Low-Noise Synchronous PWM Step-Down DC/DC Converter

FEATURES

- 95% Efficiency or up
- 700mA Guaranteed Output Current.
- Adjustable Output Voltage from 0.75V to VIN of a range from +2.5V to 6.5V.
- Very Low Quiescent Current: 35μA (Typ.).
- Fixed- 500KHz or Adjustable Frequency Synchronous PWM Operation.
- Synchronizable external Switching Frequency up to 1MHz.
- Accurate Reference: 0.75V (±2%).
- 100% Duty Cycle in Dropout.
- Low Profile 8-Pin MSOP Package.

APPLICATIONS

- PDAs.
- Digital Still Cameras.
- Handy-Terminals.
- Cellular Phones.
- CPU I/O Supplies.
- Cordless Phones.
- Notebook Chipset Supplies.
- Battery-Operated Devices (4 NiMH/ NiCd or 1 Li-ion Cells).

DESCRIPTION

The AIC1554 is a low-noise pulse-width-modulated (PWM) DC-DC step-down converter. It powers logic circuits in PDAs and small wireless systems such as cellular phones, handy-terminals.

The device features an internal synchronous rectifier for high conversion efficiency. Excellent noise characteristics and fixed-frequency operation provide easy post-filtering. The AIC1554 is ideally suited for Li-ion battery applications. It is also suitable for +3V or +5V fixed input applications. The device can operate in either one of the following four modes.

(1) **Forced PWM mode** operates at a fixed frequency regardless of the load.

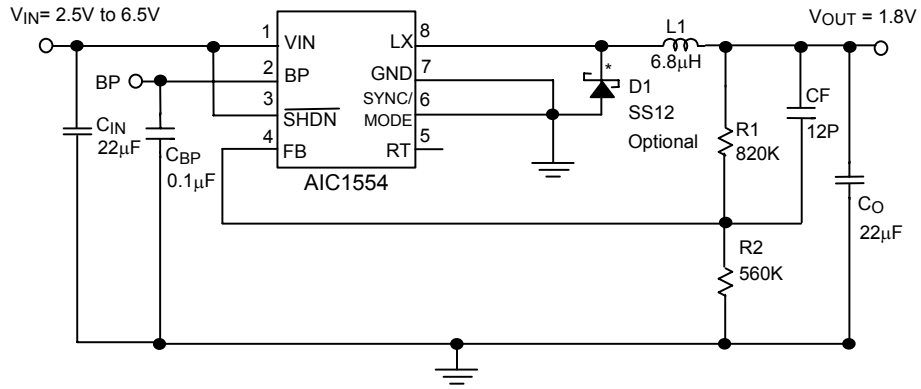
(2) **Synchronizable PWM mode** allows the synchronization by using an external switching frequency with a minimum harmonics.

(3) **PWM/PFM Mode** extends battery life by switching to a PFM pulse-skipping mode under light loads.

(4) **Shutdown mode** sets device to standby, reducing supply current to 0.1μA or under.

The AIC1554 can deliver over 700mA output current. The output voltage can be adjusted from 0.75V to VIN ranging from +2.5V to +6.5V. Other features of the AIC1554 include low quiescent current, low dropout voltage, and a 0.75V reference of ±2% accuracy. It is available in a space-saving 8-pin MSOP package.

TYPICAL APPLICATION CIRCUIT



C_{IN}: TAIYO YUDEN LMK316F226ZL-T Ceramic capacitor

C_{O1}: TAIYO YUDEN LMK316F226ZL-T Ceramic capacitor

L1: TDK SLF6025-6R8M1R3

D1: GS SS12

* Note: Efficiency can boost 2% to 4% if D1 is connected.

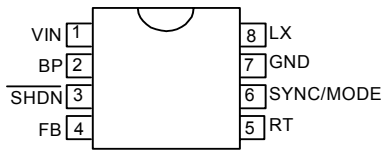
ORDERING INFORMATION

AIC1554XXXX

- PACKING TYPE
  TR: TAPE & REEL
  TB: TUBE
- PACKAGING TYPE
  O:MSOP8
- C: Commercial Degree
  P: Lead Free

PIN CONFIGURATION

TOP VIEW



Example: AIC1554 COTR

→ In MSOP Package & Taping & Reel Packing Type

AIC1554 POTR

→ In MSOP Lead Free Package & Taping & Reel Packing Type

ABSOLUTE MAXIMUM RATINGS

VIN, BP, SHDN, SYNC/MODE, RT to GND ..... -0.3 to +7V

BP to VIN ..... -0.3 to 0.3V

LX to GND ..... -0.3 ~ (V_{IN}+0.3V)

FB to GND ..... -0.3 ~ (V_{BP}+0.3V)

Operating Temperature Range ..... -40°C ~ 85°C

Junction Temperatrue ..... 125°C

Storage Temperature Range ..... - 65°C ~ 150°C

Lead Temperature (Soldering. 10 sec) ..... 260°C

Absolute Maximum Ratings are those values beyond which the life of a device may be Impaired.

ELECTRICAL CHARACTERISTICS

(V_{IN}=+3.6V, T_A=+25°C, SYNC/MODE =GND, $\overline{SHDN}$ =IN, unless otherwise specified.) (Note1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Voltage Range	V_{IN}			2.5		6.5	V
Output Adjustment Range	V_{OUT}			V_{REF}		V_{IN}	V
Feedback Voltage	V_{FB}			0.735	0.75	0.765	V
Line Regulation		Duty Cycle = 100% to 23%			+1		%
Load Regulation		I_{OUT} = 0 to 700mA			-1.3		%
FB Input Current	I_{FB}	V_{FB} = 1.4V,		-50	0.01	50	nA
P-Channel On-Resistance	$P_{RDS(ON)}$	I_{LX} = 100mA	V_{IN} = 3.6V		0.32	0.65	Ω
			V_{IN} = 2.5V		0.38		
N-Channel On-Resistance	$N_{RDS(ON)}$	I_{LX} = 100mA	V_{IN} = 3.6V		0.32	0.65	Ω
			V_{IN} = 2.5V		0.38		
P-Channel Current-Limit Threshold		(Note 2)		1	1.5	2.1	A
Quiescent Current		SYNC/MODE = GND, V_{FB} = 1.4V, LX unconnected			35	70	μA
Shutdown Supply Current		$\overline{SHDN}$ = LX = GND, includes LX leakage current			0.1	1	μA
LX Leakage Current		V_{IN} = 5.5V, V_{LX} = 0 or 5.5V		-20	0.1	20	μA
Oscillator Frequency	f_{OSC}			400	500	600	KHz
SYNC Capture Range				500		1000	KHz
Maximum Duty Cycle	$duty_{MAX}$			100			%
Undervoltage Lockout Threshold	UVLO	V_{IN} rising, typical hysteresis is 85mV		1.9	2.0	2.1	V
Logic Input High	V_{IH}	$\overline{SHDN}$, SYNC/MODE, LIM		2			V
Logic Input Low	V_{IL}	$\overline{SHDN}$, SYNC/MODE, LIM				0.4	V
Logic Input Current		$\overline{SHDN}$, SYNC/MODE, LIM		-1	0.1	1	μA
SYNC/MODE Minimum Pulse Width		High or low		500			nS

Note 1: Specifications are production tested at TA=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note 2: Maximum specification is guaranteed by design, not production tested.

PIN DESCRIPTIONS

PIN 1: VIN- Supply Voltage Input ranging from +2.5V to +6.5V. Bypass with a 22µF capacitor.

PIN 2: BP- Supply Bypass Pin internally connecting to VIN. Bypass with a 0.1µF capacitor.

PIN 3: $\overline{\text{SHDN}}$ - Active-Low, Shutdown-Control Input reducing supply current to 0.1µA in shutdown mode.

PIN 4: FB- Feedback Input.

PIN 5: RT- Frequency Adjustable Pin connecting to GND through a resistor to increase frequency. (Refer to Fig. 15)

PIN 6: SYNC/MODE-

Oscillator Sync and Low-Noise, Mode-Control Input.

SYNC/MODE = VIN (Forced PWM Mode)

SYNC/MODE = GND (PWM/PFM Mode)

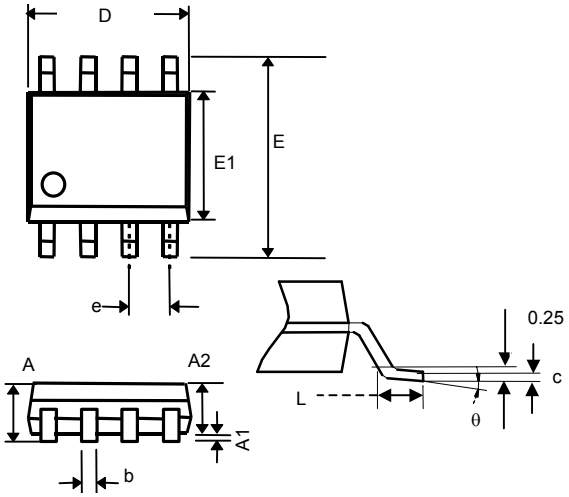
An external clock signal connecting to this pin allows LX switching synchronization.

PIN 7: GND- Ground.

PIN 8: LX- Inductor connecting to the Drains of the Internal Power MOSFETs

PHYSICAL DIMENSIONS

- **MSOP 8 (CO) (PO) (unit: mm)**



SYMBOL	MIN	MAX
A	-	1.10
A1	0.05	0.15
A2	0.75	0.95
b	0.25	0.40
c	0.13	0.23
D	2.90	3.10
E	4.90 BSC	
E1	2.90	3.10
e	0.65 BSC	
L	0.40	0.70
θ	0°	6°

Note:

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