2MHz, 3A Synchronous Step Down Converter

Features

- Two internal MOSFETs with typical Rds(on) of 50mΩ for high efficiency at 3A loads
- Switching frequency from 200kHz to 2MHz
- Voltage reference of 0.803V ± 1%
- Synchronizes to external clock from 300kHz to 2MHz
- Adjustable Slow Start/Sequencing
- Low Operating and Shutdown Quiescent Current
- Cycle-by-Cycle Current Limit, Thermal and Frequency Fold Back Protection
- RoHS-compliant and halogen-free (HF)

APPLICATIONS

- DSPs, FPGAs, ASIC, and Microprocessors
- I/O Supplies
- System Power Supplies

Description

The APE1563 is a synchronous step-down converter with integrated MOSFETs. The current-mode PWM DC/DC converter reduces the external component count and the high switching frequency (up to 2MHz) allows the use of smaller inductors.

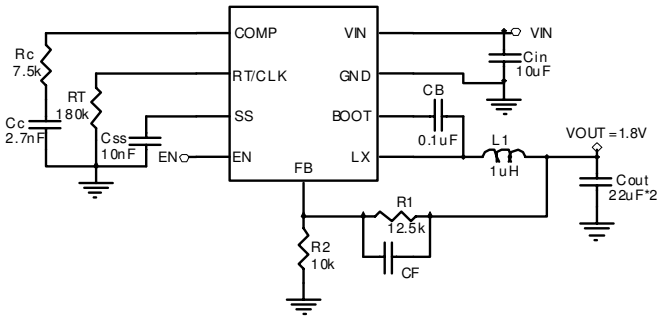
The APE1563(A) combination of integrated MOSFETs and 500uA (350uA) operating current maximizes the efficiency. The highly accurate reference voltage (1%) over the temperature range provides good load regulation.

The APE1563 supports two operating modes: auto-skip mode is for high efficiency in light loading, and PWM-only mode is for low noise operation.

The APE1563A operates only in PWM-only mode.

The soft start time is adjustable using an external resistor at the SS pin. The UVLO threshold is set at 2.6V internally and can be increased using an external resistor at the EN pin. The APE1563 also features frequency fold-back and thermal shutdown to protect the device against over-current fault conditions.

Typical Application



Ordering information

APE1563(A)XX-HF-3TR

Packing Type:
TR: Tape and reel

Package Type:
MP: ESO-8

Example:

APE1563(A)MP-HF-3TR : in RoHS-compliant, halogen-free ESO-8, shipped on tape and reel (3000 pcs/reel).

Absolute Maximum Ratings (at T_A = 25℃)

At the pin:

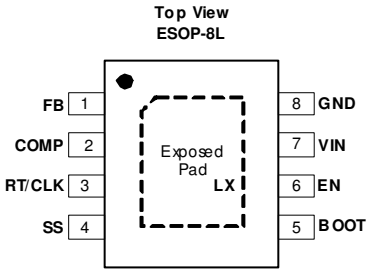
VIN	-0.3V to 6V
EN	-0.3V to 6V
LX	-0.3V to 6V
BOOT	LX+6V
COMP	-0.3V to 6V
RT/CLK	-0.3V to 6V
FB, SS	-0.3V to 6V

Storage Temperature Range (T_{ST})	-65 to +150℃
Junction Temperature (T_J)	150℃
Lead Temperature (Soldering, 10sec.)	260℃
Thermal Resistance from Junction to Ambient (Rth_{JA})	
ESOP-8L	50℃/W

Recommended Operating Conditions

VIN	2.95V to 6V
EN	-0.3V to 6V
LX	-0.3V to 6V
Operating Temperature Range	-40℃ to 85℃

Pin Assignment



Pin Functional Descriptions

PIN No.	PIN SYMBOL	PIN DESCRIPTION
1	FB	Output feedback pin.
2	COMP	Compensation pin. Connect frequency compensation components at this pin.
3	RT/CLK	Resistor timing or external clock input pin.
4	SS	Soft-start pin. Connect an external capacitor to adjust the output rise time.
5	BOOT	Supply input for internal high-side N-MOSFET gate drive (boot terminal). Connect a bootstrap capacitor from this pin to LX node.
6	EN	Enable pin, internal pull-up current source.
7	VIN	Input supply voltage from 2.95V to 6V.
8	GND	Ground.
Exposed pad	LX	Switching node.

Electrical Characteristics

(V_{IN}=2.95 to 6V, T_A =25℃, unless otherwise specified)

PARAMETER	SYM	TEST CONDITION	MIN	TYP	MAX	UNIT
Input						
Operation Voltage Range	V_N		2.95		6	V
Under Voltage Lockout Threshold	UVLO	Rising		2.6	2.8	V
		hysteresis		200		mV
Quiescent Current	I_Q	APE1563, V_{FB}=0.9V, RT=400kΩ		500		uA
		APE1563A, V_{FB}=0.9V, RT=400kΩ		400		uA
Shutdown Current	I_{SD}	EN=0V, 0.95V≦VIN≦6V		3		uA
EN Threshold	V_{EN}	Rising		1.25		V
		Falling		1.18		V
EN Input Current	I_{EN}	V_{EN} + 50mV		-3.2		uA
		V_{EN} - 50mV		-0.65		uA
Reference Voltage	V_{FB}	VIN=2.95 to 6V	0.795	0.803	0.811	V
Controller						
High Side Switch Resistance (Note1)	R_{DRVH}	BOOT-LX=5V		50		mΩ
		BOOT-LX=2.95V		64		mΩ
Low Side Switch Resistance (Note1)	R_{DRVL}	V_{IN}=5V		50		mΩ
		V_{IN}=2.95V		64		mΩ
Switching Current Limit	I_{LM}		5			A
LX Rise/Fall Time (Note1)		V_{IN}=5V		1.5		V/ns
BOOT Charge Resistance		V_{IN}=5V		16		Ω
Error Amplifier						
COMP Leakage Current				7		nA
EA Transconductance (Note1)	gm	I_{COMP} = ±2uA, V_{COMP}=1V		225		uA/V
COMP Sink/Source Current		V_{COMP}=1V, 0.1V overdrive		±20		uA
Current Sense to COMP Transconductance (Note1)	gm_{CS}			13		A/V

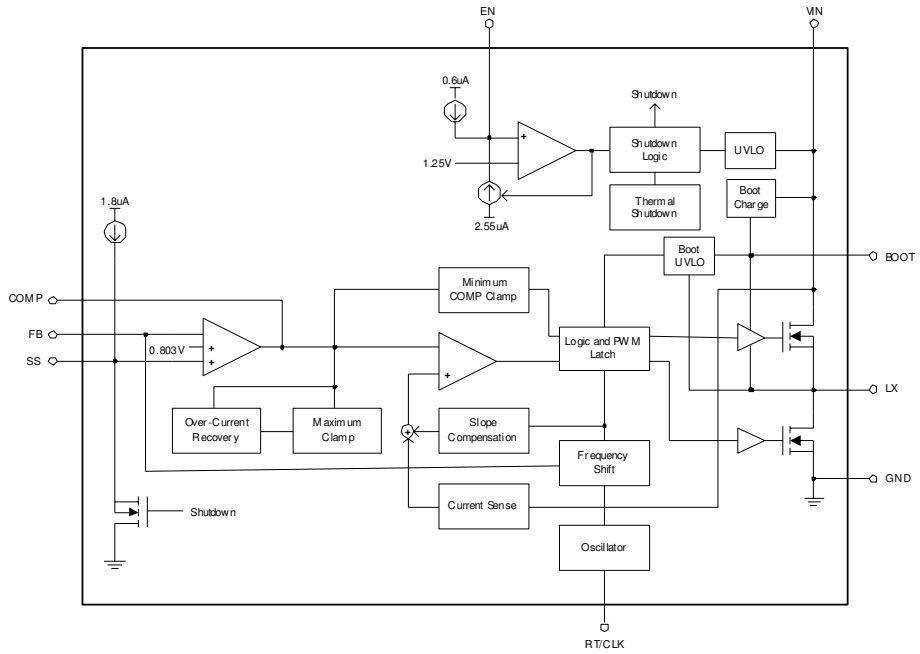
Electrical Characteristics

(T_A =25°C, unless otherwise specified)

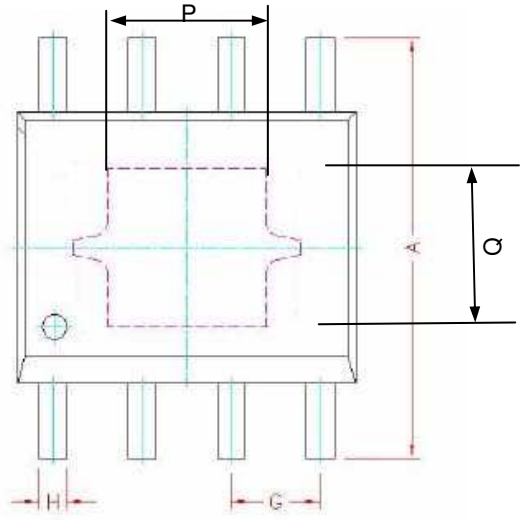
PARAMETER	SYM	TEST CONDITION	MIN	TYP	MAX	UNIT
Resistor Timing and External Clock (RT/CLK)						
Switching Frequency Range		RT mode	200		2000	kHz
		CLK mode	300		2000	kHz
Switching Frequency	fsw	RT=400kΩ	400	500	600	kHz
Minimum CLK ON Time	T_{CLK_MIN}			75		ns
RT/CLK Voltage	$V_{RT/CLK}$	RT=400kΩ		0.5		V
RT/CLK Threshold		High		1.6	2.2	V
		Low	0.4	0.6		V
Delay Time (Note1)	t_D	RT/CLK falling to LX rising edge, fsw=500kHz, with RT resistor		150		ns
Soft Start (SS)						
SS Charge Current	I_{SS}	Vss=0.4V		1.8		uA
SS Discharge Current	I_{SS-D}	UVLO, EN, Thermal fault, V_{IN}=5V, Vss=0.5V		1.25		mA
		Over-current, V_{FB}=0V		40		uA
Thermal Shutdown						
Thermal Shutdown Threshold (Note1)	T_{SD}			150		°C
		Hysteresis		20		°C

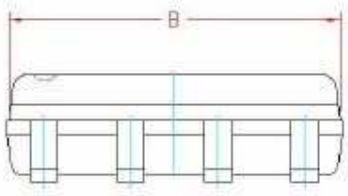
Note1: Guaranteed by design, not production tested.

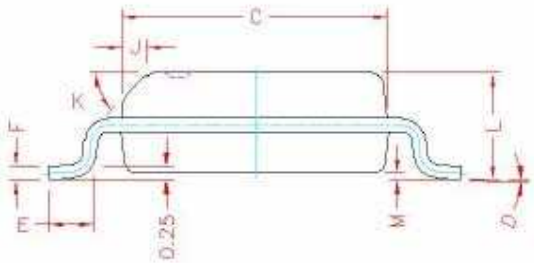
Block Diagram



Package Dimensions: ESOP-8



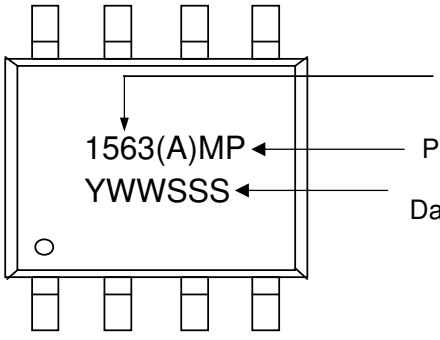




	Millimeters		
SYMBOLS	MIN	NOM	MAX
A	5.80	6.00	6.20
B	4.80	4.90	5.00
C	3.80	3.90	4.00
D	0°	4°	8°
E	0.40	0.65	0.90
F	0.19	0.22	0.25
M	0.00	0.08	0.15
H	0.35	0.42	0.49
L	1.35	1.55	1.75
J	0.375 REF.		
K	45°		
G	1.27 TYP.		
P	2.15	2.25	2.35
Q	2.15	2.25	2.35

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information



Product : APE1563 or APE1563A

Package code : MP = RoHS-compliant halogen-free ESOP-8

Date/lot code (YWWSSS)

Y: Last digit of the year

W: Work week

SSS: Lot code sequence