

NCP1423

Product Preview

200 mA Sync-Rect PFM Step-Up DC-DC Converter with Ring-Killer

NCP1423 is a monolithic micropower high frequency step-up switching converter IC specially designed for battery operated hand-held electronic products up to 200 mA loading. It integrates Synchronous Rectifier for improving efficiency as well as eliminating the external Schottky Diode. High switching frequency (up to 600 kHz) allows low profile inductor and output capacitor being used. When the IC is disabled, internal conduction path from LX or BAT to OUT is blocked, OUT pin is isolated from the battery. This achieves True-Cutoff. Ring-Killer is also integrated to eliminate the high frequency ringing in discontinuous conduction mode. Low-Battery Detector, Cycle-by-Cycle Current Limit, Overvoltage-Protection and Thermal Shutdown provide value-added features for various battery operated application. With all these functions ON, the quiescent supply current is only 9.0 μ A. This device is available in compact Micro-10 package.

Features

- High Efficiency: 95% for 3.3 V Output@ 100 mA from 1.2 V Input
92% for 2.5 V Output@ 50 mA from 1.2 V Input
85% for 1.8 V Output@ 70 mA from 0.8 V Input
- High Switching Frequency, up to 600 kHz (not hitting current limit)
- Low Quiescent Current of 9.0 μ A
- Low Battery Detector
- 0.8 V Startup at No Load Guaranteed
- Ext. Adj. Output Voltage
- Ring-Killer for Discontinuous Conduction Mode
- Thermal Shutdown
- 1.5 A Cycle by Cycle Current Limit
- Output Current up to 200 mA
- Overvoltage Protection
- Low Profile and Minimum External Part
- Open Drain Low-Battery Detector Output
- Compact Micro-10 Package

Typical Applications

- Personal Digital Assistants (PDA)
- Cellular
- Camcorders and Digital Still Camera
- Hand-held instrument
- Conversion from one NiH or NiCd or one Lithium-ion cells to 1.8 V/3.3 V/5.0 V

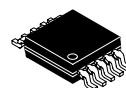
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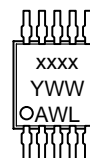
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MARKING DIAGRAM

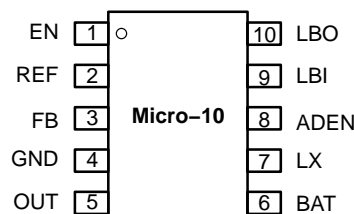


Micro-10
DM SUFFIX
CASE 846B



xxxx = Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

Device	Package	Shipping†
NCP1423DM	Micro-10	3000 Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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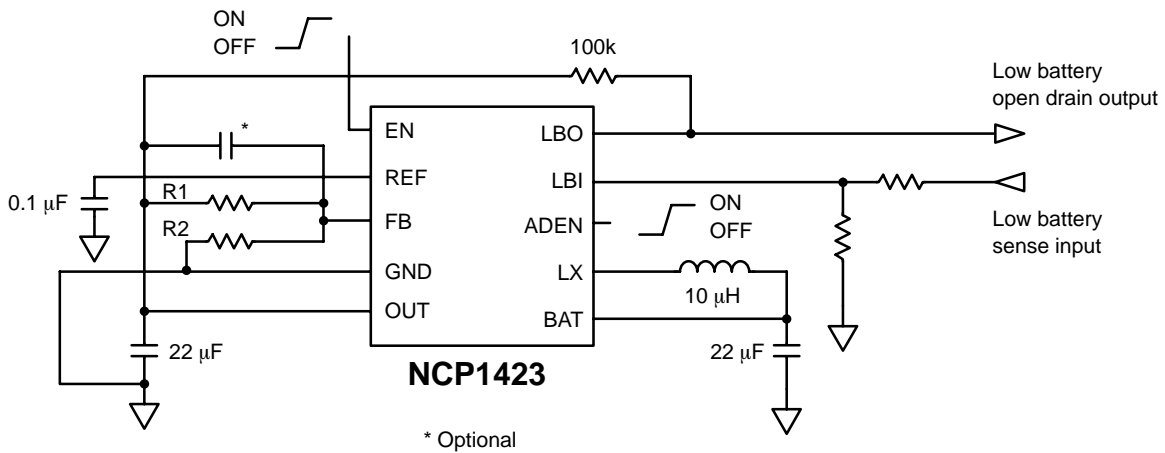


Figure 1. Typical Operation Circuit

PIN DESCRIPTION

Pin No.	Symbol	Description
1	EN	Low-Battery Detector Input and Enable. With this pin pulled down below 0.5 V, the device will be disabled and will enters shutdown mode
2	REF	1.195 V Reference Voltage Output, bypass with 0.1 μ F capacitor if this pin is not loaded, with a 1.0 μ F bypassing capacitor, this pin can be loaded up to 2.5 mA @ $V_{OUT} = 3.3$ V.
3	FB	Output Voltage Feedback Input
4	GND	Ground
5	OUT	Power Output. OUT provides bootstrap power to the IC
6	BAT	Battery supply input pin and connection for internal Ring-Killer
7	LX	N-Channel and P-Channel Power MOSFET Drain
8	ADEN	Auto Discharge Input
9	LBI	Low-Battery Detector Input
10	LBO	Open-Drain Low-Battery Detector Output. Output is Low when V_{LBI} is < 560 mV. LBO is high impedance shutdown

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply (Pin 6)	V_{OUT}	-0.3, 6.0	V
Input / Output Pins Pins 1,3,5,7-9,10	V_{IO}	-0.3, 6.0	V
Thermal Characteristics Micro-10 Plastic Package, Case 846B, $T_A = 70^\circ\text{C}$ Thermal Resistance Junction to Air	P_D $R_{\theta JA}$	444 250	mW $^\circ\text{C/W}$
Operating Junction Temperature Range	T_J	- 40 to + 150	$^\circ\text{C}$
Operating Ambient Temperature Range	T_A	- 40 to + 85	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 55 to +150	$^\circ\text{C}$

NOTE: ESD data available upon request.

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ELECTRICAL CHARACTERISTICS

($V_{OUT} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$ for typical value, $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ for min/max values unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Operating Voltage	V_{IN}	0.8	–	V_{OUT}	V
Output Voltage Range	V_{OUT}	1.5	–	5.0	V
Minimum Input Voltage for start-up ($R_{LOAD} = 33\ \Omega$)	V_{IN_MIN}	–	0.85	0.9	V
Reference Voltage ($V_{OUT} = 3.3\text{ V}$, $I_{LOAD} = 0\ \mu\text{A}$, $C_{ref} = 100\ \text{nF}$, $T_A = 25^\circ\text{C}$)	V_{REF}	1.181	1.195	1.207	V
Reference Voltage Temperature Coefficient	TC_{VREF}	–	0.03	–	mV/ $^\circ\text{C}$
FB Input Threshold ($I_{LOAD} = 0\ \text{mA}$, $T_A = -40^\circ\text{C}$ to 85°C)	V_{FB}	0.485	0.50	0.515	V
FB Input Current	I_{FB}	–	1.0	–	nA
Internal NFET ON-Resistance ($I_{LX} = 100\ \text{mA}$, $V_{OUT} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$)	$R_{DS(ON)_N}$	–	0.3	–	Ω
Internal PFET ON-Resistance ($I_{LX} = 100\ \text{mA}$, $V_{OUT} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$)	$R_{DS(ON)_P}$	–	0.6	–	Ω
LX Switch Current Limit (NFET) (Note 1)	I_{LIM}	–	1.5	–	A
Operating Current into OUT ($V_{FB} = 0.7\text{ V}$, $V_{OUT} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$)	I_Q	–	9.0	TBD	μA
Operating Current into BAT ($V_{BAT} = 1.2\text{ V}$, $V_{FB} = 0.7\text{ V}$, $V_{LX} = 1.2\text{ V}$, $V_{out} = 3.3\text{ V}$)	I_{QBAT}	–	1.0	3.0	μA
Shutdown Current into BAT ($LBI/EN = 0\text{ V}$, $V_{OUT} = 3.3\text{ V}$, $V_{BAT} = 3.3\text{ V}$, $T_A = -40^\circ\text{C}$ to 85°C)	I_{BAT_SD}	–	–	TBD	μA
LX Switch MAX. ON-Time ($V_{FB} = 0\text{ V}$, $V_{OUT} = 3.3\text{ V}$)	t_{ON}	TBD	1.42	TBD	μs
LX Switch MIN. OFF-Time ($V_{FB} = 0\text{ V}$, $V_{OUT} = 3.3\text{ V}$)	t_{OFF}	TBD	240	TBD	ns
BAT to LX Resistance ($V_{FB} = 1.0\text{ V}$, $V_{OUT} = 3.3\text{ V}$)	R_{BAT_LX}	–	100	–	Ω
LBI Input Threshold	V_{LBI}	0.48	0.50	0.52	V
LBI Input Hysteresis	V_{LBI_HYS}	–	10	–	mV
LBI Input Current	I_{LBI}	–	1.5	–	nA
LBO Low Output Voltage ($V_{LBI} = 0\text{ V}$, $I_{SINK} = 1.0\ \text{mA}$)	V_{LBO_L}	–	–	0.2	V
Minimum Output Current ($V_{OUT} = 3.3\text{ V}$, $V_{IN} = 2.5\text{ V}$)	I_{OUT}	200	–	–	mA
Minimum Output Current ($V_{OUT} = 3.3\text{ V}$, $V_{IN} = 0.8\text{ V}$)	I_{OUT}	100	–	–	mA
Soft Start Time ($V_{OUT} = 3.3\text{ V}$, $V_{IN} = 1.2\text{ V}$, $T_A = 25^\circ\text{C}$)	T_{SS}	–	TBD	TBD	ms
EN Shutdown Threshold ($V_{BAT} = 1.2\text{ V}$)	V_{SHDN}	–	0.2	–	V
EN Input Current	I_{EN}	–	1.5	–	nA
EN Shutdown Hysteresis	V_{SHDN_HYS}	–	10	–	mV
ADEN Threshold ($V_{BAT} = 0.8\text{ V}$ to 3.3 V)	V_{ADEN}	–	$0.5 \cdot V_{BAT}$	–	V
ADEN Input Current	I_{ADEN}	–	1.5	–	nA
ADEN Hysteresis	V_{ASHDN_HYS}	–	10	–	mV
ADEN Switch Resistance ($V_{OUT} = 3.3\text{ V}$)	R_{ADEN}	–	300	–	Ω
Line Regulation ($I_{OUT} = 100\ \text{mA}$, $V_{OUT} = 3.3\text{ V}$)	V_{LINE_REG}	–	0.3	–	%/V
Load Regulation (50 mA to 100 mA, $V_{IN} = 1.2\text{ V}$, $V_{OUT} = 3.3\text{ V}$)	V_{LOAD_REG}	–	0.1	–	%/V
Thermal Shutdown Temperature (Note 1)	T_{SHDN}	–	–	145	$^\circ\text{C}$
Thermal Shutdown Hysteresis (Note 1)	T_{SDHYS}	–	30	–	$^\circ\text{C}$

1. Values are design guarantee.

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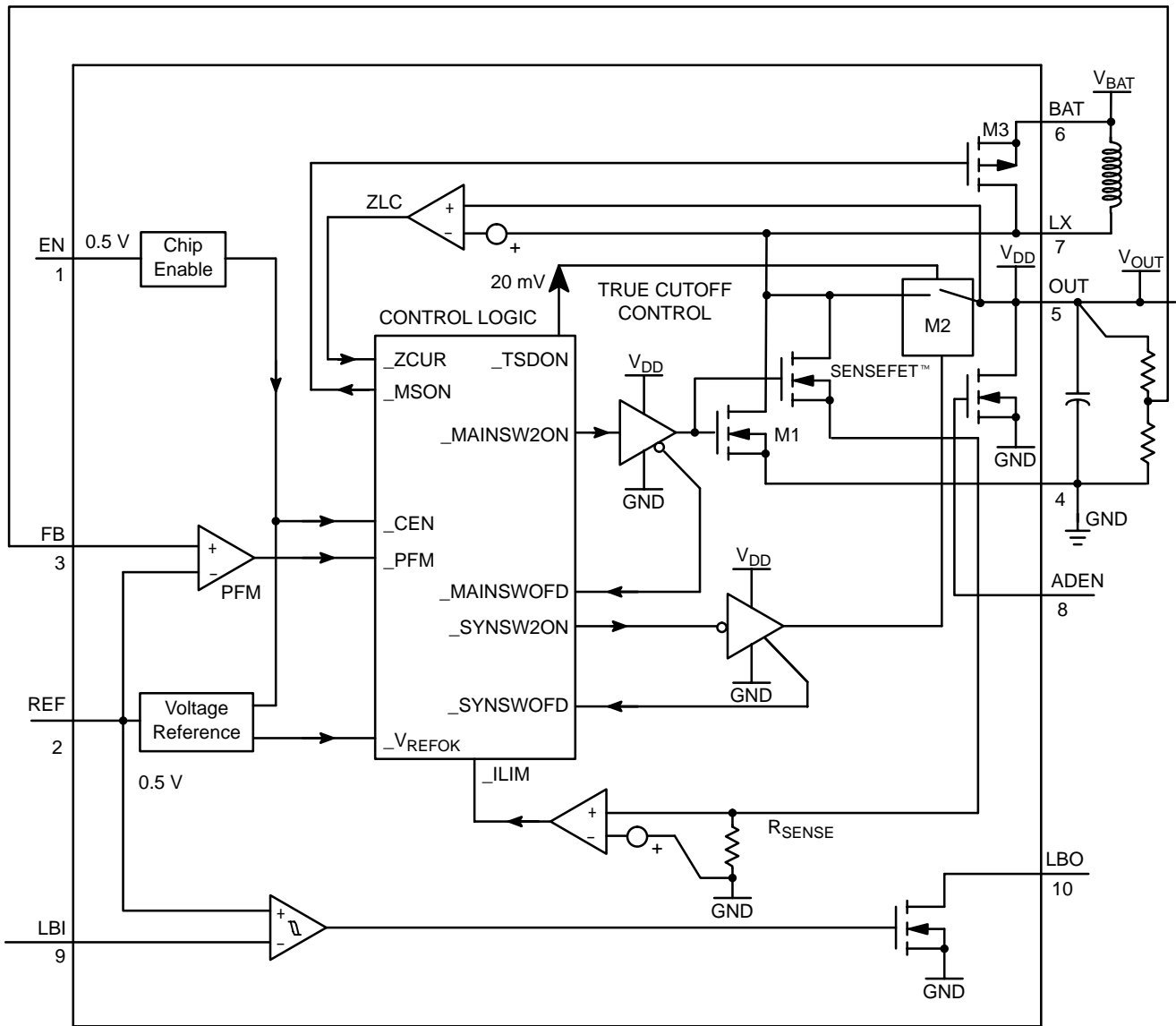
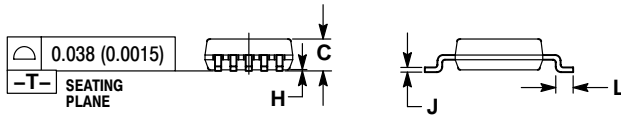
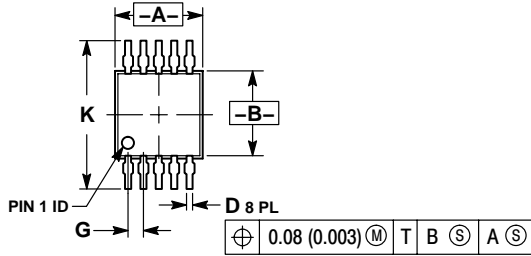


Figure 2. Detailed Block Diagram

NCP1423

PACKAGE DIMENSIONS

Micro-10
DM SUFFIX
CASE 846B-03
ISSUE C



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION "A" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION "B" DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. 846B-01 OBSOLETE. NEW STANDARD 846B-02

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	0.95	1.10	0.037	0.043
D	0.20	0.30	0.008	0.012
G	0.50 BSC		0.020 BSC	
H	0.05	0.15	0.002	0.006
J	0.10	0.21	0.004	0.008
K	4.75	5.05	0.187	0.199
L	0.40	0.70	0.016	0.028

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