

FEATURES

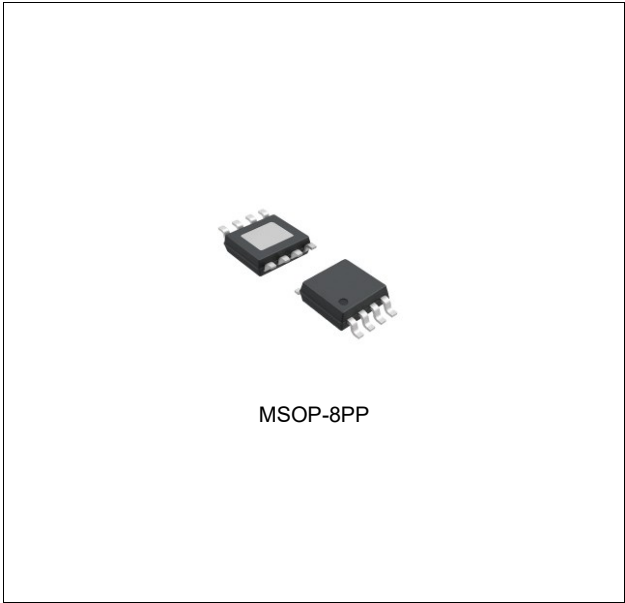
- Very High Maximum Input Voltage 100V
- Output Voltage Tolerances of  $\pm 1.5\%$
- Output Current of 50mA
- Low Quiescent Current 23 $\mu$ A
- Quiescent Current at Shutdown 8 $\mu$ A
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limit
- Adjustable Output Voltage from 1.2 to 90V

APPLICATIONS

- Microprocessors, Microcontrollers Powered by Industrial Busses with High Voltage Transients
- Industrial Automation
- Telecom Infrastructure
- Automotive
- Power over Ethernet (PoE)
- LED Lighting

DESCRIPTION

The TPS7A4001 device is a very high voltage-tolerant linear regulator that offers the benefits of a thermally-enhanced package (MSOP-8PP), and is able to withstand continuous DC or transient input voltages of up to 100V. The TPS7A4001 device has an internal thermal shutdown and current limiting to protect the system during fault conditions. In addition, this device is ideal for generating a low-voltage supply from intermediate voltage rails in telecom and industrial applications; not only can it supply a well-regulated voltage rail, but it can also withstand and maintain regulation during very high and fast voltage transients. These features translate to simpler and more cost-effective electrical surge-protection circuitry for a wide range of applications, including PoE, bias supply, and LED lighting.



ORDERING INFORMATION

| Device       | Package  |
|--------------|----------|
| TPS7A4001MDP | MSOP-8PP |

**ABSOLUTE MAXIMUM RATINGS** (Note 1)

| CHARACTERISTIC            | SYMBOL    | MIN  | MAX | UNIT |
|---------------------------|-----------|------|-----|------|
| Input Supply Voltage      | $V_{IN}$  | -0.3 | 110 | V    |
| Enable Input Voltage      | $V_{EN}$  | -0.3 | 110 | V    |
| Feedback Voltage          | $V_{FB}$  | -0.3 | 5.5 | V    |
| Storage Temperature Range | $T_{STG}$ | -65  | 150 | °C   |

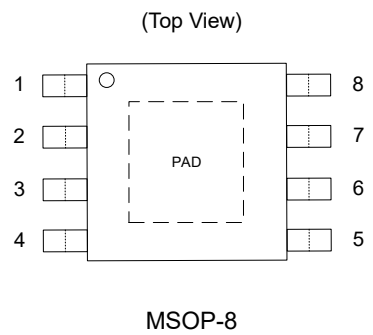
**RECOMMENDED OPERATING RATINGS** (Note 2)

| CHARACTERISTIC                       | SYMBOL     | MIN | MAX | UNIT |
|--------------------------------------|------------|-----|-----|------|
| Input Voltage                        | $V_{IN}$   | 7   | 100 | V    |
| Enable Input Voltage                 | $V_{EN}$   | 0   | 100 | V    |
| Output Voltage                       | $V_{OUT}$  | 1.2 | 90  | V    |
| Maximum Output Current               | $I_{MAX}$  | -   | 50  | mA   |
| Operating Junction Temperature Range | $T_{JOPR}$ | -40 | 125 | °C   |

**ORDERING INFORMATION**

| Package  | Order No.    | Description                    | Supplied As | Status |
|----------|--------------|--------------------------------|-------------|--------|
| MSOP-8PP | TPS7A4001MDP | 100V, 50mA, Adjustable, Enable | Tape & Reel | Active |

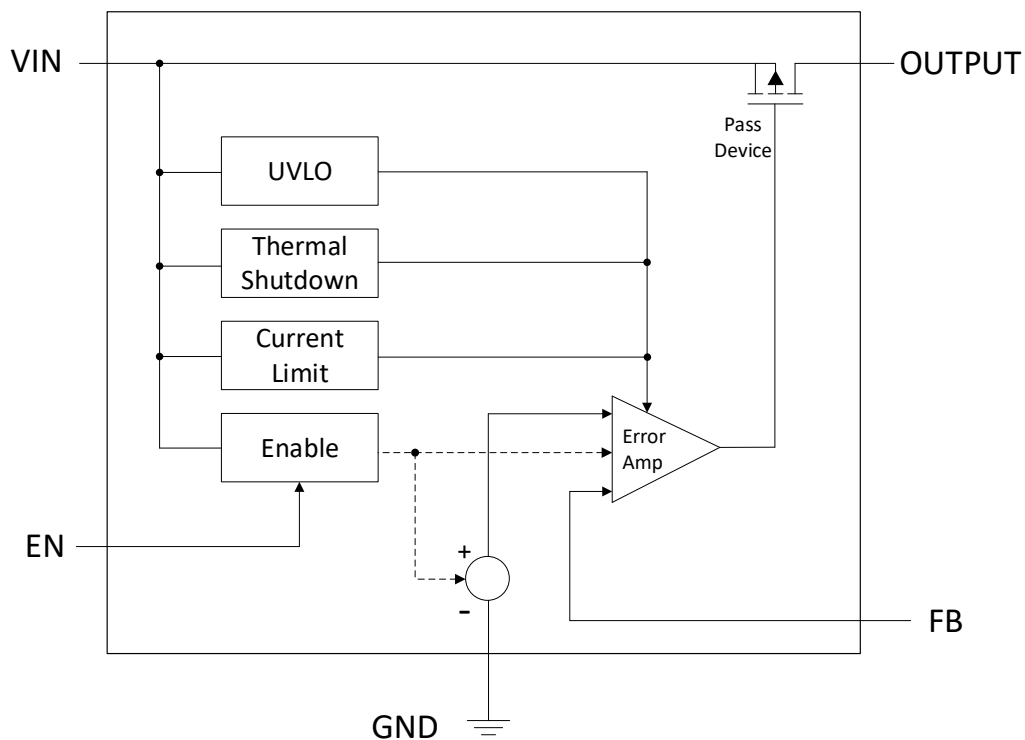
PIN CONFIGURATION



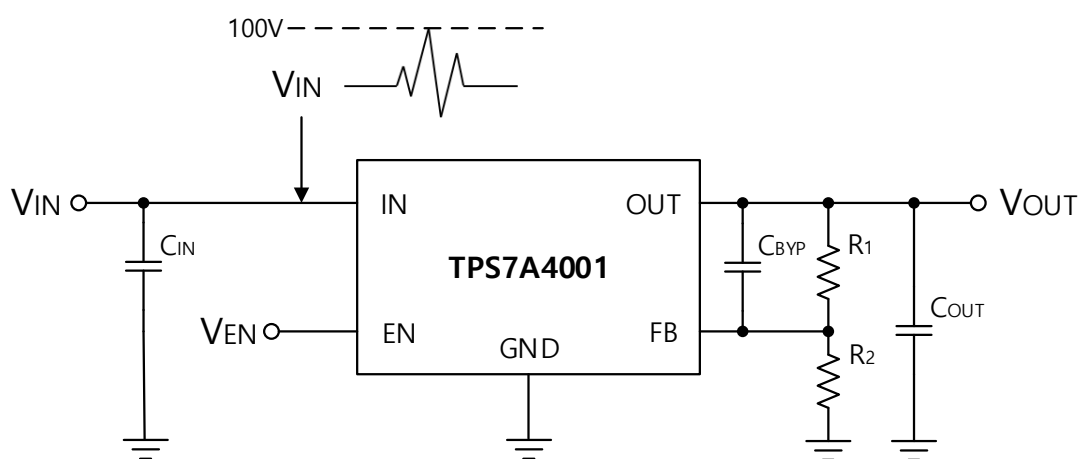
PIN DESCRIPTION

| Pin No. | Pin Name            | Pin Function                                                                  |
|---------|---------------------|-------------------------------------------------------------------------------|
| 1       | VOUT                | Output Voltage.                                                               |
| 2       | FB                  | Feedback.                                                                     |
| 3, 6, 7 | N.C                 | No connection.                                                                |
| 4       | GND                 | Ground.                                                                       |
| 5       | EN                  | Chip Enable. Do Not Float.                                                    |
| 8       | VIN                 | Input Supply.                                                                 |
| PAD     | Thermal Exposed Pad | Connect to GND. Put a copper plane connected to this pin as a thermal relief. |

## BLOCK DIAGRAM



## TYPICAL APPLICATION CIRCUIT



## ELECTRICAL CHARACTERISTICS (Note 3)

Unless otherwise specified:  $V_{IN} = V_{OUT(NOM)} + 3.0\text{ V}$  or  $7.0\text{ V}$  (whichever is greater),  $I_{OUT} = 100\text{ }\mu\text{A}$ ,  $C_{IN} = 1.0\text{ }\mu\text{F}$ ,  $C_{OUT} = 4.7\text{ }\mu\text{F}$ ,  $T_J = 25^\circ\text{C}$

| PARAMETER                    |            | SYMBOL            | TEST CONDITIONS                                            | MIN   | TYP  | MAX      | UNIT             |
|------------------------------|------------|-------------------|------------------------------------------------------------|-------|------|----------|------------------|
| Feedback Pin Voltage         |            | $V_{FB}$          |                                                            | 0.788 | 0.8  | 0.812    | V                |
| Line Regulation              |            | $\Delta V_{LINE}$ | $7.0\text{ V} < V_{IN} < 100\text{ V}$                     | -     | 3    | 20       | mV               |
| Load Regulation              |            | $\Delta V_{LOAD}$ | $100\text{ }\mu\text{A} < I_{OUT} < 50\text{ mA}$          | -     | 20   | 50       | mV               |
| Dropout Voltage              |            | $V_{DROP}$        | $I_{OUT} = 20\text{ mA}$                                   | -     | 1000 | -        | mV               |
|                              |            |                   | $I_{OUT} = 50\text{ mA}$                                   | -     | 2800 | -        |                  |
| Quiescent Current            |            | $I_Q$             | $I_{OUT} = 0\text{ mA}$                                    | -     | 20   | 40       | $\mu\text{A}$    |
| Shutdown Current             |            | $I_{SD}$          | $V_{EN} = 0\text{ V}$                                      | -     | 8    | 15       | $\mu\text{A}$    |
| Current Limit                |            | $I_{CL}$          | $V_{OUT} = V_{OUT(NOM)} * 0.9$                             | 55    | 100  | 180      | mA               |
| Enable Pin Current           |            | $I_{EN}$          | $7.0\text{ V} < V_{IN} < 100\text{ V}$ , $V_{EN} = V_{IN}$ | -     | 0.02 | 1        | $\mu\text{A}$    |
| Feedback Pin Current         |            | $I_{FB}$          |                                                            | -     | 0.01 | 0.11     | $\mu\text{A}$    |
| Enable threshold             | Logic Low  | $V_{IL}$          | Output = Low                                               | 0     | -    | 0.4      | V                |
|                              | Logic High | $V_{IH}$          | Output = High                                              | 1.0   | -    | $V_{IN}$ | V                |
| Thermal Shutdown Temperature |            | $T_{SD}$          | Shutdown, temperature increasing                           | -     | 145  | -        | $^\circ\text{C}$ |
|                              |            |                   | Reset, temperature decreasing                              | -     | 125  | -        | $^\circ\text{C}$ |

Note 1. Exceeding the absolute maximum ratings may damage the device.

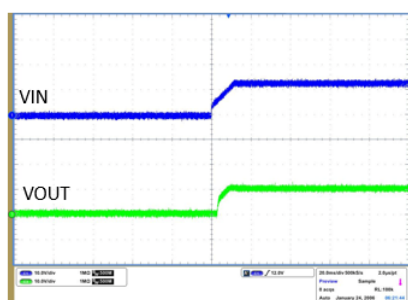
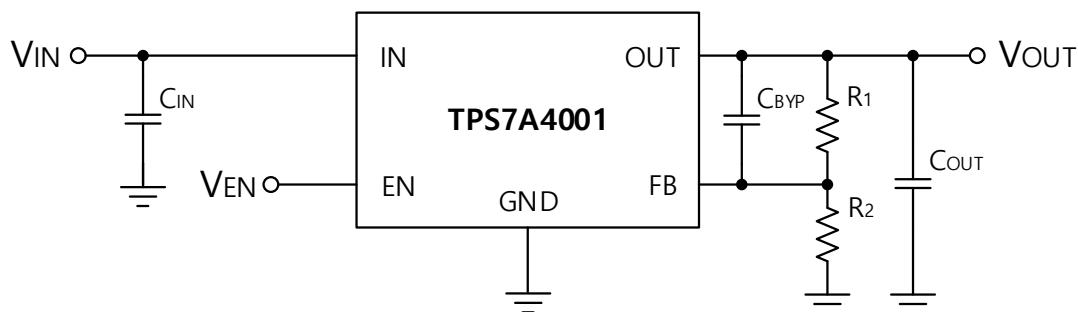
Note 2. The device is not guaranteed to function outside its operating ratings.

Note 3. Stresses listed as the absolute maximum ratings may cause permanent damage to the device. These are for stress ratings. Functional operating of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibly to affect device reliability.

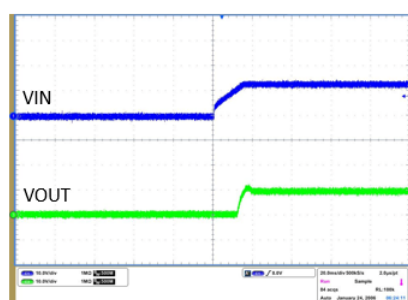
## TYPICAL OPERATING CHARACTERISTICS

### TEST CIRCUIT

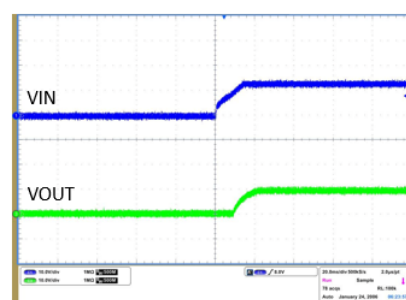
$V_{IN} = 12.8\text{ V}$ ,  $V_{OUT} = 10\text{ V}$ ,  $C_{IN} = 1.0\text{ }\mu\text{F}$ ,  $C_{OUT} = 4.7\text{ }\mu\text{F}$ ,  $T_J = 25^\circ\text{C}$



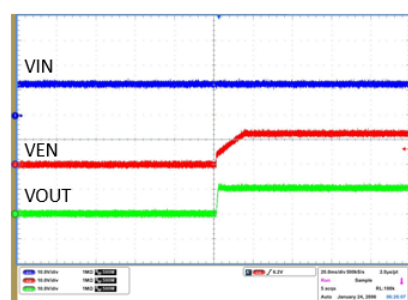
$V_{IN} = V_{EN} = 12.8\text{V}$ ,  $V_{OUT} = 10\text{V}$   
**Start Up @  $I_{OUT}=0\text{A}$**



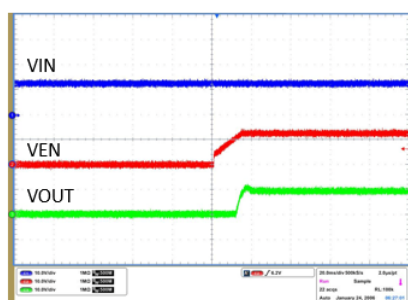
$V_{IN} = V_{EN} = 12.8\text{V}$ ,  $V_{OUT} = 10\text{V}$   
**Start Up @  $I_{OUT}=50\text{mA}$**



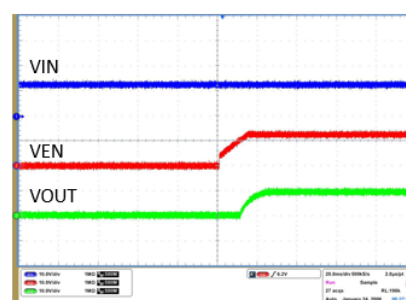
$V_{IN} = V_{EN} = 12.8\text{V}$ ,  $V_{OUT} = 10\text{V}$   
**Start Up @  $I_{OUT}=50\text{mA}$  with  $C_{BYP}$**



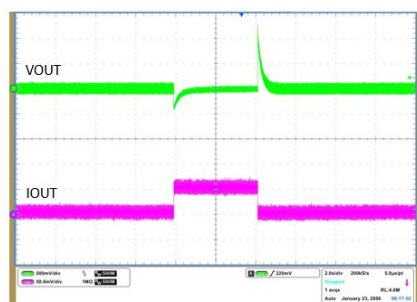
$V_{IN} = 12.8\text{V}$ ,  $V_{EN} = 12.8\text{V}$ ,  $V_{OUT} = 10\text{V}$   
**Start Up @  $I_{OUT}=0\text{A}$**



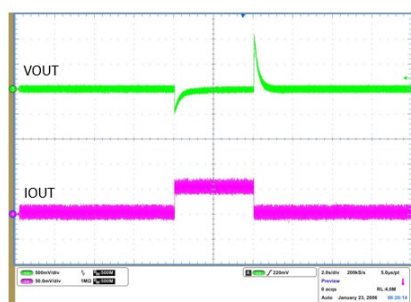
$V_{IN} = 12.8\text{V}$ ,  $V_{EN} = 12.8\text{V}$ ,  $V_{OUT} = 10\text{V}$   
**Start Up @  $I_{OUT}=50\text{mA}$**



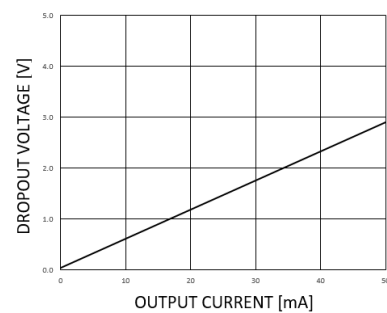
$V_{IN} = 12.8\text{V}$ ,  $V_{EN} = 12.8\text{V}$ ,  $V_{OUT} = 10\text{V}$   
**Start Up @  $I_{OUT}=50\text{mA}$  with  $C_{BYP}$**



Load transient 0 to 50mA



Load transient 0 to 50mA with  $C_{BYP}$



Dropout Voltage

## REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.