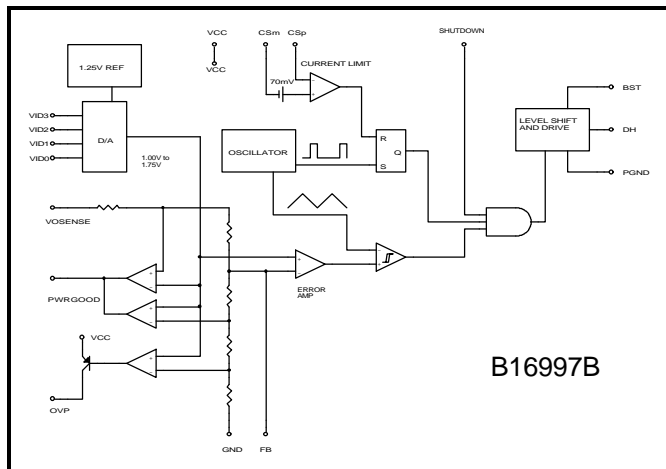
The SC1150 features an integrated D/A converter, pulse by pulse current limiting, integrated power good signaling, logic compatible shutdown and on-board over voltage protection (OVP).

The SC1150 operates at a fixed frequency of 200kHz, providing an optimum compromise between size, efficiency and cost in the intended application areas.

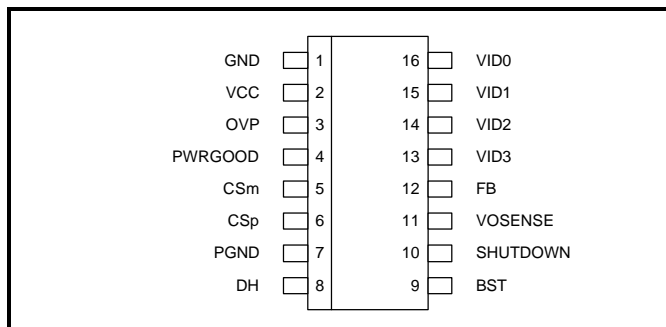
The integrated D/A converter provides programmability of output voltage from 2.0V to 3.5V in 100mV increments with no external components. Both the range and the increment value may be changed by adding external components.

The SC1150 provides an OVP output which can be used to trigger a crowbar circuit for true over voltage protection.

## BLOCK DIAGRAM



## PIN CONFIGURATION



## FEATURES

- 85% efficiency
- 4 bit DAC for output programmability
- On chip power good and OVP functions
- Meets Intel Pentium® Pro VRM8.0 specifications

## APPLICATIONS

- Pentium® Pro Processor supplies
- Pentium® Pro Processor VRM modules
- 2.0V to 3.5V microprocessor supplies
- Programmable power supplies

## ORDERING INFORMATION

| DEVICE <sup>(1)</sup> | PACKAGE | TEMP RANGE (T <sub>J</sub> ) |
|-----------------------|---------|------------------------------|
| SC1150CS              | SO-16   | 0 - 125°C                    |

Note:

(1) Add suffix 'TR' for tape and reel.

## ABSOLUTE MAXIMUM RATINGS

| Parameter                           | Symbol            | Maximum     | Units |
|-------------------------------------|-------------------|-------------|-------|
| V <sub>CC</sub> to GND              | V <sub>IN</sub>   | -0.3 to 7   | V     |
| PGND to GND                         |                   | ± 1         | V     |
| BST to GND                          |                   | -0.3 to 15  | V     |
| Operating Temperature Range         | T <sub>A</sub>    | 0 to 70     | °C    |
| Storage Temperature Range           | T <sub>STG</sub>  | -65 to +150 | °C    |
| Lead Temperature (Soldering) 10 sec | T <sub>LEAD</sub> | 300         | °C    |

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**ELECTRICAL CHARACTERISTICS**

 Unless specified:  $V_{CC} = 4.75V$  to  $5.25V$ ;  $GND = PGND = 0V$ ;  $V_{OSENSE} = V_O$ ;  $0mV < (CSp-CSm) < 60mV$ ;  $T_A = 25^{\circ}C$ 

| PARAMETER                     | CONDITIONS                               | VID<br>3210 | MIN   | TYP   | MAX   | UNITS            |
|-------------------------------|--|-------------|-------|-------|-------|------------------|
| Output Voltage <sup>(2)</sup> | $I_O = 2A$ in Application circuit 16935E | 1111        | 1.980 | 2.000 | 2.020 | V                |
|                               |  | 1110        | 2.079 | 2.100 | 2.121 |                  |
|                               |  | 1101        | 2.178 | 2.200 | 2.222 |                  |
|                               |  | 1100        | 2.277 | 2.300 | 2.323 |                  |
|                               |  | 1011        | 2.376 | 2.400 | 2.424 |                  |
|                               |  | 1010        | 2.475 | 2.500 | 2.525 |                  |
|                               |  | 1001        | 2.574 | 2.600 | 2.626 |                  |
|                               |  | 1000        | 2.673 | 2.700 | 2.727 |                  |
|                               |  | 0111        | 2.772 | 2.800 | 2.828 |                  |
|                               |  | 0110        | 2.871 | 2.900 | 2.929 |                  |
|                               |  | 0101        | 2.970 | 3.000 | 3.030 |                  |
|                               |  | 0100        | 3.069 | 3.100 | 3.131 |                  |
|                               |  | 0011        | 3.168 | 3.200 | 3.232 |                  |
|                               |  | 0010        | 3.267 | 3.300 | 3.333 |                  |
|                               |  | 0001        | 3.366 | 3.400 | 3.434 |                  |
| 0000                          | 3.465                                    | 3.500       | 3.535 |       |       |                  |
| Load Regulation               | $I_O = 0.3A$ to $13A^{(1)}$              | xxxx        |       | 1     |       | %                |
| Line Regulation               |  | xxxx        |       | 0.5   |       | %                |
| UV Lockout                    |  | xxxx        |       |       | 4.2   | V                |
| Current Limit Voltage         |  | xxxx        | 60    | 70    | 80    | mV               |
| Oscillator Frequency          |  | xxxx        | 180   | 200   | 220   | kHz              |
| Oscillator Max Duty Cycle     |  | xxxx        | 90    | 95    |       | %                |
| DH Sink/Source Current        | BST - DH = 4.5V, DH - PGND = 2V          | xxxx        | 1     |       |       | A                |
| Output Voltage Tempco         |  | xxxx        |       | 65    |       | ppm/ $^{\circ}C$ |

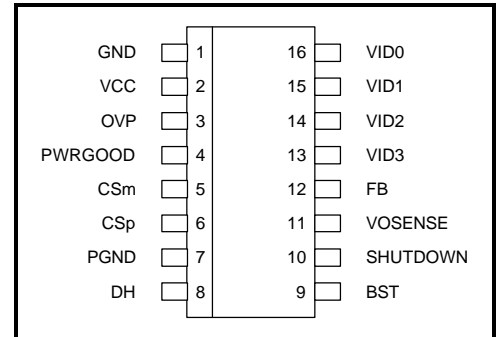
**NOTES:**

- (1) Low output currents, below the continuous conduction threshold will cause an increase in output voltage beyond the load regulation limit. For Application circuit 16935E see the regulation curve on sheet 5.
- (2) All VID codes not specifically listed here are invalid and cause shutdown exactly as if the shutdown pin had been asserted. xxxx refers to any valid VID code.

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**PIN DESCRIPTION**

| Pin # | Pin Name                | Pin Function   |
|-------|-------------------------|--|
| 1     | GND                     | Small Signal Analog and Digital Ground                                     |
| 2     | V <sub>CC</sub>         | Chip Supply Voltage  |
| 3     | OVP <sup>(1)</sup>      | High Signal out if V <sub>O</sub> > setpoint + 20%                         |
| 4     | PWRGOOD <sup>(1)</sup>  | Open collector logic output, high if V <sub>O</sub> within 10% of setpoint |
| 5     | CS <sub>m</sub>         | Current Sense Input (negative)   |
| 6     | CS <sub>p</sub>         | Current Sense Input (positive)   |
| 7     | PGND                    | Power Ground   |
| 8     | DH                      | High side Driver Output  |
| 9     | BST                     | V <sub>CC</sub> for high side Driver                                       |
| 10    | SHUTDOWN <sup>(1)</sup> | Logic low shuts down the converter   |
| 11    | VOSENSE                 | Top end of internal feedback chain   |
| 12    | FB                      | Voltage Feedback Input   |
| 13    | VID3 <sup>(1)</sup>     | Programming Input (MSB)  |
| 14    | VID2 <sup>(1)</sup>     | Programming Input  |
| 15    | VID1 <sup>(1)</sup>     | Programming Input  |
| 16    | VID0 <sup>(1)</sup>     | Programming Input (LSB)  |


**NOTE:**

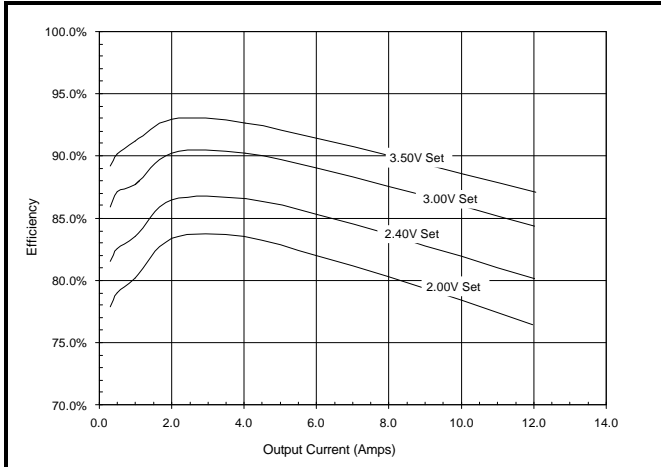
(1) All logic level inputs and outputs are open collector TTL compatible



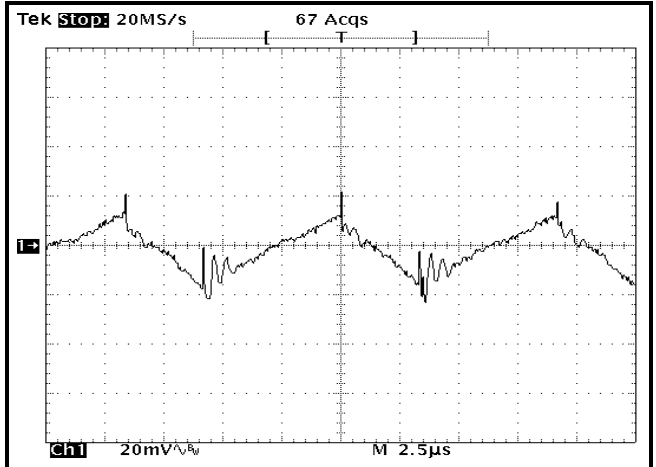
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**CHARACTERISTIC CURVES**

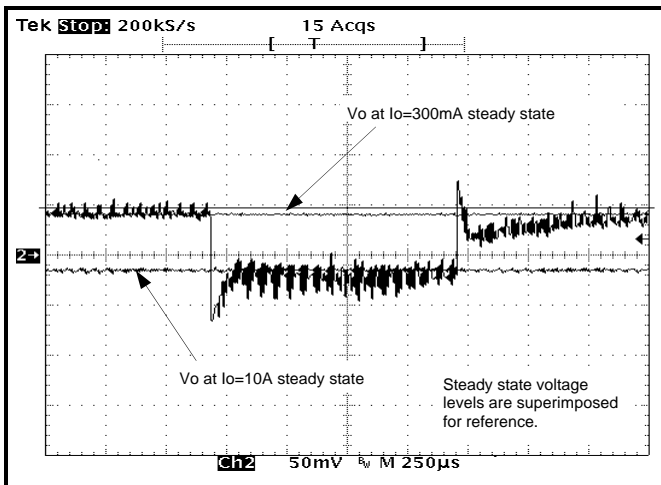
SC1150 Efficiency in Application circuit 16935E



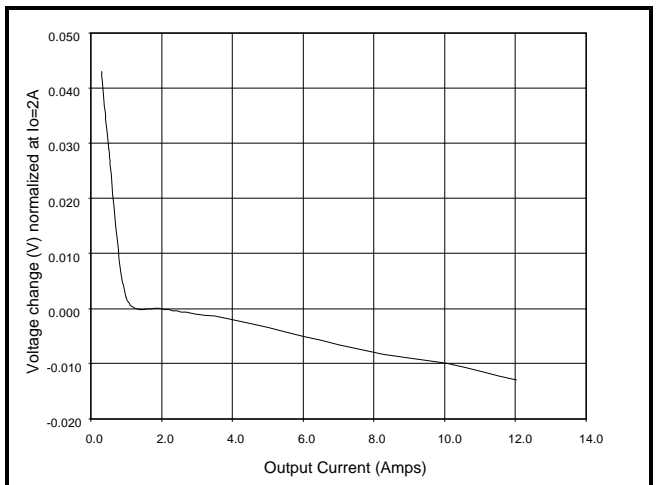
Application circuit 16935E Ripple, 3.1V, 10A out



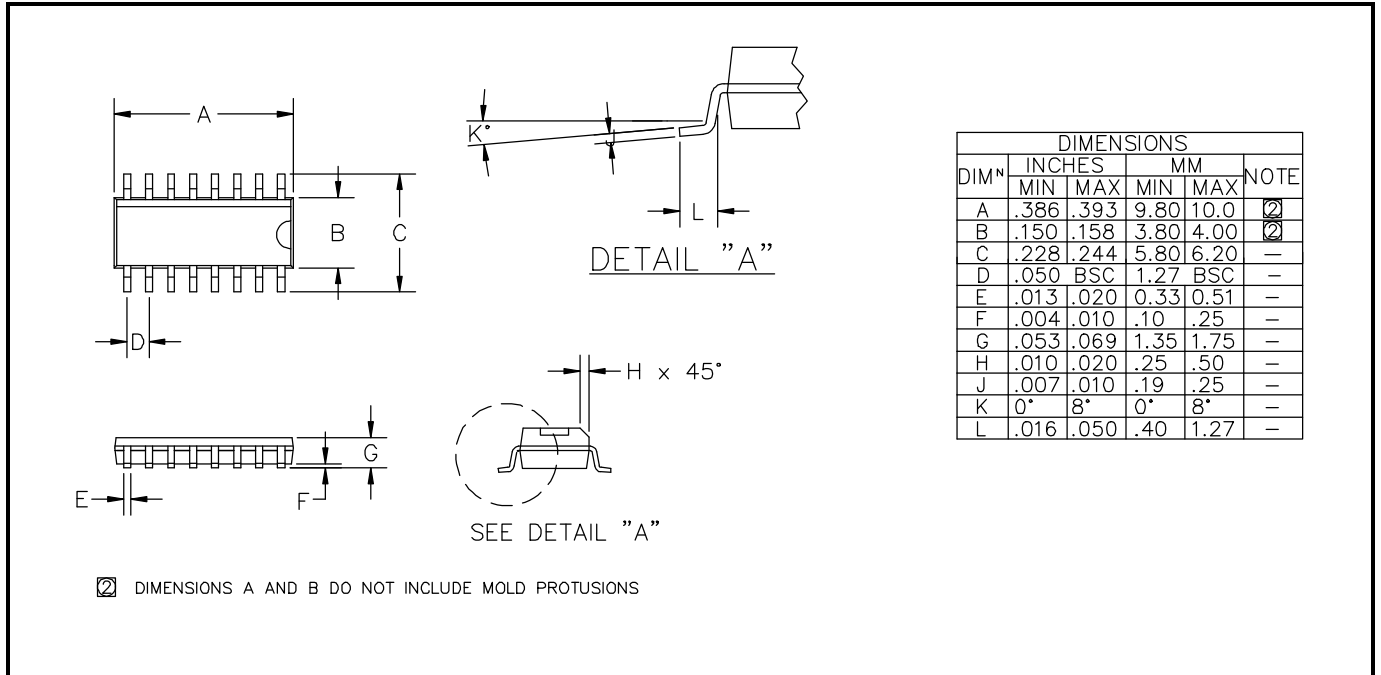
Application circuit 16935E Transient Response, 3.1V, 0.3A to 10A



SC1150 Regulation in Application circuit 16935E



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**OUTLINE DRAWING SO-16**

**LAND PATTERN SO-16**
