MP2363

3A, 27V, 365KHz Step-Down Converter

The Future of Analog IC Technology

DESCRIPTION

The MP2363 is a non-synchronous step-down regulator with an integrated Power MOSFET. It achieves 3A 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. Adjustable soft-start reduces the stress on the input source at turn-on. In shutdown mode, the regulator draws 20µA of supply current.

The MP2363 requires a minimum number of readily available external components to complete a 3A step-down DC to DC converter solution.

The MP2363 is available in an 8-pin SOIC package.

EVALUATION BOARD REFERENCE

Board Number	Dimensions
EV2363DN-00A	2.0"X x 1.9"Y x 0.4"Z

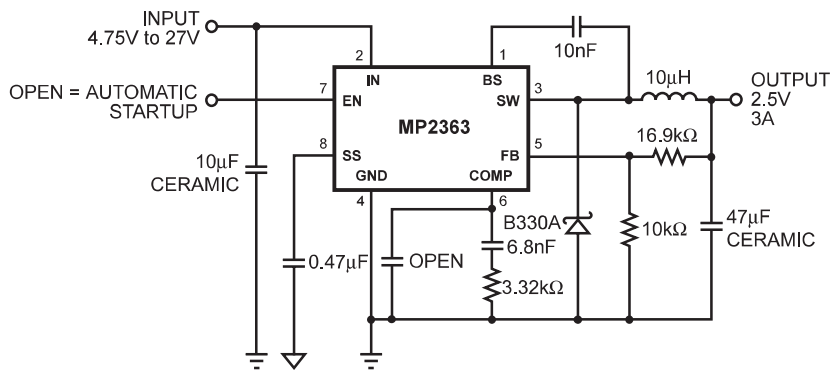
FEATURES

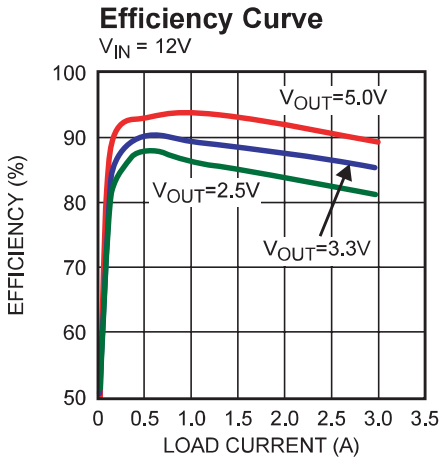
- 3A Continuous Output Current, 4A Peak Output Current
- Programmable Soft-Start
- 100mΩ Internal Power MOSFET Switch
- Stable with Low ESR Output Ceramic Capacitors
- Up to 95% Efficiency
- 20µA Shutdown Mode
- Fixed 365KHz frequency
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Wide 4.75V to 27V Operating Input Range
- Output is Adjustable From 0.92V to 21V
- Under Voltage Lockout

APPLICATIONS

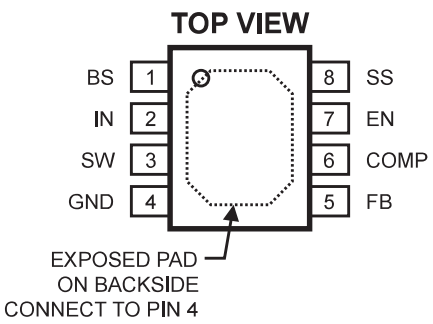
- Distributed Power Systems
- Battery Chargers
- Pre-Regulator for Linear Regulators

TYPICAL APPLICATION





PACKAGE REFERENCE



Part Number*	Package	Temperature
MP2363DN	SOIC8N	–40°C to +85°C

* For Tape & Reel, add suffix –Z (eg. MP2363DN–Z)
For RoHS Compliant Packaging, add suffix –LF (eg. MP2363DN–LF–Z)

ABSOLUTE MAXIMUM RATINGS (1)

Supply Voltage V_{IN} ..... –0.3V to +28V
Switch Voltage V_{SW} ..... –1V to V_{IN} + 0.3V
Boost Voltage V_{BS} ..... V_{SW} – 0.3V to V_{SW} + 6V
All Other Pins ..... –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 27V
Ambient Operating Temp ..... –40°C to +85°C

Thermal Resistance (3)

	θ_{JA}	θ_{JC}	
SOIC8N	50	10	°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.

Parameters	Symbol	Condition	Min	Typ	Max	Units
Shutdown Supply Current		V_{EN} = 0V		20	30	µA
Supply Current		V_{EN} = 3V, V_{FB} = 1.4V		1.0	1.2	mA
Feedback Voltage	V_{FB}	4.75V ≤ V_{IN} ≤ 27V	0.90	0.92	0.94	V
Error Amplifier Voltage Gain (4)	A_{VEA}			400		V/V
Error Amplifier Transconductance	G_{EA}	ΔI_{COMP} = ±10µA	500	800	1120	µA/V
High-Side Switch On-Resistance (4)	$R_{DS(ON)1}$			100		mΩ
Low-Side Switch On-Resistance	$R_{DS(ON)2}$			6		Ω
High-Side Switch Leakage Current		V_{EN} = 0V, V_{SW} = 0V		0.1	10	µA
Short Circuit Current Limit			4.5	5.7		A
Current Sense to COMP Transconductance	G_{CS}			7.0		A/V
Oscillation Frequency	f_S		315	365	415	KHz
Short Circuit Oscillation Frequency		V_{FB} = 0V	20	35	50	KHz
Maximum Duty Cycle	D_{MAX}	V_{FB} = 0.8V		88		%
Minimum On Time (4)	T_{ON}			120		ns
EN Threshold Voltage			0.9	1.2	1.5	V
Enable Pull Up Current		V_{EN} = 0V	0.9	1.4	2.2	µA
Under Voltage Lockout Threshold		V_{IN} Rising	2.37	2.54	2.71	V
Under Voltage Lockout Threshold Hysteresis				210		mV
Thermal Shutdown (4)				160		°C

Note:
4) Guaranteed by design.

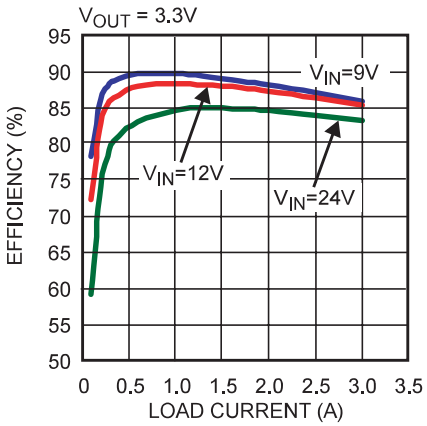
PIN FUNCTIONS

Pin #	Name	Description
1	BS	High-Side Gate Drive Boost Input. BS supplies the drive for the high-side N-Channel MOSFET switch. Connect a 10nF or greater capacitor from SW to BS to power the high-side switch.
2	IN	Power Input. IN supplies the power to the IC, as well as the step-down converter switches. Drive IN with a 4.75V to 27V power source. Bypass IN to GND with a suitably large capacitor to eliminate noise on the input to the IC. See *Input Capacitor* section of Application Information.
3	SW	Power Switching Output. SW is the switching node that supplies power to the output. Connect the output LC filter from SW to the output load. Note that a capacitor is required from SW to BS to power the high-side switch.
4	GND	Ground. Connect the exposed pad on backside to Pin 4.
5	FB	Feedback Input. FB senses the output voltage to regulate said voltage. Drive FB with a resistive voltage divider from the output voltage. The feedback threshold is 0.92V. See *Setting the Output Voltage* section of Application Information.
6	COMP	Compensation Node. COMP is used to compensate the regulation control loop. Connect a series RC network from COMP to GND to compensate the regulation control loop. In some cases, an additional capacitor from COMP to GND is required. See *Compensation* section of Application Information.
7	EN	Enable Input. EN is a digital input that turns the regulator on or off. Drive EN higher than 2.71V to turn on the regulator, lower than 0.9V to turn it off. For automatic startup, leave EN unconnected.
8	SS	Soft Start Control Input. SS controls the soft start period. Connect a capacitor from SS to GND to set the soft-start period. Soft-start cap is always recommended to eliminate the start-up inrush current and for a smooth start-up waveform.

TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = 12V, V_{OUT} = 2.5V, L = 15µH, C1 = 10µF, C2 = 22µF, T_A = +25°C, unless otherwise noted.

Efficiency Curve vs Load Current



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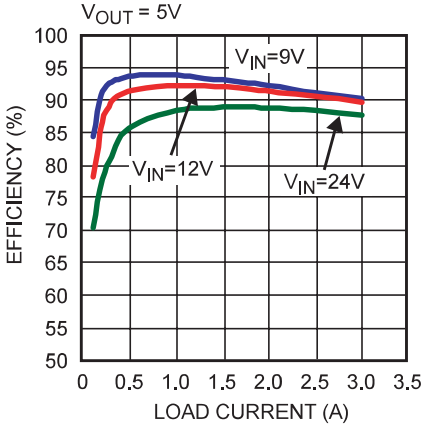

Limit Current vs Duty Cycle