MP2000

Low Input Voltage 150mA Linear Regulator

The Future of Analog IC Technology™

INITIAL RELEASE SPECIFICATIONS SUBJECT TO CHANGE

DESCRIPTION

The MP2000 is a low-voltage, low-dropout bipolar linear regulator. It operates from 1.35V to 6.0V input voltage, and regulates the output voltage from as low as 0.5V.

The MP2000 can supply up to 150mA of load current. The MP2000 features thermal overload and current limit protection. It is available in a 5-pin TSOT23-5 package.

Part Number	Output Voltage
MP2000DJ-ADJ	Adjustable
MP2000DJ-1.0	1.0V

EVALUATION BOARD REFERENCE

Board Number	Output*	Dimensions
EV2000DJ-00A	1.2V	2.0”X x 2.0”Y x 0.4”Z

* Default output voltage adjustable from 0.5V to 5.0V using an external resistor divider.

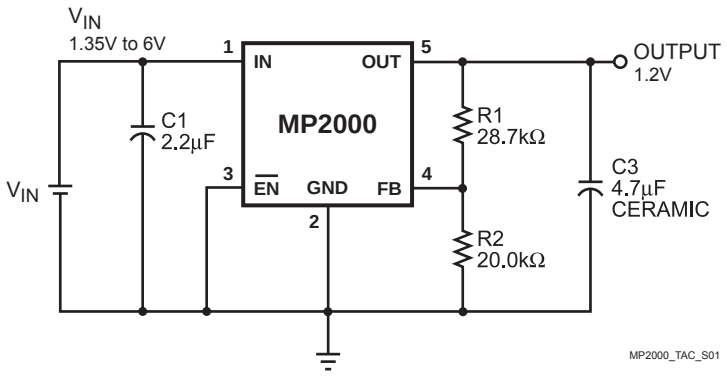
FEATURES

- Operates with V_{IN} = 1.35V
- Low 300mV Dropout at 150mA Output
- ±3% Accurate Output Voltage
- Fixed and Adjustable Output Voltage Option
- Better Than 0.001%/mA Load Regulation
- Stable With Low-ESR Output Capacitor
- Low 65µA Ground Current
- Internal Thermal Protection
- Current Limit Protection
- 6µA Typical Quiescent Current at Shutdown

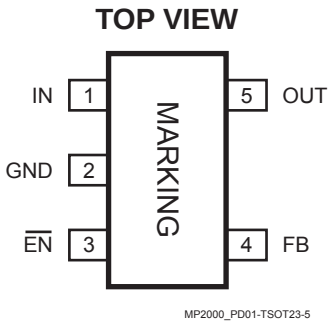
APPLICATIONS

- Low Current Regulators
- Battery Powered Systems
- Cellular Phones

TYPICAL APPLICATION



PACKAGE REFERENCE



Part Number**	Package	Temperature
MP2000DJ-ADJ	TSOT23-5	–40°C to +85°C
MP2000DJ-1.0		

** For Tape & Reel, add suffix –Z (eg. MP2000DJ–ADJ–Z)
For Lead Free, add suffix –LF (eg. MP2000DJ–ADJ–LF–Z)

ABSOLUTE MAXIMUM RATINGS (1)

IN Supply Voltage ..... –0.3V to +7.0V
FB Voltage ..... –0.3V to V_{OUT} + 0.3V
$\overline{EN}$ Voltage ..... IN – 0.7V
Junction Temperature ..... 150°C
Lead Temperature ..... 260°C
Storage Temperature ..... –65°C to +150°C

Recommended Operating Conditions (2)

Input Voltage ..... 1.35V to 6.0V
Output Voltage ..... 0.5V to 5V
Load Current ..... 150mA Maximum
Operating Temperature ..... –40°C to +85°C

Thermal Resistance (3)

	θ_{JA}	θ_{JC}	
TSOT23-5	220	110	°C/W

Notes:
1) Exceeding these ratings may damage the device.
2) The device is not guaranteed to function outside of its operating conditions.
3) Measured on approximately 1" square of 1 oz copper.

ELECTRICAL CHARACTERISTICS

V_{IN} = 1.8V, T_A = +25°C, unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Units
Ground Pin Current		I_{OUT} = 1mA		65		µA
		I_{OUT} = 150mA		2.7		mA
Shutdown Current		$\overline{EN}$ = 1.0V, V_{IN} = 5V		7	10	µA
FB Regulation Voltage			0.485	0.500	0.515	V
Dropout Voltage (4)		I_{OUT} = 100mA		250		mV
		I_{OUT} = 150mA		300		
Line Regulation		I_{OUT} = 1mA, V_{IN} = (V_{OUT} + 0.5V) to 6.0V (6)		0.01	0.08	%/V
Load Regulation		I_{OUT} = 1mA to 150mA, V_{IN} = V_{OUT} + 0.5V (6)		0.001	0.02	%/mA
PSRR (5)		V_{IN} > V_{OUT} + 0.5V, C3 = 2.2µF, V_{IN}(AC) = 100mV, f = 1KHz		50		dB
Output Voltage Noise (5)		f = 1KHz, C_{FB} > 0.1µF, I_{OUT} = 1mA		300		nV/√Hz
$\overline{EN}$ Input Low Voltage				0.7		V
$\overline{EN}$ Input Bias Current		$\overline{EN}$ = 5V		0.01	1	µA
Thermal Protection (5)				145		°C
Current Limit Protection (5)		V_{OUT} = 1.2V		200		mA
Thermal Protection Hysteresis (5)				30		°C

Notes:
4) Dropout Voltage is defined as the input to output differential when the output voltage drops 1% below its normal value.
5) Parameter is guaranteed by design, not production tested.
6) V_{IN} = 1.35V for V_{OUT} = 0.5V to 0.85V

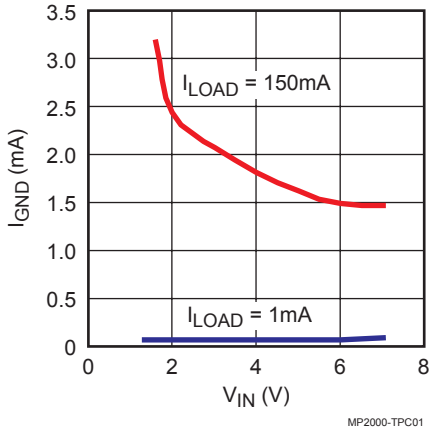
PIN FUNCTIONS

Pin #	Name	Description
1	IN	Power Source Input. IN supplies the internal power to the MP2000 and is the source of the pass transistor. Bypass IN to GND with a 2.2µF or greater capacitor.
2	GND	Ground.
3	$\overline{EN}$	Enable Input. Drive $\overline{EN}$ high to turn off the MP2000; low to turn it on. For automatic startup, connect $\overline{EN}$ to GND.
4	FB	Feedback Input. Connect a resistive voltage divider from OUT to FB to set the output voltage. OUT feedback threshold is 0.5V.
5	OUT	Regulator Output. OUT is the output of the linear regulator. Bypass OUT to GND with a 2.2µF or greater capacitor.

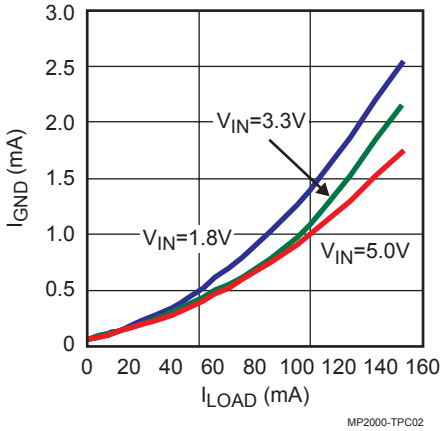
TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = 1.8V, V_{OUT} = 1.2V, C1 = 2.2µF, C2 = 0.1µF, C3 = 4.7µF, T_A = +25°C unless otherwise noted.

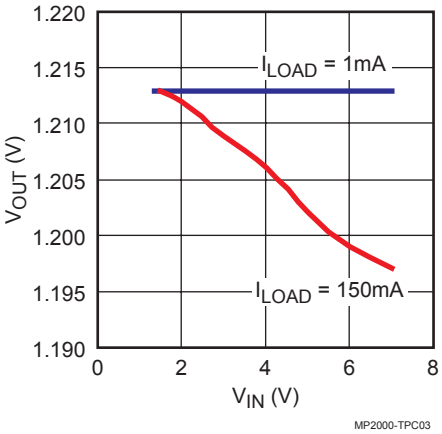
I_{GND} vs V_{IN}



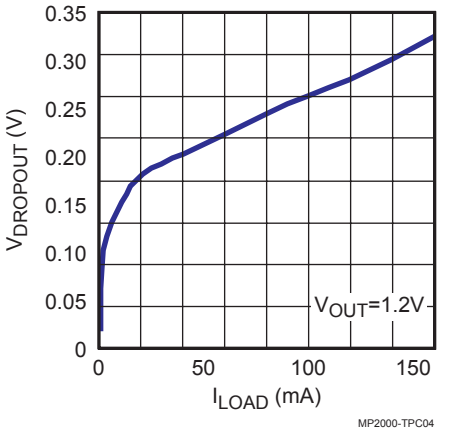
I_{GND} vs I_{LOAD}



V_{OUT} vs. V_{IN}

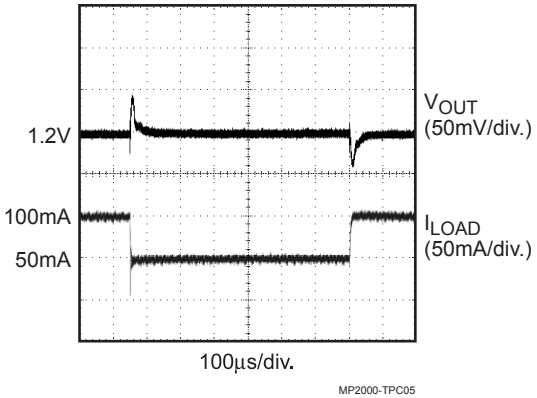


$V_{DROPOUT}$ vs I_{LOAD}



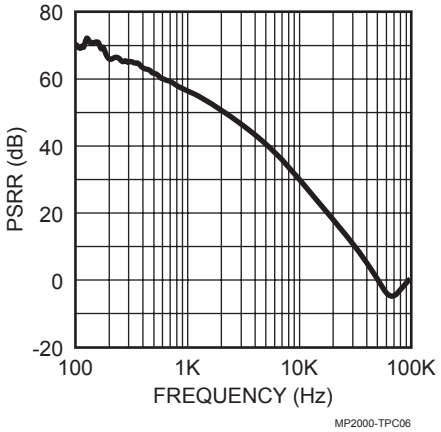
Load-Transient Response

Circuit of Figure 2



PSRR vs Frequency

V_{IN} = 2.5V, V_{OUT} = 1.0V, I_{LOAD} = 10mA

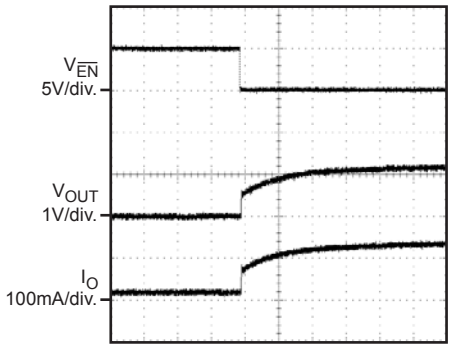


TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

V_{IN} = 1.8V, V_{OUT} = 1.2V, C1 = 2.2µF, C2 = 0.1µF, C3 = 4.7µF, T_A = +25°C unless otherwise noted.

Startup

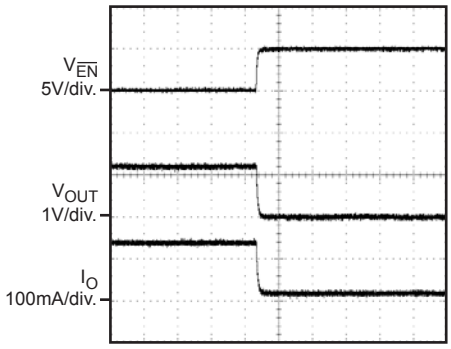
V_{IN} = 5V, I_{OUT} = 130mA



MP2000-TPC07

Shutdown

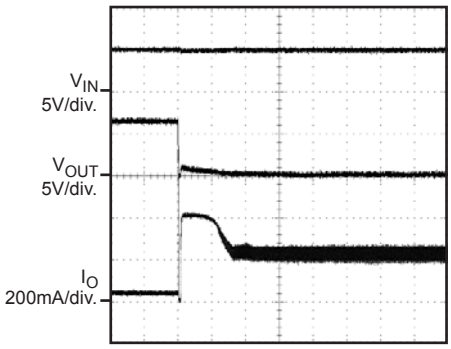
V_{IN} = 5V, I_{OUT} = 130mA



MP2000-TPC08

Current Limit Protection

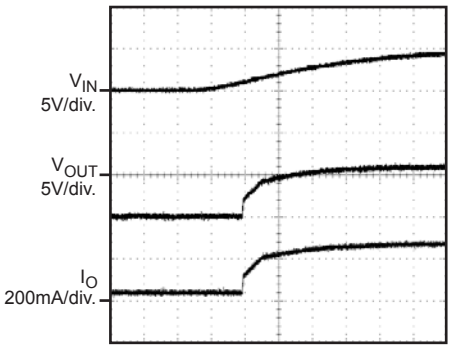
V_{IN} = 5V, $\overline{EN}$ = 0V, I_{OUT} = 90mA



MP2000-TPC09

Power Ramp Up

V_{IN} = 5V, $\overline{EN}$ = 0V, I_{OUT} = 130mA



MP2000-TPC10

OPERATION

The MP2000 is a low-current, low-voltage, low-dropout linear regulator. It is intended for use in devices that require very low voltage and low quiescent current power such as wireless modems, pagers and cellular phones.

The MP2000 uses a PNP pass element and features internal thermal shutdown and an internal current limit circuit.

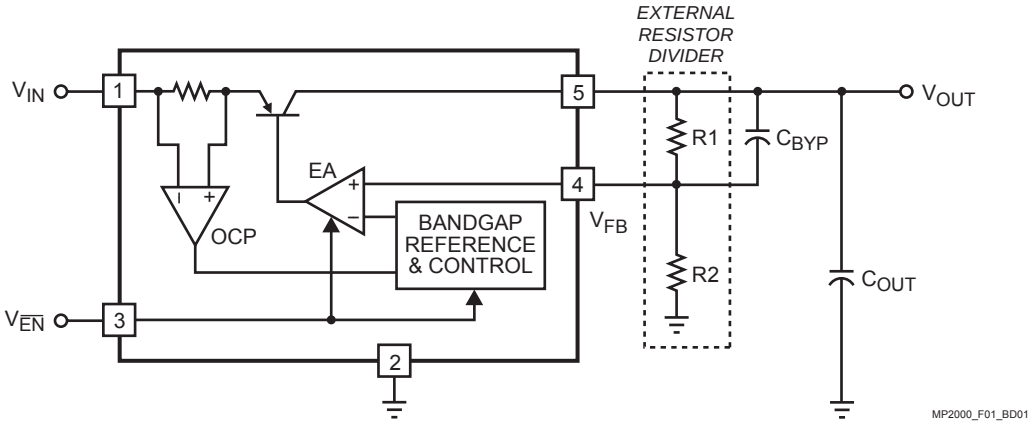


Figure 1—Adjustable Regulator

APPLICATION INFORMATION

Setting the Output Voltage

The output voltage can be adjusted by changing the values of the external resistor divider.

Use the following equation to determine these values:

$$V_{OUT} = 0.5V \times \left(1 + \frac{R1}{R2}\right)$$

Typically R1 + R2 are recommended to be less than 100kΩ.

In Figure 2, C2 is added for improved transient response.

TYPICAL APPLICATION CIRCUIT - ADJUSTABLE

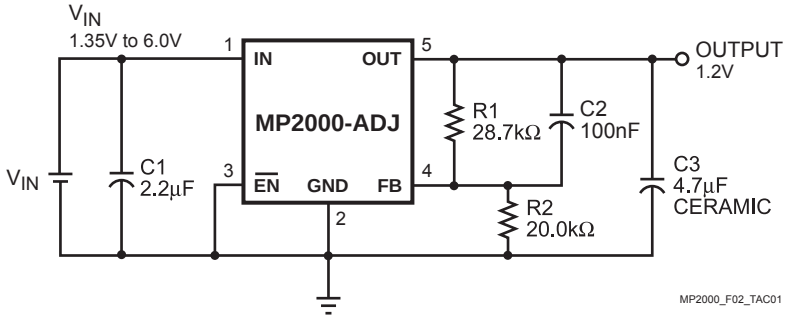
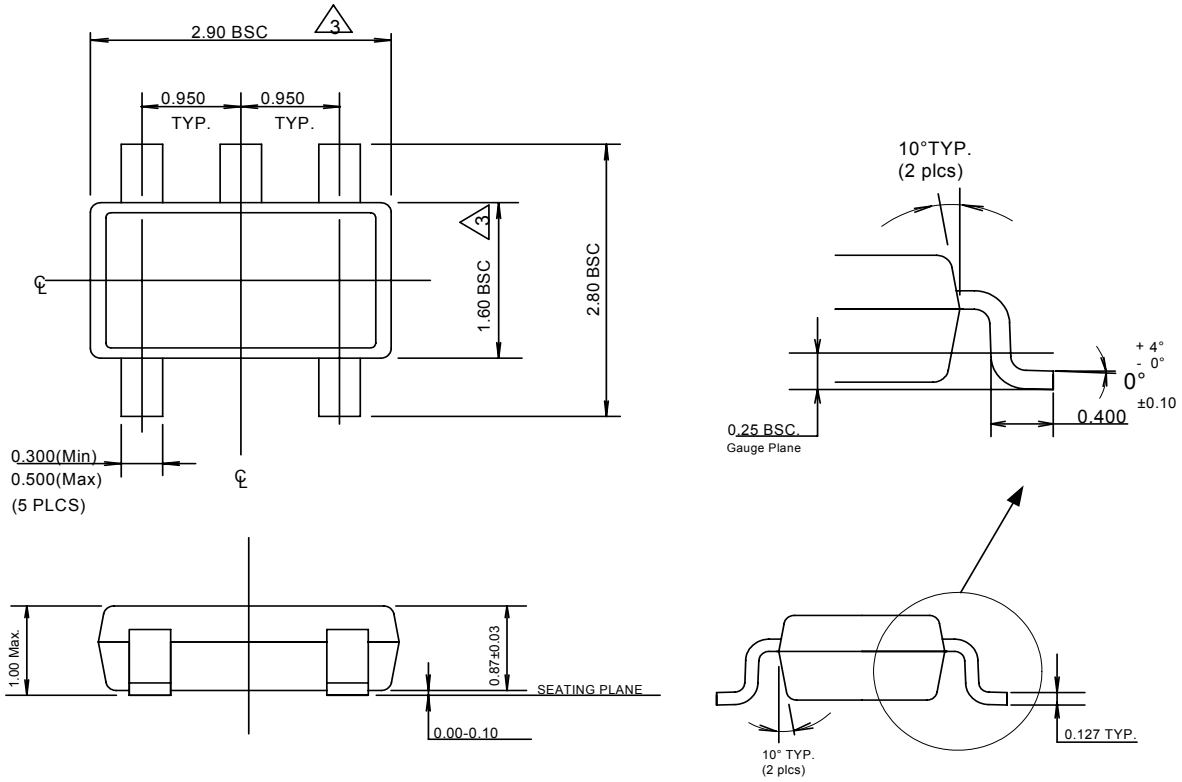


Figure 2—Typical Application Circuit with V_{OUT} = 1.2V

PACKAGE INFORMATION

TSOT23-5



Dimensions are in millimeters

NOTE:

1. Dimensions and tolerances are as per ANSI Y14.5M, 1994.
2. Die is facing up for mold. Die is facing down for trim/form, ie. reverse trim/form.
3. Dimensions are exclusive of mold flash and gate burr.
4. The footlength measuring is based on the gauge plane method.
5. All specification comply to Jedec Spec MO193 Issue C.