



LP8340

Low Dropout, Low I_Q, 1.0A CMOS Linear Regulator

General Description

The LP8340 low-dropout CMOS linear regulator is available in 5V, 3.3V, 2.5V, 1.8V and adjustable output versions. Packaged in the 6ld LLP package and 3ld DPAK. The LP8340 can deliver up to 1.0A output current.

Typical dropout voltage is 420mV at 1.0A for the 5.0V version, 540mV at 1.0A for the 3.3V version, 670mV at 1.0A for the 2.5V version and 680mV at 800mA for the 1.8V version.

The LP8340 includes a zener trimmed bandgap voltage reference, foldback current limiting and thermal overload limiting.

The LP8340 features a PMOS output transistor which unlike PNP type low dropout regulators requires no base drive current. This allows the device ground current to remain less than 50µA over operating temperature, supply voltage and irrespective of the load current.

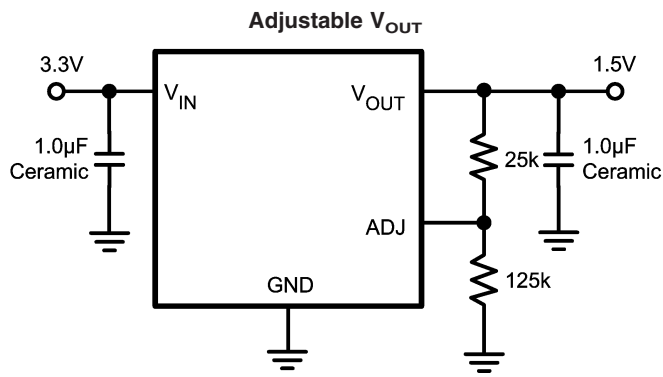
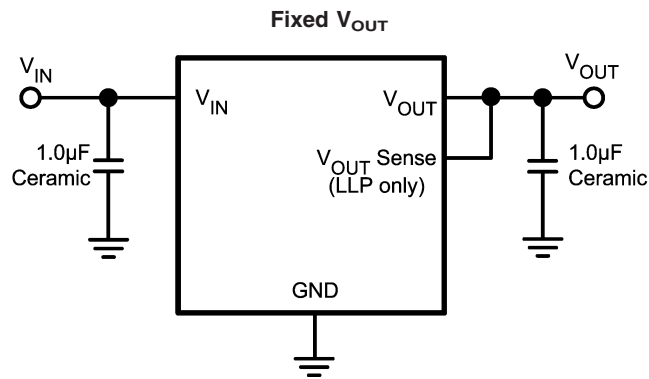
Features

- ±1.5% Typical V_{OUT} tolerance
- 420mV Typical Dropout @ 1.0A (V_O = 5V)
- Wide Operating Range 2.7V to 10V
- Internal 1.0A PMOS Output Transistor
- 19µA Typical Quiescent Current
- Thermal Overload Limiting
- Foldback Current Limiting
- Zener Trimmed Bandgap Reference
- Space saving LLP package
- Temperature Range
 - LP8340C 0°C to 125°C
 - LP8340I -40°C to 125°C

Applications

- Hard Disk Drives
- Notebook Computers
- Battery Powered Electronics
- Portable Instrumentation

Typical Applications



Ordering Information

| Package | Part Number | Package Marking | Transport Media | NSC Drawing |
|------------|----------------|-----------------|--------------------------|-------------|
| 6-Pin LLP | LP8340CLD-ADJ | L041B | 1k Units Tape and Reel | LDE06A |
| | LP8340CLDX-ADJ | | 4.5k Units Tape and Reel | |
| | LP8340CLD-1.8 | L042B | 1k Units Tape and Reel | |
| | LP8340CLDX-1.8 | | 4.5k Units Tape and Reel | |
| | LP8340CLD-2.5 | L043B | 1k Units Tape and Reel | |
| | LP8340CLDX-2.5 | | 4.5k Units Tape and Reel | |
| | LP8340CLD-3.3 | L051B | 1k Units Tape and Reel | |
| | LP8340CLDX-3.3 | | 4.5k Units Tape and Reel | |
| | LP8340CLD-5.0 | L044B | 1k Units Tape and Reel | |
| | LP8340CLDX-5.0 | | 4.5k Units Tape and Reel | |
| | LP8340ILD-ADJ | L078B | 1k Units Tape and Reel | |
| | LP8340ILD-ADJ | | 4.5k Units Tape and Reel | |
| | LP8340ILD-1.8 | L079B | 1k Units Tape and Reel | |
| | LP8340ILD-1.8 | | 4.5k Units Tape and Reel | |
| | LP8340ILD-2.5 | L080B | 1k Units Tape and Reel | |
| | LP8340ILD-2.5 | | 4.5k Units Tape and Reel | |
| | LP8340ILD-3.3 | L081B | 1k Units Tape and Reel | |
| | LP8340ILD-3.3 | | 4.5k Units Tape and Reel | |
| | LP8340ILD-5.0 | L082B | 1k Units Tape and Reel | |
| | LP8340ILD-5.0 | | 4.5k Units Tape and Reel | |
| 3-Pin DPAK | LP8340CDT-1.8 | LP8340CDT-1.8 | 75 Units/Rail | TD03B |
| | LP8340CDTX-1.8 | | 2.5k Units Tape and Reel | |
| | LP8340CDT-2.5 | LP8340CDT-2.5 | 75 Units/Rail | |
| | LP8340CDTX-2.5 | | 2.5k Units Tape and Reel | |
| | LP8340CDT-3.3 | LP8340CDT-3.3 | 75 Units/Rail | |
| | LP8340CDTX-3.3 | | 2.5k Units Tape and Reel | |
| | LP8340CDT-5.0 | LP8340CDT-5.0 | 75 Units/Rail | |
| | LP8340CDTX-5.0 | | 2.5k Units Tape and Reel | |
| | LP8340IDT-1.8 | LP8340IDT-1.8 | 75 Units/Rail | |
| | LP8340IDTX-1.8 | | 2.5k Units Tape and Reel | |
| | LP8340IDT-2.5 | LP8340IDT-2.5 | 75 Units/Rail | |
| | LP8340IDTX-2.5 | | 2.5k Units Tape and Reel | |
| | LP8340IDT-3.3 | LP8340IDT-3.3 | 75 Units/Rail | |
| | LP8340IDTX-3.3 | | 2.5k Units Tape and Reel | |
| | LP8340IDT-5.0 | LP8340IDT-5.0 | 75 Units/Rail | |
| | LP8340IDTX-5.0 | | 2.5k Units Tape and Reel | |

Absolute Maximum Ratings (Notes 1, 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

| | |
|---|----------------|
| V_{IN} , V_{OUT} , V_{OUT} Sense, ADJ | -0.3V to 12V |
| Storage Temperature Range | -65°C to 160°C |
| Junction Temperature (T_J) | 150°C |
| Power Dissipation | (Note 3) |
| ESD Rating | |

| | |
|---------------------------|------|
| Human Body Model (Note 6) | 2kV |
| Machine Model | 200V |

Operating Ratings (Notes 1, 2)

| | |
|-------------------|----------------|
| Supply Voltage | 2.7 to 10V |
| Temperature Range | |
| LP8340C | 0°C to 125°C |
| LP8340I | -40°C to 125°C |

LP8340C Electrical Characteristics

Unless otherwise specified all limits guaranteed for $V_{IN} = V_O + 1V$, $C_{IN} = C_{OUT} = 10\mu F$, $T_J = 25^\circ C$. **Boldface** limits apply over the full operating temperature range of $T_J = 0^\circ C$ to 125°C

| Symbol | Parameter | Conditions | Min (Note 5) | Typ (Note 4) | Max (Note 5) | Units |
|--------------|-----------------|---|---------------------------------------|--------------|---------------------------------------|-------|
| V_{IN} | Input Voltage | LP8340-ADJ, 1.8, 2.5 LP8340-3.3, 5.0 | 2.7 | | 10 10 | V |
| V_{OUT} | Output Voltage | LP8340-ADJ, ADJ = OUT $I_{OUT} = 10mA$, $V_{IN} = 2.7V$, $T_J = 25^\circ C$ $100\mu A \leq I_{OUT} \leq 800mA$, $3.0V \leq V_{IN} \leq V_{OUT} + 4V$ $800mA < I_{OUT} \leq 1.0A$, $3.2V \leq V_{IN} \leq V_{OUT} + 4V$ | 1.231 1.213 1.213 | 1.250 | 1.269 1.288 1.288 | V |
| | | LP8340-1.8 $I_{OUT} = 10mA$, $V_{IN} = 2.8V$, $T_J = 25^\circ C$ $100\mu A \leq I_{OUT} \leq 800mA$, $3.2V \leq V_{IN} \leq 6V$ $800mA < I_{OUT} \leq 1.0A$, $3.4V \leq V_{IN} \leq 6V$ | 1.773 1.746 1.746 | 1.800 | 1.827 1.854 1.854 | V |
| | | LP8340-2.5 $I_{OUT} = 10mA$, $V_{IN} = 3.8V$, $T_J = 25^\circ C$ $100\mu A \leq I_{OUT} \leq 1.0A$, $3.8V \leq V_{IN} \leq 6.5V$ | 2.463 2.425 | 2.500 | 2.538 2.575 | V |
| | | LP8340-3.3 $I_{OUT} = 10mA$, $V_{IN} = 4.3V$, $T_J = 25^\circ C$ $100\mu A \leq I_{OUT} \leq 1.0A$, $4.3V \leq V_{IN} \leq 7.5V$ | 3.250 3.201 | 3.300 | 3.350 3.399 | V |
| | | LP8340-5.0 $I_{OUT} = 10mA$, $V_{IN} = 6V$, $T_J = 25^\circ C$ $100\mu A \leq I_{OUT} \leq 1.0A$, $6V \leq V_{IN} \leq 9V$ | 4.925 4.850 | 5.000 | 5.075 5.150 | V |
| ΔV_O | Load Regulation | LP8340-ADJ, ADJ=OUT $I_{OUT} = 1mA$ to 1.0A, $V_{IN} = 3.2V$ | | 6 | 25 | mV |
| | | LP8340-1.8 $I_{OUT} = 1mA$ to 1.0A, $V_{IN} = 3.4V$ | | 8 | 30 | |
| | | LP8340-2.5 $I_{OUT} = 1mA$ to 1.0A, $V_{IN} = 3.5V$ | | 15 | 50 | |
| | | LP8340-3.3 $I_{OUT} = 1mA$ to 1.0A, $V_{IN} = 4.3V$ | | 20 | 75 | |
| | | LP8340-5.0 $I_{OUT} = 1mA$ to 1.0A, $V_{IN} = 6V$ | | 25 | 100 | |
| ΔV_O | Line Regulation | $V_{OUT} + 0.5V \leq V_{IN} \leq 10V$, $I_{OUT} = 25mA$ (Note 7) | | 4 | 15 | mV |

LP8340C Electrical Characteristics (Continued)

Unless otherwise specified all limits guaranteed for $V_{IN} = V_{O+} + 1V$, $C_{IN} = C_{OUT} = 10\mu F$, $T_J = 25^\circ C$. **Boldface** limits apply over the full operating temperature range of $T_J = 0^\circ C$ to $125^\circ C$

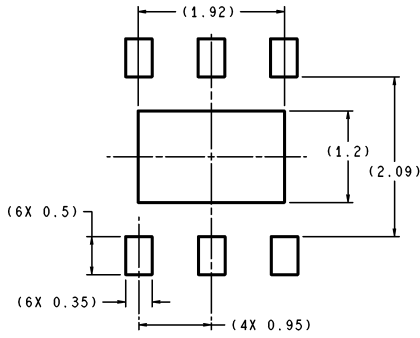
| Symbol | Parameter | Conditions | Min (Note 5) | Typ (Note 4) | Max (Note 5) | Units |
|----------------|---|---|-------------------|-------------------|-----------------|---------------|
| $V_{IN} - V_O$ | Dropout Voltage (Note 7) (Note 8) | LP8340-1.8 $I_{OUT} = 800mA$ | | 680 | 1400 | mV |
| | | LP8340-2.5 $I_{OUT} = 800mA$ | | 550 | 1000 | |
| | | LP8340-2.5 $I_{OUT} = 1.0A$ | | 670 | 1300 | |
| | | LP8340-3.3 LP8340-ADJ, $V_{OUT} = 3.3V$, $I_{OUT} = 800mA$ | | 420 | 800 | |
| | | LP8340-3.3 LP8340-ADJ, $I_{OUT} = 1.0A$ | | 540 | 1000 | |
| | | LP8340-5.0 $I_{OUT} = 800mA$ | | 330 | 650 | |
| | | LP8340-5.0 $I_{OUT} = 1.0A$ | | 420 | 800 | |
| | | I_Q | Quiescent Current | $V_{IN} \leq 10V$ | | |
| | Minimum Load Current | $V_{IN} - V_{OUT} \leq 4V$ | | | 100 | μA |
| I_{LIMIT} | Foldback Current Limit | $V_{IN} - V_{OUT} > 5V$ | | 450 | | mA |
| | | $V_{IN} - V_{OUT} < 4V$ | | 1600 | | |
| | Ripple Rejection Ratio | $V_{IN} (dc) = V_{OUT} + 2V$ $V_{IN} (ac) = 1 V_{P-P} @ 120Hz$ | 48 | 55 | | dB |
| T_{SD} | Thermal Shutdown Temp. Thermal Shutdown Hyst. | | | 160 | | $^\circ C$ |
| | | | | 10 | | |
| | ADJ Input Leakage Current | $V_{ADJ} = 1.5V$ or $0V$ | | ± 0.01 | ± 100 | nA |
| | V_{OUT} Leakage Current | LP8340-ADJ ADJ = OUT, $V_{OUT} = 2V$, $V_{IN} = 10V$ | | | 10 | μA |
| | | LP8340-1.8, $V_{OUT} = 2.5V$, $V_{IN} = 10V$ | | | 10 | |
| | | LP8340-2.5, $V_{OUT} = 3.5V$, $V_{IN} = 10V$ | | | 10 | |
| | | LP8340-3.3, $V_{OUT} = 4V$, $V_{IN} = 10V$ | | | 10 | |
| | | LP8340-5.0, $V_{OUT} = 6V$, $V_{IN} = 10V$ | | | 10 | |
| e_n | Output Noise | 10Hz to 10kHz, $R_L = 1k\Omega$, $C_{OUT} = 10\mu F$ | | 250 | | μV_{rms} |

LP8340I Electrical Characteristics

Unless otherwise specified all limits guaranteed for $V_{IN} = V_{O+} + 1V$, $C_{IN} = C_{OUT} = 10\mu F$, $T_J = 25^\circ C$. **Boldface** limits apply over the full operating temperature range of $T_J = -40^\circ C$ to $125^\circ C$

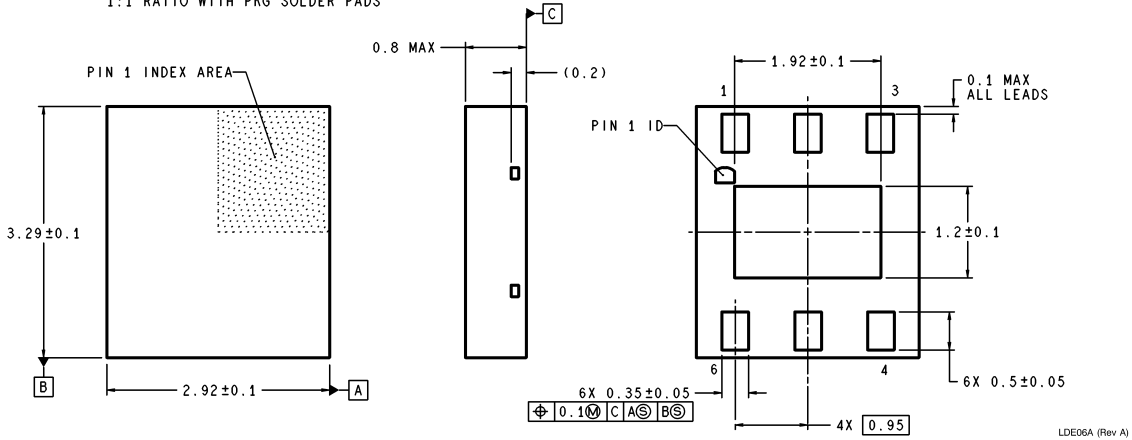
| Symbol | Parameter | Conditions | Min (Note 5) | Typ (Note 4) | Max (Note 5) | Units |
|----------|---------------|---|-----------------|-----------------|------------------------|-------|
| V_{IN} | Input Voltage | LP8340-ADJ, 1.8, 2.5 LP8340-3.3, 5.0 | 2.7 | | 10 10 | V |

Physical Dimensions inches (millimeters) unless otherwise noted



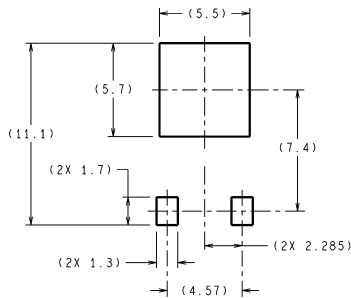
DIMENSIONS ARE IN MILLIMETERS

RECOMMENDED LAND PATTERN
1:1 RATIO WITH PKG SOLDER PADS



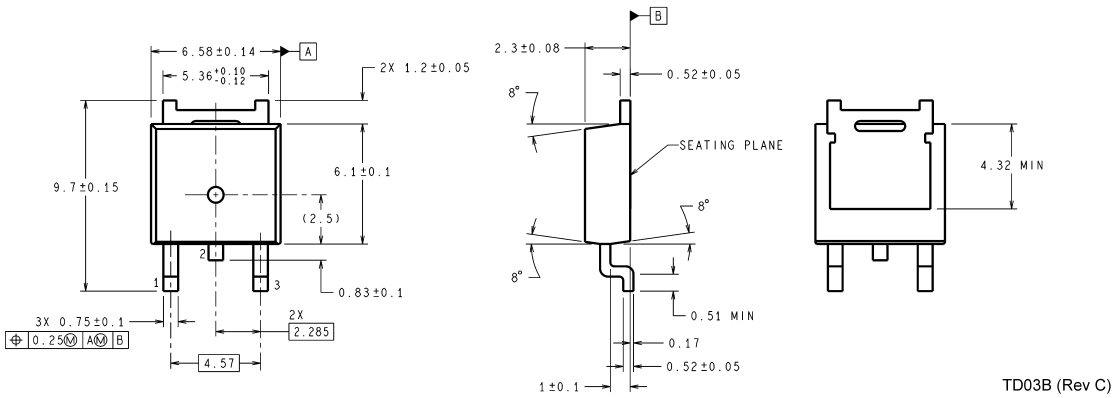
LDE06A (Rev A)

6-Pin LLP
NS Package Number LDE06A



DIMENSIONS ARE IN MILLIMETERS

LAND PATTERN RECOMMENDATION



TD03B (Rev C)

3-Pin DPAK
NS Package Number TD03B