

Features

- 0.8V Low Start-Up Input Voltage
- Up to 90%Efficiency
- Adjustable 100mA Output with 1 Alkaline Cell or 200mA Output with 2 Alkaline Cell Battery input.
- 1.8V/3.0V/3.3V/300mA Output with USB Power input.
- Small Number of External Components needed
- Load Disconnects from Input in Shutdown
- Power good output
- 32 μ A Quiescent(Switch OFF) Supply current
- 1 μ A Shutdown Mode Supply current
- 8-Pin TSSOP package

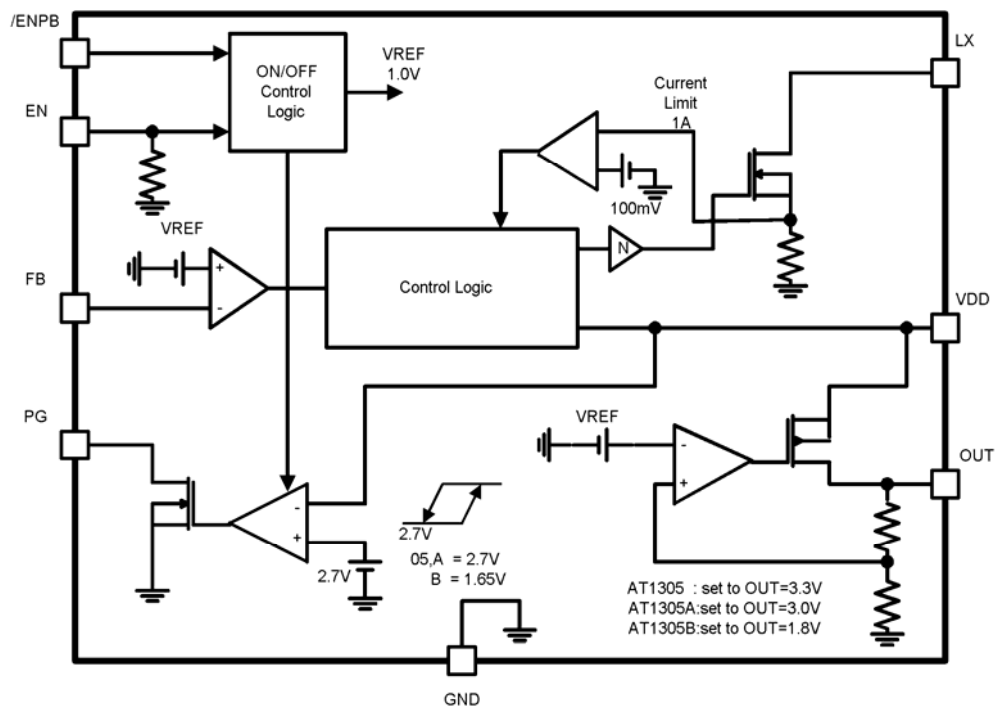
General Description

The AT1305 is a PFM step-up DC/DC converter with LDO for applications using 1 Cell or 2 Cell Alkaline battery and USB applications. Besides, the 32 μ A low quiescent current together with high efficiency maintains long battery life time. It provides a constant output voltage for inputs that vary above and below the output voltage.

Applications

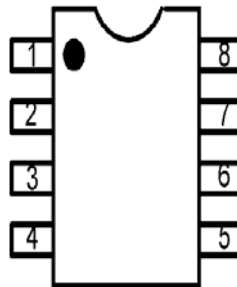
- MP3
- Power source for battery-powered equipment
- Power source for cameras, camcorders, VCRs, PDAs, electronic data banks, and hand-held Communication equipment

Block Diagram



Aimtron reserves the right without notice to change this circuitry and specifications.

Pin Configuration



Ordering Information

| Part number | Package | Remarks |
|--------------|----------------------------|---------------------------------------|
| AT1305 | 8-pin Plastic TSSOP | □□□□□□ Date Code |
| AT1305_GRE | 8-pin Plastic TSSOP, Green | □□□□□□,Date Code with one bottom line |
| AT1305 A | 8-pin Plastic TSSOP | □□□□□□ Date Code |
| AT1305 A_GRE | 8-pin Plastic TSSOP, Green | □□□□□□,Date Code with one bottom line |
| AT1305 B | 8-pin Plastic TSSOP | □□□□□□ Date Code |
| AT1305 B_GRE | 8-pin Plastic TSSOP, Green | □□□□□□,Date Code with one bottom line |

AT1305:LDO set to 3.3V AT1305AP:LDO set to 3.0V AT1305BP:LDO set to 1.8V

**For more marking information, contact our sales representative directly*

Pin Description

| Pin No. | Symbol | I/O | Description |
|---------|--------|-----|-----------------------------------|
| 1 | LX | O | Switching Output |
| 2 | EN | I | Enable Control Input, active high |
| 3 | /ENPB | I | Enable Control Input, active low |
| 4 | GND | - | Ground |
| 5 | PG | O | Power Good Detected |
| 6 | FB | I | Step-Up Converter feedback input |
| 7 | OUT | O | Output |
| 8 | VDD | - | Power input |

Absolute Maximum Ratings*1

(T_a=+25°C)

| Parameter | Symbol | Condition | Rated Value | | Unit |
|-------------------------|------------------|-----------|-------------|------|------|
| | | | Min. | Max. | |
| Power supply voltage | V _{DD} | — | — | 6.0 | V |
| LX pin voltage | V _{LX} | — | — | 6.0 | V |
| OUT output voltage | V _{OUT} | — | — | 6.0 | V |
| Other I/O pin voltage | | — | — | 6.0 | V |
| LX pin output current | I _{LX} | — | — | 2 | A |
| LDO output Peak Current | I _{LDO} | — | — | 400 | mA |
| Allowable dissipation | P _D | TSSOP8 | — | 500 | mW |
| Operating temperature | T _{OP} | — | -30 | +85 | °C |
| Storage temperature | T _{stg} | — | -55 | +165 | °C |

1. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation 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 affect device reliability.

Electrical Characteristics

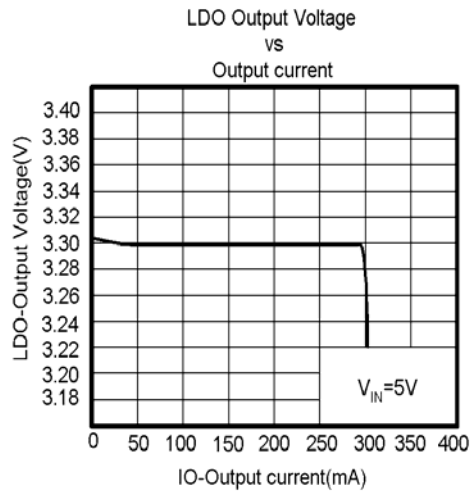
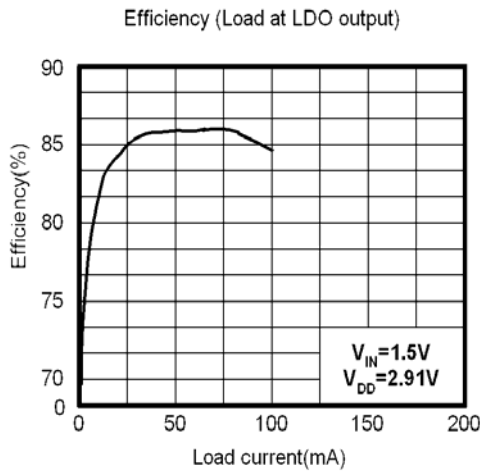
(V_{IN}=1.0V, V_{OUT}=2.8V, I_{OUT}=0mA, T_a=+25°C)

| Parameter | Symbol | Condition | Values | | | Unit |
|---------------------------------|------------------|-----------------------------------|--------|------|-------|------|
| | | | Min. | Typ. | Max. | |
| Start-Up Voltage | V _{ST} | I _{OUT} =1mA | 0.7 | 0.8 | - | V |
| Power On Reset Threshold | V _{DD} | | - | 2 | - | V |
| Operating V _{DD} Range | V _{DD} | AT1305,AT1305A | 2.0 | - | 5.5 | V |
| | | AT1305B | 1.65 | | 5.5 | V |
| No-Load Input Current | I _{IN1} | I _{OUT} =0mA | - | 87 | - | μA |
| Switch- Off Input Current | I _{IN2} | V _{IN} =5V | - | 32 | 50 | μA |
| Shutdown Current | I _{IN3} | EN=0V, /ENPB=High | - | 1 | 10 | μA |
| Feedback Reference | V _{FB} | Close Loop V _{DD} =2.85V | 1.176 | 1.2 | 1.224 | V |
| FB Input Current | I _{FB} | V _{FB} =1.2V | - | - | 50 | nA |
| LX Switch On-time | F _S | V _{OUT} =2.85V | - | 1.75 | - | μS |

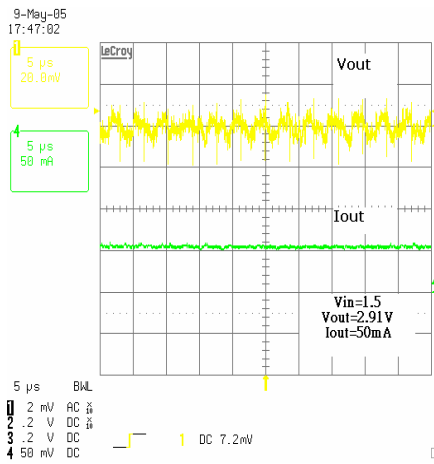
| | | | | | | |
|-----------------------|-----------|--|-----|------|-----|----------|
| Maximum Duty | D_{MAX} | $V_{OUT}=2.85V$ | - | 85 | - | % |
| LX ON Resistance | R_{LX} | N-Channel | - | 0.3 | - | Ω |
| LX Leakage Current | I_L | $V_{LX}=1.5V,$ $EN=0V, ENPB=VDD$ | - | | 1 | μA |
| Current Limit Setting | I_{LX} | $V_{DD}=2.85V$ | - | 1.5 | 2 | A |
| LDO Current Limit | I_{LDO} | $V_{DD}=3.2V$ | - | 350 | - | mA |
| OUT ON Resistance | R_{OUT} | $V_{DD}=2.85V, I_{OUT}=100mA$ | - | 0.5 | - | Ω |
| LDO enable threshold | V_{DD1} | OUT regulated to 1.8/3.0/3.3V | - | 4.0 | - | V |
| LDO Line Regulation | | $V_{in}=4.5V\sim 5.5V,$ $I_{OUT}=100mA$ | - | 1 | - | % |
| LDO Load Regulation | | $V_{out}=3.3V, I_{OUT}=10\sim 100mA$ | - | 1 | - | % |
| PG Threshold | V_{DD2} | AT1305, AT1305A, VDD falling | - | 2.7 | - | V |
| | | AT1305B, VDD falling | - | 1.65 | - | V |
| PG sink current | I_{PG} | $I_{PG}=1mA$ | - | 0.4 | - | V |
| PG Leakage current | I_{LPG} | $V_{DD}=3V$ | - | - | 1 | μA |
| EN,/ENPB Trip Level | V_{IH} | | 0.8 | - | - | V |
| | V_{IL} | | - | - | 0.5 | V |

Note 1 : Once the output is in regulation , the AT1305/A/B operate down to a 0.7V input voltage.

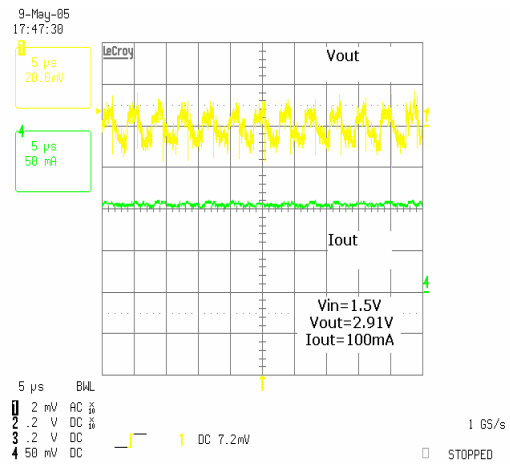
Typical Operating Characteristics



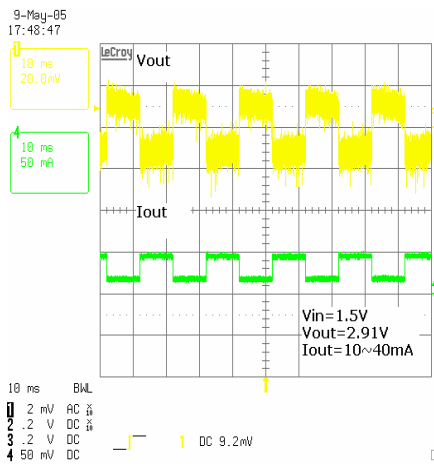
Boost Converter Line Transient Response



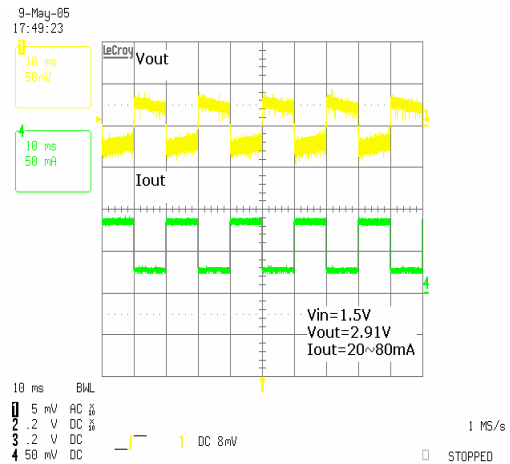
Boost Converter Line Transient Response



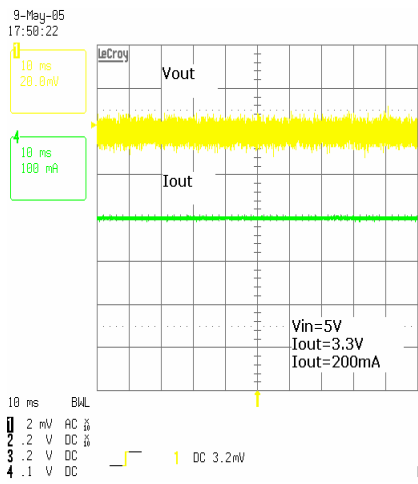
Boost Converter Load Transient Response



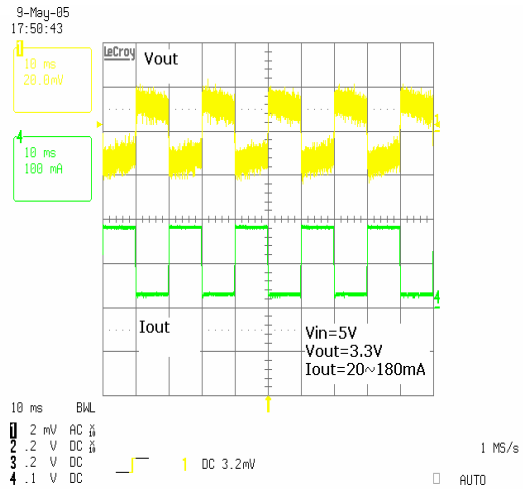
Boost Converter Load Transient Response



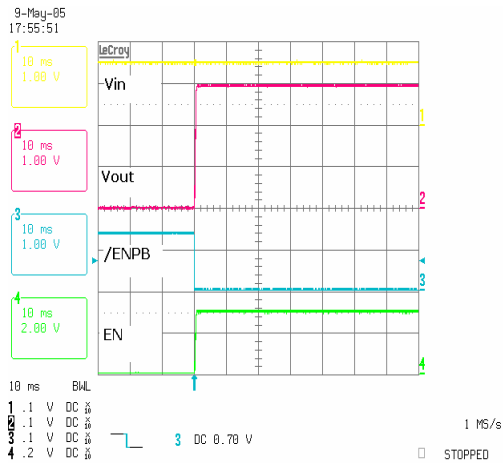
LDO Line Transient Response



LDO Load Transient Response

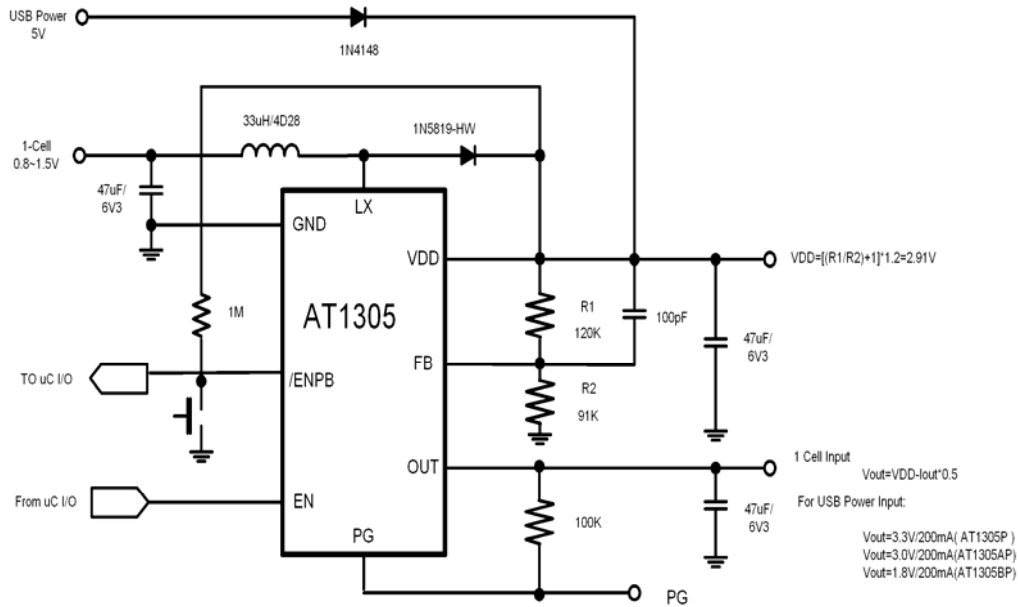


Boost Converter Start-up After Enable

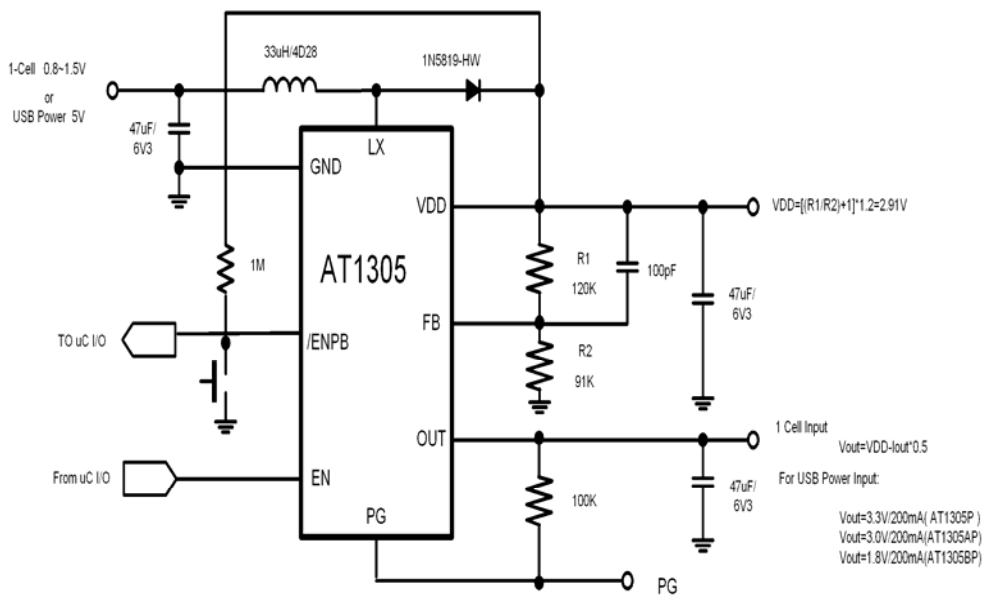


Typical Application Circuit

1Cell And USB Power Input

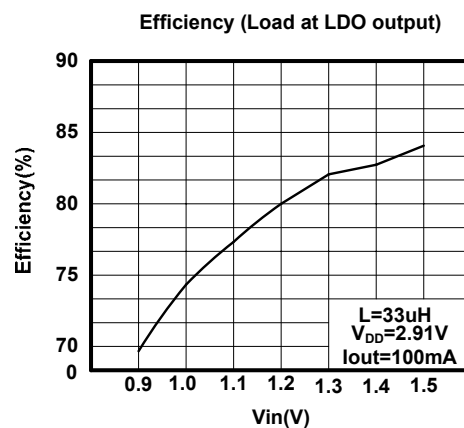
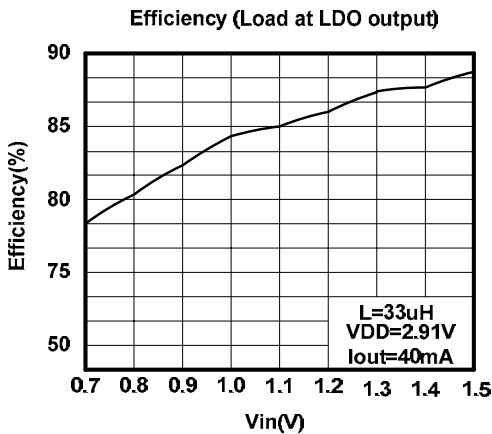
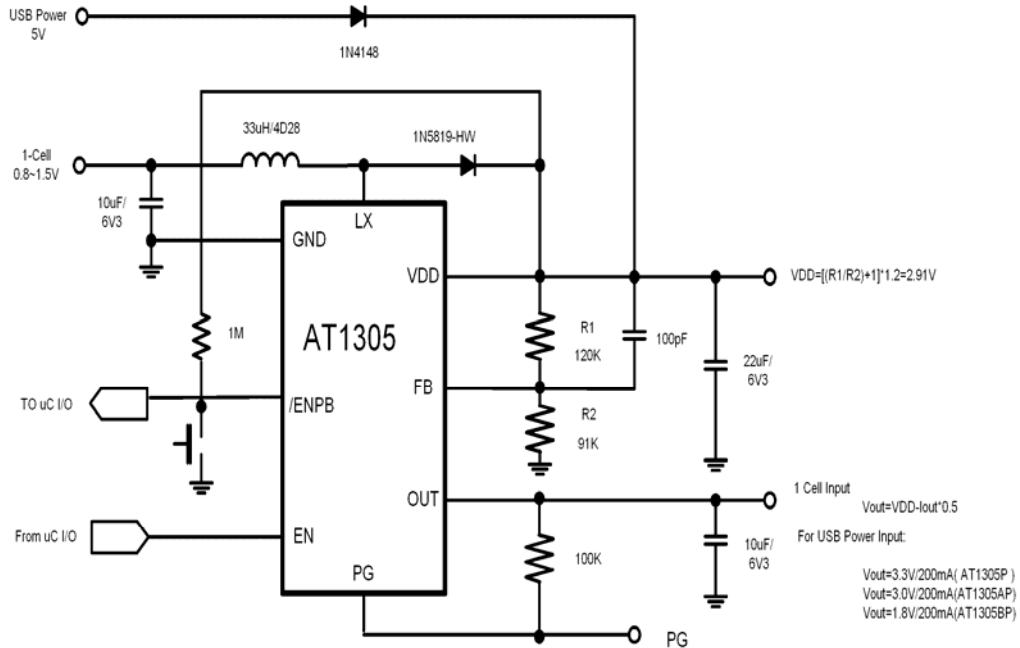


1Cell or USB Power Input

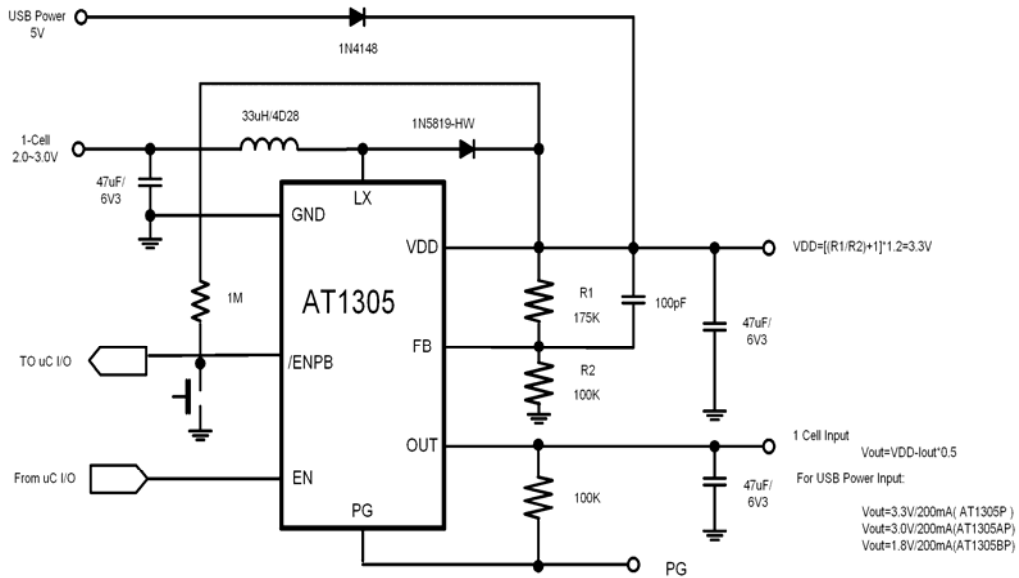


Typical Operating Characteristics

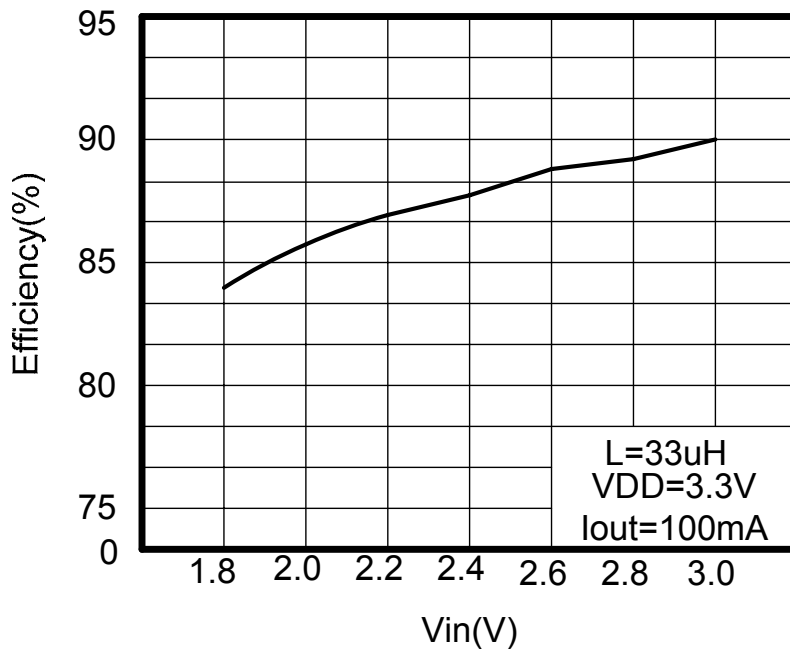
1Cell and USB Power Input



2Cell And USB Power Input



Efficiency (Load at LDO output)

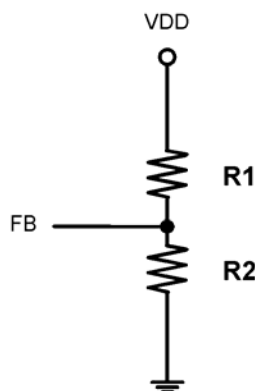


Function Description

Boost Converter

The AT1305 integrates a step-up, switch-mode DC/DC converter with a linear regulator to provide step up/down voltage conversion. A pulse frequency modulation (PFM) with a constant on time 4.5us and minimum off-time 1.4μs controls the N-channel MOSFET. The linear regulator contains a P-channel MOSFET. In 1-cell or 2-cell battery input (When VBAT < VOUT), only the step-up regulator is active, and the linear regulator behaves as a pass gate. The output voltage can be adjusted with two external resistors. The formula show as follow equation.

$$\begin{aligned}
 VDD &= V_{FB} \left(1 + \frac{R1}{R2} \right) \\
 &= 1.2 \times \left(1 + \frac{R1}{R2} \right)
 \end{aligned}$$



The maximum efficiency could be 89% over 50mA load range. The AT1305 guarantee starts up as low as 1.0V input.

LDO mode

The low-dropout linear regulator consists of a reference, an error amplifier and a P-channel MOSFET. In USB mode, when VIN > 4V, the linear regulator is active automatically whether the EN and /ENPB is enabled or not. The output voltage is default 3.3V, 3.0V and 1.8V version. Its driving capability is nearly 250mA.

Power good

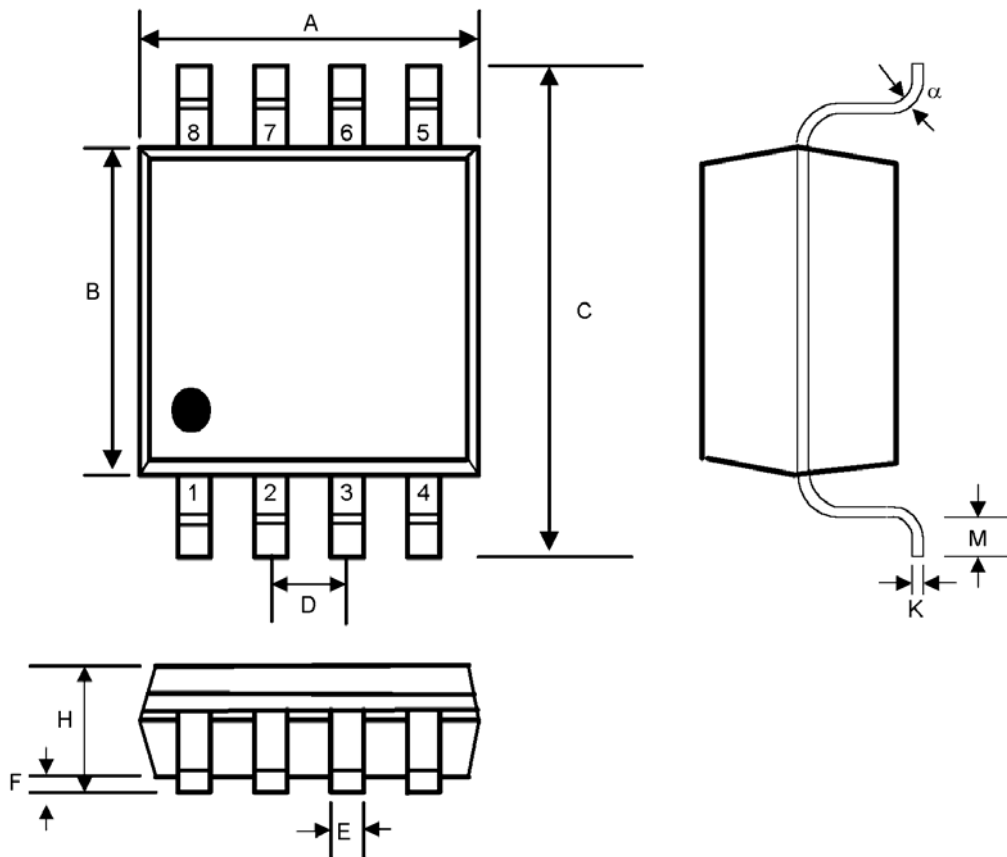
The PG pin stays high impedance when the dc/dc converter or the LDO output voltage high than 2.7 V, and falling down when the voltage low than 2.6V. It could be used to enable the processor after the push-button start-up.

On/Off Control

A single pushbutton switch can be used to turn the AT1305 on and off. EN is pulled low (internal) and /ENPB is pulled high when the AT1305 is off. When the switch is pressed, /ENPB is pulled low and the IC turns on. The switch should be on long enough for the processor to exit reset. The controller issues a logic high to EN, which guarantees the IC will stay on regardless of the switch state.

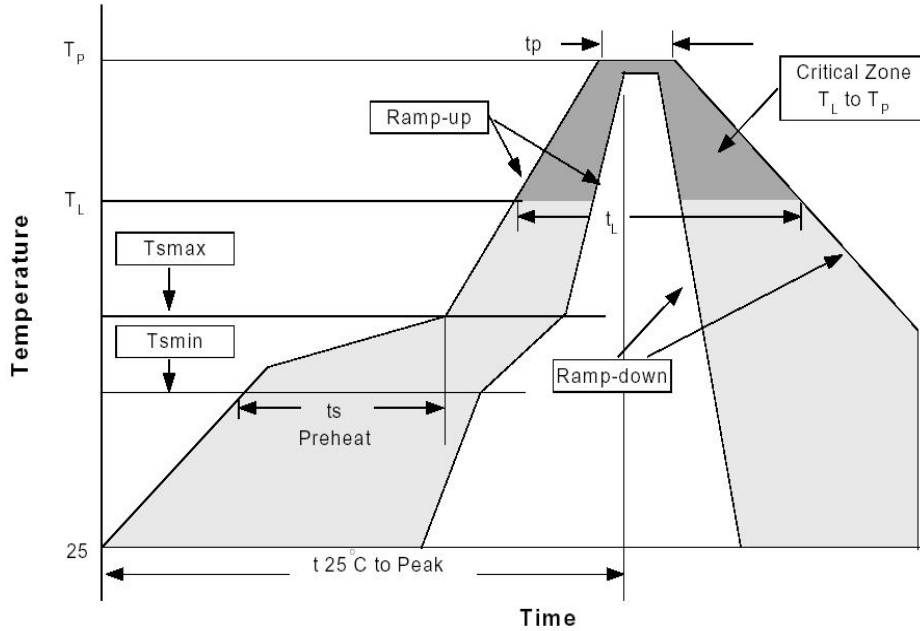
| EN | /ENPB | AT1305 |
|----|-------|--------|
| 0 | 0 | ON |
| 0 | 1 | OFF |
| 1 | 0 | ON |
| 1 | 1 | ON |

Package Outline : 8-pin TSSOP



| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|----------|----------------|----------------|----------------|----------------|-------|
| | MIN | MAX | MIN | MAX | |
| A | 0.114 | 0.122 | 2.90 | 3.10 | - |
| B | 0.169 | 0.177 | 4.30 | 4.50 | - |
| C | 0.244 | 0.260 | 6.20 | 6.60 | - |
| D | 0.026 | BSC | 0.65 | BSC | - |
| E | 0.010 | 0.012 | 0.25 | 0.30 | - |
| F | 0.002 | 0.006 | 0.05 | 0.15 | - |
| H | 0.041 | 0.047 | 1.05 | 1.20 | - |
| K | 0.005 | BSC | 0.127 | BSC | - |
| M | 0.020 | 0.028 | 0.50 | 0.70 | - |
| α | 0 ⁰ | 8 ⁰ | 0 ⁰ | 8 ⁰ | - |

Reflow Profiles



| Profile Feature | Sn-Pb Eutectic Assembly | | Pb-Free Assembly | |
|---|--|--|--|--|
| | Large Body Pkg. thickness ≥2.5mm or Pkg. volume ≥350mm ³ | Small Body Pkg. thickness <2.5mm or Pkg. volume <350mm ³ | Large Body Pkg. thickness ≥2.5mm or Pkg. volume ≥350mm ³ | Small Body Pkg. thickness ≥2.5mm or Pkg. volume ≥350mm ³ |
| Average ramp-up rate (T _L to T _P) | 3°C/second max. | | 3°C/second max. | |
| Preheat -Temperature Min(T _{min}) -Temperature Max (T _{max}) -Time (min to max)(t _s) | 100°C 150°C 60-120 seconds | | 150°C 200°C 60-180 seconds | |
| T _{max} to T _L -Ramp-up Rate | | | 3°C/second max. | |
| Time maintained above: -Temperature (T _L) -Time (t _L) | 183°C 60-150 seconds | | 217°C 60-150 seconds | |
| Peak Temperature(T _P) | 225+0/-5°C | 240+0/-5°C | 245+0/-5°C | 250+0/-5°C |
| Time within 5°C of actual Peak Temperature (t _p) | 10-30 seconds | 10-30 seconds | 10-30 seconds | 20-40 seconds |
| Ramp-down Rate | 6°C/second max. | | 3°C/second max. | |
| Time 25°C to Peak Temperature | 6 minutes max. | | 8 minutes max. | |

*All temperatures refer to topside of the package, measured on the package body surface.