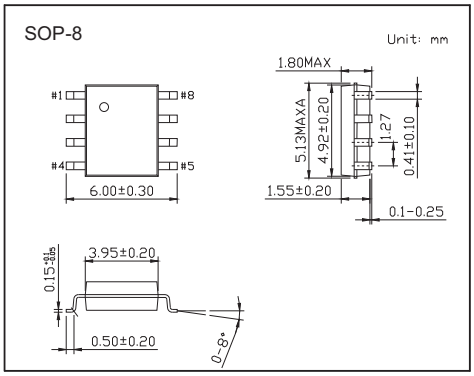
3A, 23V, 340KHz Synchronous Rectified Step-Down Converter

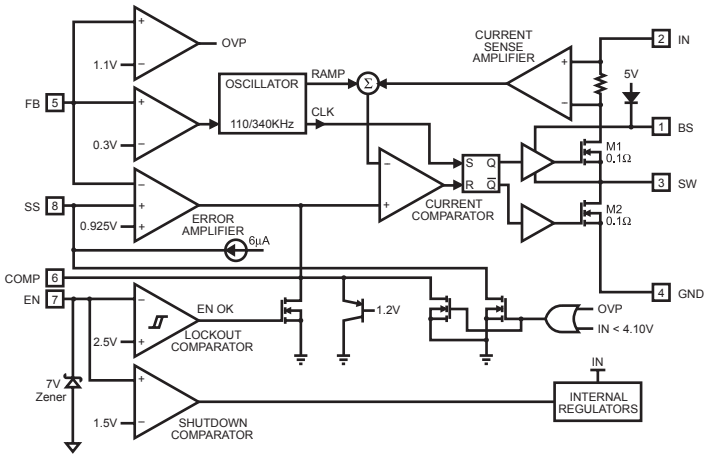
MP2307

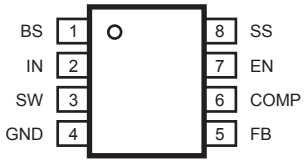
■ Features

- 3A Continuous Output Current, 4A Peak Output Current
- Wide 4.75V to 23V Operating Input Range
- Integrated 100mΩ Power MOSFET Switches
- Output Adjustable from 0.925V to 20V
- Up to 95% Efficiency
- Programmable Soft-Start
- Stable with Low ESR Ceramic Output Capacitors
- Fixed 340KHz Frequency
- Cycle-by-Cycle Over Current Protection
- Input Under Voltage Lockout



■ Functional Block Diagram





■ Absolute Maximum Ratings Ta = 25℃

Parameter	Symbol	Rating	Unit
Input Voltage	V_{in}	-0.3 to 26	V
Switch Voltage	V_{SW}	-1 to V_{IN} +0.3	V
Boot Strap Voltage	V_{BS}	V_{SW}-0.3 to V_{SW}+6	V
All Other Pins		-0.3 to 6V	V
Power Dissipation	P_D	2.5	mW
Thermal Resistance	$R_{\theta JA}$	50	℃/W
Junction Temperature	T_j	150	℃
Storage Temperature	T_{stg}	-65 to 150	℃
Lead Temperature	T_L	260	℃

■ Recommended Operating Conditions

Input Voltage	V_{in}	4.75 to 23	V
Output Voltage	V_{out}	0.925 to 20	V
Operating Temperature	T_A	-40 to 85	℃

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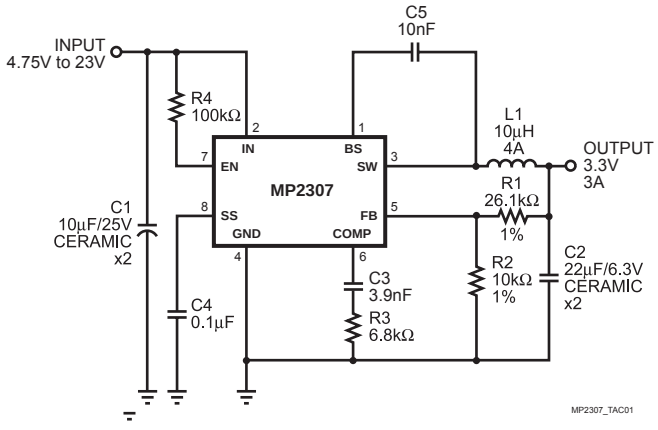
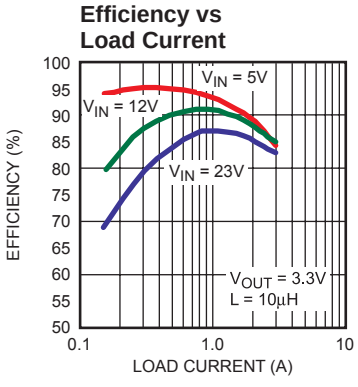
■ Electrical Characteristics (Ta = 25℃, V_{IN}=12V,unless otherwise specified)

Parameter	Symbol	Condition	Min	Typ	Max	Units
Shutdown Supply Current		V_{EN} = 0V		0.3	3.0	μA
Supply Current		V_{EN} = 2.0V, V_{FB} = 1.0V		1.3	1.5	mA
Feedback Voltage	V_{FB}	4.75V ≤ V_{IN} ≤ 23V	0.900	0.925	0.950	V
Feedback Overvoltage Threshold				1.1		V
Error Amplifier Voltage Gain (4)	A_{EA}			400		V/V
Error Amplifier Transconductance	G_{EA}	ΔI_C = ±10μA		820		μA/V
High-Side Switch On-Resistance (4)	$R_{DS(ON)1}$			100		mΩ
Low-Side Switch On-Resistance (4)	$R_{DS(ON)2}$			100		mΩ
High-Side Switch Leakage Current		V_{EN} = 0V, V_{SW} = 0V		0	10	μA
Upper Switch Current Limit		Minimum Duty Cycle	4.0	5.8		A
Lower Switch Current Limit		From Drain to Source		0.9		A
COMP to Current Sense Transconductance	G_{CS}			5.2		A/V
Oscillation Frequency	F_{osc1}		300	340	380	KHz
Short Circuit Oscillation Frequency	F_{osc2}	V_{FB} = 0V		110		KHz
Maximum Duty Cycle	D_{MAX}	V_{FB} = 1.0V		90		%
Minimum On Time (4)	T_{ON}			220		ns
EN Shutdown Threshold Voltage		V_{EN} Rising	1.1	1.5	2.0	V
EN Shutdown Threshold Voltage Hysterisis				220		mV
EN Lockout Threshold Voltage			2.2	2.5	2.7	V
EN Lockout Hysterisis				210		mV
Input Under Voltage Lockout Threshold		V_{IN} Rising	3.80	4.05	4.40	V
Input Under Voltage Lockout Threshold Hysteresis				210		mV
Soft-Start Current		V_{SS} = 0V		6		μA
Soft-Start Period		C_{SS} = 0.1μF		15		ms
Thermal Shutdown (1)				160		°C

Note:
1) Guaranteed by design, not tested.

■ Typlacl Characteristics





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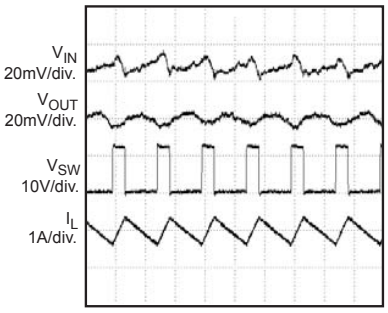
■ Typical Characteristics

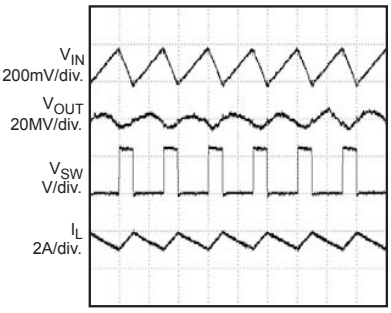
Steady State Test Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V, I_{OUT} = 0A



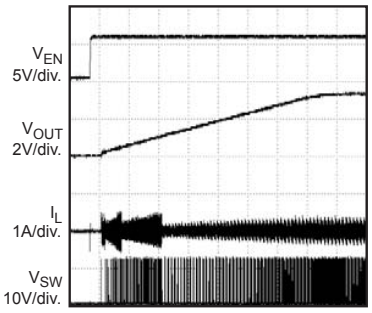
Steady State Test Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V, I_{OUT} = 3A



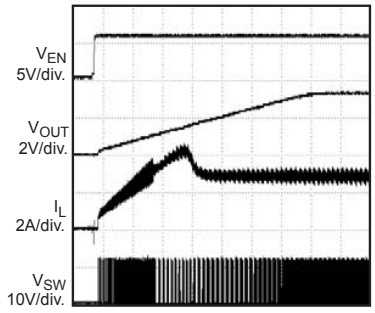
Startup through Enable Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V, No Load



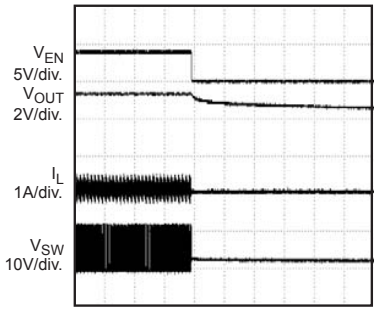
Startup Through Enable Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V,
I_{OUT} = 3A (Resistance Load)



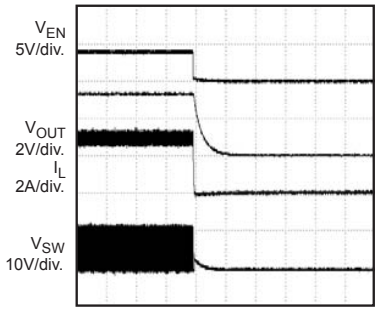
Shutdown Through Enable Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V, No Load



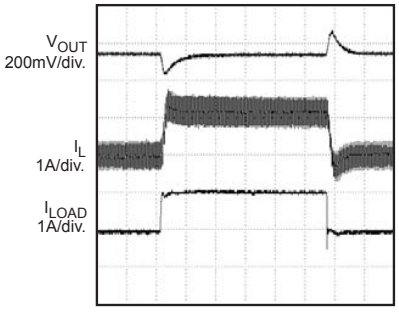
Shutdown Through Enable Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V,
I_{OUT} = 3A (Resistance Load)



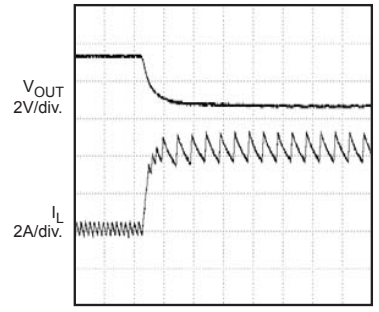
Load Transient Test Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V,
I_{OUT} = 1A to 2A step



Short Circuit Test Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V



Short Circuit Recovery Waveforms

V_{IN} = 12V, V_{OUT} = 3.3V