MP1580

2A, 380 KHz
Step-Down Converter

The Future of Analog IC Technology™

DESCRIPTION

The MP1580 is a monolithic step-down switch mode converter with a built in internal power MOSFET. It achieves 2A continuous output current over a wide input supply range with excellent load and line regulation.

Current mode operation provides fast transient response and eases loop stabilization.

Fault condition protection includes cycle-by-cycle current limiting and thermal shutdown. In shutdown mode the regulator draws 23μA of supply current.

The MP1580 requires a minimum number of readily available standard external components. A synchronization pin allows the part to be driven to 600KHz.

EVALUATION BOARD REFERENCE

Board Number	Dimensions
EV0007	2.3"X x 1.5"Y x 0.5"Z

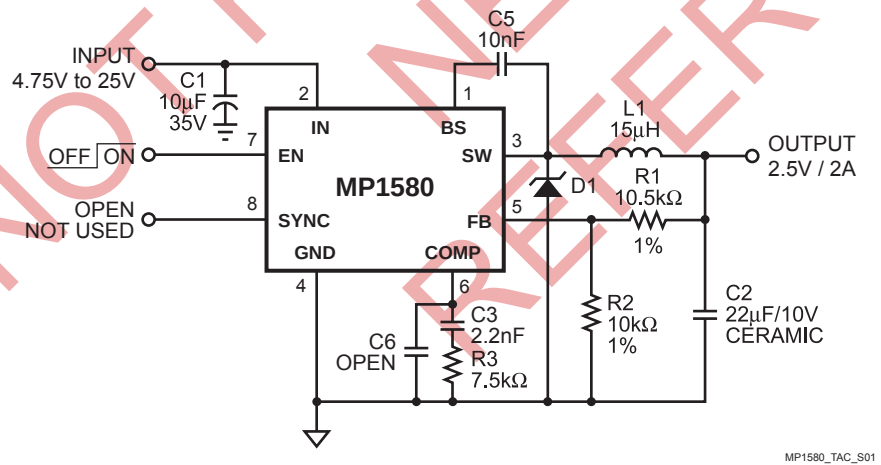
FEATURES

- 2A Output Current
- 0.18Ω Internal Power MOSFET Switch
- Stable with Low ESR Output Ceramic Capacitors
- Up to 95% Efficiency
- 23μA Shutdown Mode
- Fixed 380KHz Frequency
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Wide 4.75 to 25V Operating Input Range
- Output Adjustable from 1.22V to 21V
- Programmable Under Voltage Lockout
- Frequency Synchronization Input
- Available in an 8-Pin SO Package

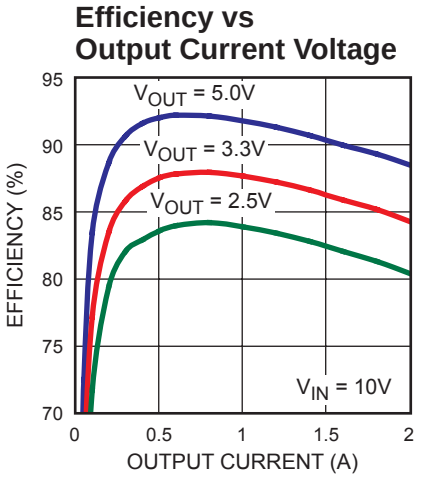
APPLICATIONS

- Distributed Power Systems
- Battery Chargers
- Pre-Regulator for Linear Regulators

TYPICAL APPLICATION

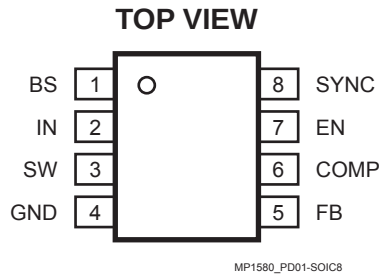


MP1580_TAC_S01



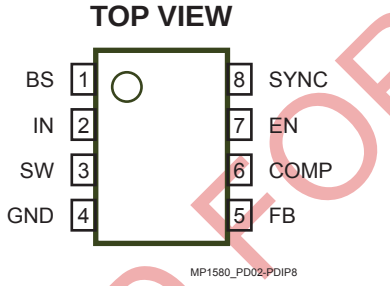
MP1580_TAC_EC01

PACKAGE REFERENCE



Part Number*	Package	Temperature
MP1580HS	SOIC8	–40°C to +125°C

* For Tape & Reel, add suffix –Z (eg. MP1580HS–Z)
For Lead Free, add suffix –LF (eg. MP1580HS –LF–Z)



Part Number**	Package	Temperature
MP1580HP	PDIP8	–40°C to +125°C

** For Tape & Reel, add suffix –Z (eg. MP1580HP–Z)
For Lead Free, add suffix –LF (eg. MP1580HP –LF–Z)

ABSOLUTE MAXIMUM RATINGS (1)

Supply Voltage (V_{IN}) 27V
Switch Voltage (V_{SW}) ..... –1V to V_{IN} + 1V
Bootstrap Voltage (V_{BS}) ..... V_{SW} + 6V
Feedback Voltage (V_{FB}) ..... –0.3V to +6V
Enable/UVLO Voltage (V_{EN}) ..... –0.3V to +6V
Comp Voltage (V_{COMP}) ..... –0.3V to +6V
Sync Voltage (V_{SYNC}) ..... –0.3V to +6V
Junction Temperature ..... +150°C
Lead Temperature ..... +260°C
Storage Temperature ..... –65°C to +150°C

Recommended Operating Conditions (2)

Input Voltage (V_{IN}) ..... 4.75V to 25V
Operating Temperature ..... –40°C to +125°C

Thermal Resistance (3)

	θ_{JA}	θ_{JC}	
SOIC8	105	50	°C/W
PDIP8	95	55	°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} = 12V, T_A = +25°C, unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Units
Feedback Voltage		4.75V ≤ V_{IN} ≤ 25V V_{COMP} < 2V	1.198	1.222	1.246	V
Upper Switch-On Resistance				0.18		Ω
Lower Switch-On Resistance				10		Ω
Upper Switch Leakage		V_{EN} = 0V, V_{SW} = 0V		0	10	μA
Current Limit (4)			2.4	3.0	3.6	A
Current Limit Gain. Output Current to Comp Pin Voltage				1.95		A/V
Error Amplifier Voltage Gain				400		V/V
Error Amplifier Transconductance		ΔI_C = ±10μA	500	770	1100	μA/V
Oscillator Frequency			342	380	418	KHz
Short Circuit Frequency		V_{FB} = 0V	20	35	54	KHz
Sync Frequency		Sync Drive 0V to 2.7V	445		600	KHz

ELECTRICAL CHARACTERISTICS *(continued)*

V_{IN} = 12V, T_A = +25°C, unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Units
Maximum Duty Cycle		V_{FB} = 1.0V		90		%
Minimum Duty Cycle		V_{FB} = 1.5V			0	%
EN Shutdown Threshold Voltage		I_{CC} > 100µA	0.7	1.0	1.3	V
Enable Pull-Up Current		V_{EN} = 0V	1.15	1.46	1.8	µA
EN UVLO Threshold Rising		V_{EN} Rising	2.37	2.495	2.62	V
EN UVLO Threshold Hysteresis				210		mV
Supply Current (Shutdown)		$V_{EN} \leq$ 0.4V		23	36	µA
Supply Current (Quiescent)		$V_{EN} \geq$ 2.6V, V_{FB} = 1.4V		1.0	1.2	mA
Thermal Shutdown				160		°C

Note:

4) Derate current limit 0.011A/°C.

PIN FUNCTIONS

Pin #	Name	Description
1	BS	Bootstrap (C5). This capacitor is needed to drive the power switch's gate above the supply voltage. It is connected between SW and BS pins to form a floating supply across the power switch driver. The voltage across C5 is about 5V and is supplied by the internal +5V supply when the SW pin voltage is low.
2	IN	Supply Voltage. The MP1580 operates from a +4.75V to +25V unregulated input. C1 is needed to prevent large voltage spikes from appearing at the input.
3	SW	Switch. This connects the inductor to either IN through M1 or to GND through M2.
4	GND	Ground. This pin is the voltage reference for the regulated output voltage. For this reason care must be taken in its layout. This node should be placed outside of the D1 to C1 ground path to prevent switching current spikes from inducing voltage noise into the part.
5	FB	Feedback. An external resistor divider from the output to GND, tapped to the FB pin sets the output voltage. To prevent current limit run away during a short circuit fault condition the frequency foldback comparator lowers the oscillator frequency when the FB voltage is below 700mV.
6	COMP	Compensation. This node is the output of the transconductance error amplifier and the input to the current comparator. Frequency compensation is done at this node by connecting a series R-C to ground. See the compensation section for exact details.
7	EN	Enable/UVLO. A voltage greater than 2.62V enables operation. For complete low current shutdown the EN pin voltage needs to be less than 700mV.
8	SYNC	Synchronization Input. This pin is used to synchronize the internal oscillator frequency to an external source. There is an internal 11kΩ pull down resistor to GND; therefore leave SYNC unconnected if unused.